ECB Unconventional Monetary Policy Actions: Market Impact, international Spillovers and Transmission Channels

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Abstract

This paper quantifies the impact of the most important ECB's non-standard monetary policy measures on asset prices in the euro area and globally. The paper also tests for a number of transmission channels of policies to asset markets, including a portfolio balance channel and different risk channels. The results show that ECB policies were beneficial on impact for asset prices in the euro area and lowered market fragmentation in bond markets. Spillovers to advanced economies and emerging markets included a positive impact on global equity markets and confidence. We show that ECB policies lowered credit risk among banks and sovereigns in the G20 countries, while they did not lead to international portfolio rebalancing across regions and assets.

JEL Codes: E52, E58, F32, F34, G15.
Keywords: unconventional monetary policy, quantitative easing, asset prices, capital flows, European Central Bank.

1 Introduction

The domestic effectiveness of unconventional monetary policies and their international spillovers to global asset prices and capital flows have dominated policy discussions over recent years[1]. The debate has intensified since May 2013 in relation to the tapering off of US quantitative easing (QE) polices. On the one hand, policy makers in emerging markets emphasize that unconventional monetary policy could have destabilizing international spillovers by leading to volatility swings in capital flows and asset prices. Therefore, they call for more policy coordination and cooperation across the globe. On the other hand, policy makers in advanced economies argue that, while there are indeed risks associated with unconventional monetary policies, they are effective from the domestic point of view and help the economic recovery. In doing so, unconventional monetary policies ultimately have overall positive spillovers to the global economy. Furthermore, it appears that market volatility and in particular "risk on" and "risk off" modes in global markets (Bernanke, 2012)[2] are often determined by exogenous events which are not under the direct influence of central banks. In this context, policy makers in emerging markets should focus on adopting appropriate domestic policies which would preserve monetary independence, smooth the spillovers of third countries' policies and preserve macro-financial stability.

This empirical study analyses and quantifies the impact of the most important ECB's non-standard policy measures on asset prices and exchange rates in the euro area and globally. In line with the bipolarization of the debate, we differentiate between the spillovers to emerging markets and to other advanced economies. In addition, this paper tests for a number of transmission channels of policies to international financial markets, namely an international portfolio balance channel and different risk channels. Following a related paper (Fratzscher, Lo Duca and Straub, 2013), we differentiate between the impact of announcements of policies and the impact of their actual implementation thereafter.

More specifically, we look at the impact of ECB policies on equity and exchange rate returns, changes in yields, changes in risk measures and capital flows across countries in a panel model over the period May 2007 to September 2012, using daily data. Using daily data allows for a more precise identification of the effects of unconventional monetary policy on financial variables (Wright, Scotti and Rogers, 2014, among several others). We control for a large number of shocks including, among other things, macroeconomic data releases, sovereign bond auctions in troubled euro area countries and US monetary policy announcements. Our modeling strategy combines an event study methodology (i.e. using impulse dummies) to capture the announcement effects of policies with an approach that measures the impact of ECB long term loans to banks (focusing on Supplementary Long Term Refinancing Operation, SLTROs) and Securities Markets Programme (SMP) bond purchases. Concerning the SMP, we propose an approach that relies on publicly

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[1] See for example R. Rajan, "Global Monetary Policy: A View from Emerging Markets", Brookings Institution, April 10, 2014.

[2] B. Bernanke, "Challenges of the Global Financial System: Risks and Governance under Evolving Globalization", Tokyo, October 14, 2012.

available data and uses deviations from an estimated reaction function to identify the impact of purchases. This approach reduces/eliminates the endogeneity bias that emerges when the ECB SMP daily purchases depend on the deterioration of market conditions.

Our paper relates to a number of strands of the empirical literature studying the impact of central banks' unconventional policies on financial markets, using (high frequency) daily data. First, it relates to empirical papers quantifying the impact of policies on domestic asset prices. In this field, the literature has predominately looked at the impact of QE on US domestic financial markets (Gagnon et al. 2011; D'Amico and King, 2011; Wright, 2012; Joyce et al, 2011 for the UK; Hancock and Passmore, 2011; Stroebel and Taylor, 2012; Hattori, Shrimpf and Sushko, 2013; Rosa, 2012; Gilchrist and Zakrajsek, 2013). In this context, our paper is the first one to offer a comprehensive assessment of the impact of ECB policies on asset prices across the euro area "core" and "periphery", going beyond announcement effects. In addition, our paper presents an approach that uses publicly available data to identify the effects of the SMP by addressing the endogeneity bias that emerges when the ECB purchases bonds in response to a deterioration of market conditions. Therefore, our paper links to studies attempting to identify the effects of the SMP (Ghysels, Idier, Manganelli and Vergote, 2013; Eser and Schwaab, 2013). Second, our paper relates to empirical studies analyzing the spillovers of central bank policies to global asset prices and capital flows (Neely, 2010; Chen et al., 2012; Leduc, 2012; Fratzscher, Lo Duca and Straub, 2013; Gambacorta, Hoffmann and Peersman, 2012; Rogers, Scotti and Wright, 2014; Bowman, Londono and Sapriza, 2014; Lim, Mohapatra and Stocker, 2014; Lo Duca, Nicoletti and Vidal, 2014; Chen et al., 2014; Gilchrist, Yue and Zakrajsek, 2014). Our paper also relates to the recent literature on the relation between the global financial cycle and monetary policy in advanced economies (Rey, 2013; Obstfeld, 2014; Miranda-Agrippino and Rey, 2014). In this context, to our knowledge, our paper is the only one looking at the global impact of ECB policies. Finally, by testing for a number of transmission channels, this study contributes to the literature that analyses how unconventional monetary policies are transmitted to global markets (Christensen and Rudebusch, 2012; Bauer and Neely, 2013; Krishnamurthy and Vissing-Jorgensen, 2011; Bauer and Rudebush, 2013).

The main findings of this study are as follows. While ECB policies mainly affected financial markets in the euro area, they also had positive spillovers to global markets by increasing equity prices and lowering risk aversion and credit risk. Liquidity injections via Supplementary LTROs (with maturity from 6 to 36 months), the Outright Monetary Transactions (OMT) and the SMP (both announcements and operations) positively affected equity prices (both broad equity indexes and banking indexes) in the "core" and the "periphery" of the euro area, while they decreased bond yields in the "periphery". The OMT and the SMP (both announcements and operations) had also positive spillovers to equity prices worldwide (both broad equity indexes and banking indexes), while the overall effect of policies on international yields was negligible. The euro slightly depreciated on average in response to the ECB's unconventional measures,

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with the exception of the OMT which led the euro to appreciate slightly on average. Unconventional monetary policies in the euro area affected global markets mainly through a rise in confidence/decrease in risk aversion (as measured by a decrease in option implied equity market volatilities). They also led to a reduction of sovereign risk in euro area and other G20 countries and to a decrease in bank credit risk for euro area banks and Global Systemically Important Financial Institutions (GSIFIs). The effect of policies on risk perceptions partially explains the larger worldwide impact of policies on riskier assets such as equity prices than safer assets such as bonds.

Interestingly, we find that the response of international portfolio flows to ECB policies was small. This suggests that the price impact on ECB policies reflected mainly domestic investors' decisions. This is in contrast with Fed unconventional policies which led to large portfolio rebalancing across assets and countries (Fratzscher, Lo Duca and Straub, 2013; Lim, Mohapatra and Stocker, 2014).

The above results document that ECB policies had beneficial effects on international financial markets in the short term by lifting global asset prices and by lowering the global price of risks in periods of elevated uncertainty. Assessing the longer term implications of policies for the pricing of financial assets is left for future research. It is also beyond the scope of this study to shed light on the macroeconomic effects of ECB policies[3].

The article is organized as follows. Section 2 briefly reviews the non-standard monetary policy measures adopted by the ECB that are covered in the empirical analysis; Section 3 describes the data and the empirical approach; Section 4 presents the empirical findings; Section 5 discusses our results in relation to the literature on the global financial cycle; Section 6 conducts robustness tests and extends the analysis; Section 7 concludes.

2 ECB Non-Standard Monetary Policy Measures

This section provides an overview of the different unconventional policy instruments used by the ECB and highlights potential channels of transmission of policies to asset markets.

2.1. ECB unconventional policies

The reversal of the housing boom in the United States and the collapse of the US sub-prime mortgage market resulted in a crisis of a global dimension in 2008. In the euro area, the economic and financial collapse escalated into a sovereign crisis in 2010. At that time, markets started questioning the solvency of countries with large fiscal deficits and high debt, and a feedback loop between banking and sovereign credit risk started.

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[3] Altavilla, Giannone and Lenza (2014) analyse the financial and macroeconomic implications of the ECB announcement of "Outright Monetary Transactions".

Since the initial market strains began in 2007 and in response to the escalation of the crisis, major central banks entered into unchartered territory by adopting unconventional monetary policy actions in line with their operational frameworks and mandates. Fawley and Neely (2013) provide a detailed overview of unconventional policies of major central banks, including the ECB. We sketch below the main policy actions adopted by the ECB that we analyze in our paper[4].

Supplementary Long Term Refinancing Operations (SLTROs), with maturity between six months and one year and "Very" Long Term Refinancing Operations (VLTROs), with maturity of three years[5]. To address the illiquidity in euro area money markets, and in particular tight financing conditions at long maturities, the ECB changed the maturity structure of its liquidity-providing operations by providing collateralized loans over longer than usual time horizons. In addition to its regular and supplementary three month long term refinancing operations (LTROs / SLTROs), in March 2008 the ECB introduced six month SLTROs. Between April 2008 and October 2011, the ECB conducted twenty SLTROs with six month maturity. In the largest six month SLTRO auction the ECB allotted 50 euro billions. In May 2009, the ECB announced for the first time twelve month SLTROs and conducted four of them between June 2009 and December 2011. In the largest twelve month auction the ECB allotted around 442 euro billions. Six month operations in the ECB balance sheet peaked at around 160 euro billions in March 2009, while 12 month operations peaked at around 660 euro billions between late-2009 and early-2010. In December 2011, as the sovereign crisis intensified and bank funding conditions further deteriorated, the ECB announced two "very" long term refinancing operations (VLTROs) with three year maturity. In these two VLTROs, the ECB allotted around 1019 euro billions[6] in total.

All the SLTROs and VLTROs were pre-announced by the ECB. For example, on 7 May 2009, the ECB announced that the Governing Council decided to conduct three long term liquidity operations with one year maturity[7]. The communiqués normally specified the dates of the operations and the modalities of the auctions. Initially, auctions took place for preset amounts at variable rate tenders.[8] In October 2008, as the crisis intensified, the ECB moved to a framework where it agreed to satisfy all the liquidity demanded by banks ("full allotment") against collateral. Also, the variable rate tenders were abandoned and the cost of liquidity was linked to the average main refinancing rate (the discount rate) of the ECB over the life of loans.

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[4] In this paper, we do not analyse the impact of swap lines between major central banks and the ECB covered bond programme. The latter was relatively small in size compared to other unconventional monetary policy actions and targeted a specific market segment.

[5] The ECB did not officially use the name Very Long Term Refinancing Operations or VLTROs.

[6] Note that the allotted amounts in liquidity auctions did not translate in an equivalent expansion of the ECB balance sheet as SLTROs and VLTROs partially replaced expiring loans. See Figure 1 for the evolution of the balance sheet of the ECB.

[7] http://www.ecb.europa.eu/press/pr/date/2009/html/pr090507_2.en.html

[8] In variable rate tenders, banks bid both the amount of money and the interest rate. The ECB would satisfy the demand of liquidity starting from the highest offered interest rate until exhaustion of the pre-set amount of loans available for auction.

Securities Markets Programme (SMP). On 10 May 2010, in order to address tensions in certain market segments that hampered the monetary policy transmission mechanism, the ECB announced direct purchases of government bonds in secondary markets under the SMP. Purchased bonds were to be held until maturity and the ECB did not commit to roll over the portfolio as bonds matured. Furthermore, the liquidity created by bond purchases under the SMP was sterilized by the ECB via weekly liquidity absorbing operations. Initially, starting from May 2010, purchases were limited to Greek, Portuguese and Irish Government bonds. In a second round of purchases that started in August 2011, the ECB extended the SMP to Italian and Spanish Government bonds. As market conditions improved during early 2012, the ECB stopped purchasing bonds. In February 2012, as a result of purchases, the ECB held around 220 euro billions of sovereign bonds of countries experiencing financial stress. In September 2012, the SMP was discontinued with the introduction of the Outright Monetary Transactions (OMT).

Under the SMP, the ECB intervened by purchasing government bonds potentially on a daily basis, without any predetermined public target in terms of price or quantity. The ECB would simply observe market conditions and decide on the intervention on a daily basis. Crucially, initial market conditions (early in the morning) were an important input to decide on the upper limit of the intervention every day. The pace of the intervention during the day was adapted to the evolution of intraday prices[9].

While the end of the programme was officially communicated in September 2012, there were periods when the programme was simply "dormant" while potentially active. For example, after the initial activation in mid 2010, the SMP became "dormant" in the first half of 2011 until it was reactivated in August 2011. The programme was again "dormant" in 2012 (the last purchase took place in February) until the official deactivation in September 2012.

Outright Monetary Transactions (OMTs). In September 2012, in order to repair the monetary policy transmission mechanism by containing redenomination risk due to fears of a euro area break up and to avoid self-fulfilling bad equilibria, the ECB announced the introduction of a new policy instrument, the OMT. The latter consists of the possibility of unlimited purchases of government bonds (up to the three year maturity bucket) issued by countries under a European Stability Mechanism (ESM) macroeconomic adjustment programme or a precautionary programme (Enhanced Conditions Credit Line). The latter conditions addressed concerns regarding the distorted incentives for governments to adopt sound policies that were present with the SMP. The OMT announcement was sufficient to calm markets. At the time of writing, the announcement has not yet been followed by ECB purchases of government bonds.

Mirroring different mandates, the ECB and the Fed responded to the crisis with different measures that had different goals. After the initial phase of the crisis between mid 2007 and late 2008 when both central banks

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[9] Unfortunately, further operational details are not available for the SMP.

addressed strains in funding markets by providing more liquidity to financial intermediaries[10], the policies of the two central banks diverged. Since late 2008, the Fed engaged in a number of rounds of Large Scale Asset Purchases of Mortgage Backed Securities (MBS), Agency debt and Treasury bonds with the goal of lowering long term yields. The ECB expanded its lending operations to euro area banks in response to frozen interbank markets (especially across borders within the euro area) to ensure that its stance was passed to final borrowers and to avoid a credit crunch. Also, the ECB engaged in asset purchases, although of smaller size compared to the Fed and with different goals. While the Fed bought AAA rated US Treasury bonds to lower long term benchmark yields, the ECB purchased sovereign bonds of euro area countries in distress to contain "excessive" risk premia and restore the transmission mechanism of monetary policy. Also the modalities of implementation of purchases were different between the two central banks. While the Fed pre-announced the scale and the pace of purchases for several months ahead[11], the ECB instead, under the SMP, decided on purchases on day to day basis in response to the deterioration of market conditions[12].

Figure 1: ECB and Fed balance sheets

2.2 Channels of transmission and international repercussions

The literature proposes different ways of classifying the potential transmission channels of unconventional monetary policy. Krishnamurthy and Vissing-Jorgensen (2011) test for a number of channels of transmission of QE to US financial markets. These channels include duration risk, liquidity risk, the safety premium, default risk and mortgage prepayment risk, a signaling[13] and an inflation channel. Krishnamurthy and Vissing-Jorgensen find that US QE was transmitted to asset prices via the signaling channel, via a reduction of the safety premium, while QE increased expected inflation (thereby implying that the reduction in real yields was larger than in nominal yields). Other papers (Christensen and Rudebusch, 2012; Bauer and Rudebush, 2013; Abrhams et al. 2013; Bauer and Neely, 2013) focus on disentangling the role of the signaling and the term premia (portfolio balance) channels in transmitting QE to US yields, although the results are not clear cut and crucially depend on the used methodology[14].

Channels are not mutually exclusive and can work in parallel. As a consequence, they can be difficult to identify. In this paper, we focus on four transmission channels. The choice falls on this set of channels

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[10] For a review of liquidity policies by the Fed, see Bernanke (2009).

[11] Fed purchases were pre-announced and the schedule of the daily operations, indicating the quantities to be purchased of each individual security, were published at the beginning of each month.

[12] Another difference is that until recently the ECB fully sterilised the liquidity created by SMP purchases.

[13] According to Eggertson and Woodford (2003) central banks' large scale asset holdings serve as a credible commitment to keep interest rates low. Therefore, by introducing the LSAP, the Fed led to expectations of low rates for long (signalling channel).

[14] Joyce et al. (2011) also discuss a number of potential transmission channels.

mainly for two reasons. First, they are important in relation to the goals of the analyzed ECB policies. Second, we can develop a relatively simple strategy to test them[15].

Confidence channel. By taking decisive actions, central banks might help restoring confidence in the financial system. As a consequence, risk premia and uncertainty might decline, with a positive effect on asset prices. We test for the confidence channel by looking at the impact of ECB policies on option implied volatilities that convey information on risk aversion and uncertainty in financial markets (see Section 5).

Bank credit risk channel. As described above, while ECB policies tried to address mainly bank liquidity concerns, they might have had an impact on bank credit risk due to the interaction between liquidity and credit risk. Lower credit risk in the banking sector might boost asset prices by decreasing risk premia overall. We test for the impact of ECB policies on bank credit risk by looking at CDS spreads for global banks (see Section 5).

Sovereign credit risk channel. The intermediate goal of two ECB policies, the SMP and OMT, was to repair the transmission mechanism of monetary policy by containing sovereign risk premia that were considered excessive. In other words, ECB policies indirectly targeted sovereign credit risk, following the ECB's assessment that the latter was not in line with fundamentals and reflected panic or unfounded fears of euro area break up, thereby impairing the transmission mechanism of monetary policy. We test for the impact of ECB policies on sovereign credit risk by looking at sovereign CDS spreads (see Section 5).

International portfolio balance channel. The portfolio balance is a potential channel of transmission of asset purchases to asset prices across market segments and countries (Bernanke, 2009, among many others). As investors are crowded out from some market segments by central bank purchases, they move to close substitute assets, leading to portfolio rebalancing and to a chain of price effects. More broadly, unconventional monetary policy actions by affecting risk premia and yields of key benchmark assets (in particular, government bonds) induce investors to rebalance their portfolios, ultimately having additional price effects on a broad range of assets. Therefore, in this paper we look at how investors' rebalance their portfolio across assets and countries in response to ECB unconventional monetary policy actions. We test for the impact of ECB policies on portfolio rebalancing across assets and regions by looking at high frequency (daily) data on international equity and bond portfolio flows (see Section 5). The daily data on portfolio flows are described in the next section.

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[15] A cross country investigation of the signalling channel would indeed offer valuable insights on how ECB policies were transmitted across countries. However, the latter analysis would entail particular challenges that go beyond the scope of this paper. The analysis would require estimating a term structure model to extract the expected path of the short term rate for each of the more than thirty individual countries in the sample. Data limitations and modelling uncertainty would complicate the analysis. To our knowledge, from the literature it emerges that the importance of the signalling channel is model dependent (Bauer and Rudebusch, 2013; Bauer and Neely, 2013). Against the background of the impact of the modelling strategy on the results, a credible analysis of the signalling channel would call for the adoption of different term structure models. We feel that this goes beyond the scope of our paper.

3 Empirical Methodology and Data

In this section, we discuss the empirical strategy that we employ for assessing the impact of ECB policies on a range of financial prices and capital flows. We start the section by outlining the dataset, in particular the fund-level data on portfolio flows that will be used to test the international portfolio balance channel.

3.1 Data

The time period covered in our dataset ranges from 1/5/2007 to 30/9/2012. We cover a set of 38 advanced and emerging economies. Countries are clustered in regional groups. Within the euro area we separate between a group of highly rated euro area countries (Austria, Finland, Germany and Netherlands) and large systemic countries experiencing sovereign tensions (Italy and Spain)[16]. In line with the bipolarization of the debate on the global spillovers of unconventional monetary policies, we split the remaining countries into emerging and advanced economies, further separating emerging EU countries from other emerging markets. Summary statistics and other information for the key data used in this study are displayed in Table 1, 2 and 3. Daily data on equity prices, interest rates, yields, exchange rates, CDS spreads and implied volatilities were collected via Datastream; the source for data on macro-economic releases and expectations is Bloomberg; data on the ECB balance sheet, including SMP purchases (at weekly frequency) and long term refinancing operations were collected directly from the ECB website; dates when US and ECB unconventional policies were announced were collected from the ECB website and from Fawley and Neely (2013).

The dataset on capital flows consists of daily data on portfolio equity investment flows by country of destination. The data are compiled by Emerging Portfolio Fund Research (EPFR) which aggregates data on the activity of a large number of individual funds. Most of the funds are domiciled in advanced economies, prevalently in the US. Therefore, the EPFR data on flows can be assimilated to gross flows from a balance of payment point of view when looking at countries outside the US. In our analysis we separate between flows stemming from investment decisions of all funds and funds domiciled in the euro area.

Although EPFR assets invested in individual countries are only a fraction of the equity/bond market capitalisation of these countries and the corresponding investment flows are smaller than gross portfolio flows as recorded in the balance of payments, EPFR flows display high correlation with balance of payment data for emerging markets (Miao and Pant, 2012). For this reason, an increasingly large number of policy institutions[17] and academic papers[18] use EPFR data to track portfolio flows in real time.

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[16] France and Belgium were also covered in an earlier version of the paper. The results suggest that they should be clustered in a third group which we do not include in this version of the study. Greece, Portugal and Ireland were also included in an earlier version of the study. However, a number of specific events that affected these countries (lack of market access, EU/IMF programmes, etc.) complicate the analysis of bond yields.

[17] See, for example, any recent issue of the Quarterly Review of the Bank of International Settlement or of the Global Financial Stability Report of the International Monetary Funds.

[18] Lim, Mohapatra and Stocker (2014) use EPFR to assess the impact of quantitative easing on international capital flows. Fratzscher, Lo Duca and Straub (2014) also use high frequency EPFR data to assess the impact of quantitative easing announcements and operations on global portfolio flows. Forbes, Fratzscher, Kostka and Straub (2012) use

Regarding the drivers of flows, Raddatz and Schmukler (2012) show that EPFR flows reflect new investment into (or redemptions from) individual funds and managerial changes in country weights and cash. They also show that both managers and fund investors adjust their investing strategy by reacting to both global and country specific factors. The results of Lo Duca (2013), Fratzscher (2013) and Fratzscher, Lo Duca and Straub (2013) show that the EPFR flows quickly respond to announcements and changes in risk factors on a daily basis.

Table 1, 2 and 3 – summary statistics and information on the main variables

3.2 Empirical approach

We evaluate the impact of unconventional monetary policies using the following model (Equation 1):

$$y_{i,t} = \beta\, MP_t + \gamma_1\, F_t + \gamma_2\, Z_{t-1} + \varepsilon_{i,t} \qquad \text{Equation (1)}$$

$$\text{With } MP_t = [AN\_OMT_t, AN\_SMP_t, SLTRO_t, VLTRO_t, SMP_t]$$

The dependent variable $y_{i,t}$ is alternatively the return on the main equity index, the return of the banking equity index, the first difference of the 10 year Government bond yield, the return of the bilateral exchange rate of the euro in country i and day t. In Section 5, we extend the analysis to other dependent variables to test for different channels of transmission of ECB policies.

In the benchmark specification, we estimate a panel regression with country fixed effects. Standard errors (clustered by country) are calculated with a bootstrap procedure using 1000 repetitions. In the robustness section we use alternative estimation strategies.

It is important to highlight that looking at daily data is crucial to identify the effects of policies. The decision of engaging in policy actions does not depend on changes in daily conditions in one day (i.e. our dependent variable), what really matters is the "broad" picture. Conversely, a policy action might alter the "broad" picture and have significant implications on daily developments. Therefore, using daily data alleviates the risk of issues related to reverse causality.

The explanatory variables include monetary policy instruments (in the matrix MP_t) and a set of contemporaneous (F_t) and lagged (Z_{t-1}) control variables. In our benchmark specification, we take account of (i) country fixed effects to capture country-specific time-invariant elements, (ii) surprises related to the release of macroeconomic indicators in the US and the euro area (both aggregate euro area data and data for key individual euro area countries), including conventional monetary policy decisions, (iii) key unconventional monetary policy announcements in the US, (iv) indicators of the outcome of bond auctions in key euro area countries experiencing sovereign tensions and (v) dummies for "special" days. Table 3 (Part 2) presents a detailed description of the explanatory variables included in the benchmark specification of the model. In the annex there is summary description of the model and an explanation of the alternative

EPFR data to assess the impact of capital controls, while Lo Duca (2013) uses them in a model for monitoring the drivers of capital flows in real time.

model specifications that we use. In practice, it turns out that the inclusion of different sets of controls only modestly influences the magnitude of the estimated coefficients and does not alter the sign or statistical significance of the estimates for most of the results, especially for sovereign bond yields in Spain and Italy and equity prices across the globe.

Turning to monetary policy instruments (in the matrix MP_t), we distinguish between two types of unconventional monetary policy measures, namely announcements of policies and actual market interventions. While under the hypothesis of market efficiency prices and quantities would adjust immediately after a policy announcement, there are a number of reasons why this could not be the case, which motivates the choice of looking at the impact of actual market interventions. First, actual operations might lead to unexpected demand for some financial assets due to a portfolio rebalancing channel across market segments. Second, in the presence of market stress, which often motivates policy interventions, financial constraints might be binding. As consequence arbitrage opportunities can only be exploited when actual operations take place (Dedola, Karadi and Lombardo, 2013). Third, market interventions might have information content. For example, SMP purchases might unveil relevant information to market participants on the ECB's assessment about solvency/credit risk of countries in distress (Eser and Schwab, 2013). For these reasons, we look separately at the impact of announcements and operations. Operations further separate between long term liquidity auctions and bond purchases.

Explanatory variables capturing policy announcements

We define a number of impulse dummies to capture the announcement effects of policies on asset prices. In order to measure the market impact of announcements with dummies, one needs to be sure that the announcement shock was sufficiently unexpected and large enough to affect markets. For this reason, we focus only on ECB announcements that were covered in the front page of the Financial Times (on the following day). This alleviates the concern that announcements were not important enough (too small shock to drive markets) or were simply "no news" (widely expected)[19]. In our benchmark specification, we focus on four announcements that, according to our criteria above, appeared on the front page of the Financial Times as reported in Table A2.1 in Annex 2. The four selected announcements cover two key unconventional policies by the ECB, namely the SMP and the OMT. Accordingly, we define two impulse dummies. The dummy AN_OMT_t is equal to one on the day of ECB President Draghi's speech in London (26th July 20120 - "Whatever it takes" speech) and on the day of the Outright Market Transactions (OMT) announcement (6th September 2012). The dummy AN_SMP_t is equal to one on the 10th of May 2010, when the ECB announced the Securities Markets Programme in response to the escalation of the Greek Crisis, and

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[19] This approach also reduces the concern that other events occurring over the same day drive market developments.

on the 8th of August 2011, when the ECB re-activated the programme[20]. In the robustness section, we further discuss the choice of event dummies extending the analysis to other events.

Explanatory variables capturing V/SLTROs liquidity injections

The second set of policy measures relates to (i) long term liquidity provision with maturity from 6 to 12 months via Supplementary Long Term Refinancing Operations (SLTRO) (ii) long term liquidity provision with maturity of 36 months via "Very" Long Term Refinancing Operations (VLTRO).

The explanatory variable capturing SLTROs (VLTROs) is defined in the following way:

$$V/SLTRO_t = (\Delta \text{ Loans}) / 7; \textit{ on t-3 to t+3 where t is the day of the liquidity auction}$$
$$V/SLTRO_t = 0; \textit{ on other days}$$

Where Δ Loans is the change in the amounts outstanding of loans (in hundreds of euro billions) with maturity from 6 to 12 months (36 months) in the balance sheet of the ECB after the liquidity auction. The change is expressed in hundreds of euro billions and it is equally split over the seven days around the auction and/or repayment date (i.e. between day t-3 and t+3 where t is the auction/repayment day). In this way the estimated coefficient for SLTRO (VLTRO) can be interpreted as the impact of net loan expansion of 100 billion euro on the dependent variable.

Focusing on a seven day window centred on the auction date allows us to capture a number of effects. First, in the days before the auction (t-3 to t-1) banks might demand bonds that can be used as collateral in liquidity operations, thereby driving down yields. Other investors might also buy bonds in anticipation of higher demand for these securities after the auction, when banks might use the money borrowed from the ECB to buy government bonds. These actions might drive yields down and affect other asset prices before the auction takes place.[21] Second, including the auction day and in the immediate aftermath of it (between t and t+3) might capture the price effects of banks investing the borrowed money in government bonds.

As the demand for long term liquidity by banks depends on long term expectations on cash flows and funding conditions (for example, loan and bond rollover needs over the coming months), endogeneity should not be a concern in our high frequency (daily) analysis of the impact of SLTROs and VLTROs. Putting it differently, we assume that changes in market conditions in the proximity of a V/SLTRO auction have no impact on the demand for long term liquidity at horizons longer than six months which is determined by other factors (that operate at lower frequency). To substantiate this view, in the robustness section we show

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[20] The ECB communicated the intention to "actively implement its Securities Markets Programme" on Sunday 7 August 2011.

[21] Using information on the total allotment before the auction takes place might be problematic if the sum finally allotted is not known in advance. Two considerations alleviate this concern. First, there could be market expectations on the size of the allotment. Second, before the auction, banks might start frontloading collateral (also government bonds) on the basis of their predetermined demand of liquidity that will be revealed (to the public) at the auction. In the robustness section, we do some tests to ensure that the ex-ante inclusion of the allotted amounts is not crucial for our results.

that daily changes in equity prices and yields (our key dependent variables) do not predict variables associated with banks liquidity demand and do not exhibit systematic patterns when interbank tensions are high (as measured by money market spreads). Therefore, we assume that after controlling for other shocks, any systematic movement in prices around auctions/repayments would reflect the impact of changes in central bank liquidity.

It is worth highlighting that our approach does not assume that the market situation "today" does not matter for the demand of long term liquidity by banks. In our approach, we simply argue that the change in the market situation today (daily developments) does not really alter the "broad picture" and does not matter for the demand of liquidity in the long term.

Explanatory variable capturing SMP purchases

The last policy tool that we analyze is the Securities Markets Programme. Since the ECB engaged in SMP purchases on a daily basis when market conditions deteriorated, an endogeneity bias complicates the assessment of the impact of purchases on asset prices. In other words, by simply plugging SMP purchases in Equation 1, we would obtain a positive coefficient for the SMP when yields are the dependent variable. This would happen for the simple reason that the ECB intervened when yields were increasing.

A number of studies attempted to address this issue by either looking at high frequency micro data on bond purchases (Ghysels, Idier, Manganelli and Vergote, 2013) or by comparing market prices with model based counterfactuals in the absence of the SMP (Eser and Schwaab, 2013). While those two studies rely on confidential data, in this study, we propose an easily replicable approach that uses publicly available data and is based on the estimation of an ECB's SMP reaction function. Essentially, our approach identifies the price impact of purchases that are "unexpected" according to the estimated reaction function. The latter reaction function, takes into account that the ECB would observe market conditions at the market opening (early in the morning) on day t to decide the intensity/upper limits of SMP purchases (as described in Section 2). Specifically, we compute the "expected" SMP purchases in week *t* on the basis of a reaction function that links actual purchases to lagged SMP purchases and other indicators of market conditions that might induce the ECB to act. The latter indicators are observed early in the morning, before SMP purchases take place. In our preferred specification, among these indicators, we include the overnight return and realised volatility of sovereign bonds of troubled euro area countries[22]. When checking the robustness of our results, we also include other measures of financial market conditions before the opening of European markets. We assume that our predicted SMP purchase is the markets' best guess of the ECB intervention and, therefore, it is already incorporated in bond prices. Thus, we focus on the unexpected part of the SMP (i.e. the difference between actual purchases and predicted purchases) which contains new information and

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[22] The overnight return is the percentage price change between the closing price on day t-1 and the opening price on day t (source: Bloomberg).

should have an impact on prices. In Annex 1 we present a detailed description of the methodology for the calculation of the unexpected component of the SMP on the basis of the reaction function approach.

There are two caveats with the above approach. First, the ECB might adjust purchases on the basis of the evolution of the market conditions during the day. Unfortunately, we have no way to tackle this issue with publicly available data. On this front, however, it is important to highlight that observing market conditions early in the morning was a crucial step in determining the upper limits of SMP purchases in one day. Second, a complication arises because the ECB did not clearly announce the end of the programme until September 2012. For several months, after the two rounds of interventions in mid 2010 and late 2011, the programme was dormant, i.e. the programme was active but it was not used. This implies that we cannot consider the intervention and non-intervention periods as exogenous when estimating the reaction function. We address this issue in the robustness section.

4 Empirical Results

This section presents the findings of the benchmark model in Equation 1 by presenting the "total impact" of ECB policies. The latter is equal to the total size of unconventional operations (in euro billions) multiplied by the estimated coefficients of the underlying econometric model in Equation 1, which measure the impact of the operations per billion of euro[23]. This way of calculating the total impact implies that the effects of operations and announcements are permanent. We discuss the persistence of the effects in the robustness section. With these *caveats* in mind, our tables focus on the "total impact" to provide the reader with a broad idea of the economic significance of ECB policies.

4.1 Impact of ECB policies on the euro area

Table 4A and 4B reports the total impact of ECB policies in highly rated euro area countries ("Core" euro area, i.e. Finland, Germany, Austria and the Netherlands) and two large euro area countries that experienced sovereign tensions (Spain and Italy)[24].

OMT related announcements (26 July and 6 September 2012) led do a cumulated -74 b.p. decline in 10 year government bond yields in Italy and Spain, while they led to a cumulated +10 b.p. increase in yields on bonds of highly rated euro area countries. Equity indexes in Italy and Spain increased by around +9%, while bank equity prices went up by around +14%. Also in highly rated euro area countries equity indexes and bank equity prices went up, although the increase was smaller than in Italy and Spain. In response to the OMT announcement, the euro nominal effective exchange rate (NEER) appreciated by +0.72%.

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[23] For the announcement dummies the procedure is the same i.e. we multiply the number of ones/events by the estimated coefficients of the dummies.

[24] See Section 3.1 for information on the composition of the country sample.

SMP related announcements (10 May 2010 and 8 August 2011)[25] led to a cumulated -121 b.p. decrease in the 10 year sovereign yields of Italy and Spain, while they did not affect the yields of highly rated euro area sovereigns. The SMP announcement positively impacted the main equity indexes in Italy and Spain (+ 7%) and bank equity prices (+15%). The SMP announcement led also to an increase in bank equity prices by around +6% in highly rated euro area countries.

Regarding operations, our results show that S/VLTRO loans and SMP purchases had an impact on yields and equity prices across the euro area. At the peak of the expansion (660 euro billions in early 2010), 12 month SLTROs led to a cumulated decline of 10 year government bond yields by – 24 b.p. in Italy and Spain, and by -5 b.p. in highly rated euro area countries. SLTROs boosted equity returns (main equity indexes and bank indexes) by around 4% in the whole euro area. The 1018 euro billions VLTROs loans led to a cumulated decline of 10 year government bond yields by – 52 b.p. in Italy and Spain, while in highly rated euro area countries yields went down by -6 b.p.. VLTROs positively affected broad equity indexes and bank equity prices (+5% and around +10% respectively across the whole euro area).

SMP purchases decreased yields in Italy and Spain by around –70 b.p. and lifted equity prices across the euro area. Main equity indexes and bank equities went up by around +5% in Italy and Spain and by around +10% in highly rated euro area countries. It is important to point out that, while we find that the SMP purchases decreased yields and boosted equity prices on impact, the paper is mute on whether the SMP was overall an effective crisis management tool. For example, it is beyond the scope of the paper to discuss the moral hazard implications of the SMP due to the lack of strong conditionality mechanisms. The results simply indicate that bond purchases lifted equity prices and were effective in temporarily lowering yields and decrease market fragmentation.

The results above survive a number of robustness tests that are described in details in Section 6. In general, the above findings are robust across different specifications that include different sets of explanatory variables, adopt alternative estimation methods or different measurement strategies for S/VLTROs loans and SMP purchases (Table 5A and 5B; Table 6A and 6B). For Italy and Spain, however, the positive impact of the SMP on equity prices crucially depends on the inclusion of the dummies for 14 May 2010 and 10 August 2011.

Regarding the SMP, the above results are in line with the findings of other studies that adopt different modelling strategies to address the endogeneity problem. Using confidential data on the SMP purchases by

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[25] We present the average results for the two SMP announcements although they had a different impact on asset prices in the euro area and globally. While the first one was positive on both equity and bond prices, and decreased VIX, the second one was negative on equity prices and increased VIX. Furthermore, the first announcement was widely covered by media in the context of the Greek bail out, while the second one was not widely covered by the media as several other policy actions took place around that announcement. The overall impression is that the first announcement had far reaching implications across asset classes, while the second one drove euro area bond market developments only in the periphery.

country, Eser and Schwaab (2013) found that cumulated SMP purchases of the order of 50 bn euro in one sovereign market led to a persistent reduction in yields by approximately -90 b.p. in large countries (i.e. Italy and Spain). Ghysels, Idier, Manganelli and Vergote (2013) found results of the same order of magnitude.

To gauge the economic magnitude of the above results in the context of large swings in asset prices during the economic and sovereign crisis in Europe, Figure 2A and 2B show actual and counterfactual yields and equity prices. The counterfactual is calculated by deducting the estimated impact of monetary policy according to the benchmark specification from the actual values of the dependent variable[26]. The figures show that without policy interventions yields in Italy and Spain would have been higher at the end of our sample (in September 2012) by around +300 b.p., while yields in highly rated euro area countries were not significantly affected (they would be only +5 b.p. higher). These results suggest that ECB policies contributed to the decrease in bond spreads between the "periphery" and the "core" of the euro area and lowered market fragmentation. Regarding equity prices, the figures show that at the end of the sample equity prices would have been lower by around 10 p.p. without unconventional monetary policy interventions intervention.

Table 4A and 4B – Results for the euro area (Total impact)

Table 5A and 5B – Results for the euro area (Full set of results)

Table 6A and 6B – Results for the euro area (alternative SMP and LTROs measures)

Figure 2A and 2B – Results for the euro area (Counterfactual)

4.2 International spillovers of ECB policies

Table 4C, 4D and 4E report the total estimated impact of ECB unconventional monetary policy outside the euro area.

The OMT announcements boosted equity prices across countries while they did not have significant implications for global sovereign yields. In response to OMT announcements, broad equity indexes and bank equities recorded cumulated increases by around +2% across advanced economies and emerging markets. Sovereign yields were stable across emerging economies while they went up in advanced economies by around +10 b.p., consistent with the unwinding of safe haven flows. Interestingly, the euro depreciated by around -1% vis-à-vis emerging EU currencies, while it appreciated by around +0.5% vis-à-other currencies (advanced economies and other emerging markets).

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[26] Also here, we assume that the effects of operations and announcements are permanent.

SMP related announcements had heterogeneous impact on financial markets. While the first SMP announcement in May 2010 had positive spillovers, the second announcement in August 2011 was probably overshadowed by other negative developments (results are not shown in the tables), including the US rating downgrade. As a consequence, while the beneficial effects were visible in Italy and Spain overall, the cumulated spillovers of the two events to the rest of the world are mixed. The SMP announcements had a smaller impact than the OMT announcements across the globe. The positive effects were mainly limited to emerging EU, where yields went slightly down and bank equity prices increased by around +4%. In advanced economies, yields did not move in cumulated terms after the two SMP announcements, although equities were slightly down reflecting mainly developments on 8 August 2010. In other emerging market economies (ex EU), yields went down by a cumulated -11 b.p., while equity prices declined by around -4%, reflecting no variation on 10 May 2010 and large declines on 8 August 2011.

Regarding exchange rates, the euro depreciated vis-à-vis advanced economies and emerging EU, while it did not significantly move vis-à-vis other emerging markets.

Turning to operations, we found that, in advanced economies, SLTROs decreased yields by around -8 b.p., consistent with the results for highly rated euro area countries. VLTROs and SLTROs had a positive impact on broad equity indexes and bank equity indexes in advanced economies, although the effects were smaller than in the euro area. STLROs and VLTROs did not have price effects on emerging markets, including emerging EU. In the latter region, there are positive gains in bank equity prices (+4%) associated with VLTROs, while the negative impact of SLTROs on equity prices is not robust. Overall, we interpret this evidence as suggesting that price spillovers of S/VLTROS were limited to other advanced economies and bank equities in emerging EU. Regarding exchange rates, VLTROs depreciated the euro by around -1% vis-à-vis advanced and emerging markets (ex EU), while SLTROs depreciated the euro vis-à-vis emerging EU by around -0.8%. Overall, we interpret this evidence as suggesting that S/VLTROs slightly depreciated the euro.

Finally, regarding SMP purchases, we find that they boosted equity prices overall and bank equities by more than +5% across advanced economies and emerging markets (ex EU), consistent with the results for the euro area. We do not find any significant price impact on emerging EU. In addition, the SMP purchases led to a depreciation of the euro vis-à-vis all country groups (by around -1.5% against currencies in advanced economies and emerging EU, by more than -5% against currencies of other emerging markets).

The counterfactual analysis in Figures 2C, 2D and 2E summarises our findings and shows that ECB policies had positive impact on equity prices worldwide, stemming mainly from SMP purchases and OMT announcements. At the same time, ECB policies did not have sizeable spillovers to global sovereign yields, with the exception of emerging EU where yields would have been higher by around +50 b.p.. The latter

result, however, mainly reflects the impact of SMP purchases which were not statistically significant in our baseline model and were hardly significant in other specifications for emerging EU.

Table 4C – 4E – Results for other regions (Total impact)

Table 5C – 5E – Results for other regions (Full set of results)

Table 6C – 6E – Results for other regions (Alternative SMP and LTROs measures)

Figure 2C to 2E – Results for other regions (Counterfactual)

5   Transmission channels of ECB policies

This section assesses the main channels of transmission of ECB unconventional policies on global asset markets. To this aim, we identify a number of indicators that can be associated with the main transmission channels of ECB policies and we quantify the impact of ECB actions on these indicators.

International portfolio balance channel

A first possible channel of transmission of ECB policies to international asset prices is the portfolio rebalancing channel, in a broader sense. This channel consists of ECB policies inducing a re-allocation of portfolios across assets and countries by altering risk perceptions, yields and expectations, and, in the case of bond purchases, by crowding out investors from the markets where the central bank intervenes. For example, by boosting confidence, policies might induce asset managers to invest in riskier assets as equities. Alternatively, by decreasing yields, policies could result in a search for yield and lead to a reallocation of portfolios into riskier bonds in emerging markets.

To test for the portfolio balance channel we look at the impact of ECB policies on international portfolio flows. We use daily data on bond and equity flows by country of destination, stemming from allocation decisions of mutual funds (see Section 3.1). Furthermore, we differentiate between flows stemming from allocation decisions of all the funds covered in the dataset ("all funds") and flows stemming from funds domiciled in the euro area. This might shed light on the specific reaction of euro area investors to ECB policies.

To analyze the impact of policies on flows we use the same framework described in Equation 1 in Section 3 with the only difference that the dependent variable $y_{i,t}$ measures net portfolio equity/bond inflows in country i and day t scaled by the equity/bond assets invested in country i[27].

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[27] Also, as flows tend to react more sluggishly than prices to news and announcements, we slightly modified the specification of some the explanatory variables in the model. In particular, all the announcement dummies take value one on the day of the announcement and in the following two days. Also for the other variables, we consider up to three lags. Finally, to take into account the persistence of the flows, we also estimate the model by adding three lags for the dependent variable. The latter modification does not impact the results.

The results presented in table 7A-7E and 8A- 8E show that, while statistically significant, the total impact of ECB policies on global portfolio flows (all funds and euro area funds) was economically small[28].

The OMT announcements led to bond and equity portfolio inflows in Italy and Spain by global and euro area investors, while, overall, there were little or no flows into highly rated euro area countries. After the OMT announcements, bond inflows into other regions also slightly increased across global and euro area investors.

In response to VLTROs, global funds invested more in equity and bonds in emerging markets and in the euro area "periphery", while they invested only in bonds in advanced economies and in the euro area "core". In response to VLTROs, euro area funds moved out from highly rated euro area countries into bonds worldwide and into bonds and equities into the euro area periphery.

The impact of SLTROs on flows was mixed. In particular, there is some evidence suggesting that global funds rebalanced from bonds to equities worldwide, while the activity of euro area funds was very small. Similarly, Euro area funds moved from equities into bonds, especially into the euro area periphery, advanced economies and emerging markets, while exiting highly rated euro area countries.

Overall, however, the detected flows in response to ECB policies were negligible compared to the observed total movements in portfolio flows. When deducting the estimated contribution of monetary policy actions according to the baseline model from actual flows (Figures 3A to B), it is possible to spot differences from actual and counterfactual (with no monetary policy actions) flows only in a few cases. First, flows by global investors into bonds across the euro area would have been slightly lower in a scenario with no monetary policy actions. Second, equity flows by global and euro area investors into highly rated euro area countries would have been higher. This suggests that part of the inflows into euro area bonds is a result of rebalancing from equities in highly rated euro area countries to bonds across the euro area in response to monetary policy actions. Third, investment into equity and bonds into emerging markets by global investors would have been slightly smaller, suggesting that by boosting global confidence, ECB actions slightly revived the appetite for emerging market securities. Finally, also investment by global funds into bonds of advanced economies would have been smaller in the absence of ECB policies.

These findings suggest that international portfolio rebalancing was not an important channel of transmission for ECB polices. As described in Section 3.1, the daily portfolio flow data from EPFR cover a small fraction of overall global portfolio flows and relate to mutual funds. In particular, they reflect portfolio reshuffling decisions and the allocation of new inflows/outflows into the funds from retail and institutional investors. While other categories of investors might have been more affected and responsive to ECB policies, it is

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[28] The results refer to the baseline specification. We conducted a number of checks as we did for asset prices (different set of control variables, Pesaran-Smith mean group estimator, robust regressions, random effect estimator). The tests indicate that the baseline specification delivers fairly robust results. We do not report the results for brevity.

worth noting that other studies have found EPFR daily flows to respond promptly to changes in macro financial conditions and US monetary policy (Fratzscher, 2013; Lo Duca, 2012). In particular, the small impact of ECB policies on international portfolio flows contrasts with the portfolio rebalancing across assets and countries observed in response to Fed policies. More specifically, according to Fratzscher, Lo Duca and Straub (2013), Fed announcements related to QE1 led to portfolio rebalancing towards the US, while QE2 led to relative portfolio rebalancing from global bonds to emerging market equities. In particular, Fed policies explain 20% of the total equity inflows in emerging markets over the QE2 period.

Overall, however, the difference in the total impact of ECB and Fed policies on capital flows and asset prices might be a reflection of the different size of the operations and the differences in instruments used.

Table 7A – 7E (Total impact)

Table 8A and 8E (Full set of results)

Figure 3A and 3E (Counterfactual analysis)

Confidence / Risk aversion channel

Unconventional policies can affect asset prices by boosting confidence and investor's risk appetite. To measure the confidence channel, we focus on the impact of ECB policies on option implied volatilities in key markets, as they convey information on risk aversion and uncertainty. For testing the confidence channel we adopt the framework outlined in Equation 1 in Section 3.2 with the only difference that the dependent variable $y_{i,t}$ is the first difference of implied volatility in market i in day t , where i is the VSTOXX index for Europe, VIX for the US, VFTSE for the UK, the VDAX for Germany, the VCAC40 for France and a volatility index for the Japanese NIKKEI.

The results show that the OMT, SMP purchases and V/SLTROs led to strong decreases in risk aversion/uncertainty. The OMT announcement decreased implied volatilities by -5.0 p.p. on average across countries. Both SLTROs and VLTROs allotments led to a decrease of implied volatilities by around -4 p.p each. SMP purchases lowered implied volatilities by around -15 p.p.[29]. The decline of risk aversion and uncertainty in response to S/VLTROs and the SMP is consistent with the positive impact of operations on equity prices.

Bank credit risk channel

Unconventional policies can affect asset prices by reducing overall bank credit risk premia. While some policies were targeted at addressing liquidity strains in euro area markets, by decreasing liquidity risk they could also affect credit risk as the two are closely interlinked. We test for the credit risk channel by looking at the impact of policies on CDS spreads for euro area banks and large international banks (Global Systemic Important Financial Institutions - GSIFIs). For testing the bank credit risk channel, we adopt the framework

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[29] Regarding the announcements related to the SMP, implied volatilities went down in response to the first SMP announcement on 10 May 2010, while they increased on the day of the second SMP announcement on 8 August 2010.

outlined in Equation 1 in Section 3.2 with the only difference that the dependent variable $y_{i,t}$ is the first difference of the CDS spread of bank i in day t , for a set of 34 euro area banks and 18 GISIFIs.

The results show that S/VLTROs and the OMT announcements decreased bank credit risk in the euro area and worldwide. VLTROs (SLTROs) led to a reduction of bank credit risk by around -100 b.p. (-21 b.p. at the peak of SLTROs in early 2010) for euro area banks and by -40 b.p. (-6 b.p.) for other GISIFIs. The OMT announcement reduced CDS spreads by more than -30 b.p. for euro area banks and by-20 b.p. for other GISIFIs.

Sovereign Credit risk

Unconventional policies can affect asset prices and portfolio flows by reducing overall sovereign credit risk premia. Looking at the impact of policies on sovereign CDS spreads in the euro area and other countries can shed light on the importance of this channel. For testing the sovereign credit risk channel, we adopt the framework outlined in Equation 1 in Section 3.2 with the only difference that the dependent variable $y_{i,t}$ is the first difference of the sovereign CDS spread of country i in day t , for a set of 6 sovereigns in the euro area and other 14 non-euro area sovereigns belonging to the G20.

The results show that the OMT and the SMP announcements, S/VLTROs and SMP purchases led to strong declines in sovereign credit risk in the euro area and worldwide. Following the SMP announcements, sovereign CDS spreads decreased by a cumulated -40 b.p. in the euro area and by -9 b.p. in other G20 countries. Following the OMT announcements, they decreased by -30 b.p. in the euro area and by -9b.p. in other G20 countries. VLTROs led to a decrease of euro area sovereign CDS spreads by more than -40 b.p., while at the peak of the expansion of SLTROs CDS spreads decreased by -12 b.p. in the euro area. These decreases, however, were not transmitted to other G20 countries. Finally, SMP purchases decreased sovereign spreads by more than -30 b.p. in the euro area and by -8b.p. in other G20 countries.

Table 9A – 9B (Total impact and full set of results)

5. ECB policies, global financial markets and the global financial cycle

The findings presented in the previous sections show that ECB policies mainly spilled over to global equity markets while there was little or no impact on global government bond yields. The larger impact on equity prices is consistent with the effects of policies on risk as measured by implied volatilities and CDS premia. The lack of sensible effects on portfolio flows suggests that the detected price movements reflected mostly domestic investors' decisions.

Our results provide insights on the role of unconventional monetary policy by the ECB in the global financial cycle. Rey (2013) and Miranda-Agrippino and Rey (2014) analyse the role of conventional monetary policy by the Fed and show that it plays an important role in driving VIX which in turn correlates

with a global financial factor. The latter factor explains a significant part of the variation in capital flows and asset prices across the globe. While the analysis of Rey (2013) and Miranda-Agrippino and Rey (2014) use lower frequency data and focus on conventional monetary policy, the role of the Fed in driving the global financial cycle emerges also from other empirical studies that use daily data and focus on unconventional monetary policy in the US (Neely, 2010; Chen et al., 2012; Leduc, 2012; Fratzscher, Lo Duca and Straub, 2013; Rogers, Scotti and Wright, 2014; Bowman, Londono and Sapriza, 2014; Lim, Mohapatra and Stocker, 2014; Lo Duca, Nicoletti and Vidal, 2014). To some extent, these studies offer the possibility to compare the estimated spillovers of ECB policies to the global impact of Fed QE.

First, we look at implied volatilities and, in particular, VIX as it seems to play an important role in the global financial cycle. Unfortunately, while some studies focused on the impact of unconventional monetary policy on tail risk (Hattori, Shrimpf and Sushko, 2013), there is no study offering a comprehensive assessment of the impact of US QE announcements and purchases on VIX. For this reason, we limit our comparison between the ECB and the Fed to the effect of policy announcements. As discussed in Section 3, we focus on those announcements that were covered in the first page of the Financial Times. This is to ensure that the announcement shock was large enough and unexpected. According to Table A2.1, the five ECB announcements that satisfy the latter condition lowered VIX by around -2.0 p.p. in cumulative terms (i.e. -0.5 p.p. per announcement on average). The large number of Fed announcements on front page of the Financial Times (Table A2.2) had a stronger impact and lowered VIX by around -15 p.p. in cumulative terms (-1.2 p.p. per announcement on average). There are some caveats when comparing these figures. First, the content of announcements is heterogeneous. Second, by looking only at announcements, we cannot fully assess the overall impact of policies, as purchases could also have affected risk premia and VIX. Against the background of these caveats, this comparison suggests that the ECB had a smaller impact than the Fed on VIX and, therefore, on the global financial cycle.

Second, we do a comparative assessment of the impact of policies on asset prices. Several studies analysed the impact of US QE on global equity prices and yields (Neely, 2010; Rogers, Scotti and Wright, 2014; Bowman, Londono and Sapriza, 2014; Fratzscher, Lo Duca and Straub, 2013). According to Fratzscher, Lo Duca and Straub (2013) who look at both announcements and purchases, QE1 and QE2 have boosted equity prices by +20% in emerging markets and by +15% in advanced economies in cumulated terms. The same study finds that QE1 and QE2 lowered yields by around -65 b.p. in emerging markets and by around -30 b.p. in advanced economies.[30] The above total effects are larger than those we found for ECB UMP. Our estimates show that ECB policies did not lower yields in emerging markets overall (in cumulated terms), while they slightly increased yields in advanced economies probably reflecting unwinding of flight to safety. Regarding equity prices, we find that ECB policies boosted main indexes in advanced economies by around +15% (similarly to Fed QE2), while the impact was lower (around +6%) in emerging markets. Differences

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[30] For emerging markets, only announcements significantly reduced yields.

in total effects of policies between the ECB and the Fed, however, might reflect the different size of underlying programmes and the different combinations of instruments. Focusing on announcements, ECB decisions did not have large spillovers on yields and equity prices. The cumulated effect of policy announcements was around +1% for equity and +11 b.p. for yields in advanced economies, while it was negligible for equity and around -11 b.p. for bonds in emerging markets. Conversely, Fed announcements of QE1 and QE2 boosted equity prices by 3% in advanced economies and by more than 7% in emerging markets and lowered yields by more than – 80 b.p. in all regions. The average impact of Fed announcement was +0.45% for advanced economy equities, +1% for emerging market equities and -11 b.p. for government bond yields across regions. This contrasts with the average small impact of ECB announcements for equities (0 for emerging markets, +0.25% in advanced economies) and yields (+2.5 b.p. in advanced and -2.5 b.p. in emerging).

Third and finally, we compare the impact of policies on portfolio flows. A number of papers analyse the impact of QE policies on capital flows. Fratzscher, Lo Duca and Straub (2013) use an approach that is comparable to the one adopted in this paper (i.e. using daily data, looking at the impact of both announcements and purchases, using EPFR data). The small impact of ECB policies on portfolio flows contrasts with the significant impact of QE1 and QE2 on cross country allocations found by Fratzscher, Lo Duca and Straub. According to the latter study a quarter of the total equity flows to emerging markets were pushed by Fed policies.

This evidence suggests that, while the ECB UMP had a significant impact on global asset prices, especially on equities, the Fed plays a larger role in driving the global financial cycle. As Rey (2013) argues, this might be a reflection of the role of the US dollar as the most important funding currency.

6 Robustness tests and extensions

Endogeneity issues with S/VLTROs

Regarding the identification of the market impact of long term liquidity auctions (SLTROs and VLTROs), we assume that daily changes in our dependent variables (equity, yields, etc.) in the proximity of V/SLTRO auctions have no impact on the demand for long term liquidity at horizons longer than six months which is determined by other factors (that operate at lower frequency). This assumption could be problematic in two situations. First, there could be a problem if the dependent variable contains information on future market distress and, therefore, determines banks' liquidity demand at LTROs. Second, there could be a problem if the dependent variable relates to current market distress, on the basis of which banks demand liquidity at LTROs. We address these issues by analysing the relation between our dependent variables and money market spreads. Money market spreads (either the Ted Spread or the OIS spread) are commonly used

indicators of tensions in money markets and are associated with banks' demand for central bank liquidity[31]. When spreads are high, interbank markets malfunction and banks rely more on central bank liquidity.

First, in Table A2.3, we show that daily changes in equity and bond yields in Italy and Spain (our key dependent variables) cannot predict increases in money market spreads at any time horizon. This test suggests that the dependent variable contains no information of future market distress and, therefore, that it would hardly affect the demand of liquidity in the long term.

Second, we look at the contemporaneous relation between the level of spreads and our dependent variable. Under the random walk hypothesis, current money market spreads are the best predictor of tomorrow's spreads. Banks, therefore, could use current money market spreads to calibrate the demand for liquidity. If changes in our dependent variables display a systematic pattern in relation to the level of spreads, we could have a problem. In Table A2.4, we show that the correlation between the level of spreads and equity and yields changes (in Italy and Spain) is basically zero (also conditionally to spreads being above average). This shows that there is no systematic pattern of our dependent variable in relation to contemporaneous indicators related to banks' demand of liquidity[32].

To conclude we would like to point out that our approach does not assume that the market situation "today" does not matter for policy actions and for the demand of long term liquidity by banks. In our approach, we simply argue that the change in the market situation today (daily developments) does not really alter the "broad picture" and does not matter for the demand of liquidity in the long term. Conversely, a policy action might alter the broad picture and have significant implications on daily market developments.

Endogeneity issues with the SMP

A complication arises when assessing the impact of the SMP because the ECB did not clearly announce the end of the programme until September 2012. For several months, after the two rounds of interventions in mid 2010 and late 2011, the programme was dormant, i.e. the programme was active but it was not used. The lack of clarity on whether the programme entered into the "dormant" phase has important implications when calculating expectations of SMP purchases using our approach based on the reaction function to calculate SMP surprises. In particular, imposing clear ending dates for the intervention periods when estimating the reaction function is problematic.

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[31] We define the Ted spread as the difference between the 3 month Euribor and the 3 month French T-bill, while the OIS spread is the difference between the 3 month Euribor and the 3 month Overnight Swap Index (OIS) rate in the euro area. The latter is the fixed rate offered in exchange to the floating overnight right over a three month time horizon. The overnight swap contract does not entail the exchange of the principal amount, therefore there is little credit risk involved in the transaction. As a consequence, the OIS rate is often viewed as the expected path of the short term rate over the duration of the contract.

[32] The evidence presented above suggests that an "attenuation" bias should not be affecting our results significantly. We also exclude that the "positive" impact of ECB policies could simply reflect the fact that LTROs auctions took place when there were "positive market rallies" on the basis of two results. First, the autocorrelation of our dependent variable is negligible. Second, there is no systematic improvement in global or European market conditions in the period preceding our testing window for the impact of LTROs. These results are available from the authors on request.

To address this issue we change the estimation strategy for the reaction function. More specifically, we estimate it using a rolling regression (using five data points). In this way, we capture that markets' expectations on SMP purchases might evolve depending on how the ECB conducts the purchases. In particular, this approach captures that markets understand that the SMP became "dormant" after a few periods of inactivity and adjust expectations accordingly. The results in this setting confirm our main findings (Table A2.4).

Announcement effects

As discussed in Section 3, in order to measure with impulse dummies the market impact of policy announcements, one needs to be sure that the announcement shock was sufficiently unexpected and large enough to affect markets. For this reason, in our benchmark specification, we focused only on four selected key policy announcements related to the SMP and the OMT that were covered in the front page of the Financial Times. This alleviates the concern that announcements were not important enough (shock too small to drive markets) or were simply "no news" (widely expected).

The information reported in Table A2.1 in Annex II, which describes the press reaction to ECB announcements, would suggest two modifications to the baseline analysis. First, it would suggest excluding the announcement of the reactivation of the SMP on 8 August 2011 from the SMP impulse dummy. While the announcement was covered by the press, several actions took place over the weekend of the announcement. The VIX increased by +16 p.p. on 8 August 2011 suggesting that market fear, probably related to the US downgrade, was driving market developments (in particular outside the euro area). Second, the information in Table A2.1 would also suggest including 6 October 2011 (announcement of 12 month SLTROs and new covered bond purchase programme) in a separate additional impulse dummy. The exclusion of the 8 August 2011 and the inclusion of a dummy for 6 October 2011 increases the overall estimated impact of ECB policies (see Table A2.5).

When releasing the "Financial Times front page" requirement and extending the analysis to other announcements that did not receive the same level of media attention (i.e. events not covered in the first page of the Financial Times), the results are mixed and difficult to interpret. For example, equity market declines and government bond yields increases occurred on average when the ECB announced the intention to conduct SLTROs with maturities between six months and one year[33]. It is difficult to relate these market developments to the announcements of SLTROs which received little or no media attention (Table A2.1 in Annex II). In our benchmark analysis, we also excluded the announcement of VLTROs on December 8, 2011. The reason for the exclusion is that looking at media coverage reveals that the main focus of that day

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[33] For SLTROs announcements we set an impulse dummy equal to 1 on the following dates: 28 March 2008, 4 September 2008, 15 October 2008, 7 May 2009, 4 August 2011 and 6 October 2011. The ECB announced six month SLTROs also on 10 May 2010. However, for that day we have the SMP announcement dummy. The results including the SLTROs announcement dummy were presented in an earlier version of the article and are now available upon request.

was on expected losses at European banks and that the ECB action was not up to expectations (see Table A2.1 in Annex II). Therefore, we do not include the announcement dummy for that event as we feel the coefficient would not capture any surprise effect of ECB policies.

Finally, it is worth noting that two other "difficult to address" issues affect the analysis based on impulse dummies. First, the announced policy could be already anticipated by markets. On this front, focusing on events that attracted large media attention and detecting large price effects alleviate the concern that we are looking at fully discounted announcements. This holds true at least for the OMT announcements. Second, impulse dummies do not capture that the content of different announcements is articulated and heterogeneous. Unfortunately, the literature does not suggest established ways to tackle this issue.

Impact of the country composition on the results for the euro area
In our benchmark specification we focus on two groups of euro area countries: a group composed by highly rated euro area countries (Germany, Finland, Austria and the Netherlands) and two large "systemic" countries experiencing sovereign tensions (Italy and Spain). Our results are consistent when looking at a larger sample of euro area countries. In particular, the results show that the impact of ECB policies on yields in the euro area is stronger in countries with lower sovereign ratings. While yields in Germany, Finland, Austria and the Netherlands are the least affected by ECB policies, yields in distressed euro area countries (Italy, Spain, Greece, Portugal and Ireland) are the most affected. Yields in France and Belgium are only moderately affected. In addition, we find that the impact of ECB policies on equity prices is more homogeneous than the impact on bond yields across country groups.

Different sets of control variables and econometric techniques
Table 5A – 5E reports the full set of estimation results by using different sets of control variables and estimation techniques. The different settings range from no controls, to a setting including all the control variables of the benchmark model and, in addition, lagged stock market performance and lagged implied volatilities in the US and EU (see the model description in the annex). The results are broadly consistent when using different set of control variables. For Italy and Spain, however, the positive impact of the SMP on equity prices crucially depends on the inclusion of the dummies for 14 May 2010 and 10 August 2011. Regarding different econometric techniques, the results are confirmed when using the Pesaran-Smith mean group estimator, a random effect model and an outlier robust regression approach.

Different measurement of the explanatory variables related to ECB policies
Table 6A – 6E report the results for the benchmark specification when we use alternative measuring strategies for ECB policies.

Regarding V/SLTROs, we use four alternative definitions for the respective explanatory variables: (i) VLTROs and SLTROs are equal to the net expansion/contraction of long term liquidity (i.e. expansion/contraction in loans with maturity equal to 3 months or above) in the ECB balance sheet as a result of the auction/repayment. As in our benchmark specification, the net change is equally split in the seven days around the auction/repayment (i.e. between t-3 and t+3 where t is the auction/repayment day) (Column "Long Term"); (ii) VLTROs and SLTROs are equal to the net expansion of the total ECB balance sheet as a result of the auction/repayment (as usual, equally split in the seven days around the auction) (Column "Assets"); (iii) VLTROs and SLTROs are equal to the expansion in the related instruments (as in the benchmark specification) equally split over the 5 days around the allotment/repayment (Column "5 day"); (iv) VLTROs and SLTROs are dummy variables equal to one in the 7 days around auctions/repayment days (Column "Dummy"). Overall, the results are confirmed across country groups with only a few exceptions. While the estimated coefficients change reflecting the different scale of the explanatory variables, the implied movement in yields and equity prices is remarkably consistent with the benchmark specification.

Regarding the SMP, in the tables we use four alternative measures of "unexpected" purchases either based on "naïve" approaches or based on alternative reaction functions: (i) the SMP variable is the difference between current and previous purchases. This is equivalent to assuming that the market expects the ECB to continue purchases at the pace observed in the previous week (Column "Previous"); (ii) the SMP variable is the residual of an AR(1) model for SMP purchases i.e. the market expects current purchases being somehow related to the purchases observed the week before (Column "AR(1)"); (iii) and (iv) the SMP variable is the residual of two reaction functions described in Annex 1 where market expectations for purchases are based on different indicators of "early morning" market tensions (Column "Tobit 1" and "Tobit 2"). Finally, for comparison purposes, the table includes the "Benchmark" results (Column "Benchmark" – model "Tobit 3" in Annex 1) and the results when we plug actual SMP purchases directly into the model (Column "Actual"). The bottom line result from the different specifications is that when fairly "sophisticated" reaction functions are used (i.e. the benchmark model, Tobit 1 and Tobit 2) the results are stable and have the expected sign in most of the cases.

The main results presented survive also to the following additional robustness tests that are not reported in the tables for brevity: (i) using only large (unexpected) SMP purchases (i.e. the unexpected purchases that are smaller than -0.5 and larger than +0.5 euro billions per day on average during a week); (ii) using a narrower sample period that covers only the intensification of the sovereign crisis in Europe (i.e. the estimation sample starts in April 2010 instead of May2007); (iii) splitting the SMP_t variable into $SMP1_t$, i.e. "unexpected" purchases under the first SMP started in May 2010 and $SMP2_t$, i.e. "unexpected" purchases under the second SMP started in August 2011.

Generated regressor bias

The explanatory variable "unexpected" SMP purchases is the residual of a regression model describing the SMP reaction function of the ECB (Section 3.2 and Annex I). This can create a generated regressor bias. To assess the impact of this problem, we proceed in two steps. First, on the basis of the asymptotic distribution of the parameters of the regression describing the SMP reaction function of the ECB, we generate 1000 alternative series for SMP unexpected purchases. Second, we estimate the benchmark model using each of the generated series for unexpected SMP purchases. We then calculate the average coefficient for the SMP and the fraction of times the coefficient is above zero across all the replications.

The results (Table 10 A and B) broadly confirm the findings of our baseline specification, i.e. negative impact of the SMP on yields in Italy and Spain and positive impact on equity prices across regions. However, the SMP coefficient for equity prices in Italy and Spain is on average negative and most frequently below zero. This confirms that the positive effects of the SMP on Italy and Spain in the baseline specification are not robust.

Persistence of the effects of unconventional monetary policy

In our benchmark specification, there is no dynamic response of asset prices to unconventional monetary policy announcements and operations. While this is standard in the event study literature, this approach implicitly assumes that markets are efficient and price in quickly the available information. However, such an assumption might not be consistent with the complex and innovative nature of unconventional policy announcements, with the existence of market frictions and of other forces that might dissipate the impact of policies on yields and other assets (for a discussion see Rogers, Scotti and Wright, 2014). For example, while we find that the SMP purchases decreased bond yields on impact in Italy and Spain, the effect might not be persistent if investors believe that that bond purchases without conditionality lead to loosening fiscal discipline. As in Wright (2012), Rogers, Scotti and Wright (2014) and Neely (2014) in this section we discuss the persistence of the identified effects of unconventional monetary policy actions. In particular, we focus on the persistence of the effects of SMP purchases and SLTROs with maturity of 6 months of above. To do so we use a VAR approach and proceed according to the following steps. First, in order to solve a dimensionality problem, we regress equity returns and differences in bond yields on all the (non-monetary policy) explanatory variables that we include in the baseline specification (macro shocks, special day dummies, etc) and we retain the residuals. Second, we plug the SMP and SLTROs/VLTROs explanatory variables from our baseline specification as exogenous variables in the VAR model where the dependent variables are the residuals of equity returns and yield differences of the first step. We estimate the VAR (with 1 lag) for each individual country and we average impulse responses across the relevant country groups[34].

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[34] We do not report error bands as, from the VAR analysis, we just want to have broad indications on the dynamic response of variables.

Cumulated impulse responses from the VAR analysis are presented in Figure 4A and 4B. The impact of the SMP seems to persist on yields and equity prices, with the maximum impact on equity prices being reached after 2 days. The effects of LTROs tend to overshoot on impact, although some effects persist on both yields and equity prices. While the presented evidence is not conclusive, it is consistent with the findings of other studies showing that the impact of monetary policy shocks on long term yields either "wears off" fairly slowly (Rogers, Scotti and Wright, 2014) or is very persistent (Neely, 2014)[35].

Symmetry of the effects of LTROs

In our baseline analysis we did not differentiate between the impact of liquidity expansions and withdrawals/repayments for SLTROs with maturity from 6 to 12 months[36]. In order to test whether the impact of operations is asymmetric, we estimated the baseline model including separately liquidity expansions and repayments of loans (for the 6 to 12 month maturity), focusing on Italy and Spain where the impact of SLTROs was larger than in other countries. The results show that the impact of liquidity operations is asymmetric, in the sense that expansions are systematically associated with decreases in yields (the coefficient for Italy and Spain is -0.55***), while liquidity withdrawals/repayments do not seem to have any significant effects on yields.

7 Conclusions and discussion

The domestic effectiveness of unconventional monetary policies and their international spillovers to global asset prices and capital flows have dominated policy discussions over recent years. While the research literature focused prevalently on the domestic impact and on the spillovers of US quantitative easing, this paper analyzed the domestic and global implications of unconventional monetary policies of the ECB on financial prices.

We studied the impact of ECB policies on equity and exchange rate returns, changes in yields, changes in risk measures and capital flows across countries in a panel model over the period May 2007 to September 2012, using daily data. Using daily data allows for a more precise identification of the effects of unconventional monetary policy on financial variables. We controlled for a large number of shocks including, among other things, macroeconomic data releases, sovereign bond auctions in troubled euro area countries and US monetary policy announcements. In our model, we combined an event study methodology (i.e. using impulse dummies) to capture the announcement effects of policies with an approach that measures the impact of ECB long term loans to banks (focusing on Supplementary Long Term Refinancing Operation, SLTROs) and Securities Markets Programme (SMP) bond purchases. Concerning the SMP, we proposed an approach that relies on publicly available data and uses deviations from an estimated reaction function to

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[35] Neely (2014) highlights that VAR models that are constrained to be consistent with standard asset price models generate much more persistent impulse responses to monetary policy shocks. As Neely puts it "*monetary policy shocks appear to be very persistent, although we cannot really know how persistent*".
[36] Early repayments of VLTROs started after the end of the period under review.

identify the impact of purchases. This approach reduces/eliminates the endogeneity bias that emerges when the ECB SMP purchases depend on the deterioration of daily market conditions.

The results of our paper contributed to the empirical literature on the impact of central banks' unconventional policies on financial markets, using (high frequency) daily data.

First, this paper is the first one to offer a comprehensive quantification of the immediate impact of ECB policies on asset prices across the euro area "core" and "periphery", going beyond announcement effects. The literature has previously focused on the domestic impact of policies un the US (Gagnon et al. 2011; D'Amico and King, 2011; Wright, 2012; Joyce et al, 2011 for the UK; Hancock and Passmore, 2011; Stroebel and Taylor, 2012; Hattori, Shrimpf and Sushko, 2013; Rosa, 2012; Gilchrist and Zakrajsek, 2013). In this regard, our results show that liquidity injections via Supplementary LTROs (with maturity from 6 to 36 months), the OMT and the SMP (both announcements and operations) positively affected equity prices (both broad equity indexes and banking indexes) in the "core" and the "periphery" of the euro area, while they decreased bond yields in the "periphery". In this context, our paper also contributed to studies attempting to identify the effects of SMP purchases (Ghysels, Idier, Manganelli and Vergote, 2013; Eser and Schwaab, 2013). We did so by using an approach that, in contrast with the other studies, relies on publicly available data and we found consistent results with the findings of the literature.

Second, our paper contributed to empirical studies analyzing the spillovers of central bank policies to global asset prices and capital flows. Also in this case, the literature has predominately quantified the impact of US policies (Neely, 2010; Chen et al., 2012; Leduc, 2012; Fratzscher, Lo Duca and Straub, 2013; Gambacorta, Hoffmann and Peersman, 2012; Rogers, Scotti and Wright, 2014; Bowman, Londono and Sapriza, 2014; Lim, Mohapatra and Stocker, 2014; Lo Duca, Nicoletti and Vidal, 2014; Chen et al., 2014; Gilchrist, Yue and Zakrajsek, 2014). Our results show that while ECB unconventional policies mainly affected financial markets in the euro area, they also had positive spillovers to global markets by increasing equity prices and lowering risk aversion and credit risk of sovereigns and global banks. In particular, the OMT and the SMP (both announcements and operations) had positive spillovers to equity prices worldwide (both broad equity indexes and banking indexes), while the overall effect of policies on international yields was negligible. The euro slightly depreciated on average in response to the ECB's unconventional measures, with the exception of the OMT which led the euro to appreciate slightly on average across country groups.

Third, by testing for a number of transmission channels, this study contributed to the literature that analyses how unconventional monetary policies are transmitted to global markets (Christensen and Rudebusch, 2012; Bauer and Neely, 2013; Krishnamurthy and Vissing-Jorgensen, 2011; Bauer and Rudebush, 2013). We showed that unconventional monetary policies in the euro area affected global markets mainly through a rise in confidence/decrease in risk aversion (as measured by a decrease in option implied equity market

volatilities). They also led to a reduction of sovereign risk in euro area and other G20 countries and a decrease in bank credit risk for euro area banks and Global Systemically Important Financial Institutions (GSIFIs). The effect of policies on risk perceptions partially explains the larger worldwide impact of policies on riskier assets, such as equity prices, compared to the impact on safer assets, such as bonds. Interestingly, we found that the response of international portfolio flows to ECB policies was small. This suggests that the price impact on ECB policies reflected mainly domestic investors' decisions. This is in contrast with Fed unconventional policies which, according to other studies, led to large portfolio rebalancing across assets and countries (Fratzscher, Lo Duca and Straub, 2013; Lim, Mohapatra and Stocker, 2014).

Finally, our paper also relates to the recent literature on the relation between the global financial cycle and monetary policy in advanced economies (Rey, 2013; Miranda-Agrippino and Rey, 2014, Obstfeld, 2014). In this context, to our knowledge, our paper is the only one that looked at the global impact of ECB policies. Our findings show that the spillovers of ECB policies were somehow more limited than the effects of US policies. This suggests that the US play a more prominent role in the global financial cycle.

The above results document that ECB policies had beneficial effects on international financial markets in the short term by lifting global asset prices and by lowering the global price of risks in periods of elevated uncertainty. Assessing the longer term implications of policies for the pricing of financial assets and quantifying the macroeconomic impact of policies is left for future research.

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Table 1: List of countries and data coverage
(Number of daily observations per country, sample period 1/5/2007 – 30/9/2012)

	Country Name	Country Group	Equity Index	10 Year Sov Yields	Bank Equity Index	Portfolio Equity Flows	Portfolio Bond Flows	Portfolio Equity Flows (EA)	Portfolio Bond Flows (EA)	Exchange Rate
1	Australia	Advanced Economies	1413	1413	1413	1407	1405	1407	1405	1413
2	Austria	Euro area - Core	1413	1336	1413	1408	1405	1408	1405	1199
3	Brazil	Emerging Markets (ex EU)	1413	1413	1413	1408	1405	1408	1405	1350
4	Bulgaria	Emerging Markets (EU)	1413	1382	1413	1408	1405	1408	1405	1396
5	Canada	Advanced Economies	1413	1413	1413	1408	1405	1408	1405	1413
6	Chile	Emerging Markets (ex EU)	1413	993	1413	1408	1405	1408	1405	1386
7	China	Emerging Markets (ex EU)	1413	1389	1413	1407	1405	1407	1405	1401
8	Colombia	Emerging Markets (ex EU)	1413	1383	1413	1408	1405	1408	1405	1391
9	Czech Republic	Emerging Markets (EU)	1413	1386	1413	1408	1405	1408	1405	1413
10	Denmark	Advanced Economies	1413	1413	1413	1408	1405	1408	1405	1413
11	Finland	Euro area - Core	1413	1413	1413	1408	1405	1408	1405	1199
12	Germany	Euro area - Core	1413	1413	1413	1408	1405	1408	1405	1199
13	Hong Kong	Emerging Markets (ex EU)	1413	1413	1413	1407	1405	1407	1405	1413
14	Hungary	Emerging Markets (EU)	1413	1413	1413	1408	1405	1408	1405	1413
15	India	Emerging Markets (ex EU)	1413	1413	1413	1407	1405	1407	1405	1259
16	Indonesia	Emerging Markets (ex EU)	1413	1409	1413	1407	1405	1407	1405	1397
17	Italy	Euro area - Periphery	1413	1410	1413	1408	1405	1408	1405	1199
18	Japan	Advanced Economies	1413	1413	1413	1407	1405	1407	1405	1413
19	Korea	Emerging Markets (ex EU)	1413	1408	1413	1407	1405	1407	1405	1409
20	Malaysia	Emerging Markets (ex EU)	1413	1410	1413	1407	1405	1407	1405	1409
21	Mexico	Emerging Markets (ex EU)	1413	1409	1413	1408	1405	1408	1405	1413
22	Netherlands	Euro area - Core	1413	1413	1413	1408	1405	1408	1405	1199
23	New Zealand	Advanced Economies	1413	1413	626	1407	1252	1407	1251	1413
24	Norway	Advanced Economies	1413	1228	1413	1408	1405	1408	1405	1413
25	Philippines	Emerging Markets (ex EU)	1413	1390	1413	1407	1405	1407	1405	1398
26	Poland	Emerging Markets (EU)	1413	1411	1413	1408	1405	1408	1405	1403
27	Russia	Emerging Markets (ex EU)	1413	1390	1413	1408	1405	1408	1405	1411
28	Singapore	Emerging Markets (ex EU)	1413	1413	1413	1407	1405	1407	1405	1413
29	South Africa	Emerging Markets (ex EU)	1413	1413	1413	1408	1405	1408	1405	1413
30	Spain	Euro area - Periphery	1413	1413	1413	1408	1405	1408	1405	1199
31	Sweden	Advanced Economies	1413	1413	1413	1408	1405	1408	1405	1413
32	Switzerland	Advanced Economies	1413	1413	1413	1408	1405	1408	1405	1413
33	Taiwan	Emerging Markets (ex EU)	1413	1399	1413	1407	855	1407	850	1401
34	Thailand	Emerging Markets (ex EU)	1413	1400	1413	1407	1405	1407	1405	1413
35	Turkey	Emerging Markets (ex EU)	1413	695	1413	1408	1405	1408	1405	1411
36	UK	Advanced Economies	1413	1413	1413	1408	1405	1408	1405	1413
37	US	Advanced Economies	1413	1413	1413	1408	1405	1408	1405	1413
38	Vietnam	Emerging Markets (ex EU)	1413	1014	0	1407	1405	1407	1405	0

Note: for euro area countries Exchange Rate refers to the euro Nominal Effective Exchange Rate - NEER (source: ECB)

Table 2 (Part 1): Summary statistics for the dependent variables
(Sample period 1/5/2007 – 30/9/2012, daily data)

Variable	Unit	Source	Country Group	Units (countries)	Observations	Mean	Std Dev	Minimum	Maximum
10 Year Sovereign Yield	*difference in p.p.*	Datastream	Advanced Economies	10	13945	-0.0018	0.0553	-0.7260	0.6240
			Emerging Markets (EU)	4	5592	-0.0004	0.1230	-1.0350	0.9810
			Emerging Markets (ex EU)	18	23754	-0.0014	0.1363	-2.9980	3.1300
			Euro area - Core	4	5575	-0.0018	0.0560	-0.6580	0.6130
			Euro area - Periphery	2	2823	0.0009	0.0839	-1.0560	0.5790
Bank Equity Index	*return in % (i.e. log difference * 100)*	Datastream	Advanced Economies	10	13343	-0.0470	2.4123	-21.6783	25.4870
			Emerging Markets (EU)	4	5652	-0.0572	2.6811	-29.3593	20.9158
			Emerging Markets (ex EU)	18	24021	0.0148	1.8922	-25.6807	31.5882
			Euro area - Core	4	5652	-0.1097	3.2159	-129.9141	19.6235
			Euro area - Periphery	2	2826	-0.1015	2.5275	-11.9628	19.0584
Equity Index	*return in % (i.e. log difference * 100)*	Datastream	Advanced Economies	10	14130	-0.0181	1.4850	-11.5572	12.2917
			Emerging Markets (EU)	4	5652	-0.0447	1.6943	-14.2092	15.2129
			Emerging Markets (ex EU)	18	25434	0.0118	1.5644	-19.8503	23.1743
			Euro area - Core	4	5652	-0.0411	1.6397	-9.2217	16.0461
			Euro area - Periphery	2	2826	-0.0583	1.6747	-8.6364	11.7492
Bilateral Exchange Rate* (with the Euro)	*return in % (i.e. log difference * 100) ; '+' indicates euro appreciation*	Bloomberg and ECB	Advanced Economies	10	14130	-0.0107	0.6807	-7.0150	8.3865
			Emerging Markets (EU)	4	5625	0.0015	0.6402	-5.0513	5.9701
			Emerging Markets (ex EU)	18	23688	-0.0030	0.8386	-13.5854	14.6017
			Euro area (NEER)	1	4796	-0.0022	0.3811	-2.9377	2.5191
Portfolio Bond Flows (all investors)	*investment flow in percent of the assets invested in the country*	Emerging Portfolio Fund Reaserach (EPFR)	Advanced Economies	10	13897	0.0363	0.3887	-13.5506	5.3455
			Emerging Markets (EU)	4	5620	-0.0156	0.5994	-20.1090	4.6469
			Emerging Markets (ex EU)	18	24740	0.0706	0.6070	-16.5199	8.6015
			Euro area - Core	4	5620	0.0024	0.5699	-21.0061	5.1412
			Euro area - Periphery	2	2810	-0.0039	0.5737	-12.6607	6.5990
Portfolio Bond Flows (euro area investors)	*investment flow in percent of the assets invested in the country*	EPFR	Advanced Economies	10	13896	0.0126	0.2111	-3.8768	4.5033
			Emerging Markets (EU)	4	5620	-0.0226	0.2359	-2.7516	3.3322
			Emerging Markets (ex EU)	18	24735	0.0386	0.2600	-4.3019	4.1812
			Euro area - Core	4	5620	-0.0112	0.2654	-3.7213	3.2070
			Euro area - Periphery	2	2810	-0.0132	0.2658	-4.6611	2.6016
Portfolio Equity Flows (all investors)	*investment flow in percent of the assets invested in the country*	EPFR	Advanced Economies	10	14077	-0.0160	0.2157	-6.8840	5.7251
			Emerging Markets (EU)	4	5632	-0.0329	0.3305	-9.2540	1.8474
			Emerging Markets (ex EU)	18	25333	0.0281	0.3561	-4.1147	25.2352
			Euro area - Core	4	5632	-0.0284	0.3956	-7.9509	12.1178
			Euro area - Periphery	2	2816	-0.0354	0.1747	-2.2615	0.9012
Portfolio Equity Flows (euro area investors)	*investment flow in percent of the assets invested in the country*	EPFR	Advanced Economies	10	14077	-0.0240	0.1820	-3.3451	6.5091
			Emerging Markets (EU)	4	5632	-0.0317	0.1708	-1.3153	1.6244
			Emerging Markets (ex EU)	18	25333	0.0144	0.4071	-32.2558	32.5344
			Euro area - Core	4	5632	-0.0237	0.5653	-12.3603	18.2811
			Euro area - Periphery	2	2816	-0.0304	0.1498	-1.0306	0.8314

Note: * for euro area countries Exchange Rate refers to the euro Nominal Effective Exchange Rate - NEER (source: ECB)

Table 2 (Part 2): Summary statistics for the dependent variables
(Sample period 1/5/2007 – 30/9/2012, daily data)

Variable	Unit	Source	Number of Units	Observations	Mean	Std Dev	Minimum	Maximum
Option Implied Equity Volatilities	*difference in p.p.*	Datastream	5 (Vix, Vstox, FR, UK, DE, JP)	8478	0.0014	2.2651	-20.6300	29.0900
CDS Spreads for Euro Area Banks	*difference in b.p.*	Datastream	48	42999	0.2340	29.0773	-1911.7150	1519.3770
CDS Spreads for Systemically Important Global Banks	*difference in b.p.*	Datastream	18	16336	0.0607	13.4338	-831.0341	382.5251
CDS Spreads for euro area Sovereigns	*difference in b.p.*	Datastream	6	8207	0.1146	6.6176	-79.2050	72.1500
CDS Spreads for non-euro area G20 Sovereigns	*difference in b.p.*	Datastream	14	19034	0.0382	10.2767	-255.0000	295.0000

Table 3 (Part 1): Summary statistics and information on the explanatory variables – ECB policies related variables included in the benchmark model
(Sample period 1/5/2007 – 30/9/2012, daily data)

Variable	Code	Description	Source	Detailed description
SMP announcement	AN_SMP	*impulse dummy*	Authors	*When the dependent variable is a price variable: the dummy is equal to 1 on 10 May 2010 (activation of the SMP) and 8 August 2011 (re-activation of the SMP), zero otherwise. Note that the announcement re-activation of the SMP was on Sunday 7 August 2011, therefore the dummy has been moved to the following Monday. When the dependent variable is a quantity variable (for portfolio flows): the dummy is equal to 1 on the above dates and in the following 2 days, zero otherwise.*
OMT announcement	AN_OMT	*impulse dummy*	Authors	*When the dependent variable is a price variable: the dummy is equal to 1 on 26 July 2012 (Mr. Draghi "Whatever it takes" speech) and 6 September 2012 (details of the OMT unveiled), zero otherwise. When the dependent variable is a quantity variable (for portfolio flows): the dummy is equal to 1 on the above dates and in the following 2 days, zero otherwise.*

Variable		description	Source	Observations	Mean	Median	Std Dev	Minimum	Maximum
Unexpected SMP purchases	SMP	*Unexpected daily purchases under the SMP, Billions euro*	ECB and Authors' calculation - see Annex 1	1434	0.0337	0.0000	0.3714	-1.0708	4.4000
Allotted amounts at SLTROs	SLTRO	*Change in outstanding amounts of SLTROs with maturity between 6 and 12 months, hundreds of euro billions . The amount is equally split in the 7 days around the auctions days / repayment days (see Section 3, for details).*	ECB and Authors' calculation	1428	0.0000	0.0000	0.0669	-0.6318	0.6318
Allotted amounts at VLTROs	VLTRO	*Change in outstanding amounts of VLTROs with 36 month maturity, hundreds of euro billions . The amount is equally split in the 7 days around the auctions days (see Section 3, for details).*	ECB and Authors' calculation	1428	0.0071	0.0000	0.0718	0.0000	0.7565

Table 3 (Part 2): Summary statistics and information on the explanatory variables – Other variables included in the benchmark model
(Sample period 1/5/2007 – 30/9/2012, daily data)

Variable	Source	Detailed description
Macroeconomic data surprises	Bloomberg	*We calculated economic surprises as the deviation of the actual data release from the median expectation, according to Bloomberg survey data. Surprises are normalised by their own standard deviation prior to 2007. We calculated surprises for a number of key economic variables for the US, euro area, Germany, France, Italy and Spain covering a total of 48 economic indicators. The variables are listed below. Due to collinearity among some of the variables the actual number of surprises entering in the regressions is less than 48.*
US QE announcements	Fawley and Neely (2013)	*Impulse dummies for key announcements related to US QE policies. We include a set of 19 announcements related dummies capturing expansion and the termination of QE policies. The considered announcements are those listed in Table 1A of Fawley and Neely (2013) that falls in our sample period (January 2007 to September 2012).*
Sovereign Bond Auctions	Bloomberg	*Indicators of the outcome of bond auctions for Italy and Spain, including the bid to cover ratio and the yield for bonds with 1, 5 and 10 year maturity.*
Dummy for May 14, 2010	Authors	*On 14 May 2010 equity markets recorded large losses in Europe and worldwide. Rumours about French President threatening to leave the euro zone spread on May 14. Moreover, fears of a possible downgrade of France's sovereign credit rating and a statement by the German Chancellor on the gravity of the Eurozone situation exacerbated markets' fears.*
Dummy for August 10, 2011	Authors	*On 10 August 2011 equity markets recorded large losses in Europe and worldwide. While speculations about France losing its triple A played a role, market stress originated mainly from fears related to the situation of European banks, especially French and Italian ones. Some Italian banks were suspended from trading from 2 pm to 3 pm*

List of economic data releases

EU Area : ECB Announces Interest Rates
EU Area : GDP SA QoQ
EU Area : CPI YoY
EU Area : GDP SA YoY
EU Area : Consumer Confidence Index
EU Area : CPI Estimate YoY
EU Area : CPI MoM
EU Area : PMI Manufacturing
EU Area : PMI Composite - Output
EU Area : PMI Composite - New Orders
EU Area : PMI Services

France : CPI YoY
France : Consumer Confidence Index
France : PMI Manufacturing
France : PMI Services
France : Industrial Production MoM
France : Industrial Production YoY
France : GDP QoQ
France : GDP YoY
France : Business Confidence
France : CPI EU Harmonised YoY

Germany : GDP SA QoQ
Germany : PMI Manufacturing
Germany : Sentiment
Germany : IFO Business Climate
Germany : Industrial Production SA MoM
Germany : IFO Expectations
Germany : Factory Orders MoM
Germany : IFO Current Assessment
Germany : Unemployment Change (000s)
Germany : GDP NSA YoY

Italy : Consumer Confidence Index
Italy : PMI Manufacturing
Italy : PMI Services
Italy : Industrial Production MoM
Italy : Business Confidence
Italy : CPI EU Harmonised YoY
Italy : CPI EU Harmonised MoM
Italy : GDP WDA QoQ
Italy : GDP WDA YoY
Italy : CPI NIC incl. tobacco MoM

Spain : CPI MoM
Spain : Business Confidence
Spain : Unemployment MoM net
Spain : Retail Sales YoY
Spain : GDP QoQ
Spain : GDP YoY
Spain : Unemployment Rate

Table 4A: Total impact of ECB unconventional monetary policy on prices
Italy and Spain

	10 year yields (diff. in p.p.)	Equity Returns (% change)	Bank Returns (% change)	NEER (% change, "+" euro appreciation)
AN_OMT	-0.74 ***	8.69 ***	13.63 ***	0.72 **
AN_SMP	-1.21 ***	6.92 ***	15.65 ***	-0.58
SLTRO	-0.24 ***	4.15 ***	5.33 ***	0.08
VLTRO	-0.52 ***	5.68 ***	8.24 ***	-1.21
SMP	-0.70 ***	5.47 ***	5.33 ***	-1.31

Note: Total impact of ECB policies according to benchmark model (see model description in the annex). The total impact is equal to the total size of unconventional operations multiplied by the estimated model coefficients. Stars refer to the significance of the β coefficients of the underlying equation (see Table 5 for the full results). For SLTROs the total impact is calculated at the peak expansion of loans with maturity between 6 and 12 months (March 2010, 660 euro billions). For other instruments the number refers to the cumulated impact at the end of the sample period in September 2012.

Table 4B: Total impact of ECB unconventional monetary policy on prices
Germany, Austria, Finland and Netherlands

	10 year yields (diff. in p.p.)	Equity Returns (% change)	Bank Returns (% change)	NEER (% change, "+" euro appreciation)
AN_OMT	0.10 **	4.03 ***	5.31 ***	0.72 **
AN_SMP	0.01	-0.97	5.85 *	-0.58
SLTRO	-0.05 ***	3.88 ***	3.29 ***	0.08
VLTRO	-0.06 ***	6.09 ***	11.28 ***	-1.21
SMP	0.01	10.69 ***	7.04 ***	-1.31

Note: Total impact of ECB policies according to benchmark model (see model description). The total impact is equal to the total size of unconventional operations multiplied by the estimated model coefficients. Stars refer to the significance of the β coefficients of the underlying equation (see Table 5 for the full results). For SLTROs the total impact is calculated at the peak expansion of loans with maturity between 6 and 12 months (March 2010, 660 euro billions). For other instruments the number refers to the cumulated impact at the end of the sample period in September 2012.

Table 4C: Total impact of ECB unconventional monetary policy on prices
Advanced Economies

	10 year yields (diff. in p.p.)	Equity Returns (% change)	Bank Returns (% change)	Exchange Rate (% change, "+" euro appreciation)
AN_OMT	0.11 ***	2.55 ***	2.52 ***	0.45 **
AN_SMP	0.04	-1.85 ***	0.36	-0.76 ***
SLTRO	-0.08 ***	2.62 ***	1.13	0.57
VLTRO	0.00	2.97 ***	4.52 ***	-0.73 ***
SMP	-0.03	8.83 ***	5.74 ***	-1.37 *

Note: Total impact of ECB policies according to benchmark model (see model description in the annex). The total impact is equal to the total size of unconventional operations multiplied by the estimated model coefficients. Stars refer to the significance of the β coefficients of the underlying equation (see Table 5 for the full results). For SLTROs the total impact is calculated at the peak expansion of loans with maturity between 6 and 12 months (March 2010, 660 euro billions). For other instruments the number refers to the cumulated impact at the end of the sample period in September 2012.

Table 4D: Total impact of ECB unconventional monetary policy on prices
Emerging Markets (ex EU)

	10 year yields (diff. in p.p.)	Equity Returns (% change)	Bank Returns (% change)	Exchange Rate (% change, "+" euro appreciation)
AN_OMT	0.01	2.53 ***	2.47 ***	0.66 **
AN_SMP	-0.11 ***	-3.49 ***	-4.18 ***	1.11 ***
SLTRO	0.03	0.12	-0.29	-0.18
VLTRO	0.08 *	0.76	0.23	-1.08 ***
SMP	-0.08	6.26 ***	7.65 ***	-5.07 ***

Note: Total impact of ECB policies according to benchmark model (see model description in the annex). The total impact is equal to the total size of unconventional operations multiplied by the estimated model coefficients. Stars refer to the significance of the β coefficients of the underlying equation (see Table 5 for the full results). For SLTROs the total impact is calculated at the peak expansion of loans with maturity between 6 and 12 months (March 2010, 660 euro billions). For other instruments the number refers to the cumulated impact at the end of the sample period in September 2012.

Table 4E: Total impact of ECB unconventional monetary policy on prices
Emerging EU

	10 year yields	Equity Returns	Bank Returns	Exchange Rate
	(diff. in p.p.)	(% change)	(% change)	(% change, "+" euro appreciation)
AN_OMT	-0.03	1.08 ***	2.60 ***	-0.95 ***
AN_SMP	-0.13	0.89	4.68 ***	-0.42 *
SLTRO	0.03	-1.37 *	-0.83	-0.79 *
VLTRO	-0.02	3.28	4.74 ***	-0.05
SMP	-0.37	-2.81	-5.88	-1.71 ***

Note: Total impact of ECB policies according to benchmark model (see model description in the annex). The total impact is equal to the total size of unconventional operations multiplied by the estimated model coefficients. Stars refer to the significance of the β coefficients of the underlying equation (see Table 5 for the full results). For SLTROs the total impact is calculated at the peak expansion of loans with maturity between 6 and 12 months (March 2010, 660 euro billions). For other instruments the number refers to the cumulated impact at the end of the sample period in September 2012.

Table 5A – Full estimation results for prices
Italy and Spain

Dependent variable: **10 Year Sovereign Bond Yield**

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) P&S	(7) Robust	(8) Lagged	(9) Random
AN_OMT	-0.366***	-0.362***	-0.361***	-0.370***	-0.370***	-0.370***	-0.409***	-0.370***	-0.370***
	(0.042)	(0.039)	(0.040)	(0.040)	(0.039)	(0.055)	(0.030)	(0.038)	(0.038)
AN_SMP	-0.616***	-0.614***	-0.614***	-0.611***	-0.606***	-0.606***	-0.765***	-0.610***	-0.606***
	(0.083)	(0.085)	(0.086)	(0.087)	(0.086)	(0.121)	(0.031)	(0.090)	(0.083)
SLTRO	-0.031***	-0.037***	-0.037***	-0.036***	-0.036***	-0.036***	-0.038**	-0.029***	-0.036***
	(0.005)	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)	(0.017)	(0.006)	(0.006)
VLTRO	-0.047***	-0.049***	-0.049***	-0.050***	-0.051***	-0.051***	-0.040**	-0.048***	-0.051***
	(0.016)	(0.013)	(0.013)	(0.013)	(0.013)	(0.018)	(0.016)	(0.015)	(0.013)
SMP	-0.013***	-0.013***	-0.013***	-0.013***	-0.015***	-0.015***	-0.010***	-0.015***	-0.015***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)
Constant	0.003***	0.003***	0.003***	0.001***	0.001***	0.001***	-0.001	-0.001**	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)
Observations	2,823	2,823	2,823	2,823	2,823	2,823	2,823	2,821	2,823
R-squared	0.129	0.145	0.155	0.167	0.168	N.A.	0.320	0.175	0.168
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Dependent variable: **Equity Prices**

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) P&S	(7) Robust	(8) Lagged	(9) Random
AN_OMT	4.546***	4.178***	4.194***	4.331***	4.347***	4.347***	3.999***	4.361***	4.347***
	(0.345)	(0.331)	(0.318)	(0.389)	(0.384)	(0.544)	(0.744)	(0.386)	(0.391)
AN_SMP	4.421***	4.475***	4.503***	4.468***	3.461***	3.461***	10.292***	2.563***	3.461***
	(0.646)	(0.632)	(0.613)	(0.636)	(0.643)	(0.911)	(0.766)	(0.672)	(0.653)
SLTRO	0.441***	0.572***	0.577***	0.563***	0.629***	0.629***	0.417	0.780***	0.629***
	(0.092)	(0.131)	(0.126)	(0.125)	(0.123)	(0.174)	(0.412)	(0.130)	(0.125)
VLTRO	0.448***	0.459***	0.456***	0.447***	0.558***	0.558***	0.341	0.496***	0.558***
	(0.107)	(0.090)	(0.087)	(0.099)	(0.100)	(0.142)	(0.381)	(0.086)	(0.102)
SMP	-0.137***	-0.150***	-0.157***	-0.148***	0.113***	0.113***	0.037	0.136***	0.113***
	(0.028)	(0.028)	(0.028)	(0.025)	(0.029)	(0.040)	(0.079)	(0.029)	(0.029)
Constant	-0.061***	-0.072***	-0.072***	-0.071***	-0.074***	-0.074***	-0.039	-0.111***	-0.074***
	(0.006)	(0.006)	(0.006)	(0.000)	(0.000)	(0.001)	(0.041)	(0.001)	(0.000)
Observations	2,826	2,826	2,826	2,826	2,826	2,826	2,826	2,824	2,826
R-squared	0.025	0.046	0.059	0.068	0.082	N.A.	0.145	0.166	0.082
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Table 5A – Full estimation results for prices (continued)

Italy and Spain

Dependent variable: **Bank Equity Prices**

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) P&S	(7) Robust	(8) Lagged	(9) Random
AN_OMT	7.111***	6.407***	6.432***	6.790***	6.817***	6.817***	6.423***	6.856***	6.817***
	(0.102)	(0.146)	(0.151)	(0.144)	(0.144)	(0.206)	(1.112)	(0.150)	(0.148)
AN_SMP	9.305***	9.323***	9.362***	9.309***	7.826***	7.826***	17.454***	6.654***	7.826***
	(0.315)	(0.340)	(0.339)	(0.320)	(0.384)	(0.548)	(1.145)	(0.445)	(0.394)
SLTRO	0.401***	0.740***	0.746***	0.708***	0.808***	0.808***	0.287	0.951***	0.808***
	(0.127)	(0.189)	(0.187)	(0.192)	(0.181)	(0.259)	(0.615)	(0.181)	(0.186)
VLTRO	0.632***	0.653***	0.657***	0.643***	0.809***	0.809***	0.345	0.728***	0.809***
	(0.160)	(0.155)	(0.157)	(0.176)	(0.182)	(0.260)	(0.569)	(0.194)	(0.187)
SMP	-0.277***	-0.283***	-0.292***	-0.275***	0.110***	0.110**	0.021	0.140***	0.110***
	(0.011)	(0.019)	(0.019)	(0.013)	(0.031)	(0.044)	(0.117)	(0.034)	(0.032)
Constant	-0.108***	-0.123***	-0.129***	-0.138***	-0.143***	-0.143***	-0.125**	-0.180***	-0.143***
	(0.022)	(0.020)	(0.021)	(0.018)	(0.019)	(0.027)	(0.061)	(0.017)	(0.020)
Observations	2,826	2,826	2,826	2,826	2,826	2,826	2,826	2,824	2,826
R-squared	0.033	0.054	0.071	0.080	0.092	N.A.	0.159	0.145	0.092
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Dependent variable: **Exchange Rate**

(Euro NEER, "+" indicates appreciation of the euro)

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) P&S	(7) Robust	(8) Lagged	(9) Random
AN_OMT	0.179***	0.240***	0.244***	0.356**	0.358**		0.340	0.363**	
	(0.024)	(0.073)	(0.073)	(0.167)	(0.168)		(0.248)	(0.170)	
AN_SMP	-0.172	-0.198	-0.193	-0.190	-0.289		-0.147	-0.312	
	(0.631)	(0.638)	(0.643)	(0.648)	(0.640)		(0.259)	(0.672)	
SLTRO	-0.090	0.008	0.011	0.004	0.012		-0.055	0.006	
	(0.265)	(0.300)	(0.304)	(0.312)	(0.312)		(0.182)	(0.314)	
VLTRO	-0.177*	-0.111	-0.107	-0.128	-0.119		-0.133	-0.101	
	(0.092)	(0.084)	(0.084)	(0.101)	(0.102)		(0.139)	(0.107)	
SMP	-0.059*	-0.054	-0.054	-0.053	-0.027		-0.066**	-0.025	
	(0.034)	(0.035)	(0.035)	(0.036)	(0.038)		(0.029)	(0.037)	
Constant	0.001	0.001	-0.002	-0.011	-0.012		0.000	-0.007	
	(0.011)	(0.012)	(0.011)	(0.012)	(0.012)		(0.011)	(0.014)	
Observations	1,199	1,199	1,199	1,199	1,199		1,192	1,198	
R-squared	0.006	0.046	0.094	0.111	0.113		0.120	0.115	
Fixed Effects	N	N	N	N	N	N	N	N	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The results refer to time series regressions where the dependent variable is the return of the euro NEER. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Table 5B – Full estimation results for prices
Germany, Austria, Finland and Netherlands

Dependent variable: **10 Year Sovereign Bond Yield**

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) P&S	(7) Robust	(8) Lagged	(9) Random
AN_OMT	0.052**	0.039*	0.040*	0.050**	0.050**	0.050*	0.043**	0.052**	0.050**
	(0.021)	(0.021)	(0.021)	(0.022)	(0.022)	(0.026)	(0.018)	(0.022)	(0.022)
AN_SMP	0.032*	0.031*	0.031*	0.029	0.006	0.006	-0.106***	-0.012	0.006
	(0.018)	(0.018)	(0.018)	(0.018)	(0.020)	(0.023)	(0.018)	(0.019)	(0.020)
SLTRO	-0.010***	-0.009***	-0.009***	-0.010***	-0.008***	-0.008***	-0.013	-0.006***	-0.008***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.010)	(0.002)	(0.002)
VLTRO	-0.007***	-0.010***	-0.010***	-0.008***	-0.006***	-0.006***	-0.006	-0.008***	-0.006***
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.009)	(0.001)	(0.001)
SMP	-0.006***	-0.006***	-0.006***	-0.006***	0.000	0.000	0.001	0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
Constant	-0.002***	-0.001***	-0.001***	-0.002***	-0.002***	-0.002***	-0.002	-0.003***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Observations	5,575	5,575	5,575	5,575	5,575	5,575	5,575	5,571	5,575
R-squared	0.004	0.028	0.040	0.047	0.054	N.A.	0.087	0.069	
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Dependent variable: **Equity Prices**

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) P&S	(7) Robust	(8) Lagged	(9) Random
AN_OMT	2.272***	1.907***	1.917***	2.005***	2.015***	2.015***	2.861***	2.024***	2.015***
	(0.125)	(0.166)	(0.169)	(0.231)	(0.232)	(0.267)	(0.493)	(0.225)	(0.224)
AN_SMP	0.130	0.160	0.180	0.139	-0.487	-0.487	6.342***	-1.118	-0.487
	(0.646)	(0.642)	(0.614)	(0.608)	(0.646)	(0.716)	(0.508)	(0.747)	(0.631)
SLTRO	0.556***	0.549***	0.552***	0.546***	0.588***	0.588***	0.605**	0.759***	0.588***
	(0.082)	(0.087)	(0.086)	(0.090)	(0.087)	(0.104)	(0.273)	(0.081)	(0.088)
VLTRO	0.535***	0.540***	0.538***	0.529***	0.598***	0.598***	0.410	0.516***	0.598***
	(0.062)	(0.072)	(0.074)	(0.059)	(0.057)	(0.064)	(0.252)	(0.058)	(0.054)
SMP	0.062*	0.056*	0.051	0.059*	0.221***	0.221***	0.096*	0.231***	0.221***
	(0.032)	(0.031)	(0.031)	(0.033)	(0.044)	(0.050)	(0.052)	(0.042)	(0.043)
Constant	-0.042***	-0.050***	-0.051***	-0.039***	-0.040***	-0.040***	0.006	-0.081***	-0.040***
	(0.010)	(0.011)	(0.011)	(0.012)	(0.012)	(0.014)	(0.037)	(0.013)	(0.011)
Observations	5,652	5,652	5,652	5,652	5,652	5,652	5,652	5,648	5,652
R-squared	0.009	0.026	0.039	0.047	0.053	N.A.	0.099	0.134	0.053
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Table 5B – Full estimation results for prices (continued)
Germany, Austria, Finland and Netherlands

	Dependent variable: **Bank Equity Prices**								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No controls	Surprises	US QE	Auctions	Benchmark	P&S	Robust	Lagged	Random
AN_OMT	3.547***	2.645***	2.669***	2.641***	2.653***	2.653***	3.577***	2.658***	2.653***
	(0.462)	(0.373)	(0.383)	(0.613)	(0.613)	(0.699)	(0.765)	(0.596)	(0.615)
AN_SMP	3.932***	3.895***	3.919***	3.661**	2.924*	2.924*	8.240***	2.392	2.924**
	(1.506)	(1.440)	(1.482)	(1.515)	(1.532)	(1.680)	(0.788)	(1.513)	(1.467)
SLTRO	0.253***	0.440***	0.447***	0.450***	0.498***	0.498***	0.797*	0.752***	0.498***
	(0.097)	(0.121)	(0.125)	(0.129)	(0.135)	(0.152)	(0.423)	(0.130)	(0.131)
VLTRO	0.931***	0.952***	0.951***	1.026***	1.107***	1.107***	0.928**	1.134***	1.107***
	(0.187)	(0.144)	(0.147)	(0.071)	(0.074)	(0.083)	(0.391)	(0.125)	(0.072)
SMP	-0.110***	-0.102***	-0.108***	-0.046	0.146**	0.146**	-0.090	0.154***	0.146**
	(0.030)	(0.027)	(0.027)	(0.065)	(0.060)	(0.069)	(0.081)	(0.058)	(0.062)
Constant	-0.114**	-0.120**	-0.121**	-0.105***	-0.107***	-0.107***	-0.066	-0.147***	-0.107***
	(0.045)	(0.050)	(0.049)	(0.025)	(0.025)	(0.029)	(0.057)	(0.025)	(0.025)
Observations	5,652	5,652	5,652	5,652	5,652	5,652	5,652	5,648	5,652
R-squared	0.006	0.015	0.024	0.041	0.043	N.A.	0.077	0.064	0.043
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Dependent variable: **Exchange Rate (Euro NEER)**
(See the results for Italy and Spain in Table 5A)

Table 5C – Full estimation results for prices

Advanced Economies

Dependent variable: **10 Year Sovereign Bond Yield**

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) D&K	(7) P&S	(8) Robust	(9) Lagged	(10) Random
AN_OMT	0.067***	0.053***	0.054***	0.057***	0.057***	0.057***	0.057***	0.058***	0.058***	0.057***
	(0.012)	(0.011)	(0.012)	(0.011)	(0.011)	(0.014)	(0.012)	(0.011)	(0.011)	(0.011)
AN_SMP	0.037**	0.037*	0.038**	0.038**	0.019	0.019	0.019	0.036***	0.006	0.019
	(0.018)	(0.019)	(0.019)	(0.019)	(0.019)	(0.063)	(0.020)	(0.012)	(0.020)	(0.018)
SLTRO	-0.012***	-0.013***	-0.013***	-0.013***	-0.012***	-0.012	-0.012***	-0.011*	-0.011***	-0.012***
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.015)	(0.004)	(0.006)	(0.004)	(0.004)
VLTRO	0.002	-0.003	-0.003	-0.002	-0.000	-0.000	0.000	-0.004	-0.001	-0.000
	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.009)	(0.004)	(0.006)	(0.003)	(0.003)
SMP	-0.005***	-0.005***	-0.006***	-0.006***	-0.001	-0.001	-0.001	-0.005***	-0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.002***	-0.001***	-0.001***	-0.001***	-0.002***	-0.002	-0.002***	-0.004***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)
Observations	13,945	13,945	13,945	13,945	13,945	13,945	13,945	13,945	13,932	13,945
R-squared	0.004	0.022	0.036	0.043	0.047	0.047	N.A.	0.047	0.053	0.047
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Dependent variable: **Equity Prices**

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) D&K	(7) P&S	(8) Robust	(9) Lagged	(10) Random
AN_OMT	1.441***	1.159***	1.165***	1.268***	1.275***	1.275***	1.275***	1.296***	1.296***	1.275***
	(0.130)	(0.112)	(0.108)	(0.129)	(0.123)	(0.384)	(0.129)	(0.267)	(0.127)	(0.129)
AN_SMP	-0.494*	-0.492*	-0.467*	-0.502*	-0.927***	-0.927	-0.927***	-3.140***	-1.492***	-0.927***
	(0.281)	(0.290)	(0.281)	(0.263)	(0.245)	(2.752)	(0.263)	(0.275)	(0.238)	(0.257)
SLTRO	0.398***	0.381***	0.384***	0.369***	0.397***	0.397	0.397***	0.535***	0.480***	0.397***
	(0.050)	(0.069)	(0.065)	(0.069)	(0.067)	(0.424)	(0.073)	(0.148)	(0.081)	(0.067)
VLTRO	0.248***	0.253***	0.247***	0.244***	0.291***	0.291	0.291***	0.186	0.218***	0.291***
	(0.066)	(0.075)	(0.074)	(0.079)	(0.079)	(0.237)	(0.084)	(0.137)	(0.077)	(0.076)
SMP	0.069***	0.071***	0.063***	0.072***	0.183***	0.183	0.183***	0.027	0.190***	0.183***
	(0.014)	(0.014)	(0.014)	(0.011)	(0.016)	(0.127)	(0.018)	(0.028)	(0.018)	(0.016)
Constant	-0.014***	-0.022***	-0.019***	-0.018***	-0.019***	-0.019	-0.019***	0.050	-0.048***	-0.019***
	(0.004)	(0.004)	(0.004)	(0.007)	(0.007)	(0.036)	(0.007)	(0.031)	(0.006)	(0.006)
Observations	14,130	14,130	14,130	14,130	14,130	14,130	14,130	14,130	14,117	14,130
R-squared	0.010	0.024	0.037	0.043	0.046	0.046	N.A.	0.057	0.082	0.046
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Table 5C – Full estimation results for prices (continued)
Advanced Economies

Dependent variable: **Bank Equity Prices**

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) D&K	(7) P&S	(8) Robust	(9) Lagged	(10) Random
AN_OMT	1.850***	1.232***	1.248***	1.249***	1.258***	1.258**	1.291***	1.612***	1.289***	1.261***
	(0.302)	(0.257)	(0.283)	(0.296)	(0.285)	(0.534)	(0.293)	(0.400)	(0.299)	(0.292)
AN_SMP	0.696	0.674	0.692	0.685	0.180	0.180	0.178	-2.438***	-0.310	0.181
	(0.693)	(0.659)	(0.679)	(0.620)	(0.645)	(3.554)	(0.680)	(0.411)	(0.582)	(0.682)
SLTRO	0.147	0.138	0.142	0.136	0.172	0.172	0.150	0.164	0.254**	0.166
	(0.108)	(0.117)	(0.119)	(0.116)	(0.116)	(0.507)	(0.121)	(0.227)	(0.121)	(0.117)
VLTRO	0.383***	0.347***	0.351***	0.387***	0.443***	0.443*	0.442***	0.394*	0.336***	0.448***
	(0.100)	(0.105)	(0.108)	(0.111)	(0.123)	(0.250)	(0.127)	(0.204)	(0.113)	(0.119)
SMP	-0.020	-0.013	-0.016	-0.012	0.119***	0.119	0.119***	-0.040	0.119***	0.120***
	(0.031)	(0.030)	(0.031)	(0.031)	(0.033)	(0.160)	(0.035)	(0.042)	(0.033)	(0.034)
Constant	-0.043***	-0.051***	-0.055***	-0.064***	-0.066***	-0.066	-0.062***	-0.106**	-0.101***	-0.066***
	(0.012)	(0.011)	(0.013)	(0.012)	(0.012)	(0.051)	(0.014)	(0.046)	(0.017)	(0.013)
Observations	13,343	13,343	13,343	13,343	13,343	13,343	13,343	13,343	13,332	13,343
R-squared	0.004	0.016	0.031	0.037	0.039	0.039	N.A.	0.055	0.064	0.039
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Dependent variable: **Exchange Rate**
(Bilateral exchange rate with the euro, "+" indicates euro appreciation)

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) P&S	(7) Robust	(8) Lagged	(9) Random
AN_OMT	0.148	0.145	0.141	0.227**	0.227**	0.227**	0.218*	0.232**	0.227**
	(0.097)	(0.089)	(0.088)	(0.093)	(0.093)	(0.098)	(0.124)	(0.097)	(0.094)
AN_SMP	-0.328**	-0.346***	-0.360**	-0.367***	-0.378***	-0.378***	-0.145	-0.412***	-0.378***
	(0.133)	(0.132)	(0.141)	(0.137)	(0.124)	(0.136)	(0.128)	(0.133)	(0.131)
SLTRO	0.011	0.095	0.093	0.085	0.086	0.086	0.079	0.076	0.086
	(0.060)	(0.062)	(0.060)	(0.060)	(0.062)	(0.064)	(0.069)	(0.066)	(0.061)
VLTRO	-0.144***	-0.075***	-0.072***	-0.073***	-0.072***	-0.072**	-0.050	-0.072***	-0.072***
	(0.036)	(0.024)	(0.024)	(0.024)	(0.027)	(0.028)	(0.064)	(0.023)	(0.026)
SMP	-0.040***	-0.037***	-0.033**	-0.031**	-0.028*	-0.028*	-0.029**	-0.028*	-0.028*
	(0.013)	(0.013)	(0.014)	(0.014)	(0.015)	(0.016)	(0.013)	(0.015)	(0.015)
Constant	-0.008**	-0.009**	-0.010**	-0.009	-0.009	-0.009	0.010	-0.008	-0.009
	(0.004)	(0.004)	(0.004)	(0.006)	(0.006)	(0.007)	(0.014)	(0.007)	(0.006)
Observations	14,130	14,130	14,130	14,130	14,130	14,130	14,130	14,117	14,130
R-squared	0.001	0.008	0.013	0.016	0.016	N.A.	0.020	0.016	0.016
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Table 5D – Full estimation results for prices
Emerging Markets (ex EU)

Dependent variable: **10 Year Sovereign Bond Yield**

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) P&S	(7) Robust	(8) Lagged	(9) Random
AN_OMT	0.012	0.004	0.003	0.004	0.005	0.003	0.005	0.004	0.004
	(0.011)	(0.014)	(0.013)	(0.016)	(0.016)	(0.016)	(0.008)	(0.016)	(0.016)
AN_SMP	-0.048***	-0.048***	-0.049***	-0.049**	-0.054***	-0.053***	0.001	-0.045**	-0.054***
	(0.018)	(0.018)	(0.018)	(0.020)	(0.019)	(0.020)	(0.008)	(0.020)	(0.019)
SLTRO	-0.002	0.005	0.004	0.005	0.005	0.008	-0.001	0.004	0.005
	(0.008)	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)	(0.005)	(0.007)	(0.007)
VLTRO	0.004	0.006	0.005	0.007	0.008*	0.008*	0.001	0.010**	0.008*
	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.004)
SMP	-0.003***	-0.003***	-0.003***	-0.003***	-0.002	-0.001	-0.003***	-0.002*	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.001***	-0.001***	-0.000*	-0.000	-0.000	-0.000	-0.005***	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)
Observations	23,754	23,754	23,754	23,754	23,754	23,754	23,754	23,730	23,754
R-squared	0.000	0.003	0.006	0.008	0.008	N.A.	0.012	0.010	0.008
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Dependent variable: **Equity Prices**

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) P&S	(7) Robust	(8) Lagged	(9) Random
AN_OMT	1.191***	1.086***	1.097***	1.260***	1.263***	1.263***	1.163***	1.286***	1.263***
	(0.195)	(0.227)	(0.219)	(0.222)	(0.226)	(0.232)	(0.208)	(0.230)	(0.218)
AN_SMP	-1.533***	-1.553***	-1.501***	-1.486***	-1.743***	-1.743***	-1.313***	-2.165***	-1.743***
	(0.266)	(0.273)	(0.257)	(0.265)	(0.275)	(0.285)	(0.214)	(0.279)	(0.273)
SLTRO	0.083	0.014	0.019	0.001	0.017	0.017	0.079	0.107	0.017
	(0.068)	(0.074)	(0.071)	(0.072)	(0.072)	(0.075)	(0.115)	(0.079)	(0.072)
VLTRO	0.133**	0.096	0.090	0.047	0.075	0.075	-0.004	0.043	0.075
	(0.067)	(0.074)	(0.075)	(0.070)	(0.076)	(0.076)	(0.106)	(0.073)	(0.074)
SMP	0.068***	0.076***	0.062***	0.063***	0.129***	0.129***	0.033	0.136***	0.129***
	(0.022)	(0.023)	(0.023)	(0.022)	(0.026)	(0.026)	(0.022)	(0.024)	(0.025)
Constant	0.016***	0.010*	0.010*	-0.006	-0.006	-0.006	0.051	-0.023***	-0.006
	(0.006)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)	(0.032)	(0.006)	(0.006)
Observations	25,434	25,434	25,434	25,434	25,434	25,434	25,434	25,405	25,434
R-squared	0.006	0.018	0.025	0.031	0.032	N.A.	0.035	0.046	0.032
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Table 5D – Full estimation results for prices (continued)

Emerging Markets (ex EU)

Dependent variable: **Bank Equity Prices**

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) P&S	(7) Robust	(8) Lagged	(9) Random
AN_OMT	1.221***	1.085***	1.100***	1.232***	1.237***	1.237***	1.239***	1.268***	1.237***
	(0.223)	(0.248)	(0.240)	(0.246)	(0.256)	(0.263)	(0.256)	(0.262)	(0.250)
AN_SMP	-1.789***	-1.809***	-1.751***	-1.737***	-2.088***	-2.088***	-1.504***	-2.575***	-2.088***
	(0.365)	(0.363)	(0.346)	(0.337)	(0.390)	(0.391)	(0.263)	(0.391)	(0.379)
SLTRO	0.035	-0.056	-0.051	-0.067	-0.044	-0.044	-0.046	0.049	-0.044
	(0.088)	(0.083)	(0.083)	(0.088)	(0.088)	(0.090)	(0.141)	(0.086)	(0.087)
VLTRO	0.098	0.027	0.024	-0.016	0.022	0.022	0.002	0.002	0.022
	(0.081)	(0.086)	(0.085)	(0.085)	(0.093)	(0.093)	(0.131)	(0.088)	(0.093)
SMP	0.072***	0.081***	0.067**	0.067***	0.158***	0.158***	0.053*	0.168***	0.158***
	(0.025)	(0.024)	(0.026)	(0.025)	(0.032)	(0.034)	(0.027)	(0.031)	(0.033)
Constant	0.019***	0.010	0.008	-0.008	-0.009	-0.009	0.017	-0.023**	-0.009
	(0.007)	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)	(0.038)	(0.010)	(0.009)
Observations	24,021	24,021	24,021	24,021	24,021	24,021	24,021	23,994	24,021
R-squared	0.004	0.015	0.022	0.027	0.029	N.A.	0.029	0.041	0.041
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Dependent variable: **Exchange Rate**

(Bilateral exchange rate with the euro, "+" indicates euro appreciation)

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) P&S	(7) Robust	(8) Lagged	(9) Random
AN_OMT	0.281**	0.259**	0.249**	0.333**	0.331**	0.332**	0.334***	0.332**	0.332**
	(0.124)	(0.117)	(0.117)	(0.146)	(0.149)	(0.150)	(0.128)	(0.147)	(0.149)
AN_SMP	0.477***	0.449***	0.428***	0.446***	0.557***	0.561***	1.068***	0.629***	0.557***
	(0.116)	(0.118)	(0.120)	(0.122)	(0.130)	(0.139)	(0.131)	(0.144)	(0.137)
SLTRO	-0.161***	-0.008	-0.012	-0.020	-0.027	-0.026	-0.062	-0.026	-0.027
	(0.040)	(0.040)	(0.042)	(0.041)	(0.040)	(0.042)	(0.071)	(0.045)	(0.042)
VLTRO	-0.201***	-0.115***	-0.112***	-0.094**	-0.106***	-0.114***	-0.078	-0.094**	-0.106**
	(0.042)	(0.041)	(0.041)	(0.040)	(0.040)	(0.041)	(0.065)	(0.042)	(0.041)
SMP	-0.085***	-0.080***	-0.075***	-0.076***	-0.105***	-0.106***	-0.094***	-0.107***	-0.105***
	(0.007)	(0.007)	(0.008)	(0.007)	(0.010)	(0.011)	(0.014)	(0.010)	(0.011)
Constant	-0.003	-0.003	-0.003	-0.015***	-0.015***	-0.015***	-0.023	-0.012***	-0.015***
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.019)	(0.003)	(0.003)
Observations	23,688	23,688	23,688	23,688	23,688	23,688	23,688	23,663	23,688
R-squared	0.006	0.017	0.029	0.033	0.034	N.A.	0.041	0.036	0.034
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Table 5E – Full estimation results for prices

Emerging EU

Dependent variable: **10 Year Sovereign Bond Yield**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No controls	Surprises	US QE	Auctions	Benchmark	P&S	Robust	Lagged	Random
AN_OMT	-0.009	0.002	0.002	-0.015	-0.015	-0.015	-0.021	-0.014	-0.015
	(0.012)	(0.015)	(0.016)	(0.016)	(0.017)	(0.019)	(0.019)	(0.018)	(0.017)
AN_SMP	-0.065	-0.065	-0.067	-0.065	-0.067	-0.013	0.021	-0.045	-0.067
	(0.100)	(0.100)	(0.102)	(0.098)	(0.083)	(0.118)	(0.022)	(0.087)	(0.087)
SLTRO	0.011***	0.004	0.004	0.005	0.005	0.005	0.002	0.011	0.005
	(0.004)	(0.007)	(0.007)	(0.006)	(0.006)	(0.007)	(0.011)	(0.008)	(0.006)
VLTRO	-0.007*	-0.004	-0.004	-0.002	-0.002	-0.001	-0.015	-0.002	-0.002
	(0.004)	(0.006)	(0.007)	(0.007)	(0.007)	(0.008)	(0.010)	(0.008)	(0.007)
SMP	-0.008*	-0.008*	-0.007	-0.008*	-0.008	-0.006	-0.004*	-0.010*	-0.008
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.002)	(0.006)	(0.006)
Constant	0.000	-0.000	-0.000	0.000	0.000	0.000	-0.001	-0.001***	0.000
	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
Observations	5,592	5,592	5,592	5,592	5,592	5,592	5,592	5,588	5,592
R-squared	0.001	0.008	0.014	0.017	0.017	N.A.	0.034	0.028	0.017
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Dependent variable: **Equity Prices**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	No controls	Surprises	US QE	Auctions	Benchmark	P&S	Robust	Lagged	Random
AN_OMT	0.597***	0.378*	0.389**	0.533**	0.539**	0.539**	0.887*	0.468**	0.539**
	(0.084)	(0.199)	(0.194)	(0.223)	(0.218)	(0.244)	(0.481)	(0.212)	(0.217)
AN_SMP	0.709	0.743	0.738	0.756	0.443	0.443	-2.681***	0.458	0.443
	(1.233)	(1.217)	(1.235)	(1.232)	(0.990)	(1.155)	(0.495)	(0.934)	(1.024)
SLTRO	-0.304***	-0.246**	-0.243**	-0.229*	-0.208*	-0.208	0.253	-0.154	-0.208*
	(0.093)	(0.121)	(0.120)	(0.120)	(0.115)	(0.131)	(0.266)	(0.125)	(0.114)
VLTRO	0.333	0.370	0.371	0.287	0.322	0.322	0.077	0.258	0.322
	(0.261)	(0.276)	(0.275)	(0.264)	(0.246)	(0.275)	(0.246)	(0.240)	(0.243)
SMP	-0.130***	-0.136***	-0.135***	-0.139***	-0.058	-0.058	-0.115**	-0.035	-0.058
	(0.026)	(0.031)	(0.030)	(0.025)	(0.043)	(0.051)	(0.051)	(0.045)	(0.045)
Constant	-0.040**	-0.052***	-0.053***	-0.056***	-0.057***	-0.057***	-0.076**	-0.065***	-0.057***
	(0.016)	(0.014)	(0.012)	(0.018)	(0.017)	(0.019)	(0.036)	(0.015)	(0.017)
Observations	5,652	5,652	5,652	5,652	5,652	5,652	5,652	5,648	5,652
R-squared	0.003	0.015	0.019	0.031	0.032	N.A.	0.039	0.109	0.032
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Table 5E – Full estimation results for prices (continued)
Emerging EU

Dependent variable: **Bank Equity Prices**

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) P&S	(7) Robust	(8) Lagged	(9) Random
AN_OMT	1.710***	1.053***	1.062***	1.286***	1.300***	1.300***	1.752**	1.171***	1.300***
	(0.172)	(0.281)	(0.282)	(0.371)	(0.371)	(0.411)	(0.743)	(0.330)	(0.358)
AN_SMP	2.903**	2.902**	2.942**	3.019**	2.342**	2.342**	-1.643**	2.929***	2.342**
	(1.389)	(1.432)	(1.456)	(1.423)	(0.955)	(1.067)	(0.765)	(0.723)	(0.910)
SLTRO	-0.254	-0.184	-0.182	-0.174	-0.126	-0.126	0.153	-0.079	-0.126
	(0.194)	(0.285)	(0.299)	(0.268)	(0.303)	(0.343)	(0.411)	(0.247)	(0.300)
VLTRO	0.506*	0.472*	0.478*	0.389*	0.465**	0.465*	0.252	0.344	0.465**
	(0.269)	(0.254)	(0.254)	(0.235)	(0.232)	(0.262)	(0.380)	(0.229)	(0.231)
SMP	-0.270***	-0.270***	-0.278***	-0.297***	-0.122	-0.122	-0.185**	-0.106	-0.122
	(0.091)	(0.089)	(0.082)	(0.088)	(0.134)	(0.152)	(0.078)	(0.155)	(0.136)
Constant	-0.053*	-0.060***	-0.066***	-0.070***	-0.073***	-0.073***	-0.127**	-0.081***	-0.073***
	(0.030)	(0.022)	(0.021)	(0.019)	(0.016)	(0.018)	(0.055)	(0.012)	(0.016)
Observations	5,652	5,652	5,652	5,652	5,652	5,652	5,652	5,648	5,652
R-squared	0.004	0.015	0.019	0.032	0.034	N.A.	0.038	0.098	0.034
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Dependent variable: **Exchange Rate**
(Bilateral exchange rate with the euro, "+" indicates euro appreciation)

	(1) No controls	(2) Surprises	(3) US QE	(4) Auctions	(5) Benchmark	(6) P&S	(7) Robust	(8) Lagged	(9) Random
AN_OMT	-0.534***	-0.383**	-0.386**	-0.470***	-0.475***	-0.475***	-0.807***	-0.486***	-0.475***
	(0.207)	(0.163)	(0.162)	(0.152)	(0.153)	(0.178)	(0.169)	(0.155)	(0.157)
AN_SMP	-0.435**	-0.426**	-0.452**	-0.452**	-0.212*	-0.212*	0.059	-0.058	-0.212*
	(0.191)	(0.198)	(0.203)	(0.203)	(0.109)	(0.126)	(0.174)	(0.093)	(0.111)
SLTRO	-0.088	-0.112	-0.113*	-0.103	-0.120*	-0.120	-0.125	-0.143**	-0.120*
	(0.058)	(0.073)	(0.069)	(0.066)	(0.069)	(0.079)	(0.093)	(0.072)	(0.070)
VLTRO	0.010	0.023	0.026	0.022	-0.005	-0.005	-0.035	-0.024	-0.005
	(0.096)	(0.114)	(0.108)	(0.108)	(0.115)	(0.132)	(0.086)	(0.108)	(0.116)
SMP	0.023	0.020	0.027	0.027	-0.035***	-0.035***	0.021	-0.038***	-0.035***
	(0.016)	(0.016)	(0.018)	(0.017)	(0.011)	(0.013)	(0.018)	(0.011)	(0.011)
Constant	-0.001	0.002	0.001	0.000	0.001	0.001	0.005	0.006	0.001
	(0.002)	(0.004)	(0.004)	(0.005)	(0.005)	(0.006)	(0.013)	(0.006)	(0.005)
Observations	5,625	5,625	5,625	5,625	5,625	5,625	5,625	5,621	5,625
R-squared	0.005	0.015	0.023	0.030	0.035	N.A.	0.063	0.041	0.035
Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	N
Control Variables	No	Surprises	Surprises US QE	Surprises US QE Auctions	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies Lags	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Table 6A – Alternative measurement of the SMP and S/VLTROs under the benchmark specification
Italy and Spain

Alternative SMP measurement

Dependent variable: **10 Year Sovereign Bond Yield**							Dependent variable: **Equity Prices**						
	(1) Actual	(2) Previous	(3) AR(1)	(4) Tobit 1	(5) Tobit 2	(6) Benchmark		(1) Actual	(2) Previous	(3) AR(1)	(4) Tobit 1	(5) Tobit 2	(6) Benchmark
AN_OMT	-0.369***	-0.369***	-0.369***	-0.370***	-0.369***	-0.370***	AN_OMT	4.342***	4.341***	4.344***	4.345***	4.344***	4.347***
	(0.038)	(0.039)	(0.037)	(0.040)	(0.039)	(0.039)		(0.382)	(0.393)	(0.385)	(0.388)	(0.388)	(0.381)
AN_SMP	-0.665***	-0.645***	-0.655***	-0.609***	-0.664***	-0.606***	AN_SMP	3.861***	3.809***	4.246***	3.698***	3.748***	3.461***
	(0.083)	(0.086)	(0.085)	(0.088)	(0.100)	(0.086)		(0.517)	(0.632)	(0.526)	(0.625)	(0.650)	(0.638)
SLTRO	-0.037***	-0.036***	-0.037***	-0.036***	-0.038***	-0.036***	SLTRO	0.641***	0.633***	0.659***	0.632***	0.639***	0.629***
	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)		(0.119)	(0.129)	(0.119)	(0.125)	(0.122)	(0.122)
VLTRO	-0.045***	-0.046***	-0.046***	-0.048***	-0.045***	-0.051***	VLTRO	0.514***	0.517***	0.454***	0.523***	0.528***	0.558***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)	(0.013)		(0.087)	(0.096)	(0.087)	(0.094)	(0.102)	(0.099)
SMP	0.001***	-0.004***	-0.002	-0.014***	0.001	-0.015***	SMP	0.009***	0.022	-0.105***	0.051**	0.038	0.113***
	(0.000)	(0.001)	(0.002)	(0.001)	(0.004)	(0.001)		(0.003)	(0.023)	(0.002)	(0.023)	(0.029)	(0.028)
Constant	0.000	0.000*	0.000**	0.001***	0.000***	0.001***	Constant	-0.072***	-0.071***	-0.072***	-0.072***	-0.072***	-0.074***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	2,823	2,823	2,823	2,823	2,823	2,823	Observations	2,826	2,826	2,826	2,826	2,826	2,826
R-squared	0.165	0.165	0.165	0.167	0.165	0.168	R-squared	0.081	0.081	0.082	0.081	0.081	0.082
Fixed Effects	Y	Y	Y	Y	Y	Y	Fixed Effects	Y	Y	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Note: the table reports the estimated coefficients for the benchmark specification (see model description in the annex) under alternative measurement schemes for the "unexpected" SMP purchases. "Actual", the SMP variable is the actual SMP purchased amounts. "Previous", the SMP variable is the difference between current and previous purchases. "AR(1)" the SMP variable is the residual of an AR(1) model for SMP purchases. "Tobit 1" and "Tobit 2", the SMP variable is the residual of two different Tobit models for SMP purchases (see Annex 1). "Benchmark" indicates the benchmark model ("Tobit 3" in Annex 1).

Alternative SLTROs and VLTROs measurement

Dependent variable: **10 Year Sovereign Bond Yield**						Dependent variable: **Equity Prices**					
	(1) Benchmark	(2) long term	(3) assets	(4) 5 day	(5) Dummy		(1) Benchmark	(2) long term	(3) assets	(4) 5 day	(5) Dummy
AN_OMT	-0.370***	-0.370***	-0.370***	-0.370***	-0.372***	AN_OMT	4.347***	4.350***	4.354***	4.349***	4.389***
	(0.038)	(0.039)	(0.039)	(0.039)	(0.038)		(0.388)	(0.387)	(0.378)	(0.384)	(0.390)
AN_SMP	-0.606***	-0.606***	-0.606***	-0.607***	-0.605***	AN_SMP	3.461***	3.474***	3.481***	3.457***	3.418***
	(0.085)	(0.086)	(0.086)	(0.086)	(0.085)		(0.650)	(0.646)	(0.625)	(0.638)	(0.652)
SLTRO	-0.036***	-0.045***	-0.071***	-0.023***	-0.006***	SLTRO	0.629***	0.595***	0.548	0.447***	0.210***
	(0.006)	(0.006)	(0.004)	(0.009)	(0.000)		(0.124)	(0.168)	(0.348)	(0.149)	(0.006)
VLTRO	-0.051***	-0.071***	-0.102***	-0.047**	-0.028***	VLTRO	0.558***	0.670***	0.900***	0.677***	0.195**
	(0.013)	(0.019)	(0.026)	(0.018)	(0.009)		(0.101)	(0.137)	(0.155)	(0.064)	(0.084)
SMP	-0.015***	-0.014***	-0.014***	-0.015***	-0.014***	SMP	0.113***	0.110***	0.109***	0.117***	0.090***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		(0.029)	(0.029)	(0.030)	(0.028)	(0.029)
Constant	0.001***	0.001***	0.001***	0.001***	0.002***	Constant	-0.074***	-0.074***	-0.074***	-0.073***	-0.113***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Observations	2,823	2,823	2,823	2,823	2,823	Observations	2,826	2,826	2,826	2,826	2,826
R-squared	0.168	0.168	0.168	0.167	0.168	R-squared	0.082	0.082	0.081	0.082	0.083
Fixed Effects	Y	Y	Y	Y	Y	Fixed Effects	Y	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Note: the table reports the estimated coefficients for the benchmark specification (see model description in the annex) under alternative measurement schemes for the SLTRO and VLTRO variables. "Benchmark", benchmark specification. "Long Term", VLTROs and SLTROs are equal to the net expansion of long term liquidity as a result of the auction (equally split in the seven days around the auction). "Assets", VLTROs and SLTROs are equal to the net expansion in the ECB balance sheet as a result of the auction (equally split in the seven days around the auction). "5 day", VLTROs and SLTROs are equal to auction allotted amounts equally split in the 5 days around the auction. "Dummy", VLTROs and SLTROs are dummy variables equal to one in the 7 days around the auction.

Table 6B – Alternative measurement of the SMP and S/VLTROs under the benchmark specification
Germany, Austria, Finland and Netherlands

Alternative SMP measurement

Dependent variable: 10 Year Sovereign Bond Yield

	(1) Actual	(2) Previous	(3) AR(1)	(4) Tobit 1	(5) Tobit 2	(6) Benchmark
AN_OMT	0.050**	0.050**	0.050**	0.050**	0.050**	0.050**
	(0.022)	(0.022)	(0.022)	(0.021)	(0.022)	(0.022)
AN_SMP	0.010	-0.002	0.015	0.006	-0.003	0.006
	(0.018)	(0.018)	(0.018)	(0.019)	(0.019)	(0.018)
SLTRO	-0.008***	-0.009***	-0.008***	-0.008***	-0.008***	-0.008***
	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
VLTRO	-0.006***	-0.005***	-0.007***	-0.006***	-0.005***	-0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
SMP	-0.001***	0.002**	-0.002*	0.000	0.003**	0.000
	(0.000)	(0.001)	(0.001)	(0.002)	(0.001)	(0.003)
Constant	-0.001***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	5,575	5,575	5,575	5,575	5,575	5,575
R-squared	0.054	0.054	0.054	0.054	0.054	0.054
Fixed Effects	Y	Y	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Dependent variable: Equity Prices

	(1) Actual	(2) Previous	(3) AR(1)	(4) Tobit 1	(5) Tobit 2	(6) Benchmark
AN_OMT	2.006***	2.005***	2.004***	2.016***	2.014***	2.015***
	(0.238)	(0.230)	(0.237)	(0.231)	(0.232)	(0.232)
AN_SMP	0.279	-0.171	0.445	-0.337	-0.122	-0.487
	(0.639)	(0.634)	(0.628)	(0.628)	(0.654)	(0.616)
SLTRO	0.611***	0.569***	0.612***	0.580***	0.605***	0.588***
	(0.086)	(0.089)	(0.092)	(0.092)	(0.087)	(0.093)
VLTRO	0.512***	0.540***	0.494***	0.548***	0.561***	0.598***
	(0.064)	(0.062)	(0.054)	(0.060)	(0.052)	(0.054)
SMP	0.021	0.138***	-0.026	0.182***	0.126**	0.221***
	(0.028)	(0.028)	(0.035)	(0.047)	(0.052)	(0.042)
Constant	-0.038***	-0.034***	-0.036***	-0.039***	-0.038***	-0.040***
	(0.013)	(0.011)	(0.011)	(0.012)	(0.012)	(0.012)
Observations	5,652	5,652	5,652	5,652	5,652	5,652
R-squared	0.051	0.052	0.051	0.052	0.052	0.053
Fixed Effects	Y	Y	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Note: the table reports the estimated coefficients for the benchmark specification (see model description in the annex) under alternative measurement schemes for the "unexpected" SMP purchases. "Actual", the SMP variable is the actual SMP purchased amounts. "Previous", the SMP variable is the difference between current and previous purchases. "AR(1)" the SMP variable is the residual of an AR(1) model for SMP purchases. "Tobit 1" and "Tobit 2", the SMP variable is the residual of two different Tobit models for SMP purchases (see Annex 1). "Benchmark" indicates the benchmark model ("Tobit 3" in Annex 1).

Alternative SLTROs and VLTROs measurement

Dependent variable: 10 Year Sovereign Bond Yield

	(1) Benchmark	(2) long term	(3) assets	(4) 5 day	(5) Dummy
AN_OMT	0.050**	0.050**	0.050**	0.050**	0.050**
	(0.023)	(0.022)	(0.022)	(0.022)	(0.023)
AN_SMP	0.006	0.006	0.007	0.006	0.006
	(0.021)	(0.020)	(0.020)	(0.020)	(0.020)
SLTRO	-0.008***	-0.015***	-0.029***	-0.011***	-0.000
	(0.002)	(0.002)	(0.003)	(0.002)	(0.001)
VLTRO	-0.006***	-0.010***	-0.016***	-0.001	-0.003***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.000)
SMP	0.000	0.000	0.000	0.000	0.000
	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
Constant	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	5,575	5,575	5,575	5,575	5,575
R-squared	0.054	0.054	0.054	0.054	0.054
Fixed Effects	Y	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Dependent variable: Equity Prices

	(1) Benchmark	(2) long term	(3) assets	(4) 5 day	(5) Dummy
AN_OMT	2.015***	2.018***	2.022***	2.017***	2.056***
	(0.236)	(0.233)	(0.231)	(0.225)	(0.236)
AN_SMP	-0.487	-0.472	-0.459	-0.486	-0.533
	(0.628)	(0.623)	(0.644)	(0.613)	(0.625)
SLTRO	0.588***	0.508***	0.268	0.381***	0.208***
	(0.089)	(0.109)	(0.208)	(0.117)	(0.023)
VLTRO	0.598***	0.694***	0.895***	0.665***	0.233***
	(0.057)	(0.069)	(0.080)	(0.048)	(0.063)
SMP	0.221***	0.218***	0.219***	0.224***	0.198***
	(0.043)	(0.043)	(0.043)	(0.044)	(0.042)
Constant	-0.040***	-0.040***	-0.040***	-0.039***	-0.080***
	(0.012)	(0.012)	(0.011)	(0.011)	(0.009)
Observations	5,652	5,652	5,652	5,652	5,652
R-squared	0.053	0.052	0.052	0.052	0.054
Fixed Effects	Y	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Note: the table reports the estimated coefficients for the benchmark specification (see model description in the annex) under alternative measurement schemes for the SLTRO and VLTRO variables. "Benchmark", benchmark specification. "Long Term", VLTROs and SLTROs are equal to the net expansion of long term liquidity as a result of the auction (equally split in the seven days around the auction). "Assets", VLTROs and SLTROs are equal to the net expansion in the ECB balance sheet as a result of the auction (equally split in the seven days around the auction). "5 day", VLTROs and SLTROs are equal to auction allotted amounts equally split in the 5 days around the auction. "Dummy", VLTROs and SLTROs are dummy variables equal to one in the 7 days around the auction.

Table 6C – Alternative measurement of the SMP and S/VLTROs under the benchmark specification
Advanced Economies

Alternative SMP measurement

Dependent variable: **10 Year Sovereign Bond Yield**							Dependent variable: **Equity Prices**						
	(1) Actual	(2) Previous	(3) AR(1)	(4) Tobit 1	(5) Tobit 2	(6) Benchmark		(1) Actual	(2) Previous	(3) AR(1)	(4) Tobit 1	(5) Tobit 2	(6) Benchmark
AN_OMT	0.057***	0.057***	0.057***	0.057***	0.057***	0.057***	AN_OMT	1.270***	1.266***	1.264***	1.276***	1.276***	1.275***
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)		(0.124)	(0.123)	(0.127)	(0.128)	(0.125)	(0.117)
AN_SMP	0.027	0.018	0.034*	0.021	0.020	0.019	AN_SMP	-0.384	-0.700***	-0.322	-0.816***	-0.713***	-0.927***
	(0.018)	(0.018)	(0.020)	(0.019)	(0.018)	(0.018)		(0.283)	(0.255)	(0.290)	(0.247)	(0.268)	(0.250)
SLTRO	-0.012***	-0.012***	-0.011***	-0.012***	-0.012***	-0.012***	SLTRO	0.420***	0.379***	0.408***	0.390***	0.410***	0.397***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)		(0.074)	(0.069)	(0.069)	(0.070)	(0.071)	(0.070)
VLTRO	-0.000	0.000	-0.003	-0.000	-0.000	-0.000	VLTRO	0.224***	0.245***	0.233***	0.251***	0.269***	0.291***
	(0.004)	(0.004)	(0.003)	(0.004)	(0.003)	(0.003)		(0.076)	(0.077)	(0.078)	(0.080)	(0.083)	(0.080)
SMP	-0.003***	-0.000	-0.005***	-0.001	-0.001	-0.001	SMP	0.042***	0.122***	0.028**	0.154***	0.126***	0.183***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		(0.011)	(0.015)	(0.014)	(0.015)	(0.018)	(0.017)
Constant	-0.001***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	Constant	-0.021***	-0.014**	-0.015**	-0.018***	-0.018***	-0.019***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)
Observations	13,945	13,945	13,945	13,945	13,945	13,945	Observations	14,130	14,130	14,130	14,130	14,130	14,130
R-squared	0.048	0.047	0.048	0.047	0.047	0.047	R-squared	0.045	0.046	0.045	0.046	0.046	0.046
Fixed Effects	Y	Y	Y	Y	Y	Y	Fixed Effects	Y	Y	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Note: the table reports the estimated coefficients for the benchmark specification (see model description in the annex) under alternative measurement schemes for the "unexpected" SMP purchases. "Actual", the SMP variable is the actual SMP purchased amounts. "Previous", the SMP variable is the difference between current and previous purchases. "AR(1)" the SMP variable is the residual of an AR(1) model for SMP purchases. "Tobit 1" and "Tobit 2", the SMP variable is the residual of two different Tobit models for SMP purchases (see Annex 1). "Benchmark" indicates the benchmark model ("Tobit 3" in Annex 1).

Alternative SLTROs and VLTROs measurement

Dependent variable: **10 Year Sovereign Bond Yield**						Dependent variable: **Equity Prices**					
	(1) Benchmark	(2) long term	(3) assets	(4) 5 day	(5) Dummy		(1) Benchmark	(2) long term	(3) assets	(4) 5 day	(5) Dummy
AN_OMT	0.057***	0.057***	0.057***	0.057***	0.057***	AN_OMT	1.275***	1.278***	1.280***	1.276***	1.299***
	(0.011)	(0.012)	(0.011)	(0.011)	(0.011)		(0.126)	(0.123)	(0.122)	(0.115)	(0.126)
AN_SMP	0.019	0.019	0.019	0.019	0.018	AN_SMP	-0.927***	-0.916***	-0.907***	-0.931***	-0.950***
	(0.019)	(0.019)	(0.018)	(0.019)	(0.019)		(0.243)	(0.254)	(0.248)	(0.251)	(0.245)
SLTRO	-0.012***	-0.018***	-0.032***	-0.012***	0.000	SLTRO	0.397***	0.299***	0.112	0.231**	0.119***
	(0.004)	(0.005)	(0.007)	(0.004)	(0.001)		(0.070)	(0.071)	(0.134)	(0.093)	(0.027)
VLTRO	-0.000	-0.003	-0.006	0.004	0.001	VLTRO	0.291***	0.317***	0.392***	0.417***	0.094**
	(0.003)	(0.004)	(0.006)	(0.004)	(0.002)		(0.079)	(0.093)	(0.130)	(0.074)	(0.045)
SMP	-0.001	-0.001	-0.000	-0.001	-0.001	SMP	0.183***	0.181***	0.182***	0.186***	0.170***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		(0.017)	(0.016)	(0.016)	(0.017)	(0.015)
Constant	-0.002***	-0.001***	-0.001***	-0.002***	-0.002***	Constant	-0.019***	-0.019***	-0.019***	-0.020***	-0.042***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		(0.007)	(0.006)	(0.006)	(0.007)	(0.005)
Observations	13,945	13,945	13,945	13,945	13,945	Observations	14,130	14,130	14,130	14,130	14,130
R-squared	0.047	0.047	0.047	0.047	0.047	R-squared	0.046	0.046	0.046	0.046	0.047
Fixed Effects	Y	Y	Y	Y	Y	Fixed Effects	Y	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Note: the table reports the estimated coefficients for the benchmark specification (see model description in the annex) under alternative measurement schemes for the SLTRO and VLTRO variables. "Benchmark", benchmark specification. "Long Term", VLTROs and SLTROs are equal to the net expansion of long term liquidity as a result of the auction (equally split in the seven days around the auction). "Assets", VLTROs and SLTROs are equal to the net expansion in the ECB balance sheet as a result of the auction (equally split in the seven days around the auction). "5 day", VLTROs and SLTROs are equal to auction allotted amounts equally split in the 5 days around the auction. "Dummy", VLTROs and SLTROs are dummy variables equal to one in the 7 days around the auction.

Table 6D – Alternative measurement of the SMP and S/VLTROs under the benchmark specification
Emerging Markets (ex EU)

Alternative SMP measurement

Dependent variable: 10 Year Sovereign Bond Yield

	(1) Actual	(2) Previous	(3) AR(1)	(4) Tobit 1	(5) Tobit 2	(6) Benchmark
AN_OMT	0.004	0.005	0.005	0.004	0.004	0.005
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
AN_SMP	-0.051***	-0.061***	-0.056***	-0.054***	-0.055***	-0.054***
	(0.018)	(0.021)	(0.020)	(0.019)	(0.021)	(0.019)
SLTRO	0.004	0.005	0.005	0.005	0.005	0.005
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
VLTRO	0.008*	0.009*	0.008*	0.008*	0.008*	0.008*
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
SMP	-0.002***	0.000	-0.001	-0.002	-0.001	-0.002
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Constant	0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	23,754	23,754	23,754	23,754	23,754	23,754
R-squared	0.008	0.008	0.008	0.008	0.008	0.008
Fixed Effects	Y	Y	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Dependent variable: Equity Prices

	(1) Actual	(2) Previous	(3) AR(1)	(4) Tobit 1	(5) Tobit 2	(6) Benchmark
AN_OMT	1.260***	1.257***	1.255***	1.265***	1.265***	1.263***
	(0.217)	(0.219)	(0.224)	(0.229)	(0.221)	(0.226)
AN_SMP	-1.370***	-1.578***	-1.354***	-1.727***	-1.681***	-1.743***
	(0.244)	(0.277)	(0.256)	(0.273)	(0.279)	(0.291)
SLTRO	0.035	0.005	0.023	0.010	0.027	0.017
	(0.073)	(0.071)	(0.076)	(0.073)	(0.074)	(0.075)
VLTRO	0.027	0.042	0.040	0.050	0.069	0.075
	(0.068)	(0.072)	(0.078)	(0.066)	(0.073)	(0.075)
SMP	0.033***	0.086***	0.032	0.125***	0.113***	0.129***
	(0.010)	(0.022)	(0.024)	(0.023)	(0.022)	(0.026)
Constant	-0.008	-0.002	-0.003	-0.005	-0.006	-0.006
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Observations	25,434	25,434	25,434	25,434	25,434	25,434
R-squared	0.032	0.032	0.032	0.032	0.032	0.032
Fixed Effects	Y	Y	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Note: the table reports the estimated coefficients for the benchmark specification (see model description in the annex) under alternative measurement schemes for the "unexpected" SMP purchases. "Actual", the SMP variable is the actual SMP purchased amounts. "Previous", the SMP variable is the difference between current and previous purchases. "AR(1)" the SMP variable is the residual of an AR(1) model for SMP purchases. "Tobit 1" and "Tobit 2", the SMP variable is the residual of two different Tobit models for SMP purchases (see Annex 1). "Benchmark" indicates the benchmark model ("Tobit 3" in Annex 1).

Alternative SLTROs and VLTROs measurement

Dependent variable: 10 Year Sovereign Bond Yield

	(1) Benchmark	(2) long term	(3) assets	(4) 5 day	(5) Dummy
AN_OMT	0.005	0.005	0.005	0.004	0.005
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
AN_SMP	-0.054***	-0.054***	-0.053***	-0.054***	-0.053***
	(0.019)	(0.020)	(0.019)	(0.019)	(0.019)
SLTRO	0.005	0.002	-0.005	0.011	-0.001
	(0.007)	(0.009)	(0.012)	(0.012)	(0.002)
VLTRO	0.008*	0.011*	0.014*	0.007	0.005*
	(0.004)	(0.006)	(0.008)	(0.006)	(0.003)
SMP	-0.002	-0.002	-0.001	-0.002	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	23,754	23,754	23,754	23,754	23,754
R-squared	0.008	0.008	0.008	0.008	0.008
Fixed Effects	Y	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Dependent variable: Equity Prices

	(1) Benchmark	(2) long term	(3) assets	(4) 5 day	(5) Dummy
AN_OMT	1.263***	1.264***	1.264***	1.258***	1.269***
	(0.230)	(0.226)	(0.225)	(0.231)	(0.230)
AN_SMP	-1.743***	-1.737***	-1.726***	-1.774***	-1.769***
	(0.277)	(0.277)	(0.279)	(0.275)	(0.274)
SLTRO	0.017	-0.084	-0.486***	0.316***	0.063***
	(0.073)	(0.081)	(0.142)	(0.081)	(0.025)
VLTRO	0.075	0.061	0.011	0.331***	0.063
	(0.075)	(0.096)	(0.130)	(0.053)	(0.054)
SMP	0.129***	0.129***	0.133***	0.133***	0.122***
	(0.025)	(0.025)	(0.024)	(0.024)	(0.024)
Constant	-0.006	-0.006	-0.005	-0.008	-0.013*
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)
Observations	25,434	25,434	25,434	25,434	25,434
R-squared	0.032	0.032	0.033	0.033	0.033
Fixed Effects	Y	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Note: the table reports the estimated coefficients for the benchmark specification (see model description in the annex) under alternative measurement schemes for the SLTRO and VLTRO variables. "Benchmark", benchmark specification. "Long Term", VLTROs and SLTROs are equal to the net expansion of long term liquidity as a result of the auction (equally split in the seven days around the auction). "Assets", VLTROs and SLTROs are equal to the net expansion in the ECB balance sheet as a result of the auction (equally split in the seven days around the auction). "5 day", VLTROs and SLTROs are equal to auction allotted amounts equally split in the 5 days around the auction. "Dummy", VLTROs and SLTROs are dummy variables equal to one in the 7 days around the auction.

Table 6E – Alternative measurement of the SMP and S/VLTROs under the benchmark specification
Emerging EU

Alternative SMP measurement

Dependent variable: **10 Year Sovereign Bond Yield**							Dependent variable: **Equity Prices**						
	(1) Actual	(2) Previous	(3) AR(1)	(4) Tobit 1	(5) Tobit 2	(6) Benchmark		(1) Actual	(2) Previous	(3) AR(1)	(4) Tobit 1	(5) Tobit 2	(6) Benchmark
AN_OMT	-0.014	-0.015	-0.014	-0.015	-0.015	-0.015	AN_OMT	0.530***	0.542**	0.547**	0.537**	0.540**	0.539**
	(0.017)	(0.017)	(0.018)	(0.016)	(0.017)	(0.017)		(0.204)	(0.217)	(0.220)	(0.218)	(0.217)	(0.221)
AN_SMP	-0.104	-0.082	-0.086	-0.074	-0.084	-0.067	AN_SMP	0.583	0.367	0.841	0.501	0.330	0.443
	(0.103)	(0.094)	(0.095)	(0.088)	(0.092)	(0.086)		(1.108)	(1.097)	(1.126)	(1.043)	(1.056)	(1.015)
SLTRO	0.006	0.006	0.005	0.005	0.005	0.005	SLTRO	-0.230**	-0.202*	-0.178	-0.202*	-0.212*	-0.208*
	(0.006)	(0.006)	(0.007)	(0.006)	(0.006)	(0.006)		(0.114)	(0.112)	(0.116)	(0.118)	(0.115)	(0.118)
VLTRO	0.002	0.001	0.000	0.000	0.000	-0.002	VLTRO	0.331	0.337	0.243	0.330	0.334	0.322
	(0.009)	(0.008)	(0.007)	(0.008)	(0.008)	(0.007)		(0.239)	(0.248)	(0.234)	(0.250)	(0.248)	(0.249)
SMP	0.003*	-0.003	-0.003	-0.006	-0.003	-0.008	SMP	-0.097***	-0.038	-0.185***	-0.073*	-0.028	-0.058
	(0.001)	(0.003)	(0.004)	(0.005)	(0.004)	(0.006)		(0.020)	(0.029)	(0.037)	(0.041)	(0.029)	(0.045)
Constant	-0.000	-0.000	-0.000	-0.000	-0.000	0.000	Constant	-0.044***	-0.058***	-0.059***	-0.057***	-0.057***	-0.057***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		(0.014)	(0.018)	(0.018)	(0.017)	(0.017)	(0.017)
Observations	5,592	5,592	5,592	5,592	5,592	5,592	Observations	5,652	5,652	5,652	5,652	5,652	5,652
R-squared	0.017	0.017	0.017	0.017	0.017	0.017	R-squared	0.033	0.032	0.033	0.032	0.032	0.032
Fixed Effects	Y	Y	Y	Y	Y	Y	Fixed Effects	Y	Y	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Note: the table reports the estimated coefficients for the benchmark specification (see model description in the annex) under alternative measurement schemes for the "unexpected" SMP purchases. "Actual", the SMP variable is the actual SMP purchased amounts. "Previous", the SMP variable is the difference between current and previous purchases. "AR(1)" the SMP variable is the residual of an AR(1) model for SMP purchases. "Tobit 1" and "Tobit 2", the SMP variable is the residual of two different Tobit models for SMP purchases (see Annex 1). "Benchmark" indicates the benchmark model ("Tobit 3" in Annex 1).

Alternative SLTROs and VLTROs measurement

Dependent variable: **10 Year Sovereign Bond Yield**						Dependent variable: **Equity Prices**					
	(1) Benchmark	(2) long term	(3) assets	(4) 5 day	(5) Dummy		(1) Benchmark	(2) long term	(3) assets	(4) 5 day	(5) Dummy
AN_OMT	-0.015	-0.015	-0.015	-0.015	-0.016	AN_OMT	0.539**	0.539***	0.538**	0.540**	0.539***
	(0.017)	(0.018)	(0.017)	(0.017)	(0.017)		(0.210)	(0.206)	(0.219)	(0.211)	(0.203)
AN_SMP	-0.067	-0.067	-0.067	-0.067	-0.064	AN_SMP	0.443	0.454	0.471	0.435	0.425
	(0.085)	(0.089)	(0.084)	(0.085)	(0.084)		(0.992)	(1.006)	(1.008)	(0.993)	(0.998)
SLTRO	0.005	0.006	0.019	0.011	-0.007***	SLTRO	-0.208*	-0.361**	-1.041***	-0.498***	0.022
	(0.006)	(0.007)	(0.020)	(0.010)	(0.001)		(0.113)	(0.140)	(0.149)	(0.083)	(0.063)
VLTRO	-0.002	-0.003	-0.002	-0.001	0.004	VLTRO	0.322	0.330	0.324	0.588*	0.244
	(0.007)	(0.008)	(0.013)	(0.006)	(0.004)		(0.237)	(0.277)	(0.395)	(0.328)	(0.222)
SMP	-0.008	-0.008	-0.008	-0.008	-0.007	SMP	-0.058	-0.059	-0.053	-0.051	-0.061
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)		(0.043)	(0.045)	(0.047)	(0.043)	(0.038)
Constant	0.000	0.000	-0.000	0.000	0.001*	Constant	-0.057***	-0.056***	-0.054***	-0.057***	-0.061***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)		(0.016)	(0.016)	(0.017)	(0.016)	(0.005)
Observations	5,592	5,592	5,592	5,592	5,592	Observations	5,652	5,652	5,652	5,652	5,652
R-squared	0.017	0.017	0.017	0.017	0.018	R-squared	0.032	0.032	0.032	0.033	0.032
Fixed Effects	Y	Y	Y	Y	Y	Fixed Effects	Y	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Note: the table reports the estimated coefficients for the benchmark specification (see model description in the annex) under alternative measurement schemes for the SLTRO and VLTRO variables. "Benchmark", benchmark specification. "Long Term", VLTROs and SLTROs are equal to the net expansion of long term liquidity as a result of the auction (equally split in the seven days around the auction). "Assets", VLTROs and SLTROs are equal to the net expansion in the ECB balance sheet as a result of the auction (equally split in the seven days around the auction). "5 day", VLTROs and SLTROs are equal to auction allotted amounts equally split in the 5 days around the auction. "Dummy", VLTROs and SLTROs are dummy variables equal to one in the 7 days around the auction.

Table 7A: Total impact of ECB unconventional monetary policy on portfolio flows
Italy and Spain

	Equity	Bond	Equity EA	Bond EA
AN_OMT	0.30 ***	0.11 ***	0.44 ***	0.26 ***
AN_SMP	-0.03	-2.04 ***	-0.10 **	-1.26 ***
SLTRO	0.05 ***	-0.88 ***	-0.13 ***	0.09
VLTRO	0.20 ***	1.16 ***	0.14 ***	0.48 **
SMP	-0.81 ***	2.42 ***	0.11	0.49 ***

Note: "EA" indicates the results for funds domiciled in the euro area. Portfolio flows expressed in % of the asset under management (i.e. assets invested) in country i. Total impact of ECB policies according to benchmark model (see model description in the annex). The total impact is equal to the total size of unconventional operations multiplied by the estimated model coefficients. Stars refer to the significance of the β coefficients of the underlying equation (see Table 8 for the full results). For SLTROs the total impact is calculated at the peak expansion of loans with maturity between 6 and 12 months (March 2010, 660 euro billions). For other instruments the number refers to the cumulated impact at the end of the sample period in September 2012.

Table 7B: Total impact of ECB unconventional monetary policy on portfolio flows
Germany, Austria, Finland and Netherlands

	Equity	Bond	Equity EA	Bond EA
AN_OMT	0.13 ***	0.00	-0.05	0.11
AN_SMP	-1.28	-1.68 ***	-2.52 **	-1.16 ***
SLTRO	1.12	-1.10 ***	-0.19	0.28 ***
VLTRO	-0.26	1.03 ***	-0.89 *	0.02
SMP	-3.96 *	1.67 ***	-3.85	0.23

Note: "EA" indicates the results for funds domiciled in the euro area. Portfolio flows expressed in % of the asset under management (i.e. assets invested) in country i. Total impact of ECB policies according to benchmark model (see model description in the annex). The total impact is equal to the total size of unconventional operations multiplied by the estimated model coefficients. Stars refer to the significance of the β coefficients of the underlying equation (see Table 8 for the full results). For SLTROs the total impact is calculated at the peak expansion of loans with maturity between 6 and 12 months (March 2010, 660 euro billions). For other instruments the number refers to the cumulated impact at the end of the sample period in September 2012.

Table 7C: Total impact of ECB unconventional monetary policy on portfolio flows
Advanced Economies

	Equity	Bond	Equity EA	Bond EA
AN_OMT	0.07	0.43 *	0.00	0.25 ***
AN_SMP	-0.04	-1.04 ***	-0.58 ***	-1.21 ***
SLTRO	0.08	-0.68 *	0.29	-0.07
VLTRO	-0.05	1.44 ***	0.12	0.31 ***
SMP	-1.07 ***	0.65	-0.22	0.57 **

Note: "EA" indicates the results for funds domiciled in the euro area. Portfolio flows expressed in % of the asset under management (i.e. assets invested) in country i. Total impact of ECB policies according to benchmark model (see model description in the annex). The total impact is equal to the total size of unconventional operations multiplied by the estimated model coefficients. Stars refer to the significance of the β coefficients of the underlying equation (see Table 8 for the full results). For SLTROs the total impact is calculated at the peak expansion of loans with maturity between 6 and 12 months (March 2010, 660 euro billions). For other instruments the number refers to the cumulated impact at the end of the sample period in September 2012.

Table 7D: Total impact of ECB unconventional monetary policy on portfolio flows
Emerging Markets (ex EU)

	Equity	Bond	Equity EA	Bond EA
AN_OMT	0.03	0.90 ***	0.06	0.26 ***
AN_SMP	-0.36 **	-2.39 ***	-0.88 **	-1.84 ***
SLTRO	0.27 **	-1.79 ***	0.10 *	-0.33 ***
VLTRO	0.73 ***	1.74 ***	-0.06	0.38 ***
SMP	-1.27 ***	2.53 ***	-0.37 ***	1.18 ***

Note: "EA" indicates the results for funds domiciled in the euro area. Portfolio flows expressed in % of the asset under management (i.e. assets invested) in country i. Total impact of ECB policies according to benchmark model (see model description in the annex). The total impact is equal to the total size of unconventional operations multiplied by the estimated model coefficients. Stars refer to the significance of the β coefficients of the underlying equation (see Table 8 for the full results). For SLTROs the total impact is calculated at the peak expansion of loans with maturity between 6 and 12 months (March 2010, 660 euro billions). For other instruments the number refers to the cumulated impact at the end of the sample period in September 2012.

Table 7E: Total impact of ECB unconventional monetary policy on portfolio flows
Emerging EU

	Equity	Bond	Equity EA	Bond EA
AN_OMT	0.07 **	0.17 ***	0.11 **	0.14
AN_SMP	0.55 **	-1.32 **	0.08	-1.04 ***
SLTRO	-0.05	-0.80 **	0.02	0.16 *
VLTRO	0.48 ***	2.21 ***	-0.21 **	0.60 ***
SMP	-2.72 ***	0.58	-0.76 ***	-0.29

Note: "EA" indicates the results for funds domiciled in the euro area. Portfolio flows expressed in % of the asset under management (i.e. assets invested) in country i. Total impact of ECB policies according to benchmark model (see model description in the annex). The total impact is equal to the total size of unconventional operations multiplied by the estimated model coefficients. Stars refer to the significance of the β coefficients of the underlying equation (see Table 8 for the full results). For SLTROs the total impact is calculated at the peak expansion of loans with maturity between 6 and 12 months (March 2010, 660 euro billions). For other instruments the number refers to the cumulated impact at the end of the sample period in September 2012.

Table 8A: Full estimation results for portfolio flows
Italy and Spain

	(1) Equity	(2) Bond	(3) Equity EA	(4) Bond EA
AN_OMT	0.049***	0.018***	0.073***	0.043***
	(0.007)	(0.004)	(0.003)	(0.009)
AN_SMP	-0.004	-0.340***	-0.016**	-0.210***
	(0.009)	(0.034)	(0.008)	(0.016)
SLTRO	0.007***	-0.133***	-0.019***	0.013
	(0.002)	(0.025)	(0.002)	(0.009)
VLTRO	0.019***	0.114***	0.014***	0.048**
	(0.001)	(0.019)	(0.002)	(0.023)
SMP	-0.017***	0.050***	0.002	0.010***
	(0.004)	(0.015)	(0.002)	(0.002)
Constant	-0.014***	-0.001	-0.019***	-0.002*
	(0.001)	(0.003)	(0.000)	(0.001)
Observations	2,752	2,746	2,752	2,746
R-squared	0.184	0.093	0.169	0.411
Fixed Effects	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Table 8B: Full estimation results for portfolio flows
Germany, Austria, Finland and Netherlands

	(1) Equity	(2) Bond	(3) Equity EA	(4) Bond EA
AN_OMT	0.021***	-0.001	-0.008	0.018
	(0.002)	(0.020)	(0.019)	(0.022)
AN_SMP	-0.213	-0.280***	-0.420**	-0.193***
	(0.138)	(0.015)	(0.211)	(0.042)
SLTRO	0.169	-0.167***	-0.029	0.043***
	(0.134)	(0.020)	(0.051)	(0.014)
VLTRO	-0.025	0.101***	-0.088*	0.002
	(0.031)	(0.028)	(0.049)	(0.009)
SMP	-0.082*	0.035***	-0.080	0.005
	(0.047)	(0.010)	(0.057)	(0.004)
Constant	-0.020***	-0.004	-0.027***	-0.006***
	(0.004)	(0.003)	(0.007)	(0.002)
Observations	5,504	5,492	5,504	5,492
R-squared	0.075	0.089	0.076	0.339
Fixed Effects	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The table reports the results for the benchmark model. "EA" indicates the results for funds domiciled in the euro area. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Table 8C: Full estimation results for portfolio flows
Advanced Economies

	(1) Equity	(2) Bond	(3) Equity EA	(4) Bond EA
AN_OMT	0.012	0.072*	0.000	0.042***
	(0.015)	(0.039)	(0.007)	(0.008)
AN_SMP	-0.007	-0.173***	-0.096***	-0.202***
	(0.024)	(0.040)	(0.016)	(0.025)
SLTRO	0.012	-0.103*	0.044	-0.010
	(0.029)	(0.063)	(0.030)	(0.009)
VLTRO	-0.005	0.142***	0.012	0.030***
	(0.015)	(0.024)	(0.010)	(0.008)
SMP	-0.022***	0.013	-0.004	0.012**
	(0.003)	(0.012)	(0.004)	(0.005)
Constant	-0.009**	0.017***	-0.016***	0.004***
	(0.004)	(0.004)	(0.002)	(0.001)
Observations	13,757	13,571	13,757	13,571
R-squared	0.045	0.081	0.143	0.314
Fixed Effects	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Table 8D: Full estimation results for portfolio flows
Emerging Markets (ex EU)

	(1) Equity	(2) Bond	(3) Equity EA	(4) Bond EA
AN_OMT	0.005	0.151***	0.009	0.043***
	(0.016)	(0.027)	(0.015)	(0.005)
AN_SMP	-0.061**	-0.399***	-0.147***	-0.307***
	(0.028)	(0.025)	(0.044)	(0.026)
SLTRO	0.041**	-0.271***	0.015*	-0.050***
	(0.021)	(0.012)	(0.008)	(0.011)
VLTRO	0.072***	0.171***	-0.006	0.037***
	(0.019)	(0.020)	(0.008)	(0.003)
SMP	-0.026***	0.052***	-0.008***	0.024***
	(0.004)	(0.005)	(0.002)	(0.002)
Constant	0.016*	0.032***	0.010	0.008***
	(0.009)	(0.003)	(0.009)	(0.001)
Observations	24,757	24,161	24,757	24,161
R-squared	0.057	0.105	0.039	0.455
Fixed Effects	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The table reports the results for the benchmark model. "EA" indicates the results for funds domiciled in the euro area. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Table 8E: Full estimation results for portfolio flows
Emerging EU

	(1) Equity	(2) Bond	(3) Equity EA	(4) Bond EA
AN_OMT	0.012**	0.028***	0.019**	0.024
	(0.005)	(0.011)	(0.009)	(0.017)
AN_SMP	0.091**	-0.220**	0.013	-0.174***
	(0.042)	(0.086)	(0.009)	(0.063)
SLTRO	-0.007	-0.121**	0.004	0.025*
	(0.012)	(0.050)	(0.007)	(0.013)
VLTRO	0.047***	0.217***	-0.020**	0.059***
	(0.018)	(0.037)	(0.008)	(0.007)
SMP	-0.056***	0.012	-0.016***	-0.006
	(0.013)	(0.019)	(0.001)	(0.006)
Constant	-0.014**	-0.011***	-0.017***	-0.009***
	(0.005)	(0.003)	(0.003)	(0.002)
Observations	5,504	5,492	5,504	5,492
R-squared	0.174	0.118	0.244	0.328
Fixed Effects	Y	Y	Y	Y
Control Variables	Surprises	Surprises	Surprises	Surprises
	US QE	US QE	US QE	US QE
	Auctions	Auctions	Auctions	Auctions
	Dummies	Dummies	Dummies	Dummies

Note: see the model description in the Annex. The table reports the results for the benchmark model. "EA" indicates the results for funds domiciled in the euro area. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Table 9A: Transmission channels of ECB UMP
Total Impact
Dependent variable as indicated at the top of each column

	Implied Volatilities	Bank CDS EA	Bank CDS	Sovereign CDS EA	Sovereign CDS
	(diff. in p.p.)	(diff in b.p.)	(diff in b.p.)	(diff in b.p.)	(diff in b.p.)
AN_OMT	-4.56 ***	-28.49 **	-20.42 ***	-29.83 **	-8.94 ***
AN_SMP	3.04 *	n.a.	12.78	-40.95 **	-9.21 **
SLTRO	-3.20 ***	-21.32 ***	-5.59 ***	-12.58 ***	1.68
VLTRO	-4.30 ***	-98.69 ***	-43.91 ***	-40.72 ***	0.74
SMP	-15.14 ***	-10.05	7.97	-32.87 *	-8.13 *

Note: Total impact of ECB policies according to benchmark model (see model description in the annex). The total impact is equal to the total size of unconventional operations multiplied by the estimated model coefficients. Stars refer to the significance of the β coefficients of the underlying equation (see Table 9B for the full results). For SLTROs the total impact is calculated at the peak expansion of loans with maturity between 6 and 12 months (June 2010, 660 euro billions). For other instruments the number refers to the cumulated impact at the end of the sample period in September 2012.

Table 9B: Transmission channels of ECB UMP
Full estimation results
Dependent variable as indicated at the top of each column

	(1)	(2)	(3)	(4)	(5)
	Implied volatilities	Bank CDS EA	Bank CDS	Sovereign CDS EA	Sovereign CDS
	(diff in p.p.)	(diff in b.p.)	(diff in b.p.)	(diff in b.p.)	(diff in b.p.)
AN_OMT	-2.279***	-14.246**	-10.209***	-14.917**	-4.472***
	(0.225)	(5.777)	(2.193)	(6.491)	(0.897)
AN_SMP	1.522*		6.388***	-20.473**	-4.607**
	(0.891)		(1.178)	(10.316)	(2.334)
SLTRO	-0.485***	-3.231***	-0.846***	-1.906***	0.254
	(0.081)	(0.455)	(0.320)	(0.541)	(0.552)
VLTRO	-0.422***	-9.687***	-4.310***	-3.997**	0.073
	(0.077)	(1.248)	(0.711)	(1.752)	(0.209)
SMP	-0.313***	-0.208	0.165	-0.680*	-0.168*
	(0.073)	(0.339)	(0.202)	(0.364)	(0.092)
Constant	0.017	0.469***	0.309***	0.171***	0.052**
	(0.012)	(0.089)	(0.077)	(0.060)	(0.026)
Observations	8,478	30,630	16,336	8,207	19,034
R-squared	0.042	0.025	0.028	0.074	0.031
Fixed Effects	Y	Y	Y	Y	Y
Control Variables	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies	Surprises US QE Auctions Dummies

Note: see the model description in the Annex. The table reports the results for the benchmark model. The coefficient of SMP refers to the impact of 1 euro billion of unexpected SMP purchases. The coefficient of SLTRO/VLTROs refers to the impact of 100 euro billion change in the amounts outstanding of SLTROs/VLTROs.

Table 10A: Addressing the generated regressor bias
10 Year Sovereign Bond Yield

	IT and ES		AT, DE, FI, NL		Advanced Econonmies		Emerging Markets ex EU		Emerging EU	
AN_OMT	-0.3704	*0.00*	0.0499	*1.00*	0.0565	*1.00*	0.0044	*1.00*	-0.0149	*0.00*
AN_SLTRO	-0.0141	*0.00*	0.0143	*1.00*	-0.0153	*0.00*	0.0054	*1.00*	-0.0103	*0.00*
AN_VLTRO	0.2898	*1.00*	-0.0056	*0.00*	-0.0513	*0.00*	0.0126	*1.00*	0.0682	*1.00*
AN_SMP	-0.6511	*0.00*	0.0095	*1.00*	0.0284	*1.00*	-0.0513	*0.00*	-0.0789	*0.00*
SLTRO	-0.0576	*0.00*	-0.0290	*0.00*	-0.0252	*0.00*	-0.0078	*0.00*	-0.0079	*0.00*
VLTRO	-0.0422	*0.00*	-0.0055	*0.00*	0.0005	*0.98*	0.0076	*1.00*	0.0004	*0.99*
SMP	-0.0025	*0.00*	-0.0003	*0.34*	-0.0029	*0.00*	-0.0020	*0.02*	-0.0042	*0.03*

Note: The table reports the average coefficients and the fraction of times coefficients are above zero for the benchmark specification of the model when estimated using 1000 simulated series for unexpected SMP purchases. The simulated series were calculated on the basis of the asymptotic distribution of the parameters of the regression describing the SMP reaction function of the ECB (for the benchmark specification as described in Section 3.2 and Annex I).

Table 10B: Addressing the generated regressor bias
Equity prices

	IT and ES		AT, DE, FI, NL		Advanced Econonmies		Emerging Markets ex EU		Emerging EU	
AN_OMT	4.3484	*1.00*	2.0186	*1.00*	1.2770	*1.00*	1.2626	*1.00*	0.5329	*1.00*
AN_SLTRO	-1.9037	*0.00*	-1.9228	*0.00*	-2.1848	*0.00*	-1.7756	*0.00*	-1.4155	*0.00*
AN_VLTRO	-2.8606	*0.00*	-1.7222	*0.00*	-1.2493	*0.00*	-0.9668	*0.00*	-0.8286	*0.00*
AN_SMP	4.0773	*1.00*	0.1076	*0.83*	-0.5214	*0.00*	-1.5462	*0.00*	0.4415	*1.00*
SLTRO	0.5747	*1.00*	0.4462	*1.00*	0.0926	*1.00*	-0.0154	*0.00*	-0.4725	*0.00*
VLTRO	0.4482	*1.00*	0.4667	*1.00*	0.1929	*1.00*	0.0328	*1.00*	0.3510	*1.00*
SMP	-0.2303	*0.05*	0.3434	*1.00*	0.4073	*1.00*	0.3921	*1.00*	-0.2708	*0.01*

Note: The table reports the average coefficients and the fraction of times coefficients are above zero for the benchmark specification of the model when estimated using 1000 simulated series for unexpected SMP purchases. The simulated series were calculated on the basis of the asymptotic distribution of the parameters of the regression describing the SMP reaction function of the ECB (for the benchmark specification as described in Section 3.2 and Annex I).

Figure 1A: ECB balance sheet (to be updated with the separation among LTROs, SLTROs, VLTROs)
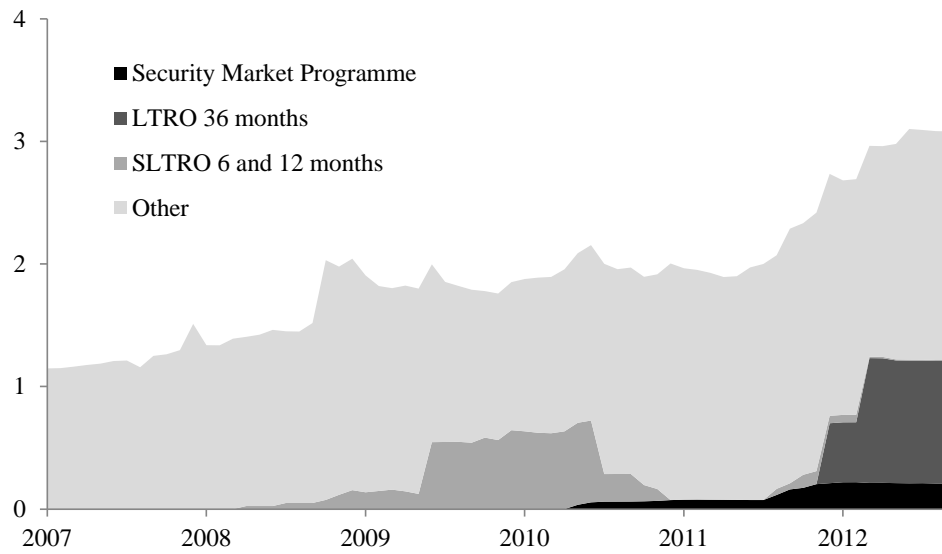euro trillions

Legend:
- ■ Security Market Programme
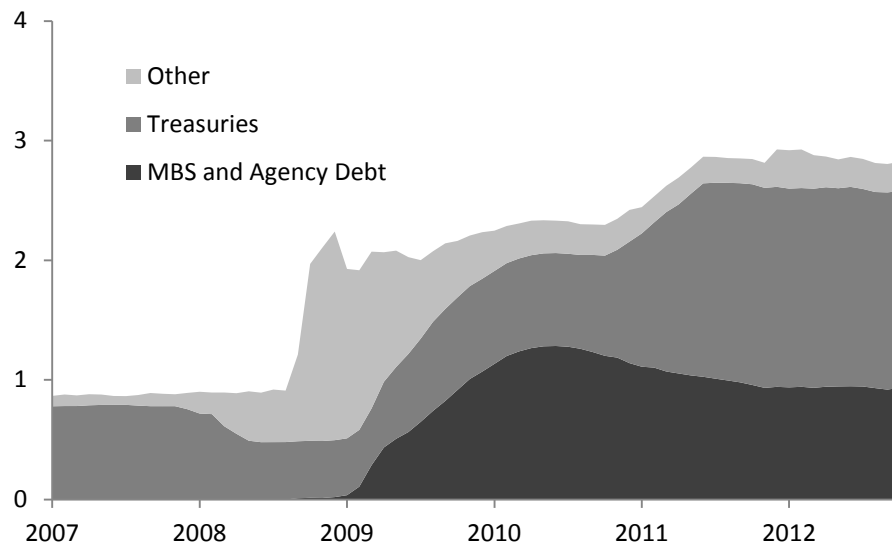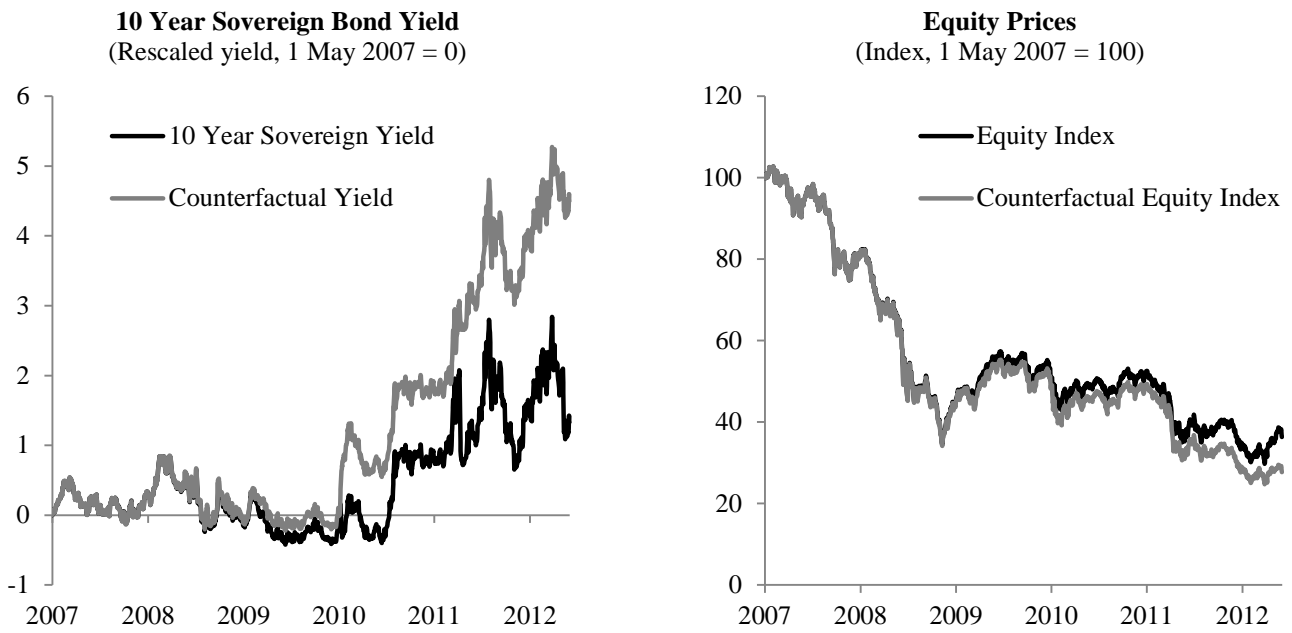- ■ LTRO 36 months
- ■ SLTRO 6 and 12 months
- ■ Other

Figure 1B: Fed balance sheet
USD trillions

Legend:
- ■ Other
- ■ Treasuries
- ■ MBS and Agency Debt

Figure 2A: Counterfactual analysis
Italy and Spain

10 Year Sovereign Bond Yield
(Rescaled yield, 1 May 2007 = 0)
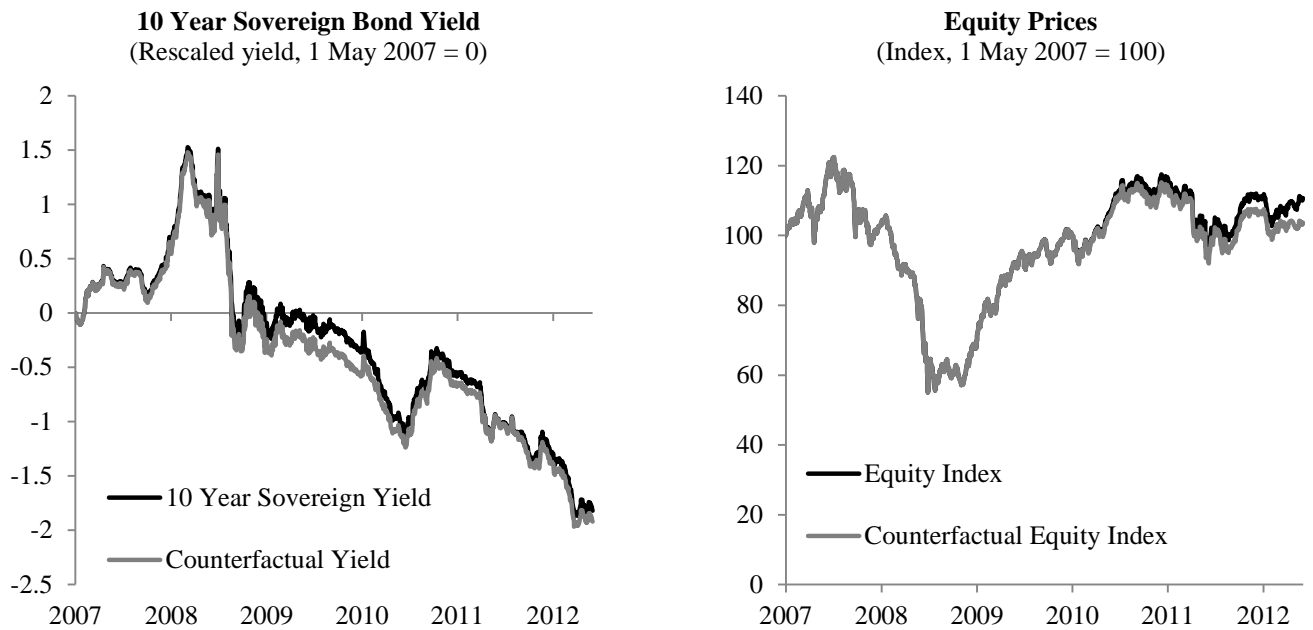
Equity Prices
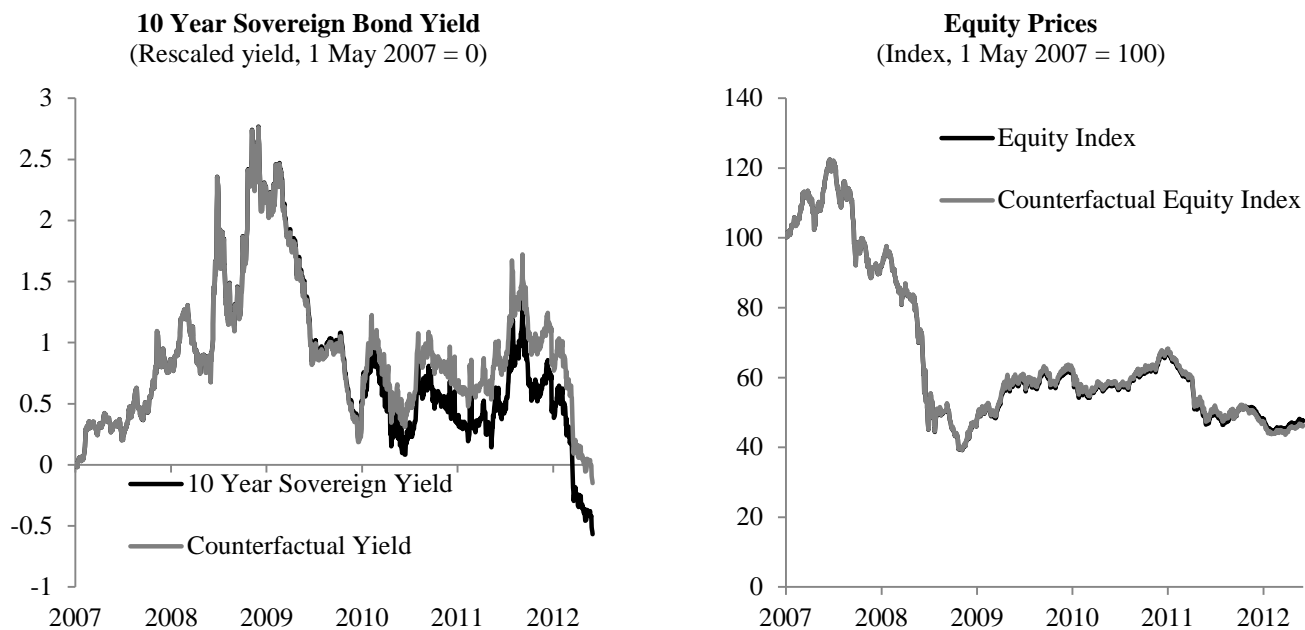(Index, 1 May 2007 = 100)

Note: The counterfactual is calculated by deducting the cumulated estimated impact of monetary policy (according to the benchmark model – see model description in the Annex) from actual values.

Figure 2B: Counterfactual analysis
Germany, Austria, Finland and Netherlands
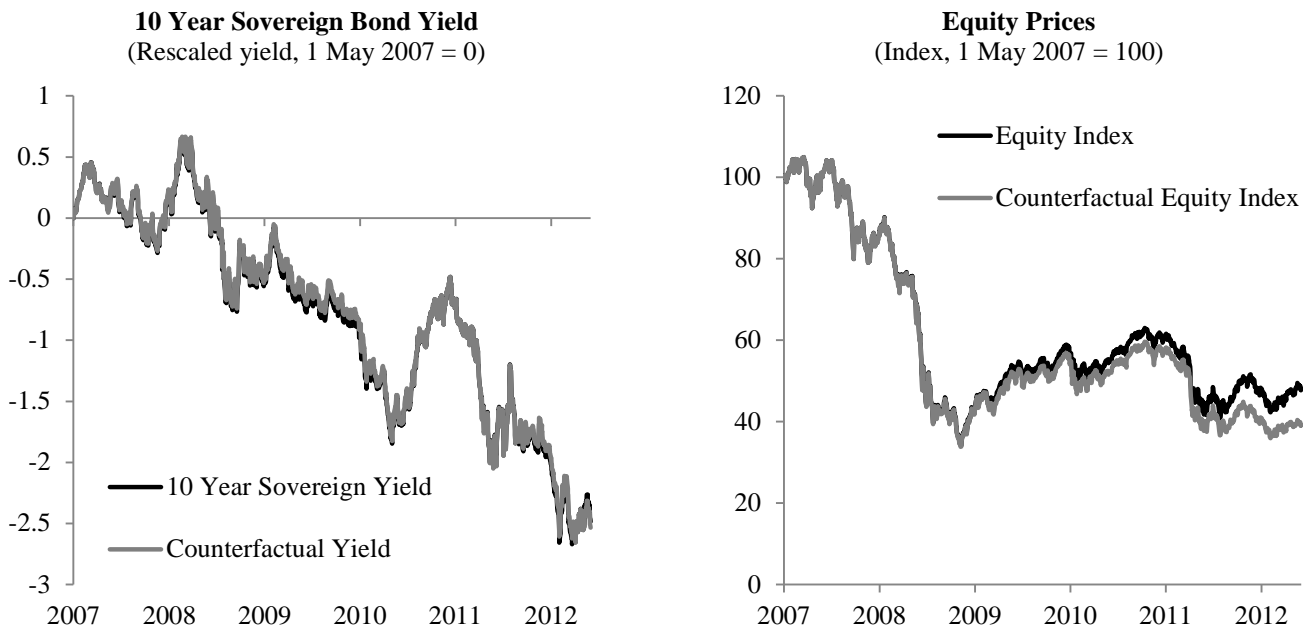
10 Year Sovereign Bond Yield
(Rescaled yield, 1 May 2007 = 0)

Equity Prices
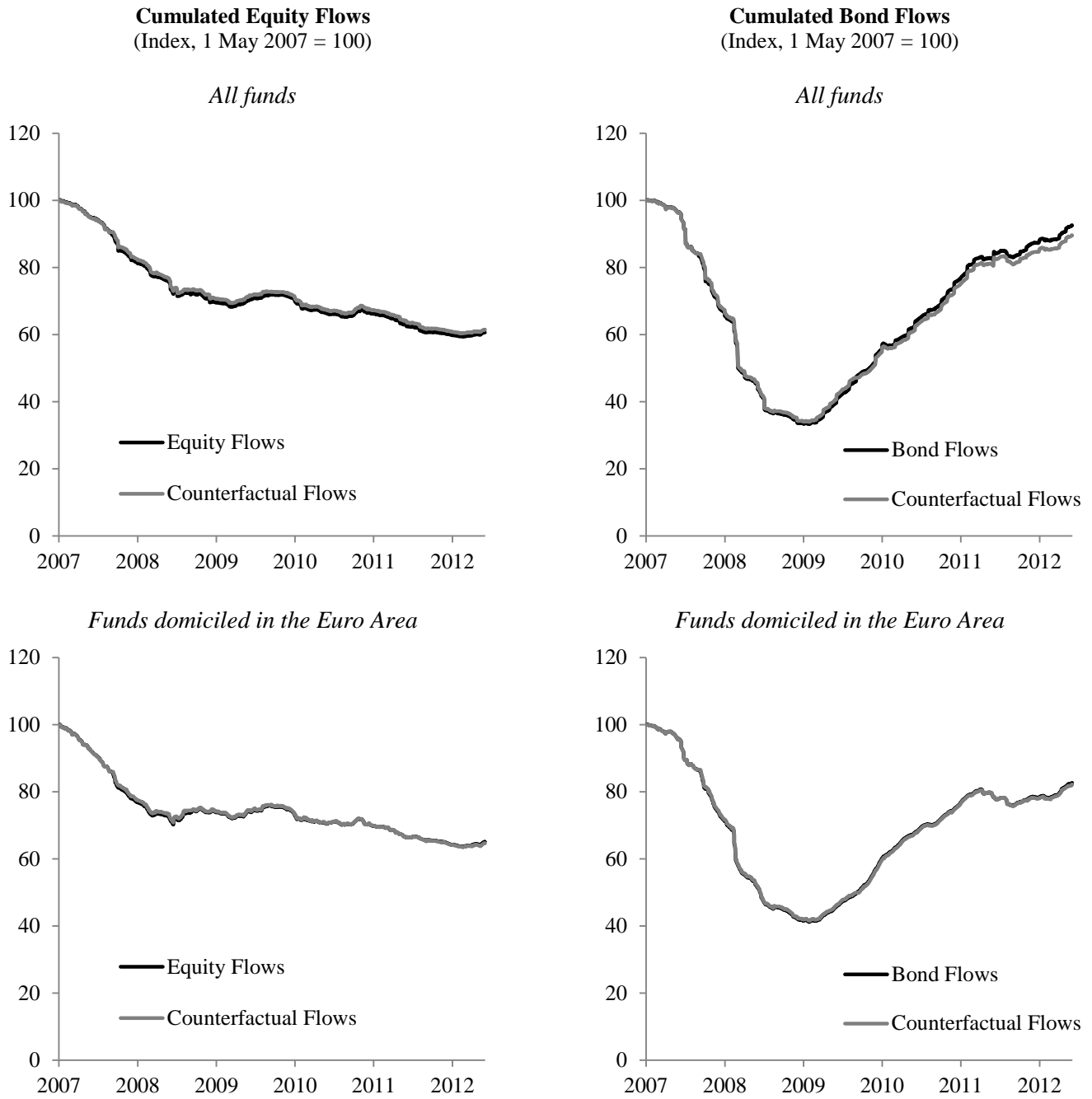(Index, 1 May 2007 = 100)

Note: The counterfactual is calculated by deducting the cumulated estimated impact of monetary policy (according to the benchmark model – see model description in the Annex) from actual values.

Figure 2C: Counterfactual analysis
Advanced Economies
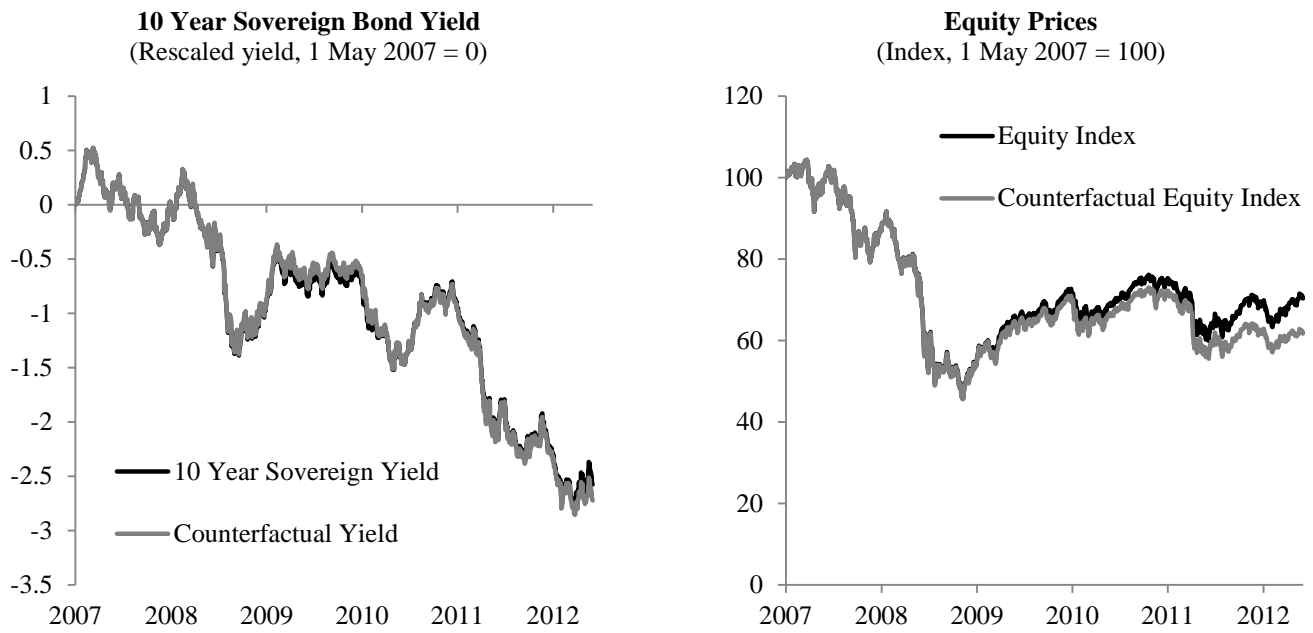
10 Year Sovereign Bond Yield
(Rescaled yield, 1 May 2007 = 0)

Equity Prices
(Index, 1 May 2007 = 100)

Note: The counterfactual is calculated by deducting the cumulated estimated impact of monetary policy (according to the benchmark model – see model description in the Annex) from actual values.

Figure 2D: Counterfactual analysis
Emerging Markets (ex EU)

10 Year Sovereign Bond Yield
(Rescaled yield, 1 May 2007 = 0)
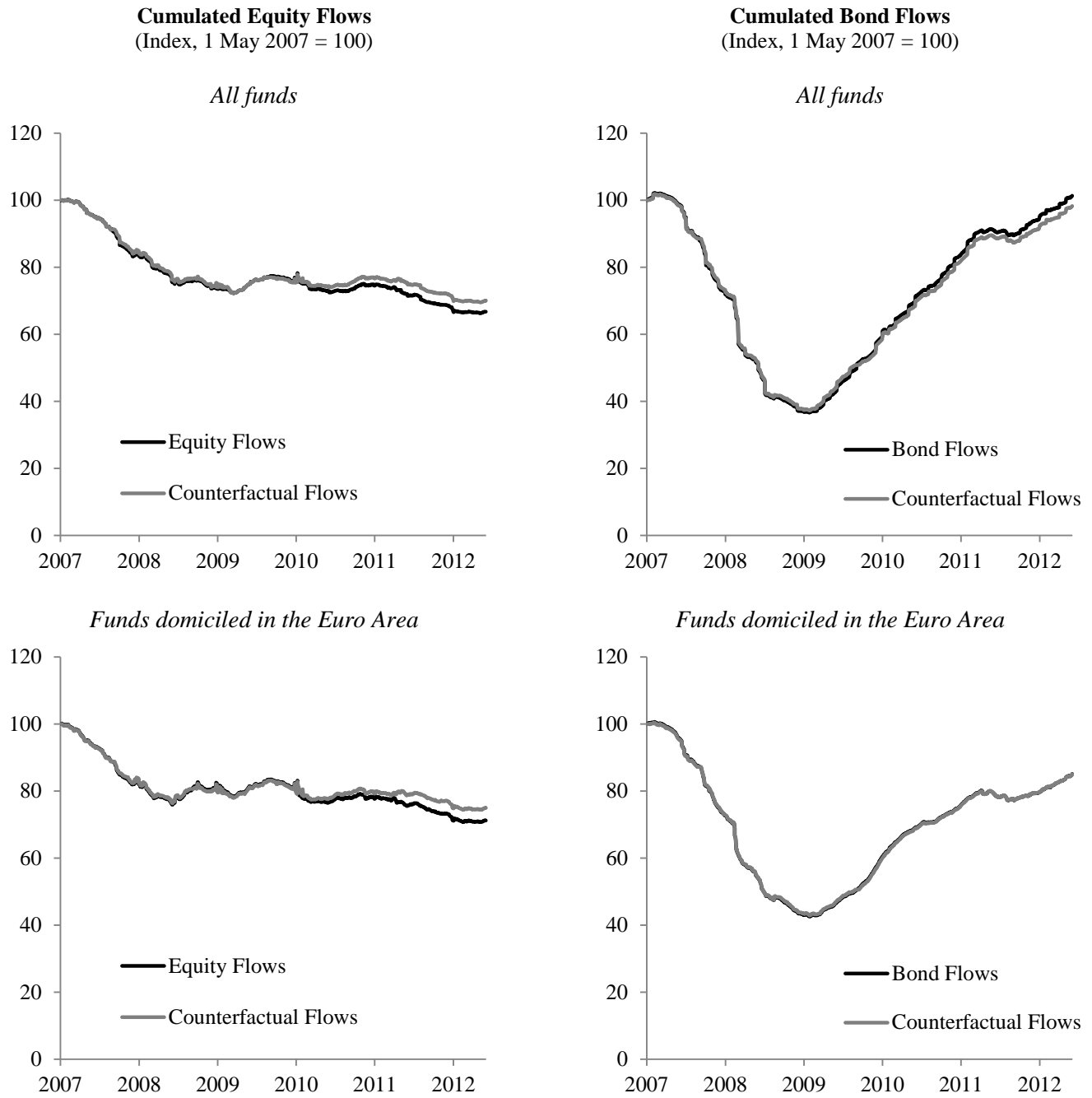
Equity Prices
(Index, 1 May 2007 = 100)

Note: The counterfactual is calculated by deducting the cumulated estimated impact of monetary policy (according to the benchmark model – see model description in the Annex) from actual values.

Figure 2E: Counterfactual analysis
Emerging EU

10 Year Sovereign Bond Yield
(Rescaled yield, 1 May 2007 = 0)

Equity Prices
(Index, 1 May 2007 = 100)

Note: The counterfactual is calculated by deducting the cumulated estimated impact of monetary policy (according to the benchmark model – see model description in the Annex) from actual values.

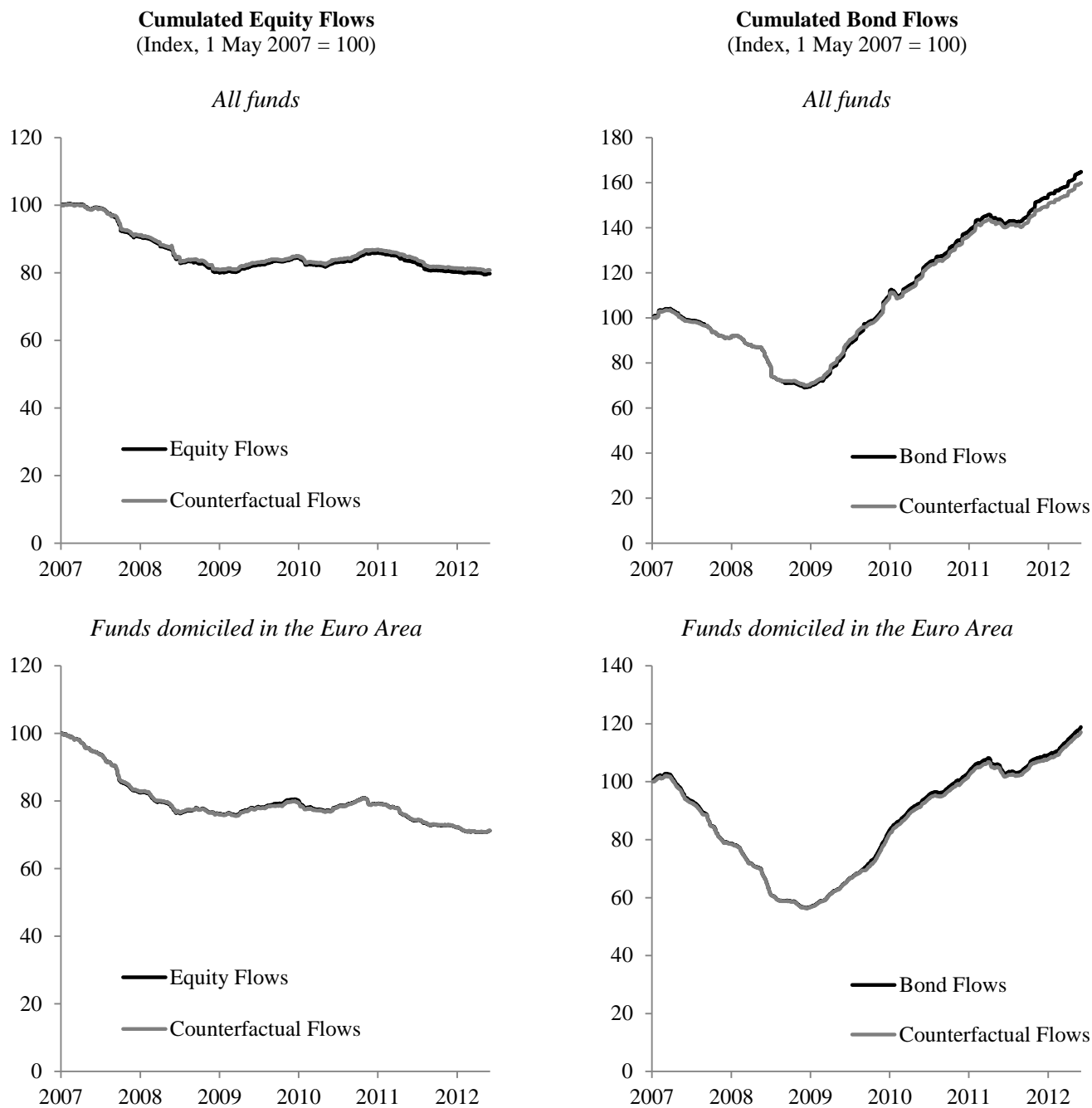**Figure 3A: Counterfactual analysis for portfolio flows**
Italy and Spain

<div align="center">

Cumulated Equity Flows
(Index, 1 May 2007 = 100)

All funds

</div>

<div align="center">

Cumulated Bond Flows
(Index, 1 May 2007 = 100)

All funds

</div>

<div align="center">

Funds domiciled in the Euro Area

</div>

<div align="center">
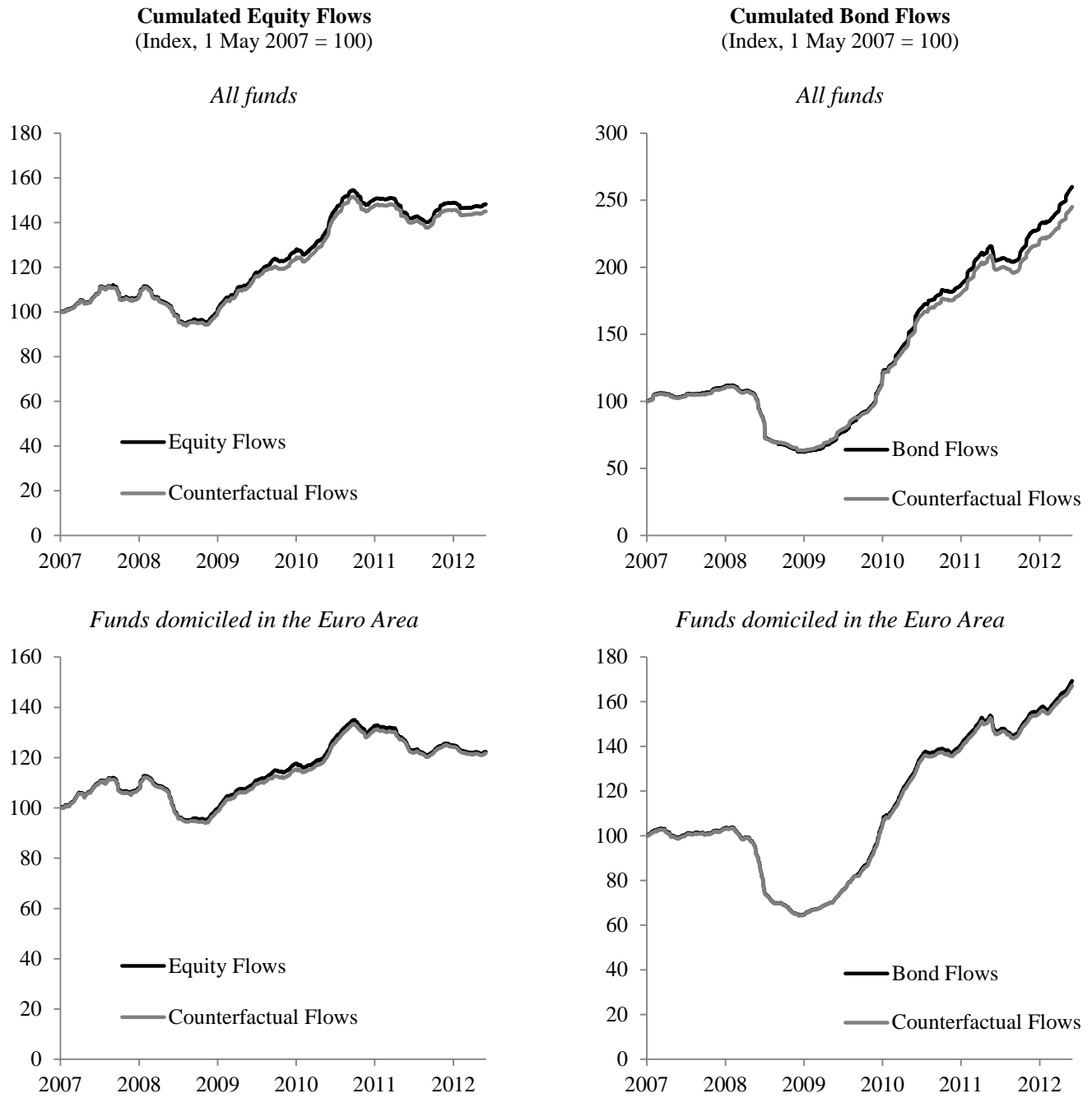
Funds domiciled in the Euro Area

</div>

Note: The counterfactual is calculated by deducting the cumulated estimated impact of monetary policy (according to the benchmark model for capital flows – see model description in the Annex) from actual values.

Figure 3B: Counterfactual analysis for portfolio flows
Germany, Austria, Finland and Netherlands

Cumulated Equity Flows
(Index, 1 May 2007 = 100)

Cumulated Bond Flows
(Index, 1 May 2007 = 100)

All funds

All funds

Funds domiciled in the Euro Area
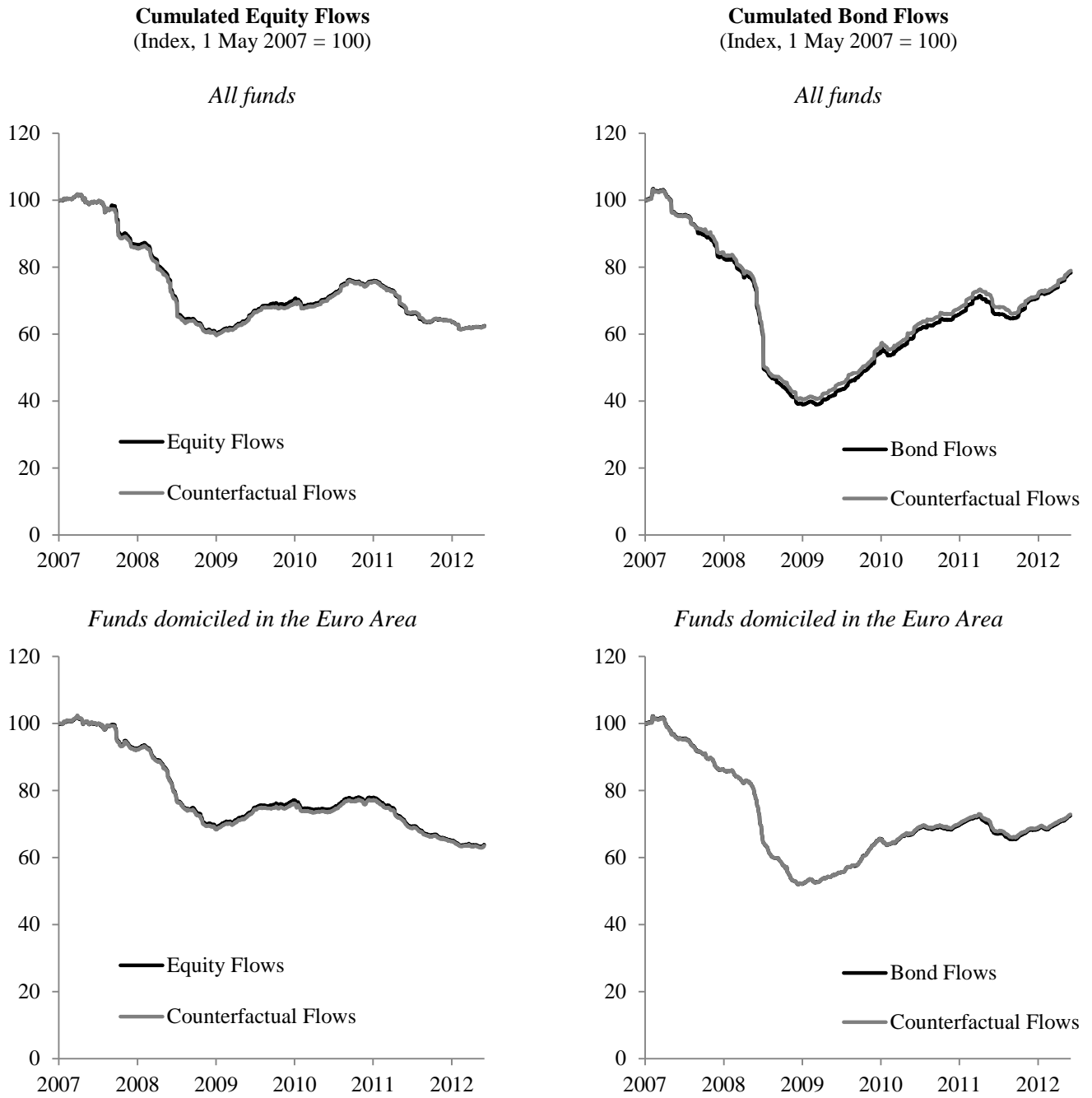
Funds domiciled in the Euro Area

Note: The counterfactual is calculated by deducting the cumulated estimated impact of monetary policy (according to the benchmark model for capital flows – see model description in the Annex) from actual values.

Figure 3C: Counterfactual analysis for portfolio flows
Advanced Economies

Cumulated Equity Flows
(Index, 1 May 2007 = 100)

All funds

Cumulated Bond Flows
(Index, 1 May 2007 = 100)

All funds

Funds domiciled in the Euro Area
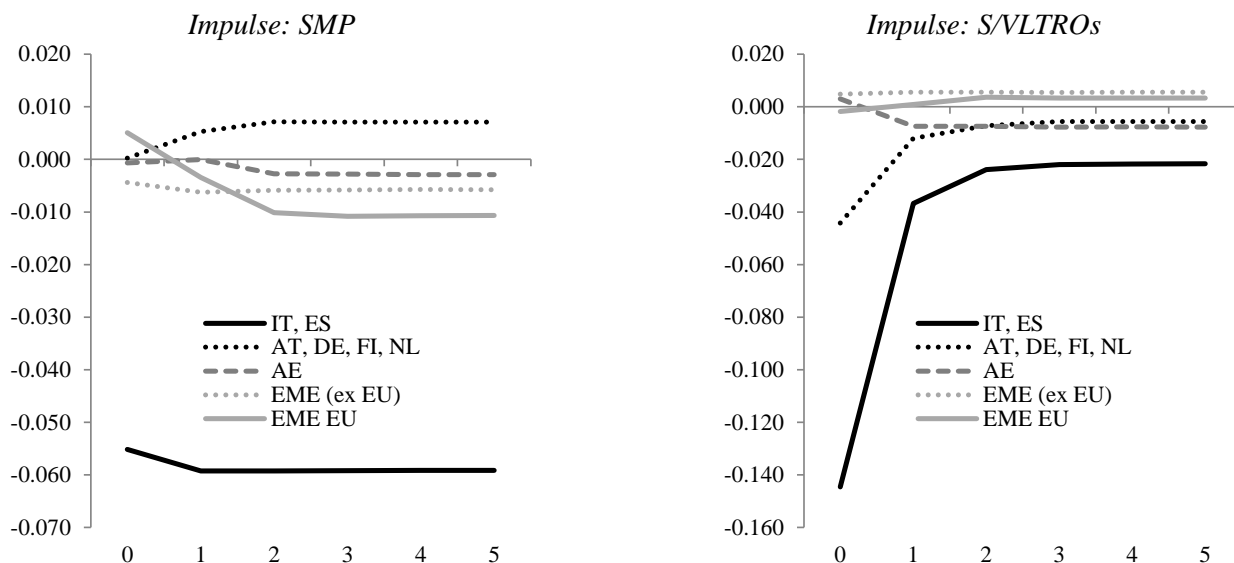
Funds domiciled in the Euro Area

Note: The counterfactual is calculated by deducting the cumulated estimated impact of monetary policy (according to the benchmark model for capital flows – see model description in the Annex) from actual values.

Figure 3D: Counterfactual analysis for portfolio flows
Emerging Markets (ex EU)

Cumulated Equity Flows
(Index, 1 May 2007 = 100)

All funds

Cumulated Bond Flows
(Index, 1 May 2007 = 100)

All funds

Funds domiciled in the Euro Area

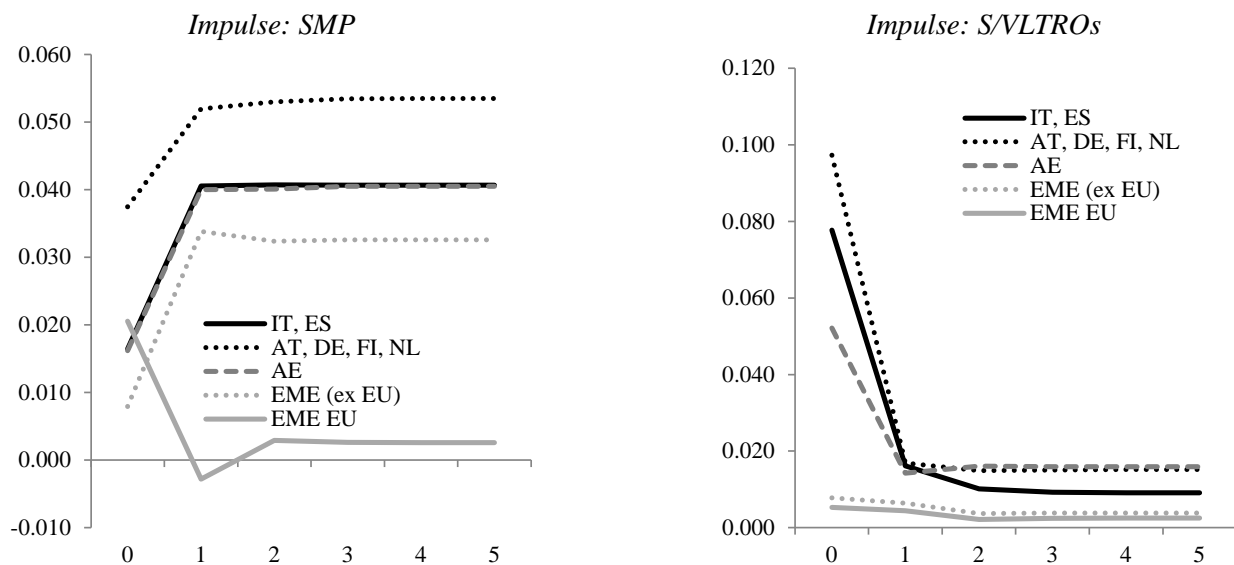*Funds domiciled in the Euro Area*

Note: The counterfactual is calculated by deducting the cumulated estimated impact of monetary policy (according to the benchmark model for capital flows – see model description in the Annex) from actual values.

Figure 3E: Counterfactual analysis for portfolio flows (all funds)
Emerging EU

Cumulated Equity Flows
(Index, 1 May 2007 = 100)

Cumulated Bond Flows
(Index, 1 May 2007 = 100)

All funds

All funds

Funds domiciled in the Euro Area

Funds domiciled in the Euro Area

Note: The counterfactual is calculated by deducting the cumulated estimated impact of monetary policy (according to the benchmark model for capital flows – see model description in the Annex) from actual values.

Figure 4A: VAR cumulated impulse responses
Response variable: 10 Year Sovereign Bond Yield

Impulse: SMP

Impulse: S/VLTROs

Note: the figure shows average (across country groups) VAR cumulated impulse responses for individual countries (x-axis: days; y-axis: endogenous variable expressed in units of standard deviation). The estimation of the individual country VAR is done in two steps. First, to solve a dimensionality issue, equity returns and differences in bond yields are regressed on all the (non-monetary policy) explanatory variables that we include in the baseline specification (macro shocks, special day dummies, etc) and the residuals of the regression are retained. Second, a VAR model (with 1 lag) is estimated for the residuals of equity returns and yield differences of the first step. In this VAR model, the SMP and SLTROs/VLTROs explanatory variables from the baseline specification are included as exogenous variables.

Figure 4B: VAR cumulated impulse responses
Response variable: Equity prices

Impulse: SMP

Impulse: S/VLTROs

Note: the figure shows average (across country groups) VAR cumulated impulse responses for individual countries (x-axis: days; y-axis: endogenous variable expressed in units of standard deviation). The estimation of the individual country VAR is done in two steps. First, to solve a dimensionality issue, equity returns and differences in bond yields are regressed on all the (non-monetary policy) explanatory variables that we include in the baseline specification (macro shocks, special day dummies, etc) and the residuals of the regression are retained. Second, a VAR model (with 1 lag) is estimated for the residuals of equity returns and yield differences of the first step. In this VAR model, the SMP and SLTROs/VLTROs explanatory variables from the baseline specification are included as exogenous variables.

ANNEX I

Model description

$$y_{i,t} = \beta\, MP_t + \gamma_1\, F_t + \gamma_2\, Z_{t-1} + \varepsilon_{i,t} \qquad \text{Equation (1)}$$

$$\text{With } MP_t = [AN\_OMT_t, AN\_SMP_t, SLTRO_t, VLTRO_t, SMP_t]$$

Estimation period: from 1/5/2007 to 30/9/2012, daily data. Panel fixed effect model unless differently specified. Standard errors are calculated with a bootstrap approach (with 1000 repetitions), unless differently specified.

Descriptive statistics and detailed explanations for the dependent variables $y_{i,t}$ are in Table 2.

$y_{i,t}$ is alternatively the following: the return on the main equity index (in %) in country i; the return of the banking equity index (in %) in country i; the first difference of the 10 year Government bond yield (in p.p.) in country i; the return of the bilateral exchange rate with the euro (in %) for country i; portfolio equity/bond inflows in country i (in % of the assets invested in country i); the first difference of Sovereign CDS spreads in country i; the first difference of bank CDS spreads for bank i; the price change (in units of standard deviation) of commodity i; the first difference of option implied volatilities (in p.p.) in country i; the first difference of interbank spreads (in p.p.) in country i.

MP_t is a set of policy instruments including both announcements of policy interventions and actual interventions, as described in Table 3 (part 1). In particular MP_t includes the following: impulse dummy for the announcement of Outright Monetary Transactions (AN_OMT_t); impulse dummy for the announcement of the Security Market Programme (AN_SMP_t); change in amounts outstanding of SLTROs with 6 to 12 month maturity ($SLTRO_t$); change in amounts outstanding of VLTROs with 36 month maturity ($VLTRO_t$); "unexpected" (i.e. deviations from a reaction function) SMP purchases (SMP_t - see the Annex 1).

F_t and Z_{t-1} are a set of contemporaneous and lagged control variables that are described in Table 3 (part 2). The following model specifications have the following control variables:
- o Model "*No controls*" - F_t and Z_{t-1} empty (fixed effects only).
- o Model "*Surprises*" - F_t: 70 indicators of economic surprises (difference between data releases and expectations according to surveys). Z_{t-1} empty.
- o Model "*US QE*" - F_t: economic surprises and impulse dummies for 19 announcements related to US Quantitative Easing policies. Z_{t-1} empty
- o Model "*Auctions*" - F_t: economic surprises, impulse dummies for US, indicators of the outcome of bond auctions for IT and ES (bid to cover ratio and average yield for 3 bond maturities, 12 indicators in total). Z_{t-1} empty
- o Model "*Benchmark*" - F_t: economic surprises, impulse dummies for US QE, indicators of the outcome of bond auctions; special impulse dummies for May 14, 2010 and August 10, 2011. Z_{t-1} empty. For portfolio flows: dummies are set to 1 in the time window *t* to *t+2*, all other explanatory variables are lagged by one period. For portfolio flows the model also includes 5 lags of the dependent variable, to take into account persistence.
- o Model "*P&S*": benchmark model estimated with the Pesaran-Smith mean group estimator.
- o Model "*Robust*": benchmark model estimated with an outlier robust approach.
- o Model "*Lagged*": benchmark model where Z_{t-1} contains the first differences of VIX and VSTOXX, and the returns of the S&P500 and the Eurostoxx Index.
- o Model "*Random*": benchmark model estimated with random effects.

Estimating the unexpected component of ECB SMP purchases

To identify the effects of the SMP, we proceed in two steps to calculate the explanatory variable SMP_t in equation 1. First, we assume that markets have expectations on the level of purchases on the basis of a hypothetic ECB reaction function for SMP purchases that we estimate. Second, we focus on surprises i.e. deviations from the reaction function that should have a price impact. To this aim we calculate the variable SMP_t as the residual of the estimated reaction function.

The reaction function that we estimate is the following:

$$Y_t = c + \beta\, Y_{t-1} + \gamma\, Z_t + \varepsilon_t \qquad \text{equation 1A}$$

Y_t denotes the SMP bond purchases in week t (until Friday close of business). As purchases are non-negative, we estimate the reaction function with a Tobit model. Z_t includes a set of indicators of market conditions at the opening of European markets that can influence the actual size of the SMP purchases[1]. As the reaction function of the ECB might be different in the two periods when the SMP was active, we separately estimated the (Tobit) equation for the two periods. We specify the reaction function for SMP purchases in five different ways as described in Table A1.1.

Table A1.1: different specifications of equation 1A for the calculation of "unexpected" SMP purchases

Model	Model description and Explanatory Variables
"Previous"	This model assumes that markets' best guess of this week purchases is last week's purchases. Therefore, the only explanatory variable in equation 1A is purchases in week t-1 with $\beta = 1$.
"AR(1)"	This model assumes that markets' best guess of this week purchases is a function of last week's purchases. Therefore, the only explanatory variable in equation 1A is purchases in week t-1.
"Tobit 1"	In addition to lagged SMP actual purchases, this model includes: (i) "FX vola": the average of the overnight absolute returns of the euro over one hour time intervals between 5AM and 8AM GMT (i.e. the realised volatility of the euro before the opening of European markets) [2]; (ii) "ON return": the average over week t of the overnight excess return of benchmark bonds of euro area countries in distress relative to the German Bund. The overnight return for bonds is calculated as the percentage price change between the last price of a day and the opening price of the following day. This variable captures "early morning" tensions in the sovereign bond market that might lead to SMP purchases. For the first phase of the SMP, "ON return" looks at the average of Greek, Portuguese and Irish bonds, during the second phase, it looks at the average of Italian and Spanish bonds.

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[1] The intraday data used in this section are collected from Datastream and Bloomberg.

[2] Although the ECB SMP is not designed to react to tensions in currency markets, the "early morning" volatility of the euro could capture market tensions stemming from common factors which would also affect sovereign markets, therefore inducing the ECB to activate SMP purchases.

"Tobit 2"	This model is the best model according to a Bayesian selection of the explanatory variables among lagged purchases and a set of around 10 indicators of "early morning" market tensions. In addition to lagged SMP actual purchases, the model for the first SMP includes: • "ON vola": the average over week t of the overnight absolute return of benchmark bonds of euro area countries in distress (GR, PT and IE). The absolute return is meant to capture the overnight realised volatility of euro area sovereign bonds. In addition to lagged SMP actual purchases, the model for the second SMP includes "FX vola", "ON return" for IT and ES and "FX return" i.e. the average over week t of the return of the euro over between 5AM and 8AM GMT ("+" indicates euro appreciation).
"Tobit 3" (preferred model)	This is a simple model where we assume that the reaction function of the ECB depends on the overnight price change ("ON return") and volatility ("ON vola") of bonds of euro area countries under stress. For the first phase of the SMP we look at "ON return" and "ON vola" for GR, PT and IE, while for the second phase we look at ES and IT.

Table A1 shows the estimated coefficients for equation 1A for the two SMP periods for our preferred model "Tobit 3", while the Figure A1 shows actual and fitted SMP purchases.

After estimating equation 1A for the two SMP periods, we calculated the variable SMP_t in the following way:
- SMP_t = actual SMP purchases during the first week when the programme is active (i.e. week 10-14 May 2010 for SMP 1 and week 8-12 August 2011 for SMP 2). This is to capture the fact that the first interventions in each of the two phases of the SMP came as a surprise to market participants.
- $SMP = \varepsilon_t$ (i.e. the residual of equation 1A) on the weeks when the SMP is active, except for the first week.
- $SMP = 0$ in other weeks.

Figure A2 shows the calculated SMP_t at weekly frequency using our preferred model "Tobit 3".

As our analysis is at the daily frequency and data on SMP purchases are publicly available only on a weekly basis, we equally split the calculated value of the unexpected purchases over the week when the purchases took place.

Table A2: Estimated coefficients for equation 1A according to the model "Tobit 3"

First SMP Estimation period, 14 May 2010 to 14 January 2011, weekly data		**Second SMP** Estimation period, 12 August 2011 to 20 January 2012, weekly data	
SMP_{t-1}	0.84 ***	SMP_{t-1}	0.53 ***
ON vola	0.13 *	ON vola	-0.26
ON price	0.12	ON price	-1.69 **
const	-0.74	const	2.58 **
Pseudo R-sq	0.36	Pseudo R-sq	0.15
Obs.	35	Obs.	23

Note: see table A1 for information on the explanatory variables.

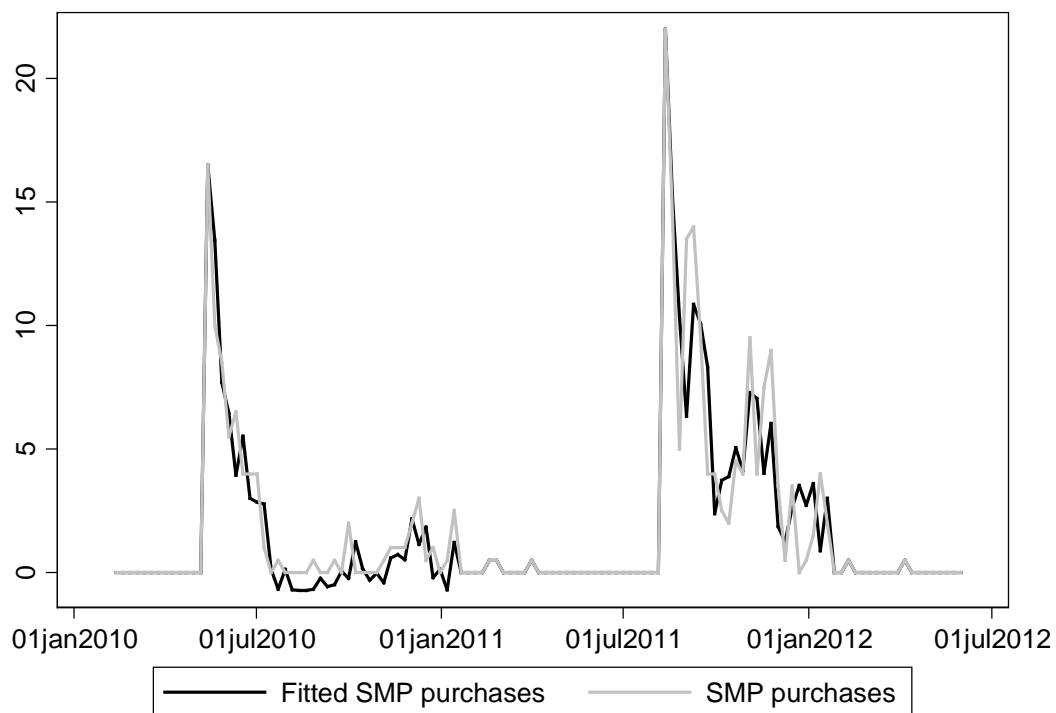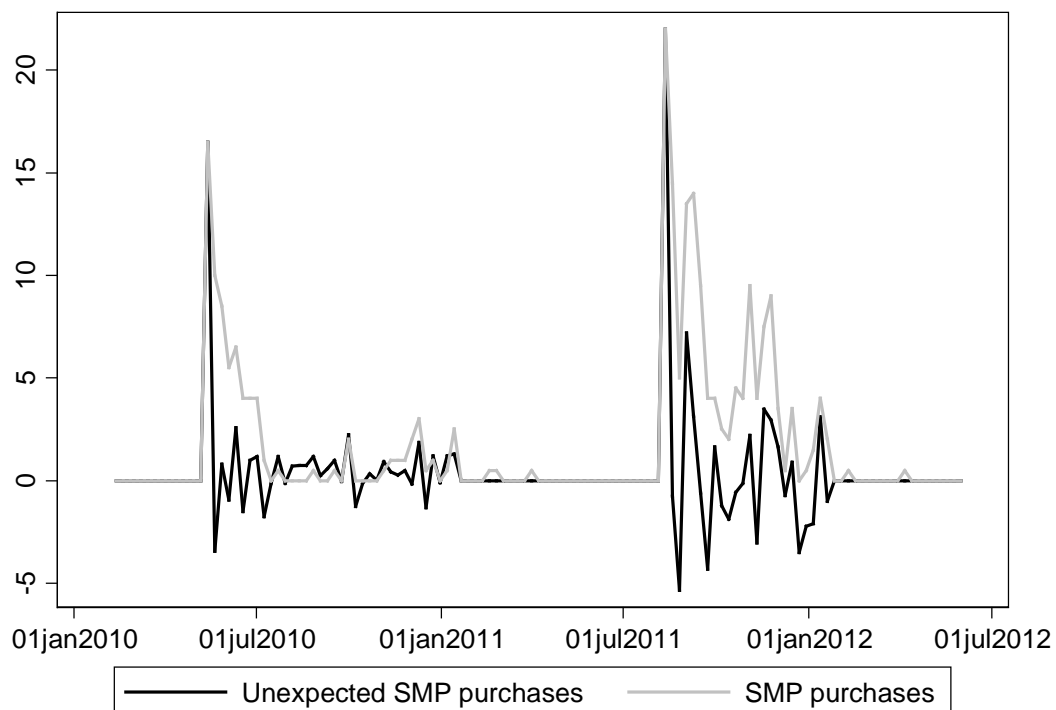**Figure A1.1: Actual and fitted SMP purchases according to the model "Tobit 3"**

Figure A1.2: Calculated SMP$_t$ explanatory variable (i.e. unexpected SMP purchases) according to the model "Tobit 3"

ANNEX II

Table A2.1: Press coverage of ECB actions

Date	Event	Financial Times Headline	Headline article	Front page	VIX	Dummy
28/03/2008	6 month SLTROs	*US sends in back-up for Iraqi offensive*	No	No	-0.17	
04/09/2008	Roll over of the outstanding 6 month SLTROs	*US stocks suffer on fear for economy*	No	No	2.6	
15/10/2008	6 month SLTROs and other measures	*Fresh squall rattles markets*	No	No	14.12	
07/05/2009	12 month SLTROs and other measures (including covered bond purchases)	*Us banks must add $74.6bn in equity*	No	text	0.99	
04/06/2009	Details for the purchase programme of covered bonds	*Obama appeal to muslims*	No	No	-0.84	
10/05/2010	SMP and other measures	*Markets rally on EU bail-out*	main text	-	-12.11	AN_SMP
30/06/2010	Completion of covered bond purchases	*EU bank bonus rules sow confusion*	No	No	0.41	
04/08/2011	SLTROs and other measures	*Stock markets plunge worldwide*	main text	-	8.28	
07/08/2011	SMP reactivation	*Traders braced for more turmoil*	main text	-	16	AN_SMP
06/10/2011	12 month SLTROs and covered bond purchases	*ECB raids policy cupboard*	title	-	-1.54	
08/12/2011	36 month VLTROs and other measures	*European banks' shortfall at €115bn*	-	-	1.92	
26/07/2012	Mr. Draghi's Speech "Whatever it takes"	*Nomura axe falls on top staff*	No	title	-1.81	AN_OMT
06/09/2012	Details for the OMT	*ECB signals resolve to save euro*	title	-	-2.14	AN_OMT

Note: Column "Event" describes the policy announcement; "Financial Times Headline" indicates the title of the "top story" on the front page of the Financial Times; "Headline Article" indicates where the ECB action is mentioned in the top story on the front page of the Financial Times (title, subtitle or main text); "Front page" indicates where the ECB action is mentioned in the on the front page of the Financial Times, if not in the "top story" (title, subtitle or main text). "VIX" indicates the change in the VIX on the day of the announcement; "dummy" indicate the impulse dummy capturing announcements effects in the baseline analysis.

Table A2.2: Press coverage of Fed actions

Date	Event	Financial Times Headline	Headline article	Front page	VIX
25/11/2008	LSAPs announced	*Fed adds $800bn to boost borrowing*	title	-	-3.80
01/12/2008	Bernanke first suggestion of extending QE to Treasuries	*Evidence of deep recession mounts*	main text	-	13.23
16/12/2008	First suggestion of extending QE to Treasuries by FOMC	*US Fed slashes rates to near zero*	main text	-	-4.39
28/01/2009	Fed stands ready to expand QE and buy Treasuries	*Economic pain to be 'worst for 60 years'*	main text	-	-2.59
18/03/2009	QEs expanded	*Fed purchase plan stuns investors*	title	-	-0.74
27/08/2010	Bernanke suggest role for additional QE	*Fed ready to boost economy*	title	-	-2.92
12/10/2010	FOMC says additional accomodation may be appropriate	*Fresh Fed boost more likely*	title	-	-0.03
15/10/2010	Bernanke says Fed stands ready for action	*Bernanke hints at further stimulus*	title	-	-0.85
03/11/2010	QE2 announced	*Fed to pump in extra $600bn*	title	-	-2.01
21/09/2011	Maturity Extension Program announced	*Fed 'twist'seeks to boost US economy*	title	-	4.46
20/06/2012	Maturity Extension Program extended	*Fed opts to extend its 'Operation Twist' plan*	title	-	-1.14
22/08/2012	FOMC says additional monetary accomodation is likely	*SA mining unrest spreads*	No	title	0.09
13/09/2012	QE3 announced	*Bernanke takes plunge with QE3*	title	-	-1.75
12/12/2012	QE3 expanded	*Fed links interest rates to US unemployment figures*	main text	-	0.38

Note: See notes to Table A2.1. The focus set on the fifteen "expansionary" announcements listed in Table 1A in Fawley and Neely (2013).

Table A2.2: Asset prices and future money market spreads

	(1) Δois t+20	(2) Δois t+60	(3) Δois t+120	(4) Δted t+20	(5) Δted t+60	(6) Δted t+120
Δgov10y it	0.236	0.533	-0.223	0.118	0.590	-0.0982
	(0.275)	(0.709)	(1.262)	(0.561)	(0.752)	(1.266)
Δgov10y es	-0.234	-0.594	-0.450	-0.484	-0.770	-0.628
	(0.329)	(0.748)	(1.507)	(0.511)	(0.922)	(1.609)
%equity it	-0.517	-1.915	2.657	-0.116	-2.571	2.678
	(1.651)	(3.914)	(6.571)	(2.959)	(4.200)	(6.720)
%equity es	0.826	2.749	1.976	2.479	3.870	2.729
	(1.869)	(3.996)	(7.502)	(2.834)	(4.981)	(8.113)
Constant	0.00192	0.00832	0.0237**	0.00146	0.00754	0.0274*
	(0.00457)	(0.00873)	(0.0116)	(0.00745)	(0.0115)	(0.0141)
Obs	1,476	1,436	1,376	1,476	1,436	1,376
R-squared	0.002	0.001	0.002	0.001	0.001	0.003

Note: the table reports the coefficients of a regression where increases in the OIS spread and in the Ted spread over different time horizons (between t and t+20, t+60 and t+120 – see the column titles) are explained by the first difference on bond yields in Italy (Δgov10y it) and Spain (Δgov10y es) and percentage changes in equity prices in Italy (%equity it) and Spain (%equity es) on day t. The OIS spread is the 3 month Euribor minus the 3 month Overnight Swap Index. The Ted spread is the 3 month Euribor minus the yield of the 3 month T-bill for France. Essentially, the table shows that daily changes in equity prices and bond yields contain no information on future changes in money market spreads.

Table A2.3: Contemporaneous correlation between asset prices and money market spreads

Panel A – unconditional correlation

	OIS spread	TED spread
Δgov10y it	-0.02	-0.01
%equity it	-0.02	-0.02
Δgov10y es	-0.03	-0.03
%equity es	-0.03	-0.03

Panel B –correlation when spreads are above or below median

	above median		*below median*	
	OIS spread	TED spread	OIS spread	TED spread
Δgov10y it	0.01	-0.02	0.03	-0.02
%equity it	0.01	-0.02	0.02	-0.03
Δgov10y es	-0.02	-0.05	0.03	-0.03
%equity es	-0.02	-0.05	0.02	-0.04

Note: the tables report the contemporaneous correlation between money market spreads (the OIS and the Ted spread) and changes in asset prices. The latter include the first difference of bond yields in Italy (Δgov10y it) and Spain (Δgov10y es) and percentage changes in equity prices in Italy (%equity it) and Spain (%equity es).

Table A2.4: impact of ECB policies under the benchmark specification using alternative reaction functions for the SMP

Italy and Spain

	(1) Actual	(2) Previous	(3) AR(1)	(4) Tobit 1	(5) Tobit 2	(6) Benchmark	(7) Rolling
AN_OMT	-0.369***	-0.369***	-0.369***	-0.370***	-0.369***	-0.370***	-0.369***
	(0.038)	(0.039)	(0.037)	(0.040)	(0.039)	(0.039)	(0.039)
AN_SLTRO	-0.014*	-0.014*	-0.014**	-0.014*	-0.014**	-0.015**	-0.014*
	(0.007)	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.007)
AN_VLTRO	0.292***	0.289***	0.290***	0.281***	0.292***	0.289***	0.280***
	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	-(0.003)
AN_SMP	-0.665***	-0.645***	-0.655***	-0.609***	-0.664***	-0.606***	-0.629***
	(0.083)	(0.086)	(0.085)	(0.088)	(0.100)	(0.086)	(0.093)
SLTRO	-0.037***	-0.036***	-0.037***	-0.036***	-0.038***	-0.036***	-0.035***
	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
VLTRO	-0.045***	-0.046***	-0.046***	-0.048***	-0.045***	-0.051***	-0.049***
	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)	(0.013)	(0.014)
SMP	0.001***	-0.004***	-0.002	-0.014***	0.001	-0.015***	-0.014***
	(0.000)	(0.001)	(0.002)	(0.001)	(0.004)	(0.001)	(0.004)
Constant	0.000	0.000*	0.000**	0.001***	0.000***	0.001***	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	2,823	2,823	2,823	2,823	2,823	2,823	2,823
R-squared	0.165	0.165	0.165	0.167	0.165	0.168	0.169
Fixed Effects	Y	Y	Y	Y	Y	Y	Y
Control Variables	Surprises	Surprises	Surprises	Surprises	Surprises	Surprises	Surprises
	US QE	US QE	US QE	US QE	US QE	US QE	US QE
	Auctions	Auctions	Auctions	Auctions	Auctions	Auctions	Auctions
	Dummies	Dummies	Dummies	Dummies	Dummies	Dummies	Dummies

Note: see notes to Table 6 "Alternative SMP measurement". The last column reports the results of a specification where the SMP reaction function is estimated using a rolling regression (which includes 5 data points).

Table A2.5: Effects of an alternative set of ECB announcements.

Daily change in equity prices (%)

date	event	IT, ES	AT, DE, FI, NL	Advanced Economies	Emerging markets (ex EU)	Emerging EU
10-May-10	SMP	10.39	6.44	3.13	0.86	4.31
06-Oct-11	SLTRO and covered bond programme	2.86	2.70	1.86	1.25	1.25
26-Jul-12	Draghi's Speech	5.17	2.33	1.36	1.04	0.58
06-Sep-12	OMT	3.80	2.13	1.50	1.37	0.54

Daily change in 10 year government bond yields (p.p.)

date	event	IT, ES	AT, DE, FI, NL	Advanced Economies	Emerging markets (ex EU)	Emerging EU
10-May-10	SMP	-0.39	0.13	0.09	-0.09	-0.15
06-Oct-11	SLTRO and covered bond programme	-0.08	0.10	0.06	-0.01	-0.06
26-Jul-12	Draghi's Speech	-0.44	0.01	0.07	0.00	-0.03
06-Sep-12	OMT	-0.29	0.09	0.07	0.02	0.01