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European Commission
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An event-study analysis of ECB balance sheet policies since October 2008

By Lucian Briciu and Giulio Lisi

Summary

Using an event-study approach, this paper provides an impact analysis of seven sets of balance sheet policies (BSPs) launched by the ECB between October 2008 and January 2015. According to the event-study results, the set of ECB BSPs announced in 2014 had the broadest immediate impact on euro area financial conditions, though possibly augmented by parallel announcements of conventional monetary policy decisions. The expanded asset purchase programme (EAPP) had the strongest impact on the exchange rate, while also significantly lowering longer-term government bond yields. The Securities Markets Programme (SMP), the BSPs announced in late 2011 and the EAPP appear to have also been successful in raising market-based inflation expectations. In interpreting the results, it should be borne in mind that event studies provide a snapshot view of immediate effects and do not capture the full effects of policy measures over time. They should hence be seen as part of a broader overall assessment.

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Balance sheet policies launched by the ECB between October 2008 and January 2015

Central banks' balance sheets have been increasingly used as a monetary policy instrument since the beginning of the financial crisis in 2008.[1] While conventional monetary policy focuses on setting the price of money, a balance sheet policy (BSP) targets the quantity of money by varying the size of the central bank balance sheet. This is aimed at affecting economic activity by altering the balance sheets of economic agents involved (directly or indirectly) in the transactions with the central bank. A BSP can be therefore defined as a monetary policy measure that aims at (directly) affecting conditions in particular market segments by actively altering the central bank's balance sheet (Borio and Disyatat, 2009; Bini Smaghi, 2009).

This study considers seven sets of BSPs launched by the European Central Bank (ECB) from October 2008 to January 2015. Given the importance of the banking sector in the financing of euro area real economic activity most ECB BSPs directly targeted the euro area banks' funding markets. However, as will be discussed below, a number of BSPs were also directed at euro area government bond markets.

The first set of monetary policy measures designed to actively make use of the Eurosystem balance sheet (BSP1) was launched in October 2008.[2] To ensure the effective transmission of the monetary policy stance to the real economy at a time of uncertainty and significant stress in financial markets, the ECB announced a number of BSPs (see Annex and Chart 1) aimed at addressing persistent funding problems (in particular in the money markets) of the euro area banking sector (i.e. fixed-rate-full-allotment tender procedure (FRFA) for all liquidity-providing operations, broader list of assets eligible as collateral, provision of US dollar liquidity through EUR/USD foreign exchange swap tenders with full allotment).

The ECB announced a second set of BSPs (BSP2) at the beginning of May 2009, when three one-year long-term refinancing operations (LTROs) were announced in combination with the decision to launch a covered bond purchase programme (CBPP1). By providing sufficient funding for a longer time and at more attractive conditions than the market to euro area banks, these measures were aimed at easing euro area banks' funding conditions more broadly (i.e. not only in the money markets) so as to lead to a broader easing in the financing conditions of the real economy.

The third set of BSPs (BSP3), consisting mainly of the Securities Markets Programme (SMP) alongside a number of other BSPs previously used, was launched at the beginning of May 2010 in response to an intensification of tensions in some euro area sovereign bond markets. Under this programme, the Eurosystem balance sheet was envisaged to expand through "temporary" purchases of public and private debt securities in order to address the malfunctioning of certain market segments which were hampering the monetary policy transmission mechanism. The ECB also reintroduced some other BSPs such as FRFA, new six-month LTROs and swap lines with the US Federal Reserve to avoid spillovers from domestic sovereign bond markets to other financial markets (ECB, 2010).

The fourth set of BSPs (BSP4), which comprises the measures announced in the last quarter of 2011, was designed to make use of the Eurosystem balance sheet in a similar way to the second set of BSPs. The ECB launched a second covered bond purchase programme (CBPP2) and announced two three-year LTROs. These measures were also aimed to ease euro area banks' funding conditions in a number of market segments (i.e. money and covered bond markets) in order to support bank lending to the real economy.[3]

In the summer of 2012, the ECB announced a new BSP (BSP5), the Outright Monetary Transactions (OMT), designed to preserve the singleness of monetary policy and to ensure the proper transmission of the monetary policy stance to the real economy throughout the euro area. The programme would be implemented through outright purchases on secondary markets of some euro area government securities to address severe distortions in government bond markets which originate from, in particular, unfounded fears on the part of investors of the reversibility of the euro.[4]

Taking into account the deterioration in the outlook for inflation in the euro area, the ECB announced a sixth set of BSPs (BSP6) in June and September 2014. With the main policy rates at their effective lower bound,[5] the ECB attempted to have a better control of the impact of its BSPs on the financing conditions of the real economy. It mainly targeted funding conditions of euro area banks in a number of financial market segments (i.e. money markets, covered bond markets, securitized asset markets). BSP6 consisted of a series of eight targeted long-term refinancing operations (TLTROs) with a maturity of four years to take place on a quarterly basis between September 2014 and June 2016. Furthermore, two new programmes of private asset purchases (covered bonds and asset-backed securities) were also announced in September 2014. Importantly, the ECB also indicated to which extent the Eurosystem balance sheet was expected to change as a result of those BSPs. According to the ECB, the impact of the new BSPs was intended to be sizeable so as to help to steer the size of the Eurosystem balance sheet towards the level of early 2012 (i.e. EUR 3trn, about EUR 1trn above its size in late 2014).

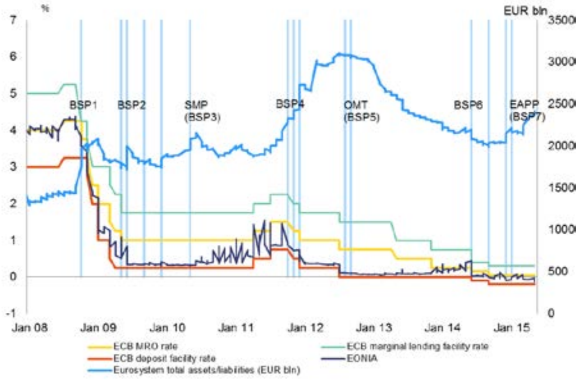
The seventh and last set of BSPs (BSP7) included in this study was announced in January 2015. Against the backdrop of weaker-than-expected inflation dynamics and increasing evidence that the prevailing degree of monetary accommodation was insufficient to adequately address heightened risks of a too prolonged period of low inflation, the ECB decided to launch the so-called expanded asset purchase programme (EAPP).[6] Under this programme, outright asset purchases were expanded to euro-denominated investment-grade securities issued by euro area governments and agencies and European institutions. The combined monthly asset purchases of public and private securities were designed to amount to EUR 60 billion. Purchases were intended to be carried out from March 2015 until the end of September 2016 and in any case until the Governing Council sees a sustained adjustment in the path of inflation consistent with its aim of achieving inflation rates below, but close to, 2% over the medium term.

The seven sets of BSPs have affected to varying degrees the balance sheet of the Eurosystem, with some BSPs having little or no impact at all on it (e.g. OMT). Whereas the Eurosystem balance sheet doubled its size from the beginning of 2008 to mid-2012, this significant increase was mainly driven by BSP1 and BSP4 (see Chart 1). The size of Eurosystem balance sheet had been declining from mid-2012 to the end of September 2014, as no intervention had been conducted under the OMT (or BSP5) while at the same time its announcement may have contributed to significant advanced repayments of the liquidity support provided under BSP4 (i.e. mainly the two three-year LTROs). After having stabilized just above EUR 2trn following the announcement of BSP6 and the expiry of the two three-year LTROs, the Eurosystem balance sheet has started to expand again since the beginning of March 2015, mainly driven by the implementation of the EAPP (or BSP7).

An event-study analysis of ECB BSPs

Given that a BSP is aimed to affect/change conditions in specific market segments, an event-study analysis appears suitable to study the impact on the markets explicitly targeted by the different BSPs launched by the ECB as well as potential spillovers to other financial market segments. This approach is mainly based on the assumption that changes in the central bank balance sheet and/or the announcements of new BSPs provide new information affecting market valuations of assets. Thus, an event study can be used as a useful method to gauge the direct, immediate effects on the targeted markets and beyond of the different ECB BSPs adopted since October of 2008.[7]

Graph1. Key ECB policy rates, ECB BSPs and Eurosystem balance sheet



Source: ECB, IHS Global Insight

This paper focuses on the analysis of variations in a number of relevant financial variables (relative to the markets targeted by the different sets of BSPs) around (i) ECB Governing Council press conferences and/or press releases in which BSPs were announced and (ii) days in which operational details about previously announced BSPs were disclosed. This second type of events also includes announcements of amounts allotted in the different LTROs. The details concerning the amounts allotted may contain elements of novelty able to trigger changes in agents' expectations. The full list of announcements considered is reported in the Annex, along with a short description of the main decisions adopted on each occasion.

The impact of the announcements related to the different sets of ECB BSPs on the relevant variables is defined as the difference between the closing level of the day prior to a particular event and the closing level observed on the day after the event. In general, there is a trade-off between selecting a large time frame (window), which allows for revised expectations to become fully incorporated in asset prices, and a narrow one, for which the estimated impact is less likely to contain the effect of other events (Martin and Milas, 2012; Gagnon et al., 2011). In line with existing empirical contributions on BSPs in the US (see for example Krishnamurthy and Vissing-Jorgensen, 2011 and Chen et al., 2013), this study adopts a two-day window interval.

While each set of ECB BSPs was generally designed to target specific market segments, the event study also attempts to capture broader effects on other financial market segments.[8] To investigate this point, it considers first euro area banks' funding indicators (e.g. money market spreads and rates, interest rates on covered bonds), which were explicitly targeted by the first set of BSPs as well as three other sets of BSPs (BSP2, BSP4 and BSP6), and euro area long-term (government) interest rates,[9] which were the object of some other BSPs (i.e. the SMP, the OMT and the EAPP). Developments in market-based inflation expectations as measured by euro area inflation swap rates are also analysed assuming that an implicit objective of all sets of ECB BSPs has been to ensure a firm anchoring of medium to long-term inflation expectations. Furthermore, as some of the BSPs were also designed to affect broader financial conditions, a comprehensive view requires considering developments in market segments beyond the market(s) targeted by ECB BSPs. This study therefore includes the analysis of variations in exchange rates and equity prices; these should allow gauging broader effects of the different sets of ECB BSPs. All data presented in the following section are obtained from Bloomberg and are taken at daily frequency.

The analysis of (cumulative) changes recorded in the selected euro area financial markets suggests that BSP1 significantly eased liquidity conditions in the money markets and lowered short-term nominal yields. Developments in the euro area money markets around the announcement of BSP1 show a significant fall in money market rates (up to 69bp for the EONIA rate). However, the magnitude of the declines decreased with maturity and in particular in the case of unsecured money market rates such as the EURIBOR rates (see table 1 below). Thus, the more limited downward adjustment in the EURIBOR rates (e.g. the three-month EURIBOR fell by only 13bp) led to a widening of money market rate spreads (e.g. three-month Overnight Indexed Swap against three-month EURIBOR and EUREPO against EURIBOR at the three-month maturity increased by more than 20bp). At the same time, the fall in money market rates was passed on to long-term nominal interest rates but only at the front end of the long-term yield curve (i.e. two-year maturity, see table 2), which is usually more reactive to changes in the monetary policy stance (provided that the central bank policy rate has not hit its lower bound).

Table 1. Changes in euro area banks' funding costs

	Cumulative two-day changes (bp)					
Sets of BSPs	*EONIA Rate*	*3M EURIBOR Rate*	*3M OIS Rate*	*3M EURIBOR - 3M OIS Spread*	*3M EURIBOR - 3M EUREPO Spread*	*5Y EUR IG CB Yield**
BSP1	-69.10	-12.90	-40.10	27.20	22.60	
BSP2	75.10	-1.90	-5.75	3.85	-3.10	-21.90
BSP3 (SMP)	32.40	0.00	-2.85	2.85	2.20	4.20
BSP4	-2.80	-13.90	-7.65	-6.25	-8.50	1.80
BSP5 (OMTs)	-0.30	-1.00	4.92	-5.92	-2.20	11.30
BSP6	-6.50	-8.00	-9.61	1.61	-2.30	-19.00
BSP7 (EAPP)	4.90	-0.20	2.25	-2.45	-0.20	-6.20

*****Bloomberg data covering the five-year investment grade covered bond (IG CB) rates are only available starting from 18/06/2009.
Source: European Commission

Movements of the EUR exchange rates were rather mixed, possibly reflecting a more limited impact of BSP1 in the EUR exchange rates at a time of heightened risk aversion at the global level. While the EUR appreciated in nominal-effective terms and against the GBP, it depreciated significantly against the USD and JPY which are usually perceived as safe-haven currencies during periods of stress in financial markets (see table 3).

Equity prices and market-based inflation expectations fell significantly in spite of the announcement of BSP1. However, given the magnitude of the declines, it is possible that uncertainty and continued deterioration in the outlook for growth and inflation in the euro area more than offset all possible positive reactions to the first set of BSPs. In addition, caution is required in interpreting the impact of BSP1 as the ECB also cut its key policy rate by 50bps on 8 October 2008.

Developments in euro area financial markets around the announcements of BSP2 are indicative of a limited and/or more localised easing effect, amid higher market-based inflation

expectations (see tables 1 and 2). While BSP2 had a moderate easing impact on most money market rates, [10]longer-term nominal yields increased significantly in synchronisation with US long-term yields as a result of the improvement in the outlook for US economic growth. At the same time, developments in money market rates should be interpreted with caution as the ECB also decided, as largely expected, to lower its main refinancing interest rate by 25bp to 1% and the marginal lending rate by 50bp to 1.75%. The available data on covered bond yields suggest that banks' funding costs in this specific market segment eased significantly for maturities up to five years (some -20bp) (see table 1). While the reaction of equity markets was rather muted, market-based inflation expectations reacted more significantly and positively (see tables 2 and 3). Finally, in a context of generally higher interest rates and inflation expectations, the EUR also strengthened broadly, albeit only to a limited extent (see table 3).

While developments described above do not appear to be indicative of a broad easing in financing conditions around the announcements of BSP2, the recorded changes could also be consistent with a "wait and see" behavior of investors until more information would become available about the new BSPs announced in the Spring of 2009. At the same time, movements related to factors outside the euro area (e.g. as a result of a gradual improvement in the outlook for US growth and the associated reassessment of risks at global level) could have limited the possible ECB induced downward pressures on the euro area long-term interest rates.

Table 2. Changes in euro area long-term nominal rates and market-based inflation expectations[11]

Sets of BSPs	Cumulative two-day changes (bp)							
	Long-term nominal interest rates						***Inflation swap rates***	
	Germany		*Italy*		*Spain*			
	2Y	10Y	2Y	10Y	2Y	10Y	2Y	10Y
BSP1	-39.00	7.80	-30.00	7.50	-38.50	4.10	-93.40	-5.50
BSP2	21.90	33.50	2.20	17.50	11.40	22.50	0.40	8.20
BSP3 (SMP)	4.70	14.00	-79.70	-31.50	-87.80	-51.20	10.70	10.65
BSP4	10.60	24.50	-18.50	23.40	44.60	41.70	15.10	5.25
BSP5 (OMTs)	10.20	9.60	-84.80	-34.80	-134.20	-66.10	-0.75	0.50
BSP6	-7.00	-17.10	-26.70	-51.90	-22.90	--54.40	-12.40	-7.25
BSP7 (EAPP)	-1.60	-16.00	-6.20	-16.60	-7.90	-15.70	5.05	5.05

Source: *European Commission*

The announcement of the SMP (or BSP3) appears to have yielded a strong easing impact on financial markets in countries under financial stress. The SMP announcement also came along with a significant increase in market-based inflation expectations at the euro area level and a broad-based depreciation of the euro. Indeed, the impact of the programme seems to have been mostly contained to some euro area government bond markets. With the exception of the EONIA rate, which increased by more than 30bp, possibly as a result of the fact that the ECB's interventions under the SMP were to be sterilized through short-term liquidity-absorbing operations, this BSP had almost no impact on money market rates. Nominal yields on core euro area government bonds were also little changed (in particular at the short end of the yield curve). At the same time, nominal and real long-term government bond yields fell substantially for Italy and Spain (see table 2). These developments are consistent with a significant reduction in the excessively high credit risk embedded within some euro area government bond yields at the time: as shorter-term government bond yields of countries under stress declined the most, this shift seems to be more related to a fall in perceived credit risk rather than to a portfolio rebalancing movement which should have triggered a flattening of the yield curve. The fall in real yields also reflected a generalized increase of more than 10bp in market-based inflation expectations (see table 2), in spite of the announcement of the sterilization of the purchases conducted under the SMP. These developments also came along with a relatively broad-based and significant depreciation of the euro (except against the JPY). Also consistent with a reduction in risk premia more broadly, euro area equity markets had a strong positive reaction, in particular for financials and in countries under financial stress (see table 3).

Although somewhat similar to BSP2, given that the same markets were targeted, BSP4 appears to have had a broader and more significant easing effect on money market rates and at the short end of the real yield curve (see tables 1 and 2). Real yields on most long-term government and covered bonds declined more significantly, as a result of a relatively strong and broad-based increased in market-based inflation expectations amid the very high take-up in the three-year LTROs. The measures had, however, no discernible impact on longer-term nominal yields. In the case of Spain, government bond yields even increased by more than 40bp amid increasing concerns about the health of the Spanish banking system. While equity markets reacted positively, the reaction was rather limited (not more than +1.5%). Furthermore, developments in the EUR exchange rates were also rather muted and relatively mixed. Thus, the EUR was only little changed in nominal-effective terms and appreciated slightly against the USD and JPY. At the same time, the euro depreciated by about 0.50% against the GBP, possibly as a result of the fact that the new set of BPSs was perceived as introducing relatively more easing than the monetary policy measures to be implemented at that time by the Bank of England (i.e. the Bank of England decided in October 2011 to increase its stock of purchased assets to GBP 275bn by purchasing an additional amount of GBP 75bn of UK government bonds).

The announcements related to the OMT (or BSP5)[12] appear to have led to a drop of more than 80bp in short-term (e.g. two year) nominal and real government bond yields of the countries most affected by the exceptionally high risk premia resulting from redenomination fears. While long-term bond yields (10-year maturity) also dropped substantially, the reduction in country risk (ECB, 2012) was also felt in some money market rates (mainly unsecured) and spreads (see tables 1 and 2). The improved confidence with regard to the euro area appears to have benefited equity markets, with financial companies' equity prices increasing by up to 4%. This positive environment also supported the EUR, which appreciated slightly in nominal-effective terms and by about 1¼% against the USD and JPY. At the same time, the OMT announcement had almost no impact on market-based inflation expectations.

Table 3. Changes in EUR exchange rates and euro area equity market indices

Sets of BSPs	Average changes (%)								
	EUR Exchange rates				*Equity market indices*				
	USD	*JPY*	*GBP*	*NEER*	*Euro-stoxx*	*Euro-stoxx financials*	*DAX*	*FTSE MIB*	*IBEX*
BSP1	-0.94	-1.58	0.73	0.38	-10.39	-10.32	-9.67	-5.72	-5.28
BSP2	0.30	1.05	0.16	0.17	0.97	1.79	0.97	1.20	1.14
BSP3 (SMP)	-0.09	1.53	-1.32	-0.72	9.21	14.24	5.65	10.76	10.64
BSP4	0.12	0.27	-0.46	-0.02	1.17	1.59	1.16	1.29	0.96
BSP5 (OMTs)	1.19	1.27	0.77	0.32	2.82	4.12	2.62	3.95	2.86
BSP6	-0.43	0.01	-0.56	-0.35	0.49	1.84	0.30	0.48	0.93
BSP7 (EAPP)	-3.50	-3.66	-2.48	-2.50	3.45	2.04	3.40	2.69	2.38

Source: *European Commission*

While BSP6 targeted the same markets as BSP2 and BSP4, the easing observed in financing costs appears to have been broader and more significant. The BSPs launched in June and September 2014[13] were associated with strong (cumulative) declines in money market rates and covered bond yields (see table 1). At the same time, a significant pass-through from short-term to longer-term rates took place, leading to a flattening of the yield curve (see table 2). Furthermore, the fall in long-term yields was broad-based, with the government bond yields of Italy and Spain recording the sharpest declines at the long end of the yield curve (by about 50bp). Market-based long-term inflation expectations recorded a significant cumulative fall around the announcements of BSP6, in contrast to what happened in the case of similar measures announced in 2009 and 2011 in particular (see table 2). However, it has to be recalled that some of the announcements related to BSP6 took place at a time when market-based inflation expectations were falling sharply to historically low levels between mid-December 2014 and mid-January 2015 amid strong declines in oil prices and lower actual inflation readings.

The impact of BSP6 was also felt to some extent in equity markets, while the EUR depreciated slightly but rather broadly (-0.35% in nominal-effective terms, see table 3). The relatively stronger increase in equity prices for financial companies also underlines the fact that BSP6 eased more broadly euro area banks' financing conditions. Finally, with the EUR depreciating somewhat in nominal-effective terms and in particular against the USD and the GBP, it appears that BSP6 also helped to slightly ease broader financial conditions.

Given that the various measures of the sixth set of BSPs were designed to reinforce each other over a longer period (i.e. all measures were designed to be implemented over longer time spans than previous similar measures), this could be put forward to explain their more significant and broad easing impact.[14] At the same time, the recorded impact might have also been somewhat augmented by the fact that their announcements came along with decisions to cut key ECB interest rates to their effective lower bound.[15] Furthermore, these results should also be interpreted with caution as BSP6 were announced at a time of a progressive reduction of monetary accommodation in the US,[16] which could have amplified their effects, notably in terms of currency depreciation.

The seventh set of BSPs, consisting mainly of the EAPP, appears to have led to a significant easing in long-term interest rates in the euro area as well as to a broad and sharp weakening of the euro. The announcement of BSP7 also supported to some extent market-based long-term inflation expectations. While short-term money market rates were mixed and only little changed (see table 1), the latest set of BSPs had a significant impact on longer-term government bond yields and in particular at the long end of the yield curve. This implied a significant flattening of the yield curve, which was more pronounced in the case of the core euro area countries (see table 2). As market-based longer-term inflation expectations were also up by about 5bp across the inflation swap curve, the easing was even more significant in real terms. Furthermore, while most euro area equity markets also reacted positively (relatively stronger in the core euro area countries), the EUR recorded the strongest and broadest depreciation among all BSP episodes, falling by about 3.5% against the USD and by around 2.5% in nominal-effective terms. Although some caution is required when interpreting those results as discussed in the previous cases (i.e. as the significant and increasing differences in the monetary policy cycle between major advanced economies have arguably contributed to the observed changes), the BSP7 appears to have contributed to a significant easing in broader financial conditions across the euro area and to have also supported somewhat longer-term inflation expectations.

Conclusion

The event-study results suggest that all ECB BSPs were successful in introducing some degree of easing in euro area financial conditions. The degree of easing achieved varied between BSPs, with some sets of BSPs able to affect financial conditions in the euro area more broadly than others. Among the different BSPs announced by the ECB, it appears that BSP6 had the broadest easing impact on euro area financial conditions. Three sets of BSPs, BSP3 (SMP), BSP4 and BSP7 (EAPP) appear to have contributed more decisively to higher longer-term market-based inflation expectations as measured by inflation swap rates. The EAPP also had the strongest impact on the EUR while also being able to significantly lower nominal and real longer-term government bond yields across the euro area.

While an event study is a straightforward approach to gauge the immediate (direct) impact of a (set of) BSP(s) as well as its potential spillovers on financial markets, a number of caveats should be borne in mind when interpreting its results. As changes in the selected variables are entirely attributed to the event under investigation, it is not possible to disentangle the effect of different announcements taking place on the same date. This is an important drawback especially for the analysis of the effect of those (sets of) BSPs taking place along with interest rates cuts by the ECB. At the same time, the observed developments around the date of the considered announcements may also account for the effects of measures previously adopted (or anticipated) by other central banks and/or authorities. Also, estimates are likely to differ according to the time span considered (Goodhart and Ashworth, 2012) with a comparatively larger time frame (window) being more likely to contain the effect of competing information on asset prices.

The event study only provides a snapshot view, and should hence be seen as one element of a broader assessment. Indeed, the methodology implies important restrictive assumptions. For instance, the agents are assumed to update their expectations only at a point when a particular policy is announced (Gagnon and others, 2011). In fact, decisions concerning BSPs may have been partly anticipated by other events. If this is the case, measuring the impact of BSPs on expectations by analysing price changes on announcement days does not fully capture the entire effect of the BSPs. Furthermore, the event-study methodology does not allow assessing the lasting effect of the different ECB BSPs. For all these reasons, the results discussed above should be considered with appropriate caution.

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Annex. List of ECB announcements (2008-2015) considered in the event study

Sets of BSPs	Date	Programmes/Measures announced	Details of announcements	Other Measures
BSP1	08/10/2008	Introduction of the fixed-rate full-allotment (FRFA) procedure for main refinancing operations (MROs)	ECB announced that as from the operation settled on 15 October, the weekly main refinancing operations (MROs) would be carried out through a fixed rate tender procedure with full allotment (FRFA) at the interest rate on the main refinancing operation.	ECB lowered by 50bp all its three key interest rates: MRO to 3.75%, DFR to 2.75% and MLR to 4.75%. These cuts were unexpected as done in a non-scheduled meeting.
	15/10/2008	FRFA extended to long-term refinancing operations (LTROs) and to the provision of US dollar liquidity-providing operations/Expansion of list of assets eligible as collateral	ECB announced that all its refinancing operations would be conducted through a fixed rate tender procedure with full allotment. The list of assets eligible as collateral in credit operations with the ECB was also expanded to include lower rated assets (i.e. as low as BBB- with the exception of asset-backed securities, ABS) and non-euro denominated assets. Furthermore, the ECB also announced on 13 October that the Eurosystem would offer starting with 15 October 2008 US dollar liquidity (funding) at fixed interest rates for full allotment.	
BSP2	07/05/2009	Three one-year LTROs and first covered bond purchase programme (CBPP1)	The ECB decided to conduct three liquidity-providing longer-term refinancing operations (LTROs) with a maturity of one year. The operations were announced to be conducted at fixed rate with full allotment. The ECB also decided to prolong until the end of 2010 the temporary expansion of the list of eligible assets, announced on 15 October 2008. In addition, the ECB announced that in principle the Eurosystem would purchase euro-denominated covered bonds issued in the euro area. The detailed modalities were scheduled to be communicated after the Governing Council meeting of 4 June 2009.	ECB cut the main refinancing rate by 25bp and the rate on the marginal lending facility by 50bp to 1.00% and 1.75% respectively.
	04/06/2009	Details on the implementations of the CBPP1	Following-up on its decision of 7 May 2009 to purchase euro-denominated covered bonds issued in the euro area, the ECB decided upon the technical modalities of the programme. The main modalities are: the purchases, for an amount of EUR 60 billion, will be distributed across the euro area and will be carried out by means of direct purchases; the purchases to be conducted in both the primary and the secondary markets; the purchases announced to start in July 2009 and expected to be fully implemented by the end of June 2010 at the latest.	
	23/06/2009	Amount allotted in the first one-year LTRO	EUR 442.24bn	
	29/09/2009	Amount allotted in the second one-year LTRO	EUR 75.24bn	
	15/12/2009	Amount allotted in the third one-year LTRO	EUR 96.93bn	

BSP3 (SMP)	10/05/2010	SMP, reintroduction of the FRFA for LTROs and of the US dollar liquidity-providing operations	The ECB decided to conduct under the Securities Markets Programme (SMP) purchases in the secondary markets of euro area public and private debt securities; The conducted purchases were announced to be sterilized through weekly liquidity-absorption operations. The ECB also decided to reactivate, in coordination with other central banks, the temporary liquidity swap lines with the Federal Reserve, and resume US dollar liquidity-providing operations at terms of 7 and 84 days. The operations should take the form of repurchase operations against ECB-eligible collateral and would be carried out as fixed rate tenders with full allotment.	
BSP4	06/10/2011	CBPP2 and two new one-year LTROs	The ECB decide to launch a new covered bond purchase programme (CBPP2) with the intention to purchase in the primary and secondary market EUR 40bn in euro-denominated covered bonds between November 2011 and the end of October 2012. Further details on the modalities of CBPP2 were announced for the ECB Governing Council meeting of 3 November 2011. The ECB also decided to conduct two longer-term refinancing operations (LTROs), one with a maturity of approximately 12 months in October and the other with a maturity of approximately 13 months in December 2011. The operations were announced to be conducted through FRFA procedures.	
	03/11/2011	Details on the implementation (technical modalities) of the CBPP2	The ECB announced the main implementation modalities of the CBPP1 as follows: (1) the purchases of euro-denominated covered bonds issued in the euro area, for an intended nominal amount of EUR 40 billion, will be distributed across the euro area and will be carried out by the Eurosystem by means of direct purchases. (2) The purchases will be conducted in both the primary and the secondary markets.	Key ECB interest rates lowered by 25bp to 1.25% for the MROs, 2.00% for the marginal lending facility and 0.50% for the deposit facility. The change in main refinancing rate was in line with market expectations (source: Bloomberg).
	08/12/2011	Two three-year LTROs and looser collateral rules for ABS	The ECB decided to conduct two long-term refinancing operations (LTROs) with a maturity of 36-months. The operations were to be conducted through a FRFA procedure. The counterparties were given the option of early repayment after one year. The first three-year LTRO was announced for 21 December 2011 and also replaced the 12-month LTRO announced on 6 October 2011. The ECB also announced a loosening of collateral rules applicable in particular to the asset-backed securities. The euro area national central banks (NCBs) were also authorized to accept as collateral additional performing credit claims.	The ECB decided to lower all its key interest rates by 25bp in line with market expectations. The reserve ratio was also reduced from 2% to 1%.
	20/12/2011	Amount allotted in the first three-year LTROs	EUR 489.19bn	
	28/02/2011	Amount allotted in the second three-year LTRO	EUR 529.53bn	

BSP5 (OMT)	02/08/2012	OMTs	The Governing Council extensively discussed the policy options to address the severe malfunctioning in the price formation process in the bond markets of euro area countries. The ECB communicated that risk premia that are related to fears of the reversibility of the euro are unacceptable, and they needed to be addressed in a fundamental manner. The ECB hinted to the fact that, within its mandate to maintain price stability over the medium term and in observance of its independence in determining monetary policy, may undertake outright open market operations of a size adequate to reach its objective. The ECB also communicated that the appropriate modalities for such policy measures still needed to be designed over the coming weeks.	
	06/09/2012	Details on the implementation of the OMTs and measures to preserve the collateral availability for refinancing operations	The ECB decided on the modalities for undertaking Outright Monetary Transactions (OMTs) in secondary markets for sovereign bonds in the euro area. The strict and effective conditionality attached to an appropriate European Financial Stability Facility/European Stability Mechanism (EFSF/ESM) programme was set as a necessary condition for Outright Monetary Transactions. Such programmes could take the form of a full EFSF/ESM macroeconomic adjustment programme or a precautionary programme (Enhanced Conditions Credit Line), provided that they included the possibility of EFSF/ESM primary market purchases. Transactions were supposed to focus on the shorter part of the yield curve, and in particular on sovereign bonds with a maturity of between one and three years. No ex ante quantitative limits are set on the size of Outright Monetary Transactions but the liquidity created through OMTs needed to be sterilized. The SMP was terminated. The ECB also decided to suspend the application of the minimum credit rating threshold in the collateral eligibility requirements for the purposes of the Eurosystem's credit operations in the case of marketable debt instruments issued or guaranteed by the central government, and credit claims granted to or guaranteed by the central government, of countries that are eligible for Outright Monetary Transactions or are under an EU-IMF programme and comply with the attached conditionality. The ECB also announced that non-euro denominated assets issued and held in the euro area would be eligible again (as In October 2008) as collateral.	
BSP6	05/06/2014		TLTROs announced, preparatory work on asset-backed securities, prolongation of MROs (full allotment, tender procedures), suspension of the weekly fine-tuning operation sterilising the liquidity injected under the Securities Markets Programme. (further communication on 3/07/2014: The initial operations will be conducted on 18 September and 11 December 2014, with the additional operations carried out in March, June, September and December 2015 and in March and June 2016)	Interest rate on the main refinancing operations reduced by 10bp to 0.15%; rate on the marginal lending facility by 35bp to 0.40%. The rate on the deposit facility lowered by 10bp to -0.10%. Surveyed interest rate: 0.10%; actual interest rate: 0.15% (source: Bloomberg).

	04/09/2014		ABS purchase programme (ABSPP) announced, CPP3 announced. The Eurosystem will purchase a broad portfolio of simple and transparent asset-backed securities (ABSs) with underlying assets consisting of claims against the euro area non-financial private sector (ABSPP); in parallel, the Eurosystem will also purchase a broad portfolio of euro-denominated covered bonds issued by MFIs domiciled in the euro area under a new covered bond purchase programme (CBPP3). Interventions under these programmes will start in October 2014.	Interest rate on the main refinancing operations reduced by 10bp to 0.05%; rate on the marginal lending facility by 10bp to 0.30%. The rate on the deposit facility lowered by 10bp to -0.20%. Surveyed interest rate: 0.10%; actual interest rate: 0.05% (source: Bloomberg).
	18/09/2014	Amount allotted in the first TLTRO	EUR 82.6bn	
	11/12/2014	Amount allotted in the second TLRO	EUR 129.84bn	
BSP7 (EAPP)	22/01/2015	EAPP/Change in the pricing of future TLTROs	The ECB decided to launch an expanded asset purchase programme (EAPP), encompassing the existing purchase programmes for asset-backed securities and covered bonds. Under the EAPP, the combined monthly purchases of public and private sector securities will amount to EUR 60bn and were intended to be carried out until at least end-September 2016. The ECB announced that the Eurosystem would start purchasing euro-denominated investment-grade securities issued by euro area governments and agencies and European institutions in the secondary market in March 2015. The ECB also indicated that only 20% of the additional asset purchases would be subject to a regime of risk sharing. Securities purchased under the EAPP that are not covered by the ABSPP or CBPP3 must have a minimum remaining maturity of 2 years and a maximum remaining maturity of 30 years at the time of purchase.	

[1] For a discussion of balance sheet policies implemented by major central banks see for instance Bowdler and Radia (2012), IMF (2013) and Fawley and Neely (2013).

[2] According to ECB (ECB, 2010), the measures introduced in October 2008 are a part of the "enhanced credit support" measures and qualified as the first non-standard monetary policy measures. See also Trichet (2009) and Cour-Thimann and Winkler (2013).

[3] The ECB also expanded the list of eligible collateral for its credit operations.

[4] The purchases would be conditional on the existence of an appropriate European Financial Stability Facility/European Stability Mechanism (EFSF/ESM) programme and would target the shorter part of the yield curve, in particular sovereign securities with a maturity of between one and three years.

[5] After the ECB cut its main refinancing rate and deposit facility rate by 10bp to 0.15% and -0.10% respectively at the beginning of June 2014, (therefore bringing the deposit facility rate below zero for the first time ever), those two rates were further lowered by 10bp in September 2014 to what is often referred to as the lower effective bound of key ECB rates.

[6] The ECB also decided to change the pricing of the six remaining targeted longer-term refinancing operations (TLTROs). The interest rate applicable to future TLTRO operations should be equal to the rate on the Eurosystem's main refinancing operations prevailing at the time when each TLTRO is conducted, thereby removing the 10bp spread over the main refinancing rate that applied to the first two TLTROs.

[7] See also Fratzscher et al. (2014) for an event-based analysis of the impact on asset prices of ECB unconventional monetary policies announced until the end of 2012, A number of other studies (e.g. Pattipeilohy et al. (2013) and Szczerbowicz (2012)) focused on the impact on interest rates of the ECB balance sheet policies over the 2008-2012 period while another category of analyses dealt with their impact on inflation expectations (e.g. Moessner, 2014).

[8] However, such a methodology does not allow disentangling the effect of different announcements taking place on the same date. This can arise when balance sheet policies were announced in the same day a standard monetary policy decision (i.e. interest rate decision) was taken and more than one balance sheet policies were announced simultaneously. While in the first case this can be an important drawback, it is considered as a less important biasing factor in the second case given the approach taken in the study (i.e. sets of BSPs). For a detailed description of the different situations see table in the Annex. For a more detailed discussion on the main caveats of an event-study approach see also the conclusion section.

[9] This analysis focuses on the developments of long-term government bonds issued by Germany and France for the core countries and by Italy and Spain for the euro area countries under financial stress.

[10] While the Eonia rate moved up by more than 70bp around the announcement of the 2009 BSPs, this was mainly driven by the developments in the Eonia rate ahead of the allotment of the first one-year LTRO, as banks reduced their demand for liquidity in the standard operations in anticipation of the longer-term liquidity-providing operation.

[11] This table also provides an indication on changes in long-term real interest rates by deducting changes in market –based inflation expectations from changes in nominal long-term interest rates. Changes in long-term interest rates were also monitored in the case of French government bonds but were not reported as very similar to the German ones and in order to also streamline the analysis.

[12] The "whatever it takes" remark of ECB President Draghi made in London on 26 July 2012 is not included in the calculations as it is not considered as a formal policy announcement

[13] The speech of ECB President Draghi at the Jackson Hole on 22 August 2014 is also not included among the announcements related to the sixth set of BSPs as it cannot be directly linked to this set of BSPs.

[14] The outright purchases of ABS and covered bonds were expected to suppress banks' funding costs in the markets where the ECB intervened, but also in other banks' funding markets. As the purchases would reduce the returns on relatively safer assets, this could push investors to look for more riskier investment opportunities, bringing down funding costs in other riskier funding markets (e.g. unsecured bank bonds). Furthermore, a search for investment opportunities outside the euro area could trigger a depreciation of the EUR.

[15] This also implied that the deposit facility rate was brought into negative territory for the first time in the ECB's history.

[16] The Federal Reserve officially concluded its asset purchase programme on 29 October 2014.

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