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European Central Bank Quantitative Easing: The Detailed Manual

Gregory Claeys

Alvaro Leandro

Allison Mandra

BRUEGEL
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GRÉGORY CLAEYS, ÁLVARO LEANDRO AND ALLISON MANDRA

Highlights

- The European quantitative easing programme, the Public Sector Purchase Programme (PSPP), started on 9 March 2015 and will last at least until September 2016. Purchases will be composed of sovereign bonds and securities from European institutions and national agencies.
- The European Central Bank Governing Council imposed limits to ensure that the Eurosystem will not breach the prohibition on monetary financing. However, these limits will constrain the size and duration of the programme, especially if it is sustained after September 2016. The possibility for national central banks to also buy national agency securities could alleviate this, but the small number of eligible agencies could limit their role as a back-up purchase.
- The Eurosystem should find other eligible agencies, especially in countries in which public debt is small, or waive the limits for countries respecting the investment grade eligibility criteria. The same issue arises with European institutions: their number and outstanding debt securities are limited. The waiver of the limits proposed for sovereigns should be applied to institutions with high ratings.
- The PSPP profits that will ultimately be repatriated to national treasuries will be small. This was to be expected, given current very low yields. Profits will also come from the major increase in reserves resulting from the implementation of QE, combined with the negative deposit rates on excess reserves at the ECB.

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Telephone
+32 2 227 4210
info@bruegel.org

www.bruegel.org

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GRÉGORY CLAEYS, ÁLVARO LEANDRO AND ALLISON MANDRA, MARCH 2015

ON 22 JANUARY 2015 the European Central Bank (ECB) announced a massive expansion of its asset purchase programme. To supplement the ECB's Asset-Backed Securities and Covered Bonds Purchase Programmes (ABSPP and CBPP3) originally launched in September 2014, the ECB introduced a new Public Sector Purchase Programme (PSPP)[1]. Under the PSPP, the Eurosystem will buy sovereign bonds from euro-area governments and securities from European institutions and national agencies. The purchases started on 9 March 2015 and will last at least until September 2016. The ECB Governing Council also made it clear that the programme is open-ended and that purchases will be conducted until the ECB sees *"a sustained adjustment in the path of inflation which is consistent with the aim of achieving inflation rates below, but close to, 2 percent over the medium term"*[2].

This Policy Contribution examines the detail of how quantitative easing will actually take place in the euro area, and its implications. All details available on the programme come from the introductory statement to the 22 January press conference by ECB President Mario Draghi, a press release published by the ECB on the same day, the account of the January Governing Council meeting published four weeks later, two press releases published after the 5 March press conference and the official ECB decision to be published in the Official Journal of the EU[3].

Even if some details are still missing because the Governing Council wants to keep some flexibility to adjust its policy, we explain in the next section how the programme will be implemented given the current ECB guidelines. We also detail what securities are currently available and which could be purchased by the ECB and the national central banks (NCBs) of the Eurosystem. In the next section, we consider potential difficulties in the implementation of quantitative easing because of the rules set by the ECB. In particular we look at the size and the length of the programme and the distribution of purchases across countries. We then estimate the direct impact on the public finances of euro-area member states through the repatriation of the profits from public sector debt securities to the various euro-area treasuries, before drawing some conclusions.

THE ASSET PURCHASE PROGRAMME GUIDELINES

What will be bought and by whom?

In January, the ECB decided that the programme will consist of monthly asset purchases of €60 billion. Figure 1 shows how the Eurosystem's monthly purchases will be allocated to different assets.

Approximately €10 billion – the average value of the monthly asset-backed securities and covered bond purchases since the programmes were started in October 2014 – will continue to be devoted to covered bonds and asset-backed securities.

The additional €50 billion will be directed towards the PSPP: €6 billion per month (12 percent of the PSPP) will go towards the purchase of the debt of supranational institutions located in the euro area and denominated in euros (see Table 1 for the list of eligible European institutions).

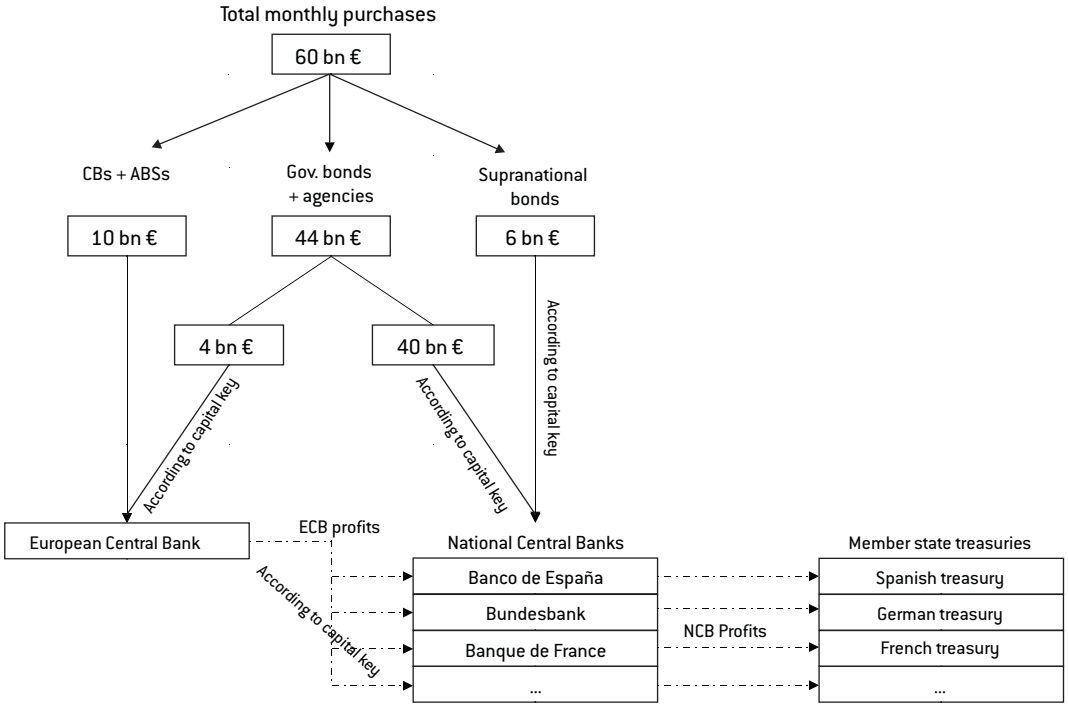
The remaining €44 billion will be used mainly to purchase sovereign debt securities, divided into €4 billion held by the ECB (8 percent of the €50 billion of additional purchases) and €40 billion held by the NCBs. However, a part will also be used to buy bonds issued by national agencies located in the euro area (see the list of eligible agencies in Table 2). The ECB has not specified what share of the €44 billion should be spent specifically on these bonds, and the NCBs will be allowed to

1. Originally, in the ECB's January documents and speeches, the programme was referred to as the Extended Asset Purchase Programme (EAPP), but its name seems to have changed since the March press conference, so for simplicity we refer to it as the PSPP.

2. Draghi (2015).

3. For the details see Draghi (2015) and ECB (2015a, 2015b, 2015c, 2015d and 2015e).

Figure 1: Allocation of monthly asset purchases by the Eurosystem



Source: Bruegel, ECB.

Table 1: Eligible supranational issuers in the euro area

Recognised issuers and outstanding euro-denominated debt in face value, € billion, 2015

	Total	2-30 year maturity
European Financial Stability Facility	226.0	204.0
European Investment Bank	228.5	206.5
European Stability Mechanism	50.2	20.0
European Union	56.2	44.9
European Atomic Energy Community*	-	-
Council of Europe Devt. Bank**	5.0	-
Nordic Investment Bank**	1.4	-

Source: ECB (2015c), Datastream, Nordic Investment Bank Annual Report 2013, Euratom Supply Agency Annual Report 2013. Note: *The EAEC continues to exist *de jure*, but *de facto* it is now under the executive authority of the EU. We could not find any outstanding debt for this institution. **The Council of Europe Development Bank and the Nordic Investment Bank cases are included even if their members include countries outside the euro area and the EU. We could not find the maturity distribution of debt securities for these institutions.

Table 2: Eligible national agencies in the euro area

Recognised issuers and outstanding euro-denominated debt in face value, € billion, 2015

	Total	2-30 year maturity
Instituto de Credito Oficial (Spain)	34.79	14.4
KfW** (Germany)	153.5	105.5
Landeskreditbank Baden-Württemberg Foerderbank (Germany)	13.28	7.43
Landwirtschaftliche Rentenbank (Germany)	12.5	9.5
NRW.Bank (Germany)	20.15	10.45
CADES*** (France)	97.89	79.88*
UNEDIC**** (France)	17.85	13.65

Source: ECB (2015c), investors' presentations and financial reports on agency websites. Note: *>1-year maturity; ** Kreditanstalt für Wiederaufbau; *** Caisse d'amortissement de la dette sociale; **** Union Nationale Interprofessionnelle pour l'Emploi dans l'Industrie et le Commerce.

choose themselves between sovereign bonds and the bonds of the agencies in their jurisdictions[4]. The outstanding amount of debt of the agencies is relatively small compared to the total amount of sovereign bonds, and they are located in three countries: Germany, France and Spain. For these reasons, they will only play a limited role. Nevertheless, as we will discuss, these bonds could play a back-up role in Germany to push back the limits, and, for other countries, the ECB will consider expanding the list of agencies if necessary[5].

In terms of allocation by country of the €44 billion, it will simply be split between all euro-area countries according to the ECB capital keys[6]. To be purchased in the secondary market, the bonds must have a remaining maturity of two to 30 years, be denominated in euros and eligible as collateral for

4. The NCBs will *"focus exclusively on their home market"* (ECB, 2015d).

5. ECB (2015c): *"This initial list may be amended following the Governing Council meeting on 15 April 2015 on the basis of monetary policy considerations and duly reflecting risk management issues"*, and ECB (2015e): *"Eurosystem central banks may, in exceptional circumstances, propose to the Governing Council public non-financial corporations located in their jurisdiction as issuers of marketable debt instruments to be purchased as substitutes in case the envisaged amount to be purchased in marketable debt instruments issued by central governments or recognised agencies located in their jurisdiction cannot be acquired"*.

6. The capital keys are used to calculate an NCB's share of the ECB's capital and reflect *"the respective country's share in the total population and gross domestic product of the EU"*. For the purposes of this paper, we have adjusted the capital keys for euro-area NCBs only.

ECB monetary policy operations (either the country has a sufficiently high rating or is benefiting from an EU financial assistance programme). Finally, the Governing Council also decided in March (ECB, 2015c) that bonds yielding less than the deposit rate (-0.2 percent in March 2015) will be excluded from the purchases.

What are the 25 and 33 percent limits about?

On top of the eligibility criteria, the Governing Council also decided to put in place a 25 percent issue limit and a 33 percent issuer limit on Eurosystem holdings.

The 25 percent issue limit is imposed to prevent the ECB from having *"a blocking minority in a debt restructuring involving collective action clauses"* (ECB, 2015c) (see Box 1). This indicates that the ECB does not want to be in a position in which it has the power to block a potential vote on the restructuring of ECB-held debt of a euro-area country, because not blocking such a restructuring could be interpreted as monetary financing of a member state. As specified by the Governing Council (ECB 2015e), the 25 percent issue limit includes holdings *"in all of the portfolios of the Eurosystem central banks"*. It thus includes bonds purchased during the Securities Market Programme (SMP) – which concerned Greece, Ireland, Italy, Portugal and Spain – and other holdings of Eurosystem central banks (which are held by NCBs for investment purposes).

The 33 percent issuer holdings limit is implemented *"with the aim of preserving market functioning and allowing the formation of a market price on a given security,"* (ECB, 2015b) and will be applied to all eligible outstanding debt with a residual maturity of two to 30 years. Since one cannot hold more than 25 percent of total eligible debt securities without breaching the 25 percent issue limit for some bonds at least, this means that the ECB felt compelled to add this limit because the Eurosystem already holds more than 25 percent of some bond issues, due to SMP or other portfolio holdings.

However, in practice, if we assume that in every country the legacy holdings maturity distribution follows the same distribution as the current outstanding debt securities, the 33 percent holdings

BOX 1: COLLECTIVE ACTION CLAUSES (CACS) IN EUROPE

On 2 February 2012, the ESM treaty mandated the inclusion of CACs *"in all new euro-area government securities, with maturity above one year,"* as of 1 January 2013. The role of a CAC is to allow for easier coordination of investors, thus mitigating the potential for holdouts to hinder a debt restructuring process.

The model CAC (EFC, 2012), which is now included in all newly issued euro-area government securities, provides a codified way for implementing individual series modifications (alterations in the terms and conditions of a bond including changes in payment dates or payment amounts) and cross-series modifications. A series is defined as an issue and any further taps, ie the tranches of debt securities that are identical in all respects (same face value, same maturity, same coupon) except for their date of issuance or first payment date. Since it seems that the ECB does not want to vote in favour of restructurings that could be interpreted as monetary financing of a member state, if the ECB owns too large a share of a series of bonds, it would automatically prevent such modifications. The model CAC makes explicit the voting requirements necessary to arrive at either type of modification. Concerning both a single series modification and cross-series modifications, if the Eurosystem were to hold more than 25 percent of a single issue (thereby holding more than 25 percent of a series if there have been no taps), it would be able to block a vote at a bond-holder meeting from reaching the necessary 75 percent threshold.

However, while the Eurosystem may already hold more than 25 percent of an issue of a country's debt through SMP or other portfolio holdings (and we know this is the case at least for Greece), such holdings might not result in any blocking power on the part of the Eurosystem, because the securities markets purchases came to a close in February 2012, and the mandatory CAC did not come into effect until 1 January 2013.

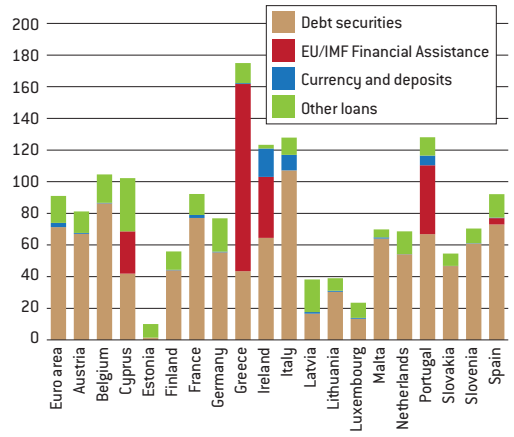
limit should only be a concern for Greek bonds, as this is the only country for which the Eurosystem already holds more than 25 percent of the two to 30 year residual maturity debt. In fact, SMP holdings of Greek debt as of 31 December 2014 also exceeded the 33 percent limit at 34.6 percent of outstanding eligible debt. As these SMP holdings are redeemed and the share drops below the 33 percent line, the ECB and the Greek Central Bank will be able to start purchasing assets from holdouts (i.e. the bondholders who rejected the 2012 Greek debt exchange and who still hold Greek bonds), while considering both limits. Purchases must be such that PSPP holdings plus SMP and other previous holdings do not violate the aggregate 33 percent limit, while accumulated PSPP purchases do not violate the 25 percent issue limit[7].

What euro-area debt securities are available?[8]

The composition of debt (in terms debt securities, loans and financial assistance loans) is very different in each country (Figure 2), but debt securities remain the primary debt instrument used by euro-area governments.

Looking more closely at sovereign debt securities, in March 2015, the total outstanding amount for the euro area stood at about €6.2 trillion at face value (or around €7.3 trillion at market value), with 80 percent coming from the four biggest countries (€1.4 trillion in Italy, €1.5 trillion in France, €1.2 trillion in Germany, and €0.8 trillion in Spain).

Figure 2: Decomposition of consolidated gross debt for euro-area countries, % GDP, 2013



Source: Bruegel based on Eurostat, European Commission, EFSF, EFSM, ESM, Irish National Treasury Management Agency, Banco de Portugal, Cyprus Ministry of Finance. Note: Eurostat does not provide more recent data than end of 2013 allowing us to make this disaggregation by types of instrument. Note also that currency and deposits appear in the chart because they are included in the sovereign debt according to the Maastricht definition used by Eurostat.

The outstanding amount of euro-area sovereign debt securities eligible for the PSPP in March 2015 is about €4.3 trillion at face value (or around €5.3 trillion at market value). This results from both excluding the bonds outside the 2-30 year maturity range chosen by the ECB for the purchases, and excluding bonds yielding less than the deposit rate. In Germany, the only country that could be affected by the exclusion of bonds yielding below -0.2 percent at the moment, eligible debt as of March 2015 falls from €787 billion to €659 billion because of this rule.

Concerning the maturity distribution of sovereign bonds, it is also interesting to see that most bonds – three quarters of the 2-30 year range for the euro area as a whole – have a remaining maturity of less than 10 years and that, therefore, most of the purchases will take place within this range as the ECB intends to be as *"market-neutral"* (ECB, 2015d) as possible by mimicking the current maturity distribution in its purchases. As an example, Figure 3 shows the distribution of bonds for the euro area's four biggest countries in the maturity range selected by the ECB.

Concerning supranational European debt securities, focusing on debt issued by the European Financial Stability Facility (EFSF), the European Stability Mechanism (ESM), the European Investment Bank (EIB) and the EU, the outstanding debt denominated in euros is limited to €560.9 billion in face value (or €611.1 billion at market value). Moreover, the amount in the 2-30 year range represents only €475.4 billion (or €524.0 billion at market value). Figure 4 depicts the maturity distribution of the bonds for these four European institutions.

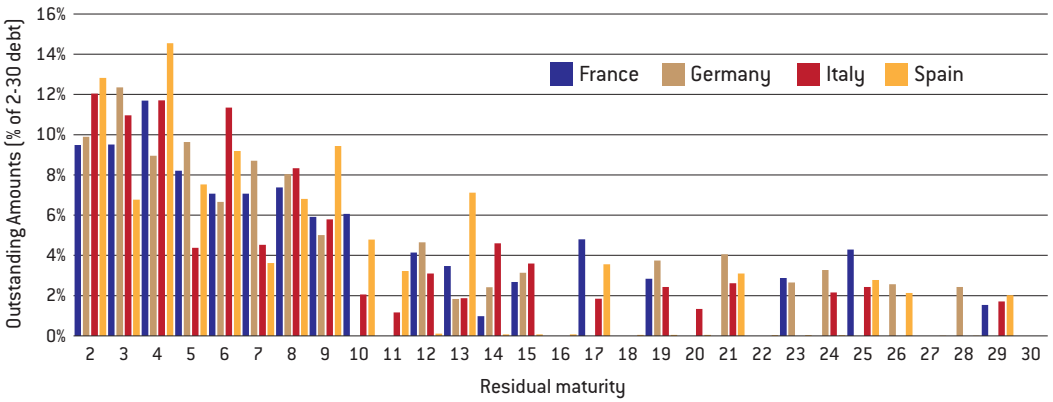
Although it is a bit early to start discussing the end of QE in Europe, it is interesting to determine for how long the PSPP might affect the size of the Eurosystem balance sheet if the ECB decides to keep all purchased bonds to maturity. Given the maturity distributions we have discussed, after

7. For a more detailed explanation of how we established when limits could be binding in different countries, see the Annex.

8. In this paper, we focus on the PSPP. For more details on potential ABS and covered bonds purchases by the ECB, see for instance Claeys *et al* (2014) or Merler (2014).

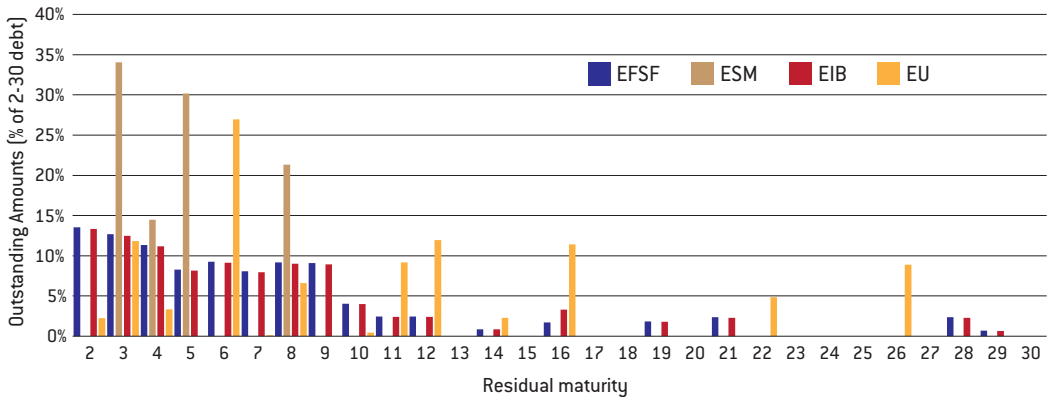
the Eurosystem stops buying bonds it will only take a decade for most of the purchases to leave the ECB's balance sheet. Of course, it will take more than 30 years for all the bonds purchased to be redeemed, but almost half should be redeemed in slightly more than five years, and 75 percent in around 10 years, given the bond maturity distribution skewed towards the short term, and given the willingness of the ECB to be market neutral. Figure 5 shows how the PSPP holdings of sovereign and supranational bonds will evolve assuming purchases stop in September 2016.

Figure 3: Outstanding sovereign debt securities by residual maturity (market value), March 2015



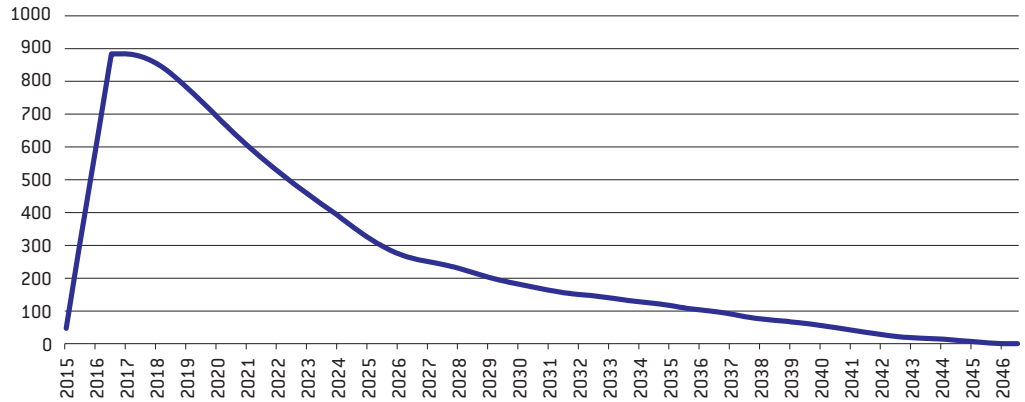
Source: Bruegel based on Datastream, Agence France Trésor, Deutschland Finanzagentur, Dipartamento del Tesoro, Tesoro Público.

Figure 4: Outstanding debt of European institutions by residual maturity (market value), March 2015



Source: Bruegel based on Datastream, EFSF, ESM, EIB and EU.

Figure 5: Holdings of sovereign and supranational bonds purchased through QE, € billions



Source: Bruegel.

IMPLICATIONS OF THE PROGRAMME GUIDELINES ON ITS SIZE AND DURATION

When will the limits be reached for sovereign bonds?

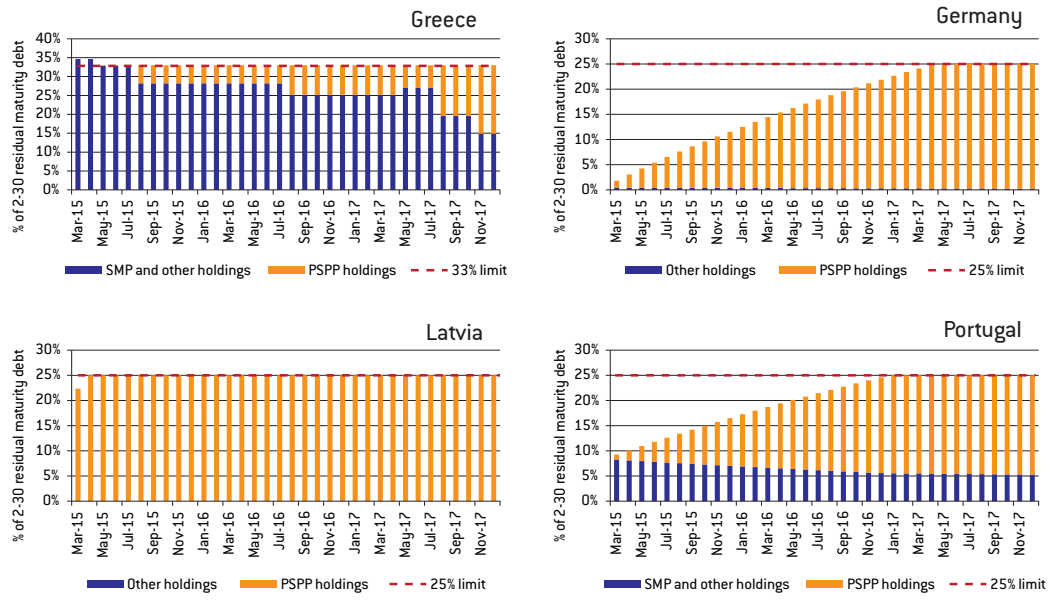
The ECB intends to carry out the asset purchase programme until at least September 2016, but the Governing Council wisely left the possibility open for PSPP to last more than 19 months. It is thus important to know when the different limits will constrain the length or size of the PSPP in the euro area[9].

We first look at the potential impact of the limits on the purchases of the bonds of each country. As an example, Figure 6 shows how the Eurosystem holdings of Greek, Portuguese, Latvian and German debt securities would evolve until the end of 2017, in the case that the programme lasts that long[10].

The Greek and Portuguese cases are interesting because they show how the limits imposed by the ECB on QE purchases interact with previous acquisitions of bonds by the ECB or the NCBs. In Greece's case, we assume that the country will be part of some kind of assistance programme allowing its debt securities to be used as collateral at the ECB and, therefore, to be bought in the context of the PSPP. In any case, purchases of Greek bonds will only really start in August 2015, because the ECB already holds more than 33 percent of Greece's eligible debt securities. For Portugal, bond purchases would have to be much smaller after January 2017 because the limit will be reached and the Eurosystem will only be able to buy from new issuances. The Latvian case is also relevant because it shows that the bonds of countries with very small debts will not be significantly included in the PSPP, because the limit will be reached after only two months of purchases. In our view, the German case is also paramount because it shows that even though the ECB has affirmed that the PSPP is open-ended, the ECB cannot go on with meaningful asset purchases for an extended period because the limits could be reached quite quickly for some major countries (April 2017 in the case of Germany[11]).

In total, given that sovereign bond purchases could be constrained by the ECB's limits before September 2016 for many countries (Greece, Slovakia, Slovenia, Latvia, Lithuania, Cyprus, Luxembourg and Estonia according to our calculations), we estimate that only €799.71 billion of euro-area sovereign bonds will be purchased between March 2015 and September 2016 (Table 3). This is significantly less than the potential €836 billion (€44bn x 19 months) that could have been bought in the absence of pre-defined limits. The difference between the two amounts should in

Figure 6: Evolution of Eurosystem sovereign holdings for Greece, Germany, Latvia and Portugal



Source: Bruegel based on ECB, NCBs, national treasuries.

9. This could also be a problem if the ECB has to boost the size of the PSPP because of an unexpected deflationary shock.

10. See the Annex for detailed explanations of how we calculate the points at which limits are reached and for charts for other euro-area countries.

11. These calculations assume constant yields at the level prevailing at the beginning of March 2015. For Germany, a small increase in short-term yields, such as is anticipated by the markets from 2015 to 2017, could lift all 2-30 year bonds above the deposit rate of -0.2 percent and therefore increase the outstanding amount of debt eligible for purchases. This would push back the date when the limit will be reached by a few months from April to September 2017.

principle be used for the purchases of agency bonds, as mentioned previously, but so far there are no eligible agencies in the countries that will affected by the limits before September 2016. The ECB and the NCBs should therefore quickly find other eligible agencies in these countries if the Governing Council really wants the €44 billion monthly purchase level to be reached, and the distribution of purchases across jurisdictions to take place according to the ECB capital keys.

A way to avoid this issue all together, especially if the PSPP has to be sustained for a long time, could be to waive the 25 percent issue limit for countries respecting the high rating eligibility criteria, on the basis that the probability of a debt restructuring in which the ECB could have a blocking minority could be considered low enough in these countries[12].

The issue of reaching the limit could become more serious if the PSPP has to continue after September 2016. As Figure 7 shows, monthly purchases will have to decrease each time a country reaches a limit. A major turning point would be April 2017 when the limit affecting German sovereign bonds would be reached. At that point German bond purchases would fall from more than €11 billion per month to only €3 billion per month because the Eurosystem would only be able to buy 25 percent of Germany's gross issuance of 2-30 year bonds. The inclusion of the German promotional banks, KfW in particular, could help to compensate, but only for three or four months. Other countries will follow the same path until the division of purchases, initially determined by capital keys, becomes totally distorted towards certain countries. In December 2019 for instance, the monthly

Table 3: Sovereign bond purchases by country and by bondholder, March 2015 to September 2016

			March - December 2015			January - September 2016			
	ECB capital key (%)	Maximum monthly purchases €billions	ECB purchases €billions	NCB purchases €billions	Total purchases €billions	ECB purchases €billions	NCB purchases €billions	Total purchases €billions	Total QE purchases March 2015 to Sept 2016, €bns
Germany	25.6	11.2	10.2	102.3	112.5	9.2	92.0	101.2	213.7
France	20.1	8.9	8.1	80.6	88.6	7.3	72.5	79.8	168.4
Italy	17.5	7.7	7.0	70.0	77.0	6.3	63.0	69.3	146.2
Spain	12.6	5.5	5.0	50.2	55.3	4.5	45.2	49.7	105.0
Netherlands	5.7	2.5	2.3	22.7	25.0	2.0	20.5	22.5	47.5
Belgium	3.5	1.5	1.4	14.1	15.5	1.3	12.7	13.9	29.4
Greece	2.9	1.3	0.1	0.7	0.7	0.0	0.4	0.4	1.2
Austria	2.8	1.2	1.1	11.2	12.3	1.0	10.0	11.0	23.3
Portugal	2.5	1.1	1.0	9.9	10.9	0.9	8.9	9.8	20.7
Finland	1.8	0.8	0.7	7.1	7.9	0.6	6.4	7.1	14.9
Ireland	1.6	0.7	0.7	6.6	7.3	0.6	5.9	6.5	13.8
Slovakia	1.1	0.5	0.4	4.4	4.8	0.4	4.0	4.3	9.2
Lithuania	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Slovenia	0.5	0.2	0.2	2.0	2.2	0.2	1.3	1.4	3.5
Latvia	0.4	0.2	0.1	0.7	0.7	0.1	0.5	0.5	1.3
Luxembourg	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Estonia	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cyprus	0.2	0.1	0.1	0.5	0.6	0.0	0.2	0.2	0.8
Malta	0.1	0.0	0.0	0.4	0.4	0.0	0.3	0.4	0.8
TOTAL	100.0	44.0	38.3	383.2	421.5	34.5	343.8	378.2	799.7

Source: Bruegel based on ECB, NCBs. Note: the first column reports the maximum monthly purchase by countries before limits are taken into accounts. Other columns report the purchases that will take place when the 25 percent issue limit and 33 percent issuer limit as well as the low yield limit are taken into account. Since purchases will be made at least until September 2016, we divided the analysis into 10 months of purchases in 2015 (March through December) and 9 months of purchases in 2016 (January through September). Luxembourg, Lithuania and Estonia display no purchases because of the very small amount of debt securities of these countries in the market. Even though Cyprus is currently under review by the institutions and purchases cannot start in March 2015, we decided nevertheless to include the country because it is impossible to know exactly when the review will turn positive. The results for Cyprus have therefore to be read with caution and as an upper bound.

12. This recommendation could be considered in six months as the ECB's official decision states that: *"The limit will initially be set at 25 percent, for the first six months of purchases and subsequently reviewed by the Governing Council."*

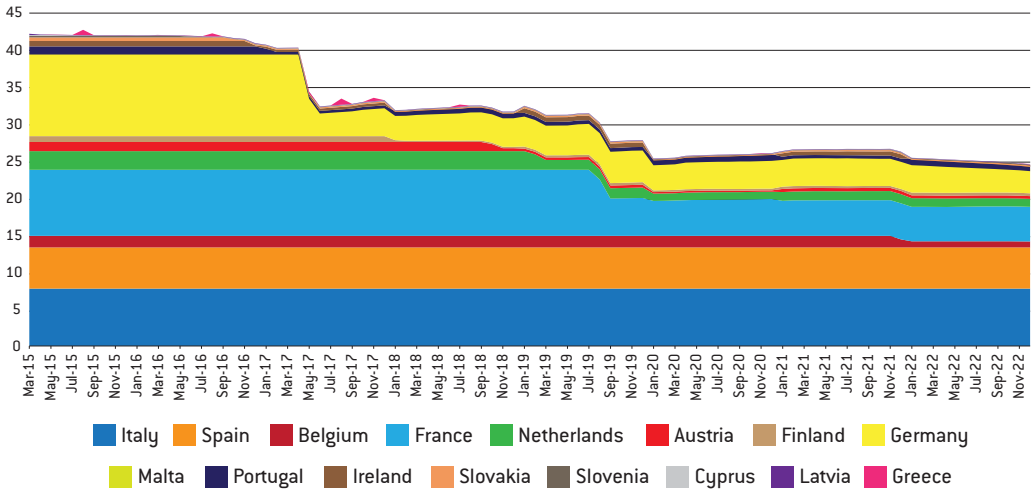
purchase would only be €28 billon and the shares of Italy and Spain would be as high as 28 percent and 20 percent, respectively, compared to the initial 18 percent and 13 percent.

When will the limits be reached for supranational bonds?

As an illustration, we assume that NCBs will only purchase debt securities of the EFSF, the ESM, the EIB and the EU[13]. We therefore assume that the €6 billion of monthly purchases of supranational debt will be distributed between these four institutions according to their outstanding debt securities in the 2-30 year range (the EFSF's outstanding debt securities in the 2-30 year range is roughly 10 times greater than the ESM's and, therefore, the monthly purchases by the NCBs of EFSF debt are roughly 10 times greater than purchases of the ESM's debt). Of the four institutions, only the EIB issues debt securities denominated in currencies other than the euro. For instance, in 2013 the EIB's total outstanding debt securities stood at €406 billion, but were issued in 15 different currencies, which explains why the total outstanding debt securities denominated in euro represents just over half of this total.

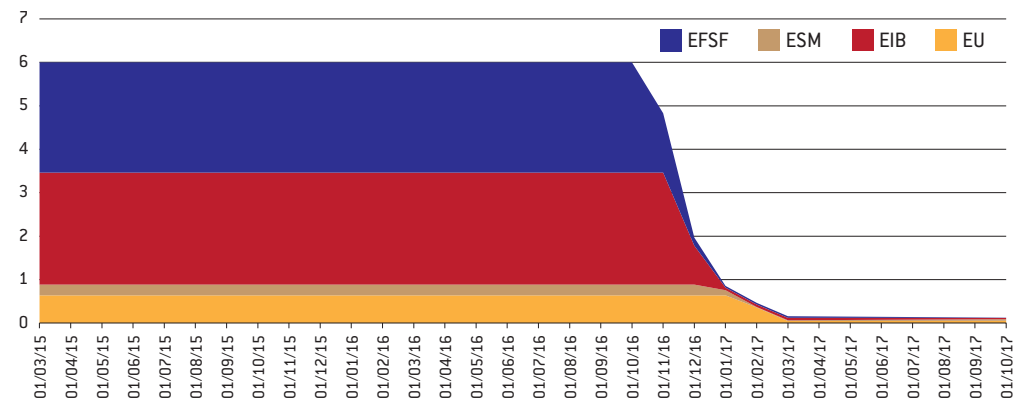
Given that the 25 percent issue limit also appears to apply to the debt securities of these institutions[14], the ECB will not be able to carry out full-scale purchases of these debt securities for very long (see Figure 8), because the debt outstanding in the 2-30 year range denominated in euro is not very large. One way to avoid that problem could be again to waive the limit on supranational bonds with high ratings (or at least for the bonds without CACs such as the ones of the EFSF).

Figure 7: Monthly sovereign bond purchases (€billions) taking limits into consideration



Sources: Bruegel based on ECB, NCBS, National Treasuries, Datastream. Note: Luxembourg, Lithuania and Estonia do not appear on this chart given the very small amount of debt securities of these countries in the market.

Figure 8: Monthly supranational bond purchases (€billions) taking limits into consideration



Sources: Bruegel based on DataStream, EFSF, ESM, EIB, EU.

13. The full list of supranational or international institutions whose debt could be purchased under the PSPP is larger, as shown in Table 1, but we exclude the 3 others because their debt is negligible: around €1.4bn for NIB and €5bn for the Council of Europe Development Bank and we could not find any outstanding debt for the European Atomic Energy Community.

14. See Article 4.1 of ECB (2015e), even if the European institutions' bonds do not always include CACs (the ESM does, but EFSF does not, for instance).

THE DIRECT IMPACT OF THE PSPP ON EURO-AREA PUBLIC FINANCES

So far, much attention has focused on establishing by how much yields have been reduced in anticipation of the programme and if they will continue to fall as a result of the purchases. The QE experiences of the US, the UK and Japan, and the SMP carried out by the ECB from May 2010 to September 2012, could give an idea of the PSPP's impact on yields. However, even though the current fall in sovereign yields will clearly have a beneficial impact on public finances, estimating the exact effect of QE on euro-area yields is quite difficult[15] and estimating precisely the effects on growth and inflation and, therefore, on tax revenues is even more challenging. That is why our goal in this section is simply to determine the direct savings made by euro-area governments resulting from the profits of the PSPP ultimately being repatriated to the various euro-area treasuries.

What are the yields on the bonds that will be purchased by the Eurosystem?

Assuming that the monthly purchases of sovereign bonds by the Eurosystem (in terms of remaining years to maturity) mirrors the distribution of outstanding debt of 2-30 years remaining maturity for each country, we can calculate a weighted-average-yield that the ECB and NCBs can expect on their portfolios of sovereign debt[16]. The same can be done for supranational bonds.

Given the difficulty of estimating precisely the impact of the purchases on the yields, we assume in our calculations that the yields will remain constant and equal to the level at the beginning of March 2015 until September 2016. This assumption is of course central in the calculation of the profits made on sovereign bonds, and another possibility would have been to use market expectations for yields for 2015 and 2016 (which indeed predict currently a small increase in yields over that period). However, this would have made our calculations much more complex without affecting significantly our results, so we have decided to stick to constant yields. The current weighted average yield for sovereign and supranational bonds can be found respectively in the second columns of Tables 4 and 6.

Profits from the purchase of sovereign bonds

Using these weighted-average yields for each euro-area member, profits resulting from the sovereign bond portfolios can be estimated. The profits made on the sovereign debt held by the ECB should be redistributed to countries according to the capital keys. Purchases by NCBs will *"focus exclusively on their home market"* (ECB, 2015d) and NCBs will thus hold only their own country's debt. Given the absence of risk sharing for these holdings, we assume that the profits will not be shared between NCBs and that each NCB will keep the profits it makes on its own sovereign bonds. Therefore, for example, the profits on Italian bonds purchased by the Banca d'Italia, are accrued only to Italy. Since the NCBs typically transfer profits, or at least a large portion thereof, back to their treasuries, we can view the profits resulting from PSPP as savings for the member-state governments on their interest payments. Table 4 on the next page summarises the results of our calculations of these savings from March 2015 to September 2016.

Overall, our calculations show that the estimated profits repatriated to national treasuries resulting from sovereign QE will be almost negligible: less than €4 billion over 19 months – the equivalent of 0.04 percent of annual GDP – for the whole euro area. This result was quite predictable given the current very low level of European yields.

As a comparison, the US and the UK started implementing QE in November 2008 and January 2009 respectively. When QE started in the US and UK, 10-year yields were still about 4 percent in the US and about 3.5 percent in the UK. As a result, the Fed generated for instance $80.5 billion (ie 0.5 percent of US GDP) in interest income on its large-scale asset purchases in 2012 alone, while the Bank of England Asset Purchase Facility's net interest income was equal to £8.1 billion (ie 0.5 percent of UK GDP) during that year[17] (Table 5). These amounts were not negligible especially at a time when budget deficits were quite high (-6.8 percent and -7.9 percent of GDP for the US and UK respectively in 2012).

It is however difficult to draw any conclusion from this comparison given that the Fed and the Bank of

15. See for instance Joyce *et al* (2012) for a good overview of the literature aiming at estimating *ex-post* the impact of asset purchases on US and UK yields, and Manganelli (2012) for the impact of the SMP on euro-area yields.

16. See the Annex for details on the calculation of weighted average yields.

17. See, for instance, Nangle (2012).

Table 4: Weighted average yield and public finance savings arising from sovereign bonds purchases

		March - December 2015			January - September 2016		
	Weighted average yield	Total savings to each country €millions	Savings % GDP	Savings % interest payments	Total savings to each country €mns	Savings % GDP	Savings % interest payments
Germany	0.27%	151.9	0.01%	0.29%	371.9	0.01%	0.74%
France	0.34%	147.2	0.01%	0.31%	360.5	0.02%	0.72%
Italy	1.08%	366.3	0.02%	0.52%	898.4	0.05%	1.24%
Spain	1.00%	243.2	0.02%	0.69%	596.5	0.05%	1.67%
Netherlands	0.24%	30.6	0.00%	0.33%	75.0	0.01%	0.82%
Belgium	0.43%	31.4	0.01%	0.27%	77.0	0.02%	0.67%
Greece	9.61%	30.7	0.02%	0.42%	62.1	0.03%	0.85%
Austria	0.28%	17.2	0.01%	0.20%	42.1	0.01%	0.49%
Portugal	1.32%	62.6	0.03%	0.72%	153.5	0.08%	1.73%
Finland	0.18%	7.9	0.00%	0.31%	19.3	0.01%	0.75%
Ireland	0.69%	22.5	0.01%	0.30%	55.1	0.03%	0.72%
Slovakia	0.70%	15.3	0.02%	1.17%	37.5	0.05%	2.82%
Slovenia	0.85%	8.1	0.02%	0.67%	19.1	0.05%	1.62%
Latvia	0.63%	2.6	0.01%	0.78%	5.3	0.02%	1.62%
Cyprus	7.55%	22.6	0.13%	3.99%	35.3	0.20%	6.32%
Malta	1.46%	2.6	0.03%	1.12%	6.3	0.07%	2.66%

Source: Bruegel based on Eurostat, AMECO, ECB, NCBs, national treasuries and DataStream. Note: yields observed on 2 March 2015. Luxembourg and Estonia do not appear in this table given the very small amount of debt securities of these countries in the market and the impossibility to build meaningful yield curves. For Greece, the current yield curve might not be representative of what it will be in a few months, not only because of the very low liquidity of the bond market, but mainly because of the current uncertainty surrounding the country and its future in the euro area. Once these problems are resolved the yields could be substantially lower. Even though Cyprus is currently under review by the institutions and purchases cannot start in March 2015, we decided nevertheless to include the country because it is impossible to know exactly when the review will turn positive. The results for Cyprus have therefore to be read with caution and as an upper bound.

England decided to use large-scale asset purchases as one of their main tools to fight the crisis, while for a long period the ECB's policy response to the crisis was mainly oriented towards ensuring the provision of liquidity and repairing the bank-lending channel, as suggested by Claeys (2014).

Profits from the purchase of supranational debt securities

Purchases by the NCBs of supranational debt will also generate profits that will then be repatriated to each country's treasury. Our results (Table 6) show that income resulting from the purchases of supranational debt will not be significant either, which is not surprising given that yields on these bonds are in most cases even lower than the yields on sovereign bonds.

Profits arising from the increase in excess reserves induced by QE

Another consequence of the implementation of QE by the Eurosystem will be a substantial increase in the excess reserves held by the banking sector

Table 5: Interest income on asset purchases in the US and the UK

	Interest income on securities			
	US Federal Reserve		UK APFF	
	$bn	% GDP	£bn	% GDP
2009	46.1	0.32%	2.4	0.16%
2010	76.2	0.51%	5.9	0.38%
2011	83.6	0.54%	6.1	0.37%
2012	80.5	0.50%	8.1	0.49%
2013	90.4	0.54%	8.8	0.52%
2014	115.9	0.66%	8.8	0.49%

Source: Bruegel based on Federal Reserve (press releases of 12 Jan 2010, 10 Jan 2011, 10 Jan 2012, 15 March 2013, 10 Jan 2014, 9 Jan 2015), Bank of England.

Table 6: Supranational debt securities

	Weighted average yield %	Maximum monthly purchases €billions	Purchases Mar 2015 - Sept 2016, €bns	Total income Mar 2015 - Sept 2016, €bns
EFSF	0.29	2.5	43.9	0.11
ESM	0.13	0.2	4.6	0.01
EIB	0.29	2.6	44.6	0.11
EU	0.51	0.6	11.9	0.05
Total	0.30	6.0	105.0	0.28

Sources: Bruegel based on DataStream, EFSF, ESM, EIB, EU.

at the ECB. As pointed out by Whelan (2015) and Bomholdt Nielsen et al (2015), the banking system, consisting of the credit institutions and the Eurosystem, is a closed system. Therefore the €1.1 trillion increase in assets resulting from QE between March 2015 and September 2016 should result in an increase of the liabilities of the Eurosystem by the same amount. Looking in detail at the ECB liabilities, two elements can increase: banknotes in circulation could increase more rapidly than usual, which seems unlikely, or the reserves of credit institutions will have to increase accordingly. Certainly, banks can lend to each other, but ultimately, at the end of the day, liquidity will have to be deposited at the ECB either in the current account or in the deposit facility. Given that the ECB currently applies a negative deposit rate since June 2014 (-0.1 percent initially, brought to -0.2 percent in September 2014) on reserves exceeding the minimum reserve requirements held in these two facilities, the ECB will also end up making profits on these new liabilities induced by QE. Assuming that excess reserves will increase by €60 billion per month to reach €1.1 trillion by September 2016 and that the deposit rate will be maintained at its current level of -0.2 percent, the ECB will during that period accumulate a total of €1.9 billion in extra profits thanks to the PSPP.

CONCLUSIONS

In March 2015, the Eurosystem started implementing the PSPP decided on by the Governing Council in January. It will last until at least September 2016 and will complement the €10 billion of monthly purchases carried out under the Asset-Backed Securities and Covered Bond Purchase Programmes, which launched in September 2014. The additional €50 billion of monthly purchases under the new programme will be mainly directed towards sovereign bonds, but also towards bonds from European supranational institutions and national agencies.

The ECB Governing Council imposed limits ensuring that the ECB will not breach the prohibition of monetary financing. Our results show that these limits will constrain the length and size of the programme, in particular if it has to be renewed after September 2016. Even before September 2016, we estimate that if the limits are applied strictly, only €799.7 billion of euro-area sovereign bonds will be purchased, significantly less than the €836 billion currently planned by the ECB in that period, because purchases will be constrained in many euro-area countries. The possibility for NCBs to also purchase national agency debt securities could alleviate this concern, but the small number of agencies eligible so far and their concentration in only three euro-area countries could limit severely their role as a back-up purchase.

The ECB and the NCBs should quickly find substitute purchases, especially in countries in which public debt is small and in which the limits will be reached very quickly. Another option would be to waive the limits for countries respecting the investment grade eligibility criteria. The same issue arises with debt securities from supranational European institutions, which ought to represent 12 percent of total purchases. The small number of institutions and limited outstanding amount of debt securities denominated in euros ensure that 25 percent threshold will be reached before September 2016. The same waiver could be applied to these institutions with high ratings.

It is clear that the PSPP is already having a beneficial impact on European public finances through the very significant fall in yields that has taken place throughout the euro area since mid-2014 in anticipation of the programme. Concerning the repatriation of the interest profits from the PSPP to national Treasuries, we estimate that it will ultimately be very small. This was to be expected, given the current very low yields in the euro area. Those such as Lonergan (2015), who were expecting repatriation of profits from the Eurosystem to national treasuries to translate into some form of fiscal stimulus through temporary tax cuts or public investment (as a complement to the monetary easing to boost aggregate demand), and into some additional leeway to comply with the European fiscal framework, will be deeply disappointed. Quicker implementation of sovereign QE by the ECB could have reduced the debt burden of euro-area governments by a non-negligible amount at a time when interest rates and deficits were very high.

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ANNEX

Determination of SMP and other holdings and calculation of the limits for each country

An important fact needs to be taken into account in calculating when the limits could be reached for each country: SMP and other Eurosystem holdings of sovereign debt will mature over the period of the asset purchase programme.

Given the absence of precise data on ECB SMP holdings, to determine how the SMP holdings of each SMP country will decline over the length of the PSPP we take the nominal value of the outstanding SMPs as of 31 December 2014 published by the ECB (see Table 7) and assume their maturity distribution is similar to the maturity distribution of that country's current outstanding debt with less than thirty years remaining maturity, and we adjust it to match the average maturity of SMP holdings observed at the end of 2014. We limit the distribution on the long-term side for two reasons: 1) Trebesch and Zettelmeyer (2014) observed that the ECB's Greek SMP purchases are skewed towards bonds with short and medium-term maturities, and 2) we do not want bonds that the ECB would likely not purchase, such as perpetual bonds, to distort the maturity distribution. Then we estimate what portion of the SMPs will be in the 2-30 year eligible range each month. We also apply this methodology to any other Eurosystem holdings of euro-area sovereign debt (taken from the IMF Monetary and Financial Statistics Database, see Table 7), without adjusting for the current average maturity, because we do not have such information on these holdings.

For Greece, we calculate the evolution of its SMP and other portfolio holdings differently than for other countries, because we have precise bond information disaggregated by creditor. We can therefore know in what month the ECB's and NCB's holdings of Greek debt will fall out of the 2-30 year eligible range without having to assume a distribution.

Table 7: Legacy holdings of sovereign bonds and assumption for new issuances

Country	SMP holdings as of Dec 31 2014 (€bn)	Other Holdings (€bn)	Total Holdings (€bn)	2-30 Yearly Issuance (€bn)
Austria	0,0	2,2	2,2	17,0
Belgium	0,0	4,6	4,6	33,0
Cyprus	0,0	0,0	0,0	3,5
Finland	0,0	0,4	0,4	11,0
France	0,0	42,2	42,2	187,0
Germany	0,0	4,4	4,4	159,0
Greece	19,8	0,0	19,8	0,0
Ireland	9,7	27,3	37,0	14,0
Italy	76,2	121,7	197,9	260,0
Latvia	0,0	0,0	0,0	2,3
Malta	0,0	0,4	0,4	0,4
Netherlands	0,0	0,0	0,0	48,0
Portugal	14,9	1,0	15,9	13,0
Slovakia	0,0	0,0	0,0	5,5
Slovenia	0,0	0,3	0,3	2,1
Spain	28,9	36,4	65,3	142,0

Source: Bruegel based on European Central Bank, IMF, Irish National Treasury Management Agency, Ministries of Finance, Danske Bank's forecasts.

As mentioned, according to the ECB's self-imposed rules, the ECB cannot buy more than 25 percent of a single issue, or 33 percent of all outstanding debt in the 2-30 year residual maturity range. Given that we only have aggregate data for SMP and other holdings and that we have to assume a particular maturity distribution for these bonds, we need to understand how these rules interact with our assumption. In order to do that, we considered two different scenarios and two sub-scenarios. Under the first, 2-30 year maturity SMP and other holdings are currently less than 25 percent of all 2-30 year outstanding debt. This could either mean that (a) the ECB holds less than 25 percent of all issues of in that range, or (b) that the ECB holds more than 25 percent of

one or more issues, but that these holdings are still small enough to constitute less than 25 percent of the total. Under situation (a) the ECB can continue purchasing from all eligible issues until the 25 percent limit is reached, and they will not surpass the 33 percent aggregate limit. Under situation (b) the ECB can only buy from those issues for which they are still under the 25 percent limit, and only so long as they do not surpass the 33 percent aggregate limit. Given that we do not know the true distribution of the legacy holdings and that we have to assume that that they follow the same distribution as the current outstanding debt securities, we end up assuming that the Eurosystem currently holds the same share of each issue. Our assumption therefore leads us to classify all countries except for Greece into situation (a). In that case, only the 25 percent limit is binding.

The second situation we consider is when the Eurosystem already holds more than 25 percent of a country's debt (ie Greece). This means that the ECB holds more than 25 percent of at least one or more issues. However, once enough Greek SMP bonds are redeemed to bring the ECBs holdings below 33 percent of aggregate 2-30 year debt, assuming that Greece will not issue bonds in the 2-30 year maturity range in 2015 and 2016, the ECB will have no other option but to purchase holdouts, which are separate issues from SMP holdings. Therefore, we only need to apply the 25 percent limit to new holdout purchases while still obeying the 33 percent limit.

To calculate when the above limits are reached, we also need to make assumptions about the evolution of each country's 2-30 year outstanding debt. We know the maturity distribution of current outstanding debt, and thus know how much of this debt will leave the 2-30 range each year, and we can smooth that amount out over the 12-month period. Table 7 summarises our assumptions for gross yearly new issuance. We assume that this debt will follow the same distribution of current outstanding debt, and can therefore also determine what portion of the new issuances will leave the 2-30 year range each month.

When a limit is reached for a certain country's debt, we assume that the NCBs and the ECB will buy the remaining amount allowed for the limit to be binding, according to the 40/44 and 4/44 proportions respectively. However, after that, the Eurosystem will still be able to continue buying bonds because the total outstanding amount of bonds will continue to increase thanks to new issuance of bonds in the 2-30 maturity range and also because the Eurosystem's holdings will mature over time.

Together with our assumptions on the evolution of the debt and the evolution of legacy holdings, we calculate monthly purchases according to the following formula for all countries excluding Greece:

$$P_t = \begin{cases} ECBP, & if\ (QEH_{t-1} - \Delta QEH_{t-1} + SMP_t + ECBP - \Delta ECBP) \leq 0.25 * EOD_t \\ \dfrac{[0.25 * EOD_t - (SMP_t + QEH_{t-1} - \Delta QEH_{t-1})]}{1 - \dfrac{FV_2}{12 * \sum_{i=2}^{30} FV_i}}, & if\ (QEHt - 1 \quad - \Delta QEH_{t-1} + SMP_t + ECBP - \Delta ECBP) > 0.25 * EOD_t \end{cases}$$

where all variables are (or are converted) in face value and where:

$ECBP$ is the amount the ECB would purchase according to the capital keys and without consideration of the limits (the third column of Table 3).

QEH_{t-1} is the QE holdings in the 2-30 eligible range at the end of the previous month, defined as:

$$QEH_{t-1} = QEH_{t-2} - \Delta QEH_{t-2} + P_{t-1} - \frac{P_{t-1}}{12} * \frac{FV_2}{\sum_{i=2}^{30} FV_i}$$

ΔQEH_{t-1} is the portion of previous QE holdings leaving the 2-30 year maturity range at by the end of month *t*.

SMP_t is the SMP holding at the end of month *t*.

$\Delta ECBP$ is the portion of the time *t* ECB purchase that would leave the 2-30 year maturity range by the end of month *t*.

EOD_t is the eligible outstanding debt.

FV_i is the face value of today's outstanding debt with remaining maturity *i*.

For Greece our calculations are somewhat more complicated, as the ECB must consider both the issue and issuer limit. We must first evaluate in three conditions:

(1) is $\frac{SMP_t}{EOD_t} \geq .33$?

(2) is $(QEH_{t-1} - \Delta QEH_{t-1} + SMP_t + ECBP + \frac{\Delta HO_t}{HO_t} * ECBP) \leq .33 * EOD_t$?

(3) is $(QEH_{t-1} - \Delta QEH_{t-1} + ECBP + \frac{\Delta HO_t}{HO_t} * ECBP) \leq .25 * HO_t$?

If (1) is true: $P_t = 0$

If (1) is false, (2) is true and (3) is true: $P_t = ECBP$

If (1) is false, (2) is false and (3) is true: $P_t = \frac{[0.33 * EOD_t - (SMP_t + QEH_{t-1} - \Delta QEH_{t-1})]}{1 + \frac{\Delta HO_t}{HO_t}}$

If (1) is false, (2) is true and (3) is false: $P_t = \frac{[0.25 * HO_t - (QEH_{t-1} - \Delta QEH_{-1})]}{1 + \frac{\Delta HO_t}{HO_t}}$

If (1) is false, (2) is false and (3) is false:

$$P_t = Minimum \left(\frac{[0.33 * EOD_t - (SMP_t + QEH_{t-1} - \Delta QEH_{t-1})]}{1 + \frac{\Delta HO_t}{HO_t}}, \frac{[0.25 * HO_t - (QEH_{t-1} - \Delta QEH_{t-1})]}{1 + \frac{\Delta HO_t}{HO_t}} \right)$$

where HO_t is the face Value of holdouts in the 2-30 year maturity range and $\Delta HO_t = HO_t - HO_{t-1}$

The same method is used for supranational bonds, with the assumptions for issuances in 2015 and 2016 detailed in Table 8.

Table 8: Assumed Issuance of EUR-denominated debt securities by Supranational Institutions

	2-30 Issuance 2015	2-30 Issuance 2016
EFSF	12,2	13,5
ESM	5,6	2,8
EIB	17,2	17,2
EU	4,8	4,8

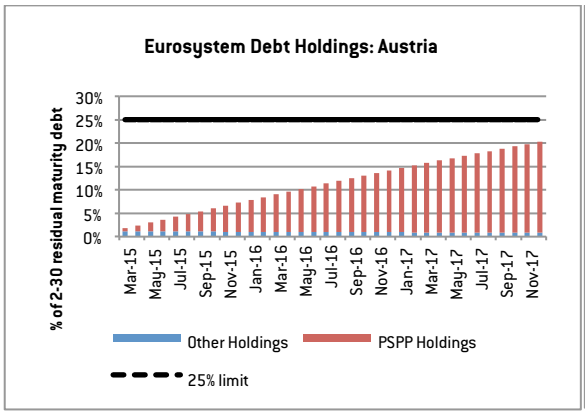
Sources: Bruegel based on institutions' investor presentations, Danske Bank's forecasts.

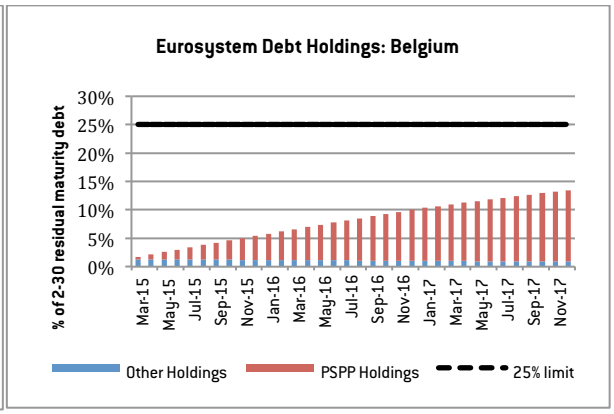
Calculation of weighted average yields for the determination of redistributed profits

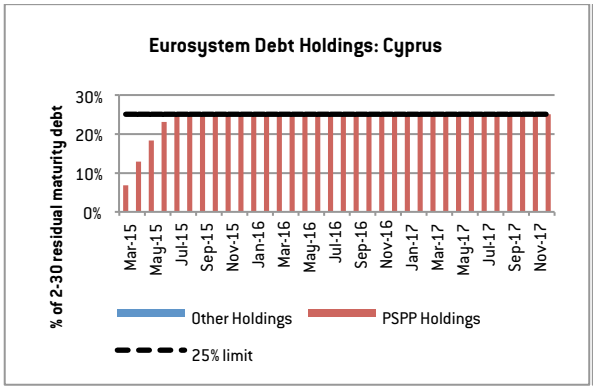
For all euro-area countries except Greece, we use DataStream to gather the face value, market value, yield-to-redemption and maturity date for all outstanding government securities. For Greece we use our own dataset compiling face value, type of bond, maturity date and creditor for all outstanding Greek debt. We then use the market price and yield of six Greek benchmark bonds (from 3 years to 30 years maturity) to apply a redemption yield and market value to the bonds in this data set.

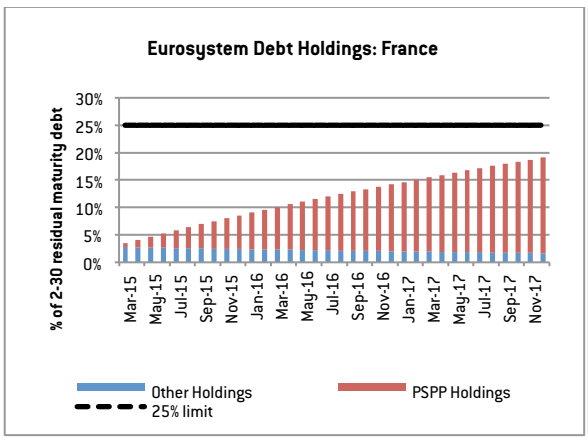
The weighted average yield is: $\sum_{i=2}^{30} \left[\frac{MV_i . yield_i}{\sum_{j=2}^{30} MV_j} \right]$, where MV_i is the market value of a bond with remaining maturity *i*. Again Greece is slightly different because the ECB will only be able to purchase holdouts (once enough SMPs redeem to allow for purchases). The weighted average yield for Greece is therefore $\sum_{i=2}^{30} \left[\frac{MVH_i . yield_i}{\sum_{j=2}^{30} MVH_j} \right]$, where MVH_i is the market value of a holdout with remaining maturity *i*.

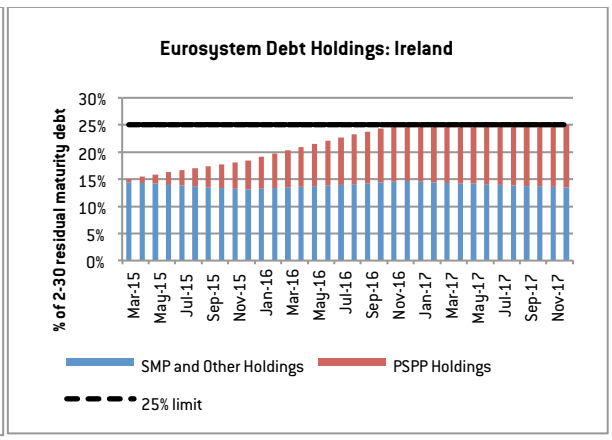
Eurosystem debt holdings for other countries

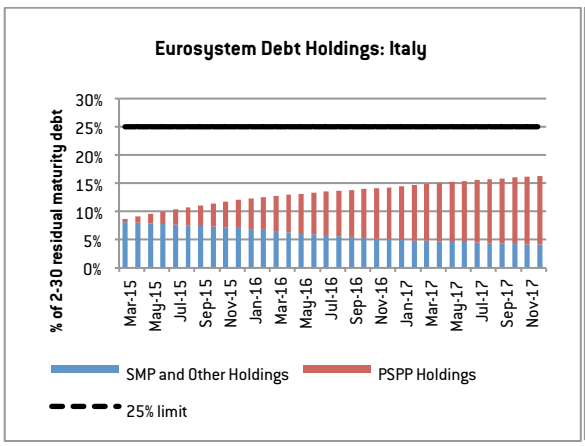


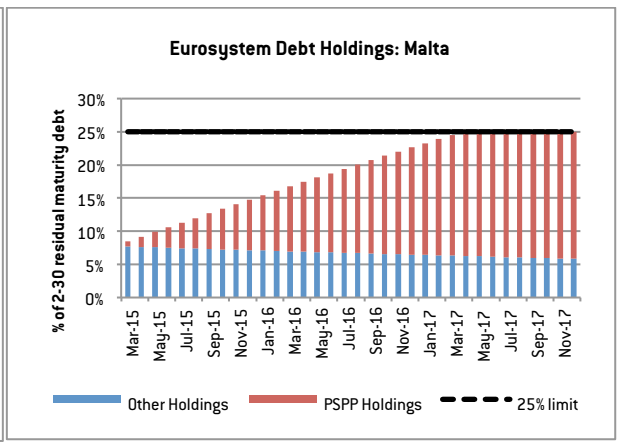


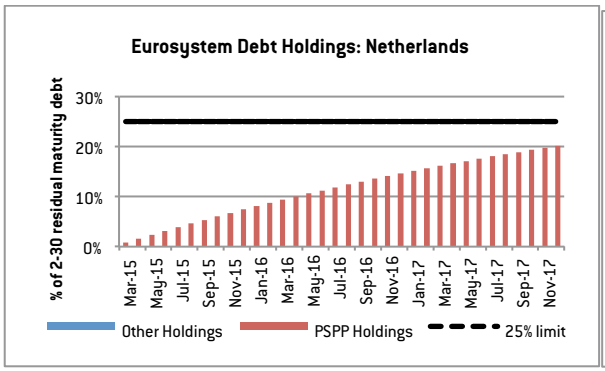


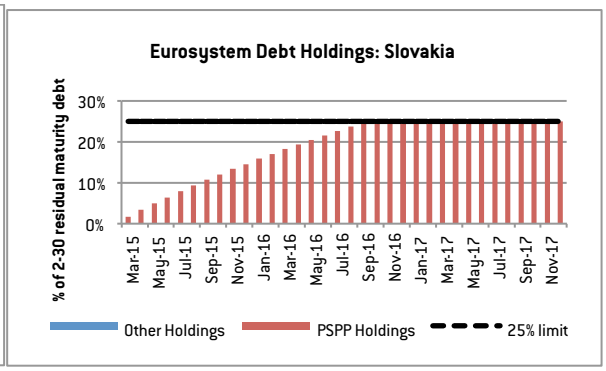


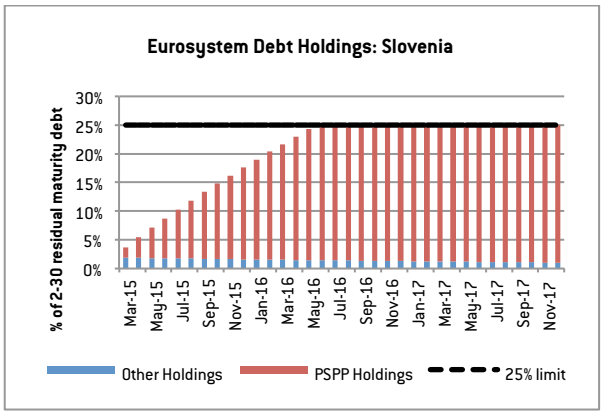


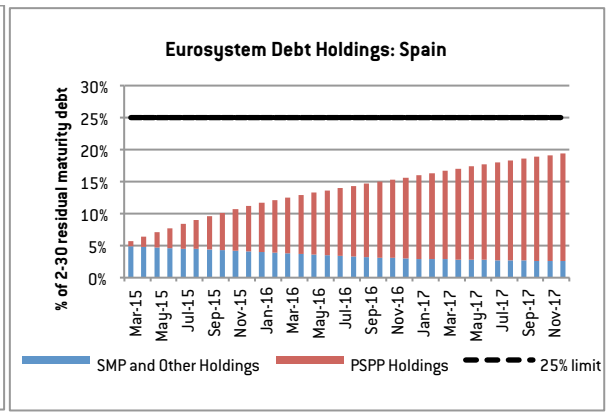





Eurosystem Debt Holdings: Netherlands
% of 2-30 residual maturity debt
30%
20%
10%
0%
Mar-15
May-15
Jul-15
Sep-15
Nov-15
Jan-16
Mar-16
May-16
Jul-16
Sep-16
Nov-16
Jan-17
Mar-17
May-17
Jul-17
Sep-17
Nov-17
Other Holdings
PSPP Holdings
25% limit


Eurosystem Debt Holdings: Slovakia
% of 2-30 residual maturity debt
30%
20%
10%
0%
Mar-15
May-15
Jul-15
Sep-15
Nov-15
Jan-16
Mar-16
May-16
Jul-16
Sep-16
Nov-16
Jan-17
Mar-17
May-17
Jul-17
Sep-17
Nov-17
Other Holdings
PSPP Holdings
25% limit


Eurosystem Debt Holdings: Slovenia
% of 2-30 residual maturity debt
30%
25%
20%
15%
10%
5%
0%
Mar-15
May-15
Jul-15
Sep-15
Nov-15
Jan-16
Mar-16
May-16
Jul-16
Sep-16
Nov-16
Jan-17
Mar-17
May-17
Jul-17
Sep-17
Nov-17
Other Holdings
PSPP Holdings
25% limit


Eurosystem Debt Holdings: Spain
% of 2-30 residual maturity debt
30%
25%
20%
15%
10%
5%
0%
Mar-15
May-15
Jul-15
Sep-15
Nov-15
Jan-16
Mar-16
May-16
Jul-16
Sep-16
Nov-16
Jan-17
Mar-17
May-17
Jul-17
Sep-17
Nov-17
SMP and Other Holdings
PSPP Holdings
25% limit