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Divorce settlement or leaving the club? A breakdown of the Brexit bill

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ABSTRACT

The 'Brexit bill' is an expected payment to be made by the United Kingdom that would settle its financial commitments when it leaves the European Union.

While in our view this financial settlement is the least important economic issue in the Brexit negotiations, a conditional agreement at least on the methodology for calculating the Brexit bill could be a prerequisite for the more meaningful discussions on the new EU-UK economic relationship after Brexit, such as future trade, financial services and labour mobility cooperation.

To bring transparency to the debate and to foster a quick agreement on the bill, we make a comprehensive attempt to quantify the various assets and liabilities that might be factors in the financial settlement.

The size of the Brexit bill will depend on fundamental political compromises and choices, which we discuss. Depending on the scenario, the long-run net Brexit bill could range from €25.4 billion to €65.1 billion, possibly with a large upfront UK payment followed by significant EU reimbursements later.

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Executive summary

- The 'Brexit bill' is the amount owed by the United Kingdom to the European Union when the UK leaves the bloc – it does not refer to any potential future payment related to any possible future association between the UK and the EU. Negotiations over the Brexit bill will likely be contentious and could derail negotiations about economically more important issues, such as future trade, financial and labour mobility cooperation between the EU and the UK after Brexit.

- The size of the Brexit bill will depend on fundamental political compromises and choices. The key question is whether one considers Brexit to be a cancellation of a club membership or a divorce. In the former case, the UK would have no claims on any EU assets but would still need to pay its outstanding membership fees. In the latter case, both assets and liabilities would have to be split.

- This paper presents a comprehensive account of EU liabilities and commitments that the UK might be asked to pay for. It also presents the EU assets and claims that the UK might benefit from. We consider the broadest set of liabilities and assets, including all planned commitments and payments related to the full 2014-20 Multiannual Financial Framework, which includes about €580 billion of planned payments after 2018. Our work is restricted to the EU as a legal entity, eg we do not consider the European Investment Bank.

- We provide detailed data and tables for all the various items to be considered. The paper presents scenarios assuming (1) 'leaving the club' vs 'divorce', (2) different UK shares of 12 percent (rebate adjusted gross contribution) or 15.7 percent (gross contribution without rebate), (3) different scopes of financial commitments, (4) differences between upfront gross payments and later reimbursements by the EU, for example for repayment of financial assistance loans granted by the EU to member states such as Romania and Ireland, (5) netting out or not of EU spending in the UK after Brexit.

- We compute that the EU's liabilities and commitments amount to €724 billion by end-2018. Assuming a UK share of 12 percent, this would amount to a gross liability of €86.9 billion. We compute EU assets and contingent claims of €192.6 billion, giving a possible share of €17.7 billion for the UK under the divorce scenario. We also compute EU spending commitments in the UK (corresponding to the €580 billion EU-wide post-Brexit spending commitments) amounting to €28.9bn, plus a rebate of €4.6 billion after the UK's contribution to the EU's budget in its last membership.

- Depending on the scenario, the long-run net Brexit bill could range from €25.4 billion to €65.1 billion. Upfront UK payments could reach €109 billion, followed by significant subsequent EU reimbursements.

Table 1: The Brexit bill: possible liabilities, assets, and alternative scenarios for their consideration, € billions

A) Possible liabilities and commitments

Type	Name	End-2015 Actual EU total	End-2018 projections EU total	UK, if its share: 12.0%	15.7%
End-2018 commitments	1. Reste à liquider (RAL)	217.7	248.8	29.9	39.1
	2. Significant legal commitments (SLC)	376.3	148.7	17.8	23.3
2019-2020 commitments	3. Other planned commitments (OPC) planned to be made in 2019-20	182.5	182.5	21.9	28.6
End-2018 liabilities	4. EU borrowing	56.9	52.7	6.3	8.3
	5. Pensions	63.8	63.8	7.7	10.0
	6. Contingent liabilities	27.6	27.6	3.3	4.3
	Total maximum possible liabilities	**924.8**	**724.0**	**86.9**	**113.7**

B) Possible offsetting assets and claims

Type	Name	End-2015 Actual EU total	End-2018 projections EU total	UK, if its share: 12.0%	15.7%
From 2018 EU membership	1. Rebate from 2018 budget contributions			4.6	4.6
From UK contribution to post-Brexit EU payments	2. RAL spending commitments in the UK post-2018			11.8	11.8
	3. SLC spending commitments in the UK post-2018			5.4	5.4
	4. OPC spending commitments in the UK post-2018			11.7	11.7
	5. Rebate from post-2018 RAL			---	9.0
	6. Rebate from post-2018 SLC			---	3.9
	7. Rebate from post-2018 OPC			---	9.1
EU "wealth"	8. Property	8.7	8.7	1.0	1.4
	9. Available for sale financial assets	9.6	9.6	1.2	1.5
	10. Cash	21.7	21.7	2.6	3.4
	11. Pre-financing	45.2	45.2	---	---
	12. Receivables/recoverables	10.3	10.3	1.2	1.6
	13. Other assets	1.0	1.0	0.1	0.2
Contingent and earmarked to specific EU liabilities	14. Loans	56.9	52.7	6.3	8.3
	15. Future pension contribution by EU employees	21.3	21.3	2.6	3.3
	16. Contingent assets	0.5	0.5	0.1	0.1
	17. Offset for non-materialised contingent liabilities and assets	21.9	21.9	2.6	3.4
	Total maximum possible assets	**197.0**	**192.8**	**51.2**	**78.6**

Note: EU total is the sum of lines 8-17, while the UK total also considers lines 1-7.

C) Various options for the Brexit bill

Approach	MFF liabilities	UK share	Main characteristics	Liabilities considered	Assets considered	Upfront UK payment	Later EU reimbursement	Long-run net
Leaving the club	RAL, SLC, OPC	12.0%	1.a: all liabilities; upfront offset is the rebate after 2018 EU budget contributions, later reimbursement of non-materialised contingent liabilities, future EU spending in the UK	All 6	1,2-4,14-17	82.3	40.5	41.8
		15.7%	1.b: same as scenario 1.a	All 6	1,2-4,14-17	109.1	44.0	65.0
		15.7%	1.c: scenario 1.b with upfront rebate after post-Brexit budget contributions	All 6	1,2-4,5-7,14-17	87.1	44.0	43.1
Divorce	RAL, SLC, OPC	12.0%	2.a: scenario 1.a plus EU wealth (netted upfront)	All 6	1,2-4,8-13,14-17	76.1	40.5	35.7
		15.7%	2.b: same as scenario 2.a	All 6	1,2-4,8-13,14-17	101.0	44.0	57.0
		15.7%	2.c: scenario 2.b with upfront rebate after post-Brexit budget contributions	All 6	1,2-4,5-7,8-13,14-17	79.1	44.0	35.1
Leaving the club	RAL, SLC	12.0%	3.a: scenario 1.a without 2019-20 OPC	1,2,4,5,6	1,2-3,14-17	60.4	28.8	31.6
		15.7%	3.b: scenario 1.b without 2019-20 OPC	1,2,4,5,6	1,2-3,14-17	80.4	32.4	48.1
		15.7%	3.c: scenario 1.c without 2019-20 OPC	1,2,4,5,6	1,2-3,5-6,14-17	67.6	32.4	35.2
Divorce	RAL, SLC	12.0%	4.a: scenario 2.a without 2019-20 OPC	1,2,4,5,6	1,2-3,8-13,14-17	54.2	28.8	25.4
		15.7%	4.b: scenario 2.b without 2019-20 OPC	1,2,4,5,6	1,2-3,8-13,14-17	72.4	32.4	40.0
		15.7%	4.c: scenario 2.c without 2019-20 OPC	1,2,4,5,6	1,2-3,5-6,8-13,14-17	59.5	32.4	27.2

Note: the numbers in columns for liabilities and assets considered refer to the numbers in panel A and B above. Black numbers indicate that the particular liability or assets is netted-out upfront, while numbers in red indicate assets/claims which will be reimbursed by the EU to the UK in later years. The long-run net amount calculations simply subtract future EU reimbursement from the upfront UK payment, without considering the time-value of money. See the main text for the particular assumptions about timing: depending on choices, the timing of UK payments to the EU, EU reimbursements to the UK, and items to be considered for netting out can be different from the assumptions implied by the table, without impacting the long-run net amount.

1. Introduction

The 'Brexit bill' is an expected payment by the United Kingdom that would settle its financial commitments when it leaves the EU.

We argue, along with Darvas (2017), that the Brexit bill is by far the least important economic issue in the EU27-UK negotiations. Much more important is what kind of post-Brexit trade relationship will be reached, whether financial service providers based in the United Kingdom will have any kind of equivalence regimes or even passports to offer services in the EU, and what will happen to labour mobility. However, a conditional agreement at least on the methodology for calculating the Brexit bill could be a prerequisite for the more meaningful discussions on the new EU-UK economic relationship after Brexit. Extreme positions on the Brexit bill, such as a demand for an overly large payment by the EU27, or insistence on no payments by the UK, might derail the negotiations.

The European Commission has not yet made any official announcement about the Brexit invoice. However, European Commission President Jean-Claude Juncker has warned the UK that it faces a very hefty invoice for Brexit ("*Aussi, la facture sera-telle, pour le dire un peu vulgairement, très salée*", see Juncker, 2017), and was reported more recently as saying: "*We have to calculate scientifically what the British commitments were and then the bill has to be paid*". Asked if the bill will be £50 billion, which is about €58 billion, Juncker replied: "*It's around that*" (Bloomberg, 2017).

In the meantime, various estimates are being prepared based on already-agreed commitments and EU assets which might offset those liabilities. Barker (2017) provides an excellent analysis of the various financial, legal and political aspects of the Brexit bill.

The UK House of Lords has advanced a legal interpretation that under the EU treaties all of the UK's commitments to the EU are linked to membership (House of Lords, 2017). If that legal interpretation is correct, the Brexit bill would be zero at the moment of leaving. We do not consider this further as we are not lawyers and we consider that insistence on such a position by the UK would certainly be regarded as an act of hostility against the EU, making any negotiations about a future association agreement more difficult.

Our goal is to take into account all possible items that could be considered in the Brexit financial settlement and to highlight various choices that the negotiators could consider[1]. Compared to Barker (2017), we consider broader sets of liabilities and assets.

2. The two main approaches to the Brexit bill

We see two main approaches to the Brexit bill that negotiators could choose to take.

Cancelling club membership

A club (or an organisation) typically has a rule for departing members, which regulates the kind of liabilities the departing member should pay. If there was a committed membership period, typically

[1] In this paper we consider only the financial settlement between the EU and the UK related to the UK's EU membership. Independently from that, the UK may contribute to certain EU projects in the future, similarly to the contributions made by four non-EU countries: Norway, Iceland, Liechtenstein and Switzerland (see Darvas, 2016).

the membership fee should be paid up to the end of that period. At the same time, when a new member joins the club, she/he is not asked to make a lump-sum payment for a share in the assets of the club, and when a member leaves the club, she/he may not claim any part of the assets. For example, no sports club member whose subscription lapses has a claim on the changing room or fitness equipment, even if her membership fees were used to pay for the renovation of the fitness club building and to buy new equipment. At the same time, if the club borrowed to finance the construction of a new club house, the departing member would not be asked to pay a share of this liability either.

While the EU is much more complicated than a fitness club, the analogy has merits in our view and suggests that the UK may not claim a share of the EU's assets. When the UK joined the European Economic Community (EEC) in 1973, it was not asked to pay for a share of the then-existing assets of the EEC. None of the other countries that joined the EEC/EU after 1957 were asked to pay a contribution to the existing assets.

At the same time, it is difficult to define the period for which the UK has made a 'membership fee commitment'. This issue is particularly complicated given the special nature of EU budgeting, which includes planned payments and planned commitments in each year, of which the bulk of planned commitments to be made in a particular year is deferred for payment in later years (see more explanation of EU budgeting in Section 4.1). The UK agreed to the 2014-20 Multiannual Financial Framework (MFF), even though the votes of UK representatives in the Council and the European Parliament were less supportive of the EU's annual budgets (see Box 1). The MFF includes planned commitments to be paid for up to about 2025. The UK is likely leave the EU in early 2019. Several different options therefore need to be taken into account when establishing the UK's 'membership fee commitment' period. These are listed below from the largest possible Brexit bill to the lowest possible Brexit bill:

- All planned budgetary commitments up to the end of 2020 related to the 2014-20 MFF (these include planned payments up to about 2025);
- Actual legal and budgetary commitments made before the Brexit date (which include planned payments up to about 2023);
- Planned payments up to 2020;
- Only actual payments up to the Brexit date.

Ultimately, a political agreement will be needed to set the relevant time horizon.

Divorce

In a divorce, the two parties divide their assets and liabilities. Similarly to the club membership cancellation approach, the same question arises about the UK's 'membership fee commitment' period. Another question is which EU assets should be considered in the financial settlement, and in particular, how to consider those assets that have a degree of contingency.

3. The political and economic case

Whatever the legal case is, in our view it would be damaging for the UK in particular, and also for the EU, to end the UK's EU membership without a withdrawal agreement. That would mostly likely diminish the prospects for the conclusion of new post-Brexit economic cooperation agreements between the EU and the UK, including a free trade agreement, agreement on financial services provision across the Channel and a labour mobility agreement. A sudden end to the UK's single market participation would likely cause significant harm to the economies of both the UK and the EU, but since the UK depends more on the EU than the EU depends on the UK, the UK would likely suffer more.

Moreover, since the UK agreed to the multiannual EU budget, which includes financial commitments for the period after the likely date of Brexit, disregarding those commitments could undermine the UK's reputation as a reliable international partner.

Therefore, we believe that there are strong political and economic reasons to conclude a withdrawal treaty between the UK and the EU27, which should include provisions on settling pending financial obligations. Ultimately, the negotiations should consider various aspects of the commitments as well as the likely contours of the new relationship between the UK and the EU27. The latter is also important, because when the UK agreed to long-term financial commitments, it did so in the belief that the UK would remain a member of the EU and benefit from EU membership. Paying a club membership fee but receiving nothing for it seems to be a new situation. Therefore, the future EU-UK relationship might also have implications for the Brexit bill that negotiators could consider.

Consequently, in our analysis we do not assess the merits of certain legal arguments for or against particular commitments, but summarise the various commitments and assets, and present choices that negotiators might consider.

Box 1: Summary of the EU budget legislative process and the UK's votes

The MFF is adopted by a special legislative procedure, in which the Council needs the consent of the European Parliament to adopt the relevant regulations (Table 2). Consent means that the European Parliament can accept or reject the proposals, but has no power to amend them. In the Council, adoption of the proposal requires unanimity. There is provision for qualified majority voting (QMV) in the Council if and only if the European Council unanimously decides to apply it. A special legislative procedure also applies to the annual budget, but its structure is unique to the adoption of the budget and involves many stages. For annual budgets, the European Parliament plays a much stronger role.

Table 2: Legislative procedures for the MFF and annual budgets

	MFF 2014-2020	***Annual budgets***
Procedure	*Special legislative procedure*	*Special legislative procedure*
Council voting rule	*Unanimity*	*Qualified majority voting*
Parliament's role	*Consent*	*Co-legislator*
Date(s)	*December 2013*	*December of the preceding year*

Sources: procedure: Treaty of the Functioning of the EU (TFEU) Articles 312 & 314; dates: budget documents available at EUR-Lex (http://eur-lex.europa.eu/homepage.html).

As the adoption of the MFF depends on a unanimous vote in the Council, the UK cast a yes vote when the MFF Regulation was adopted in 2013 (Table 3). The vast majority of UK MEPs also voted in favour of Parliamentary consent to the Council Regulation. However, in both the Council and the European Parliament, UK representatives have been less supportive of the annual budgets. Since 2013, the UK representative voted in favour in the Council only once, for the 2016 budget. He voted against the 2014 budget, and abstained for the 2015 and 2017 budgets. Moreover, a majority of British MEPs has opposed the adoption of the joint text agreed in the Conciliation Committee for the budget in each year that the budget procedure reached that point. For the 2015 budget, the Council position on the (second) draft budget was adopted outright and the vote in the European Parliament was anonymous.

Table 3: Votes cast in the Council and the European Parliament by UK representatives

<table>
<tr><th></th><th>MFF</th><th colspan="4">Annual budgets</th></tr>
<tr><th></th><th>2014-2020</th><th>2014</th><th>2015</th><th>2016</th><th>2017</th></tr>
<tr><td colspan="6">UK in Council</td></tr>
<tr><td></td><td>Yes</td><td>No</td><td>Abstain</td><td>Yes</td><td>Abstain</td></tr>
<tr><td colspan="6">UK MEPs</td></tr>
<tr><td>For</td><td>54</td><td>16</td><td rowspan="3">No Roll Call vote / anonymous</td><td>25</td><td>19</td></tr>
<tr><td>Against</td><td>14</td><td>46</td><td>45</td><td>36</td></tr>
<tr><td>Abstain</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Document approved</td><td>MFF Regulation</td><td>Joint text</td><td>Council Position</td><td>Joint text</td><td>Joint text</td></tr>
</table>

Sources: Bruegel based on Council Register, European Parliament Legislative observatory, itsyourparliament.eu, votewatch.eu. Note: the legislative processes were typically concluded in December of the previous year.

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4. Brexit bill calculations

First, we highlight that we consider only the assets and liabilities of the European Union as a legal entity (including all EU institutions, consultative bodies, agencies, joint ventures and associates; see the full list on page 100 of European Commission, 2016c). There are a number of other legal entities related to the EU, such as the European Investment Bank (EIB), the European Central Bank (ECB), the European Financial Stability Facility (EFSF) and the European Stability Mechanism (ESM): these separate legal entities are not considered here[2].

Let us summarise the key steps of our analysis:

1. **Taking stock of EU liabilities at the end of 2015.** While there is there no simple official table which summarises all types of EU financial commitments, the latest annual consolidated annual accounts of the EU include the various liabilities as at end-2015. These liabilities can be broadly classified into four main categories:

    i. Spending commitments related to the 2014-20 MFF, and some other similar items,

[2] The UK is shareholders in the EIB, but did not make any financial contribution to the ECB, EFSF and ESM. Note that EU itself has some rescue funds: European Financial Stability Mechanism (EFSM), the balance of payments facility and the Macro-financial assistance (MFA) facility: these EU-owned rescue funds are included in our analysis. Also, the EU budget provides guarantees for certain EIB lending, which we also consider.

such as the EU budget's contribution to the 'Juncker investment plan';

ii. Pension/sickness insurance liabilities related to EU employees;

iii. EU borrowing to finance financial assistance programmes; and

iv. Contingent liabilities.

We briefly explain and summarise the consolidated values of these liabilities in a simple table.

2. **Projecting EU spending liabilities to end-2018.** We project EU spending liabilities (ie category (i) above) to end-2018. While the date of Brexit is not known, we decided to consider end-2018, because it is easier to work with annual data. A possible Brexit date is March 2019: if that is the date, the discrepancy between end-2018 and March 2019 values should be relatively small.

3. **Estimating the planned spending in the UK as a portion of the EU's spending liabilities at end-2018.** Some part of EU's spending plans after the Brexit date is planned spending in the UK. This planned spending should be considered as an offsetting factor in the Brexit financial settlement.

4. **Projecting the rebate.** Since 1985, the UK has been entitled to a financial rebate of about 66 percent of its net contribution to the EU budget in the previous year. If the UK is asked to contribute to the EU budget after Brexit in line with current budget commitments, then the UK might continue to benefit from a rebate in relation to those UK financial contributions.

5. **Assessing the other three main types of EU liabilities.** We will assess the case for including pensions, EU borrowing and contingent liabilities in the Brexit financial settlement.

6. **Assessing EU assets.** We take a stock of the various assets and claims which can be considered as offsetting factors for the liabilities and commitments. Most of these assets are included in the EU's balance sheet, while some are not. We assess how these assets could be considered in the Brexit financial settlement.

7. **UK's share.** We assess alternatives that could be considered in apportioning EU liabilities and assets to the UK.

8. **The net Brexit invoice.** Based on the previous steps, we estimate the net liability that the UK may be asked to pay when leaving the EU.

9. **Summary:** we briefly summarise the various liabilities and commitments and possible offsetting assets and claims

10. **Sensitivity:** we assess the sensitivity of our end-2018 projections

Finally, in Section 5 we discuss twelve questions around how these assets and liabilities might be included in the Brexit bill.

4.1 Taking stock of EU liabilities at the end of 2015

Unfortunately, there is no simple official table that summarises all categories of the EU's financial commitments. However, a comprehensive list can be prepared from the EU's balance sheet, other liabilities derived from the seven year multiannual financial framework (MFF) and contingent liabilities.

EU budgeting operates through a combination of a seven-year budget plan and annual budgets. Both the seven-year and the annual budgets include two indicators for each expenditure item: a planned payment in a given year and a planned commitment to be made in the given year[3]. Some of the actual commitments are paid in the year in which the commitment is made, while the rest are deferred for payment from subsequent annual budgets. Table 4 reports the MFF as originally approved, while Table 5 shows the updated ceiling for the whole 2014-20 period. There are some yearly deviations, but the overall seven-year amounts have not changed. Some commitments are actually de-committed – we also include these in Table 5.

Table 4: Multiannual Financial Framework 2014-2020 (as originally approved, € billion)

	2014	2015	2016	2017	2018	2019	2020	Total
Payments (ceiling)	135.9	141.9	144.7	142.8	149.1	153.4	156.3	**1024.0**
Commitments (ceiling)	142.5	146.5	150.2	154.4	158.4	163.0	167.6	**1082.6**

Source: Official Journal of the European Union (2013); converted to current prices.

Table 5: Multiannual Financial Framework 2014-2020 (in 2017 after adjustments, € billion)

	2014	2015	2016	2017	2018	2019	2020	Total
Payments (ceiling)	135.8	140.7	144.7	142.9	149.7	154.3	157.4	**1025.4**
Commitments (ceiling)	121.4	163.0	154.7	155.6	159.5	164.1	168.8	**1087.2**
De-commitments (actual & Commission forecast)	3.5	3.9	3.7	4.8	4.9	2.4	1.4	**24.6**

Source: European Commission (2016a).

Multi-annual planning and the separate recording of payments and commitments imply that once a multi-annual financial framework is approved, it includes planned payments not just up to the end of the MFF period, but substantial commitments that are planned to be made by the end of the MFF but that are deferred for payment from later budgets. The current MFF, which runs up to 2020, includes about €250 billion in commitments planned to be made by 2020, but that will be deferred for payment from budgets after 2020.

These multi-annual commitments, and other EU liabilities, are detailed in the annual consolidated annual accounts of the EU, though it does not include a simple table summarising them. The latest report includes information about end-2015 data (see European Commission, 2016c).

[3] To be more precise, the MFF includes payment ceilings for the overall annual budgets as well as for each heading. As we show below, payment ceilings are almost fully exploited.

The five sources for EU liabilities to be considered, which have some overlaps as we discuss later, are:

Liability source 1: The EU's balance sheet. The obvious starting point summarising the EU's liabilities is the EU's balance sheet, published as part of the EU's consolidated annual accounts. It is based on the International Public Sector Accounting Standards (IPSAS). At the end of 2015, the balance sheet showed assets worth €153.7, liabilities amounting to €226.1 billion, thus yielding a net liability position of €72.4 billion. Broadly speaking, the EU's balance sheet includes three types of liabilities, related to:

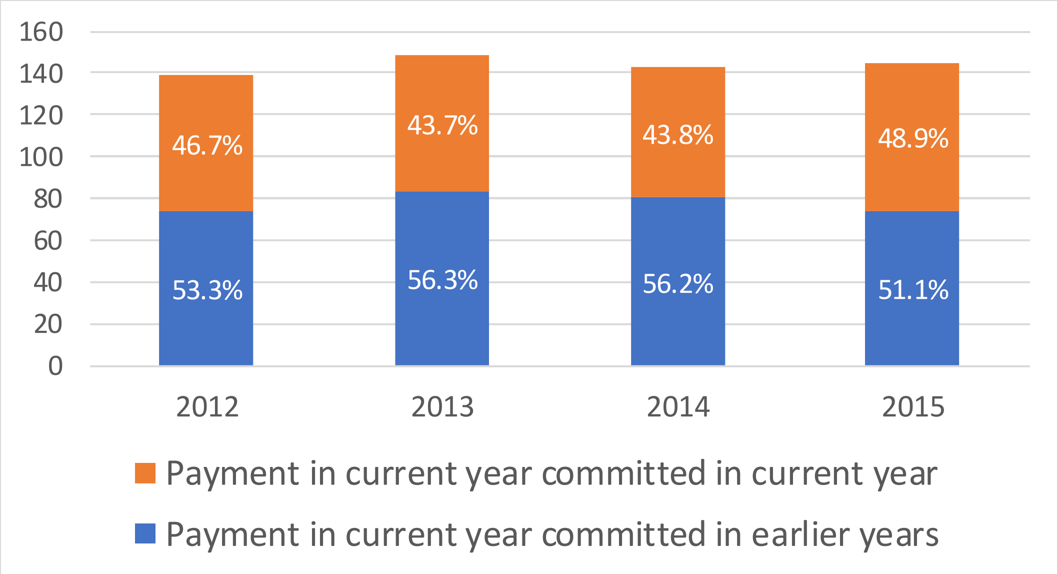
- The multiannual financial framework (MFF);
- The capitalised value of pension/sickness insurance liabilities related to EU employees;
- EU borrowing to finance financial assistance programmes.

The EU balance sheet is compiled on an accrual accounting basis, implying that MFF-related expenses are recognised in the year they are incurred. In practice this means that expenditure is charged not when it is planned at the time of the approval of the MFF or when money is paid to the EU's counterparty, but when that expenditure is claimed, eg through an invoice or when a grant application is accepted. Until that claim is settled by an EU payment, the amount constitutes a liability on the EU's balance sheet.

The net minus €72.4 billion amount of the EU balance sheet thus implies the amount of revenue the EU would have to raise from member states, beyond selling all EU assets, should it have to settle at once all claims made by the end of 2015.

Liability source 2: Outstanding budgetary commitments, or from its French name, *reste à liquider* (RAL). As we highlighted, each line of the EU budget consists of payments and budgetary commitments for each year. Because of the different time horizons for payments and commitments, payments in a given year partly relate to commitments made in past budgets. For example, as Figure 1 demonstrates, in 2015 only 48.9 percent of payments were related to commitments made in 2015, and 51.1 percent of 2015 payments were related to commitments made in earlier years. Figure 1 also shows that there was no break between 2013, the last year of the previous MFF, and 2014, the first year of the current MFF: both at the end of the last MFF and at the beginning of the current MFF, more than half the annual payments were related to past commitments. Therefore, at each point in time, there is a stock of unpaid commitments: this is the RAL. At the end of 2015, RAL amounted to €217.7 billion.

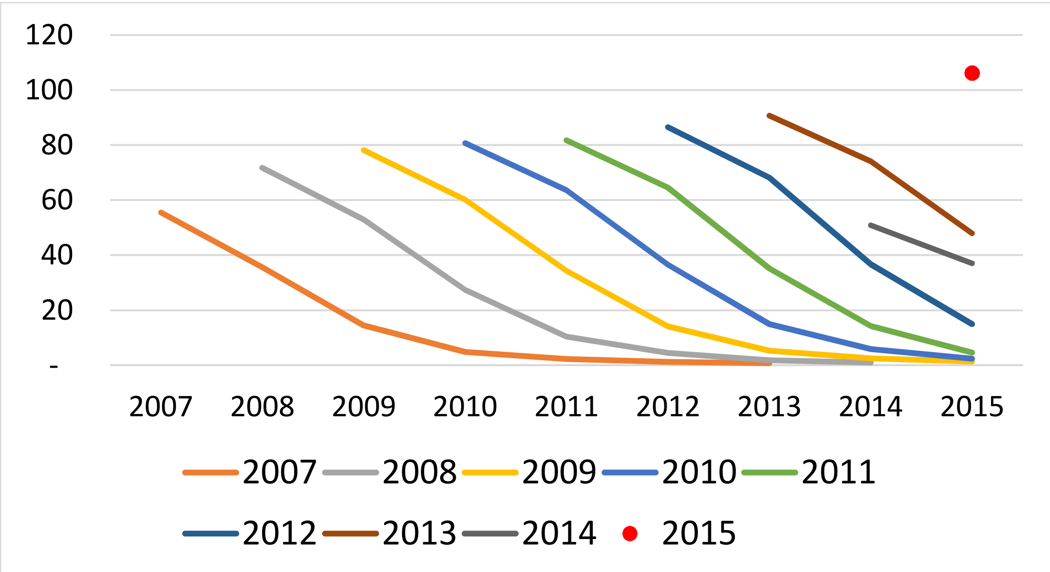
Figure 1: Distribution of annual payments between current year and earlier year commitments, € billions



Source: Consolidated Annual Accounts, each year from 2012-2015.

Figure 2 shows how the RAL from each year gradually declines. For example, at the end of 2007, RAL related to commitments made in 2007 amounted to €56 billion. The volume of these commitments declined to €36 billion by the end of 2008, etc. The figure shows that it takes about five years for the RAL committed in a given year to decline to close to zero: mostly because of payments related to those commitments, and to a much lesser extent because of de-commitments.

Figure 2: Budgetary commitments outstanding (RAL) by year of origin, € billions



Source: Consolidated Annual Accounts of the EU, 2007-2015.

There is some overlap between the RAL and the balance sheet liabilities related to planned spending: whereas an outstanding commitment is created as soon as the amount is reserved in the budget as a commitment, a balance sheet liability is created when the beneficiary of expenditure claims it from the EU.

Liability source 3: Significant legal commitments (SLC). The bulk of these commitments are amounts for specific actions (rather than general ceilings) that have been pledged in legal terms but not yet been committed in an annual budget[4]. Since these legal commitments are only gradually expensed and committed in the budget over a long period, at a given point in time, they are not included in the EU's balance sheet or in the RAL. In later years, when some items under the SLC heading are committed in an annual EU budget, those items will be either paid in the year in which they are committed, or become part of the RAL. The consolidated accounts of the EU reported that there were €376.3 billion of such legal commitments in 2015. These amounts are either contained in the MFF for multi-annual shared actions with the member states (allocations to member states in relation to the European Structural and Investment Funds (ESIF), the Asylum, Migration and Integration Fund (AMIF), and the Internal Security Fund (ISF)) or specific projects (eg building works). The level of spending to be allocated to member states from the aforementioned funds and the contribution of the EU to infrastructure projects can be traced back to the European Council's MFF conclusions and/or the MFF Regulation. There are also legal commitments contained in this category that derive from other legal bases, for instance administrative contracts (ie for the provision of services). The EU's guarantee for the so-called Juncker investment plan, the European Fund for Strategic Investments (EFSI), is another example of significant legal commitment that the MFF does not contain a commitment for. Nevertheless, 91 percent of significant legal commitments relate to multi-annual shared actions with member states (ESIF, AMIF, ISF).

Liability source 4: Contingent liabilities. Contingent assets and liabilities relate to claims and obligations respectively that might arise in the future (Table 6). On the asset side there is €0.4 billion worth of guarantees received, the bulk of which (€0.3 billion) is performance guarantees received from beneficiaries of funds and is contingent on meeting contractual obligations. Liabilities are far larger at €27.6 billion. Of these, EU guarantees account for €21.4 billion. This includes guarantees from the EU budget covering part or the total amount of loans made to third countries by the European Investment Bank (€19.4 billion), and smaller guarantees given in the context of other financing instruments and facilities (the EFSI portfolio, Horizon 2020, Risk-sharing Finance Facility and Loan Guarantee Instrument for TEN-T projects). The contingent liabilities also contain a sizable sum of paid competition fines that are either subject to an appeal or that could be subject to an appeal. Finally, other potential claims hinge on pending judgements from the EU Court of Justice (with respect to cohesion and rural development funding) or in general, other legal cases and disputes.

[4] The 2015 annual accounts of the European Union states that these commitments "*arise because the EU entered into long-term legal commitments in respect of amounts that were not yet covered by commitment appropriations in the budget*". "*Significant legal commitments*" is the name used by the consolidated annual accounts of the EU after 2007, while before the name was "*Legal commitments for which budgetary commitments have not yet been made*".

Table 6: Contingent assets and liabilities, end of 2015, € billion

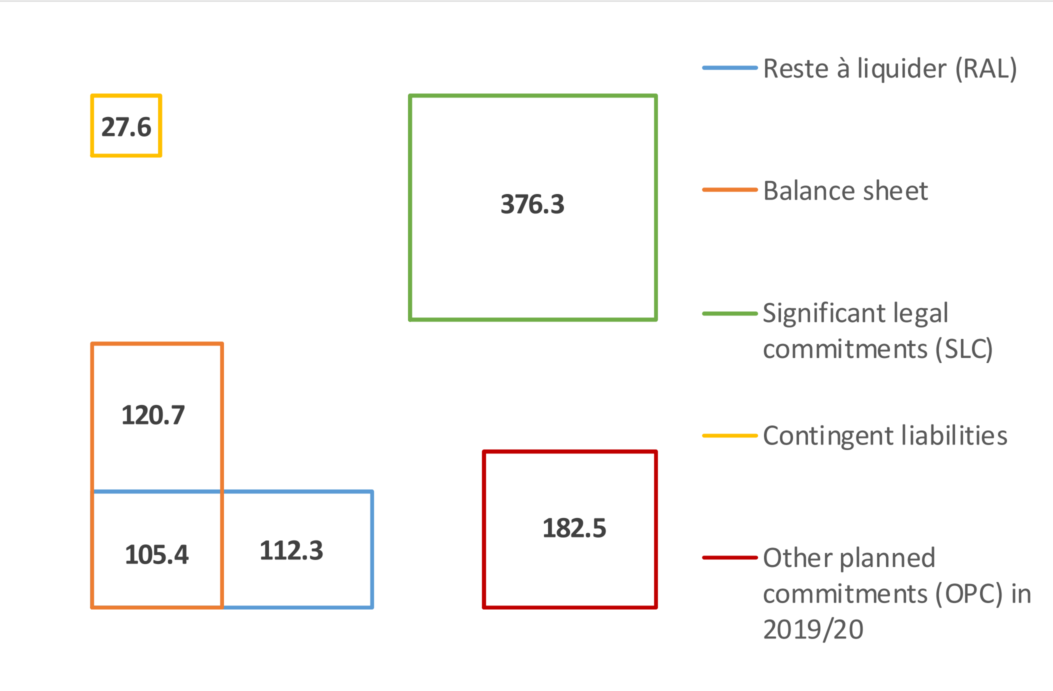
Assets		Liabilities	
Guarantees received	0.4	Guarantees given	21.4
Other contingent assets	0.0	Fines	4.0
		EAGF, rural development and pre-accession	1.4
		Cohesion policy	0.0
		Legal cases and other disputes	0.8
		Other contingent liabilities	0.1
Total	**0.5**		**27.6**

Source: European Commission (2016c). Note: EAGF = European Agricultural Guarantee Fund. Numbers may not add up due to rounding.

Liability source 5: Other planned commitments (OPC) to be made in 2019-20. So far we have considered possible liabilities and commitments that will be accumulated by end-2018. However, the 2014-20 MFF also includes a ceiling for commitments to be made in 2019-2020 annual budgets, which are not related to the SLC (and RAL up to 2018). These include, for example, Common Agricultural Policy (CAP) payments and administrative payments. Our calculations suggest that the total value of these other planned 2019-20 commitments is €182.5 billion, which will be gradually paid by annual EU budgets between 2019 and approximately 2025.

Figure 3 summarises the overlaps between the different sources for EU liabilities. A pending payment obligation is reflected in one of these aggregates depending on whether it is legally committed, committed in the budget and/or expensed. We assume that no expenditure is claimed before it has been committed in the budget. In other words, notwithstanding pensions and EU borrowing, all balance sheet liabilities are contained in the RAL. The pension liability and EU borrowing are included in the balance sheet, but not in the RAL and not in significant legal commitments. Therefore, for the calculation of the financial settlement between the UK and the EU27, only the pension liability and EU borrowing should be taken directly from the balance sheet, while other amounts should be taken from either the RAL, if they have already been committed in an annual budget, or from the outstanding legal commitments, if they have not been committed in the budget. The consolidated annual accounts of the EU treat contingent liabilities separately from the EU's balance sheet, RAL and significant legal commitments, and so there is no overlap between contingent liabilities and other types of liabilities.

Figure 3: Overlap between categories of liabilities, € billions



Source: Bruegel based on the 2015 consolidated accounts of the EU, published by European Commission (2016c).

Table 7 consolidates all the EU's liabilities, which amounted to €924.8 billion at the end of 2015.

Table 7: Summary of consolidated EU liabilities, end of 2015, € billion

Reste à liquider (RAL)	217.7
Significant legal commitments (SLC)	376.3
Capitalised value of pension/sickness insurance liabilities to EU employees	63.8
EU borrowing	56.9
Contingent liabilities	27.6
Other planned commitments (OPC) in 2019/20	182.5
Total	**924.8**

Source: Bruegel based on the 2015 consolidated accounts of the EU (European Commission, 2016c) and draft 2017 general EU budget (European Commission, 2016f).

4.2 Projecting EU spending liabilities to end-2018

The important question is not what the current levels of the RAL and the SLC are, but what their value will be on the date the UK leaves the EU. That date is not known. Since we are using annual data, we make our calculations up to the end of 2020 and will consider end-2018 as the Brexit financial settlement date. This date is the closest end-year date to March 2019, when the two-year period stipulated in Article 50 of the EU Treaty expires. If for any reason the Brexit date is postponed, one can readily consider our end-2019 or end-2020 projections, or use our methodology to make calculations for post-2020 dates, once the 2021-27 MFF is adopted.

To the best of our knowledge, the only publically available forecast of an item related to the Brexit bill is made in a Commission Staff Working Document (SWD) accompanying the proposal for the MFF review/revision and concerns only the level of the RAL in 2020 (European Commission, 2016d). Although there is a graph in this report that illustrates the Commission's RAL projections through the years, the exact values for the intermediate years are not shown. Moreover, we could not find a projection for the evolution of the outstanding legal commitments.

We therefore make our own projections for both the RAL and SLC in a consistent and transparent way. Our key assumptions, which are based on the assumptions of the SWD, as well as our detailed method, are given in the Annex. Below we only highlight the simple principle behind our calculations and present our results.

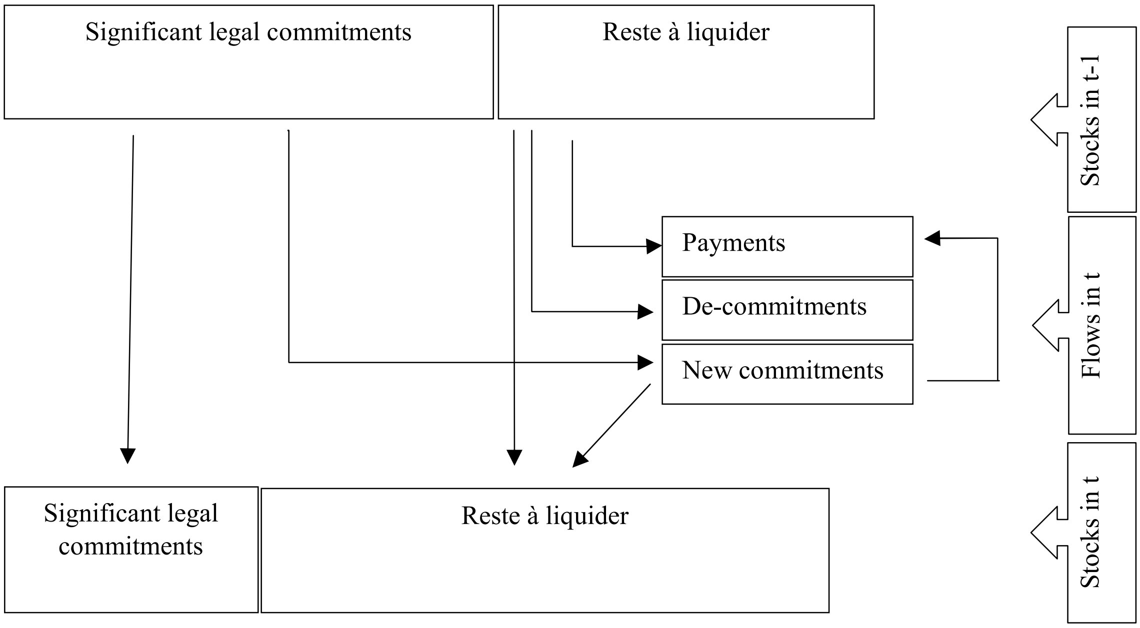
Our approach is very simple: we assume flows of commitments, payments and de-commitments for each year up until 2020, based on the planned annual commitments included in the financial programming section of the 2017 draft budget and the Commission's projection for annual payments and de-commitments (European Commission, 2016f).

Figure 4 illustrates in a schematic way the initial and final stocks of significant legal commitments and RAL and the flows between them during a year.

- Items in significant legal commitments will either remain significant commitments, or become committed in the budget. In turn, these new budget commitments can be paid (at least partly) in that year or go to the RAL.
- Items in the RAL will either remain in the RAL, be paid during the year or de-committed.
- The annual budget makes new commitments: some paid in the year, while others became part of the RAL.

Within an MFF, the outstanding volume of significant legal comments declines from one year to the next. There is no definitive direction of change for the RAL, though since historically the RAL increased in most years, we indicate a larger box for the year *t* RAL than for the year *t-1* RAL.

Figure 4: Flows between categories of liabilities used in our projection from one year to the next

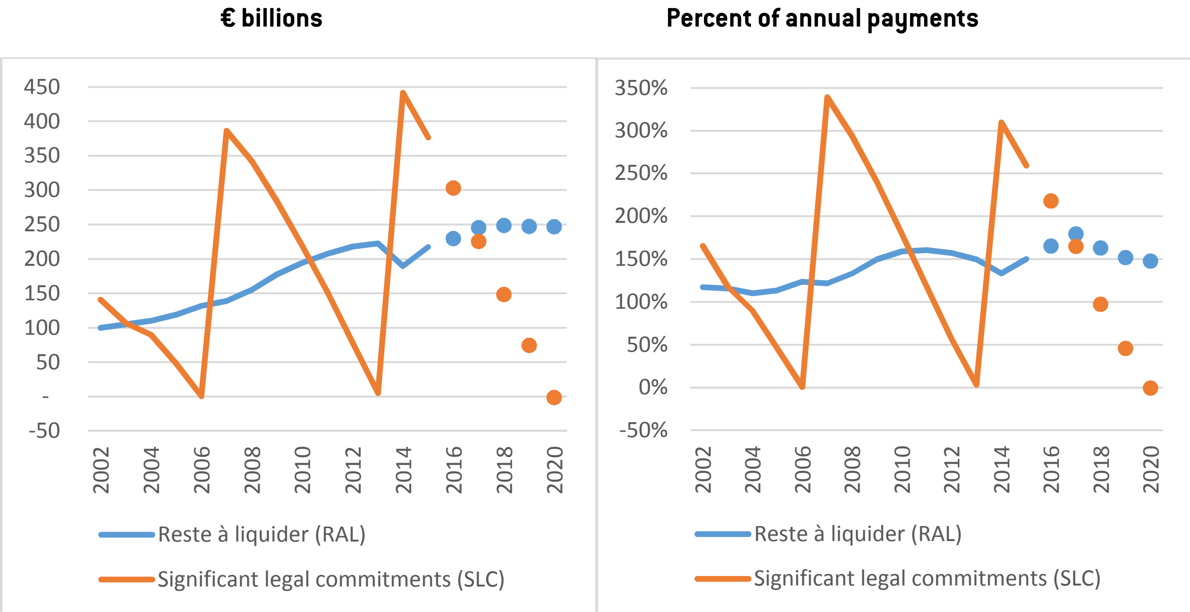


Source: Bruegel.

Historical data for 2002-15 and our projections for 2016-20 are included in Figure 5. The RAL increased substantially from its €100 billion value in 2002 to €218 in 2015, but at the same time the size of the EU's annual budget has also increased. We therefore plot both the € values (left panel) and values as a share of the annual EU budget (right panel).

According to our projections, the RAL will increase in € terms from its €217.7 billion value in 2015 to about €247 billion in 2020, but decline as a share of annual payments, similarly to its decline toward the end of the previous MFF which ended in 2013. The significant legal commitments are large at the beginning of an MFF, but they declined to close to zero by 2006, 2013, and are expected to decline to close to zero by 2020 according to our projections.

Figure 5: RAL and significant legal commitments: actual data for 2002-15 and our projections for 2016-20



Source: Bruegel based on Consolidated Annual Accounts of the EU in each year from 2002-2015; projections: see Annex for details.

Certainly, such projections should be treated carefully. Even the Commission SWD (European Commission, 2016d), which serves as the basis for our projections, mentions the sensitivity of the RAL projections to the underlying assumptions. However, since both the RAL and the significant legal commitment projections are derived predominantly from the MFF, the open issue is the distribution between these two categories, but not their sum.

4.3 Estimating the planned spending in the UK from the EU spending liabilities at end-2018

Our projections indicate that at the end of 2018, the RAL will be €248.8 billion, SLC will be €148.7 billion, while other spending commitments planned to be made in 2019-20 based on the current MFF will amount to €182.5 billion. These spending commitments relate to all 28 EU countries. Some commitments relate to planned expenditure in the UK: therefore, if the UK is asked to pay for its share of this total €580 billion in spending commitments, planned spending in the UK should be considered as an offsetting factor.

In our calculations we consider commitments and payments pertaining to the European Structural and Investment Funds (ESIF) for the 2014-20 programming period separately from all other spending, for three reasons.

- The vast majority of outstanding legal commitments (90 percent in 2015), as well as the RAL (66 percent in 2015), are related to ESIF spending.

- Programmes financed by ESIF are under shared management and the corresponding funds are allocated directly to member states. This is important for estimating the portion of liabilities payable to the UK, as for most other items of expenditure there is no *ex-ante* information on the distribution of spending by member state.

- There is more publically available information on the implementation (commitments and payments) of ESIF spending than on other spending categories[5].

Therefore, for calculating the UK's share of the post-Brexit spending commitments, we make different assumptions for ESIF and non-ESIF commitments:

- For commitments and payments related to the ESIF 2014-20, we use actual flows up to 2015 and simulate the expected flows to member states from 2016 onward, which are assumed to be proportional to the member state allocation. In these calculations, we consider the most disaggregated expenditure item level available, ie expenditure sub-headings. On this basis, we attribute the ESIF-related end-2018 stock of the RAL and SLC to the UK.

- For the RAL not related to ESIF and for the OPC, the outstanding stock is multiplied by the UK's average share of the non-ESIF expenditures of EU budgets from 2007-15, which is 6.4 percent.

- For the SLC not related to ESIF, information on the UK's share is available for three sub-headings, while for the other four sub-headings we assumed the 6.4 percent general share (see Table 22 in the Annex).

Table 8: EU spending commitments and the UK's share in those, € billions

	RAL, end-2018			SLC, end-2018			OPC in 2019/20	Total
	ESIF	*Non-ESIF*	***RAL Total***	*ESIF*	*Non-ESIF*	***SLC Total***	***OPC Total***	
EU total	148.7	100.1	**248.8**	140.5	8.2	**148.7**	**182.5**	**579.9**
Planned spending in the UK	5.4	6.4	**11.8**	5.1	0.3	**5.4**	**11.7**	**28.9**
UK % share	*3.7%*	*6.4%*	***4.8%***	*3.6%*	*3.9%*	***3.6%***	***6.4%***	***5.0%***

Source: Bruegel. RAL= reste à liquider (see the description under Liability source 2 above); SLC = significant legal commitments (see the description under Liability source 3 above); OPC = other planned commitments in 2019-20 (see the description under Liability source 5 above).

Table 8 summarises the results. According to our estimates, €28.9 billion of the €579.9 billion in post-Brexit EU commitments was planned to be spent in the UK, which is 5.0 percent of the total. This relatively low share largely reflects the relatively low share allocated to the UK for cohesion, regional and rural development.

4.4 Projecting the UK rebate

Since 1985, the UK has been entitled to receive a rebate amounting to about 66 percent of its net contribution to the annual EU budget of the previous year. The formula to calculate the UK rebate has been amended a number of times, including when new countries joined the EU in 2004. The UK rebate increased the EU budget contribution of other net payer countries, and ultimately led to a complicated

[5] European Commission (2015a), European Commission (2016b).

system of rebates from which Austria, Denmark, Germany, the Netherlands and Sweden also benefit in the 2014-20 period (see a nice overview of the UK rebate issue in D'Alfonso, 2016). Moreover, the rebates are adjusted retroactively up to three years later, as new information becomes available. Box 2 describes the current UK rebate formula.

Should the UK will leave the EU on 1 January 2019, it would be entitled to a rebate on its 2018 contribution to the EU budget. The UK Office for Budget Responsibility (2016) forecasts the rebate after the UK's 2018 contributions under a 'no referendum' counterfactual basis to be €4.6 billion.

If the UK is asked to contribute to part or all of the €579.9 billion post-2018 outstanding EU budget commitments after Brexit, then the UK might benefit from a rebate on those UK financial contributions too. However, the justification for that rebate also depends on the way the UK's share is calculated. If the UK's share is calculated from its rebate-adjusted historical gross contribution to the EU budget (which is 12.0 percent and thereby the UK contributes €69.6 billion to post-Brexit spending), then a rebate might not be justified. But if the UK's share is calculated from its historical gross contribution to the EU budget which is not adjusted by the rebate (which is 15.7 percent and thereby the UK contributes €91.1 billion to post-Brexit spending plans), then a rebate might be justified.

Giving a precise estimate of the rebate after the UK's post-Brexit EU budget contributions is difficult, because it depends on a number of adjustments (Box 2). We therefore follow a simplified method, which in our view indicates the order of magnitude well. We calculate the rebate for RAL, SLC and OPC separately, because the rebate also depends on EU spending in the countries that joined the EU in 2004-13, and these countries have different shares in the three main commitment categories. The main steps of our estimation are the following:

- We consider the totals for RAL, SLC and OPC commitments as 'total allocated expenditure', which appears in line 4 of Table 10).
- We estimate the share of the new member states in these commitments.
- We adjusted the commitments related to new member states by CAP spending (line 5).
- Thereby, we get 'enlargement-adjusted total allocated expenditure' (line 6).
- We multiply this number by the 2009-15 average share of the UK in the relevant net contribution aggregate (line 3) and by 0.66, to get an estimate of the 'original amount' of the rebate (line 7).
- We cannot calculate the so-called 'UK advantage', which relates to the changeover to the capped VAT and the introduction of the GNP/GNI-based own resources. But for 2009-15 we calculate the average share of the UK advantage in 'original amount' of the rebate, which was 15 percent (line 12), and use this average value to proxy the UK's advantage from the post-Brexit projections (line 8).
- Thereby we get the core rebate (line 9), and by disregarding the historically almost zero windfall gains (line 10), we get final value of the rebate (line 11).

To sum up, given a hypothetical Brexit happening on 1 January 2019 and a UK contribution to the full €579.9 billion post-Brexit spending RAL, SLC and OPC commitments based on the 15.7 percent UK's share (which is calculated from historical average gross-contributions without rebate-adjustment), the

UK might receive the following rebates:

- €4.6 billion arising from its 2018 EU budget contributions, and
- €21.9 billion arising from its contribution to the €579.9 billion liability post-2018 if the UK's share in liabilities is calculated from a historical average of the UK's gross contribution, which is not adjusted by the rebate.

Finally, we note that similar net UK contributions to the post-Brexit EU budget is obtained in the two possible cases (Table 9):

- Calculating the UK's share from rebate-adjusted historical gross contributions (leading to a 12.0 percent UK share), and not considering a rebate from the UK's post-Brexit EU budget contributions;
- Calculating the UK's share from non-adjusted historical gross contributions (leading to a 15.7 percent UK share), and considering a rebate from the UK's post-Brexit EU budget contributions.

Table 9: Comparing two alternative scenarios for the UK's net contribution to post-Brexit EU spending

	(1)	(2)	(3)	(4)	(5)	(6)=(2)-(4)	(7)=(3)-(4)-(5)
	EU-total post-Brexit	**Gross UK contribution, if its share:**		**Spending in the UK**	**Rebate if share is 15.7%**	**Net UK contribution, if its share:**	
		12.0%	**15.7%**			**12.0%**	**15.7%**
RAL	248.8	29.9	39.1	11.8	9.0	18.0	18.2
SLC	148.7	17.8	23.3	5.4	3.9	12.5	14.1
OPC	182.5	21.9	28.6	11.7	9.1	10.2	7.9
Total	**579.9**	**69.6**	**91.1**	**28.9**	**21.9**	**40.7**	**40.2**

Table 10: EU budget calculations for the UK rebate in 2009-15 and our projection of the rebate from the UK's post-2018 contributions to the EU budget

									Post-Brexit rojections			
	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	average	RAL	SLC	OPC	**Total**
1. United Kingdom's share (in %) of notional uncapped VAT base	15.7	15.4	15.0	16.1	16.0	17.4	19.2					
2. United Kingdom's share (in %) of enlargement-adjusted total allocated expenditure	7.3	7.7	7.3	7.2	6.1	7.4	7.6					
3. (1) - (2)	8.4	7.7	7.6	8.9	9.9	10.0	11.6	9.2				
				EUR billions								
4. Total allocated expenditure	101.94	111.42	116.70	126.02	134.75	128.67	129.19		248.8	148.7	182.5	**579.9**
5. Enlargement related expenditure (*)	16.06	23.86	26.84	30.15	31.29	33.34	31.73		74.1	73.9	6.3	**154.3**
6. Enlargement-adjusted total allocated expenditure = (4) – (5)	85.89	87.56	89.87	95.87	103.46	95.33	97.46		174.7	74.8	176.1	**425.6**
7. United Kingdom's correction original amount = (3) × (6) × 0,66	4.77	4.46	4.54	5.62	6.79	6.30	7.48		10.6	4.5	10.7	**25.8**
8. United Kingdom's advantage (**)	1.38	0.70	0.14	0.33	0.85	1.16	1.50		1.6	0.7	1.6	**3.9**
9. Core United Kingdom's correction = (7) – (8)	3.39	3.76	4.40	5.29	5.94	5.14	5.98		9.0	3.9	9.1	**21.9**
10. Windfall gains deriving from traditional own resources (***)	-0.01	0.02	0.01	0.01	0.02	-0.03	-0.08		---	---	---	---
11. Correction for the United Kingdom = (9) – (10)	3.40	3.74	4.39	5.28	5.92	5.17	6.06		9.0	3.9	9.1	**21.9**
				Ratio calculated by us								
12. UK advantage / original rebate = (8) / (7)	0.29	0.16	0.03	0.06	0.12	0.18	0.20	0.15	0.15	0.15	0.15	0.15

Sources for lines 1 to 11 for 2009-15: Amending Budget 6/2016 (OJ L52 of 28/2/2017), Amending Budget 8/2015 (OJ L18 of 27/1/2016), Amending Budget 7/2014 (OJ L 73 of 17/03/2015) and Amending Budget 9/2013 (OJ L49 19/02/2014).

Note: The presented values are definitive for the years 2009 to 2012. Values from 2013 on may be subject to corrections in future budgets. (*) The amount of enlargement-related expenditure corresponds to total allocated expenditure in 13 Member States (that have acceded to the EU after 30 April 2004), except for agricultural direct payments and market-related expenditure as well as that part of rural development expenditure originating from the EAGGF, Guarantee Section. (**) The 'UK advantage' corresponds to the effects arising for the United Kingdom from the changeover to capped VAT and the introduction of the GNP/GNI-based own resource. (***) These windfall gains correspond to the net gains of the United Kingdom resulting from the increase — from 10 to 20 % as of 1 January 2014 for the 2015-16 calculations, and from 10 to 25 % as of 1 January 2001 in the pre-2015 calculations — in the percentage of traditional own resources retained by Member States to cover the collection costs of traditional own resources (TOR).

Box 2. UK rebate computation method

Article 4

Correction mechanism in favour of the United Kingdom

The United Kingdom shall be granted a correction in respect of budgetary imbalances.

This correction shall be established by:

(a) calculating the difference, in the preceding financial year, between:

— the percentage share of the United Kingdom in the sum of uncapped VAT assessment bases, and

— the percentage share of the United Kingdom in total allocated expenditure;

(b) multiplying the difference thus obtained by total allocated expenditure;

(c) multiplying the result under point (b) by 0,66;

(d) subtracting from the result under point (c) the effects arising for the United Kingdom from the transition to capped VAT and the payments referred to in Article 2(1)(c), namely the difference between:

— what the United Kingdom would have had to pay for the amounts financed by the resources referred to in Article 2(1)(b) and (c), if the uniform rate had been applied to non-capped VAT bases, and

— the payments of the United Kingdom pursuant to Article 2(1)(b) and (c);

(e) subtracting from the result under point (d) the net gains of the United Kingdom resulting from the increase in the percentage of resources referred to in Article 2(1)(a) retained by Member States to cover collection and related costs;

(f) adjusting the calculation, by reducing total allocated expenditure by total allocated expenditure in Member States that have acceded to the Union after 30 April 2004, except for agricultural direct payments and market-related expenditure as well as that part of rural development expenditure originating from the EAGGF, Guarantee Section.

Source: Article 4 of the Council decision of 26 May 2014 on the system of own resources of the European Union, (2014/335/*EU*, Euratom)

4.5 Assessing the other three main types of EU liabilities

As we summarised, EU liabilities can be classified in four broad categories:

i. The 2014-20 MFF and some other spending and investment items, such as the Juncker investment plan;

ii. Pension/sickness insurance liabilities related to EU employees,

iii. EU borrowing to finance financial assistance programmes, and

iv. Contingent liabilities.

So far we discussed category (i) liabilities and made our projections up to 2020. The other three categories have some similarities in the sense of each having a contingency element, which necessitates proper consideration of how to include them in the Brexit financial settlement.

4.5.1 Contingent liabilities

Contingent liabilities are uncertain. They depend, for example, on the results of court rulings or whether certain loan beneficiaries default. Table 11 shows contingent liabilities evolved to around €30 billion in 2008-15. The guarantees given, which mostly apply to European Investment Bank loans outside the EU, were always the dominant determinant of this liability category. Fines reduced considerably from over €10 billion in 2008-09 to below €4 billion in 2015.

Table 11: Contingent assets and liabilities, 2008-15

	2008	2009	2010	2011	2012	2013	2014	2015
Contingent Assets, total	**303**	**297**	**339**	**353**	**394**	**496**	**476**	**474**
Guarantees received	260	279	331	334	380	480	427	425
Other contingent assets	43	18	8	19	14	16	49	48
Contingent Liabilities, total	**29,616**	**33,672**	**34,032**	**36,261**	**30,521**	**29,805**	**27,772**	**27,584**
Guarantees given	17,510	19,330	22,171	24,394	22,317	22,162	20,862	21,401
Fines	10,198	11,969	9,627	8,951	6,378	5,227	5,602	3,951
EAGF, rural development and pre-accession	1,609	1,945	1,772	2,345	1,188	1,537	505	1,377
Cohesion policy				318	546	137	9	3
Legal cases and other disputes	281	416	458	251	91	689	789	795
Other contingent liabilities	18	12	4	2	0	52	5	58

It is difficult to project the end-2018 value of contingent liabilities. Most likely, their volume will not change much, since most are related to EIB loans, which will likely remain stable.

We see four possible options in terms of how contingent liabilities could be considered in the Brexit financial settlement:

1 The UK pays its share upfront as part of the Brexit bill, and is reimbursed by the EU in later years if particular liabilities do not materialise.

2 The UK pays nothing upfront, but pays its share in later years when particular liabilities materialise.

3 The EU balance sheet includes a €2.0 billion Guarantee Fund for external actions (within the category of *"financial assets for sale"*, see Section 4.6). This asset, or a part of it, would not be apportioned to the UK in the Brexit bill, but would be apportioned to the UK in later years if it is not used to cover loan/guarantee losses.

4 European authorities must have confidential information on how much of past contingent liabilities turned out to be actual expenses. If there is a regular pattern, then an estimate can be made of the expected expenses from the end-2018 stock of these contingent liabilities. The UK may pay its share of expected expenses on Brexit, and if actual expenses deviate from estimate expenses, the UK and the EU27 could settle those differences in later years.

We find all four options sensible. Ultimately, a political decision is needed on which to choose.

In our net Brexit bill calculations we consider option (4) combined with our conservative guess on actual expense rates. Most likely only a relatively small share of these contingent liabilities and assets will become actual expenses. The bulk of contingent liabilities relate to EU budget guarantees behind EIB lending outside the EU and we presume that the EIB adopts proper risk management techniques so only a small share of such loans actually defaults. In order to provide a conservative guess, we assume a 10 percent loss rate on guarantees and a 50 percent loss rate on other contingent liabilities, such as those that depend on court rulings. Therefore, for the EU as a whole, we assume that from the €27.1 billion in net contingent liabilities, €21.9 billion will not materialise, and we apportion the UK's share in this to the Brexit bill.

We also note that while guessing the expense rate from the contingent liabilities is imprecise, its actual impact on the Brexit bill is modest. For example, with our assumption above, the net contribution of contingent liabilities to the Brexit bill is €0.6 billion. Even markedly different outcomes would change this value only by a few million euros, which is relatively small compared to the overall Brexit bill.

4.5.2 EU borrowing to finance financial assistance programmes

At the end of 2015, EU borrowing amounted to €56.9 billion. The EU cannot borrow to fund current expenditures, but it can borrow to fund financial assistance programmes. EU borrowing perfectly matches the loans granted by the EU. The interest rate charged by the EU is practically the same as the borrowing cost of the EU, and therefore there is no net interest gain/loss for the EU from these loan operations if the beneficiary countries repay the loans on schedule.

The bulk of loans from borrowed funds were granted to[6]:

- Non-euro EU countries (Hungary, Latvia and Romania) from the balance of payments facility – Hungary already repaid the loan in full in March 2016;

[6] See: https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-financial-assistance/eu-borrower_en

- Euro-area countries (Ireland and Portugal) from the European Financial Stabilisation Mechanism (EFSM)[7];
- Non-EU countries (see Table 10) from the Macro-Financial Assistance (MFA) facility;
- There also a small Euratom facility and some loans related to the European Coal and Steel Community (ECSC), which has been in liquidation since 2002.

Loans carry a risk. However, as Table 10 details, 95 percent of the loans were granted to EU countries, which, in our view, carries a low risk of default[8]. The current €2.21 billion loan to Ukraine accounts for 3.95 percent of EU loans, which is perhaps the riskiest component. The remaining 1 percent of EU loans is diversified across ten countries, with very small values for each country.

Barker (2017) considers three options through which EU loans and the corresponding EU borrowing liability could be considered in the Brexit invoice:

1 Do not consider EU borrowing as a liability and EU loans as an asset in the Brexit invoice, but require a future contribution from the UK when there is a loan default.

2 Require the UK to pay upfront for its whole share of EU borrowing, while the EU would gradually reimburse the UK in the coming decades as loans are repaid. According to the current schedule, the loans to Ireland and Portugal expire in 2042, while the last repayment date for Ukraine is 2029.

3 Calculate the risk of each loan and charge the expected loss to the UK.

We add two more options:

4 As we have mentioned, the EU balance sheet includes a €2.0 billion Guarantee Fund for external actions. This asset, or a part of it, would not be apportioned to the UK in the Brexit invoice, but would be apportioned to the UK in later years if it is not used to cover loan/guarantee losses. This fund only covers the risk of extra-EU lending/guarantees. However, we argued that in our view the loans to the remaining four EU member states carry very low risk: as a special arrangement in the Brexit settlement, the UK's share in this fund could be considered as a guarantor of the UK's share of the intra-EU loans too.

5 There is a further option, which would be economically sensible, though it might not be possible legally: the UK could take over its share of both EU borrowing and EU loans. That is, if the UK's share is 12 percent, the UK could assume 12 percent of the EU borrowing and service it, while the financial assistance countries which borrowed from the EU would pay 12 percent of their loan service to the UK and 88 percent to the EU. The legal problem is that EU borrowing was funded with bonds, which are guaranteed by the EU budget. Those bonds cannot be split and it might be difficult to design a financial engineering solution identical to such a split.

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7 In addition, a bridge loan amounting to €7.16 billion was granted to Greece for a period of one month between 20 July and 20 August 2015. This loan was fully repaid.

8 We also note that Hungary has already repaid the last portion of the loan in full in March 2016, Latvia has so far repaid €2.2 billion of the initial €2.9 billion loan and Romania has so far repaid €1.5 billion of the initial €5.0 billion amount of the loan.

Given that 95 percent of EU loans carry a very low risk in our view, we regard option (2) as very disproportionate. Option (3) involves difficult calculations. Option (5) could be economically sensible, but legally might not be possible. Therefore, options (1) and (4) seem to be reasonable to us.

Table 10: Outstanding amounts of EU loans, end-2015

	€ billions	**% all loans**
Portugal	24.3	43.38%
Ireland	22.5	40.17%
Romania	3.5	6.25%
Ukraine	2.21	3.95%
Hungary*	1.5*	2.68%
Latvia	0.7	1.25%
Euratom	0.3	0.54%
The European Coal and Steel Community	0.204	0.36%
Tunisia	0.2	0.36%
Jordan	0.18	0.32%
Serbia	0.18	0.32%
Bosnia Herzegovina	0.12	0.21%
Armenia	0.065	0.12%
Former Yugoslav Republic of Macedonia	0.024	0.04%
Georgia	0.01	0.02%
Albania	0.009	0.02%
Kyrgyz Republic	0.005	0.01%
Montenegro	0.004	0.01%
Total	**56.011**	**100.00%**

*Source: Report from the Commission to the European Parliament and the Council on borrowing and lending activities of the European Union in 2015, COM(2016) 387 final, 15 June 2016, available at https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-387-EN-F1-1.PDF. Note: The European Coal and Steel Community has been in liquidation since 2002. The table shows outstanding amount of loans at the end of 2015, while the EU consolidated accounts includes incurred interest too and thereby report €56.9 billion for end-2015. * Hungary has already repaid the loan in March 2016.*

There are also some small loans granted from the budget (€0.4 billion), of which about €0.25 billion is in fact term deposits and therefore the riskiness of these small loans/deposits is very small.

In our Brexit bill calculations, we use the expected value of EU loans at the end of 2018 and therefore we make two adjustments to the end-2015 values:

- Hungary repaid the last €1.5 billion portion of the loan in March 2016.
- Romania is expected to repay €1.15 billion in 2017 and €1.35 billion in 2018.

While Ireland is expected to repay €3.9 billion and Portugal €0.6 billion in 2018, we will not consider those expected repayments, because the September 2016 post-programme monitoring report of European Commission (2016e) notes that "*The redemption profile of EFSF and EFSM loans to Ireland currently extends until 2042, with the next principal repayment technically due in 2018… Ireland is expected to request the maturity extension of other EFSM loans as they become due in the future.*"

Ukraine is expected to repay the EU loans between 2020-29.

Therefore, we subtract the already repaid €1.5 billion Hungarian loan and the expected €2.5 billion in Romanian repayments in 2017-18 from the €56.0 billion end-of 2015 outstanding stock of EU loans, leading to a value of €52.0 billion for end-2018.

In the end-year balance sheet calculation, accrued interest is added to the outstanding amount of loans. In 2015, €0.9 billion of accrued interest was added to the €56.0 billion of loans. We estimate end-2018 accrued interest at €0.7 billion and add that to the €52.0 billion value of loans.

4.5.3 EU staff pension and sickness insurance liabilities

Employees of EU institutions and agencies participate in unique pension and sickness insurance schemes. Officials should contribute one-third to the financing of the pension scheme via a compulsory contribution from their salaries, while two-thirds comes from the member states via the general EU budget. EU countries jointly guarantee the payment of these benefits. In contrast to other international organisations[9], there is no actual fund behind the pension and sickness schemes, but the pension scheme operates as a notional fund with defined benefits. Since there is no fund, active EU employees pay their annual pension contributions to the general EU budget, while actual pensions are paid from the general EU budget. Pension rights are gradually acquired by the active employees, so at each point in time, an estimate can be made of the total pension liability towards current and former EU staff. The EU staff sickness insurance system operates under the same principles[10].

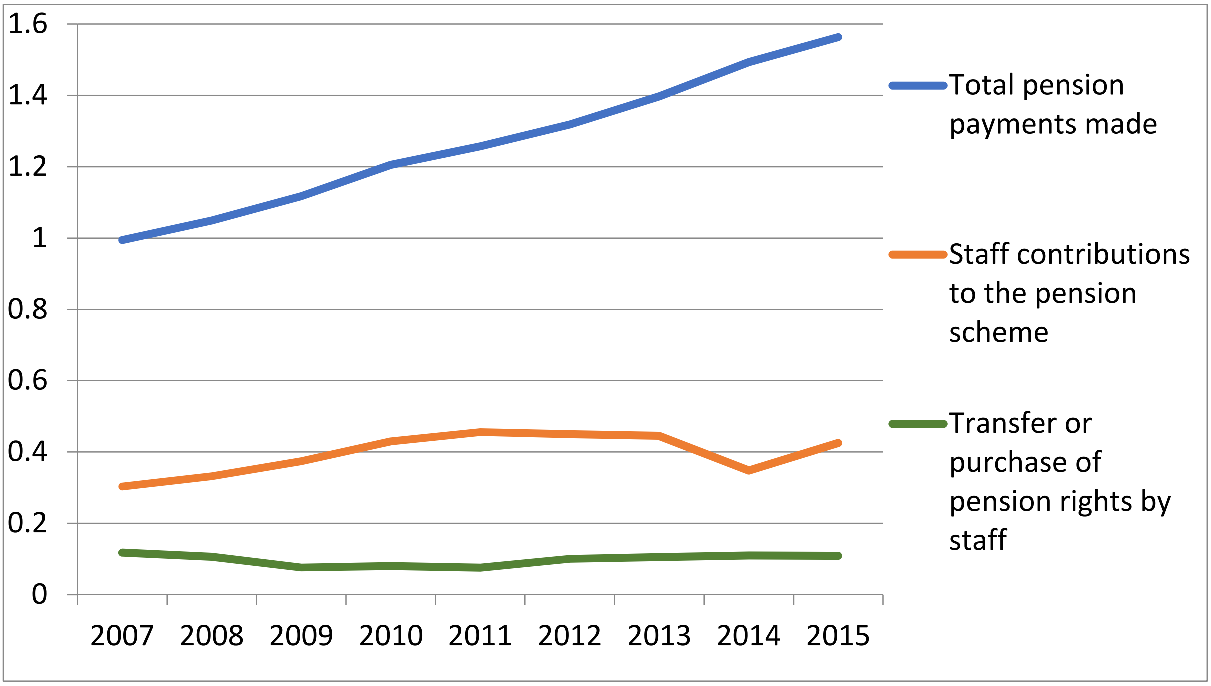
Whether or not the UK should contribute to the pension liability is an issue for negotiations. We summarise three possible interpretations of this liability in Section 5.

Given that EU staff members are supposed to contribute one third to their pension liability, one-third of so-far acquired pension rights will be funded by EU employees in the future, provided, of course that the EU continues to exist. Actual payments in the past ten years roughly corresponded to these shares (Figure 6).This theoretical one-third could be considered as an offsetting factor in the Brexit bill.

[9] European Commission (2012b, page 19) notes that "*The situation is different in other international organisations, which either have a complete pension fund or are going through a period of transition after introducing a pension fund.*"

[10] Though sickness insurance payments are capped: "*One-third of the contribution required to meet such insurance cover shall be charged to the official but so that the amount charged to him shall not exceed 2 % of his basic salary.*" (Article 82 of the Staff Regulations, Official Journal of the European Union, 2014)

Figure 6: Annual pension payments form the EU budget and staff pension contributions (€ billions)



Sources: Total pension payments made: EU Annual Accounts, each year between 2007-15; Contributions to the pensions scheme (staff contributions and transfer or purchase of pension rights by staff) - General EU Budget, each year between 2007-2015, outturn data. Note: 'Transfer or purchase of pension rights by staff' represents the payment to the European Union of the actuarial equivalent or the flat-rate redemption value of pension rights acquired by officials in their previous jobs.

In relation to the pension/sickness insurance liability and offsetting payment by the EU staff in the future, it should be noted that:

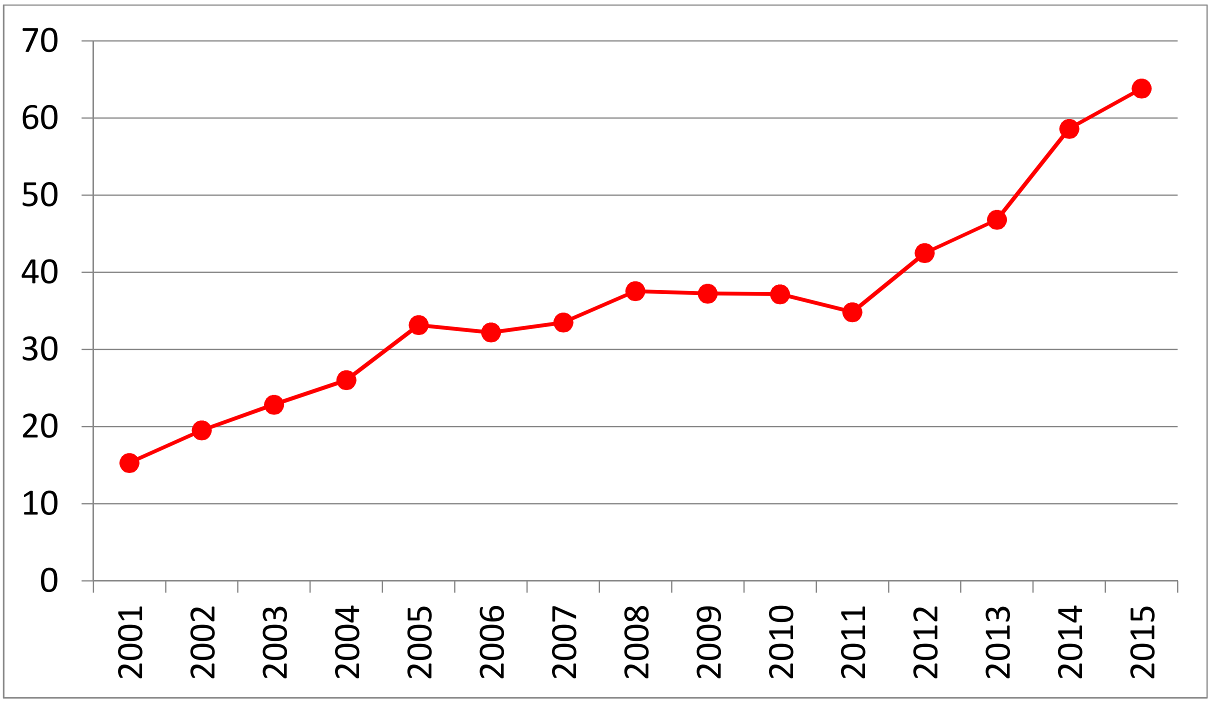
- The pension liability estimate in the EU balance sheet is rather uncertain.
- Very likely, EU staff will contribute less than the required one-third, and thus calculating the offsetting future EU staff payment is even more uncertain.

In each year, the EU consolidated annual accounts present an estimate for the present value of future pension and sickness insurance liabilities of current and former EU officials. The present value of these liabilities was €63.8 billion at the end of 2015, made up of three main items:

- The Pension Scheme of European Officials (PSEO) – €55 billion;
- The pension scheme for top officials (current and former members of the Commission, European Parliament, Court of Justice, Court of Auditors, Secretaries General of the Council, the Ombudsman, the European Data Protection Supervisor, the European Union Civil Service Tribunal) – €1.5 billion;
- The Joint Sickness Insurance Scheme – €7.4 billion.

As Figure 7 below shows, this liability increased from €15 billion in 2001 to €33 billion in 2005, then wavered around €35 billion in 2005-11, after which it almost doubled to €64 billion by 2015. There was a rather large 39 percent increase in the number of EU staff from 2005-11, so it might look puzzling that the pension liability remained more or less the same during this period, and even fell between 2010 to 2011. From 2011 to 2015, employment increased only by 8 percent, which can therefore explain only a small part of the doubling of liabilities in this period (see Darvas, Efstathiou and Goncalves Raposo, 2017b).

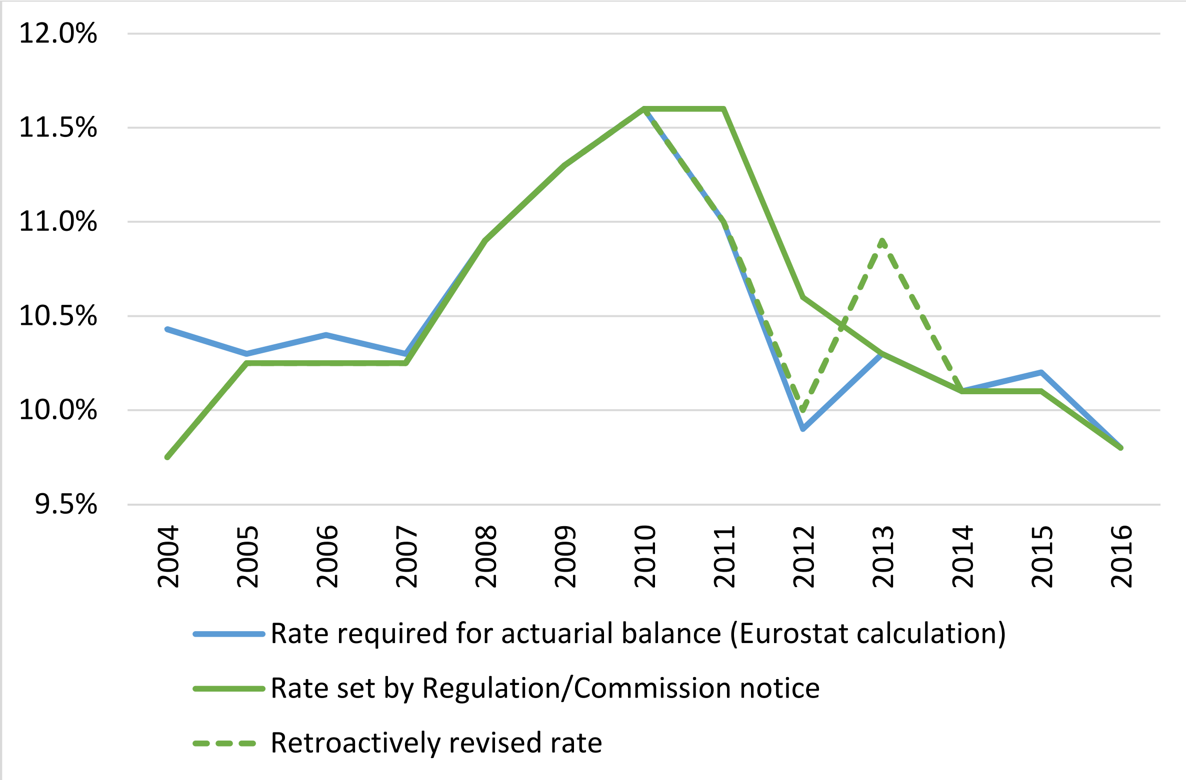
Figure 7: Present value of pensions and sickness insurance benefit liabilities in the EU balance sheet (€ billions)



Source: Bruegel based on reports in the EU consolidated annual accounts in each year between 2001-15. In 2004, there was a change in the way accounts were reported. Up to 2003, the item shown is "Provision for Pension Scheme liabilities"; from 2004 onwards, it refers to "Employee benefits".

Though according to the EU's *Staff Regulations* contributions made by EU employees are meant to cover one third of the cost of pensions rights, it is difficult to estimate what contribution rate paid by EU staff will lead to the defined benefits. This is because interest rates and other significant inputs into the calculation change from year to year. Consequently, the contribution rate applied to the staff's salaries in order to yield the required revenue is subject to adjustment on the basis of a report by Eurostat every year. Figure 8 shows that the contribution rate that EU staff pay from their salaries has actually been falling in recent years, in sharp contrast to the doubling of the EU balance sheet pension liability in 2011-15.

Figure 8: Pension contribution rate paid by EU staff

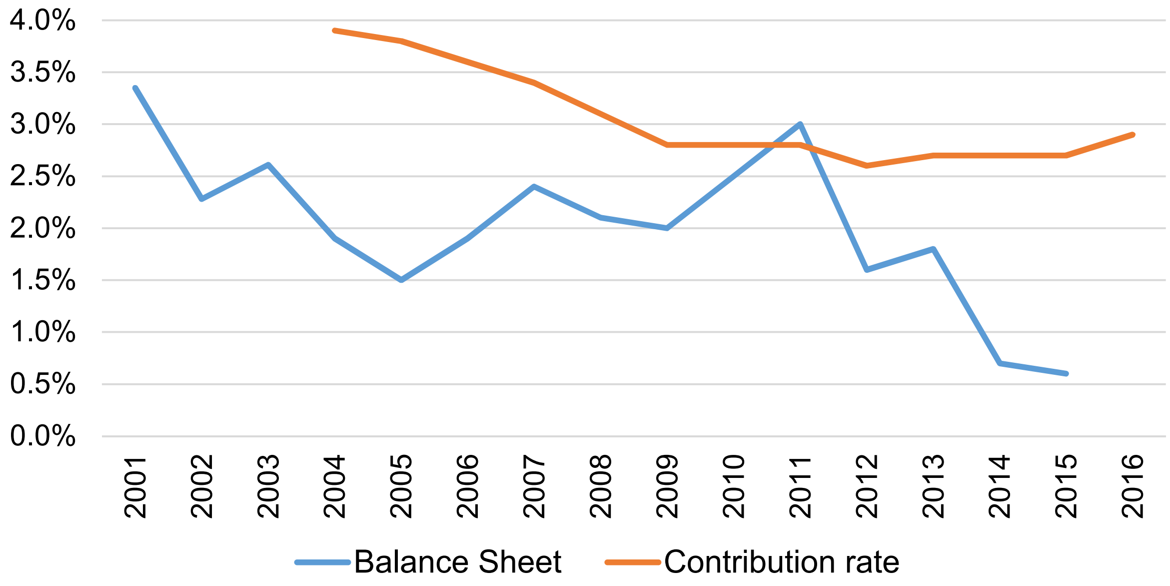


Source: Reports on the actuarial assessment of PSEO, various years; Council Regulations adjusting the rate of contribution to the pension scheme of officials and other servants of the European Union, various years.
Notes: Rate required for actuarial balance is the rate calculated by Eurostat in its assessment reports for the various years. The rate set by regulation is the contribution rate set by Council Regulations up to 2013. Since 2014, the rate is set by a Commission Notice. The rate set by the Council does not equal the equilibrium actuarial rate calculated by Eurostat due to the provisions of Staff Regulations, Annex XII, Articles: 2(2) which capped the rate at 9.75% in 2004 and 10.25% in 2005; 2(1) which stipulates that the change between years cannot exceed +/-1%. In 2014 the rate was retroactively revised for 2011, 2012 and 2013, following a European Court of Justice ruling. The retroactive change for 2013 was based on a Eurostat report that calculated the actuarial balance rate retroactively at 10.6%, but the Council set it at 10.9%.

The key reason for the different directions taken by the balance sheet pension liability and the staff pension contribution rate is related to the real discount rate used in the calculations. Different discount rates are used for the two calculations. In 2015, the balance sheet calculation used a real discount rate of 0.6 percent, while the EU staff contribution rate calculation used a real discount rate of 2.7 percent, which increased even further to 2.9 percent in 2016. The lower the discount rate, the higher the balance sheet liability and the staff contribution rate.

Therefore, the present value of the same liability (future pension and sickness insurance payments related to EU staff) looks much larger in the EU balance sheet calculations (because of the lower discount rate) than in the EU employee contribution rate calculations (because of the higher discount rate) (see Figure 9).

Figure 9: Real discount rate used in EU balance sheet and staff contribution discount rate calculations



Source: Bruegel based on reports on the consolidated annual accounts of the EU each year between 2001-15. Pension Scheme of European Officials (PSEO): Actuarial assumptions used in the assessment, various years. Note: for the balance sheet calculations, the nominal discount rate in 2015 was the zero-coupon euro-area rate 18 years ahead for pensions and 20 years for sickness insurance. In earlier years, the maturity was different (19 years for both). The definition of the inflation rate varied: in 2004 it was the actual backward-looking inflation from 2003 to 2004, while since 2005 inflationary expectations are derived from inflation-linked bonds for the same maturity as the nominal discount rate. For the staff contribution discount rate, a moving average of the past 12 years real discount rates (RDR) was used until 2012. After this date, the length of the moving average has increased to 16 years in 2013 and 18 in 2014, and this will be gradually increased to a 30-year average by 2021.

Figure 9 solves the puzzle behind the apparent discrepancy between the huge expansion of EU staff in 2005-11 but the broadly stable balance sheet pension liability: the euro crisis. An average euro-area interest rate is used for the discount rate. After 2008, nominal interest rates increased in financial assistance countries and in Italy and Spain, while inflationary expectations fell. This increase was only partly compensated for by the fall in real interest rates in Germany and other euro countries with sound fiscal positions. Consequently, the euro-area average real interest increased from 2.0 percent in December 2009 to 3.0 percent in December 2011. This increase in the average euro-area real interest kept the balance sheet pension liability broadly unchanged in this period, and even contributed to a fall in this liability from 2010 to 2011 (Figure 7). Why should the EU's pension liability decline when Italy faces a fiscal crisis?

With ECB President Mario Draghi's *"whatever it takes"* speech in July 2012 and the subsequent introduction of the ECB's outright monetary transactions (OMT) instrument, along with other major changes to the EU's economic governances, such as the summer 2012 decision to develop a European banking union, the fiscal crisis in Italy and Spain started to abate and interest rates fell. As a consequence, the EU balance sheet pension liability started to increase at a very rapid pace.

In our view, this episode highlights that it is inappropriate to use the euro-area average interest rate, which is not a risk-free rate. A more reasonable option would be the use of average interest rates of only AAA-rated countries.

The euro crisis also impacted the discount rate used for EU staff contribution rate calculations, but there was a much stronger, seemingly technical factor, which kept the discount rate rising even in recent years:

- The staff contribution rate calculation uses a historical moving average of interest rates: a 12-year average was used until 2012, it was 18 years in 2015, and this will be gradually increased to a 30-year average by 2021;
- By contrast, the EU balance sheet calculation uses the most recent values of the nominal discount and inflation rates (ie the December value in each year)[11].

Since nominal and real interest rates have fallen in many advanced countries in the past 30 to 40 years (with the temporary exception of euro-area crisis countries in 2010-12), there was a big decline in the balance sheet discount rate after the euro crisis abated after 2012. This decline pushed up the present value of pension/sickness insurance liabilities. In contrast, since the length of the historical moving average used for the staff contribution calculations has gradually increased in recent years, that discount rate has in fact increased, contrasting with the global decline in interest rates[12].

The use of a moving average is justified only if real interest rates are assumed to have a stable mean, from which actual yearly values deviate due to temporary shocks. However, a large body of academic research concludes that the decline in real interest rates in advanced countries is a global phenomenon caused by various structural factors, which will likely keep real interest rates low in the coming decades[13].

Therefore, the use of a relatively long moving average to calculate the staff contribution rate is unjustified and leads to underfinancing relative to the theoretical one-third contribution requirement. The backward extension of the moving average exaggerates the problem even further, because real interest rates were around 5 percent in the early 1990s, which years will be gradually included in the moving average.

This implies that EU staff have been underfinancing their pensions relative in the past years and will continue to underfinance for more than a decade to come, comparted to the theoretical one-third requirement. The gap will be paid by the EU member states.

To sum up, the strong dependence of the balance sheet liability on the actual interest rate in a particular month makes the present value calculations of the balance sheet uncertain, while

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[11] There are two additional differences too: (i) EU balance sheet calculations use the expected inflation rate for the euro area (derived from inflation-linked government bonds of euro countries), but the employee contribution rate calculations use a historical average of past inflation for the EU as a whole; (ii) EU balance sheet calculations currently use a 18-year maturity discount rate (earlier it was 19-year maturity), but the employee contribution rate calculations consider a 21-year maturity discount rate; both consider the average euro area rate. These differences have varying impacts on the real discount rate: EU inflation used to be higher than euro-area inflation, and expected inflation tend to be lower than historical inflation. Nominal interest rates tend to be higher at longer maturities.

[12] Another reason for the increase of the real interest rate used for calculating the staff contribution rate from 2.7 percent in 2015 to 2.9 percent in 2016 is that in 2016 a lower inflation rate is considered in the 1997-2004 period than in the 2015 calculation.

underfinancing by the EU staff makes it difficult to calculate the offsetting payment by future EU staff that should be considered in the Brexit bill calculations. These problems are coupled with the problem arising from the use of a non-risk free rate (ie the euro-area average). If an interest rate closer to a risk free rate would be used, such as eg the average interest rate of AAA-rated euro-area government bonds, then both the EU balance sheet liability and the contribution rate that EU staff pays would increase, probably substantially.

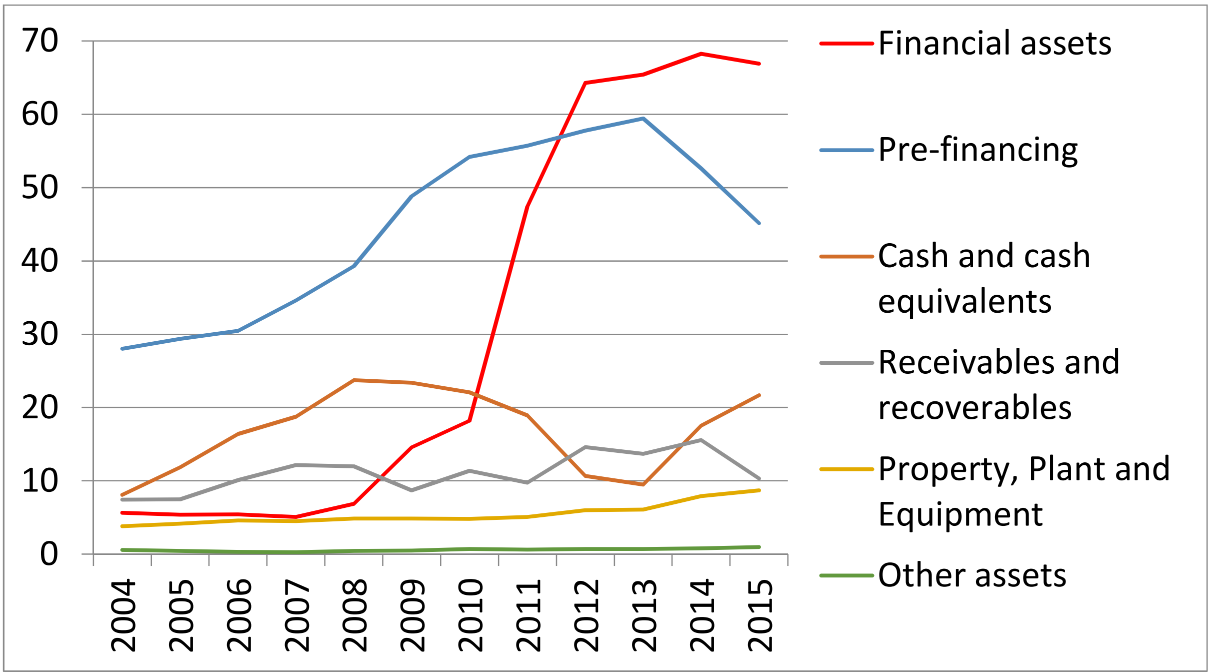
4.6 Assessing EU assets

We have so far considered the following offsetting assets and claims in the Brexit bill:

- The UK's rebate,
- EU loans,
- Future pension contributions of EU employees,
- Contingent assets.

Of these, only EU loans appear in the EU's balance sheet. But the balance sheet includes many other assets, according to the 2015 EU consolidated annual accounts (see European Commission, 2016c). Figure 10 summarises changes in the six main categories of EU balance sheet assets between 2004 and 2015.

Figure 10: EU Balance sheet assets (€ billions)



Source: reports on the Consolidated Annual Accounts of the EU in each year between 2001-15.

[13] See, for example, Holston, Laubach and Williams (2016), Laubach and Williams (2016) and Rachel and Smith (2015).

Balance sheet asset 1. Financial assets were about €5 billion in 2004-07, after which this asset category expanded primarily because of financial assistance loans. At the end of 2015, financial assets amounted to €67 billion, of which loans comprise €56 billion (plus €0.9 billion accrued interest) and available-for-sale financial assets worth €9.6 billion. We discussed the loans granted by the EU in Section 4.5.2.

Available-for-sale financial assets include:

- €2.6 billion provisionally cashed fines related to competition cases, which are allocated to a specially created fund (BUFI (budgetary fines) Fund);
- €2.0 billion Guarantee Fund for external actions, which is intended to cover any defaulting loans guaranteed by the EU, including loans under macro-financial assistance (MFA), Euratom loans outside the EU, and European Investment Bank lending operations outside the EU;
- €1.7 billion related to the liquidation of the European Coal and Steel Community;
- €0.2 billion in shares in the European Bank for Reconstruction and Development;
- €3.1 billion instruments related to various facilities, such as Risk Sharing Finance Facility (RSFF), Horizon 2020, ETF Start up and Project Bond Initiative.

Balance sheet asset 2. Pre-financing (€45.2 billion at end-2015) is a cash advance from the EU to cover future expenses related to EU-funded projects. If the beneficiary does not spend the advance, they have the obligation to return it to the EU. Pre-financing is thus considered an asset, because it is perhaps going to be returned if unused. As funding recipients submit their final costs, the value of pre-financing as an asset decreases. As new payments are allocated, the value increases.

In the case of pre-financed projects, commitments are already matched by payments and therefore pre-financed projects are not outstanding (RAL), meaning that the UK has already provided the required resources for its share of these commitments. Therefore, EU pre-financing would offset a part of the UK's share of future EU commitments only if pre-financing is not used but is returned to the EU. Since receivables and recoverables (the balance sheet assets 4 below) already include a recovery of €0.3 billion of pre-financing, and we consider receivables and recoverables as assets, we do not assume any further recovery from the €45.2 billion of pre-financing.

Balance sheet asset 3. Cash and cash equivalents (€21.7 billion at end-2015) are comprised mainly of accounts that the Commission keeps with the Treasuries and/or Central Banks of the member states for the purposes of obtaining their budget contributions (€17.1 billion). To execute payments, the Commission also maintains accounts at commercial banks (€0.1 billion), to which it transfers funds only when the need for payment arises. About €1.9 billion is cash relating to fines and another €1.9 billion relates to institutions other than the Commission, agencies and bodies.

Balance sheet asset 4. Receivables (€0.6 billion at end-2015) and recoverables (€9.7 billion at end-2015) refer to amounts of earned revenue that have not yet been paid. Receivables (a rather small value) emanate from exchange transactions, such as the receipt of payments for the services and goods the EU provides. Much more significant are recoverables, which are revenues owed arising from non-exchange transactions. These are transactions such as entitlements to tax and contribution revenue, for which the amount of revenue due is not directly linked to what the EU provides in exchange[14]. As Table 12 indicates, most recoverables are payments that member states failed to pay. If member states paid on time, the cash holdings of the EU would be higher. Therefore, these claims on the member states could also be considered as an offsetting asset in the Brexit bill calculations.

Table 12: The composition of receivables and recoverables, 2015, € million

Recoverables	**9,740**		
Recoverables from Member-States		7,703	
Own resources recoverables			*3,573*
EAGF and rural development recoverables			*3,705*
Pre-financing recovery expected			*313*
VAT paid and recoverable			*37*
Other			*75*
Fines		1,601	
Accrued income and deferred charges		369	
Other		67	
Receivables	**585**		
Customers		225	
Impairment on receivables from customers		-107	
Deferred charges		228	
Other receivables		240	
Total receivables and recoverables	**10,325**		

Source: 2015 consolidated accounts of the European Union (European Commission, 2016c)

Balance sheet asset 5. Property, plant and equipment (€8.7 billion at end-2015) encompasses tangible assets such as land and buildings (€2.2 billion), finance leases (€1.7 billion), plant and equipment (€0.7 billion) and computer hardware (€0.1 billion). A further €3.8 billion is the value of assets under construction.

Balance sheet asset 6. Other assets, less **than €1 billion** in 2004-15, include intangible assets, inventories and other investments.

With the exception of EU loans for which the repayment schedules are available, it is difficult to forecast the other main balance sheet asset categories, so we use their end-2015 values in our Brexit bill calculations.

The balance sheet value of property, plant and equipment may continue to increase slightly in the coming years as the EU will invest in its own buildings, equipment, etc. However, we cannot project the increase, which will be anyway minor compared to the overall Brexit invoice. And an even more important question is whether property is properly evaluated in the EU's balance sheet, as argued by Barker (2017).

[14] As EU Accounting Rule 3 puts it, "*there is no direct exchange relationship between paying the tax or the contribution and receiving EU services or transfers*".

4.7 The UK's share

Table 13 shows the structure of EU budget revenues in 2015. The bulk of it, €137.3 billion out of the total €146.0 billion, came from own resources, which are the contributions directly attributed to member states. Own resources have two components: total national contribution (€118.6 billion), which also takes into account adjustments among the EU member states because of the UK rebate, and traditional own resources (€18.7 billion), which predominantly consists of customs duties.

Table 13: EU budget revenues in 2015, € billions

1. Total own resources (= 1.1+1.2)	137.3		
1.1 Total national contribution (= 1.1.1+1.1.2+1.1.3)		118.6	
1.1.1 GNI-based own resource			101.0
1.1.2 VAT-based own resource			18.1
1.1.3 UK rebate and other corrections			-0.5
1.2 Traditional own resources		18.7	
2. Other revenue	7.3		
3. Surplus from previous year	1.4		
4. Total revenue (= 1+2+3)	146.0		

Source: DG-Budget: EU expenditure and revenue database, available at available at *http://ec.europa.eu/budget/library/biblio/documents/2015/internet-tables-2000-2015.xls*

Note: the UK rebate is non-zero for the EU as a whole in most years. In 2015, while the UK received €6.1 billion rebate, the other 27 member states paid €5.6 billion in total. In some other years, the UK received less than the amount the other member states paid.

A reasonable approach to calculating the UK's share in outstanding post-Brexit commitments is to consider the UK's historical share in gross EU budget contributions. The question is whether the rebate-adjusted or non-adjusted gross contribution should be considered.

The rebate has been in place since 1985 and aims to reduce the UK's contribution to the EU budget, which suggests that the UK's share in gross contributions should take the rebate into account. Also, EU budget reporting includes the UK rebate in the 'Total national contribution', that is, the rebate is considered as a factor reducing the UK's gross contribution to the EU budget.

However, one may also argue that the rebate is a separate payment to the UK which reduces the UK's net contribution, but it is a different matter from gross contributions, in which case the gross contributions should not be adjusted by the rebate.

A further question is what time period to take into account for the calculation of the UK's historical share.

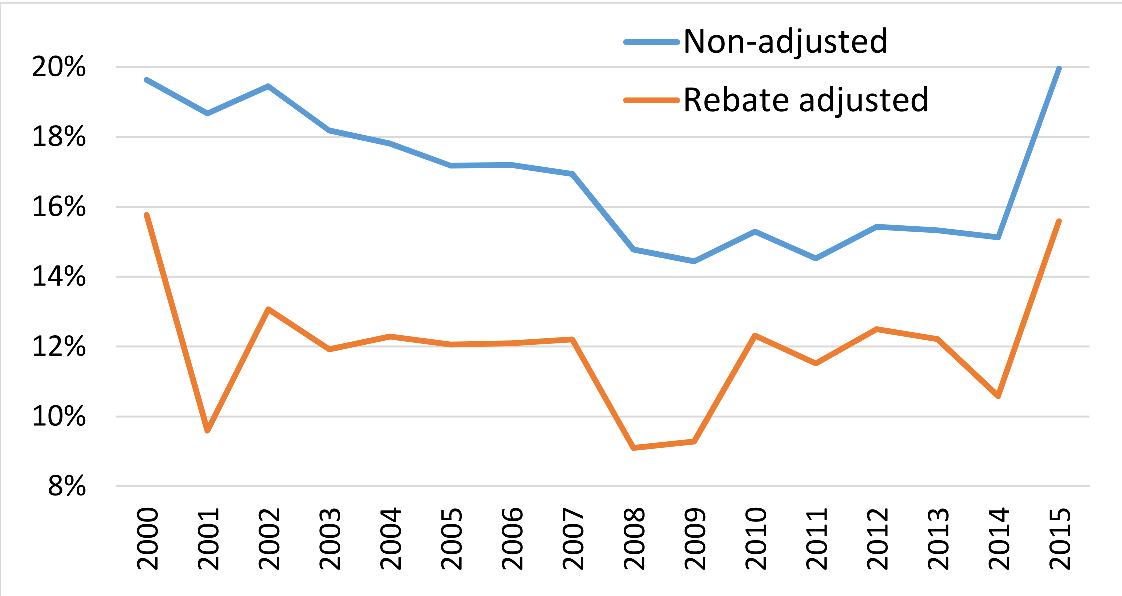
Figure 11 shows the UK's share of gross budget contributions both with and without the rebate. The UK's share has been somewhat volatile, partly reflecting the euro value of UK GNI, which the GNI-based resources directly relate to, while the VAT-based resources may also correlate with the GNI.

The euro value of UK GNI also depends on the exchange rate. For example, the temporary fall of the UK's share in 2008-09 might be related (at least partly) to the fall in value of the pound sterling relative to the euro, while the large increase of the UK's share in 2015 was (partly) related to the appreciation of the pound against the euro in 2015 (Figure 12). Since the pound depreciated in 2016 and its value has remained relatively weak compared to the euro since then, the UK's share in EU budget contributions will likely fall in 2016 and later years, compared to the high 2015 value.

Because of the volatility of the UK's share, it would be reasonable to use a historical average, for which the post-2007 period could be considered, when the EU had 27 member states. Croatia joined the EU in 2013 and too little time has passed since then, but also Croatia's share of the gross EU budget contribution was a mere 0.3 percent in 2014-15: taking into account Croatia's hypothetical share in 2008-2012 would hardly change the UK's share.

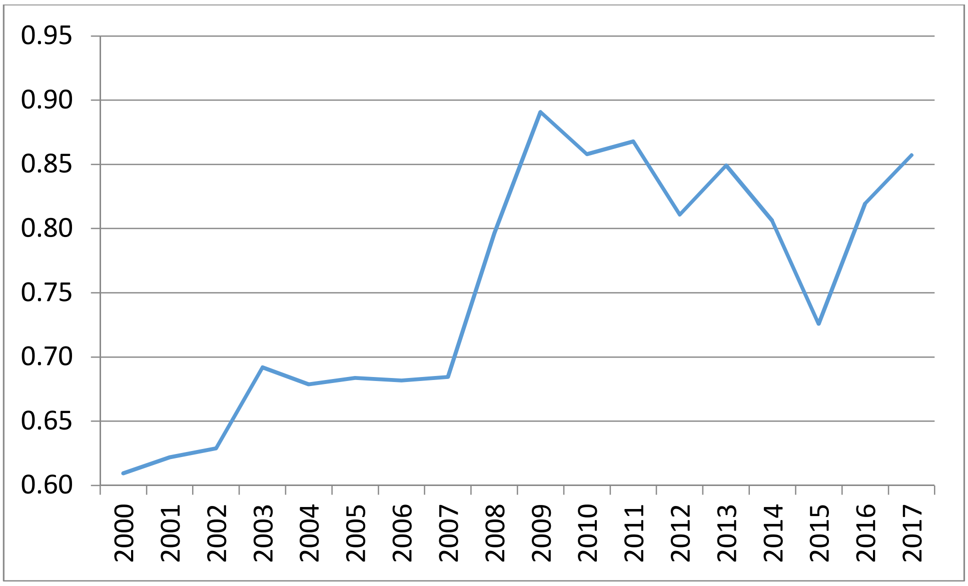
It is noticeable that the UK's rebate-adjusted share has hovered at 12 percent in most years. The average share in 2009-15 was also 12.00 percent, while the average share in 2000-15 was almost identical at 12.01 percent. We therefore apply 12.00 percent for the purposes of our calculations. In an alternative scenario, we also consider the UK's non-rebate adjusted share, which was 15.7 percent on average from 2009-15.

Figure 11: The UK's share of gross EU budget contributions (percent), 2000-15



Source: Bruegel using data from DG-Budget on EU expenditure and revenue. (available at http://ec.europa.eu/budget/library/biblio/documents/2015/internet-tables-2000-2015.xls). Note: the EU had 15 members in 2000-03, while it was enlarged in 2004, 2007 and 2013 to 28 members. The decline in the UK's non-adjusted share in EU budget contributions partly reflects the impact of EU enlargements.

Figure 12: Euro-pound sterling exchange rate, 2000-17



Source: Eurostat's "Euro/ECU exchange rates - annual data [ert_bil_eur_a]" dataset. Note: annual average data. For 2017 the average of January and February is indicated.

4.8 The net Brexit bill

There are many different options in terms of how to take into account the various liabilities/commitments and offsetting assets/claims in the Brexit bill. We discuss these options in Section 5 and present some key scenarios in Table 1.

4.9 Summary of possible assets and liabilities

To sum up, the following liability and asset categories might be considered in the Brexit bill (the numbering below for both liabilities and assets coincides with the numbering in Table 1 of the executive summary).

- **Liabilities and commitments:**

  1 The RAL, from its French *name reste à liquider*, includes outstanding budgetary commitments from annual EU budgets, but for which payment has been deferred to future annual budgets. We project the RAL will increase from its €217.7 billion value in 2015 to €248.8 billion by 2018, which will be gradually paid by annual EU budgets up to approximately 2023.

  2 Significant legal commitments (SLC) primarily relate to that part of the MFF that has not yet been included in annual budgets. The volume of these commitments are very large at the beginning of an MFF and decline to essentially zero by the end of an MFF. We project SLC to decline from their €376.3 billion value in 2015 to €148.7 billion by 2018. Most of these SLCs will become budgetary commitments in the annual budgets of 2019 and 2020, and will be gradually paid by annual EU budgets between 2019 and approximately 2025.

  3 Other planned commitments (OPC) to be made in 2019-20: The 2014-20 MFF also includes a ceiling for commitments to be made in 2019-20 annual budgets, which are not

related to the SLC (and RAL up to 2018). The total value of these planned 2019-20 commitments is €182.5 billion.

4 The EU cannot borrow to fund current expenditures, but borrows to fund financial assistance programmes: EU borrowing perfectly matches EU lending. At the end of 2015, EU borrowing (and also the corresponding EU loans on the assets side) amounted to €56.9 billion, of which €56.0 billion was the outstanding volume of loans and €0.9 billion accrued interest. Of these loans, Hungary repaid €1.5 billion in March 2016 and Romania is expected to repay €2.5 billion in 2017-18. Therefore, the expected volume of outstanding loans, which are matched by EU borrowing, is €52.0 billion at the end of 2018, to which we add our estimate for the end-2018 accrued interest, €0.7 billion.

5 The EU balance sheet includes the estimated present value of pension and sickness insurance liabilities to current and former employees of EU institutions and agencies. These employees participate in unique pension/sickness insurance schemes, to which they should contribute one third, while the other two thirds are paid by the EU budget. In contrast to other international organisations which have fully funded pension/sickness insurance schemes for their employees, the EU schemes operate as a notional fund with defined benefits. The end-2015 present value of these liabilities was €63.8, which we use. We do not dare to project this liability to end-2018, because it depends on many factors, including the December 2018 interest rates.

6 The 2015 consolidated accounts of the EU report €27.6 billion in contingent liabilities. €21.4 billion of these relate to guarantees given, primarily to European Investment Bank lending outside the EU, while another sizeable part relates to issues pending at courts (eg disputes about EU fines). We use the end-2015 €27.6 billion amount for end-2018.

- **Possible offsetting assets and claims:**

1 Since 1985, the UK has been entitled to receive a rebate amounting to 66 percent of its net contribution to the annual EU budget in the previous year. The initial formula to calculate the UK rebate has become rather complicated through the years, but the principle has not changed. If the UK leaves the EU on 1 January 2019, it should be entitled to a rebate on its 2018 budget contributions. This rebate is estimated by the UK Office for Budget Responsibility to be €4.6 billion).

2-4. Post-Brexit spending commitments in the UK: we estimate that out of the €248.8+€148.7+€182.5=€580 billion RAL, SLC and OPC post-Brexit spending plans from 2019-25, €28.9 billion will be spent in the UK, which implies a 5.0 percent spending share. This share is between the UK's 3.7 percent share in cohesion, regional and rural development spending (as we derived from the 2014-20 national allocations), and the UK's 6.4 percent historical share in other EU spending categories.

5-7. The UK may receive a rebate after its contribution to the €580 billion post-Brexit EU spending plans. However, the justification for that rebate also depends on the way the UK's share is calculated. If the UK's share is calculated from its rebate-adjusted historical gross contribution to the EU budget (which is 12.0 percent, and thus the UK would contribute €69.6 billion to post-Brexit spending), then a rebate may not be justified. But if the UK's share is calculated from its historical gross contribution to the EU budget not adjusted for the rebate, resulting in a share of 15.7 percent and a UK contribution to post-Brexit spending of €91.1 billion, then a rebate might be justified after this contribution. We estimate such a rebate to be €21.9 billion.

8 Property, plant and equipment assets of the EU amounted to €8.7 billion at the end of 2015. It is difficult to project the value of these assets to 2018, so we used this value.

9 Available-for-sale financial assets amounted to €9.6 billion at end-2015; we assumed this value for end-2018 too.

10 The EU had €21.7 billion in cash at the end of 2015; we assumed this value for end-2018 too.

11 Pre-financing (€45.2 billion at the end of 2015) is payments by the EU to provide cash in advance to cover future expenses for EU-funded projects. Given that advance payments indicate that a project's budget has been approved and is being implemented, we think that most pre-financing will actually be claimed by beneficiaries and a rather small share of it will be returned unspent to the EU. The next asset category, receivables and recoverables, includes €0.3 billion of pre-financing recovery at the EU-level: since we consider the full amount of receivables and recoverables, we do not consider any additional recovery from pre-financing.

12 Receivables (€0.6 billion at end-2015) and recoverables (€9.7 billion) refer to amounts of EU revenue that have not yet been received. The bulk of these amounts is budget contributions that member states failed to pay by the end of 2015. It is very likely that member states will actually pay, in which case these amounts will increase the EU's cash holdings. We use the end-2015 values for end-2018 too.

13 There was a small amount (€1.0 billion) of other assets on the EU balance sheet at the end of 2015, including inventories, intangible assets and other investments. The value of these assets has not changed much in the past decade, so we use the 2015 value in our Brexit bill calculations.

14 Loans granted by the EU correspond to EU borrowing on the liability side. If EU borrowing is considered as a liability to which the UK should contribute, the UK could also benefit from the repayment of the loans (should they not default). There are different options in terms of how to account for the EU loans and the corresponding EU liabilities in the Brexit bill.

15 EU officials should contribute one third to their pensions, which operate as a defined benefit scheme without an actual fund. In the 'steady-state', when the ratio of EU pensioners to EU employees is constant and there is no surprise interest rate and inflation changes, exactly one-third of the annual pension costs is paid by employees and two-thirds by EU member states. In the coming years, approximately one-third of the pension rights acquired so far will be paid by future EU employees (if the EU continues to exist), which could be considered in the Brexit bill as an offsetting factor.

16 There was a small amount (€0.5 billion) of contingent assets at the end of 2015, primarily related to the guarantees that the EU received. The value of these assets did not change

much in the past decade, so we use the 2015 value in our Brexit bill calculations.

17 We have already considered the full amount of €27.6 billion of contingent liabilities and the full amount of €0.5 billion of contingent assets. However, most likely, only a relatively small share of the net €27.1 billion contingent liabilities will turn to actual expenses. For example, the bulk of contingent liabilities relate to EU budget guarantees for EIB lending outside the EU. We presume that the EIB adopts proper risk management techniques, so only a small share of such loans will actually default. In order to provide a conservative estimate, we assume a 10 percent loss rate on guarantees and a 50 percent loss rate on other contingent liabilities, which eg depend on court rulings. Therefore, for the EU as a whole, we assume that €21.9 billion from the €27.1 billion amount of net contingent liabilities will not materialise.

4.10 Sensitivity

Our calculations are particularly sensitive to the UK's share. For example, if the share is 13.0 percent instead of 12.0 percent, then the UK's contribution to the post-Brexit €580 billion EU-wide RAL+SLC+OPC is €75.4 billion instead of €69.6 billion.

However, in our assessment other factors have much smaller impacts on the Brexit bill, for four main reasons (i) the total volume of possible commitments is fixed by the 2014-20 MFF, (ii) the EU budget cannot generate net financial value, (iii) actual budgetary developments alter the level and composition of assets and liabilities, but not their net balance, and (iv) the most uncertain items have rather small impacts on the bill. Some examples:

- The projections for the RAL and significant legal commitments (SLC) involve a degree of uncertainty. Yet since both are derived from the 2014-20 MFF, there is little uncertainty in the sum of these two planned spending categories, even if the division of this sum between the two categories is less certain.

- De-commitments (withdrawal of a previous budget commitment) have an impact on the future values of the sum of the RAL and SLC. In our calculations we consider the latest European Commission projections for de-commitments, which is probably based on an examination of past de-commitment practices. In any case, the total value of planned de-commitments in 2016-18, €13.4 billion, is relatively small compared to our estimated €397.4 billion of pending post-Brexit RAL+SLC spending commitments. If de-commitments are zero, the Brexit bill will increase by just €0.1 billion.

- The pension liability estimate strongly depends on the discount rate used to calculate the present value. Also, EU employees will likely contribute less than one third to the current pension liability, because of the particular discount rate used to calculate the share of the salaries that current EU employees contribute. Therefore, it is difficult to quantify the offsetting payments by EU employees in the future. However, since the contribution of the pension liability to the Brexit bill could be between €7.7-10 billion (depending on the UK's share), of which one third is the expected offsetting future contribution by EU staff, even radically different assumptions are unlikely to have an impact of more than +/- €1 billion.

- Contingent liabilities and assets are rather uncertain. However, the contribution of these liabilities and assets to the net Brexit bill is just €0.6 billion, so if actual outcomes turn out to be very different from our assumptions, the net Brexit bill may not be impacted by more than some million euros.

- We use the end-2015 values of the EU's financial assets when making estimates for end-2018, with the sole exception of EU loans (for which we adjusted the end-2015 value in line with the 2016 repayment by Hungary and the expected 2017-18 repayments by Romania). This assumption does not really alter the net Brexit bill calculations for end-2018, because the EU's annual budgets do not create new financial assets. A key principle for the EU annual budget is that it should be balanced, and if a yearly budget actually ends in a surplus, that surplus is carried over to the next year and reduces the budget contributions from member states. The values of EU financial assets (beyond EU loans) fluctuate between the years, but these fluctuations are primarily a result of different timings of payments to the EU budget and payments from the EU budget, not altering the net balance. However, the actual value of financial assets might impact the Brexit bill under the 'cancelling club membership' scenario (when liabilities are considered, but not the assets), because if, for example, liabilities are not paid down by cash, then both cash holdings and payment liabilities are higher.

- It is uncertain when member states will settle their delayed payment to the EU budget and what the stock of such payment delays will be at the end of 2018. However, these factors do not impact at all the Brexit bill under either the divorce or the cancelling club membership scenarios. If member states settle their obligations, EU cash holdings will go up, while if member states accumulate even more payment delays, EU cash holdings will go down. The sum of cash holdings and payment delays is not altered in these cases, and their sum matters for the Brexit bill.

- The book value of EU property has slightly increased in recent years. It might increase further because the EU will continue to invest in its own properties in the coming years. We did not consider a change in the value of properties from 2015 to 2018. If the increase in the value of EU properties follows the trend of the past few years, it could reduce the net Brexit bill by less than €0.1 billion under the divorce scenario (property is not considered for the cancelling club membership scenario). A potentially more important question for the divorce scenario is whether the book value is the right value to consider, or if market valuation should be used, which is currently not available.

5. Brexit bill choices

Several questions over the UK's Brexit bill face negotiators:

1. The very first question is the broad approach to the Brexit bill: cancelling club membership or divorce?

2. Should the UK contribute to all planned commitments and spending plans implied by the 2014-20 MFF, including commitments planned for after Brexit, ie commitments to be included in the 2019 and 2020 annual budgets? Most of these commitments will be actually paid by about 2025. Or should the commitments made only up to the Brexit date be considered? Most of these commitments will be actually paid by about 2023. Or instead of all future commitments, should planned payments be taken into account up to a cut-off date, eg 2020? Some factors to consider:

    - The UK agreed to the 2014-20 MFF.

    - In votes for the subsequent annual budgets, UK representatives both in the Council and in the European Parliament were less supportive.

    - When the UK agreed to the 2014-20 MFF, it did so in the belief that the UK would remain a member of the EU and benefit from EU membership. Therefore, the degree of the UK's access to the EU single market after Brexit, and other elements of the new EU-UK relationship, might also be factors to consider when answering the question above.

3. How should the UK's share of EU commitments be calculated? The UK's historical share of gross EU budget contributions seems to be a good candidate, but the question is whether the rebate-adjusted or non-adjusted gross contribution should be considered? The rebate has been in place since 1985 and aims to reduce the UK's contribution to the EU budget, which suggests that the UK's share of gross contributions should be adjusted by the rebate (leading to a 12.0 percent share considering the 2009-15 average). However, one might also argue that the rebate is a separate payment to the UK which aims to reduce the UK's net contribution, and therefore it is a separate matter to gross contributions. If such an interpretation is adopted, the gross contributions should not be adjusted by the rebate (leading to a 15.7 percent share considering the 2009-15 average). A further question is what time period to consider for the calculation of the UK's historical share, which has been volatile and influenced by, among other things, euro/pound sterling exchange rate movements.

4. Should the UK benefit from the (a) the rebate on the UK's contribution to the 2018 EU budget, ie the hypothetical last year of the UK's EU membership; and (b) the rebate on the UK's post-Brexit EU budget contributions to the €580 billion in EU spending. Since in 2018 the UK will still be a full EU member, we cannot find a reason for the UK not to benefit from a rebate on those payments. The rebate on post-Brexit UK contributions to the EU budget might perhaps be an issue for discussion. It could be argued that the rebate was an unfair reduction in the UK's contribution to EU budgets and since unanimity would have been needed to change it, it was politically impossible to change. But once the UK is out of the EU, that rebate should be removed. However, it could also be argued that the rebate was part of the rules governing the EU budget, and if the UK is asked to

contribute to post-Brexit EU budgets according to current rules, the current rules regulating the rebate should apply. We note that the possible rebate on the EU's post-Brexit EU budget contributions also depends on the way the UK's share of EU commitments is calculated, as we discussed under question 2 above.

5. Should the planned €28.9 billion of EU spending in the UK from 2019-25 be considered as an offsetting factor if the UK pays its full share of the €580 billion post-Brexit EU spending plans? An extreme answer might be no. However, it would be difficult to rationalise why the UK would not benefit from its share of the planned post-Brexit budget payments if it is asked to contribute to these post-Brexit spending plans. A related question: should the EU27 countries pay their share of the planned €28.9 billion of post-Brexit EU spending in the UK if the UK pays its share of the total €580 billion post-Brexit EU spending plans? A numerical example illustrates this issue. The straightforward way to calculate the UK's net contribution to the €580 billion of planned post-Brexit EU spending would be to multiply this amount by the UK's share (say 12 percent), which results in a gross UK contribution of €69.6 billion. Taking away from this amount the planned €28.9 spending in the UK results in a net UK contribution of €40.7 billion. This calculation implies that both the UK and EU27 countries pay their share of all EU28 planned post-Brexit spending, including in the UK. Another approach might be to take away the €28.9 billion of planned spending in the UK from the €580 billion total spend, which leads to €551 billion spending in the EU27. By multiplying this amount by the UK's 12 percent share, the UK's contribution becomes €66.1 billion. This calculation logic implies that while the UK pays it share of the post-Brexit spending plans in EU27 countries, the EU27 countries do not pay anything for the post-Brexit spending plans in the UK.

6. A related question is if the planned spending in the UK should be netted out or not from the Brexit bill. If it is not netted out, then the UK would contribute €69.6 billion to post-Brexit spending commitments (if its share is 12.0 percent) and benefit from €28.9 billion of EU spending in 2019-25. If it is netted out, then the UK's contribution is reduced to €69.6 minus €28.9 = €40.7 billion and all €28.9 billion of post-Brexit EU spending plans in the UK would be dropped. This choice does not alter the net Brexit bill, but has other important implications. From the perspective of the EU, not netting might seem preferable, because it would facilitate the implementation of planned spending in the annual EU budgets of 2019, 2020 and beyond. The UK's view might be different ("*the UK would spend this money more efficiently*"), though we note that stopping all EU projects in Britain overnight on the day of Brexit could be disadvantageous to the UK.

7. Should the planned EU payments to be spent in the UK be separated according to whether the beneficiary is a UK government institution or the UK private sector? Such a question might be important for the UK government. However, since the UK as a country is leaving the EU, in our calculations we consider the UK as a whole.

8. Should the UK contribute at all to the pension liability? The regulation says that "*Member States shall jointly guarantee payment of such benefits*". One possible interpretation is that once the UK leaves the EU, it will no longer be a guarantor and therefore it should not contribute. Another view could be that the UK should contribute to the pensions of British citizens only. A third interpretation (which we share) is that the nationality of EU employees does not matter: all EU

employees worked for the EU, from which the UK benefitted while it was a member, and since there is no actual fund behind the pension scheme, but only accumulated pension rights, the UK should contribute to the pension rights earned by all EU employees up to the Brexit date.

9. Given the great sensitivity of the pension liability to the discount rate used, should the Brexit bill calculations consider the interest rate at the time of the Brexit date, or should it consider a historical average, similarly to the calculation of EU employee contribution rates?

10. Should the UK pay its contribution to the post-Brexit spending plans upfront in one go? Or should the UK contribute annually when the spending becomes due?

11. How should those assets that have an element of contingency be treated? For example, while we believe that Ireland will not default on its loans from the EU, this will be known with certainty only after Ireland has fully repaid its loans, which is expected to happen in 2042 according to the current repayment schedule. The expenses from EU contingent liabilities will be also be known only several years from now. There are a number of options for taking into account the liabilities that have a degree of contingency:

    - The UK pays its full share of these liabilities upfront and is reimbursed by the EU in the future if losses from these liabilities do not materialise.
    - The UK does not pay anything upfront on Brexit, but pays in the future if and when a loss from a particular liability materialises.
    - The UK pays the estimated expected loss from these contingent liabilities, without any later clearing.
    - The UK pays the estimated expected loss from these contingent liabilities, but the EU and the UK later settle any deviation between the actual loss and the expected loss.
    - The EU balance sheet includes a €2.0 billion guarantee fund for external actions. This asset, or a part of it, would not be apportioned to the UK on Brexit, but its unused part would be apportioned in later years, or if this fund proves to be insufficient to cover actual losses, the UK will pay. While this fund guarantees extra-EU loans, as a special Brexit agreement, the UK's share of it could be considered as a guarantor of the UK's share in intra-EU financial assistance loans too.

12. What about future pension contributions of EU staff, which also involve a degree of contingency? While we believe that the EU will not be dissolved and therefore EU employees in the future will contribute to pension payments, there is a non-zero probability of EU dissolution. The possible time horizon is even longer in this case: an employee who joined the EU recently might retire about 40 years from now and thereafter could benefit from pensions for 20, 30 or even more years. This implies that the final date when an EU pensioner might claim part of her/his pension rights from the period when the UK was an EU member could be as far ahead as 70 years after Brexit. We see two possible options, analogous to the first two options of the previous point:

    - The net UK payment upon Brexit is not reduced by one-third of pension rights, but the UK is gradually reimbursed as EU employees pay their contributions.

- The net UK payment on Brexit is reduced by one-third of pension rights, but if for any reason the EU dissolves, the UK will contribute to those pension rights which were earned during the UK's EU membership.

These twelve questions highlight that the size of the Brexit bill will depend on fundamental political compromises and choices. Depending on the results of these political discussions, very different Brexit bills might arise.

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Annex: Our calculation method to project RAL and significant legal commitments to 2018 and to project the share of the UK in these planned expenditures

The purpose of this annex is to describe the method and the assumptions behind the projections for the outstanding budget commitments (RAL) and the significant legal commitments (SLC) from one year to the next, both for the total amounts and for the part to be spent in the UK and other member states.

The simple framework for our projections

Our method is relatively simple. It consists of making informed guesses about the evolution of three flows – commitments, payments and de-commitments – until 2020, using the multiannual financial framework (MFF) as a constraint.

Where possible, we used publicly available projections made by the Commission. Specifically, total flows of payments and de-commitments come from European Commission (2016d). The only twist is that we also complemented the payment flow with an additional stream of payments stemming from assigned revenue[15]. For commitments, we resort to the 2017 draft general budget European Commission (2016f), and specifically its financial programming section, which was the primary source that European Commission (2016d) also used.

The flows for any given year are then added/subtracted to the stocks of the previous year to yield the new stock. This is the interpretation of Figure 4 in the main text, which shows how the stocks of liabilities evolve from one year to the next.

Splitting overall flows and stocks by ESIF/non-ESIF and by Member State

We would like to know the share of overall stocks of liabilities that would ultimately end up as EU expenditure in the UK, if the UK remained a member of the EU. We would also like to calculate the same share of the 13 new EU member states too, because the UK rebate depends on expenditures in these member states.

Ex-ante, we only know the amounts allocated to each Member State for the European Structural and Investment Funds (ESIF), which was agreed along with the 2014-2020 MFF. By now, all ESIF spending plans are incorporated in operational programmes. ESIF commitments relate to the bulk of significant legal commitments (90% in 2015) for expenditure headings H1b (economic, social and territorial cohesion) and H2 (sustainable growth – natural resources), as indicated by Table 14.

[15] It is explicitly mentioned that the commitments and de-commitments forecasts include appropriations from assigned revenue, which is not the case for payments.

Table 14: The composition of significant legal commitments (SLC) at the end of 2015, € billion

Multiannual actions under shared management	**343.7**	
ESIF (H1b, H2)		*339.3*
non-ESIF (H3)		*4.4*
Other (non-ESIF) SLC:	**32.6**	
European Fund for Strategic Investments (EFSI)		*16.0*
Connecting Europe Facility (CEF)		*10.1*
Copernicus		*2.9*
Fisheries agreements		*0.4*
Galileo		*0.1*
Protocol with Mediterranean countries		*0.0*
Other contractual commitments		*3.1*
Total	**376.3**	

Source: European Commission (2016c). Note: H1b = economic, social and territorial cohesion, H2 = sustainable growth – natural resources, H3= security and citizenship.

The following five funds fall under the ESIF:

- H1b: European Regional Development Fund (ERDF),
- H1b: Cohesion Fund (CF),
- H1b: European Social Fund (ESF),
- H2: European Agricultural Fund for Rural Development (EAFRD),
- H2: European Maritime and Fisheries Fund (EMFF).

However, for non-ESIF flows (i.e. commitments, payments and de-commitments) we do not know the ex-ante distribution among member states. Publicly available information is available only for the previous budgets.

We perform our analysis in two steps.

1. Splitting the end-2015 RAL between ESIF and non-ESIF components,
2. For each year in 2016-2020, we split both RAL and SLC between ESIF and non-ESIF components.

As regards the first task, using information from European Commission (2015a) and European Commission (2016b), we deduce the part of the end-2015 RAL due to ESIF 2014-2020 unpaid commitments (Table 15). The residual is the non-ESIF component which contains all other budget commitments pending payments. Thereby, we split the stock of 2015 RAL between ESIF and no-ESIF, while such decomposition was already provided for the SLC (see Table 14).

The second step involves taking the end-2015 decomposition of RAL and SLC as the starting-point and then using simple stock-flow equations as described below.

For commitments, the division between ESIF and non-ESIF is straightforward as the financial programming goes into more detail, i.e. even more detailed than budget Headings. In other words, the financial programming lists commitments by sub-heading which permits us to sum those sub-headings related to ESIF (flow (a) in the equations) (Table 16), sub-headings pertaining to non-ESIF significant legal commitments and (flow (b) in the equations) (Table 17), and finally sub-headings that do not form part of significant legal commitments, i.e. they are not legally committed before they are entered in the budgets as commitments (flow (c) in the equations). It goes without saying that the sum of the three equals the overall commitments flow.

For payments, we have to make some additional assumptions. The aim is to separate the overall payments flows into payments for ESIF 2014-2020 commitments and all other commitments (non-ESIF). All the assumptions we make concern the payments toward ESIF 2014-2020, which is the only flow we calculate directly; non-ESIF payments are obtained simply by subtracting ESIF payments from the overall.

In order to estimate annual payments, we use ESIF 2014-2020 approved amounts under operational programmes (which by the end of 2015 are practically equal to the entirety of national allocations agreed in 2013). Each year's payments are projected using the following (expressed in percent of that total allocation):

- The schedule for interim payments for CF, ESF, ERDF (funds under Heading 1b) found in European Commission (2016d) (Table 18),
- The pre-financing schedules for all ESIF are from European Commission (2015b) (Table 19),
- The historical (2007-2013 programming period) rate of EAFRD (Heading 2) interim payments is from European Commission (2008, 2009, 2010, 2012, 2013, 2016g) (Table 20),
- We assume the same rate of interim payments for the EMFF (Heading 2) as for the H1b funds.

For de-commitments, we make the same assumption as in European Commission (2016d), i.e. no de-commitments for ESIF 2014-2020.

Breakdown by member state

The final step is to estimate the UK's share of each of the four liability aggregates: ESIF SLC, non-ESIF SLC, ESIF RAL, non-ESIF RAL. Applying the same method, we do the same for the 13 Member States that joined the EU from 2004 onwards, as a large share of EU spending that ends up in these countries enters the calculation of the UK correction (commonly known as the "UK rebate").

For all aggregates for which allocations by Member States are known (ESIF SLC, the non-ESIF SLC, ESIF RAL), we assume that all related UK flows (commitments, payments, de-commitments) are proportional to the UK shares in these allocations. Shares vary by expenditure heading and sub-heading (i.e. the allocation to the UK for sub-heading of H1b "less developed regions" vs. sub-heading EAFRD of H2 are different) and we chose to be as granular as possible (i.e. apply the UK share to the flows per sub-heading). The UK shares per sub-heading are shown in Table 21 for ESIF allocations and in Table 22 for non-ESIF allocations. We apply the latter to estimate the UK share in non-ESIF SLC. Note that for the Copernicus, EFSI, Galileo and other sub-headings denoted by (*), no allocation by Member State was available. For these sub-headings, we took the UK share in non-ESIF expenditure in 2007-2015 (see below).

On the other hand, since the non-ESIF RAL is not allocated by Member States, we simply divide the end-of year stock of the liability at the EU-level by the average share of non-ESIF payments to Member State from the annual budget of years 2007-2015. For the UK, that amounts to 6.4%.

When estimating the share of the 13 new EU Member States, we apply the same logic. The only difference is that the calculation of the UK rebate requires adjusting for spending in these Member States only insofar as this spending is not related to agricultural direct payments and market-related expenditure as well as that part of rural development expenditure originating from the EAGGF, Guarantee Section (see Box 2 in section 4.4). Of these four liability aggregates, such expenditure is contained only in the non-ESIF RAL and must, therefore, be excluded for the purposes of the calculation. As an approximation, we calculate the 2007-2015 average share of such expenditure (we considered code 2.0.1 in the tables published by the European Commission[16]) in non-ESIF related expenditure and exclude it. We also use the 2007-2015 average shares for each of the 13 Member States in that residual RAL in order to apportion it.

The key equations of our calculations:

$$RAL_t = RAL_{t-1} + C_t - P_t - D_t$$

$$RAL_t = RAL_t^E + RAL_t^O$$

$$SLC_t = SLC_t^E + SLC_t^{OL}$$

$$C_t = (a) + (b) + (c)$$

$$P_t = (d) + (e)$$

$$D_t = (f) + (g)$$

$$RAL_t^E = RAL_{t-1}^E + (a) - (d) - (f)$$

$$RAL_t^O = RAL_{t-1}^O + (b) + (c) - (e) - (g)$$

$$SLC_t^E = SLC_{t-1}^E - (a)$$

$$SLC_t^{OL} = SLC_{t-1}^{OL} - (b)$$

$$SLC_t = SLC_{t-1} - (a) - (b)$$

RAL_t: the stock of reste a liquider at the end of year t

SLC_t: the stock of outstanding legal commitments at the end of year t

C_t: the flow of (new) budgetary commitments during year t

P_t: the flow of payments during year t

D_t: the flow of decommitments during year t

RAL_t^E: the stock of reste a liquider related to the ESIF for the 2014-2020 period at the end of year t

RAL_t^O: the stock of reste a liquider related to other expenditure at the end of year t

SLC_t^E: the stock of outstanding legal commitments related to the ESIF for the 2014-2020 period at the end of year t

[16] *Available at http://ec.europa.eu/budget/library/biblio/documents/2015/internet-tables-2000-2015.xls.*

SLC_t^{OL}: the stock of outstanding legal commitments related to other expenditure at the end of year t

(a): the part of budgetary commitments owing to significant legal commitments made under the ESIF 2014-2020

(b): the part of budgetary commitments owing to significant legal commitments unrelated to the ESIF 2014-2020

(c): the part of budgetary commitments that do not derive from already made significant legal commitments

(d): the part of payments towards budgetary commitments made under the ESIF 2014-2020

(e): the part of payments towards budgetary commitments unrelated to the ESIF 2014-2020

(f): the part of de-commitments of budgetary commitments made under the ESIF 2014-2020

(g): the part of de-commitments of budgetary commitments unrelated to the ESIF 2014-2020

Data sources:

C_t: Financial Programming, Draft Budget 2017

P_t: forecast in SWD (2016) 299 + payments made from assigned revenue appropriations

D_t: Financial Programming, Draft Budget 2017

(a): Financial Programming, Draft Budget 2017; commitments for Heading 1b (excluding the contribution of the Cohesion Fund to the Connecting Europe Facility programme), EAFRD and EMFF

(b): Financial Programming, Draft Budget 2017; pace of commitments (as % of stock of total commitments) for the AMIF, ISF, CEF, Copernicus. No reduction is foreseen for the EFSI commitment. For the residual, straight line commitment rate assumed (20% per year)

(c): $C_t - (a) - (b)$

(d): based on the rules for pre-financing (initial and annual), interim payments schedule for ERDF, CF and ESF (extended to FEAD, EMFF) and interim payments profile for EAFRD for 2007-2013.

(e): $P_t - (d)$

(f): as in SWD (2016) 299, set to zero

(g): D_t

RAL_{2015}: consolidated annual accounts, 2015

SLC_{2015}: consolidated annual accounts, 2015

RAL_{2015}^{E}: Analysis if the budgetary implementation of the European Structural and Investment Finds in 2015; calculations

RAL_{2015}^{O}: $RAL_{2015} - RAL_{2015}^{E}$

SLC_{2015}^{E}: consolidated annual accounts, 2015

SLC_{2015}^{OL}: consolidated annual accounts, 2015

Table 15: RAL end-2015, broken down by ESIF/non-ESIF 2014-20

	€ billion	% of total
RAL, total	217.7	
RAL , ESIF 2014-2020	103.7	47.7%
RAL, non-ESIF 2014-2020	114.0	52.3%

Sources: Bruegel calculations, European Commission (2015a, 2016b, 2016c)

Table 16: ESIF 2014-20 commitments, by expenditure sub-heading (in % of SLC at the end of 2015)

	2016	2017	2018	2019	2020
H1b					
Less Developed Regions	18.4%	19.4%	20.1%	20.7%	21.4%
Transition Regions	17.8%	19.9%	20.3%	20.7%	21.2%
More Developed Regions	18.8%	19.7%	20.1%	20.5%	20.9%
Outermost and northern sparsely populated regions	19.2%	19.6%	20.0%	20.4%	20.8%
Cohesion Fund	18.6%	19.3%	20.0%	20.7%	21.4%
European Territorial Cooperation	11.8%	21.8%	21.7%	22.1%	22.6%
Youth Employment Initiative	0.0%	0.0%	0.0%	0.0%	0.0%
FEAD	19.2%	19.6%	20.0%	20.4%	20.8%
H2					
EAFRD	24.5%	18.9%	18.9%	18.8%	18.8%
EMFF	19.3%	19.6%	20.1%	20.3%	20.7%

Source: European Commission (2016f)

Table 17: Commitments, non-ESIF significant legal commitments (in % of amount outstanding in 2015)

	2016	2017	2018	2019	2020
H3-AMIF	28.7%	26.0%	14.8%	15.2%	15.3%
H3- ISF	20.7%	23.7%	18.5%	18.0%	19.1%
CEF	26.1%	17.5%	18.2%	18.7%	19.6%
Copernicus	17.4%	18.0%	19.1%	26.2%	19.3%
EFSI	30.4%	39.4%	29.6%	0.3%	0.3%
Galilleo	18.6%	19.6%	17.8%	16.5%	27.4%
Residual	20.0%	20.0%	20.0%	20.0%	20.0%

Source: European Commission (2016f)

Table 18: Forecast profile of interim payment claims for H1b ESIF (% total allocation)

	2014	2015	2016	2017	2018	2019	2020
ESF	0.0%	0.3%	4.1%	10.8%	12.9%	15.1%	16.0%
ERDF	0.0%	0.3%	3.8%	10.5%	13.5%	15.3%	16.5%
CF	0.0%	0.0%	4.0%	9.7%	11.0%	13.0%	15.0%

Source: Commission (2016d).

Table 19: Pre-financing schedule for ESIF

Pre-financing schedule for ESIF (% total allocation)								
FUND(S)		2014	2015	2016	2017	2018	2019	2020 to 2023
ERDF – ESF - COHESION FUND – EMFF	Initial	1% or 1.5%	1% or 1.5%	1%	-	-	-	-
ERDF – ESF - COHESION FUND – EMFF	Annual	-	-	2%	2.63%	2.75%	2.88%	3%
EAFRD	Initial	1%	1%	1%	(no annual pre-financing)	(no annual pre-financing)	(no annual pre-financing)	(no annual pre-financing)

Pre-financing schedule for ESIF (% total allocation) – adapted for use								
FUND(S)		2014	2015	2016	2017	2018	2019	2020 to 2023
ERDF – ESF - COHESION FUND – EMFF	Initial	1.25%	1.25%	1%	-	-	-	-
ERDF – ESF - COHESION FUND – EMFF	Annual	-	-	2%	2.63%	2.75%	2.88%	3%
EAFRD	Initial	1%	1%	1%	0%	0%	0%	0%

Source: European Commission (2015b).

Table 20: EAFRD interim payments schedule (in % of the allocation), 2007-2013

	2007	2008	2009	2010	2011	2012	2013	EAFRD 2007-2013
Interim payments	2.5%	6.3%	8.5%	11.1%	12.3%	13.6%	13.5%	67.8%

Sources: European Commission (2008, 2009, 2010, 2012, 2013, 2016g).

Table 21: ESIF 2014-2020, % allocated to the UK by sub-heading

H1b	
Less Developed Regions	1.5%
Transition Regions	7.1%
More Developed Regions	9.9%
Outermost and northern sparsely populated regions	0.0%
Cohesion Fund	0.0%
European Territorial Cooperation	9.0%
Youth Employment Initiative (additional allocation)	6.4%
FEAD	0.1%
H2	
EAFRD	5.2%
EMFF	4.2%

Source: http://ec.europa.eu/budget/mff/preallocations/index_en.cfm.

Table 22: non-ESIF SLC, % allocated to the UK by sub-heading

H3-AMIF	16.26%
H3- ISF	0.00%
CEF	0.00%
Copernicus*	6.39%
EFSI*	6.39%
Galilleo*	6.39%
Residual*	6.39%

Sources: Regulations (EU) No 513/2014, 514/2014, 515/2014, 516/2014 and http://ec.europa.eu/budget/mff/preallocations/index_en.cfm.

**Note: no known allocations per Member State for these items; the average share of the UK in non-ESIF payments from 2007 to 2015 is used.*