Introducing the Currency and Residual Maturity Breakdowns in the International Investment Position of France

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Introducing the Currency and Residual Maturity Breakdowns in the International Investment Position of France

Contribution to the IMF 2016 Balance of Payments Committee
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1. Introduction

In the framework of the G20 data gaps initiative, launched in order to improve the availability of statistics following the 2007-2008 financial crisis, the Banque de France has started to compile and disseminate the currency composition of the international investment position.

This paper is intended to keep the IMF Committee on Balance of Payments updated on the developments undertaken to achieve the goal, and to present the ongoing work on the residual maturity breakdown. A companion paper attached as Appendix I discusses more in depth this latter topic.

2. Overview of recent developments and structure of the France's international investment position

France's international investment position is compiled quarterly along with detailed balance of payments[2], in accordance to the Sixth Edition of the Balance of Payments and International Investment Position Manual[3]. The data are published approximately three months after the end of the quarter under review. Besides, once a year, the balance of payments and international investment position data from the last three years are revised while the revisions are reported in the *Annual Report – the French Balance of Payments and International Investment Position*[4].

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[1] This paper has been prepared by Gwenaëlle Fégar and benefited from comments and review by Bertrand Collès. The companion paper dealing with the impact of unexpected events (early redemptions, embedded options) on measures of the residual maturity has been prepared by Pierre Bui Quang.

[2] France's Balance of Payments is also compiled on a monthly basis.

[3] Complete document is available at the following link:
https://www.imf.org/external/pubs/ft/bop/2007/pdf/bpm6.pdf

[4] The schedule of statistical publications is available on the Banque de France's website *https://www.banque-france.fr/en/economics-statistics/calendar.html* and the annual report is available at the following link *https://www.banque-france.fr/en/economics-statistics/balance-of-payments-and-other-*

a. Structure and evolution

The financing of accumulated current account deficits since 2005 leads to a net liability of France's international investment position. This contrasts with the previous period 2000-2005 when it was close to balance or in surplus. France's net liability position was fairly stable between 2014 and 2015, from EUR 362 billion to EUR 358 billion, which accounts for 16.4 % of GDP (well below the indicative "alert threshold", set by the European Commission at 35 % of GDP). Looking further within the structure of France's international investment position, which, as a whole, has not changed much since 2012, evolutions differ across financial instruments (chart 1).

- The *direct investment position* shows large net foreign assets because outward investment flows have exceeded inward flows every year during the last 25 years, with the exception of 2013 and 2015 in the recent period. This reflects the globalization strategies of French companies. The net foreign asset position at mixed value stood close to EUR 500 billion at the end of 2015. Equity capital accounted for about 95% of year-to-year net changes.

- The *portfolio investment position* shows net foreign liabilities at EUR 758 billion compared to EUR 785 billion in 2014. The composition of assets French residents' portfolio in securities issued by non-residents remains stable: long-term debt securities account for almost two thirds, equity securities and investment fund shares account for more than a quarter and short-term debt securities account for less than 8 %. At the end of 2015, non-residents held EUR 3 082 billion in securities issued by French residents. The share of non-residents in the holdings of securities does not move significantly from a year to another.

- The net foreign liability on *financial derivatives* stays at EUR 31 billion in 2015, compared to 59 billion in 2014. Swaps account for the bulk of the portfolio, at 60 % of the overall market value of the outstanding assets and liabilities in financial derivatives, while options account for 34 % and forwards and futures for 6 %.

- The *loan-deposit position* for all sectors together shows a net liability as it did in previous years. In 2015, the net liability stays at EUR 190 billion, compared to EUR 100 billion in 2014. In 2015, the MFIs' loan-deposit position shows a net liability of EUR 59 billion, whereas it shows net assets of EUR 66 billion in 2013 and EUR 44 billion in 2014. This example illustrates the relevance of crossing instruments and sectors to identify specific volatility patterns, changes in trends, and thus, select topics deserving a more in-depth analysis, notably via micro-datalinking exercises.

- The *Banque de France's net assets vis-vis the rest of the world*, including its positions in securities and reserve assets, increased by EUR 28 billion to stand at EUR 120 billion at the end of 2015. Acquisitions of securities, mainly carried out in the framework of the eurosystem's asset purchase program, stood at EUR 11 billion. In addition, reserve assets increased by EUR 9 billion.

Chart 1: The structure of international investment position
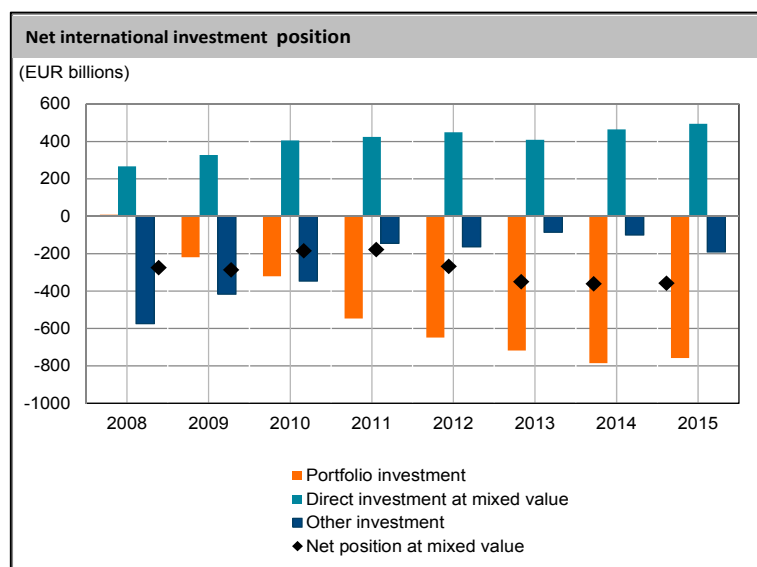
Source: The French Balance of Payments and International Investment Position Annual Report, 2015

The net external debt stays at 37.3 % of GDP at the end of 2015 (EUR 813 billion) and largely stems from the financing by non-resident investors of a substantial share of the increase in the general government debt.

    b.   Effect of the changeover to BPM6 on France's international investment position [5]

As from 2014 onwards, the Banque de France publishes its international investment position in accordance to the Sixth Edition of the Balance of Payments and International Investment Position Manual developed by the IMF. Consistent back time series using the new methodology are also available from 2008.

As well as introducing a new methodology, the Banque de France also took the opportunity during the transition to BPM6 to complete the revision of its time series, incorporating better quality data, such as the results of surveys established in recent years, or correcting breaks.

The transition to BPM6 caused the net international investment position to be revised up by EUR 16 billion on average between end-2008 and end-2012, or approximately eight-tenths of a percentage point of GDP.

In terms of the stock of securities (portfolio investment), assets were revised upwards to take better account of foreign securities owned by non-financial companies and households and held in securities account abroad. Also, more detailed identification of counterparties to LCH CLEARNET trades and the inclusion of new data on repos involving government securities made it possible to refine the estimated holdings of French securities by non-residents (liabilities).

The largest revisions concerned "other investments", i.e. essentially stocks of lending and borrowing. Consistent with the revision of flows, the bulk of the upward revision to assets and

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[5] For more details, see complete article on the impact of BPM6 introduction, available at the following link: *https://www.banque-france.fr/fileadmin/user_upload/banque_de_france/publications/Quarterly-Selection-of-Articles_37_2015-Spring_5_Preparing-FR-Balance.pdf*

liabilities vis-à-vis non-residents stemmed from the inclusion of data linked to LCH. Clearnet's clearing business in government debt securities, which provided a clearer view on owners of securities in repos operations. Furthermore, on average between end-2008 and end-2012, the Banque de France's net position was revised from EUR 87 billion to EUR 78 billion owing to recognition of IMF SDR allocations in the liabilities of the Banque de France, which resulted in total liabilities being revised upwards by about EUR 10 billion.[6]

Chart 2: International investment position at mixed value

(EUR billions)
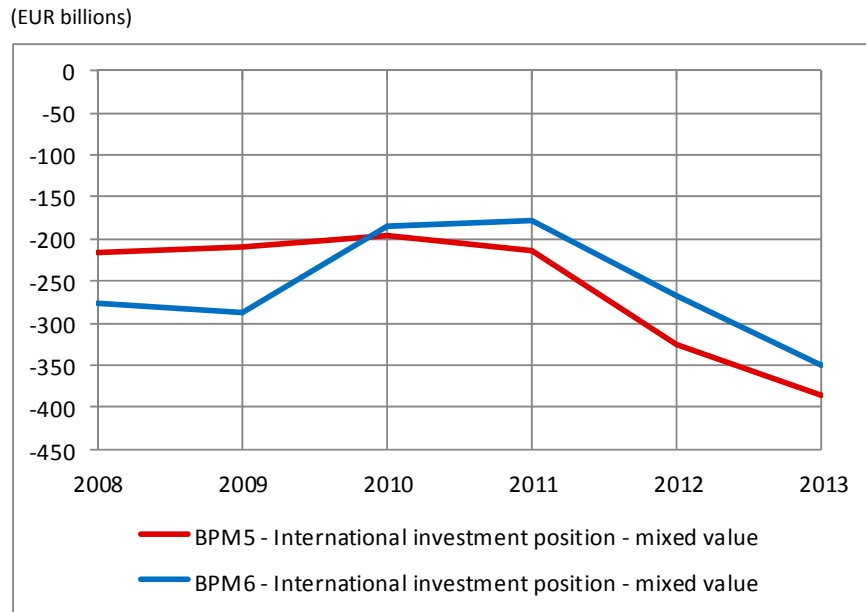
Source: Banque de France

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[6] As a corollary, flows of reserve assets were reassessed by the same amount.

3. Currency breakdown of the international investment position

a. Analytical value

As shown in table 1 below, the international investment position is the result of cumulative current account balances and valuation effects. Hence, it is important to look at changes in the market value of bonds in share prices but also to comprehend changes in the euro exchange rate.

Table 1: The French international investment position from the end of 2014 to the end of 2015

Integration of flows and positions between the balance of payments and the international investment position								
(EUR billions)								
	Stocks end 2014	Balance of payments flows 2014 (a)	Changes attributable to changes in exchange rates, market prices and other adjustments (a)				Total variations between end 2014 and end 2015 (a)	Stocks end 2015
			Total	Changes in exchange rates	Change in market prices	Other adjustements		
	1	2	3				4 = (2 +3)	5 = (1+4)
Direct investisments (mixed value)	465	-2	32	34	-1	0	30	495
Portfolio investisments	-785	54	-26	3	-35	6	28	-758
Financial derivatives	-59	11	17	0	17	0	28	-31
Loan-deposit position	-100	-77	-14	-4	0	-10	-91	-191
Reserve assets	118	7	2	3	-1	0	9	127
Balance	-362	-7	11	36	-21	4	4	-358
Gross external debt	4 490	5	79	108	-38	10	84	4 574
Net external debt	780	4	29	20	-13	22	33	813

Source: The French Balance of Payments and International Investment Position Annual Report, 2015

Given the level of variations attributable to changes in exchange rates, a currency breakdown therefore proves to be key data to analyze changes in the National Wealth[7] and develop a better understanding of the investment choices of residents.

The currency composition of the international investment position can also provide warnings of emerging risks and vulnerabilities, evaluating the debt exposures of different resident sectors to foreign currencies, and their vulnerability in the event of a currency appreciation or depreciation.

b. Current implementation

Currently, the Banque de France meets all the requirements described above, with the exception of those related to the notional value of foreign currency financial derivatives.

Surveys involved to establish France's international investment position have been designed to include information about the denomination currency. Till now this data was used for ad hoc analysis but did not enter into the compiling process of the IIP. In 2016 processes have been set up to create series, implying process adjustments and codification issues to leverage these existing data.

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[7] See also IMF's Policy Development and Review Department (2007), "Data Needs In The Areas Of International Investment Positions And Balance Of Payments Arising From The 2007 Decision On Bilateral Surveillance", BOPCOM-07/23, for a presentation of wealth effect in the IIP. Available at the following link *https://www.imf.org/external/pubs/ft/bop/2007/07-23.pdf*

Table 2: Current Banque de France surveys collecting currency breakdown

Statistical report	Reporting entities	Type of survey	Frequency	Collected currencies	BoP/IIP items
DEVISITU	Financial intermediaries subject to the supervision of the ACPR (credit institutions and investment firms)	Census	Quarterly	EUR / USD / CHF / JPY / GBP / AUD/ BGN CZK / PLN / SEK / DKK / HUF / RON / HRK / CNY / Other currencies	Other investment
PROTIDE	Custodians	Census	Monthly and quarterly	EUR /USD / Other currencies	Portfolio investment
ECO/EFI	Industrial and commercial enterprises	Sample survey	Quarterly and annually	EUR / USD / Yen / Other currencies	Direct investment Other investment

Source : Banque de France

In addition, a new survey has been implemented last year so as to be able to fill tables A9-I-Ib / 2b and table A9-III-Ib "Foreign Currency derivatives : notional value of contracts with non-residents" of the Balance of Payments and International Investment Position Manual Sixth Edition (BPM6)[8]. This survey named CHDB (reporting on off-balance sheet items denominated in foreign currency) is conducted on a quarterly basis from a sample of resident financial intermediaries. This new survey is part of a global project to enhance the statistical data collection on crossborder derivatives. The survey covers positions recorded at notional value and broken down into paid foreign currency and received foreign currency. The breakdown by currency covers seven categories: euro, U.S dollar, Yen, Pound sterling, Swiss franc, Yuan Renminbi and others. The results of the first round (2015Q4) make the starting point of the time series. A first publication will be considered once two full years are available. In 2015, the Banque de France has started publishing currency breakdown of derivatives at market value.

c. Data published in 2016 (reference year 2015)

The Banque de France published in June 2016 the currency composition of the external debt in the framework of the "Annual Report on Balance of Payments and International Investment Position – year 2015". Gross external debt[9] stood at EUR 4 574 billion at the end of 2015, of which 3 362 billion are denominated in euro, 793 billion in US dollars, 191 billion in pounds sterling, 91 billion in yen, 8 billion in renminbi and 129 billion in other currencies. Considering assets, net external debt stood

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[8] Specified tables are available in Appendix II.

[9] Gross external debt consists solely of financial liabilities vis-à-vis non-residents in the form of debt instruments (money market securities, bonds, loans), and does not include equities or financial derivatives. The debt is expressed in gross terms, since French residents' assets are not subtracted from their liabilities. On the other hand, their assets are subtracted to calculate the net external debt, which is the net position in debt instruments.

at EUR 813 billion including reserve assets and 863 billion excluding reserve assets, of which 620 billion denominated in euro.

Table 3: External debt broken down by major currencies[10]

| EUR billions	2013			2014			2015		
	Assets	Liabilities	Net	Assets	Liabilities	Net	Assets	Liabilities	Net
TOTAL - External Debt excluding reserve assets	**3 379**	**4 103**	**-724**	**3 670**	**4 490**	**-820**	**3 591**	**4 574**	**-863**
Euro	2 592	3 106	-514	2 763	3 354	-591	2 670	3 362	-620
U.S. dollar	486	664	-178	544	727	-183	566	793	-182
Yen	109	61	48	157	94	63	152	91	61
Pound sterling	88	145	-56	98	176	-78	104	191	-86
Yuan	2	1	0	8	9	0	6	8	-1
Other currencies	102	126	-24	100	130	-31	93	129	-34
Monetary Finanial Institutions and Central Bank	**1 735**	**1 860**	**-125**	**1 884**	**2 042**	**-158**	**1 877**	**2 064**	**-186**
Euro	1 162	1 175	-13	1 204	1 252	-48	1 189	1 226	-37
U.S. dollar	342	462	-120	387	505	-117	388	537	-148
Yen	102	50	52	159	84	74	146	81	64
Livre sterling	61	88	-27	69	105	-36	83	123	-40
Yuan	0	0	0	6	7	-1	4	5	-1
Other currencies	68	85	-17	59	90	-31	67	91	-24
General government	**81**	**1 191**	**-1 110**	**92**	**1 326**	**-1 234**	**93**	**1 322**	**-1 230**
Euro	76	1 142	-1 066	87	1 278	-1 192	87	1 268	-1 181
U.S. dollar	5	35	-30	5	35	-30	6	43	-38
Yen	0	2	-1	0	1	-1	0	1	-1
Pound sterling	0	8	-8	0	7	-7	0	5	-5
Yuan	0	0	0	0	0	0	0	0	0
Other currencies	0	6	-6	0	5	-5	0	5	-5
Other sectors	**1 219**	**678**	**541**	**1 329**	**751**	**577**	**1 244**	**819**	**546**
Euro	1 117	502	614	1 225	542	683	1 142	593	621
U.S. dollar	65	110	-46	72	131	-59	81	151	-25
Yen	6	8	-3	-4	8	-11	5	7	-2
Pound sterling	17	36	-18	18	49	-31	11	48	-35
Yuan	0	1	-1	0	1	-1	0	1	0
Other currencies	14	20	-6	17	20	-4	6	20	-12
Inter-company loans	**344**	**373**	**-29**	**365**	**370**	**-5**	**377**	**369**	**8**
Euro	237	287	-50	248	282	-34	252	275	-23
U.S. dollar	75	58	17	80	56	24	91	62	29
Yen	2	1	1	2	1	1	2	1	0
Pound sterling	10	13	-3	11	15	-5	10	15	-6
Yuan	1	0	1	2	1	1	2	2	0
Other currencies	20	14	5	23	15	9	20	13	7

Source : Annual report on the Balance of Payments and International Investment Position 2015, Supplementary statistical tables

The crossing between currency and sector enables to capture at a glance the essential structural elements and trends at a macro-level. It makes a good starting point for a range of analysis.

Looking specifically at the MFIs' loan-deposit position for instance, the chart 3 highlights the net borrowing loan-deposit position, stemming from a borrowing position in euro and a shrinking of the net lending position in foreign currencies. The net lending position in foreign currencies decreased from 52 billion in 2014 to 13 billion in 2015 primarily because of increased borrowing, in yen, in US dollars and to a lesser extent in pounds sterling.

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[10] Table 2 does not include reserve assets.

Chart 3: MFIs' loan-deposit position
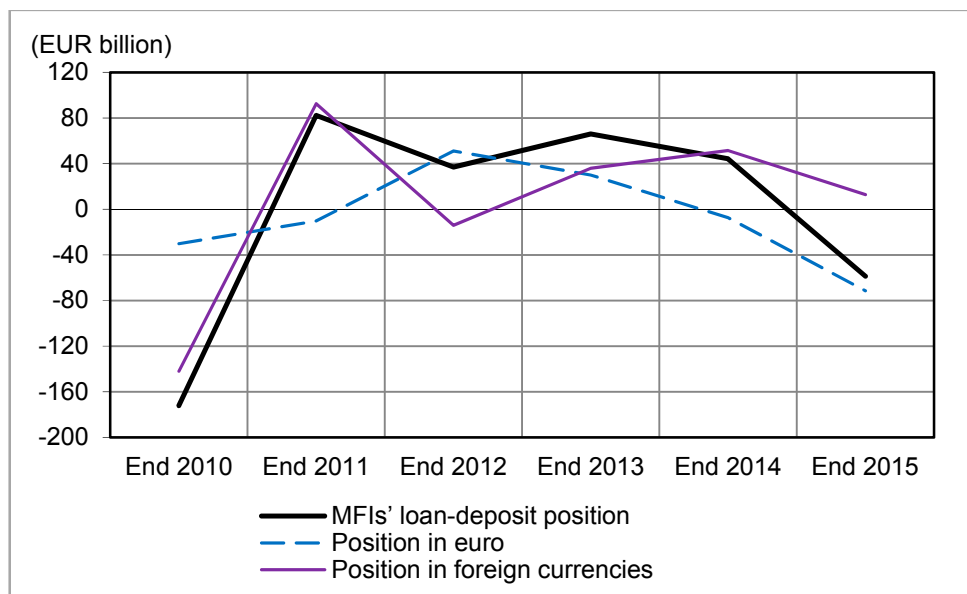
Source : Banque de France

4. Remaining maturity breakdown

a. Preliminary remarks

The G-20 Data Gaps Initiative has taken on board the conclusion that the remaining maturity[11] breakdown would be very helpful, among others, to support the analysis of the currency composition and thus, support a better analysis of vulnerabilities at the macro-level. Indeed, if residents of a country hold high levels of short-term borrowing vis-à-vis the rest of the world and long-term lending to the rest of the world, they are running a funding risk due to maturity mismatches. In case of liabilities denominated in foreign currency, there will be an additional, currency-mismatch, risk. Here again, the risk assessment should be accompanied by an examination of potential linked hedging transactions.

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[11] The original maturity remains used in the standard components.

b.   Implementation of the definition of the remaining maturity according to the EDS Guide

Initially, the remaining maturity, also called residual maturity, refers to the period from the reference date until the final contractually scheduled payment (see appendix III: BPM6 reference tables). However, the need for a clarification of the definition of remaining maturity in BPM6 was handled in BOPCOM paper 15/15 "Remaining Maturity Classification—Clarification of the Definition," which was presented at the BOPCOM meeting in October 2015[12]. Given that remaining maturity data are intended to convey information on liquidity risk, BOPCOM members came to an agreement that the remaining maturity definition in BPM6 should be brought into line with the 2013 EDS Guide[13], while accepting that the practical implementation could raise some issues. Under the clarified definition, the breakdown of debt liabilities by remaining maturity is based on the payments that fall due: remaining maturity of one year or less relates to payments that fall due in the coming year, while remaining maturity over one year relates to all other debt payments on the instrument.

A further breakdown for (i) Other financial corporations, and (ii) Nonfinancial corporations (except intercompany lending), households, and NPISHs is recommended. Implementing a robust measure of the remaining maturity implies to overcome some challenges that are described hereafter.

c.   Compiling the remaining maturity : state of play in France

Currently, debt instruments are classified by maturity, i.e. as either short-term or long-term[14]. A working program is ongoing to fill in the "remaining maturity data gap". In this respect, the current state of play differs across the different units involved in the production of France's international investment position data.

Table 4: Availability of residual maturity data

Currently available	Not yet available
"PROTIDE" (securities holdings)	"EFI/ECO" (Non Financial Companies loans and trade credits – country/currency data)
"SURFI Client-RE and Client_NRE" (MFI granular reporting but not for BoP/IIP purposes: only retail operations vis-à-vis euro area)	"DEVI_SITU" (MFI reporting on loans-deposits for BoP/IIP, with country/currency data)
"SURFI MATURITES" (MFI reporting but not for BoP/IIP purposes: does not include the concept of resident/non-resident)	"SITUATION" (full balance sheet, monthly)
	"Syndicated loans"(balance of payments specific data collection : share of syndicated loans arranged by resident credit institutions, subscribed by non-resident (country/currency data)

[12] The full paper is available at the following link: *https://www.imf.org/external/pubs/ft/bop/2015/pdf/15-15.pdf*

[13] *2013 External Debt Statistics: Guide for Compilers and Users* is available at the following link: http://www.tffs.org/pdf/edsg/ft2014.pdf

[14] Definition from the Sixth Edition of the Balance of Payments and International Investment Position Manual: "(a) Short-term is defined as payable on demand or with a maturity of one year or less (payable on demand refers to a decision by the creditor; an instrument where the debtor can repay at any time may be short- or long-term) (b) Long-term is defined as having a maturity of more than one year or no stated maturity (other than on demand, which is included in short-term).

As regards <u>debt securities</u>, the residual maturity classification is available and can be broken down by resident sector, namely central bank, deposit-taking corporations except the central bank, money market funds, General government, Financial corporations other than MFIs, Non-financial corporations, households, non-profit institutions serving households, vis-à-vis rest of the word (see table 5).

In computing the remaining maturity of debt securities, the Banque de France considers the interval between the reference date and the final redemption, in accordance to the ECB current requirements. Results are not expected to be very different by following the clarified definition, *i.e.* based on the debt payments that fall due instead of the final contractually scheduled payment. Indeed, almost all French debt securities (99 %, excluding perpetuals) have a principal to be redeemed on maturity date.

We understand that the definition of the EDS guide[15] means that interests to be paid in a near future are to be included in the "short-term remaining maturity debt" even if they are based on a principal to be paid in several years. This is consistent with a "cash basis approach". Another interpretation however would be that interest payments are embedded in the value of the principal on which they are based, so that whatever the date at which they occur, their value are to be included in the remaining-maturity category of their principal. In this interpretation, positions are measured at market value (hence already discounted, whatever their complexity or their currency). If (almost) all debt securities are *in* fine, these two definitions ("former" BPM6 guidance and EDS guidance) would be equivalent, and for practical reasons, the measure at market value would be more straightforward to implement.

If debt securities with periodic redemptions were to develop more significantly, the Banque de France would face several challenges to comply with the definition of the EDS Guide. The reconstruction of the sequence of future payments would require a one-shot "R&D investment" but not raise major conceptual difficulties, while deciding on the discounting rate of their value would be challenging. The discounted value of a debt in a foreign currency for example - or floating rate - if not observed directly on the secondary market - requires to build assumptions on the future evolution of exchange rates or interest rates. Given the uncertainty of any estimation, it seems more reasonable to envisage an approximated measure. This proxy could be based on the share of the short-term maturity payments in the *undiscounted* value of the debt, applied the *discounted* value of the bond (all payments included), as measured by its market value.

All in all as portfolio investments represent about 45 % of the liabilities side of the French IIP, a significant share of debt liabilities can already be broken down by remaining maturity – besides the issues of embedded options – see next section.

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[15] Extract from 2013 EDS Guide (page 54): "Conceptually, at the reference date the value of outstanding long-term external debt (original maturity) due to be paid in one year or less is the discounted value of payments to be made in the coming year, both interest and principal"
http://www.tffs.org/pdf/edsg/ft2014.pdf

Table 5: Residual maturity classification at the end of 2015 - Long-term debt securities to non-residents

(EUR billions)	Central Bank	Deposit-taking corporations (except the Central Bank)	Money market funds	Financial corporations other than MFIs	General Government	Non-financial corporations, ménages, non-profit institutions serving households
Long-term original maturity	0	543,1	0	72,1	1114,6	366,6
of which: redemption due in more than 1 year	0	473,1	0	70,7	1000,7	341,4
redemption due in 1 year or less	0	70,0	0	1,4	113,9	25,2

Source : Banque de France

As regards other segments of debt instruments, the implementation of the residual maturity do appear as a longer process than it is for the currency breakdown since not all the information is collected. When information on the residual maturity is available, it is not broken down along with the resident/non-resident concept and experience shows that the introduction of such criteria requires sometimes significant adaptations in the IT systems of the reporting entities.

In the MFIs' sector, our approach would be in a first step to build estimates from existing datasets. For instance, MFIs' loan-deposit data are collected through a SURFI[16] report that does not contain the variable "residual maturity". Three other SURFI tables contain the information, one of which considers remaining maturity classification according to debt payments that fall due. Then, it seems possible to match up data. Obviously, there are some scope issues, as two surveys do not include interbank transactions while the third does not specify the geographic area. The limit of such an approach would be considering homogeneity between positions in France and in rest of the world, as well as homogeneity of residual maturities across countries, currencies and sectors. In this respect, experimental estimates will be carried out in 2017. Another approach could be exploiting the future dataset that will be delivered in the framework of AnaCredit[17] , which is scheduled to start in September 2018.

As regards external borrowing transactions of the private non-MFI sector, it seems more complicated to identify a relevant distribution key using existing dataset. Yet if considering amending existing surveys, the Banque de France has firstly to assess the merits and costs of such a step. Today the relative share of these transactions in the international investment position is quite low. Most intra-company finance is related to international cash-pooling, with a short residual maturity. Long term finance is generally provided by the issuance of securities – for which the residual maturity is available – or, alternatively, via syndicated loans. Against this background we need to assess to what extent the international investment position of the non-financial sector could be compiled under the general assumption that the residual maturity of the trade credits and intragroup finance is less than one year. .

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[16] SURFI is the regulatory reporting system handled by the ACPR (the French prudential supervisory authority) and the Banque de France.

[17] AnaCredit is a eurosystem project to set up a dataset containing detailed information in individual bank loans (loan-by-loan). For more details, see
https://www.ecb.europa.eu/stats/money/aggregates/anacredit/html/index.en.html

d.   The impact of early redemptions on residual maturity

Another issue with the analysis of residual debt maturity relates to the possibility that debt may be redeemed before the theoretical maturity date. In the case of security instruments for example – which are prominent when it comes to the analysis of the long term liabilities component of the IIP – options may be attached to bonds that allow early redemptions, either at the initiative of the issuer or at the initiative of the holder. Even if there are none, issuers can repurchase bonds on secondary markets.

Ongoing work on residual maturity of French debt securities suggests that the latter actually has a more significant impact on the discrepancy between residual maturity of debts measured ex ante and residual maturity of debts recorded ex post (see Appendix I). Our estimation is that repurchases of "conventional" bonds (without options) may reduce the time to redemption of 1€ of French stock of bonds by 6 months to 1 year (see chart 4). Yet, this estimation still relies on strong hypothesis about the determinants of repurchases and their future evolution, and it is based on a selected subset of French securities. Nonetheless, its magnitude suggests that uncertainty about true residual maturity of portfolio liabilities - as measured by the time span between reference period and maturity date – is up to one year. Therefore, one year appears a reasonable lower limit to the length of the intervals that may be used to break down portfolio liabilities by maturity.

Chart 4: Theoretical maturity vs. observed maturity vs. statistical maturity
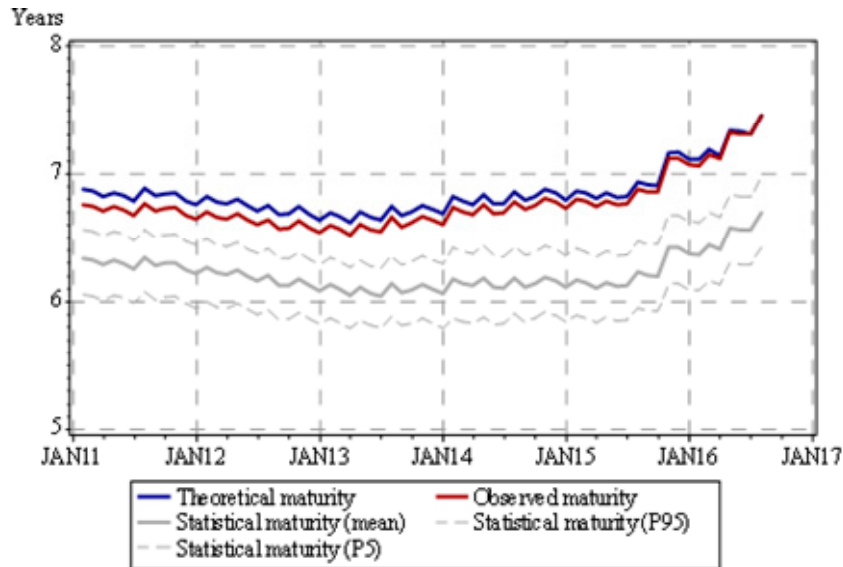
♦ *Theoretical maturity refers to the time span between reference period and maturity date.*
♦ *Observed maturity takes into account observed repurchases between January 2011 and July 2016.*
♦ *Statistical maturity takes into account observed repurchases between January 2011 and July 2016 and model-based estimates of repurchases between July 2016 and July 2036.*

All these measures are based on a subset of French "conventional" bonds (that includes only bonds with redemption in EUR, theoretically at maturity date and with fixed interest rates).

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Appendix I:

Assessing the impact of early redemptions on debt securities aggregate residual maturity
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Usually, statistics on debt securities are broken down by initial maturity. However, when traded on the secondary market, residual maturity is more relevant to the investors than initial maturity. Moreover at the macro-level, a statistical dataset such as the International Investment Position, or the net external debt, would have an improved analytical content if the measure according to the initial maturity is complemented by a measure of residual maturity. This would notably improve the analysis of maturity mismatches.
Taking into account the prominent part of the instrument "securities" in the long term liabilities component of the IIP, the effort should focus on investment portfolio liabilities first.

One of the difficulties in this exercise is that the residual maturity of a bond on the secondary market may not be well-known. Redemptions often occur before the maturity date, either because of option activation or repurchases by the issuer.

In this document, we aim at assessing the statistical impact of early redemption of bonds on the residual maturity structure of aggregate debt. In the descriptive section, we estimate the relative responsibility of option activation and repurchases on early redemption. We then focus on repurchases of conventional bonds, to assess their impact on average maturity.

We use the dataset produced by the Banque de France on bond securities issued by French residents. It contains monthly flows of issuance and redemption, on a security-by-security basis, as well as a description of the security. For practical reasons, we restricted ourselves to a subset of securities and included only securities whose redemption was in EUR, on maturity date, and that had fixed interest rates and initial maturity greater than one year.

Our results suggest that early repurchases of "conventional" bonds have a more significant impact on debt maturity than redemptions that occur because of option activations. Moreover, we find that early repurchases are quite sensitive to monetary conditions, and may therefore be difficult to predict with accuracy. Nonetheless, if we assume that monetary rates would smoothly return to their past average over the next 20 years, we estimate that 1€ of today's debt in our dataset will be repaid by the issuer in 6,7 years on average, instead of 7,5 years as theoretically planned. Hence, our data suggests avoiding too narrow residual maturity bands and discussing a classification with intervals above one year.

1   Early redemptions of bonds are significant, and driven by repurchases of "conventional" bonds

From our dataset (see Annex 1), we observe that early redemptions have steadily increased over the past 2 years. Since the end of 2015, yearly flows of early redemptions amounted to around 60 Bn €, whereas in 2012 and 2013, they were between 30 and 40 Bn € (graph 1).

Although it may be accentuated by our restricted sample, it also appears that most of these early redemptions come from "conventional" (without options) bonds, rather than from bonds with embedded options or from perpetual bonds[18]. They account for more than 80 % of observed early redemptions over the period.

<u>**Graph 1**</u>: Yearly flows of early redemption flows

The dataset is restricted to securities with redemption in EUR, theoretically at maturity date, with fixed interest rates and initial maturity greater than one year. Securities for which the existence of optional redemption features was not found are excluded.
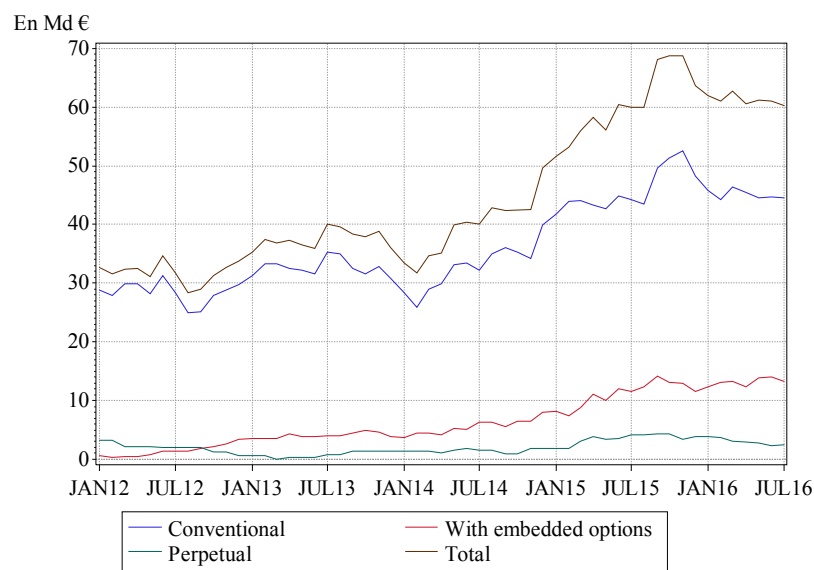
Source: Banque de France, CSDB, Bloomberg

Although conventional bonds make the largest part of early redemptions, the probability for one EUR to be early redeemed seems larger for securities with embedded options (graph 2). Hence, beginning year 2014, more than 80% of yearly redemption flows on bonds with embedded option

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[18] In this document, "Conventional bonds" are mostly "plain vanilla" securities, with rather large amounts per issue. They are typically issued to finance long term assets. "Perpetual" securities are a mixed population: they can be a component of issuers' own funds or "structured" callable products targeting fund managers' needs. Bonds with "embedded options" are bonds that include options on the redemption date (such as calls or puts).

were early redemptions. On the other hand early redemptions of bonds with options seem more volatile.

Graph 2: Share of early redemption in yearly redemption flows

2   Measuring the impact of early repurchase on residual maturity

For the purpose of this research, we define different concepts of maturity:

- *The "theoretical" maturity* of a security is defined as the difference between the reference period and the maturity date.

- The *"observed" maturity* takes into account early redemptions between the reference period and July 2016, end of our observation interval. It is defined as an average of the differences between the reference period and the (potentially many) *actual* redemption dates. When all redemptions are not observed by the end of July 2016, we assume that the residual redemption flow occurs at the maturity date.

- The *"statistical" maturity* takes not only observed early redemptions into account, but also potential future early redemptions that are not yet observed. It can be defined as the "life expectancy" of 1€ of debt in a security.

2.1 Observed maturity vs. theoretical maturity

In graph 3 below, we computed the "observed" residual maturity of the stock of conventional debt in our dataset and compare it to the "theoretical" residual maturity.

Graph 3: Observed maturity vs. theoretical maturity

When all redemptions are not observed by the end of July 2016, we assume that the residual redemption flow occurs at the maturity date. Therefore, "observed" maturity converges to "theoretical" maturity as we get closer to the end of the observation period.
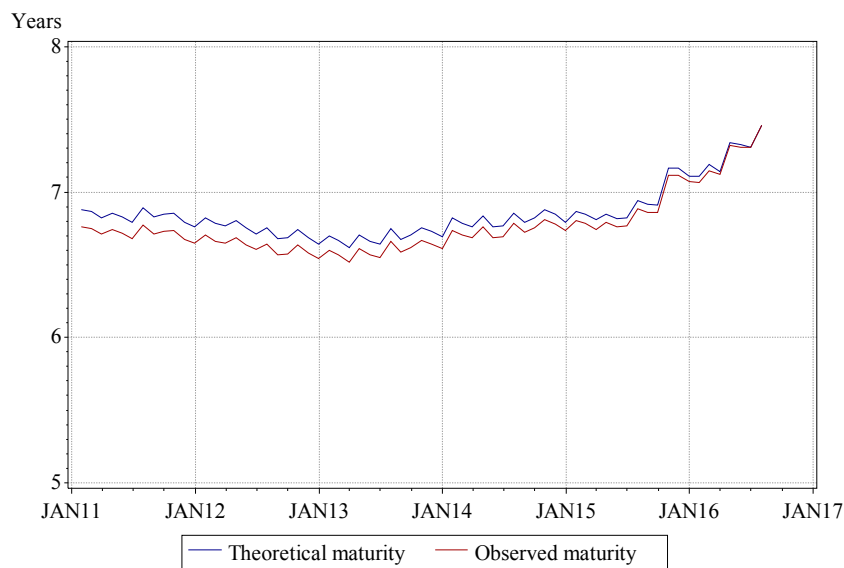
Source: Banque de France

This statistic suggests that observed early repurchases do not have a high impact on residual maturity of debt. At the beginning of the observed period, when their impact is maximal, residual maturity is reduced by only one month and a half. Yet, it underestimates the real impact of early repurchase, as it does not take into account *unobserved* early redemptions, which may occur in the future, after the end of our time span.

In order to account for these, we need to have a better understanding on the determinants of early repurchases.

2.2   Statistical maturity vs. theoretical maturity

In order to compute a "statistical" maturity on debt securities - which is the "life expectancy" of 1€ of debt at a given point in time - we need to estimate the probability that a security will be early repurchased in the future.

Estimating the probability of early repurchases

One cannot consider that early repurchases occur with a constant hazard rate, independent of security characteristics and financial conditions. Therefore, we estimated a LOGIT model on our dataset, in order to link the probability of early repurchase to a set of explaining variables.

In particular, we expect that the decision to repurchase will be driven by two key considerations: the nominal interest rate vs. contemporary monetary interest rates and residual maturity. Results are provided in table 1 below.

The direction of the effect of nominal interest rate and monetary interest rates is ambiguous.

On the one hand, issuers may be willing to repurchase their bonds when the interest rate they pay is high compared to the market, so that they can issue new securities at better conditions. And symmetrically, for a given issuer, a high market rate compared to nominal rate may indicate a deterioration of credit worthiness, that is associated with a liquidity risk (that the issuer will not be able to roll-over its debt) making it less likely that it will repurchase.

However on the other hand, issuers may be willing to buy back their bonds when their price is low compared to redemption price.

Empirically, the first effect appears dominant. When nominal interest rates are high and monetary rates are low, issuers have a higher probability to repurchase.

Table 1: Probability of early repurchases

Variable	Coefficient	Significance
Intercept	-6.5857	<.0001
Amount outstanding (log)	0.1675	<.0001
Spread between nominal rate and monetary rate (of maturity equal to theoretical residual maturity)	0.1835	<.0001
5Y monetary rate	-0.1489	<0.05
Theoretical residual maturity	-0.1686	<.0001
Theoretical residual maturity squarred	0.00345	<.0001
Early repurchases the month before	3.7705	<.0001

Computing statistical maturity

To compute the "statistical maturity" of debt, we consider the observed period, and simulate repurchases over 20 year after its end. This requires some extra features.

First, we need to compute the expected amount of repurchase given that the issuer has decided to repurchase. Starting with the idea that a higher "score" in the probability model will be associated with a higher effort in repurchasing the totality of the debt, we applied an OLS model using the "score" (of the LOGIT model) as explaining variable to amount repurchased (taken relative to amount outstanding and logistically transformed).

However, it turned out that a higher probability to repurchase is actually associated with a lower amount repurchased. This may be explained by the fact that the conditions under which issuers are more willing to buy back their securities meet the conditions under which holders are less willing to sell them.

Second, we had to make assumptions about the future evolution of monetary rates. We assumed that they will smoothly return to empirical average over the next 20 years (graph 4).

Graph 4: Hypothesis on the evolution of monetary rates
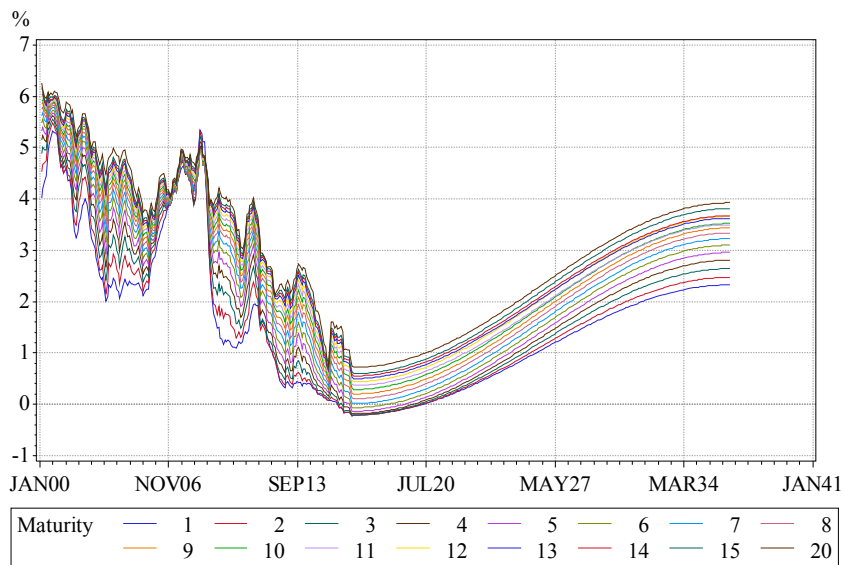
Given these additional features, we compute the "statistical maturity" by simulation. For each security at a given time, the probability to repurchase is computed from the LOGIT model. A random variable is produced accordingly, to decide whether this possibility turns into an event. If it does,

the amount repurchased is chosen according to the OLS model described above, to which a residual is added from a random selection in the set of residuals observed in the estimation step.

Eventually, Graph 5 below shows the results of our computation. We estimate that in July 2016 (end of the observation period) the statistical maturity of debts in our dataset is between 6,4 and 7 years (at 90% confidence interval, for an average estimate around 6,7 years), whereas the theoretical maturity is 7,5 years. Put otherwise, we expect early repurchases to decrease the average maturity of debt securities by 6 months to 1 year.

Graph 5: Statistical maturity vs. theoretical maturity
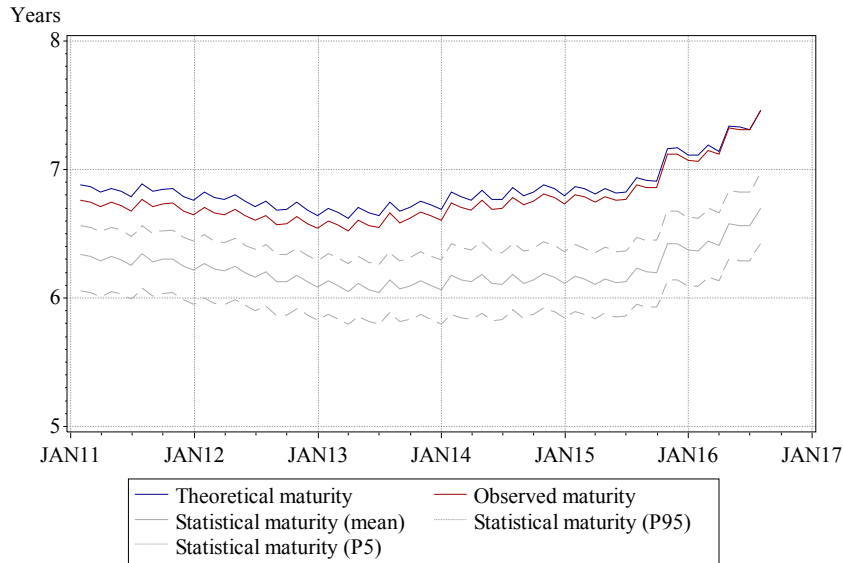
Source: Banque de France

3   Way forward

The analyses described above are the results of an ongoing work at the Banque de France. Further developments are still required to achieve a better understanding of the determinants of early redemptions and their statistical impact on residual maturity.

Robustness checks

The estimation of a "statistical maturity" can be very sensitive to model specification. Therefore, one key issue is to develop robustness checks so as to validate the simulations. In particular one can compare descriptive statistics on observed redemption flows vs. simulated ones, controlling for changes in explaining variables.

For example, we reproduced Graph 1 including simulated repurchases (see graph 6). We observe that the share of early redemptions in yearly flows of redemption in the simulated period is in line with that of the observed period. However, it also appears more volatile in the simulation period compared to the observed period. This may be explained by the fact that the more we move in

time, the narrower is the support on which simulation is based (as less and less securities remain alive), and the more volatile is the aggregation of all individual events. But it can also indicate a misspecification in the LOGIT model, in particular concerning the fact that we allowed early repurchases to depend very much on the existence of early repurchases the previous month.

Graph 6: Statistical maturity vs. theoretical maturity
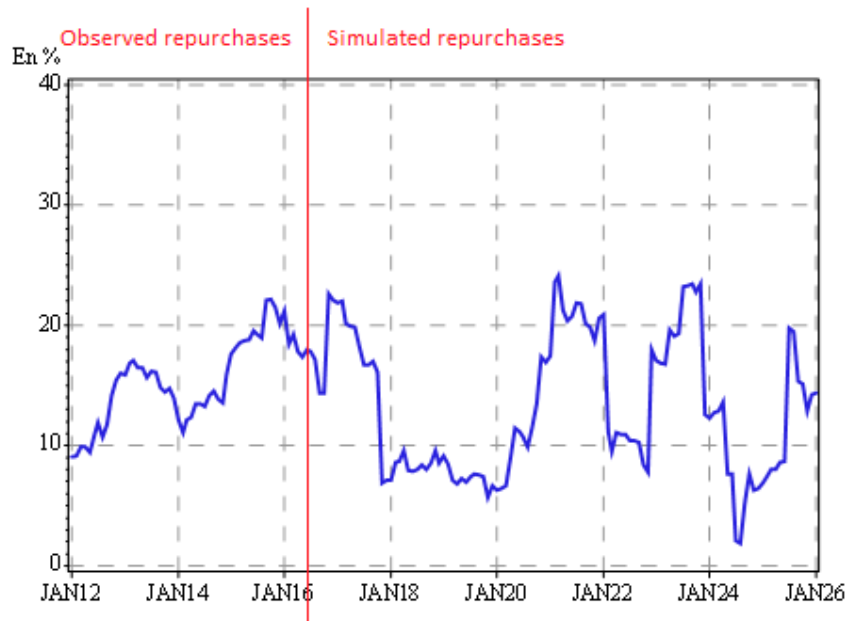
Source: Banque de France

Extending the analysis to other categories of bonds

Our analysis has focused on a subset of French debt securities. But it can be generalized to other categories of bonds, with proper adaptations.

One issue in particular would be to include bonds with embedded options (see Annex 2).

This extension however would be quite demanding. Not only would it probably require different explaining variables (for example, stock market indices for convertible bonds), but also more precise description about the nature of embedded options - at least their type (Call, Put…) and the associated premium - that are not available in the databases of the Banque de France.

Annex 1: Dataset

The dataset we use includes all long-term debt securities issued by French residents and alive over January 2011 to July 2016. It is produced by the Banque de France (Directorate of Balance of Payments - Securities Statistics Division), and relies on mandatory declarations, private data providers and market monitoring.

The dataset contains monthly flows of issuance and redemption on a security-by-security basis, as well as a description of the security (such as the name of the issuer and its institutional sector; maturity and settlement dates; coupon type, frequency and rate etc.).

However, it does not contain information on the existence of redemption options. To identify these securities, we used the European Centralized Securities Database and Bloomberg. Because of a limited access to the latter, we chose to focus on a subset of French long-term securities and considered only securities whose redemption was in EUR, on maturity date, and that had fixed interest rates.

This choice was made in the perspective of the econometric analysis. Indeed, other kind of securities would require more complicated statistical designs (such as expected value for exchange rates and indices underlying variable interest rates).

Annex 2: Measuring the impact of early redemptions on residual maturity of bonds with embedded options

We reproduced the analysis developed for conventional bonds on bonds with embedded options. The residual "statistical" maturity on this population was estimated to be around 5,7 years (vs. 6,8 years for "theoretical" maturity).

This analysis however is still fragile. Indeed, we did not have enough information to take into account the specificities of bonds with embedded options, and applied our model with very few adaptations. We did not change the set of explaining variables in the LOGIT model that simulates early redemption events, and did not perform specific estimations according to the types of options embedded in the bond.

Graph 6: Statistical duration vs. observed vs. theoretical duration
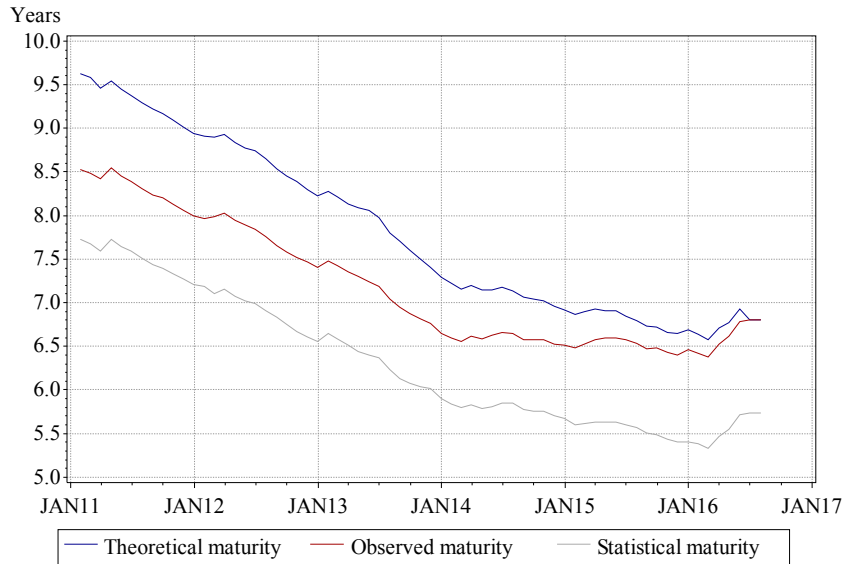
Source: Banque de France

Appendix II: Required tables regarding currency breakdown

Table A9-I-1a. Debt Claims on Nonresidents
Year ... (latest year under review)

	Central bank	General government	Deposit-taking corporations, except the central bank	Other sectors[5] Total	OFC	Other	Inter-company lending[6]	Total
Total[2]								
Domestic currency								
Foreign currency								
U.S. dollar								
Euro								
Yen								
Other currencies								
Unallocated[3]								
Of which one year or less[4]								
Domestic currency								
Foreign currency								
U.S. dollar								
Euro								
Yen								
Other currencies								
Unallocated[3]								

Reserve assets[7]

In SDR basket	
Not in SDR basket	

Table A9-I-1b. Financial Derivative Positions with Nonresidents
Foreign Currency Derivatives: Notional Value of Contracts with Nonresidents[8]

	Central bank	General government	Deposit-taking corporations, except the central bank	Other sectors[5] Total	OFC	Other	Inter-company lending	Total
Receive foreign currency								
U.S. dollar							n.a.	
Euro							n.a.	
Yen							n.a.	
Other currencies							n.a.	

Table A9-I-2a. Debt Liabilities to Nonresidents

Year ... (latest year under review)

	Central bank	General government	Deposit-taking corporations, except the central bank	Other sectors[2]			Inter-company lending[3]	Total
				Total	OFC	Other		
Total								
Domestic currency								
Foreign currency								
U.S. dollar								
Euro								
Yen								
Other currencies								
Unallocated								
Of which one year or less[1]								
Domestic currency								
Foreign currency								
U.S. dollar								
Euro								
Yen								
Other currencies								
Unallocated								

Table A9-I-2b. Financial Derivative Positions with Nonresidents
Foreign Currency Derivatives: Notional Value of Contracts with Nonresidents

	Central bank	General government	Deposit-taking corporations, except the central bank	Other sectors[2]			Inter-company lending	Total
				Total	OFC	Other		
Pay foreign currency							n.a.	
U.S. dollar							n.a.	
Euro							n.a.	
Yen							n.a.	
Other currencies							n.a.	

[1]Original maturity.

[2]OFC = other financial corporations, Other = nonfinancial corporations (except intercompany lending), households, and NPISHs.

[3]Data on debt instruments from the direct investment category. There is no original maturity breakdown for intercompany lending (as defined in paragraph 6.26); see also paragraph 5.103 on maturity for direct investment). Intercompany lending is excluded from data for the other sectors.

Table A9-II. Currency Composition of Assets and Liabilities (time series data)[1]

Table A9-II-1a. Debt Claims on Nonresidents

All Sectors	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Total[2]								
Domestic currency								
Foreign currency								
U.S. dollar								
Euro								
Yen								
Other currencies								
Unallocated								
Of which one year or less[3]								
Domestic currency								
Foreign currency								
U.S. dollar								
Euro								
Yen								
Other currencies								
Unallocated								
Reserve assets								
In SDR basket								
Not in SDR basket								

Table A9-II-1b. Financial Derivative Positions with Nonresidents
Financial Derivatives: Notional Value of Foreign Currency Contracts with Nonresidents

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Receive foreign currency								
U.S. dollar								
Euro								
Yen								
Other currencies								

[1]Table A9-II is supplementary and covers time series data, not projections.
[2]Excluding reserve assets.
[3]Original maturity.

Table A9-II-2a. Debt Liabilities to Nonresidents

All Sectors	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Total								
Domestic currency								
Foreign currency								
U.S. dollar								
Euro								
Yen								
Other currencies								
Unallocated								
Of which one year or less[1]								
Domestic currency								
Foreign currency								
U.S. dollar								
Euro								
Yen								
Other currencies								
Unallocated								

[1]Original maturity.

Table A9-II-2b. Financial Derivative Positions with Nonresidents
Financial Derivatives: Notional Value of Foreign Currency Contracts with Nonresidents

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Pay foreign currency								
U.S. dollar								
Euro								
Yen								
Other currencies								

Other sectors[3]
Debt securities
Trade credit and advances
Loans
Currency and deposits
Other debt claims

SHORT-TERM

Central bank[2]
Debt securities
Trade credit and advances
Loans
Currency and deposits
Other debt claims

General government
Debt securities
Trade credit and advances
Loans
Currency and deposits
Other debt claims

Deposit-taking corporations, except the central bank
Debt securities
Trade credit and advances
Loans
Currency and deposits
Other debt claims

Other sectors[3]
Debt securities
Trade credit and advances
Loans
Currency and deposits
Other debt claims

DIRECT INVESTMENT[4]

Intercompany lending
Debt claims on direct investors
Debt claims on direct investment enterprises
Debt claims on fellow enterprises

TOTAL

[1]Table A9-III is supplementary.
[2]Excluding reserve assets.
[3]A further breakdown for (i) other financial corporations, and (ii) nonfinancial corporations (except intercompany lending), households, and NPISHs is encouraged.
[4]There is no original maturity breakdown for intercompany lending (as defined in paragraph 6.26). Intercompany lending is excluded from data for the other sectors.

Table A9-III. Currency Composition by Sector and Instrument (at a reference date)[1]

Table III-1a. Debt Claims on Nonresidents

	Foreign currency	Domestic currency	Unallocated	Total
LONG-TERM				
Central bank[2]				
Debt securities				
Trade credit and advances				
Loans				
Currency and deposits				
Other debt claims				
General government				
Debt securities				
Trade credit and advances				
Loans				
Currency and deposits				
Other debt claims				
Deposit-taking corporations, except the central bank				
Debt securities				
Trade credit and advances				
Loans				
Currency and deposits				
Other debt claims				

Other sectors³
Debt securities
Trade credit and advances
Loans
Currency and deposits
Other debt claims

SHORT-TERM

Central bank²
Debt securities
Trade credit and advances
Loans
Currency and deposits
Other debt claims

General government
Debt securities
Trade credit and advances
Loans
Currency and deposits
Other debt claims

Deposit-taking corporations, except the central bank
Debt securities
Trade credit and advances
Loans
Currency and deposits
Other debt claims

Other sectors³
Debt securities
Trade credit and advances
Loans
Currency and deposits
Other debt claims

DIRECT INVESTMENT⁴

Intercompany lending
Debt claims on direct investors
Debt claims on direct investment enterprises
Debt claims on fellow enterprises

TOTAL

¹Table A9-III is supplementary.
²Excluding reserve assets.
³A further breakdown for (i) other financial corporations, and (ii) nonfinancial corporations (except intercompany lending), households, and NPISHs is encouraged.
⁴There is no original maturity breakdown for intercompany lending (as defined in paragraph 6.26). Intercompany lending is excluded from data for the other sectors.

Table A9-III-1b. Financial Derivative Positions with Nonresidents

Financial Derivatives: Notional Value of Foreign Currency and Foreign-Currency-Linked Contracts with Nonresidents

To Receive Foreign Currency
Central bank
  Forwards
  Options

General government
  Forwards
  Options

Deposit-taking corporations, except the central bank
  Forwards
  Options

Other sectors¹
  Forwards
  Options

Total
  Forwards
  Options

¹A further breakdown for (1) other financial corporations and (2) nonfinancial corporations (except intercompany lending), households, and NPISHs is encouraged.

Table A9-III-2a. Debt Liabilities to Nonresidents

	Foreign currency	Domestic currency	Unallocated	Total
LONG-TERM				
Central bank				
Debt securities				
Trade credit and advances				
Loans				
Currency and deposits				
Other debt liabilities				
General government				
Debt securities				
Trade credit and advances				
Loans				
Currency and deposits				
Other debt liabilities				
Deposit-taking corporations, except the central bank				
Debt securities				
Trade credit and advances				
Loans				
Currency and deposits				
Other debt liabilities				
Other sectors[1]				
Bond and notes				
Trade credit and advances				
Loans				
Currency and deposits				
Other debt liabilities				
SHORT-TERM				
Central bank				
Debt securities				
Trade credit and advances				
Loans				
Currency and deposits				
Other debt liabilities				
General government				
Debt securities				
Trade credit and advances				
Loans				
Currency and deposits				
Other debt liabilities				
Deposit-taking corporations, except the central bank				
Debt securities				
Trade credit and advances				
Loans				
Currency and deposits				
Other debt liabilities				
Other sectors[1]				
Debt securities				
Trade credit and advances				
Loans				
Currency and deposits				
Other debt liabilities				
DIRECT INVESTMENT[2]				
Intercompany lending				
Debt liabilities to direct investors				
Debt liabilities to direct investment enterprises				
Debt liabilities to fellow enterprises				
TOTAL				

[1]A further breakdown for (i) Other financial corporations, and (ii) Nonfinancial corporations (except intercompany lending), households, and NPISHs is encouraged.

[2]There is no original maturity breakdown for intercompany lending (as defined in paragraph 6.26). Intercompany lending is excluded from data for the other sectors.

Table A9-III-2b. Financial Derivative Positions with Nonresidents

Financial Derivatives: Notional Value of Foreign-Currency and Foreign Currency-Linked Contracts with Nonresidents

To pay foreign currency

Central bank
  Forwards
  Options

General government
  Forwards
  Options

Deposit-taking corporations, except the central bank
  Forwards
  Options

Other sectors[1]
  Forwards
  Options

Total
  Forwards
  Options

[1] A further breakdown for (i) Other financial corporations, and (ii) Nonfinancial corporations (except intercompany lending), households, and NPISHs is encouraged.

Appendix III: Required tables regarding remaining maturity breakdown

Table A9-IV. Remaining Maturity of Debt Liabilities to Nonresidents (at a reference date)[1]

Specific Financial Instruments: Remaining Maturity of One Year or Less of Long-Term Debt Instruments by Sector

	Central bank	General government	Deposit-taking corporations, except the central bank	Other sectors[2]			Total
				Total	OFC	Other	
Deb securities							
Trade credit and advances							
Loans							
Currency and deposits							
Other debt liabilities							
Total							

[1]Table A9-IV is supplementary.
[2]A further breakdown for (i) Other financial corporations, and (ii) Nonfinancial corporations (except intercompany lending), households, and NPISHs is encouraged.