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France's Sovereign Debt Issuance Strategy

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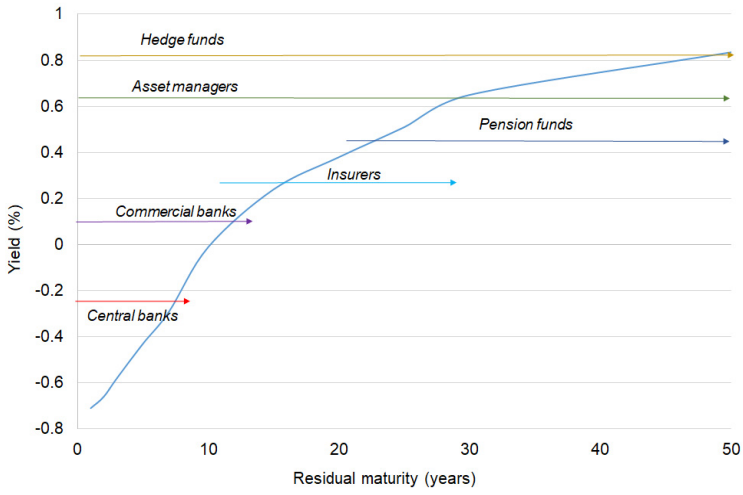
- For a given deficit, the objective of Agence France Trésor (AFT), the agency responsible for managing the French government's debt, is to minimise borrowing costs and run the funding programme under the most secure conditions possible. This involves ensuring the liquidity of the government's debt securities (the main endogenous factor in bond pricing) and basing its issuance policy and the structure of its debt market on the principles of consistency, predictability and flexibility.
- AFT's issuance policy is based on its understanding of the preferred habitats of investors, i.e. their preferences in terms of maturities (see chart below), in order to adjust to these preferences and thereby obtain the best possible financing conditions. There are indeed regulatory, financial and economic factors specific to each class of investors that influence demand for debt securities, based on which AFT adjusts its issuance policy and places investment products on the market, such as inflation-linked bonds and green bonds.
- AFT's management of refinancing risk involves smoothing borrowing needs over time and maintaining permanent market access for its debt. The average maturity of an issuer's debt is largely the result of the past and projected composition of the demand for securities and the composition of savings in the currency of issuance. France has a stable and diversified investor base that provides resilience when rates fluctuate.
- Since 2003, the average maturity of French debt has increased by 2.4 years. At end-2020, it stood at 8.2 years, one of the longest maturities among advanced economies. Very low interest rates are not necessarily an argument for lengthening the average maturity any further than what results from structural demand. A simple modelling study suggests that the cost of extending average maturity outweighs the anticipated gain in the event of a future rise in interest rates, and that any potential gain is limited vis-à-vis the total cost of debt service, even in an optimistic scenario.

Nominal yield curve (OATs) and preferred habitats of investors (stylised)



Source: AFT, constant maturity yields, 17 December 2021.

1. Minimising the government's cost of funding

1.1 A bond market structured to maximise the liquidity of government securities

Over the past 40 years, borrowing needs of advanced economies have increased and bond markets have soared. France and other major developed countries have implemented similar issuance policies, designed to manage the government debt at the lowest cost and under the most secure conditions possible. In France, this responsibility has been entrusted to *Agence France Trésor* (AFT) since 2001. At end-2020, the government debt stood at €2,001bn, or 86.9% of GDP, with an average maturity of 8.2 years. Government debt service stood at €36.2bn, or 1.6% of GDP, at an average implied interest rate of 1.3% (under national accounting).[1]

The size of governments' issuance programmes requires them to hold frequent market auctions, which they have decided to organise on a regular schedule rather than taking an opportunistic approach. For France, its issuance strategy is based on the principles of consistency and predictability. Auctions are held throughout the year, at specific dates and times of the week and month. As all market participants are aware of the process, they are able to anticipate these supply shocks. While a more opportunistic approach might occasionally result in lower issuance yields, it would not be a sustainable strategy over the long term. First, a recurrent issuer will ultimately end up exposed to average yield trends. Second, investors would demand a larger premium for uncertainty about future supply shocks, or for presumed information asymmetry as to the state of the public finances and the associated borrowing requirement, which would ultimately drive up the cost of borrowing for the government.

This policy of regular and predictable issuance relies on a market designed for such purpose, allowing AFT to reach as many investors as possible and meet their needs, particularly in terms of liquidity.[2] To this end it works with a select group of banks, known as primary dealers, which are tasked with providing liquidity on the secondary market for French sovereign debt. Primary dealers are required to make certain commitments with regard to acquiring market share on the primary market and listing securities on the secondary market, which supports the liquidity of the sovereign debt market. An annual league table is published ranking the primary dealers, based largely on quantitative criteria concerning market share on the primary and secondary markets, as set out in the SVT Charter;[3] this serves as incentive for the primary dealers and ensures that all bond market participants are kept informed about their performance. Another important aspect of the market's design is transparency: announcing the size and features of the annual borrowing programme and the auction calendar, publishing auction results and other figures in an online monthly newsletter, etc.

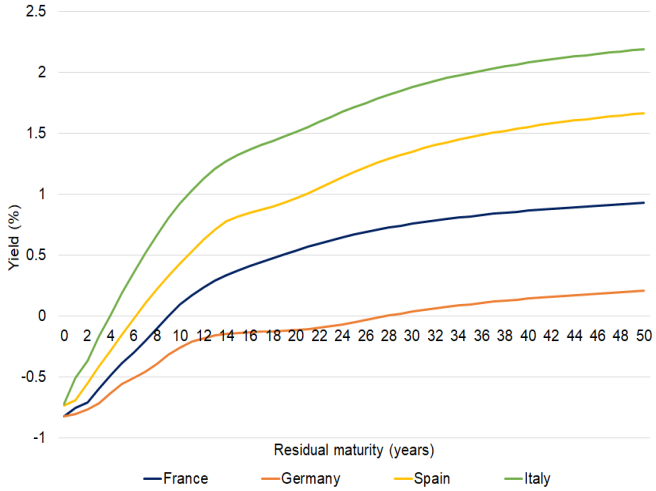
(1) The implied interest rate is calculated as the cost of negotiable debt service (excluding cash and SNCF debt expense), as measured according to Maastricht rules, as a proportion of the total debt outstanding at the start of the period. For 2020 this gives: 23.3 / 1,823 = 1.32%.
(2) Liquidity refers to the ease with which a financial asset can be bought or sold without the transaction strongly influencing its price.
(3) https://www.aft.gouv.fr/en/primary-dealers-presentation

Box 1: The sovereign yield curve and its term structure

The yield curve (see Chart 1) is constructed by plotting the maturity of each bond against its observed market rate of return. In theory, the curve should slope upward, due to the risks to the investor (interest rate risk, credit risk) being higher over a longer investment horizon.

Short-term yields (in France, yields on negotiable fixed-rate discount Treasury bills called BTFs) are primarily determined by the central bank's policy rates and forward guidance[a] and by the balance between the supply of securities and the excess liquidity in circulation. These are exogenous factors for AFT; in practice, it means short-term yields remain anchored, even when there are fluctuation in medium- and long-term yields.

Graphique 1 : Yield curves of main euro area sovereign issuers



Source: Bloomberg, 17 December 2021.

For longer maturities on the yield curve, which in France correspond to fungible Treasury bonds called OATs, yields are determined by multiple factors.

Expected short-term rates: These reflect the movements of the central bank's policy rates over the remaining term to maturity, as expected at a given point in time by investors. This is a largely exogenous factor for countries with an independent central bank.

Term premium: This is a premium paid in compensation for interest rate risk, which theoretically rises with maturity. It reflects investors' aversion to risk and the premium they demand for bearing the risk of a long-term investment (i.e. the risk that the underlying short-term rate expectations do not materialise) rather than holding short-term debt and "rolling it over"[b] over the same duration. The term premium is also a largely exogenous factor for a sovereign issuer.

Credit premium: In the case of a sovereign issuer, this premium measures the risk that an investor takes with regard to the government's ability to service its debt. This risk largely depends on the macro-fiscal trajectory[c] and, in theory, increases with maturity. The credit premium usually correlates with the ratings assigned by credit rating agencies and, in practice, is measured by the yield spread compared to a risk-free benchmark curve (in the euro area, this is currently the German bond curve). As French debt is widely considered to be a safe-haven investment, like US Treasury bonds and German Bunds, the credit premium is low, corresponding to the extremely low probability of default associated with France's creditworthiness. The government's economic and fiscal policy has a direct influence on the credit premium, but its debt agency can also play a role in keeping it low by minimising investors' perception of information asymmetry, through a policy of transparency that involves answering their questions and maintaining regular dialogue with credit rating agencies as part of their rating processes.

a. Monetary policy also affects the yield curve in other ways. Excess liquidity, a sign of demand for safe and liquid assets, particularly for short maturities, will cause short-term yields to fall. Additionally, central bank long-term refinancing operations foster demand for debt instruments with maturities of up to four years, anchoring the short end of the yield curve. At the longer end of the curve, central bank purchase programmes put downward pressure on rates. These are exogenous factors for AFT and all other European debt agencies.
b. "Rolling over" refers to the practice of reinvesting in a new debt instrument when the current one matures.
c. The credit premium is also affected by the risk of currency redenomination, i.e. change of currency or adjustment of the peg, resulting in a potential loss of value for the holder.

Liquidity premium: This premium is an indicator of the liquidity of a security, i.e. the ability for the investor to sell a high volume without impacting the price. If debt is deemed liquid, investors will be willing to pay a premium to purchase it. This premium is an endogenous factor over which the issuer has direct influence, since it is a direct outcome of its issuance policy and how it adapts to investor demand. Financial regulation also tends to exogenously affect demand for safe and liquid assets, especially during periods of market uncertainty.

In addition to these, there are various market structure factors, particularly market segmentation and demand for securities (see below), that influence the yield at which a bond is ultimately issued.

1.2 A range of securities tailored to a broad and diverse investor base

The issuer adjusts its issuance to the depth of the market based on its understanding of the preferred habitats of investors (see Box 2), and thus their natural demand. It thereby reduces the cost of borrowing for the government. The depth of the market varies by maturity, making it another de facto driver of the yield curve. While not directly apparent in financial information systems, it does play a major role in the country's issuance policy.

Having a broad and diversified investor base means the market is better able to absorb debt along the entire maturity range, increasing overall demand from investors that may have different preferred habitats. For example, bank treasuries need safe and liquid assets to guarantee their solvency at any given time, whereas pension funds require ultra-long-term assets to back their future pension commitments. AFT therefore offers a diversified range of securities meeting the varied needs of end-investors, not only in terms of maturities but also in terms of features such as inflation linking (to French or European inflation) or matching to green expenditure. For example, some investors may need to hedge liabilities with long maturities (insurers, pension funds) or regulated rates of return (e.g. registered savings products like France's *Livret A*), or to protect themselves against inflation risk. Others may have specific portfolio mandates with environmental criteria.

Box 2: Preferred habitats of investors

The structure of investors' preferred habitats broadly reflects the operational, risk and regulatory constraints faced by investors, which translate into different investment horizons. There is, for example, a specific demand for certain segments of the yield curve or for certain debt products from investors who are constrained by liability-hedging needs or risk-management needs driven by prudential constraints (e.g. a liquidity buffer for banks or asset managers, duration gap management for insurers and pension funds[a]). These constraints influence investment behaviour, particularly as regards to the maturity of their investment (see stylised chart on cover page).

These preferred habitats, and how they change over time, result in different market depths for different segments of the yield curve. For instance, on the secondary OAT market in 2020, out of a total volume of nearly €3,200bn, some 85% of transactions were concentrated in the under 15-year residual maturity bucket, with 15% in the 15- to 43-year bucket and only 1% in the over 43-year bucket.

a. Fache Rousová L., Ghiselli A., Ghio M. and Mosk B. (2021), "The Structural Impact of the Shift From Defined Benefits to Defined Contributions", BCE, *Economic Bulletin* Issue 5.

In the late 1990s, the emergence of investors with a stronger aversion to inflation risk and changing demand for inflation-linked bonds prompted France to adjust its issuance policy and develop a market for such securities. The implicit cost of hedging inflation risk takes the form of an inflation premium, which can be positive or negative depending on the balance between supply and demand. This type of bond allows the government to smooth its deficit over a full economic cycle by exploiting the countercyclical benefit of lower borrowing costs at the start of the cycle, when inflation is lower. It has also been observed that when inflation is high, there is higher investor demand for inflation protection, theoretically reducing initial yields via the inflation premium. Inflation-linked bonds currently account for some 10% of AFT's annual borrowing programme.

In contrast, the absence of investors with long-term or very long-term liabilities explains the lack of a natural and enduring demand for ultra-long or perpetual bonds, which come with considerable exposure to loss of principal in the event of an interest rate hike. Demand for maturities above 50 years comes primarily from arbitrage funds or convexity[4] hedgers. For this reason, perpetual bonds do not currently form part of France's borrowing programme.[5]

France has been expanding its green bond market since 2017. France was the euro area's first sovereign issuer of green bonds (issuing its first in January 2017) and is the current leader in terms of volume (after issuing a second in March 2021). The total value of France's green OATs now stands at €42.3bn. These bonds have the benefit of offering the same liquidity as other OATs, thanks to regular auctions that have generated outstanding volumes akin to those of other OATs with similar maturities.

The practice of adapting to preferred habitats is also illustrated by the fact that the average issuance maturity has been lengthening since 2015, i.e. since the Eurosystem introduced its public sector purchase programme (PSPP). According to a recent study by the European Central Bank (ECB),[6] the introduction of the PSPP led to a compression of the term premium at the long end of the yield curve, which triggered a lengthening of the investment horizon of some market participants to increase the performance of their portfolio in this new lower rate and flatter curve environment, thus creating demand for longer-dated bonds. The study showed that the issuance policies of the main euro area countries reacted endogenously to the rate decrease by increasing the average maturity of their issuance over the period by more than one year. However, this lengthening of sovereign bond maturities has not resulted in an increase in the average maturity of public debt if the government's balance sheet is consolidated with that of the central bank, which in France is wholly government-owned.[7] As the government's consolidated liabilities are composed of debt issued by the government and reserves issued by the national central bank to fund its purchases of government securities, and these reserves have no duration risk, the public asset purchase policy led the average public debt maturity to stabilise, and even decrease slightly.

(4) Convexity is a correction term to adjust for the non-linear relationship between bond price and yield (second derivative). A highly convex bond can provide a portfolio with immunity against a sudden rate change, which is a feature sought out by some investors.
(5) Corsetti, Erce, Garcia Pascual (2020), "Perpetual Bonds Are Not the Best Way to Finance the European Recovery Fund", V*ox eBook Chapters, in Europe in the Time of Covid-19*, pp. 221-229, Centre for Economic Policy Research.
(6) Plessen-Mátyás K., Kaufmann C. and von Landesberger J. (2021), "Funding Behaviour of Debt Management Offices and the ECB's Public Sector Purchase Programme", BCE, *Working Paper Series* no. 2552.
(7) Broadbent (2020), "Government Debt and Inflation".

2. Reducing refinancing risk

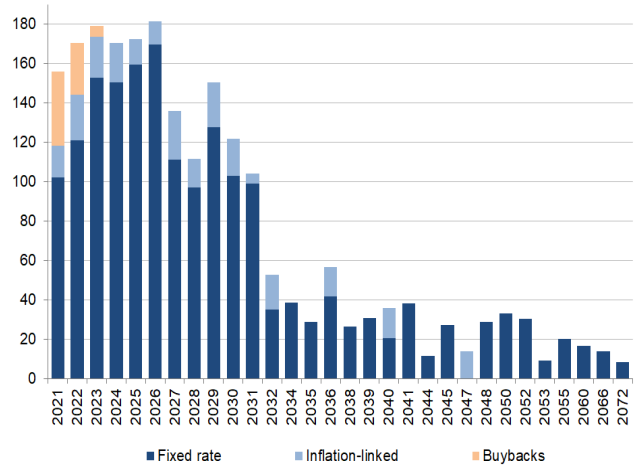
2.1 Smoothing borrowing needs over time

The borrowing time horizon, which is a determinant of the issuance policy, reflects the trade-off between, on the one hand, financing conditions (since, as a result of term premiums, credit premiums and preferred habitats, yields on short maturities tend to be lower than those on long maturities) and, on the other hand, the refinancing risk and debt service volatility risk associated with the amount of debt to be refinanced on the market each year. In this context, smoothing the annual cost of redemptions limits refinancing risk by reducing fluctuations in market issuance.

Choosing the maturities of its debt instruments is the first part of the issuer's smoothing process (in France, the choice is between short-term instruments (BTFs) and medium– and long-term instruments (OATs)). Between the Great Financial Crisis in 2009 and before the pandemic in 2020, these choices have resulted in the medium- to long-term borrowing programme stabilising at around 8.4% of GDP on average. The net medium- and long-term issuance programme then grew to 11.3% of GDP in 2020 in response to the pandemic. While the total borrowing requirement to GDP ratio had been trending downward, the stabilisation of medium- and long-term issuance had caused the outstanding amount of BTFs to decline from €214bn at end-2009 (roughly 11% of GDP) to €107bn at end-2019 (less than 5% of GDP). This helped build up an additional issuance buffer for short-term securities, which tend to become even more liquid during crisis periods (and this buffer was tapped during the 2020 crisis, given the depth of the market on this maturity), with the outstanding amount of BTFs rising by €54.7bn to €161.6bn (7% of GDP). The 2022 Budget Bill provides for a reduction in the share of OATs and BTFs in the issuance programme in terms of GDP, seeing them return to 10% and 6% of GDP, respectively.

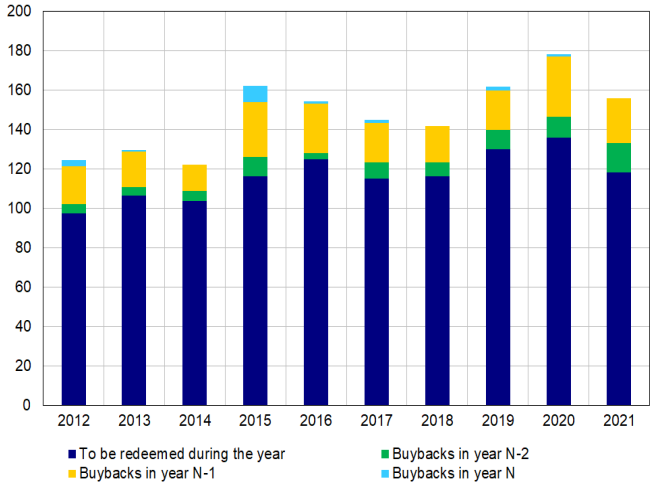
Borrowing needs are smoothed over time through buybacks of short-maturity bonds (two years or less) financed by issuing longer-dated bonds, when market demand for auctions of long-term instruments exceeds the borrowing requirement for a given year (see Chart 2). These buybacks reduce the volume of securities coming up for redemption over the next two years, thereby smoothing the size of the net medium- and long-term borrowing programme over time. Over the past decade, AFT has bought back an average of €30bn in OATs every year as part of this strategy (see Chart 3).

Chart 2: Refinancing schedule for medium- and long-term negotiable government debt as at 31 December 2021 (€bn)



Source: AFT, outstanding amounts net of inflation adjustment expense, December 2021. The orange segments show the amount of buybacks of securities that were originally to be redeemed during the year in question.

Chart 3: Effect of buyback policy on redemption profile since 2012 (€bn)

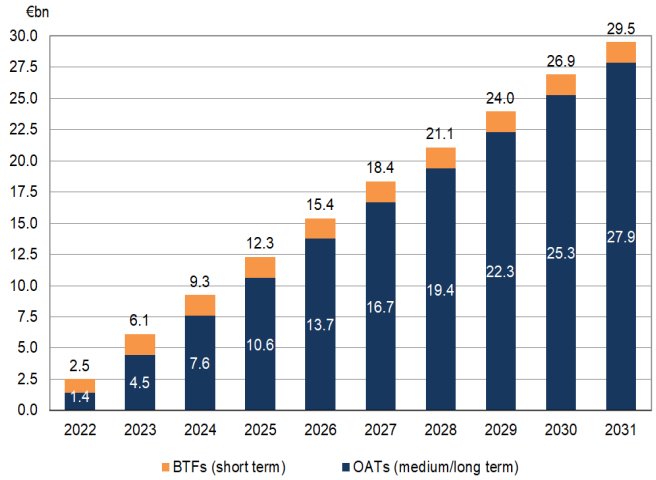


Source: AFT. Green, yellow and light blue segments represent volumes of debt purchased during the reference years, thereby reducing redemption volumes. For example, for 2021, the initial amount of redemptions stood at €156bn, which was reduced by €15bn worth of buybacks in 2019 and €22.8bn in 2020, effectively bringing the total amount to be redeemed in 2021 down to €118bn.

If medium- and long-term debt accounts for a significant proportion of total debt, it can minimise the immediate impact of an interest rate shock on debt service cost. In this context, given the high average

residual maturity of French debt, the shock of a 100 basis point increase in interest rates would cause additional interest expense to gradually and diffusely increase by €15bn over five years (0.6% of 2021 GDP) and €30bn over 10 years (1.2% of 2021 GDP), as compared to an annual expense of €36bn in 2020 (see Chart 4).

Chart 4: Impact of a 1 percentage point interest rate shock on the debt service of OATs and BTFs



Source: AFT, 2022 Budget Bill.

2.2 Optimising debt placement capability

Management of refinancing risk is primarily concerned with the government's capacity to refinance its debt under any circumstances. While an increase in average debt maturity can help to reduce this risk by smoothing upcoming redemptions, in a dynamic environment, smaller market depth and more volatile financing conditions for longer maturities must also be factored in.

To illustrate, it can be safer to roll over a 10-year debt held by a stable investor base than doing so at half the pace with a 20-year debt with a fragile investor base, as the latter is at greater risk of a sudden sell-off, thereby disrupting the issuer's access to financing in the segment. In practice, the stability of the composition of its investor base is a good indicator of both the quality of the issuer placement capability and the risk of volatility in the government's financing costs. It is the investment behaviour of its debtholders, more so than their geographic origin, that matters: a government issuance policy mainly targets investors who are able to hold for the long term (e.g. pension funds, insurers, asset managers, central banks) while also relying on the positive externalities of having holders with shorter-term investment horizons, who are able to provide liquidity to the market (e.g. banks, hedge funds).

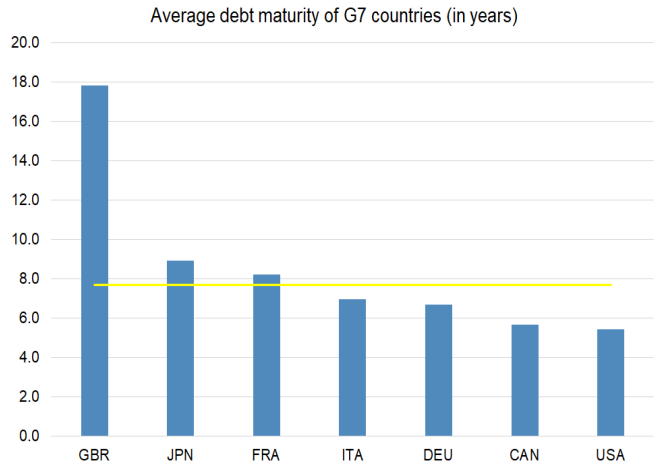
There is a lack of consensus as to the theoretical optimal average debt maturity, although there are models[8] that provide insight by determining the efficient frontier in the trade-off between financing costs and financing risks. More specifically, the literature remains divided and inconclusive as to the optimal issuance maturity. Some consider there to be circumstances, namely when interest rates fall below the economic growth rate ($r - g < 0$), under which a longer issuance maturity is justified. However, this argument runs up against potential nonlinearities in a context of historically high debt levels[9] that could cause interest rates to rise (or growth to slow) more quickly than anticipated,[10] meaning no conclusions can be drawn as to an optimal duration from this perspective. Others recommend maintaining a relatively short average maturity, as the nature of sovereign debt justifies the issuance of short-term debt (as a "near-money"[11] instrument), not only to satisfy the financial system's demand for safe and liquid assets, thereby allowing the government to benefit from a convenience premium, but also to limit the risks to financial stability associated with excessive issuance of long-dated securities.[12] Issuance of short-term securities could even bolster the credibility of the government's commitment to not default on its debt.[13]

(8) For Italy see Bernaschi, Briani, Papi, Vergni (2007), "Scenario-Generation Methods for an Optimal Public Debt Strategy"; for Hungary see Bebes, Tran, Bebesi (2018), "Optimizing the Hungarian Government Debt Portfolio".
(9) Mauro P. and Zhou J. (2021), "r – g < 0: Can We Sleep More Soundly?", *IMF Economic Review* 69, pp. 197-229.
(10) Lian W., Presbitero A. F. and Wiridinata U. (2020), "Public Debt and r – g at Risk", *IMF Working Paper* no. 20/137.
(11) Nagel S. (2014), "The Liquidity Premium of Near-Money Assets", *NBER Working Paper* no. 20265.
(12) Bhandari A., Evans D., Golosov M. and Sargent T. (2019), "The Optimal Maturity of Government Debt", *EconPapers, Meeting Papers* no. 1011.
(13) Aguiar M., Amador M., Hopenhayn H. and Werning I. (2019), "Take the Short Route: Equilibrium Default and Debt Maturity", *Econometrica*, Vol. 87, pp. 423-462.

Box 3: International comparison of average government debt maturity

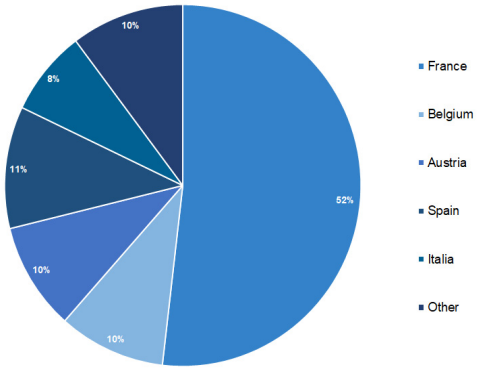
In France, the average maturity of the government debt stood at 8.2 years at end-2020 (see Chart 5), following a steady upward trend since 2003 (5.8 years). This reflects a lengthening of the average maturity of OATs issuances, growing from 8.3 years in 2003 to 11.5 years in 2020. This is comparable to that of most other G7 countries and is considered satisfactory by rating agencies. In the euro area, France is the benchmark issuer in the very long segment of the yield curve, having issued more than 50% of the current outstanding of euro-denominated sovereign debt with maturities beyond 30 years (see Chart 6).

Chart 5: Average debt maturity (in residual years)



Source: OECD data (at 31 December 2020).

Chart 6: Outstanding euro area debt with residual maturity above 30 years



Sources: Bloomberg data, restated by AFT (at 31 December 2021).

The average maturity of sovereign debt is primarily a reflection of the composition of domestic savings (or euro area savings) and the international appeal of the debt. The duration of the financial liabilities of investors (banks, insurers, pension funds, etc.) therefore influences the maturity of their government's bond issuance. For instance, the long maturity of UK debt (roughly double that of France) is due to the country's large pension fund industry, with total liabilities exceeding those of all the pension funds in all euro zone countries combined.[a] This results in strong demand for safe, long-term GBP-denominated assets capable of covering these pension funds' long-term liabilities (fixed-rate or inflation-linked). Another consequence of this demand is that the UK yield curve begins to invert at around the 25-year maturity mark.

Lastly, a currency with international status that is held by central banks for the purpose of foreign exchange reserve management will attract demand for shorter maturities with higher liquidity and less interest rate risk. This drags down the average maturity of the safest sovereign bonds denominated in the most common foreign exchange reserve currencies, which explains the relatively short maturity of US government debt.

a. See EIOPA, *Detailed Data on European Institutions for Occupational Retirement Provision*.

In addition to these exogenous factors of structural demand for debt securities, some argue that a sovereign issuer might consider taking advantage of a period of low interest rates by lengthening the average maturity of its debt even further in order to "lock in" low financing costs. However, for a "large" country,[14] issuing securities whose maturities exceed natural investor demand will increase financing costs for these

(14) The situation is different for countries whose borrowing needs are quite low compared to investor demand in the currency of denomination (e.g. smaller euro area countries).

specific maturities. Even without an endogenous increase in financing costs, the strategy will only pay off if the gains generated by a possible rise in rates exceed the cost of carry (term premiums, credit premiums, premiums paid for deviating from preferred habitats). The calculation in Box 4 shows that the strategy of lengthening maturities will not necessarily pay off. Any potential gains will only arise under very specific conditions as to the size of the anticipated interest rate shock, the date it occurs, the shape of the yield curve and the value of the term premium between an original maturity and a target maturity.

One way to actively manage the average debt maturity without putting the government's financing model at risk is to not adjust the issuance strategy but use interest rate swaps, which is akin to adjusting the rate-setting horizon and therefore the average debt maturity, thereby providing a hedge against an undesirable swing in interest rates. AFT used this type of strategy in 2001 to reduce the average debt maturity in order to save on term premiums.[15] Although the strategy was suspended in 2002, as market conditions were no longer favourable, it did result in a total of €4.3bn in savings on cumulative debt service costs.

Box 4: Modelling a maturity lengthening strategy

It is possible to roughly model the trade-offs between the cost of carry of a debt maturity lengthening strategy (term premiums, liquidity premiums) and the opportunity gain of a potential rise in interest rates (gain associated with avoiding an increase in refinancing costs).

The analysis uses a marginal approach, considering the premium paid on long maturities to be a fixed cost. If the issuer wanted to reissue the next three years of OAT redemptions at an average maturity of 15 years, it would need to almost double the current stock of OATs with a residual maturity above 15 years, to the extent that it would likely cause financing conditions to deteriorate in this segment, with market participants demanding an additional premium to absorb the issuance, thereby cancelling out any benefits of the strategy.

The exercise presented here involves gradually lengthening the average debt maturity D_0 (original maturity) to D (target maturity) by issuing debt with maturities of D as debt with maturities of D_0 come up for redemption, continuing to do so until interest rates rise by A on date T_0. There is assumed to be a uniform distribution of refinancing activity over time. The gain of this strategy (reduction in annual interest per euro of debt) is:

$$G(D) = (D - D_0)\left(\left(1 + e^{-\frac{T_0}{D_0}}\right)(A - \mu(D - D_0)) - \mu T_0\right)$$

where A is the anticipated interest rate shock (in basis points), T_0 is the date of the shock (in years from the current date) and μ is the annual term premium (in basis points).

The gain $G(D)$ is therefore the product of two factors. The first is the number of years by which the average maturity is lengthened. The second is the potential gain per year of additional duration. If $T_0 = 0$, i.e. if the interest rate shock has already occurred before the average maturity is lengthened, then $G(D) = 0$: there is no benefit to the strategy, since interest rates have already gone up. $G(D)$ becomes positive $T_0 > 0$, but only if the anticipated interest rate rise A is higher than the additional term premium $\mu(D - D_0)$ and the direct carry cost resulting from issuing at a longer maturity. $G(D)$ starts out increasing with T_0 as maturities are lengthened year after year, and it will be higher the later the interest rate rise occurs - but if the shock fails to materialise at all, the strategy will never pay off.

(15) Renne J. P. and Sagnes N. (2006), "Une modélisation des stratégies d'endettement de l'État", *Diagnostics Prévisions et Analyses Économiques* no. 99.

To illustrate, consider the assumption of an annual term premium of 6 basis points per year of maturity ($\mu = 6$), and a strategy of lengthening average debt maturity over the course of three years ($T_0 = 3$) by refinancing redemptions with a new target maturity D of 15 years (compared to an original maturity (compared to an original maturity D_0 of eight years) This would result in a cumulative gain of €7bn after 20 years and €26bn after 40 years (for a maximum gain of €35bn after an "infinite" number of years[a]) in the case of a 200 basis point rate shock ($A = 200$) three years after the start of the strategy ($T_0 = 3$). Once annualised, this gain only represents about 1% of the fiscal cost of debt service for 2020 (€36.2bn). In a less favourable scenario (100 basis point rate shock after three years), the same strategy would generate a loss of €9bn after 20 years and €3bn after 40 years, breaking even beyond 40 years. If interest rates fail to rise, the strategy results in a loss of €32bn after 10 years, €89bn after 20 years and €221bn after 40 years.

This is admittedly a simplistic analysis. In particular, it assumes that the market is capable of absorbing the longer maturities without an increase in premiums, that the eventual interest rate shock will be permanent and that the government plans to return to the initial maturity as soon as rates rise, which would require it to know the exact date of the interest rate shock. However, the model does show that a strategy of lengthening average debt maturity would not necessarily result in a gain, and that if it did, it could take a long time to materialise and not amount to much once annualised and expressed as a percentage of GDP. In short, any potential gain should be weighed against the high risk of this type of strategy.

a. After a certain amount of time, the annual gain decreases as debt with maturity D itself comes up for redemption and must be refinanced at the new interest rate, which has increased by A. The annual gain therefore approaches zero and the cumulative gain levels off.

Box 5: The composition of the French sovereign debt investor base

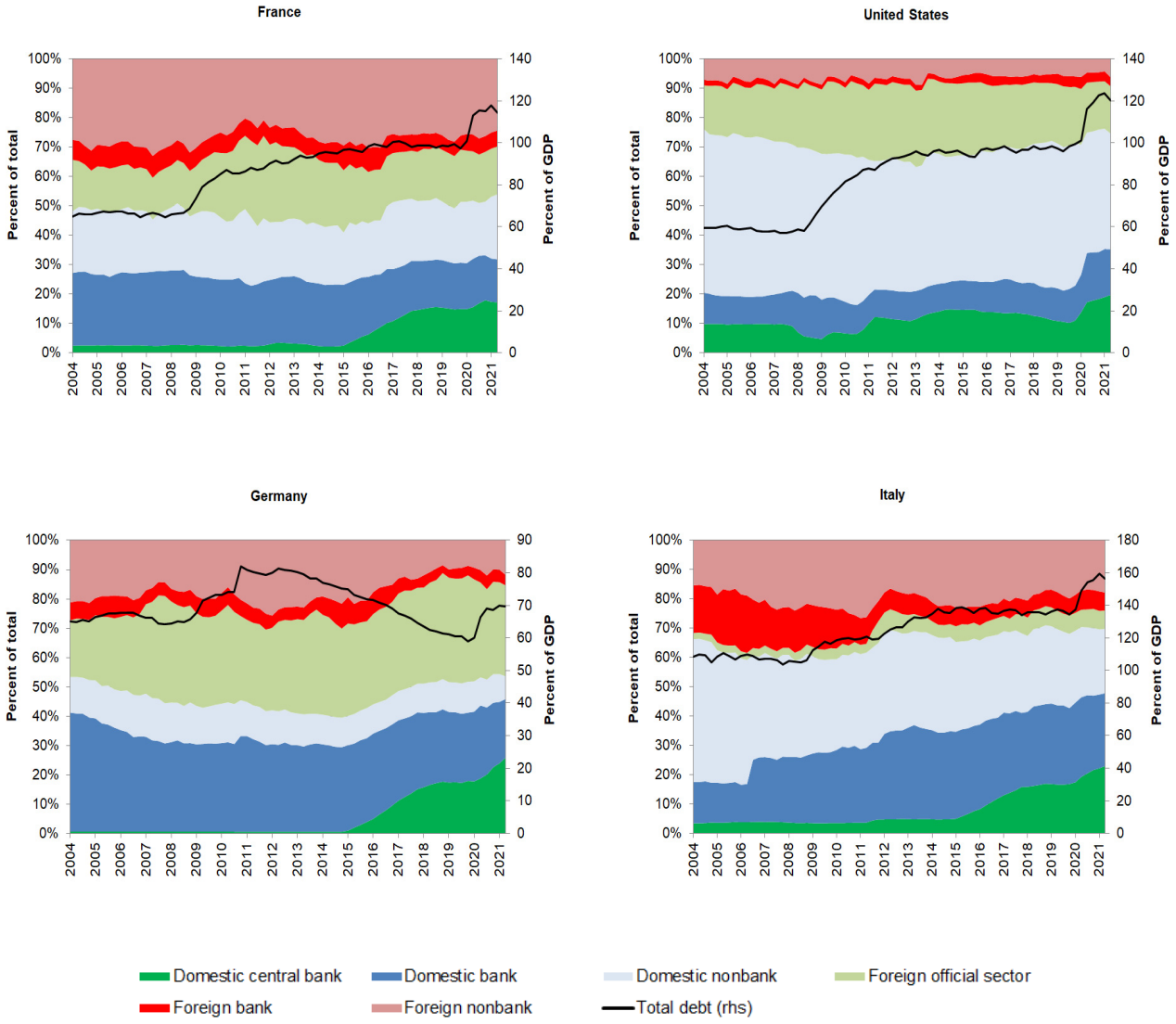
Determining who holds France's government debt – its investor base – can be done by analysing existing public data, published twice a year by the *Banque de France* and the IMF and available on the AFT website. AFT also collects qualitative data during meetings with investors. The government does not know the names of the holders of its debt, which changes hands all the time on the secondary market (the equivalent of 165% of France's debt is traded every year on the markets); at any rate, this information would not be useful since the holder of a bond is not entitled to anything more than repayment (as opposed to the holder of a corporate share). However, by combining the publicly available data, it is possible to obtain an overview of the composition of the government debt investor base.[a]

According to this data, France has an investor base that has remained stable over time and that is diversified in terms of both investor class and geographic location. As at Q2 2021, the breakdown was: 18% foreign central banks or sovereign funds, 5% foreign banks, 24% foreign nonbank investors, 17% *Banque de France*, 15% domestic banks and 22% domestic nonbank investors. The most recent notable shift has been the growth in holdings by the *Banque de France*, due to the decentralised implementation of the Eurosystem's asset purchase programme (dark green in the chart below), which caused the share of domestic government debt holders to grow (to roughly 50% of debt as at Q1 2021 compared to less than 38% at end-2014).

a. Arslanalp S. and Tsuda T., 2014, "Tracking Global Demand for Advanced Economy Sovereign Debt", *IMF Economic Review*, Volume 62, Number 3, Washington DC.

The stability of the investor base is an asset for sovereign debt placement, since a diversity of investors enables the government to place its debt resiliently in different market configurations and at attractive rates. Furthermore, having a high proportion of investors with cautious investment behaviours and low price sensitivity (such as central banks) or that are able to hold for the long term (like insurance companies or pension funds) helps guarantee the stability of the government's financing conditions. On the bond market, the nature of the investor underlying the investment behaviour matters more than their geographic origin, whether domestic or foreign.

Chart 7: Composition of government debt investor base for France, the US, Germany and Italy



Source: International Monetary Fund, Sovereign Debt Investor Base for Advanced Economies

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