

ASSESSMENT OF RISKS TO THE FRENCH FINANCIAL SYSTEM

DECEMBER 2022



CONTENTS

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| CONTENTS | 3 |
| OVERVIEW | 4 |
| RISK SUMMARY | 6 |
| MEASURES TAKEN BY AUTHORITIES | 7 |
| 1. CROSS-CUTTING ANALYSIS OF VULNERABILITIES | 9 |
| 1.1 Against a backdrop of uncertainty, insufficient regulation of non-bank financial institutions could amplify the risks of disorderly market corrections | 9 |
| 1.2 Vulnerabilities of non-financial corporates remain contained, although debt trajectories need to be monitored | 23 |
| 1.3 French financial intermediaries (banks and insurance companies) have successfully absorbed the shocks suffered in 2022 | 30 |
| 1.4 Some structural challenges have become even more pressing in the short term | 36 |
| 2. VULNERABILITIES LINKED TO LEVERAGE IN NON-BANK FINANCIAL INSTITUTIONS | 40 |
| 2.1 Definition of leverage and main risks for financial stability | 40 |
| 2.2 The supervisory framework governing leverage in non-bank financial institutions | 44 |
| 2.3 Analysis of leverage in investment funds and insurance companies | 47 |
| 3. NATURE-RELATED RISKS AND RISKS LINKED TO BIODIVERSITY LOSS | 52 |
| 3.1 Definition of nature-related risks | 52 |
| 3.2 Although physical risks appear locally at first, they can spread to the whole financial system | 54 |
| 3.3 Public policies aimed at containing these physical risks are set to be strengthened, potentially resulting in transition risks | 58 |

The macroeconomic and financial environment remains highly uncertain, although the likelihood of the most adverse scenarios occurring has diminished since the summer. The global economy remains affected by multiple large-scale shocks, which are clouding the economic growth outlook and keeping inflation at an overly high level. This environment, coupled with the rapid rise in interest rates, could amplify pre-existing sources of vulnerability, particularly in connection with market volatility and weaknesses at some lightly regulated non-bank financial institutions (NBFIs). Adjustments have been orderly so far, and the main financial and non-financial participants still have significant capacity to absorb shocks. But today's uncertain setting is conducive to sizeable shocks that could lead to disorderly corrections. To ensure continued resilience, micro- and macroprudential authorities, as well as financial participants, must remain vigilant.

Major sources of vulnerability for the financial system remain in place and some are increasing

The financial system is exposed to severe volatility. Financial markets, especially equity and bond markets, have been characterised by severe volatility and lower liquidity since June, in response to the swift increase in interest rates. Localised pressures have cropped up from time to time, notably due to liquidity stress affecting some less regulated participants. Soaring gas and electricity prices on physical markets caused renewed liquidity stress on derivatives markets in August 2022. Faced with reduced supplies of Russian gas, European countries took steps to reduce the risks of shortages in winter 2022/23, but the threat persists, fuelling volatility in this market segment.

Vulnerabilities in the less regulated NBFIs could lead to disorderly market adjustments. Among these institutions, those in the weakest positions, including some pension funds, open-end funds and alternative funds, could face significant liquidity requirements in the event of market stress. Heavily leveraged participants are especially vulnerable to adverse market movements. Liquidity risk management by these entities could lead to procyclical behaviour that contributes to disorderly increases in volatility movements in certain market segments. In a volatile market environment, French investment funds showed resilience in the second half of 2022. A thematic chapter of this assessment concludes that leverage at France's NBFIs remains under control overall. Even so, our financial system could be exposed to spillover risk via financial markets from pressures connected with non-resident NBFIs, many of which are more lightly regulated.

The financial system remains exposed to the high debt of non-financial participants. Bank lending ensured that the real economy continued to enjoy plentiful financing in the second half of 2022. As a result, however, the outstanding net debt of French non-financial corporations (NFCs) remains at a high level relative to European standards.

Households and NFCs are however insulated against increased rates by the structure of their debt, which features fixed rates and medium- and long-term maturities. As a result, they are favourably positioned compared with other European households and corporations in the current setting of rising interest rates.

Furthermore, companies' repayment capacity is supported by profitability levels, which remain relatively elevated, while the failure rate remains contained, although it is normalising towards levels on a par with 2019. At this stage, therefore, French NFCs (non-financial corporations) look to be equipped to cope with a macroeconomic environment comprising high inflation, rising interest rates and more subdued growth, even if some sectors are in a weaker situation than others.

In addition, French households and corporations continue to benefit from access to inexpensive bank credit. Interest rates on home and business loans, while rising, remain below those seen in other European markets and are also below bond financing rates in the case of companies. France's home loan distribution model, which has been strengthened by compliance with the credit standards set by the *Haut Conseil de stabilité financière* (HCSF – High Council for Financial Stability), also protects households against house price volatility. In that regard, house prices continue to grow at a faster pace than during the pre-Covid period, even if transaction volumes are down slightly from the high levels of 2021.

Finally, measures to offset energy prices, the dimmer macroeconomic outlook and higher interest rates are putting pressure on France's sovereign debt trajectory. Given the elevated level of French government debt, the

factors that will enable the trajectory to remain sustainable in order to preserve credit quality need to be taken into consideration now. Yet French government debt remains attractive to investors, and yield spreads over German benchmarks of equivalent maturities are moving in an orderly fashion.

The French financial system (banks and insurance companies) has the capacity to absorb significant shocks, which nevertheless require careful monitoring

French banks and insurers have a sound balance sheet structure and continue to report healthy earnings, which stand to benefit in the medium term from higher interest rates. They are therefore well positioned to deal with a potential increase in credit risk, which has not materialised so far. Over the coming quarters, banks' net interest margin (NIM) is poised to benefit from the positive impact of an orderly increase in interest rates, although the cost of deposits may rise slightly faster than the return on assets in the short term. Consistent with the resilience of French companies and households, non-performing loan ratios and the cost of risk remain low. However, the uncertain macroeconomic and financial environment makes it necessary to keep a close eye on provisioning policies. As at end-September 2022, the policies of the major banks looked sufficiently conservative, having regard to the resilience of credit exposures.

For insurance undertakings, the effects of higher interest rates and inflation vary across business lines. Non-life insurers offering long-term coverage are more vulnerable to the impact of inflation on the cost of claims. Meanwhile, higher rates expose life insurers to the risk of surrenders, although these remained contained and inflows stayed positive in 2022. A gradual increase in interest rates will allow insurers to reinvest in higher-earning assets as their previous investments mature.

Beyond the current uncertainties, the financial system is also facing structural risks that are increasing and require action to be taken in the near term

Extreme weather events over the summer highlighted the increased risks of a disorderly energy transition, which could push up the cost of climate risk for the financial system relative to that of a swift and orderly transition. Stress tests conducted by the ACPR and the ECB highlighted the progress that still needs to be made in terms of managing these risks. Other environmental risks, which interact with climate risk, could also affect the financial system. A thematic chapter in this report explores the risks linked to the decline of nature and biodiversity loss, whose financial materiality is now recognised by the community of central banks and supervisors.

Last but not least, geopolitical stress in the wake of the Russian war in Ukraine and the growing digitalisation of the financial sector continue to exacerbate the already elevated threat of cyberattacks. Heightened vigilance is vital to preventing attacks, which are growing increasingly sophisticated. Regulatory responses at European level will ensure that these risks are tracked and prevented more effectively.

Based on this assessment, the French financial system continues to display major factors of resilience that have enabled it to absorb numerous recent shocks in the still uncertain macroeconomic environment. However, the increase in risks in the short term calls for all financial-system participants and authorities to step up their vigilance

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CYCLICAL

STRUCTURAL

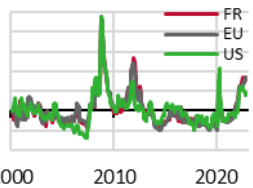
Vulnerabilities

Factors of resilience

Interaction of market risk with risks in vulnerable investment funds

- Leverage and difficulties in meeting margin calls
- Elevated volatility and liquidity stress on fixed income markets
- Liquidity requirements of non-bank financial institutions

Market stress indicator



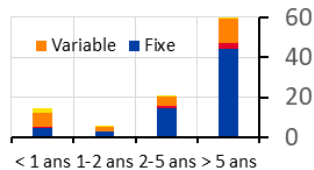
- Market structures benefiting from diversified participants and investors
- Robust market infrastructures
- Leverage under control in French investment funds

⇒ ST

Debt sustainability of non-financial participants as interest rates go up

- More costly market access (accelerated increase in interest rates)
- High NFC gross debt, significant disparities
- Elevated government debt

Characteristics of loans to French companies



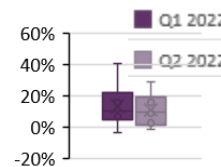
- Debt largely medium and long term, well-spaced maturities; stronger credit standards for housing loans
- Bulk of the real economy's debt at fixed rates

⇒ ST

Adjustments by financial participants to higher rates and credit risk

- Exposures to energy-dependent and inflation-sensitive sectors
- Sensitivity to the macroeconomic scenario
- Cost of the digital transition

French banks: rate shock (+200bp) to interest income



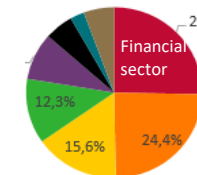
- Strong earnings posted by financial institutions
- Profitability supported by orderly rate increase
- Elevated solvency of banks and insurers

⇒ ST

Cyberthreats exacerbated by the geopolitical crisis

- Increased digital area of exposure for traditional participants
- New exposures via crypto-assets

Cyberattacks by sector in 2020



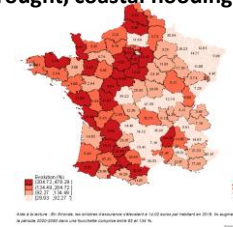
- Crisis exercises
- Regulatory work
- Operational preparations

⇒ ST to LT

Climate change-related exposures

- Need to respond to energy price shock exacerbating the risk of a disorderly transition
- Interactions with climate change already observed

Insurance claims: flooding, drought, coastal flooding



- Domestic efforts and European coordination
- Climate stress test exercises

⇒ ST to LT

Very high risk High risk Moderate risk ⇒ Future path (horizon)

Measures taken by authorities

In a bid to curb inflation, which remains far too high, the Governing Council of the European Central Bank (ECB), on which the Governor of the Banque de France sits, hiked key interest rates several times in 2022 as part of a monetary policy normalisation process, raising them to 2.5% for the main refinancing operations, 2.75% for the marginal lending facility and 2% for the deposit facility from 21 December 2022 onwards. Rates applicable to Targeted Longer-Term Refinancing Operations (TLTRO III) were also adjusted to strengthen monetary policy transmission. Specific and tailored measures (increased limit for securities lending facility) were introduced to address the money market pressures that could arise in this setting. Maturing securities acquired under asset purchase programmes will continue to be fully reinvested i) through to end-February 2023 in the case of the asset purchase programme (APP) portfolio, before being reduced by an average of EUR 15 billion per month until the end of the second quarter of 2023, and ii) at least until the end of 2024 for the PEPP portfolio.

In fiscal policy, government schemes to protect household purchasing power seek to mitigate the impact of higher inflation on consumption. France's 2023 *Budget Act* extends the price shield into 2023, however with a first price increase of gas and electricity prices of 15% at the beginning of the year. At European level, an initial regulatory package was adopted¹ with the aim of reducing energy prices, introducing in particular a binding target of lowering peak-time electricity consumption by 5%. A second set of measures is currently under discussion and could result in a joint scheme to purchase a portion of gas imports, along with a temporary mechanism to bring down price volatility in the natural gas market.² These measures are designed to supplement government schemes to support business financing.

As regards the supervision of financial institutions, while the crisis arising from the Russian war in Ukraine amplified macroeconomic uncertainties, measures did not have to be taken to adjust the supervisory framework for regulated financial institutions, as happened during the Covid-19 crisis. However, the European Union (EU) responded to the crisis by adopting financial sanctions, which consisted chiefly in freezing assets and barring Russian banking groups from interbank messaging networks, including SWIFT. Banks' implementation of these measures is being monitored. The *Autorité de contrôle prudentiel et de résolution* (ACPR – Prudential Supervision and Resolution Authority) set up ad hoc reporting arrangements to identify accounts belonging to persons subject to sanctions and affected assets or transactions. A series of thematic on-site inspections of asset freezes at the main financial institutions round out these arrangements. The Banque de France, meanwhile, made sure that the market infrastructures under its supervision implemented the sanctions properly. It also took part in international discussions, particularly at G7 level, aimed at anticipating potential attempts to get round the sanctions. The AMF introduced arrangements to monitor fund exposures to Russian securities, paying special attention to the valuations assigned to these exposures within portfolios.

Finalisation of Basel III implementation through the regulatory transposition of the framework in Europe (negotiations are currently underway on CRR3-CRD6) and the ongoing Solvency II Review should help to consolidate individual resilience through adjustments to the prudential requirements applicable to credit institutions and insurance undertakings. Macroprudential policy measures supported these efforts through a number of sector-specific measures. After a careful review of the banking system's capacity to meet the economy's funding needs at a time of heightened cyclical vulnerabilities, the Haut Conseil de Stabilité Financière (HCSF – High Council for Financial Stability) gradually raised the credit protection reserve (countercyclical capital buffer) rate to 0.5%³ and then 1%⁴ to strengthen the capacity of credit institutions to absorb potential shocks. This credit protection reserve works in tandem with two borrower-focused macroprudential measures. The first one is the HCSF's decision to limit the exposure of systemically important banks to the most heavily indebted major companies to 5% of own funds, which is currently in force until June 2023. The second one is the conversion into a legally binding standard of the recommendation strengthening credit standards applied by banks to home loans,

¹ [Council Regulation \(EU\) 2022/1854 of 6 October 2022 on an emergency intervention to address high energy prices](#)

² [Proposal for a Council Regulation enhancing solidarity through better coordination of gas purchases, exchanges of gas across borders and reliable price benchmarks](#)

³ [Decision No. D-HCSF-2022-1 of 7 April 2022 on the rate applicable to the countercyclical capital buffer](#)

⁴ [HCSF, Press release of 13 December 2022](#)

by setting a maximum debt-service-to-income ratio of 35% and a maximum credit period of 25 years. Working closely with the ACPR, the HCSF is closely monitoring compliance by credit institutions with these measures, which ensure the robustness of France's home financing model.

Besides addressing cyclical risks, public authorities are also actively tackling structural vulnerabilities for financial stability:

- Cyber-threats, which have become more likely to occur owing to the geopolitical crisis, are being addressed by three types of measures. On the regulatory front, the European Council and the European Parliament have adopted the draft *Digital Operational Resilience Act (DORA)*, which seeks to establish a harmonised framework to prevent and limit cyber-vulnerabilities. Coordination between European and French institutions on this topic is also taking place on a sector basis. In late September, following a declaration by EIOPA, the European authority that supervises insurers, the ACPR recommended that insurance undertakings should review the implicit cyber risk coverage written into their contracts, at a time when there is a high probability that such threats could materialise. These efforts have been accompanied by cyber-crisis simulation exercises.⁵ In late June 2022, the Banque de France, the ACPR and the Monetary Authority of Singapore (MAS) conducted a joint crisis management exercise focused on cybersecurity threats.⁶ Meanwhile, with a view to preventing cyber risk, supervisory authorities are integrating such risk in their inspections.
- Measures to prevent climate change-related risks are informing a slew of efforts at domestic, European and global levels. Internationally, understanding of climate risk continues to advance through work spearheaded by the Network for Greening the Financial System (NGFS), for which the Banque de France acts as secretariat, notably through the third vintage of the network's climate scenarios.⁷ Specific work is also being done domestically: in late October 2022, the AMF and the ACPR published their third report monitoring and assessing the climate commitments of members of the Paris financial centre.⁸ At the European level, the ECB announced in July that it would incorporate environmental considerations in monetary policy, and particularly in its corporate bond purchases, collateral policy, risk management and transparency requirements. These efforts are being backed by regulatory progress, with the Corporate Sustainability Reporting Directive (CSRD) being adopted on 28 November.⁹

⁵ [ACPR, Press release of 23 September 2022](#)

⁶ [Banque de France/MAS, Press release of 17 June 2022](#)

⁷ [NGFS, Press release of 9 June 2022](#)

⁸ [ACPR-AMF, Monitoring and assessing the climate commitments of members of the financial centre \(2022\)](#)

⁹ [EU Council, Press release of 28 November 2022](#)

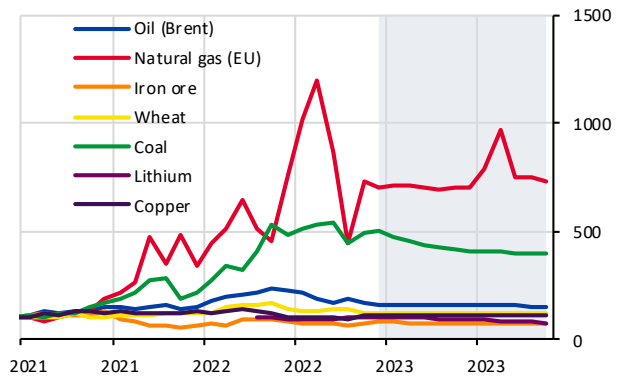
1. Cross-cutting analysis of vulnerabilities

1.1 Against a backdrop of uncertainty, insufficient regulation of non-bank financial institutions could amplify the risks of disorderly market corrections

The macroeconomic environment continues to be characterised by severe short-term uncertainty

After the war in Ukraine caused the global macroeconomic environment to deteriorate over the first six months of the year, global growth forecasts stabilised overall in the autumn. Russia’s continuing war in Ukraine ramped up the pressure on energy commodity prices (cf. Chart 1.1), while the reduction in natural gas deliveries from Russia had a major bearing on euro area growth and inflation forecasts, with sizeable cross-country disparities. Persistent supply-side difficulties and dollar appreciation stoked upside price pressures, while the cooling Chinese economy and tighter global financial conditions due to higher interest rates contributed to more subdued activity.

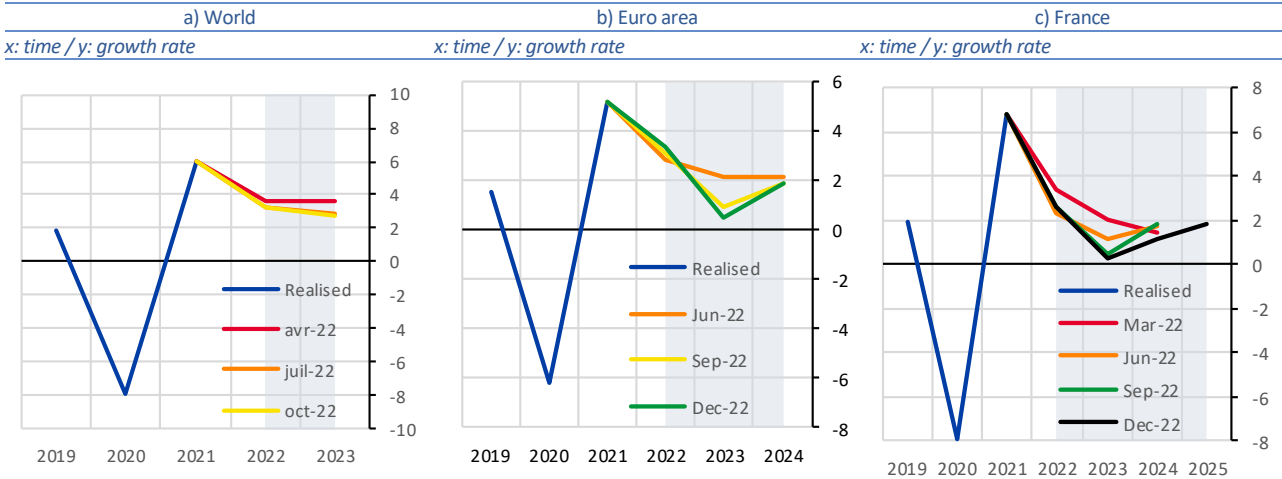
Chart 1.1: Commodity prices
x: time / y: 1 January 2020 = 100



Note: Energy, commodity and agricultural product prices. The curves in the greyed area indicate the value of forward sales on the futures market.
Source: Bloomberg.

In the euro area and in France, growth will be slightly firmer than previously expected in the second half of 2022, before slowing sharply in 2023. The latest forecasts from the [European Central Bank \(ECB\)](#) published in December 2022 predict that the euro area economy will expand by 3.4% in 2022, up from a forecast of 2.8% in June, before slowing to 0.5% in 2023, compared with the June forecast of 2.1% (cf. Chart 1.2 b). In [France](#), GDP is expected to expand by 2.6% in 2022 and then 0.3% in 2023 (cf. Chart 1.2 c).

Chart 1.2: GDP and forecasts

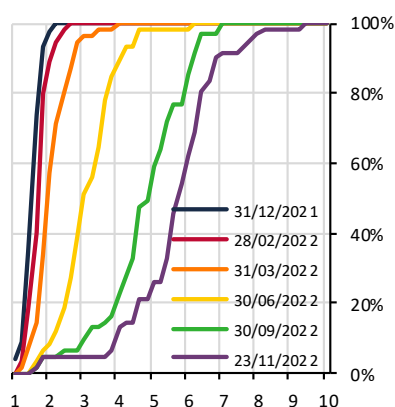


Source: (a) IMF World Economic Outlook, (b) ECB and (c) Banque de France.

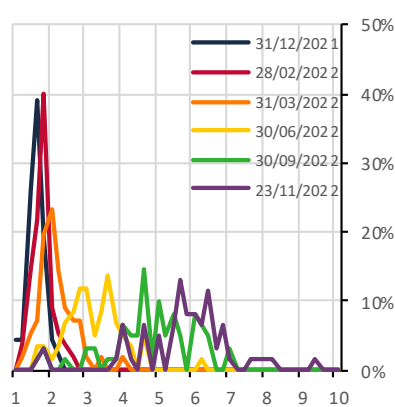
Inflation projections for France and the euro area were revised upwards during the second half of 2022, with expectations showing significant dispersion. Compared with its June projections, in December the ECB forecast growth of 8.4% (+1.6 pp) in the harmonised index of consumer prices (HICP) for 2022 and 6.3% (+2.8 pp) for 2023. The Banque de France's inflation projections for France were more contained, but also higher than where they were at end-June, at 6% for both 2022 and 2023. The ECB and the Banque de France are predicting that inflation will ease more markedly in 2024 (to 3.4% and 2.5%, respectively), before getting back to the 2% target in 2025. Inflation expectations among market participants were frequently revised upwards over the course of 2022, with widening dispersion reflecting the uncertain outlook (cf. Chart 1.3). Long-term inflation expectations obtained from market prices were more stable: France's ten-year breakeven inflation rate¹⁰ derived from French index-linked government bonds has hovered around 2.5% since June 2022.

Chart 1.3: EU inflation expectations for 2023

x: Inflation rate (%) expected in the EU for 2023 /
y: cumulative density function of inflation expectations



x: Inflation rate (%) expected in the EU for 2023 /
y: % of participants expecting each future level of inflation

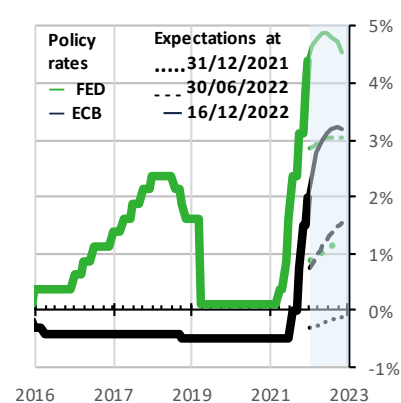


Note: Inflation forecasts for 2023 in the EU reported by bank forecasters; the density function on the left-hand side shows the % of participants expecting a future inflation level below or equal to x%; the flatter the curve is, the more expectations are dispersed.

Source: Bloomberg, Banque de France calculations.

Chart 1.4: Policy rate expectations

x: time / y: %



Source: Bloomberg, Banque de France calculations.

Monetary policy normalisation¹¹ has shifted the yield curve upwards, causing financing conditions to tighten. Expectations of an increase in key rates, which are expected to peak in 2023, were frequently revised upwards over the course of 2022 (cf. Chart 1.4.) as inflation expectations were reassessed. The monetary policy gap between the euro area and the United States, coupled with the deterioration in the terms of trade for the euro area linked to higher commodity prices, have caused the euro to depreciate by 7% relative to the dollar since the start of 2022. Over the same period, however, the single currency appreciated slightly (+0.3%) against a basket containing the currencies of the area's main trading partners.

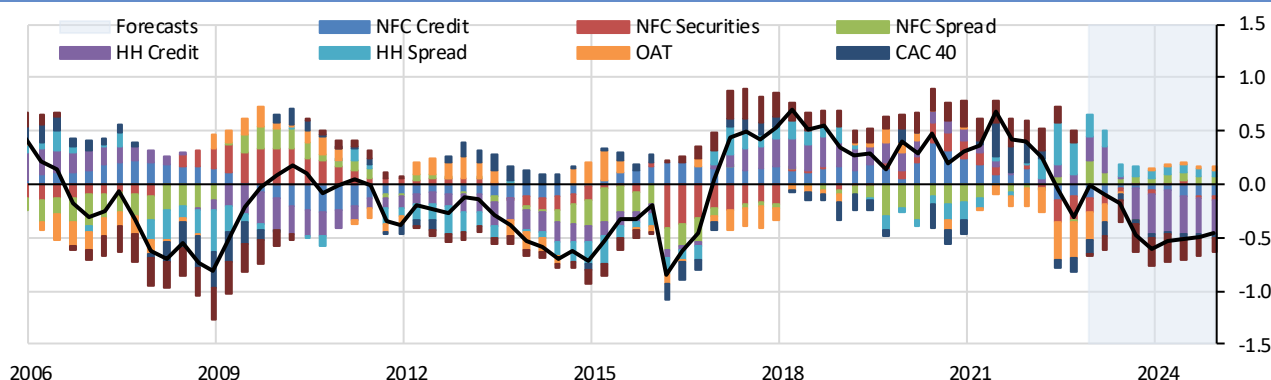
In France, the financial cycle indicator shows that financing conditions are tightening (cf. Chart 1.5). The financial cycle is expected to tighten over 2023-2024, driven initially by falling prices on equity markets and increased bond yields, and then subsequently by slower credit growth (particularly to households) via the banking channel of monetary policy transmission.

¹⁰ The inflation breakeven rate corresponds to the gap between the yield on nominal (non-index-linked) bonds and that on inflation-linked bonds of the same maturity. It shows the inflation expected by market participants. Other factors besides expected inflation contribute to the relative pricing of index-linked bonds relative to nominal bonds, such as the liquidity differential or the supply/demand equilibrium, for example.

¹¹ "Normalisation" refers here to the process by which the monetary policy stance moves from an extremely accommodative position designed to stave off the risk of deflation, to a stance whose objective is once again to encourage inflation to converge sustainably towards the target (in the current setting, with prices under upside pressure, via policy rate hikes and reductions in the stock of securities held by central banks). Cf. for example "Normalising monetary policy in non-normal times", speech by F. Panetta to the CEPR, 25 May 2022.

Chart 1.5: Financial cycle

x: time / y: index



Note: The financial cycle indicator is constructed from eight underlying variables: the change over two years in outstanding loans to domestic NFCs by domestic monetary financial institutions; the change over two years in outstanding debt securities issued by domestic NFCs; the change over two years in outstanding loans to resident households and non-profit institutions serving households by domestic credit institutions; the growth over one year in real estate prices; the change over one year in ten-year sovereign yields; the annual return on the CAC 40; the spread between the average interest rate on home loans and French ten-year government bonds; and the spread between the average interest rate on NFC loans and French ten-year government bonds. The more the cycle's value is positive and increasing, the more it indicates that financing conditions are easing; conversely, negative and falling values correspond to tightening periods and may provide an early indicator of financial stress or even a systemic crisis.

Source: Banque de France calculations.

Box 1.1: Which are more relevant: real or nominal interest rates?

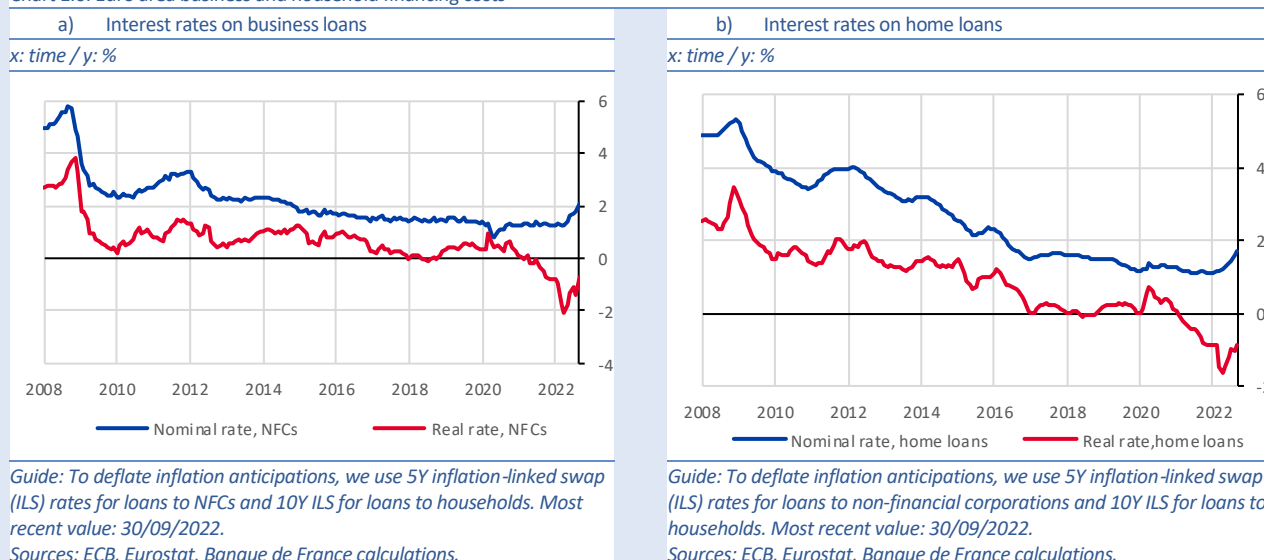
When seeking to understand the role of interest rates in the economy, we draw a distinction between nominal and real rates. The interest rate corresponds to the cost of a loan for the borrower and, conversely, the return on savings for the lender. As inflation erodes the real value of the amounts exchanged, the real rate is measured (in its simplest form) as the nominal rate less the rate of inflation. When making a savings or investment decision, it is ultimately the real rate that counts: an elevated nominal rate, if accompanied by high inflation, results in a lower or even negative cost of credit (cf. Chart 1.6).

However, agents' medium and long-term savings and investment choices are influenced not by current real rates but by real interest rates anticipated at different time horizons, also known as ex ante rates, because investors want to know the true cost of their proposed investments, that is, the real amount of repayments spread over the life of each investment. Expected inflation is what counts here, since current and past inflation provide only indirect information at best. Thus, while euro area inflation is currently running at approximately 10% year-on-year (yoy), medium-term inflation expectations are lower, at between 2% and 3%. Assuming an identical nominal interest rate, the corresponding real rate will therefore be higher for medium-term financing compared with short-term funding.

Central banks often refer to real rates when steering monetary policy, which then raises the question of which gauge of inflation to consider. Significant energy price shocks may lead to larger movements in total (headline) inflation than in underlying (core) inflation, which excludes food and energy prices. In economies where agents take savings, financing and consumption decisions at the domestic level, monetary policy influences the change in headline inflation essentially via the output gap, rather than through the terms of trade. Under these conditions, the monetary policy stance may be more effectively assessed using core inflation. Expected core inflation at different time horizons is not directly observable. In today's environment, expected core inflation might be predicted to be lower than expected headline inflation, causing real ex ante interest rates to go up.

In practice, private agents do not necessarily calculate an ex ante real interest rate. They tend rather to anticipate nominal increases in income (wages, revenues) separately from saving returns or nominal financing costs over the decision horizon. To the extent that the first type of variable tends to co-move with expected inflation and the second is determined by the interest rate, ex ante real interest rates are primarily a synthetic measure that is useful to economists in analysing savings and investment decisions at the aggregate level.

Chart 1.6: Euro area business and household financing costs



In a setting of elevated uncertainty and volatility, financial markets could be exposed to disorderly corrections

Tighter financing conditions are being accompanied by increased volatility and deteriorating liquidity on financial markets

Chart 1.7 Volatility indices

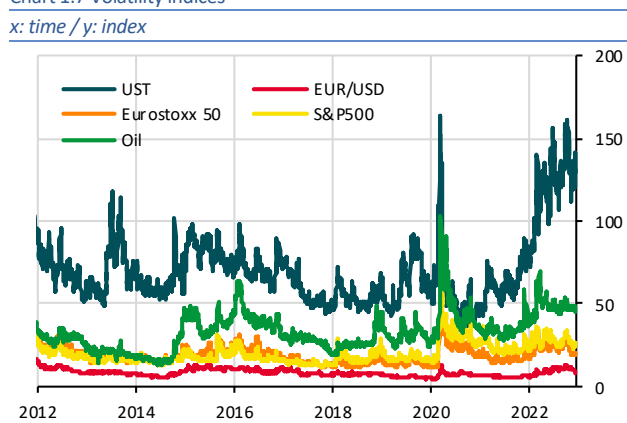
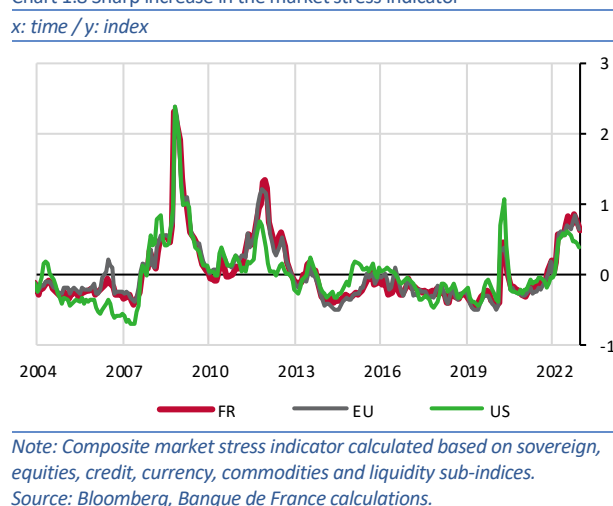


Chart 1.8 Sharp increase in the market stress indicator



Since the year began, financial market volatility has become much more pronounced, in connection with the shift in expectations of higher interest rates. So far, though, the market correction has been orderly. Volatility (cf. Chart 1.7) has increased especially on fixed income markets, in response to frequent revisions by market participants of their monetary policy expectations. These movements also affected currency and equity markets,

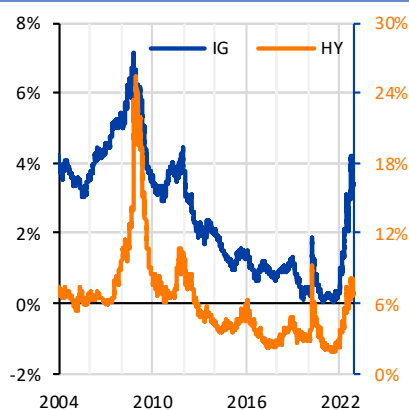
while commodity markets experienced two bouts of stress, one between March and May, and another between July and August. In this setting, the Banque de France's market stress indicator rose sharply over the course of 2022 (cf. Chart 1.8). While these movements have so far taken place without systemic pressures, localised episodes of stress on certain market segments, such as that observed on the UK sovereign bond market in September (cf. Box 1.2), nevertheless illustrate market vulnerabilities connected with potential weaknesses at certain participants, especially financial intermediaries such as heavily leveraged open-ended funds.

Market adjustments remain orderly and are essentially attributable to the increase in interest rates

Nominal yields on French sovereign debt rose sharply in 2022, keeping step with European sovereign debt as a whole, in line with shifting monetary policy expectations. The yield on French 10Y government bonds was 2.58% on 15 December 2022, up from 1.95% at end-June 2022 but well below the most recent high of 2.91% reached in October 2022. After increasing in June, yield spreads between euro area sovereign debt and German debt narrowed in the second half (cf. section 1.2 and Chart 1.519 below).

Chart 1.9: Average market yields of IG and HY EUR-denominated corporate bonds

x: time / y: %

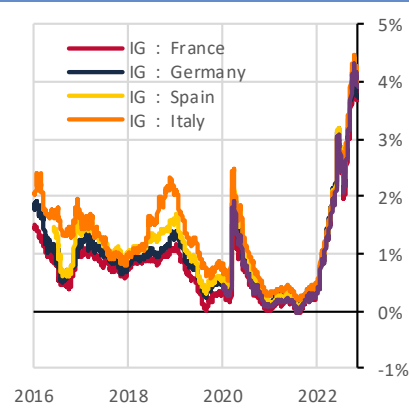


Most recent value: 12/12/2022.

Sources: Eikon, Banque de France calculations.

Chart 1.10: Market yields of IG EUR-denominated corporate bonds, by country

x: time / y: %

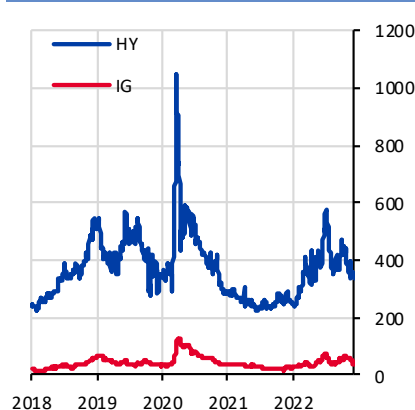


Most recent value: 12/12/2022.

Sources: Eikon, Banque de France calculations.

Chart 1.11: Index of OAS spreads for French NFC debt issues

x: time / y: basis points



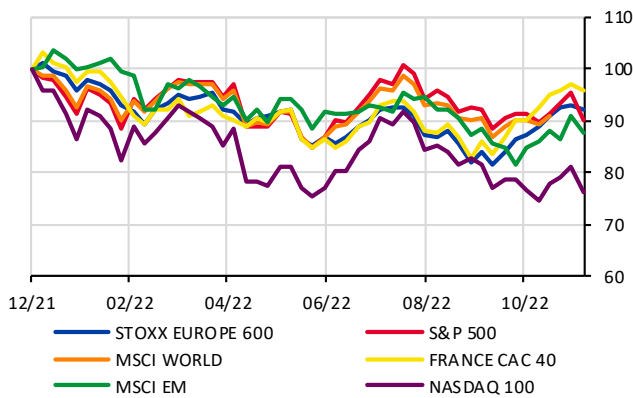
Most recent value: 12/12/2022.

Source: Eikon, Banque de France calculations.

In France, as elsewhere in the euro area, the increase in nominal yields on the market debt of NFCs is being driven chiefly by the rise in the risk-free rate, with spreads widening only moderately for top-rated companies since the start of the year. At European level, yields on EUR-denominated corporate bonds have risen steadily since the first quarter of 2022 for high yield (HY) and investment grade (IG) issuers alike (cf. Chart 1.9). In Western Europe's five largest economies, yields on bonds issued by IG companies averaged 3.51% in mid-December 2022 (all maturities) while in France they were at 3.29% (cf. Chart 1.10). Spreads over the risk-free rate, also known as option-adjusted spreads (OAS), for the securities of French IG NFCs rose from 32 bps on 3 January 2022 to approximately 42 bps in mid-December 2022, after fluctuating at slightly higher levels over the course of the year (cf. Chart 1.11). Debt securities in the HY category saw larger variations in spreads. From a starting level of approximately 250 bps going into the year, spreads hit 575 bps in early July before settling at around 340 bps in mid-December (cf. Chart 1.11).

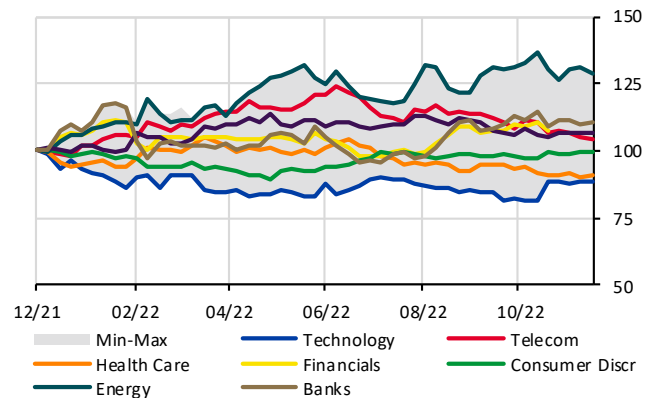
Equity markets have recorded a moderate year-to-date correction despite the volatile environment. Amid higher interest rates, a geopolitical crisis and expectations of economic cooling, global equity markets softened, particularly in the first half of the year. French and European equity indices bottomed out in late September, falling by 17% and 18% respectively year-to-date (dividends reinvested), but rebounded in November (cf. Chart 1.12). The correction featured significant sector dispersion, with sharp gains for the energy sector, which has outperformed the European index by over 35% since start of the year, while tech underperformed by approximately 10% (cf. Chart 1.13). This reflects that fact that tech firms have a profit profile based on future earnings over long time horizons, whose net present value is automatically eroded by higher interest rates.

Chart 1.12: Performance of the main equity indices
x: time / y: base 100 index



Note: Returns in EUR, dividends reinvested. Most recent value: 07/12/2022.
Source: Eikon Refinitiv.

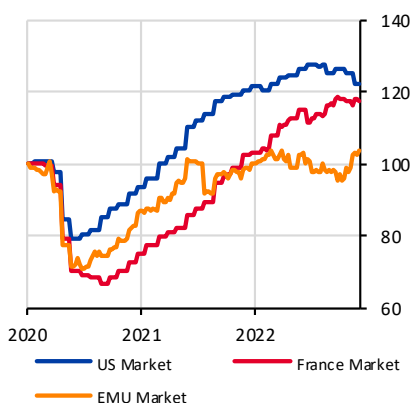
Chart 1.13: Sector performances relative to European equity index
x: time / y: base 100 index



Note: For each sector index, the surplus return over the European equity index is measured. These performances are tracked by an index where January 2022 = 100. Most recent value: 12/12/2022.
Sources: Eikon Refinitiv, Banque de France calculations.

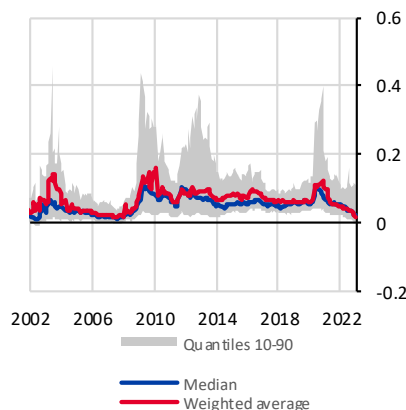
Equity markets mainly reacted to the increase in the risk-free rate and remain exposed to a continued correction in the event of dimmer growth prospects in 2023 or increased investor risk aversion. In theory, equity prices reflect future income discounted using the risk-free rate to which is added the risk premium demanded by investors, and fluctuate according to these components. It is interesting to note that earnings forecasts did not decrease in 2022 and actually increased in France (cf. Chart 1.14), buoyed by brighter prospects for energy sector firms. In addition, risk premiums¹² on CAC 40 shares continued to narrow in 2022, in a sign that risk aversion did not increase (cf. Chart 1.15). As a result, the equity market correction seems chiefly attributable to the increase in risk-free rates. This correction led to a marked decline in valuation measures (equity prices divided by actual or expected corporate earnings): the CAC 40 index's cyclically adjusted price-to-earnings (CAPE) ratio, which divides market capitalisation by earnings over the last five years, fell from 43 to 34 between January and December 2022, a decline of 23% (cf. Chart 1.16). Despite falling, valuations remain at historically high levels, with some sector heterogeneity pointing to persistent pockets of overvaluation risk among French equities.

Chart 1.14: Earnings per share, 1Y forecasts
x: time / y: base 100 index



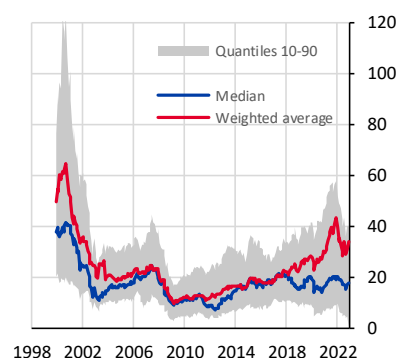
Sources: Eikon Refinitiv, IBES.
Most recent value: 07/12/2022.

Chart 1.15: Risk premium on CAC 40 shares
x: time / y: risk premium



Note: Risk premiums are calculated for each CAC 40 share using the H-model, a two-stage dividend discount model that distinguishes the short-term growth rate (IBES forecast) from the long-term rate (IMF forecasts). Most recent value: 01/12/2022.
Sources: Eikon Refinitiv, IBES, IMF WEO forecast, Banque de France calculations.

Chart 1.16: Valuation of CAC 40 shares (CAPE)
x: time / y: CAPE ratio



Note: The cyclically adjusted price-to-earnings (CAPE) ratio proposed by Robert Shiller is calculated by dividing market capitalisation by average inflation-adjusted net earnings over five years. Most recent value: 01/12/2022.
Sources: Eikon Refinitiv, IBES, Banque de France calculations.

¹² Risk premiums are calculated using a dividend discount model (H-model). They capture the portion of the change in equity prices that is not attributable to movements in expected income or the change in risk-free rates.

Market liquidity is becoming more strained, but issuance remains active on primary markets in France

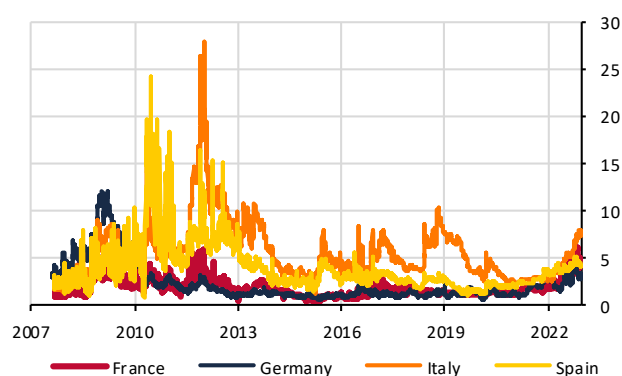
The equity market correction in France has taken place against a backdrop of relatively elevated volatility and deteriorating liquidity. Measured using the Amihud indicator, which compares equity performances against trading volumes (cf. Chart 1.18), the decline in liquidity against a backdrop of increased volatility raises the threat of a disorderly equity market correction.

Signs of liquidity stress have appeared on bond markets amid uncertainty over the future path of key rates and a wait-and-see stance among investors. The liquidity level reflects market depth (substantial if large positions can be liquidated without moving prices significantly) and transaction costs (bid-ask spreads). High price volatility automatically implies a deterioration in liquidity conditions on secondary markets, especially for transaction costs. Over the summer, market illiquidity indicators on sovereign bond markets climbed to the highest levels recorded since the outbreak of the Covid-19 crisis (cf. Chart 1.17). In the United States, they deteriorated by more for relatively short-dated government bonds (2Y), reflecting increased uncertainty over the short-term direction of monetary policy.¹³

Amid thinning liquidity in secondary markets, the primary bond market stayed open, but with windows depending on credit category. French NFCs were able to continue issuing market debt despite higher rates, but volumes were restricted for riskier names and maturities were significantly shortened. Total outstanding bonds contracted slightly over 2022, while outstanding amounts of shorter-term paper were relatively constant (cf. Chart 1.19). Cumulative primary issuance flows by broad credit category point to migration from long-term to short-term debt. At end-October 2022, there was a sharp increase, relative to 2021, in cumulative issuance flows of debt with an initial maturity of less than three months, which needs to be renewed more often than longer-term debt. Conversely, issues of debt with an initial maturity of over one year were markedly down (cf. Chart 1.20). In this setting, some market participants experienced difficulties in financing themselves during periods of severe volatility. This was notably the case for speculative-grade companies, whose issuance declined steeply (cf. Chart 1.21). Despite the contraction in outstanding debt securities, total NFC indebtedness increased with bank financing between end-June and end-October 2022 (cf. Part 1.2).

Chart 1.17: Sovereign debt liquidity indicator

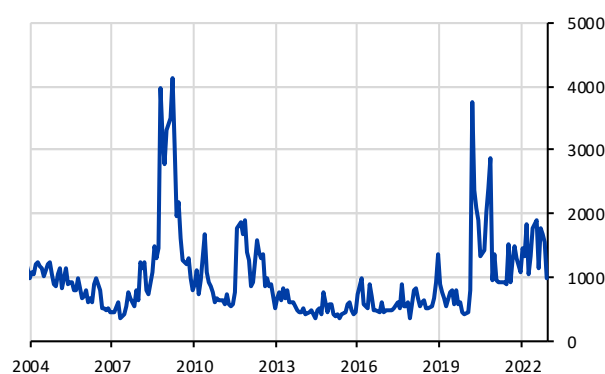
x: time / y: index



Note: a rising indicator signals a deterioration in liquidity.
Source: Bloomberg.

Chart 1.18: Amihud illiquidity indicator for the SBF120

x: time / y: Amihud ratio



Note: The Amihud illiquidity indicator is calculated based on the ratio of the absolute value of daily returns to daily trading volume for a given share. The index is aggregated by month and at the index level using averages. Most recent value: 01/11/2022.
Sources: Eikon Refinitiv, Banque de France calculations

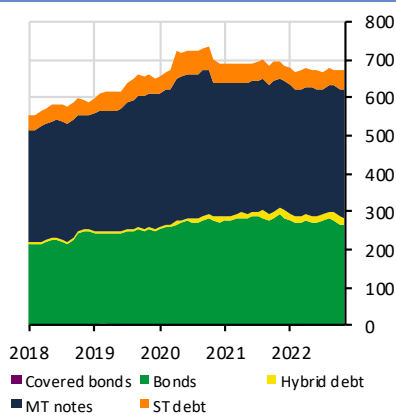
¹³ Cf. for example Fleming, M and C. Nelson, "How Liquid Has the Treasury Market Been in 2022?", Federal Reserve Bank of New York, *Liberty Street Economics*, November 15, 2022,

On money markets, the repo market is under severe strain because of higher rates and the scarcity of collateral. Demand for high-quality collateral has increased in recent months, partly owing to strategies concentrated on short bond positions in anticipation of an increase in rates and partly to an increase in margin volumes required as collateral for derivatives trades. The gap between rates on repos collateralised by euro area sovereign bonds relative to the ECB deposit facility rate widened, with an even more pronounced change for rates on repos collateralised by German sovereign bonds. Dispersion of repo rates was especially significant around the times of ECB key rate hikes, which appeared to cause a temporary reduction in market liquidity. That said, trading volumes are stable year to date, in a sign of good market resilience.

EUR/USD cross-currency basis swap spreads widened relative to the start of 2022, indicating that short-term USD financing became more costly for euro area participants. Even so, access to USD financing remains in place, particularly for banks. They continue to have access to the short-term commercial paper market, which is still extremely active, including in USD. Moreover, the presence of currency swap lines between central banks makes financial markets more resilient, which limits the risk of basis swap spreads widening significantly.

Chart 1.19: Outstanding debt securities, by instrument

x: time / y: amounts in EUR billion

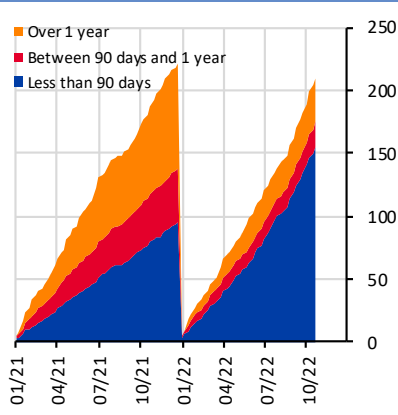


Most recent value: end-November 2022.

Sources: ECB (CSDB), Banque de France calculations.

Chart 1.20: Cumulative annual primary issuance flows, by major security category

x: time / y: EUR billion

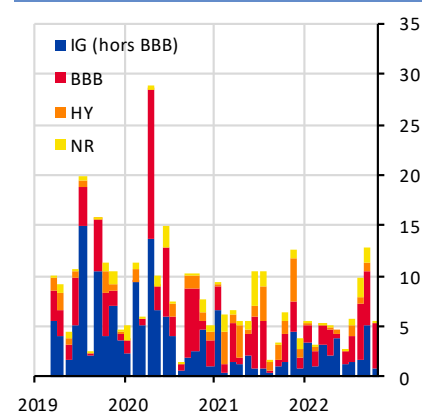


Most recent value: end-October 2022.

Sources: ECB (CSDB), Banque de France calculations.

Chart 1.21: NFC debt issuance in France (excluding short-term liabilities)

x: time / y: amounts in EUR billion



Most recent value: end-October 2022.

Source: ECB (CSDB), Banque de France calculations.

Use of leverage by non-bank financial institutions (NBFIs) has the potential to destabilise the markets. However, French participants and markets look less exposed than those in other countries

Financial market volatility could be amplified by procyclical behaviour by NBFIs that are exposed through leverage or a substantial liquidity mismatch between assets and liabilities. Collective investment schemes (CIS), including undertakings for collective investment in transferable securities (UCITS), and other NBFIs such as some hedge funds that offer daily redemptions to investors display a substantial and structural liquidity mismatch between their assets and liabilities.¹⁴ The net asset value (NAV) of investments is measured daily and corresponds to the net present value (NPV) of the assets backing the investments. In the event of a macroeconomic or financial shock, these investment funds are exposed to redemption or liquidation requests from investors anticipating that

¹⁴ CIS include UCITS as well as alternative investment funds (AIFs), which hold assets other than equities and bonds. CIS asset holdings may span a broad range of instruments, including securities that are highly liquid in normal times, such as equities, IG sovereign bonds and money market assets, but also some assets that may be traded on shallower and less liquid markets, such as HY corporate bonds, and even some illiquid investments, such as real estate. On the liability side, the investments of this type of open-ended fund are not market-traded, but issued directly to and redeemed by end-investors.

the NAV will go down.¹⁵ A major shock to liabilities could force funds into selling securities held as assets at stressed prices, further amplifying the fall in value of these assets.¹⁶

The materialisation of market risks exposes weak NBFIs to margin calls that could lead to a disorderly financial market correction.¹⁷ These vulnerabilities are particularly high among heavily leveraged participants making extensive use of repos and derivatives, which increase earnings sensitivity to market risk and create exposure to additional margin requirements in the event of volatility. To cover these urgent liquidity needs, the most liquid assets, such as sovereign debt securities, are typically sold first. The resulting bond depreciation tends to become self-perpetuating, causing wider disruptive effects for markets that could exacerbate margin calls. The disruptive potential of these participants is especially high since, according to the Financial Stability Board (FSB), the NBFIs sector accounts for a large and growing share of global financial assets (from 42% in 2008 to almost half today). Meanwhile, the International Monetary Fund (IMF) estimates that the total global value of UCITS net assets has quadrupled since 2008 (in the wake of the increase in inflows and rising asset prices) and now accounts for approximately one-fifth of the assets of the NBFIs sector.¹⁸ The ECB and the European Securities and Markets Authority (ESMA) are also warning of persistently large duration and liquidity mismatches on fund balance sheets.

Distressed sales of bonds in response to sudden increases in margin calls have occurred several times since 2020 and particularly in 2022 (cf. Box 1.2). The UK sovereign debt crisis in September/October 2022 illustrates the consequences of the materialisation of an interest rate shock, which led to upheaval for British defined benefit (DB) pension funds. To cover their liability commitments, these funds invested in liability-driven investment (LDI) funds, whose strategies involved using interest rate swaps and leverage via repos to enhance performances and manage interest rate risk. This exposed them to massive margin calls following the abrupt rise in yields triggered by the UK's government's fiscal policy announcements on 23 September. The liquidity reserves set aside by LDI funds were too small to cope with the size of the shock, so to cover their liquidity needs, the funds had to sell off long-term debt securities held in their portfolios, which drove interest rates even further up.¹⁹ France has a pay-as-you-go pension system, and total assets managed by pension funds remains marginal (cf. below).

Internationally, funds invested in HY corporate bonds, whether in EUR or USD, saw the highest net outflows in 2022, although these movements were progressive (cf. Charts 1.22 and 1.23). The potential for these NBFIs to disrupt underlying markets is especially high because these assets, which are perceived as being less liquid, are extremely sensitive to the risk of capital outflows during times of uncertainty.

The prevalence of long-term investors in some French fixed income investment funds helps to lessen the liquidity strain on fund liabilities. The duration of the bond portfolios of investment funds domiciled in France has increased over recent years. This exposes these funds to a larger fall in NPV in the event that interest rates go up. However as mentioned in the June 2022 Assessment of Risks to the French Financial System, the increase in duration is due to participants with long-term investment profiles, such as insurers and pension funds, which are less sensitive to interest rates. In addition, French insurance undertakings, including life insurers, which manage the bulk of retirement savings, are relatively weakly leveraged via interest rate swaps (cf. section 1.3). This lessens their exposure to margin calls and hence the risk of forced redemptions of their fund investments in market shock scenarios.

¹⁵ Investors who exit the fund first bear virtually no transaction costs, but those that remain may be subject to sizeable haircuts on the value of their investments if forced sales erode the value of the securities held as assets. Money market CIS exhibited weaknesses in 2020 when they had to cope with massive withdrawals.

¹⁶ This issue is not exclusive to collective investment schemes, but affects leveraged financial intermediaries exposed to margin calls more generally. Where leverage is not employed, managers may suspend redemptions partially or completely if they deem this to be in the best interest of their investors. The focus is on UCITS here because of their potential to disrupt bond markets (cf. below).

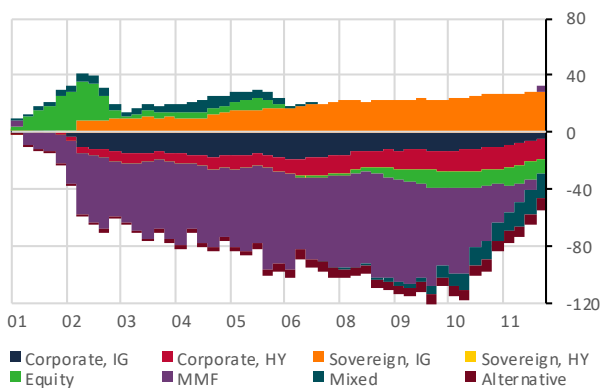
¹⁷ A disorderly correction may be understood to mean an episode of abrupt shifts during which market prices deviate significantly from market fundamentals.

¹⁸ Although the FSB issued recommendations in 2017 to address this vulnerability, it notes that asset/liability liquidity mismatches at open-ended funds (OEFs) have not decreased. Cf. FSB "Promoting Global Financial Stability", Annual Report, November 2022.

¹⁹ Cf. section on energy markets for more details about margin requirements in the context of derivatives markets.

Chart 1.22: Overall net investment flows into / out of EUR-denominated funds domiciled in advanced countries, by asset type

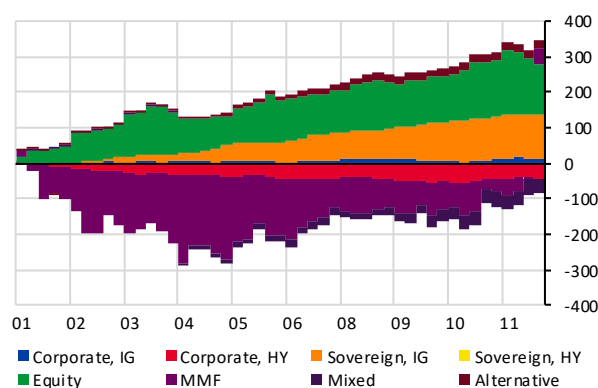
x: time / y: EUR billion



Source: EPFR.

Chart 1.23: Overall net investment flows into / out of USD-denominated funds domiciled in advanced countries, by asset type

x: time / y: EUR billion



Source: EPFR.

Box 1.2: Vulnerabilities of UK pension funds amid pressure on UK sovereign debt, and comparison with the situation in France

Defined benefit (DB) pension funds²⁰ do not have a major presence in France, which, due to its pay-as-you-go retirement system, has a relatively small volume of retirement savings. Such schemes play a big role in countries with funded systems, such as the UK and the Netherlands. DB funds are in the majority in the European Union. They held assets worth EUR 1,892 billion in the first quarter of 2022 and are chiefly based in the Netherlands (EUR 1,249 billion) and Germany (EUR 480 billion). Defined contribution (DC) pension funds, which play a smaller role, holding a total amount of EUR 498 billion, are mainly in Spain (EUR 131 billion) and Italy (EUR 147 billion). France has no entity registered as a DB or DC pension fund.

In France, savings are mainly held in life insurance contracts (EUR 1,876 billion at end-2021). There is a limited number of supplementary vocational pension funds. French life insurers hold few swaps (22% of the notional amount, taking all types of derivatives into account), with interest rate swaps occupying a particularly small place (13%). The derivatives held by insurance undertakings mainly comprise interest rate hedges (72% of the notional amount, taking all types of derivatives into account) via call options, which accounted for 54% of the notional amount of the positions held by insurers at end-June 2022. Owing to the liquidity of French life insurance products, which are redeemable at any time, insurers prefer these instruments, which allow them, in the event that interest rates go up, to earn a rate differential when the market rate exceeds the contract's pre-agreed rate. This makes it possible to guarantee an additional return in order to provide protection against potential surrender risk.

Pension funds, on the other hand, use leverage on repo and derivatives markets, which exposes to severely procyclical margin calls in the event that interest rate risk materialises. First, the duration of the assets held by pension funds, which are notably invested in money market assets, equities and medium-term sovereign bonds (typically ten years), is shorter than the duration of liabilities, which may exceed 30 years. It is this duration mismatch between assets and liabilities that these participants are seeking to cover through interest rate swaps over long time horizons. Second, during the prolonged period of low and even negative interest rates, pension funds increased their leverage by taking on very short-term debt on repo markets (using bonds posted as collateral) and by investing in riskier assets. In parallel, to reduce the interest rate sensitivity mismatch while lengthening the duration of their portfolios, these funds take positions on the interest rate swaps market, receiving a fixed rate and agreeing to pay the floating rate observed throughout the life of the contract. If short-term rates go up quickly, the value of the securities posted as collateral on the repo market

²⁰ Defined benefit pension funds must pay beneficiaries a pre-agreed amount.

goes down, while losses on the swaps market erode the margin available to cover counterparty risk, exposing funds to significant margin calls.

The crisis that rocked UK pension funds in late September 2022 shone a light on the procyclical impact of margin calls on derivatives products for long-term investors. The negative reception by financial markets to the announcement of the UK mini-budget in late September 2022 saw yields on UK government bonds, known as gilts, spike. Many pension funds lacked the liquidity needed to honour margin calls and had to make forced sales of assets, especially government bonds, which exacerbated the decline in bond prices. The Bank of England had to step in and buy bonds to avert a market spiral.

This episode is a critical illustration of the procyclicality issues facing heavily leveraged participants such as pension funds and other NBFIs more generally and of the vulnerability of these participants to liquidity risk owing to margin calls on derivatives and repo positions following a significant interest rate shock. It also highlighted the associated risks of disruption to sovereign debt markets.

Recent failures of crypto-asset trading platforms highlight the need for vigorous and global regulation of this market

Since November 2021, the valuation of the crypto-asset market has fallen by 70%, with the price of Bitcoin, the crypto-asset that dominates the market, plummeting by 75%. The collapse is partly due to higher interest rates, which hurt the risk/reward profile of some risky assets, and partly to a shift in the stockmarket correlation regime, which amplified Bitcoin's sensitivity to equity price movements. Several incidents, including the collapse of the Terra stablecoin and the failure of the Celsius exchange, reinforced fears about crypto-asset markets. The crypto-market collapse brought down with it some specialised investment funds and platforms. Owing to the market's relatively modest size – it was worth USD 840 billion in December 2022 – and the fact that linkages to traditional finance remains weak, crypto-assets do not currently pose a systemic threat to the financial system. However, the sector's lack of transparency towards authorities and investors means that caution is required. Europe's Markets in Crypto-Assets (MiCA) Regulation, which will come into force in 2024, is intended to regulate the crypto-asset ecosystem in order to supervise market participants and protect investors. Recent incidents, such as the failures of the FTX and BlockFi online trading platforms, underscore the need for global regulation of this market.

Box 1.3: FTX, the world's second-largest crypto-exchange, goes bust

FTX, the world's second-largest crypto exchange by trading volume after Binance as at end October 2022, declared bankruptcy in the week of 7 November 2022. The platform, which was established in 2019, issued its own unbacked crypto-asset, FTX token (FTT), which had a market capitalisation of around USD 5 billion prior to the collapse. Its founder owned over 100 legal entities, including FTX International, a Bahamas-registered corporation, and Alameda Research, an investment fund specialised in crypto-assets and that owned FTX tokens.

On 2 November, Coindesk, a news site, reported that Alameda Research held the majority of FTX's FTT reserves (73%), which prompted the chairman and CEO of competitor Binance to state publicly on 7 November that Binance was selling all of its FTT holdings due to the crypto-asset's illiquidity. Following this announcement, FTX users withdrew their investments on a massive scale (USD 6 billion), causing FTT to collapse. Two days later, FTX suspended client fund withdrawals. After briefly considering taking the exchange over, Binance decided to withdraw because FTX's debts were too large (USD 8 billion according to the Financial Times²¹ and 1 billion in illiquid assets). On 11 November 2022, FTX International, FTX US and Alameda Research went into bankruptcy. The US Securities and Exchange Commission (SEC) and Department of Justice (DoJ) have opened

²¹ [Financial Times - FTX balance sheet, revealed - November 2022](#)

an investigation into the US exchange. As at 22 November, FTX International owed about USD 3.1 billion to its 50 largest creditors.²²

The collapse of FTX is not the first incident on the crypto-asset market. In July 2022, Celsius, a trading venue, filed for bankruptcy following delays in Ethereum blockchain migration,²³ which caused a collapse in the price of stETH, an Ether-derived asset of which Celsius was the market's largest holder. Singapore-based specialised investment fund Three Arrows Capital (3AC) also filed for bankruptcy in early July 2022. 3AC, which managed assets worth USD 10 billion, had borrowed around USD 400 million from Aave,²⁴ a trading venue, using Ethereum as collateral, but then found itself insolvent after the asset's price plummeted.

These incidents highlight the interconnectedness within the crypto-asset ecosystem. The collapse of FTX caused a loss of confidence, which spread to all crypto-assets. In the space of two days, the market capitalisation of all crypto-assets tumbled by USD 240 billion (on USD 1,030 billion at 8 November 2022). The crisis spilled over to other sector participants such as BlockFi, a crypto trading and lending platform, which filed for bankruptcy on 28 November 2022 after borrowing USD 275 million from FTX. The BlockFi insolvency took place after two of the platform's main rivals, Celsius Network and Voyager Digital, went bust in July owing to losses caused by extreme market conditions. These events raise fears of a cascade of failures in the sector.

This incident did not spread to the traditional finance sector as interconnectedness with the crypto-asset environment remains weak for the time being. Following two public consultations, on 16 December 2022 the Basel Committee published a standard establishing the prudential treatment of bank exposures to crypto assets.

Last but not least, these incidents highlight regulatory differences between jurisdictions (FTX International moved from Hong Kong to the Bahamas when it was obtaining its initial authorisations). The FSB considers that better regulation and greater cooperation between jurisdictions are needed to supervise and regulate crypto-assets. At EU level, implementation of the MiCA Regulation will ensure that platforms are liable in the event of crypto-asset losses and provide protection for investors against potential failures. Sector participants will be required to obtain authorisation to do business before offering their services in the EU.

On energy markets, price volatility and margin requirements are rising, but French market participants remain robust

Derivatives markets offer protection against price variations, but associated margin calls could create liquidity stress

Derivatives play an essential role in the functioning of commodities markets, particularly for the energy segment (see Chapter 3 of the June 2022 Assessment of Risks to the French Financial System). They have long been used by participants for hedging purposes. Non-financial participants, such as producers, processors and distributors, use forward contracts to protect themselves against a future fall (in the case of producers and traders) or increase (in the case of consumers and traders) in prices. Investment funds, meanwhile, use commodity derivatives to take speculative positions on prices and to diversify their portfolios. These derivative products expose market participants to liquidity needs as they respond to margin calls, which tend to increase significantly during times of price volatility. Smaller firms, which have less capacity to draw on bank credit lines or are too small to issue debt on the markets, are particularly exposed to cash difficulties during periods of liquidity stress.

Soaring gas and electricity prices on physical markets caused derivatives markets to come under major liquidity pressure, with initial margin requirements peaking in August. Margin requirements on title transfer facility (TTF)

²² Reuters - FTX to start U.S. bankruptcy proceedings, CEO to exit

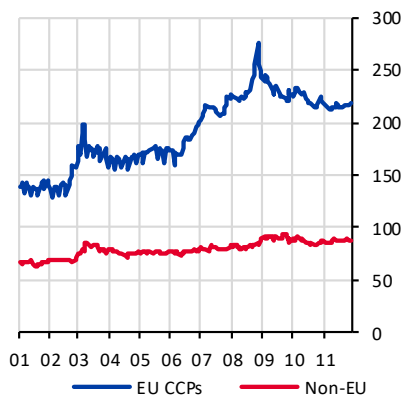
²³ The Ethereum migration involves moving from a proof-of-work to a proof-of-stake system.

²⁴ Since DeFi loans have to be over-collateralised to compensate for crypto-asset volatility.

gas front-month contracts increased tenfold between September 2021 and September 2022. Data from the European Systemic Risk Board (ESRB) on commodity derivatives exposures and margins reflect price developments. Granular data on derivatives trades²⁵ reveal that initial margins at energy firms jumped between late June and early September before decreasing gradually (cf. Chart 1.25). The sharp drop in energy prices since September led to a decrease in margin requirements, but they nevertheless remain far above pre-crisis levels, owing to calculation methods, which factor in the recent price volatility of contracts. As uncertainty lifted about whether European countries would have enough gas to make it through winter 2022/2023, a fragile calm returned to energy markets.

Chart 1.24: Initial margin posted by clearing members with central counterparties (all derivatives)

x: time / y: EUR billion



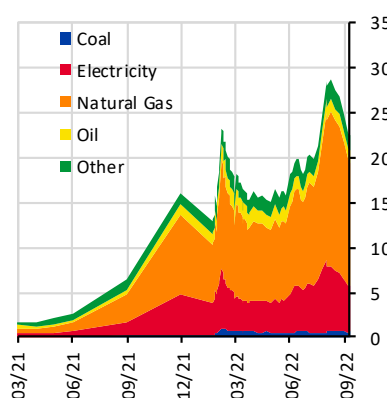
Note: The ESRB's EMIR data cover all clearing members (CMs) that are counterparties to EU central counterparties (CCPs) (blue line) as well as European CMs that are counterparties to non-EU CCPs (orange line).

Most recent value: 30/11/2022.

Sources: Aggregated and anonymised EMIR data, ESRB.

Chart 1.25: Initial margin posted by energy firms on energy derivatives in Europe

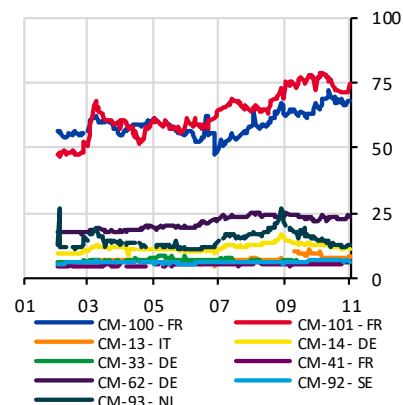
x: time / y: EUR billion



Sources: Aggregated and anonymised EMIR data, ESRB. Period from 01/02/2022 to 10/10/2022.

Chart 1.26: Initial margin posted by clearing members (all asset classes)

x: time / y: EUR billion



Note: Includes French and European energy firms that are counterparties to French banks or energy firms.

Most recent value: 02/11/2022.

Sources: Aggregated and anonymised EMIR data, ESRB.

Given the potential for these liquidity pressures to morph into solvency risk, several countries introduced measures to prevent energy firms from failing: the Austrian government provided EUR 2 billion in emergency assistance to the power provider for the city of Vienna, Finland and Sweden announced liquidity guarantees worth EUR 10 billion and EUR 23 billion respectively to prevent electricity utilities from failing, and in July the German government announced plans to nationalise Uniper, an energy company.

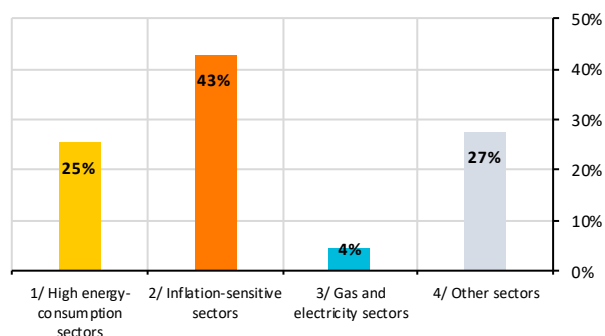
Exposures of French banks to energy sector firms appear manageable. Major French banks are extremely active on energy derivatives markets in Europe through market making and clearing activities. Banks have adopted proactive risk management measures that take account of the stress scenario, liquidity management and access to refinancing that customers are able to put in place in the event of additional strain. They supplied liquidity to healthy market participants whose solvency was not threatened, up to defined credit risk limits. This support was provided mainly via credit lines, or, as clearing members, by supplying high-quality collateral (cash or highly liquid securities) to cover customer margin requirements with the CCP, in exchange for less liquid collateral.²⁶ French banks have low exposure to gas and electricity sector companies, which account for just 4% of their total exposures to French NFCs (cf. Chart 1.27). More broadly, their exposures to energy firms, utilities and commodity traders are under control relative to their equity (cf. Chart 1.28).

²⁵ European Market Infrastructure Regulation (EMIR).

²⁶ See also [EBA response to the European Commission on the current level of margins and of excessive volatility in energy derivatives markets](#), 29 September 2022.

Chart 1.27: Distribution of French G-SIB exposures to NFCs, by sector

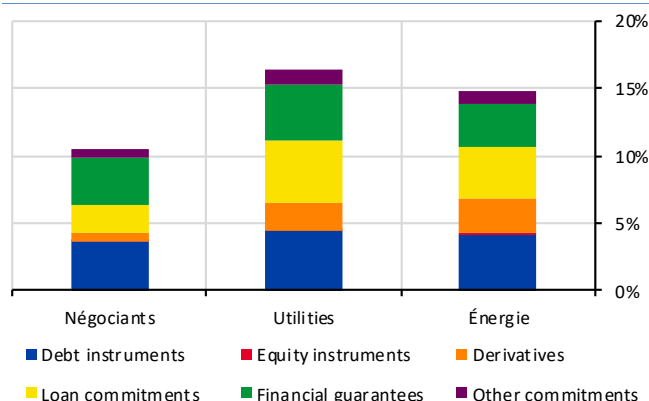
x: sector categories / y: % of total exposure to NFCs



Sources: Banque de France, Finrep.

Chart 1.28: Exposure of French banks to energy sector firms

x: bank counterparty category / y: amount of exposure divided by total CET1 as a %



Note: Q2 2022 data

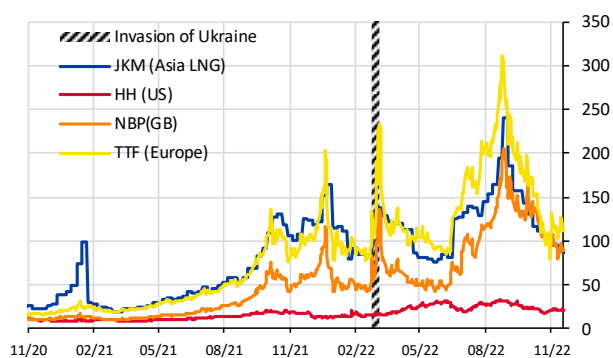
Source: ACPR.

Gas inventories should be enough to meet demand this winter

Faced with a decrease in Russian gas supplies and the threat of shortages during winter 2022/2023, Europeans benefited from two factors as they rebuilt their gas inventories. First, the reduction in Russian imports was entirely compensated for by liquefied natural gas (LNG) deliveries, particularly from the United States and Qatar (Chart 1.30), in return for a sharp increase in prices. The substitution was made easier by the slowdown of the Chinese economy, which is usually a major LNG consumer. Second, European gas consumption was markedly down on 2021. For one thing, Europe enjoyed an extremely mild October, which delayed drawdowns in gas inventories. European demand was also compressed by the combined effects of higher energy prices and the introduction of energy sobriety plans. The gas consumption of French households and companies in October/November 2022, adjusted for temperature variations, was estimated to be 20% down on its long-term average (Chart 1.31).

Chart 1.29: Gas price indices

x: time / y: MWh price, USD

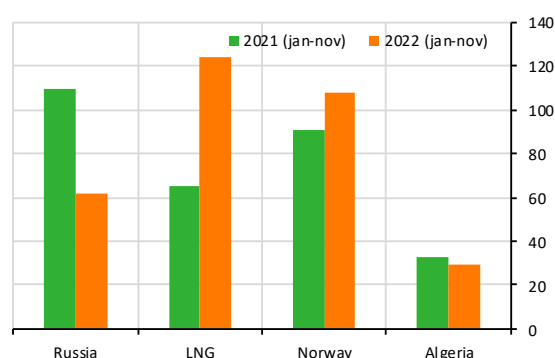


Note: the chart shows the changes in several gas price indices, each of which is converted to USD/MWh. Most recent value: 18/11/2022.

Sources: ICE, Refinitiv, BdF calculations.

Chart 1.30: EU and UK natural gas imports

x: country / y: billion cubic metres



Note: EU + UK natural gas imports in billions of cubic metres. LNG may be supplied by different countries, including Qatar, the United States and Russia. Most recent value: 07/11/2022.

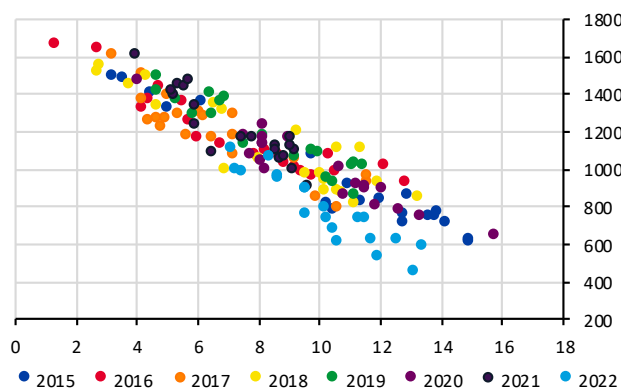
Source: Bruegel.

The high level of gas inventories lessens the likelihood of shortages in winter 2022/2023, but the risk remains. At end-November, EU gas stocks were at record levels (1,061 TWh, equivalent to 24% of annual European consumption, cf. Chart 1.32), allowing Europe to look to the coming months with greater peace of mind. The possibility of rationing remains, however, in the event of (i) a particularly harsh winter or (ii) a total shutdown of Russian imports (Europe continues to buy Russian LNG via the Turkstream pipelines or the Ukrainian transit route).

Finally, winter 2023/2024 could be subject to more elevated risks than winter 2022/2023. Over the next year, Europe is going to have to deal with two adverse factors for its inventory rebuild. First, the continent will receive smaller imports of Russian gas than during the first half of 2022. Second, competition on the global LNG market may become fiercer if China's economy picks up.

Chart 1.31: Household and service sector gas consumption as a function of temperature, days in the month of November

x: temperature in degrees Celsius / y: consumption in GWh

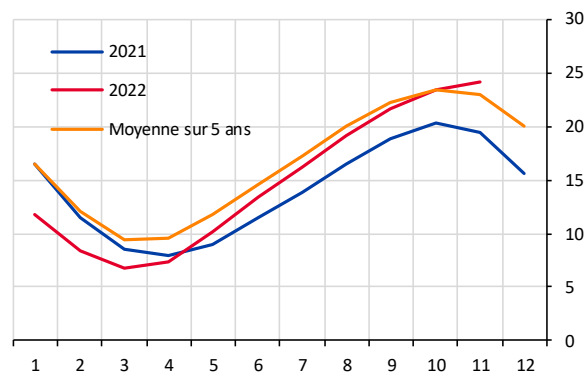


Note: working days only. Most recent value: 23/11.

Source: BdF calculations.

Chart 1.32: EU natural gas inventories

x: month / y: percentage of annual consumption in the previous year



Note: the chart shows EU gas stocks (as a proportion of annual consumption in the previous year), with the orange line indicating levels over the previous five years. Sources: AGSI+, Eurostat via Datastream. BdF calculations. Most recent value: 28/11/2022.

1.2 Vulnerabilities of non-financial corporates remain contained, although debt trajectories need to be monitored

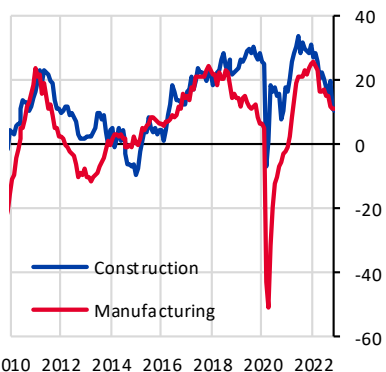
French non-financial corporates' (NFC) profit margins are sensitive to the increase in costs to varying degrees, but the dominant role of fixed-rate debt is a factor of resilience

Business activity continues to hold up, despite a challenging cyclical environment, but is expected to soften in 2023. According to the Banque de France's latest business survey (November 2022), activity picked up slightly in industry and services in October. Industry resilience was better than expected and resulted from diminished supply constraints, owing to inventory building to secure future production. Accordingly, order books (cf. Chart 1.33) are stabilising in industry and construction and reverting to 2018 levels. However, the across-the-board increase in uncertainty and the forecast economic slowdown in France in 2023 are expected to take a toll on corporate revenues.

Profit margins fell at a minority of companies in 2022. Not all companies are facing the same increase in input prices, nor do they all have the same capacity to pass increases through to selling prices. The average NFC profit ratio fell from 32.2% in Q4 2021 to 31.8% in Q1 2022. This overall decline masked different performances across companies. Sector and size chiefly dictate firms' market power. Large companies have the clout to set prices, at least in the short term, which allows them to pass inflation on to their customers. Charts 1.34 and 1.35 show how large companies have been able to increase their selling prices and revenues (60%). The picture for small and mid-sized enterprises (SMEs) and very small businesses (VSB) is more contrasted. Just 52% and 30% of them respectively saw their revenues go up in Q1 2022. Their margins are more vulnerable to higher prices insofar as they cannot pass on these costs in their selling prices.

Chart 1.33: Level of order books

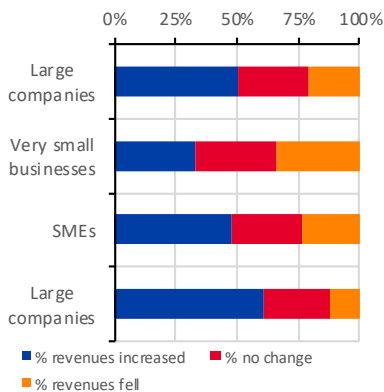
x: time / y: index



Source(s): Banque de France.

Chart 1.34: Revenues

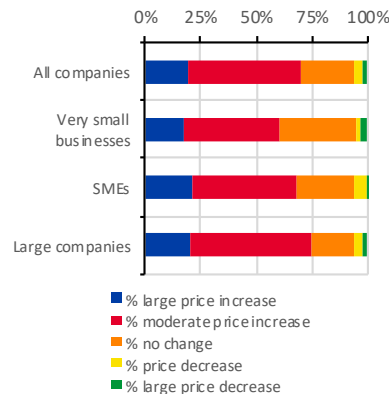
x: % of companies reporting an increase / decrease in their revenues (Q4 2021-Q2-2022)



Source(s): ECB SAFE survey, Banque de France calculations.

Chart 1.35: Selling price adjustment

x: % of companies reporting an increase / decrease in prices (Q4 2021-Q2-2022)

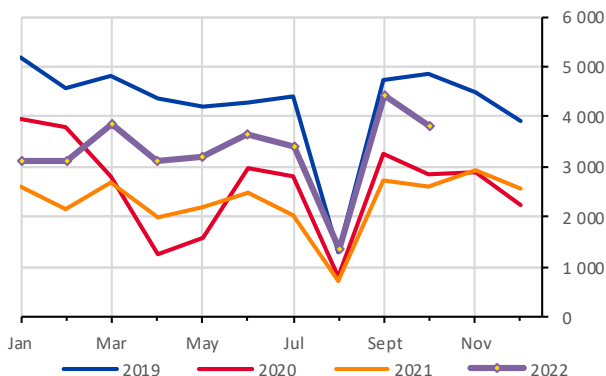


Source(s): ECB SAFE survey, Banque de France calculations.

Default rates among French companies are normalising towards monthly levels seen before the Covid crisis, while their credit rating is not deteriorating. Failures among French companies are below the level recorded in 2019 (cf. Chart 1.36), while French NFC debt securities have not suffered major rating downgrades in recent months, with the exception of the round of downgrades for energy sector firms at the start of the year (cf. Chart 1.37).

Chart 1.36: Monthly corporate failures

x: time / y: number of failures

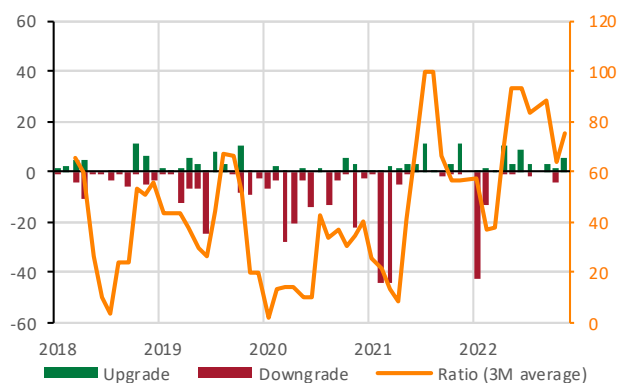


Note: Final data to August 2022, provisional data for September and October 2022.

Sources: Banque de France, Companies Directorate.

Chart 1.37: Rating changes, French NFCs

x: year / y (left-hand side: EUR billion) (right-hand side: percentage)



Most recent value: end-September 2022.

Sources: ECB (CSDB), Banque de France calculations.

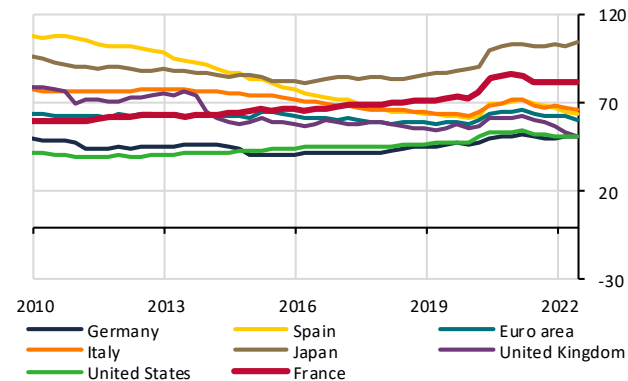
NFC debt levels continue to rise and remain a factor of vulnerability. Between end-June and end-October 2022, NFC gross debt rose by EUR 30 billion to EUR 2,007 billion.²⁷ Over that period, although EUR 9 billion flowed out of debt securities, this failed to offset the brisk growth in bank credit, which rose by EUR 39 billion. Looking at international comparisons, French NFCs were already carrying more debt than those of the euro area as a whole at end-June 2022 and this trend looks set to continue in the short run: at end-June 2022, the consolidated gross debt of French NFCs was equivalent to 81.6% of gross domestic product (GDP), compared with 60.9% for the euro area overall and 51.0% in the United States (cf. Chart 1.38). Between end-June and end-October 2022, NFC net debt also rose, by EUR 53 billion, to EUR 1,122 billion. This increase reflects not only the abovementioned growth in gross debt, but also a EUR 16 billion decrease in cash (cf. Chart 1.39). The combined path of higher debt and

²⁷ Provisional statistics.

declining cash reserves, against an uncertain macroeconomic backdrop, calls for additional watchfulness on NFC vulnerabilities in 2023.

Chart 1.38: Company vulnerability indicators: NFC consolidated gross debt / GDP ratios

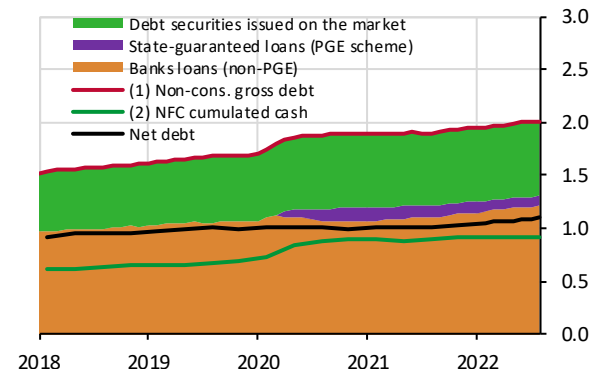
x: time / y: % of GDP



Source: Banque de France (webstat).

Chart 1.39: French NFC debt

x: time / y: EUR trillion



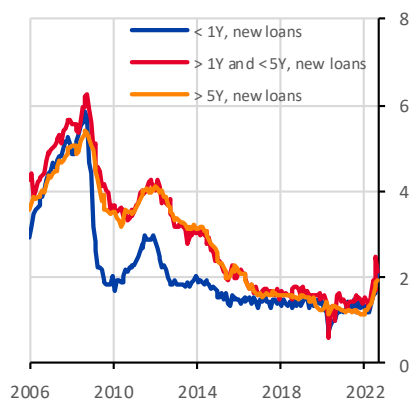
Note: NFCs = non-financial corporations, cons. = consolidated. Total cash including bank deposits and securities held in money market funds. Most recent value: end-October 2022.

Source: Banque de France (webstat).

The funding costs of French NFCs are increasing sharply as monetary policy normalises. The increase in funding costs is more pronounced for market-based finance than for bank credit. The interest rate on new loans from French banks to NFCs rose across all maturities: +1.07 pp for loans maturing in less than one year between October 2021 and October 2022, +1.27 pp for one-to-five-year maturities and +1.21 pp for loans maturing in more than five years. Relative to the rise in the risk-free rate, however, the increase remains small (+2 pp, cf. Chart 1.40). Market financing costs increased markedly more than bank financing costs in 2022. Whereas 75% of IG debt issues yielded less than 1% in December 2021, 86.7% had a yield in excess of 3% in November 2022 (cf. Chart 1.41). Likewise, 73.8% of French HY NFCs were paying over 5% to borrow in November 2022 (cf. Chart 1.42). This is due to differences in monetary policy transmission mechanisms on the two markets. Whereas bond yields instantly reflect (or even anticipate) an increase in risk-free rates, banks do not reflect such increases immediately in their lending, as funding for their liabilities is based more on term deposits and accounts than on bonds.

Chart 1.40: Interest rates on new loans to French NFCs

x: time / y: %

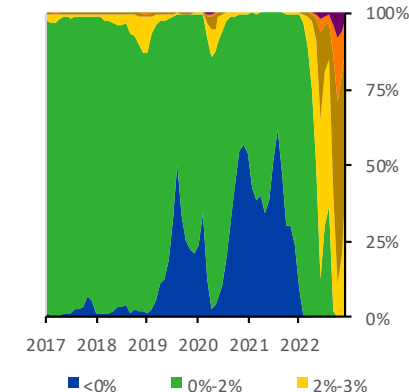


Most recent value: end-October 2022.

Source: Banque de France.

Chart 1.41: Interest rate breakdown, debt of IG French NFCs

x: time / y: %

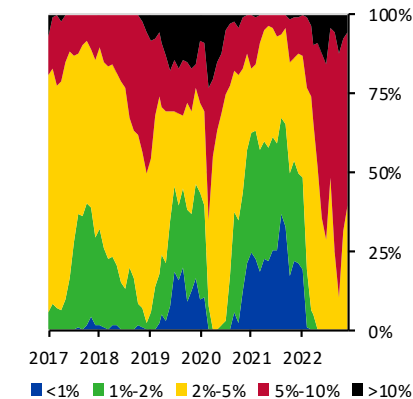


Note: Eikon data are taken from a commercial database that provides a partial but relatively representative picture of the market. Most recent value: end-November 2022.

Sources: Eikon, Banque de France calculations.

Chart 1.42: Interest rate breakdown, debt of HY French NFCs

x: time / y: %



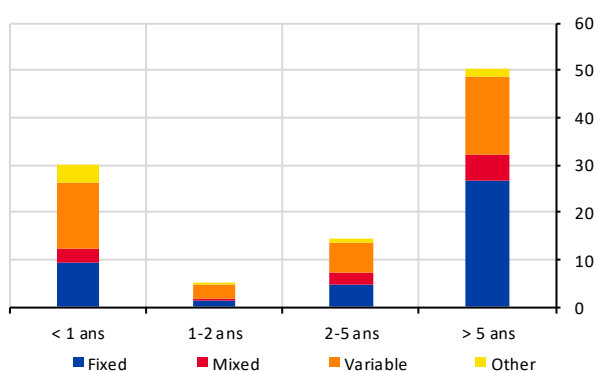
Note: Eikon data are taken from a commercial database that provides a partial but relatively representative picture of the market. Most recent value: End-November 2022.

Sources: Eikon, Banque de France calculations.

The predominance of fixed-rate financing is a factor of resilience when interest rates are rising. Fixed-rate loans made up 66% of the outstanding loans to French NFCs from French banks in September 2022 (cf. Chart 1.43). Furthermore, 44% of the total outstanding loans have a residual maturity of more than five years. In the short term, this long-dated, fixed-rate debt shields companies against the adverse impacts of higher rates on financing costs. Ultimately, French companies are less exposed to the consequences of higher financing costs than their peers in Germany, Spain and Italy, which have a higher proportion of floating-rate debt.²⁸ However, risks could emerge in the medium term when maturing loans may need to be rolled over at higher rates. In addition, the distribution of new loans by maturity and rate type (cf. Chart 1.44) points to changes in the structure of NFC lending: by comparing lending flows in September 2022 against the outstanding stock of debt, we see that the share of floating-rate debt has increased relative to fixed-rate debt. The increase is particularly pronounced for loans maturing in more than one year.

Chart 1.43: Distribution of new loans, by interest rate type

x: maturity of new loans / y: %

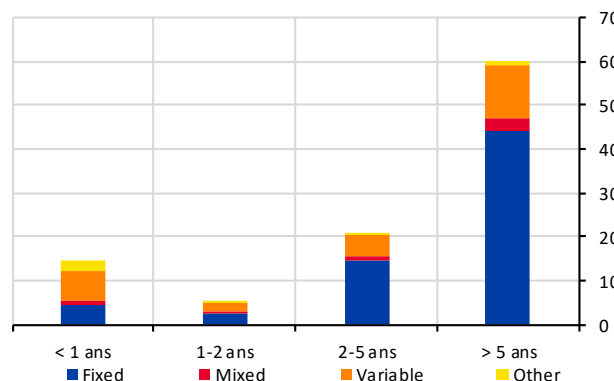


Note: new loans by French banks to French NFCs, September 2022.

Source: ECB (Anacredit).

Chart 1.44: Distribution of the outstanding stock of debt, by interest rate type

x: residual maturity / y: %



Note: stock of outstanding loans by French banks to French NFCs, September 2022.

Source: ECB (Anacredit).

Owing to their fixed-rate debt and improved credit standards, households are largely insulated against higher interest rates for home loans

Normalisation of home lending is being accompanied by higher loan interest rates, which are still lower than those in neighbouring European countries. Home lending continues to be brisk in France: annual growth in outstanding home loans slowed to +5.9% in November 2022²⁹ but is still above the ten-year historical average (cf. Chart 1.45). Home lending rates in France are increasing by less than those in other European countries. After climbing steadily from summer 2021 onwards, they averaged 1.79% in September 2022, compared with 3.41% in Germany and 2.58%³⁰ in Belgium (cf. Chart 1.46). The share of first-time borrowers in loan production³¹ stood at 48%³² in September 2022, the same as the average observed since 2017.

²⁸ Gueuder (M.), Ray (S.) (2022), "Hausse des taux d'intérêt: les entreprises européennes ne seront pas affectées au même rythme", *Bulletin de la Banque de France*, No. 243/2, November-December.

²⁹ Source: Banque de France ([link](#)).

³⁰ Source: ECB, provisional data.

³¹ Which are eligible to be covered by the 20% flexibility margin allowed under the HCSF standard.

³² Source: Banque de France ([link](#)).

Although slowing, house price growth is showing a delayed reaction to higher interest rates³³ and continues to exceed growth during the pre-Covid period. House prices rose by 6.4%³⁴ year-on-year in Q3 2022 (+3.2 pp relative to average growth rates observed in 2018-2019), while transaction volumes are starting to normalise gradually from the post-Covid record levels (cumulative total of 1,130 thousand transactions in the existing homes segment in the year to October 2022, compared with 1,174 thousand in January 2022).³⁵

Chart 1.45: Annual growth rate of outstanding home loans to individuals resident in France

x: time / y: %

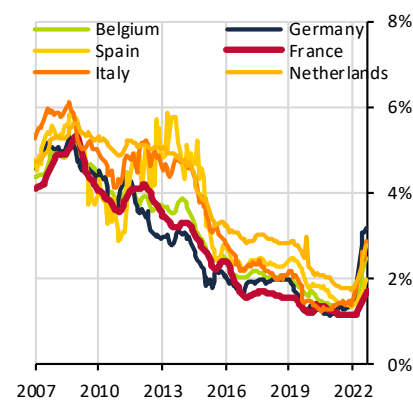


Most recent value: September 2022.

Source: Banque de France.

Chart 1.46: Interest rates on new home loans in Europe

x: time / y: %

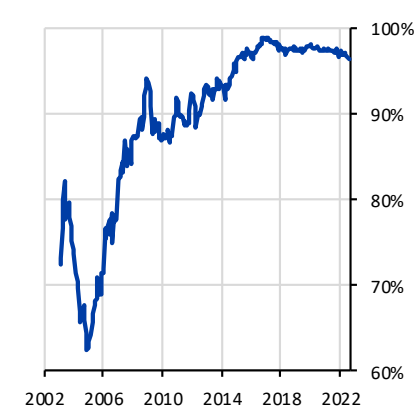


Most recent value: September 2022.

Source: ECB.

Chart 1.47: Share of fixed-rate loans in new loan origination in France

x: time / y: %



Most recent value: September 2022.

Source: ECB.

France's home financing model has structural features that promote resilience and reduce the short and medium-term impact of inflation and higher interest rates on households and on the real estate market more generally. First, although house prices are starting to slow, French households are protected from a potential reverse wealth effect because they do not use their property assets as collateral to obtain additional (consumer) loans. Accordingly, a fall in the value of the asset does not reduce the value of the household's financial wealth during loan repayment and does not increase the repayment burden. Second, home loans are almost all at fixed rates (96%³⁶ of new loans in October 2022), which protects households that have already taken out loans from an increase in rates (cf. Chart 1.47). In addition to the fact that banks are required to manage interest rate risk, rather than households, a system of home loan guarantees helps to further ensure the resilience of this financing model. Rates on new loans are also capped by the usury rate, which is set by law and revised each quarter and which shields households from overly volatile rate jumps. Finally, by capping the debt-service-to-income ratio at 35%, the HCSF's binding standard on credit standards ensures that households do not bear an excessive repayment burden.

Despite the current environment of rising inflation, which tends to erode the purchasing power of gross disposable income and to put household solvency under pressure, so far there has been no increase in excess indebtedness cases. Besides the protection provided by the home lending model, macroeconomic factors and support measures have contributed to the resilience. For one thing, households have built up EUR 146 billion³⁷ in excess financial saving since the pandemic (between Q1 2020 and Q2 2022). For another, support measures targeting electricity prices, including the price shield, are mitigating the impact of higher energy expenditures.

³³ During previous episodes of rising interest rates, house prices took around two quarters to slow significantly (with due allowance for other factors that may also have had a downside impact on the trend): in 2011, the 50-bps increase in the ECB refinancing rate between March and October was accompanied by normalisation of house price growth, which eased from 7.04% yoy in March 2011 to 6.12% in September 2011. Furthermore, economic agents appear to have built these movements into their expectations. ECB survey data show that French households' expectations for house price growth in the coming 12 months are lower than those of people in neighbouring European countries.

³⁴ Source: INSEE.

³⁵ Source: CGEDD based on information from DGFIP.

³⁶ Source: ECB ([link](#)).

³⁷ Source: Banque de France ([link](#)).

Compared with its European neighbours, France looks to be relatively resilient, and its households seem less exposed to higher interest rates and inflation: ECB survey data indicate that France is well below its European peers in terms of expectations of increased household spending on goods and services.

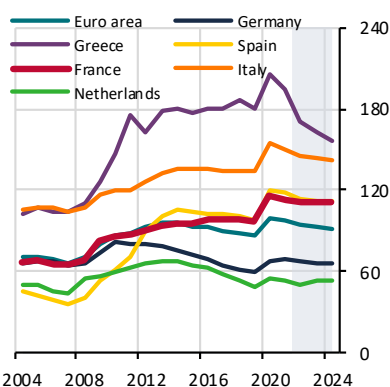
Measures to offset energy prices, a dimmer macroeconomic outlook and higher interest rates have impacted the trajectory of sovereign debt.

The cost of measures to provide support against the energy shock and dimmer macroeconomic prospects is having an adverse effect on public finances. Just as France was in the process of phasing out Covid-19-related support measures (which had contributed to a more than 15 pp increase in the government-debt-to-GDP ratio), in late 2021, the government began introducing support measures to cushion the energy price shock for households and businesses. Similar to policies adopted by other euro area countries, the measures introduced by France are not particularly targeted at specific sectors and seek essentially to soften the direct impact on prices of higher energy costs. The most significant offsetting measure is the “price shield”, whose gross cost is estimated at this stage at 1.3 pp of GDP in 2022 and 1.5 points in 2023.³⁸ This cost could change depending on final energy prices.³⁹ The shield helps to moderate rising prices in the private sector. Energy price offsetting measures and the macroeconomic downturn are also acting as a drag on the outlook for public finances. Following a forecast improvement in the government deficit (after debt servicing) from –6.5% of GDP in 2021 to –5% in 2022,⁴⁰ the budget balance is expected to deteriorate again to reach –5.4% of GDP in 2023. Government debt is expected to fall from 112.8% of GDP in 2021 to 111.5% of GDP in 2022 and 111.2% of GDP in 2023. (cf. Chart 1.49).

External shocks pushing inflation upwards and a prolonged increase in interest rates could put government debt on a higher medium-term path (cf. Chart 1.49). In recent years, the rising trend in France’s government debt has been essentially determined by the primary fiscal deficit, while the “snowball effect” resulting from the differential between the nominal interest rate r and the nominal GDP growth g , multiplied by the level of debt, has exerted downside pressure on the change in the debt ratio. With monetary conditions normalising following the increase in inflation, the downside impact of the snowball effect is expected to fade gradually over the coming years, causing the debt ratio to come under upside pressure. Given today’s record high debt levels, the factors that will enable the government debt trajectory to remain sustainable need to be taken into consideration now. Sustainability is critical to preserving the government’s ability to withstand the challenges of the future and ensure the stability of the French financial system.

Chart 1.48: Government debt (as defined by the Maastricht Treaty) as a share of GDP

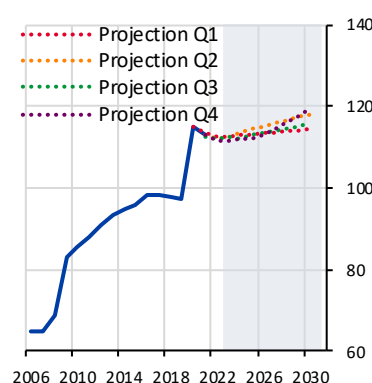
x: time / y: % of GDP



Source: Eurostat, European Commission projections (2022-2023).

Chart 1.49: Projected debt-to-GDP ratio

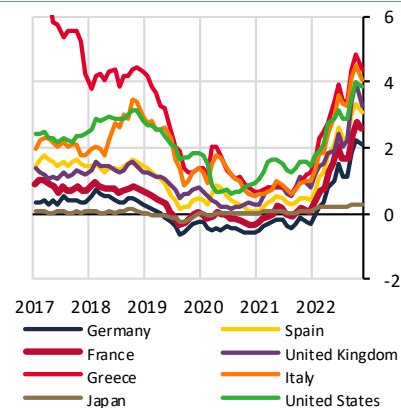
x: year / % ratio



Source: Banque de France.

Chart 1.50: Sovereign interest rates

x: time / y: %



Source: Bloomberg.

³⁸ Banque de France estimates.

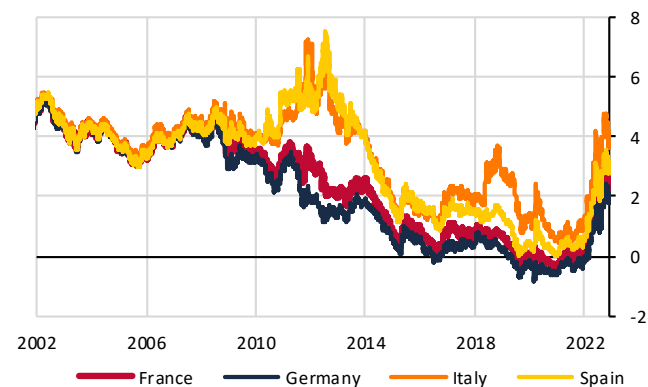
³⁹ France’s “price shield” includes caps on increases in regulated electricity and gas prices and reductions on fuel prices at the pump.

⁴⁰ Source: European Commission.

The structure of government debt in France also has a bearing on its path. In terms of vulnerability factors, inflation has an immediate impact on interest expense and debt dynamics via French index-linked government bonds, which made up approximately 11% of the total in 2021 (of which about 70% are indexed to euro area inflation). In terms of factors of resilience, the average maturity of government debt has increased (over a long period), and maturities remain well spaced over time, with no refinancing peaks. This limits the immediate effects of an increase in interest rates compared with other countries (cf. Chart 1.53). High bid-to-cover ratios at government debt auctions reflect the appeal of France's sovereign credit quality and limit refinancing risk.

Chart 1.51: 10Y sovereign spreads over Bunds since 2000

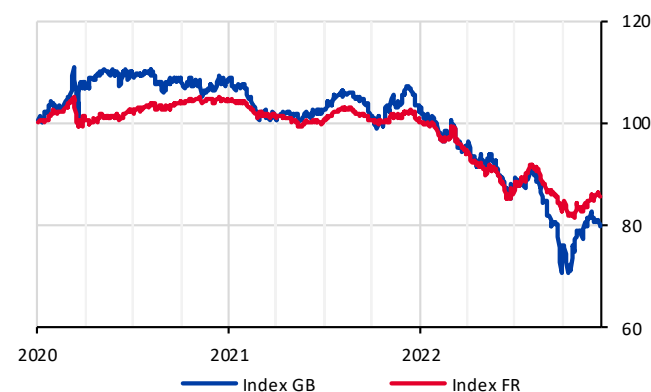
x: time / y: basis points



Source: Bloomberg, most recent value: 13/12/2022.

Chart 1.52: French and UK sovereign bond prices

x: time / y: basis points



Source: Bloomberg, Banque de France calculations. Most recent value: 12/12/2022.

Resilience factors continue to keep risk premiums for French government securities lower than those in other euro area countries. At this stage, despite widening slightly in the first half amid market volatility, French sovereign spreads over German benchmarks of equivalent maturity are moving in an orderly fashion and do not seem to be exposed to the risk of a shock (cf. Chart 1.51). Likewise, CDS premiums on French government bonds have been stable overall since the start of the year.

Fragmentation risk for European sovereign debt markets remains contained at this stage. While sovereign spreads rose more swiftly in some countries, they gradually narrowed in the second half, and financing conditions are showing similar trends throughout the euro area and especially in Western Europe. Outside the euro area, UK yield spreads (cf. Chart 1.52) reflect the massive gilt sell-offs by pension funds following the announcement of Britain's mini-budget in late September (cf. Box 1.2). Spreads for Eastern European countries, which are more exposed to geopolitical pressures, continue to rise in a fairly correlated manner. Faced with the risk of fragmentation in European sovereign debt markets,⁴¹ in late July the Eurosystem set up a [Transmission Protection Instrument](#) (TPI). The TPI may be activated to combat disorderly market dynamics that could pose a serious threat to policy transmission. At this stage, while fragmentation risk remains contained, bond market dynamics need to be monitored. Recent experience shows that negative perceptions on the sustainability of public finances can put severe strain on financial markets, even in large advanced economies.

⁴¹ Bond market fragmentation is a trend characterised by a "disorderly" yield correction, where spreads become disconnected from intrinsic country (or issuing agent) credit risk. Fragmentation can affect sovereign securities as well as corporate debt and results in yield spreads between markets or issuer categories that are not warranted by the economic fundamentals. The euro area experienced a pronounced trend of this type in 2011-2012. Since then, sovereign spreads have tended to co-move, driven essentially by common, systemic factors, such as monetary policy developments. Although this is still the case currently, liquidity pressures could affect some markets in particular, distorting the formation of bond spreads. Given the speed with which fragmentation dynamics were transmitted in the past in the euro area, and considering the risks in relation to financial stability and distortions in the transmission of monetary policy, authorities were quickly on their guard after the outbreak of geopolitical pressures in 2022. Cf. ECB *Financial Stability Review*, November 2022.

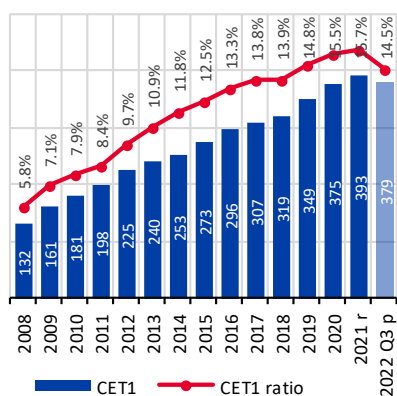
1.3 French financial intermediaries (banks and insurance companies) have successfully absorbed the shocks suffered in 2022

Banks have coped with the uncertain cyclical environment, showing resilience to the multiple shocks affecting market conditions

Banks continue to have a sound balance sheet structure. The aggregate CET1 solvency ratio of France's six main banking groups was 466 bps over the regulatory requirement at 14.55% in September 2022 (cf. Chart 1.53), slightly down on December 2022 (15.66%). The dip reflects the increase in risk-weighted assets (RWA) for credit risk (+ EUR 92 billion, cf. Chart 1.54), driven by balance sheet growth (+6.1%), and a decline in CET1 equity (–3.4%). Under the “Danish compromise”, prudential regulations allow banking groups to include holdings in insurance subsidiaries in their own funds. With accounting standard IFRS 4 currently in effect for insurers, the increase in interest rates had a negative impact on insurers’ assets and, through application of the equity method, led to a sharp decline in banks’ equity. The average leverage ratio of France’s six largest banking groups fell by 79 bps to 4.65% in September 2022, owing to increased exposures and the phase-out in March 2022 of the option of excluding central bank exposures when measuring leverage.⁴² The average liquidity coverage ratio (LCR) and net stable funding ratio (NSFR) of France’s six largest banking groups were still well above the minimum requirement of 100% in September 2022, at 148.7% (cf. Chart 1.55) and 116.4% respectively. Early repayments by banks of targeted longer-term refinancing operations (TLTROs) following the change to the interest calculation method are not affecting their compliance with liquidity requirements (LCR and NSFR).

Chart 1.53: Aggregate CET1 ratio of France's six main banking groups

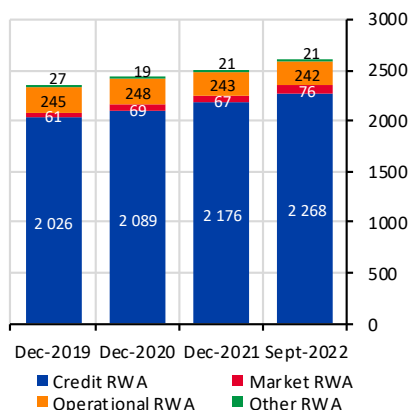
x: time / y: %



Source: ACPR.

Chart 1.54: RWA by risk category at France's six main banking groups

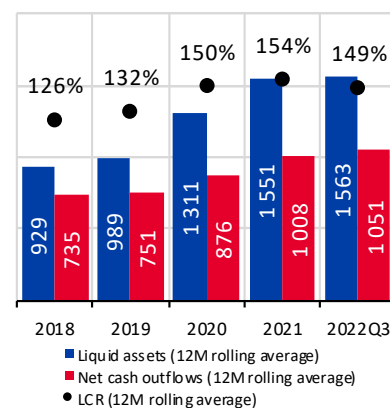
x: time / y: amount in EUR billion



Sources: ACPR.

Chart 1.55: Aggregate LCR of France's six main banking groups

x: time / y: %



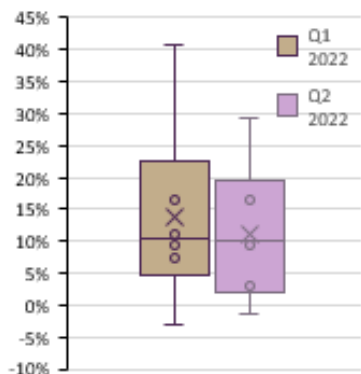
Source: ACPR.

After an outstanding 2021, continued healthy earnings helped to strengthen banks’ resilience. Net earnings at France's four largest banks increased by 5.1% over the first nine months of 2022 relative to the same period in 2021, before adjusting for exceptional items in the first half linked to asset disposals following Russia's invasion of Ukraine (12.2% decrease when these non-recurring elements are factored in). Investment bank income was boosted by market activities, particularly in response to increased customer hedging needs against a backdrop of volatile markets. Even so, the profitability ratios of French banks remain below those of their main competitors, with return on equity (RoE) down 1.2 points at 6.4% (cf. Charts 1.57 and 1.58) while the return on assets (RoA) slipped from 0.37% to 0.31%.

⁴² These exemptions made it possible to improve the leverage ratio by 42 bps as at December 2021.

Chart 1.56: Distribution of the impact of a 200 bps interest rate shock on net interest income

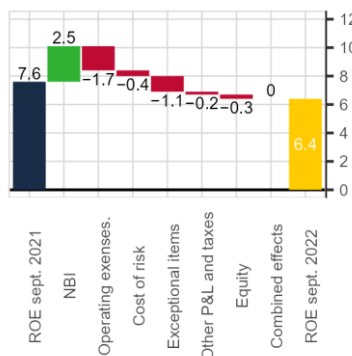
x: category / y: %



Source: ACPR.

Chart 1.57: Factors contributing to RoE (*detailed data on net banking income not available for all French banks on a quarterly basis)

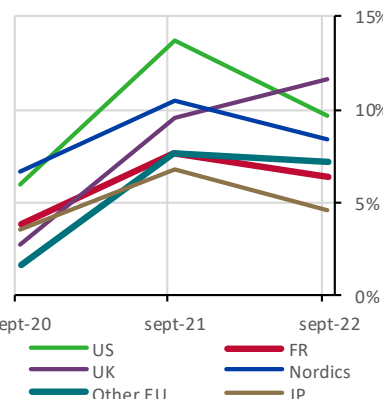
x: category / y: amount in EUR billion



Sources: ACPR.

Chart 1.58: RoE - international comparison

x: time / y: %



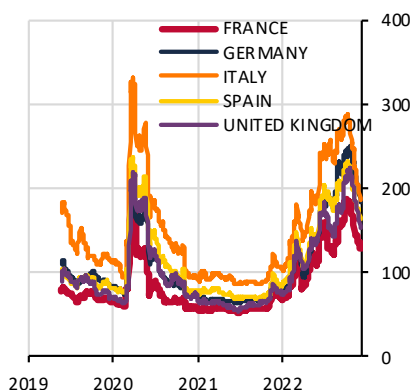
Source: ACPR.

Thanks to their solid footing, French banks were able to continue appropriately financing the economy. Outstanding loans to households increased by 5.9% over the year to September 2022, while loans to businesses were up by 7.9%.

Meanwhile, the market financing needs of French banks for 2022 were covered, as financing costs rose uniformly and relatively moderately for French banks compared with the European banking sector as a whole, although within individual institutions, differentiations may be more pronounced depending on debt category. Short-term debt and covered bond markets remained highly liquid, while issuance conditions deteriorated by more in subordinated debt markets, notably due to issues being concentrated around periods of low volatility. Forecast financing needs for 2023 are largely on a par with those of previous years. Banks say that they anticipate TLTRO repayments in their funding programmes and might cover their liquidity needs through defensive instruments such as covered bonds, which showed resilience in 2022. However, issues of subordinated debt to meet coverage needs under the minimum requirement for own funds and eligible liabilities (MREL) could be, as they were in 2022, more sensitive to movements in risk premiums if market conditions remain volatile.

Chart 1.59: OAS for senior preferred bonds issued by banks in the main European countries

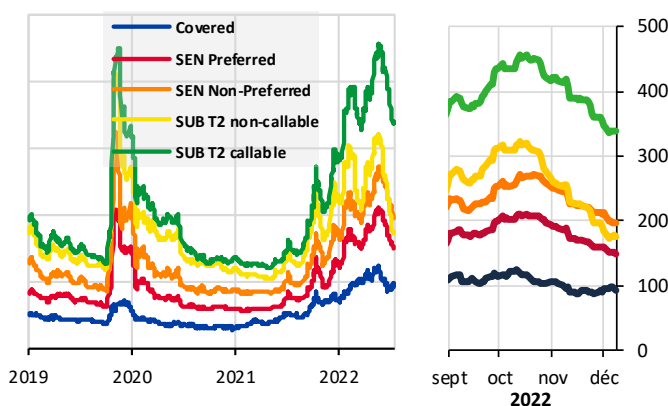
x: time / y: OAS (bps)



Scope: EUR-denominated IG securities.
Most recent value: 13 October 2022.
Notes: Option-adjusted spread (OAS) calculated against the EUR benchmark curve (German sovereign).
Sources: IHS Markit, SRV/DSF calculations.

Chart 1.60: OAS for the bond debt of French banks

x: time / y: OAS (bps)



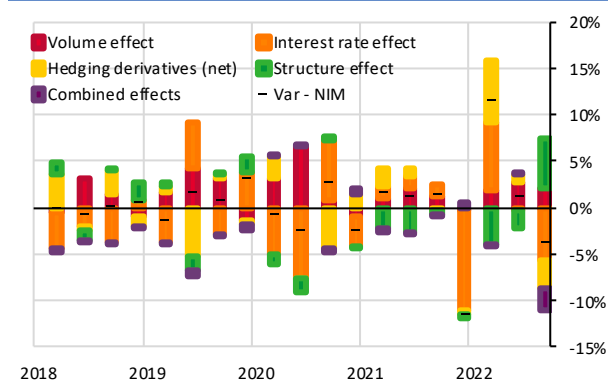
Scope: Option-adjusted spread (OAS) calculated against the German sovereign benchmark curve, for EUR-denominated IG bond securities.
Most recent value: 13 October 2022.
Sources: Markit, SRV/DSF calculations.

Over the coming quarters, banks are poised to benefit from an orderly increase in interest rates. Higher rates should support growth in net interest margin (NIM) given the dominant proportion of non-interest-bearing and fixed-rate liabilities (see Box 1.2 of the [Risk Assessment for the First Half of 2022](#) and Chart 1.56). Broadly, banks' fixed-rate assets (residential property and investment credit) are backed by⁴³ home savings plans and by the stable portion of non-interest-bearing deposits⁴⁴ and passbooks (Livret A and LDDS). From an interest rate risk management perspective, non-interest-bearing sight deposits are treated as fixed-rate liabilities because they are empirically insensitive to changes in interest rates (this is particularly true for households but also for NFCs to a lesser degree). Ultimately, therefore, increased market rates tend to affect assets more than liabilities in this portion of the loan portfolio. Once the contractual and behavioural characteristics of assets and liabilities are factored in together, institutions may use interest rate derivatives to adjust the sensitivity of their balance sheet and/or net interest margin.⁴⁵

At this stage, however, NIM growth is being contained by the relatively swifter increase in the average cost of liabilities and especially of regulated savings. Looking at short-term developments, NIM shrank slightly in the third quarter of 2022 (by EUR 0.6 billion compared with the second quarter of 2022) owing to the slightly faster increase in the cost of deposits (rate on Livret A passbooks especially, and NFC term deposits) relative to the increase in the return on assets (especially property loans, cf. Chart 1.61). The effects of higher market interest rates on outstanding loans are however set to intensify over the coming quarters. On the liability side, retail sight deposits continue to grow at a brisk clip (+2.8% yoy at end-September 2021), although the pace slackened relative to passbooks, which recorded growth of 6.5%. Accordingly, at this stage, the risk of migration from sight deposits to higher-earning passbook accounts is moderate. Sight deposits accounted for 46.8% of total outstanding NFC and household deposits at France's six largest banking groups, compared with 47.6% at the end of Q2 2022 (cf. Chart 1.62).

Chart 1.61: Quarterly change in NIM

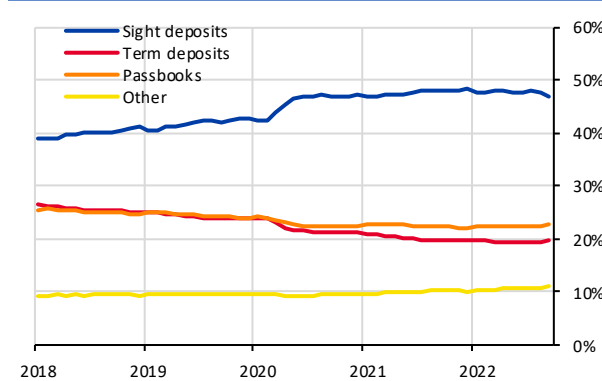
x: time / y: %



Source: ACPR.

Chart 1.62: Distribution of outstanding household and NFC deposits, by instrument type - Top 6 (%)

x: time / y: %



Source: ACPR.

While the resilience of companies and households makes it possible to contain the cost of risk at a low level, this cost could rise in today's uncertain macroeconomic environment (cf. Chart 1.63). Non-performing loan ratios remain at record low levels (3.2% for NFCs, 2.2% for households). However the share of outstanding loans whose credit risk has risen significantly (IFRS 9 stage 2)⁴⁶ is increasing (cf. Chart 1.64). In particular, the quality of outstanding state-guaranteed loans continues to deteriorate, with 38.2% classified as stage 2 and 7.2% as non-performing. Accordingly, the share of state-guaranteed loans in non-performing loans to businesses rose from

⁴³ This is a simplified representation. Assets and liabilities are analysed by institutions without ex ante allocation of sources of funding.

⁴⁴ Non-interest-bearing sight deposits, such as ordinary deposits, amounted to EUR 1,055.9 billion in September 2022 at the six main French banks.

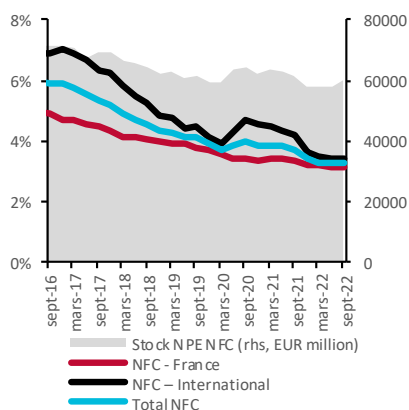
⁴⁵ This adjustment reflects, among other things, the institution's interest rate risk management goals or expectations for the future path of market interest rates.

⁴⁶ Under IFRS 9, stage 2 assets are financial instruments that have deteriorated significantly in credit quality since initial recognition but offer no objective evidence of a credit loss event.

8.4% at end-2021 to 9.7% at end-September 2022. Given the high level of uncertainty surrounding macroeconomic variables for 2023, provisioning models are expected to be conservative when taking the macroeconomic downturn into account. These models and the classification of bank exposures under the three IFRS 9 stages determine the provisioning flows that are subtracted from profits, also known as the cost of risk (cf. Chart 1.65). The overall cost of risk increased in the third quarter of 2022 (EUR 2,812 million vs. EUR 2,695 million in the second quarter of 2022), totalling 0.26% of loans on an annual basis, up from 0.24% in the previous half. The provisioning coverage ratio remains low and fell to 1.53% overall, compared with 1.73% at the end of 2019. However, the total stock of provisions relative to French banks' performing loans stands at approximately three times the actual cost of risk in 2019. This proportion has remained stable since the latest round of maturities.

Chart 1.63: NPEs and NPE ratio among NFCs, by geographical area

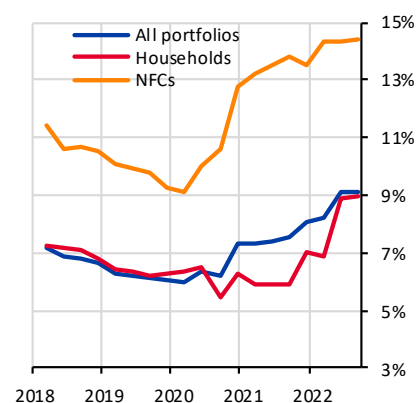
x: time / y: left: %; right: amount in EUR million



Source: ACPR.

Chart 1.64: Share of stage 2 IFRS9 loans

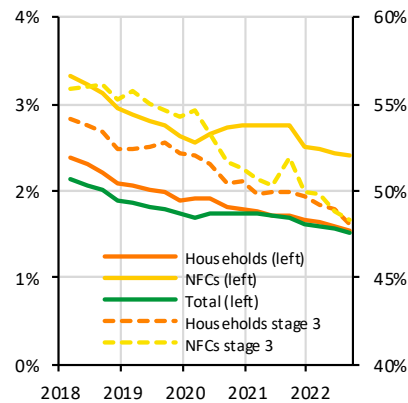
x: year / y: amount in EUR billion



Source: ACPR.

Chart 1.65: NFC and household coverage ratios, by IFRS stage

x: time / y: %



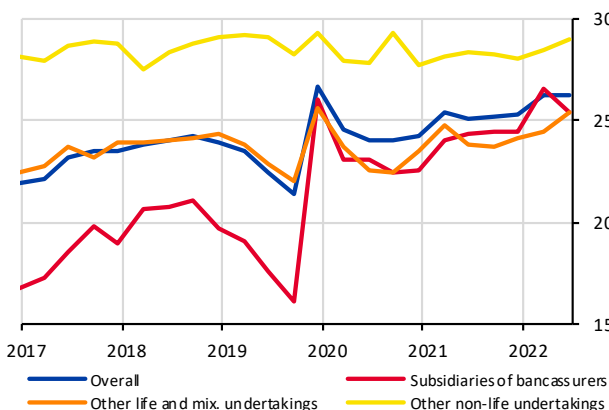
Source: ACPR.

Insurance undertakings have a solid balance sheet structure but must adapt to the new interest rate environment

The insurance sector's capital requirements are comfortably covered, although levels vary considerably across undertakings. Insurers hold significant eligible own funds to cover capital requirements. At end-June 2022 (cf. Chart 1.66), the average solvency capital requirement (SCR) coverage ratio across all undertakings stood at 263%, up ten points compared with the fourth quarter of 2021. At many insurers, increased interest rates have reduced the value of long-term technical liabilities, which are discounted at higher rates, by more than assets, which have been especially impacted by the decrease in the value of bond investments. Disparities between undertakings may be significant. For example, 25% of insurers have a ratio of lower than 175% while 25% have a ratio in excess of 325% (cf. Chart 1.67). Other non-life undertakings have an average ratio of 290%, while the subsidiaries of bank-insurers, which have to be analysed in the context of their group's conglomerate structure, have lower rates.

Chart 1.66: Solvency capital requirement coverage ratio

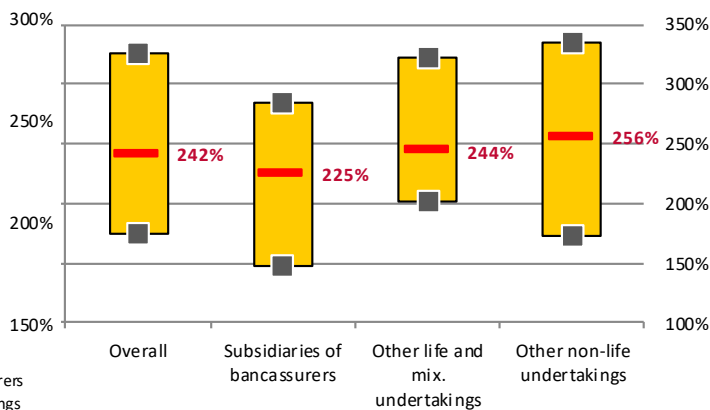
x: time / y: %



Source: ACPR.

Chart 1.67: Distribution of the SCR coverage ratio

x: type of undertaking / y: 1st quartile, median and 3rd quartile as a %



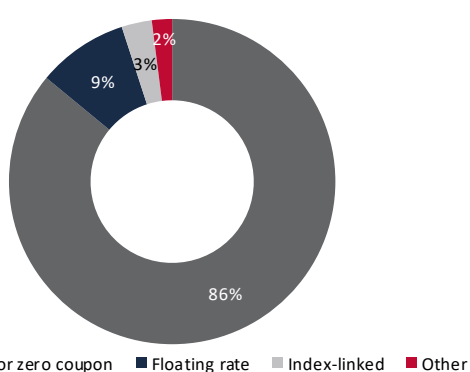
Note: The red lines correspond to median values and may therefore differ from the averages mentioned in the body of the text.

Source: ACPR.

The effects of higher interest rates and inflation vary across different business lines and undertakings.

Non-life insurers offering long-term guarantees are especially affected by inflation, which can impact the cost of benefits over several years, whereas prices are not revised annually. This is particularly true in construction, liability, and death & disability insurance. While loss ratios are traditionally below 100% in these businesses, they could be pushed above 100% by (i) an increased number of claims and/or (ii) a rise in the cost of claims, particularly in connection with inflation. The current inflationary environment is also impacting relative returns on assets. Returns on equities, collective investment schemes and real estate may go up or down as a function of the level of inflation, but bond income is fixed in the vast majority of cases. Zero-coupon and fixed-rate bonds made up 86% of the bond portfolio at end-June 2022, compared with shares of just 9% for floating-rate bonds and 3% for index-linked bonds (cf. Chart 1.68). Finally, with 92% of investments denominated in EUR and 5% in USD, French insurers have minimal exposure to currency risk (cf. Chart 1.69).

Chart 1.68: Breakdown of insurers' bond portfolio, as a % of total investments at 30 June 2022

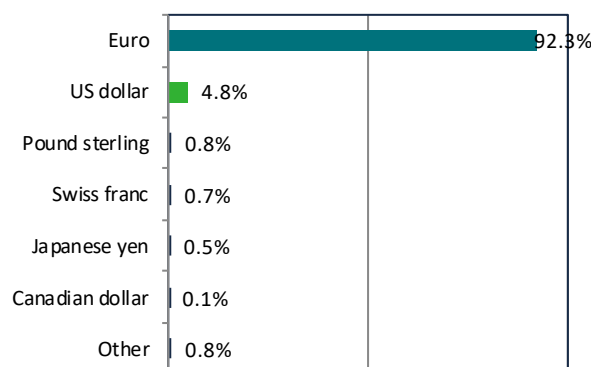


Source: ACPR.

Note: After applying the look-through approach to CIS.

Chart 1.69: Breakdown of insurers' investments by currency, as a % of total investments

x: % / y: currency



Source: ACPR.

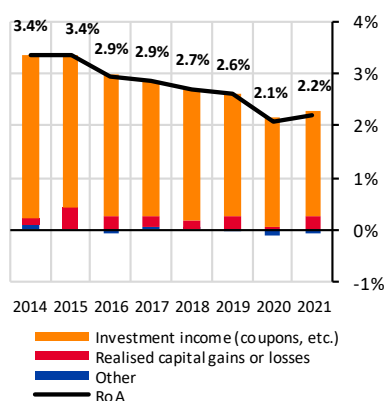
Note: Based on 93% of investments, after applying the look-through approach to CIS.

The downward trend in interest rates over recent years has squeezed insurers' financial income, particularly from bond coupons. Despite the increase in interest rates, the recurring portion of the return on assets (RoA) earned by insurers continued to slide in 2021, falling to 2% from 2.1% in 2020, as older high-yielding bonds were replaced by lower-yielding ones. In 2021, strong performances on financial markets enabled insurers to make up

for this decline with capital gains on equities. In 2022, stock price movements dampened the prospects of capital gains (cf. Chart 1.70). The composition of the asset portfolio held by insurers at end-June 2022 reflects these valuation effects and differs slightly from the structure observed at the end of 2021. Sovereign bonds account for 23% of investments, after applying the look-through approach to Collective Investment Schemes (CISs) assets, financial sector bonds make up 25% and equities account for 11% (compared with 25%, 25% and 12% respectively) (cf. Chart 1.71).

Chart 1.70: Insurance vulnerability indicators:
Return on Assets (RoA)

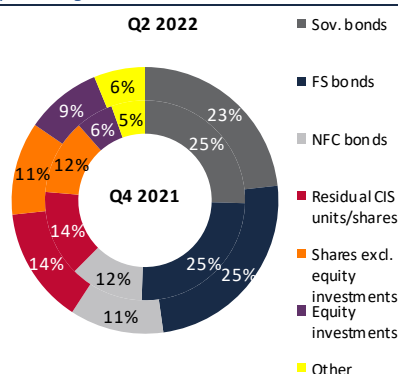
x: time / y: %



Source: ACPR.

Chart 1.71: Decomposition of insurers' assets

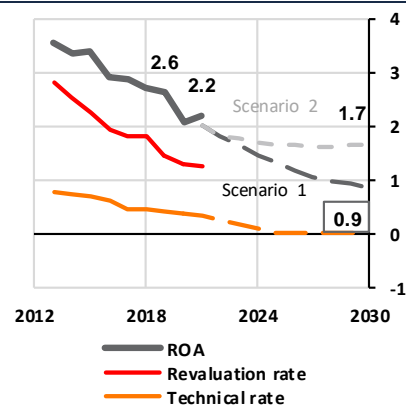
percentage



Source: ACPR.

Chart 1.72: Ten-year RoA projection

x: time / y: %



Note: Projections from 2021 (excl. realised capital gains or losses for the RoA).

Scenario 1 = French ten-year government bond yield to rise to 2% from 2022.

Source: ACPR.

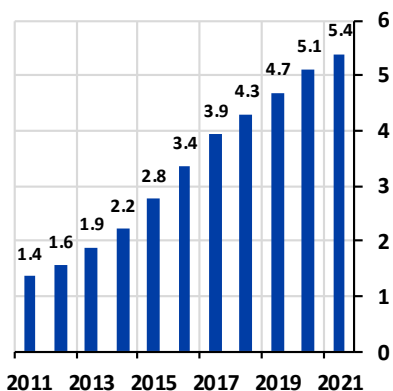
Movements in RoA ratios pose a challenge to insurers. The downtrend in interest rates over recent years has exerted steady downward pressure on insurers' financial income. The average return on assets (RoA) fell from 3.4% to 2.2% between 2014 and 2021. This decline was passed on to the revaluation rate for non-unit-linked funds, which stood at around 1.3% in 2021. Assuming a 2% increase in market rates from 2022, the reinvestment of maturing bonds would see the RoA of insurers flatten out at 1.7% (cf. Chart 1.72).⁴⁷

A swift rise in interest rates would expose insurers to the risk of increased surrenders if they are unable to offer attractive returns due to the inertia of their investment income. Over the first part of 2022, higher interest rates did not trigger outflows from life insurance: gross inflows totalled EUR 103.9 billion over the first ten months of 2022 (compared with EUR 107.2 billion over the same period in 2021) and the average surrender rate on the market remains contained at 4.5%, notably thanks to tax incentives designed to limit exits during the first eight years of contracts. Furthermore, to offer attractive rates of return and counter the risk of competition from new entrants on the market, insurers can tap a portion of their profit-sharing reserves, which stood at 5.1% of technical provisions at end-2021 (cf. Chart 1.73) after several years of steady growth.

A gradual increase in interest rates, conversely, will allow insurers to reinvest in higher-earning assets as their previous investments mature. Insurers continue to hold bonds with low residual maturity acquired during the prolonged period of low interest rates and offering relatively high yields. At end-2021, 45% of bond investments maturing in the next four years had a coupon of over 3% (compared with 54% at end-2020 and 60% at end-2019). To offset the decline in the return on non-unit-linked funds, in recent years insurers have promoted investments in unit-linked products, whose market risk is borne essentially by savers. As a result, while non-unit-linked products have recorded almost continuous outflows since the end of 2019, in the first half of 2022, unit-linked products saw net inflows of around EUR 22 billion, ensuring that life insurance continued to receive net inflows over the first months of the year (cf. Chart 1.75).

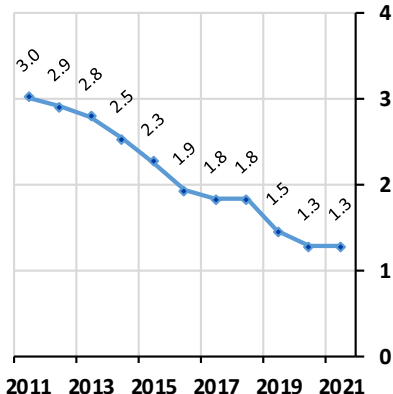
⁴⁷ In addition to interest rate scenarios, RoA projections also assume zero net inflows to non-unit-linked instruments.

Chart 1.73: Ratio of allocations to profit-sharing reserves
x: time / y: %



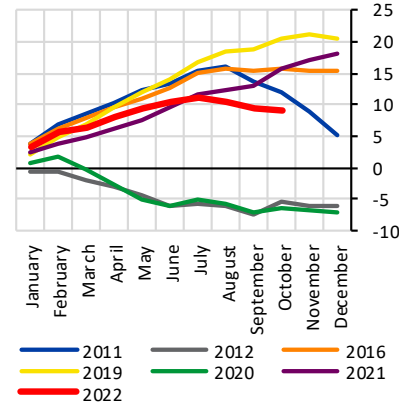
Source: ACPR.

Chart 1.74: Revaluation rate for non-unit-linked contracts
x: time / y: %



Source: ACPR.

Chart 1.75: Cumulative net annual inflows (outflows), life insurance
x: time / y: EUR billion



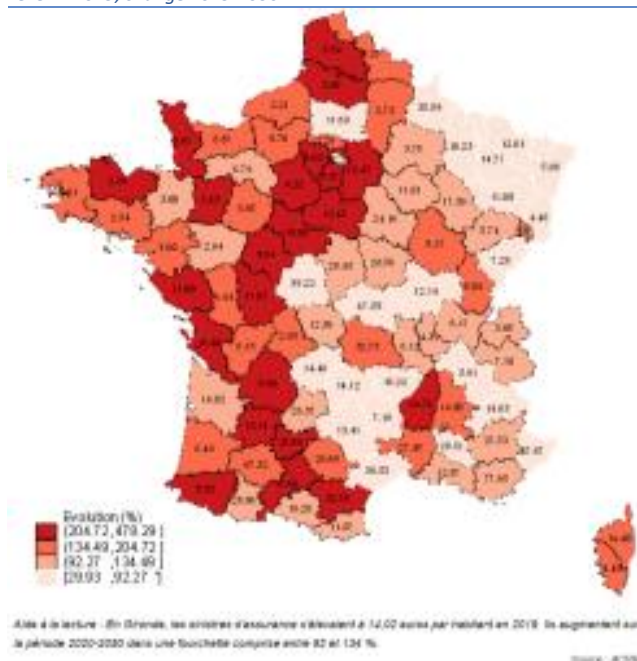
Source: ACPR.

1.4 Some structural challenges have become even more pressing in the short term

The war in Ukraine and extreme weather events over the summer highlighted the increased risks of a disorderly energy transition

The latest report by the Intergovernmental Panel on Climate Change (IPCC), published in April 2022, stressed yet again that strong and urgent climate policies are vital if carbon neutrality is to be achieved by 2050. Yet global emissions remain on an upward trend, recording a 12% increase over the last decade and 54% over the last 30 years. Numerous extreme weather events over 2022, including floods and repeated heatwaves, also indicated that climate risks are becoming more pronounced. Meanwhile, the war in Ukraine, the economic and financial sanctions imposed on the Russian Federation, and Russia's manipulation of oil and gas exports highlighted our economies' heavy reliance on fossil fuels and our corresponding exposure to transition risk. Gas shortages left Europe facing a choice with starkly different consequences for the climate: either speed up the transition to low-carbon energies or reinvest in fossil fuels, which would delay the transition and increase the chances of a disorderly transition in the coming years.⁴⁸

Chart 1.76: Insurance claims: flooding, droughts, coastal flooding
Level in 2019, change 2019-2050



Source: ACPR.

⁴⁸ See the June 2022 Assessment of Risks to the French Financial System for an analysis of the increase in risks associated with a disorderly transition in the wake of the Ukraine conflict.

Climate stress test exercises have been used to prepare initial assessments of risks connected with a disorderly transition. The ACPR⁴⁹ drew up crisis scenarios for French banks and insurers in 2021, while at European level, scenarios were drawn up in 2022 by the ECB⁵⁰ for banks and by EIOPA⁵¹ for pension funds. The ACPR's stress tests showed that banks and insurers have moderate overall exposure to transition risk, although these risks were contingent on the scenarios analysed. Thus, at end-2019, 9.7% of the loan portfolio of banks was exposed to at-risk sectors, while 17% of the total assets of insurers were exposed. The cost of risk appeared to be higher in disorderly transition scenarios than in orderly transition scenarios characterised by progressive implementation starting in 2020.

According to the same exercise, physical risk for insurers could lead, in the most exposed parts of the country, to an increased cost of claims: i) the cost of claims linked to natural catastrophes could go up five or sixfold between 2020 and 2050, ii) the cost of claims linked to vector-borne diseases, such as dengue, could increase by a factor of between 3 and 4.5, and iii) claims linked to air pollution and the increased length and frequency of heatwaves could increase by a factor of between 2.5 and 3.5. Consequently, to maintain a constant loss ratio, premiums would have to increase by between 2.8% and 3.7% per year to offset the higher cost of claims associated with the climate change scenario used by the ACPR. But the sustainability of such increases is uncertain, ultimately raising questions about the insurability of certain risks. That being said, assessing the financial sector's climate risks is a new exercise, and one that remains subject to numerous methodological restrictions.

The ACPR and ECB stress tests also highlighted the progress that still needs to be made in managing the financial risks linked to climate change. Notably, banks are not doing enough to integrate climate change in their risk self-assessments, internal models and long-term strategies. The ECB's thematic review on climate and environmental risks also underlined shortcomings in the governance of these risks.⁵² While 85% of European banks have set up basic climate risk arrangements, almost all of them have blind spots in identifying these risks. They have until end-2024 to align their practices with supervisory expectations. Meanwhile, the third joint ACPR-AMF report on monitoring climate commitments⁵³ emphasised that the operational application of these commitments remains inadequate and that governance frameworks need to be strengthened.

Transition plans could become a key instrument in the toolbox used to improve recognition of climate risks by banks, following the negotiations currently underway at European level (CRR3/CRD6). The transition-plan-based approach recognises that measuring absolute transition risk is difficult. Furthermore, this approach considers that transition risk may be proxied by assessing the relative misalignment of bank business models with regulatory greenhouse gas (GHG) emissions reduction targets. While this approach still needs to be made ready for operational use to allow supervisors to introduce additional capital requirements linked to transition plan assessments, the transition risk of individual institutions may be measured based on the credibility of their transition plans with respect to regulatory objectives.

Other environmental risks, which interact with climate risk, could also affect the financial system.^{54,55} The dependence of economic and financial sectors on the ecosystem services⁵⁶ provided by nature is a source of physical risk, at a time when biodiversity is shown to be swiftly declining across the world. At end-2019, 42% of the total amount of securities (equities and bonds) held by French institutional investors were issued by companies that depend directly on ecosystem services, to degrees ranging from "highly" to "very highly".⁵⁷ Measures to mitigate the impact of economic and financial activities on ecosystems are moreover a source of

⁴⁹ Cf. *Climate stress test – ACPR pilot exercise*

⁵⁰ Cf. *ECB stress test*

⁵¹ European Insurance and Occupational Pensions Authority (EIOPA), cf. *Climate stress test for the occupational pensions sector 2022 | Eiopa (europa.eu)*

⁵² *ECB thematic review* following publication of the *Guide on climate-related and environmental risks (europa.eu)*

⁵³ Cf. *AMF-ACPR report*

⁵⁴ The theme of nature-related risks is discussed in greater detail in chapter 3 of this review.

⁵⁵ See the March 2022 statement by the NGFS on the materiality of nature-related risks:

https://www.ngfs.net/sites/default/files/medias/documents/statement_on_nature_related_financial_risks_-_final.pdf

⁵⁶ Which include the provision of essential items such as food, wood and water, as well as regulating functions such as climate regulation, water purification, pollination and cultural services (religious, tourism).

⁵⁷ Svartzman et al., 2021.

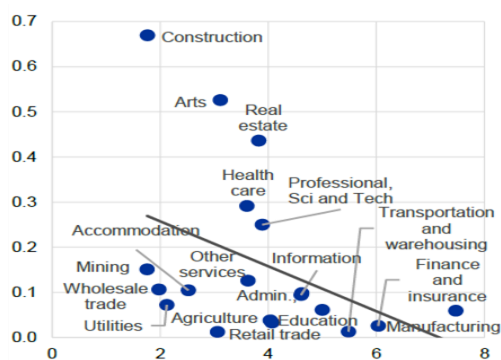
transition risk that is set to grow.⁵⁸ The situation in the Netherlands illustrates the coming risks. The country's nitrogen emissions reduction policies have increased credit risk linked to the agricultural sector and impacted portfolio values at major banks, including Rabobank. Chapter 3 of this report considers the financial stability risks arising from the damage being done to nature.

Cyber risk has been on the rise in recent months, stoked by geopolitical pressures

Cyclical factors such as geopolitical stress connected with the Russian war in Ukraine have exacerbated the threat of cyberattacks beyond the geographical boundaries of the conflict.⁵⁹ This context motivates to set out a detailed mapping of cyber risk threats and contagion channels for the financial system in the June 2022 Assessment of Risks to the French Financial System⁶⁰. Currently, the financial system is resilient to cyber risk, thanks to major and growing investments in cybersecurity. But the sophistication and scale of attacks require stepped-up vigilance by financial participants and tailored crisis management arrangements, such as provided for by Europe's DORA Regulation.

The growing digitalisation of the sector, a trend that was magnified during the Covid-19 crisis by the introduction of remote working tools, has extended exposure to cyber risk by generating new vulnerabilities that may be exploited by attackers, notably through online cloud-type services. However, the general government, health and education sectors were the hardest hit by cyberattacks in 2021, while attacks on the financial sector accounted for between 5% and 10% of all cyberattacks globally.⁶¹ According to a cyber-defence report by Orange, a telecommunications company, the location of cyberattacks is shifting, with attacks targeting European countries rising by 18% between 2021 and 2022⁶² and a marked decrease in those targeting North America.

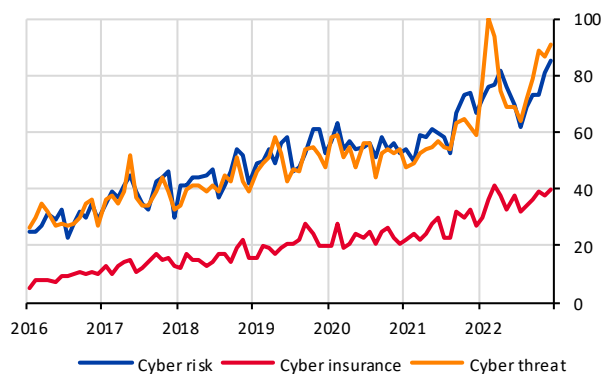
Chart 1.77: Cyber-costs and IT spending across US sectors
x: IT spending as a % of revenues / y: Cost of cyberincidents as a % of revenues



Source: ECB Financial Stability Review – November 2022 – Special Features A.

Chart 1.78: Google searches

x: time / y: Index of Google searches



Note: The Google trends shown here are measured as an index which takes the value 100 for the point of highest search interest for any of the three terms since 2004.

Sources: Google Trends, Banque de France calculations.

To date, no financial entity has experienced a direct or indirect (i.e. through service providers) cyberattack that resulted in systemic losses. However, the increasingly complex interconnectedness of financial participants through service providers (software, cloud services, SWIFT messaging network, payment systems, power

⁵⁸ Increasingly restrictive public policies are being put in place internationally (COP15 on biodiversity), in Europe (Green Deal) and in France (Energy-Climate Act, Climate and Resilience Act) to protect nature.

⁵⁹ Microsoft - Special Report: Ukraine and Microsoft - Defending Ukraine: Early Lessons from the Cyber War

⁶⁰ Assessment of Risks to the French Financial System - June 2022

⁶¹ ECB Financial Stability Review – November 2022 - Towards a framework for assessing systemic cyber risk

⁶² Orange - Security Navigator Report 2023

infrastructures) increases the risk of contagion within the financial sector and hence the systemic nature of that risk. Furthermore, the digitalisation of banking and financial services, with new online services now being offered via fintech providers, exposes the financial system to new participants and new operational dependencies. Illustrating this, Revolut, a bank, was hit by a cyberattack in September 2022 that exfiltrated the personal data of around 50,000 customers.

Changes in the number and cost of cyberattacks are hard to assess because a cyberattack can cause not only direct costs, such as data theft, but also indirect costs, such as loss of confidence, contagion to other corporations or the introduction of new security systems. However, the ECB⁶³ and the BIS⁶⁴ have shown that the costs of cyber events are inversely proportional to IT expenditures, suggesting that investing in computer defences reduces the cost of cyberattacks suffered.

Owing to the sensitive nature of the data processed, the financial sector is the sector that invests the most in cybersecurity every year.⁶⁵ Consequently, its costs related to cyber incidents are currently lower than those in other sectors (cf. Chart 1.77). According to Gartner, a consultancy, global spending on cybersecurity and risk management is set to exceed USD 188 billion in 2022, an 11.3% increase on 2021.⁶⁶

Heightened vigilance is vital to preventing attacks, which are growing increasingly sophisticated. As the 2021 review of IT threats published by France's National Cybersecurity Agency (ANSSI)⁶⁷ stresses, the level of IT threats is rising all the time, notably as hackers get more sophisticated. The increase in cyber risk has also led to more awareness about this issue, as reflected in the upturn in Google searches (cf. Chart 1.78). Several attack vectors may be the source of systemic risk, notably by disrupting the availability or integrity of financial data. A 2020 study by the Bank of Canada showed that an attack on one bank via the Canadian payments system⁶⁸ could swiftly become systemic and threaten financial stability. Likewise, a cyberattack targeting power infrastructure could result in a loss of confidence in data reliability and potentially lead to systemic losses for many market participants.

To study and prevent the transmission of cyber risk to the financial system, a regulatory framework and crisis management mechanisms must be set up. Europe's *Digital Operational Resilience Act (DORA)*,⁶⁹ which is set to come into application in 2025,⁷⁰ significantly bolsters the prudential framework applicable to financial sector corporations in the area of IT risk. Among other things, it requires all entities to implement an operational resilience testing policy and sets rules on performing advanced tests for critical systems.

In Europe, the ESRB has recommended setting up a pan-European coordination framework⁷¹ to strengthen information-sharing and crisis communication between EU and international financial authorities and promote a swift collective response. Similarly, the 2022 cybersecurity report by the US Federal Reserve⁷² makes the point that intergovernmental, international and joint coordination between the public and private sectors is needed to establish a regulatory framework that will ensure the stability of the financial system.

Beyond the regulatory aspects, mechanisms to support operational exchanges in place at national level, such as France's Marketwide Robustness Group, and at international level, such as the G7's Cyber Incident Response Protocol, allow public and private participants to share information on cyber threats and incidents and to organise crisis management exercises in normal times, but also to coordinate themselves to mitigate the business impacts of a cyberattack during times of crisis.

⁶³ Cf. *ECB Financial Stability Review – November 2022 - Towards a framework for assessing systemic cyber risk*

⁶⁴ Cf. Aldasoro, I., L. Gambacorta, P. Giudici, and T. Leach, *The drivers of cyber risk*, BIS 2022.

⁶⁵ Kennedy and Stratopoulos, *Mapping IT Spending Across Industry Classifications: An Open Source Dataset, 2017*

⁶⁶ Cf. Gartner press release, *Gartner Identifies Three Factors Influencing Growth in Security Spending - October 2022*

⁶⁷ ANSSI - *Panorama de la menace informatique 2021*

⁶⁸ *Bank of Canada - Transmission of Cyber Risk through the Canadian Wholesale Payments System*

⁶⁹ Cf. Box 2.3 – *Assessment of Risks to the French Financial System - June 2022*

⁷⁰ The Joint Committee that brings together the three European supervisory authorities, namely EBA, EIOPA and ESMA, has set up a working group, called JC-SC-DOR, to draft the implementing legislation (technical standards) for DORA.

⁷¹ Cf. ESRB, *ESRB recommends establishing a systemic cyber incident coordination framework - January 2022*

⁷² *Federal Reserve - Cybersecurity and Financial System Resilience Report - 2022*

2. Vulnerabilities linked to leverage in non-bank financial institutions

In the wake of the 2008 crisis and the new financial regulations put in place to provide a more effective framework for banking, the growth of bank assets slowed, which opened up opportunities for other financial intermediaries. Since that time, non-bank financial institutions (NBFIs)⁷³ have greatly expanded and become more diversified, and in 2020 accounted for almost one-half of global financial assets, compared with 42% in 2008. With the growth of NBFIs, financial risks are increasingly transmitted and held outside the banking sector, which could have repercussions for the stability of the global financial system. This means that the financial system's resilience depends less directly on bank buffers and more on the capacity of investors and other intermediaries to manage market, credit and liquidity risk efficiently, especially during times of stress.

During the same period, the global financial system enjoyed increased liquidity, in response to deflationary risks, which may have encouraged excessive risk-taking with the potential for sudden and brutal reversals. Face-paced financial innovation promoted the development of increasingly complex and sometimes poorly understood financial instruments comprising significant debt components and making it tricky to analyse the associated risks.

This chapter explores leverage-related vulnerabilities in French NBFIs. Part one describes the different ways to acquire leverage, the types of financial institutions involved in financing leverage, and how leverage is used. Part two details the regulatory framework applicable to NBFIs. The final section analyses leverage at the most exposed participants, including insurers, which in France are traditionally included among financial intermediaries because of their role in managing domestic savings.

Available data suggests that investment funds and insurers do not make extensive use of leverage when executing their investment mandates. Although they are subject to different sets of legislation,⁷⁴ French investment funds governed by the Collective Investment in Transferable Securities (UCITS) Directive and funds subject to the Alternative Investment Fund Managers Directive (AIFMD) display comparable and low average leverage levels.⁷⁵ On average, the value of exposures (including derivatives) of French funds (all types) ranges from 110% (net positions) to 220% (gross positions) of net asset value (at end-2021),⁷⁶ depending on the indicator. However, some alternative funds, such as hedge funds and real estate funds, report more substantial levels of leverage, in some cases exceeding 300%. French insurers make limited use of debt: on average, their financial debt is equivalent to 4.5% of total assets. The bulk of derivatives held by French insurers are used to hedge against the rise of interest rates and do not create exposure to potential losses.

2.1 Definition of leverage and main risks for financial stability

Leverage is a financial technique used to increase exposure to investments

Leverage is the magnification of the rate of return (positive and negative) on a position or investment beyond the rate obtained by direct investment of own funds in the market. Leverage can be thought of as indicating the responsiveness of the value of an equity stake to changes in the value of overall assets. As changes in the value of

⁷³ An NBFi is a financial institution that does not have a full banking license and cannot accept deposits from the public. However, NBFIs do facilitate alternative financial services, such as investment (both collective and individual), risk pooling, financial consulting, brokering, money transmission and cheque cashing.

⁷⁴ Alternative investment funds governed by the AIFMD generally have more flexibility in their investment choices than funds governed by the UCITS Directive. This may allow them to invest in a broader range of assets, including illiquid and private credit assets, with the potential promise of higher returns.

⁷⁵ Under the first sub-paragraph of Article 111 of the [European Regulation](#) of 19 December 2012, leverage is considered to be employed on a "substantial" basis when exposure as calculated according to the commitment method exceeds three times net asset value.

⁷⁶ We are talking here about gross synthetic leverage, which likely overestimates economic exposure, and net synthetic leverage, which likely underestimates it. The calculation methods are detailed in part three of this chapter.

equity are theoretically equal to changes in the asset portfolio (the value of debt being fixed), leverage is conventionally defined as the ratio of assets to equity.

Leverage is achieved by increasing the investment through either outright borrowing or off-balance-sheet transactions, particularly derivatives. In the former case, a loan is used to supplement the equity investment. Instead of cash, the loan could consist of a security, as in short-selling operations, for example.⁷⁷ This is referred to as **financial leverage**. In the latter case, derivatives positions, such as futures, forwards, options and swaps, allow the investor to earn the return on the notional amount underlying the contract by committing a small portion of equity in the form of initial margin or option premium payments. This is known as **synthetic leverage**.

Acquiring leverage through derivatives or repos is generally cheaper than through on-balance-sheet transactions, because it allows firms to assume a given position by committing less capital than would be the case with an equivalent cash market position. For example, repurchase agreements typically involve small haircuts, making it possible to obtain leverage at attractive interest rates. Forward contracts tend to be the least costly way of acquiring exposure, especially as they are not always subject to margin requirements when they are traded bilaterally over the counter (OTC).⁷⁸ Options, conversely, are more costly instruments to obtain leverage with because of their declining time value and they also need to be regularly adjusted to ensure precise replication and constant leverage.

Leverage may create or amplify financial system vulnerabilities through a variety of direct and indirect channels

A number of events have highlighted the way in which leverage-related risks may materialise and have major consequences for the global financial system. In 1998, Long-Term Capital Management, a heavily leveraged speculative fund betting on bond yield spreads, was bailed out by US authorities to avoid a major financial crisis. In 2008, the unwinding of leveraged positions held by securitisation vehicles played a big part in triggering the global financial crisis. Following the onset of the Covid-19 pandemic in March 2020, bond market vulnerabilities were amplified by forced sales of US Treasuries by investors who had tried to use leverage to exploit narrow spreads between the spot and futures prices of these securities.⁷⁹ In March 2021, the collapse of Archegos, an unregulated US family office, caused more than USD 10 billion in losses, which were shared between several systemic banks, including USD 5.5 billion for Credit Suisse alone and just under USD 3 billion for Nomura.⁸⁰ Archegos had built up significant leveraged exposures to equities through equity derivatives with bank counterparties. In October 2022, the Bank of England was forced to intervene to prevent upheaval on the sovereign debt market following the announcement of the government's new fiscal policy and forced sales by UK pension funds, whose liability-driven strategies use leverage (via repos) to cover their commitments (cf. box in chapter containing the cross-cutting analysis of vulnerabilities).

Leverage may create or amplify vulnerabilities in the global financial system through direct and indirect channels. In the first place, leveraged entities are more sensitive to changes in asset prices. Adverse movements in asset prices, margin calls and larger haircuts may force them to sell assets to obtain cash, which affects other participants through falling prices and increased margin calls. In the second place, leverage may contribute to procyclicality when entities reduce exposures during slowing phases of the business cycle or engage in asset sales triggered by increased market volatility. All in all, leverage may increase the risk of an entity facing financial distress, which could be transmitted to direct counterparties and the wider financial system through interconnectedness, for example via indirect exposures or portfolio similarities.

⁷⁷ In short-selling, leverage comes from the loan generated by the cash received from selling the security.

⁷⁸ CCP margin requirements apply to centrally cleared products, while in the case of non-centrally cleared products, initial margin must be exchanged only by companies that have a notional amount of non-centrally cleared OTC derivatives exceeding an average of EUR 8 billion over the months of March, April and May of the previous year. Cf. Article 28 [REGULATION \(EU\) 2016/2251](#)

⁷⁹ Hedge Funds and the Treasury Cash-Futures Disconnect (D. Barth, R. J. Kahn, 2021), *Office of Financial Research Paper Series*.

⁸⁰ Leverage and derivatives – the case of Archegos (Bouveret, Haferkorn, 2022), ESMA.

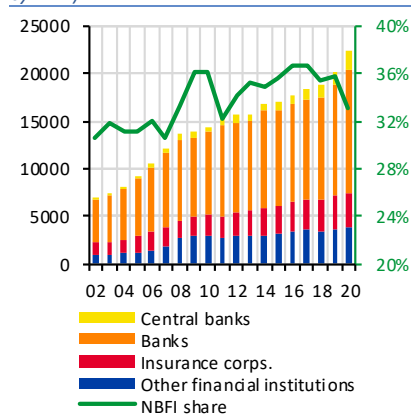
The rapid unwinding of major positions in response to margin calls following exogenous price movements or major fund withdrawals by investors could amplify these movements significantly. The greater leverage is, the smaller the change in price needs to be to trigger an unwinding of positions. A leveraged long position will be sold following a fall in prices, which will contribute to amplify the price movement. Conversely, a short position needs to be covered in a rising market by purchasing securities, thereby further fuelling the upside pressure on prices. Concentrated positions in an asset or a group of highly correlated assets with insufficient market liquidity may be even trickier to unwind. Thus, leveraged positions may magnify this disruptive mechanism and increase market volatility more swiftly.

Banks finance a mosaic of non-bank financial institutions

Through their prime brokerage activities,⁸¹ banks are the main suppliers of funding to NBFIs and are often counterparties to their transactions. Unlike in the international financial system, the share of NBFIs in the French financial system has remained relatively stable since the 2008 financial crisis, rising from 30% in 2007 to 33% in 2020 (cf. Chart 2.1).⁸² The exposure of French banks to European NBFIs⁸³ rose by 33% between January 2020 and September 2022, with total outstanding amounts climbing from EUR 295 billion to EUR 400 billion. Four similarly-sized NBF categories receive funding from French banks: investment funds and administration of financial markets⁸⁴ (28% each), activities auxiliary to financial services⁸⁵ and insurers (22.8% and 21% respectively) (cf. Chart 2.2). These shares have been relatively stable over the last two years.

Chart 2.1: NBF share of domestic financial assets

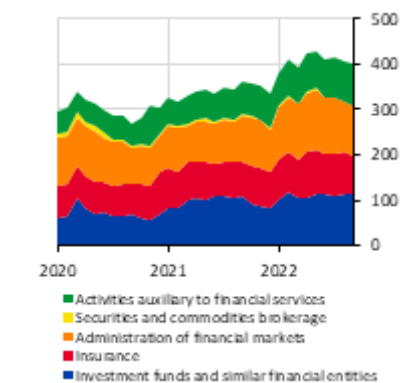
x: time / y (left: billions) (right: % of assets held by NBF)



Source: FSB NBF Monitoring Report 2021.
Note: Data submitted by France on the composition of total financial assets. AIFs include pension funds, brokers, securitisation vehicles and clearing houses.

Chart 2.2: Sector exposures of French banks to European NBFs

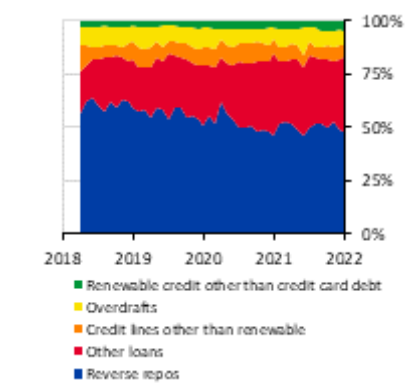
x: time / y: billion



Source: Anacredit, Banque de France calculations. Data on European counterparties only. Most recent value: 30/09/2022.

Chart 2.3: Types of exposure of French banks to European investment funds and insurers

x: time / y: % of exposure, by instrument type



Source: Anacredit, Banque de France calculations. Data on European counterparties only. Most recent value: 30/09/2022.

Short-term funding is mainly provided through secured financing transactions (SFTs) (cf. Chart 2.3), which involve exchanges of cash (lender) against securities (borrower looking to obtain leverage) or of securities against securities. If the entity that borrowed the cash defaults, the lender retains the collateral to cover potential losses. Collateral may take different forms, allowing investors and companies to use the assets that they hold, such as equities and bonds, to obtain financing for their activities. Under repurchase agreements, a party may sell a

⁸¹ Brokerage activity performed by banks aimed at providing a range of services to institutional investors.

⁸² Global Monitoring Report on Non-Bank Financial Intermediation (FSB).

⁸³ Including investment funds and similar financial entities, insurance and reinsurance undertakings, fund management companies, undertakings that administer financial markets, securities and commodity brokerage firms and activities auxiliary to financial services.

⁸⁴ This category includes the operation and supervision of financial markets, such as securities and commodities exchanges and clearing houses, other than by public entities.

⁸⁵ This category includes the provision of services that are involved in or closely related to financial services but are not themselves financial services, such as securities transaction processing and clearing services, merger and acquisition services, investment advisory services, and mortgage advisory and brokerage services.

security (against cash or another security) while agreeing to buy the security back at the initial sale price plus remuneration for use of the cash. As with repurchase agreements, margin loans are a form of secured loan where the lender provides credit to a counterparty in exchange for collateral. The main difference lies in the fact that margin loans are secured by a portfolio of assets, which may include cash, held by the lender. Haircuts and margin requirements apply at the level of the portfolio rather than at the level of the individual securities.

It is possible to buy a security on the spot market, repo that security to obtain more funds, use those funds to buy another security, which may in turn be used in a repo transaction to get more funds, and so on theoretically *ad infinitum*. In practice, however, this infinite multiplier runs up against the credit limits imposed by banks on their counterparties, regulatory capital constraints, and the SFTR directive, which restricts collateral reuse⁸⁶ and requires the collateral-issuing counterparty to give its assent. Even if a borrower tried to borrow from several lenders, the increased size of that entity's balance sheet would soon become apparent, which would put off potential lenders. There are also practical constraints, such as the impact of haircuts or initial margin, when the purchase price is set below the market value of the collateral, which reduces its financing potential.

Investment funds and insurers use leverage to increase the exposure of their investments. Institutional investors use leverage in various ways to design strategies aimed at boosting the return on assets while committing the least possible amount of equity. The most common form is the margin loan, in which a fund deposits a certain amount of equity with a prime broker, for example, 50% of the initial purchase price of a security, and the prime broker lends the remaining amount. Other methods used to obtain leverage include repurchase and reverse repurchase agreements and securities lending arrangements offered by banks. Another strategy by which funds obtain leverage is through the use of OTC derivatives, notably total return swaps (TRS). Generally, in such arrangements, the prime broker pays the fund the “total return” on a reference asset (for example, in the case of equities, capital gains and dividends) and the fund pays the prime broker fees, capital losses and interest on any embedded leverage. “Synthetic prime brokerage” is a means of institutionalising TRS-based delivery of leverage to funds from prime brokers.

The amount of leverage therefore depends significantly on investment strategies, which are themselves dictated by investors' preferences and attitude to risk. Leverage is created by the fact that funds use derivative instruments, such as options, futures, forwards and swaps, on which positions may be taken by posting margin rather than the total nominal value of the position.

Box 2.1: Total return swaps, a key instrument in obtaining leverage

Total return swaps are derivative instruments that are regularly used in equity markets to create leveraged exposure to one or more securities. They make it possible to obtain “synthetic” exposure without having a direct holding on the market (and hence without reporting ownership), to set up protection against falling prices, to gain exposure to otherwise inaccessible securities, or to obtain significant synthetic leverage at low cost. In exchange for the “total return”, that is, including capital gains and dividends, investment funds pay an interest rate based on a standard rate, but they are required to commit only a portion of the total amount to which they are exposed, in the form of initial margin. Initial margin deposits enable the counterparties that pay the return to protect themselves against counterparty risk. The more volatile or risky the underlying, the larger the initial margin. Low initial margins required for a large exposure imply an elevated level of leverage

⁸⁶ Cf. SFTR - Article 15 - REUSE OF FINANCIAL INSTRUMENTS RECEIVED UNDER A COLLATERAL ARRANGEMENT

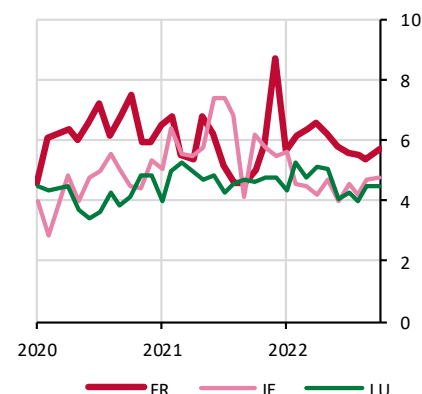
and, consequently, the possibility that liquidity, market and counterparty risks could materialise during periods of high market volatility.

Data collected under the European Market Infrastructure Regulation (EMIR) may be used to obtain gross exposures and associated initial margins for all investment funds engaging in total return swaps with French counterparties or in French equities. Margin levels are reported on the basis of netting sets between two counterparties; gross exposure ratios divided by initial margins shown in the chart are calculated from portfolios holding at least 80% of equity swaps.

Overall, the leverage obtained via equity swaps allows French, Irish and Luxembourg funds to multiply exposures by between 400% and 700% of the committed amounts (initial margin). This level has remained stable over the last three years and is in line with standard margin requirements set at 15% (implying leverage of 650%) by the Bank for International Settlements. (BIS) for non-centrally cleared OTC equity derivatives.⁸⁷

Chart 2.4: Leverage through equity swaps

x: time / y: ratio of gross exposure to initial margin



Source: EMIR (DTCC France). Most recent value: 30/09/2022.

Note(s): Average leverage by domiciliation of investment funds. Funds with very low initial

The private equity model relies heavily on leverage. The whole point of private equity is to acquire companies, transform capital structures with debt, and shift the risk from equity to debt holders.⁸⁸ Since the actual cost of debt is lower than the cost of equity (as debt holders are always paid before equity holders, so the risk is lower), these funds use large amounts of debt to finance the purchase of underperforming companies. The assets of the company being acquired are often used as collateral to secure loans and the assets of the acquiring company. In a leveraged buyout (LBO), a typical ratio is 70% debt to 30% equity. Because of this high ratio, bonds issued during buyouts are not usually investment grade and are classified as high yield or junk bonds.

2.2 The supervisory framework governing leverage in non-bank financial institutions

The legislation and regulations governing the activity of financial institutions use different approaches to measure leverage

In the European Union (EU), the UCITS and AIFM Directives set the main regulatory requirements governing leverage in the investment fund sector. While both of these directives seek to regulate investment funds, their scope of application differs: the UCITS Directive sets out a detailed and harmonised framework for investment funds that may be sold to retail investors throughout the EU. The AIFM Directive, meanwhile, sets organisational and conduct rules to regulate the managers of funds that do not fall in the UCITS category, such as hedge funds,⁸⁹ private equity and real estate investment funds.

The two directives require different methods for calculating risk exposure. Under the UCITS Directive, funds may not borrow more than 10% of their assets (thus giving financial leverage of 1.10). Borrowing must be on a temporary basis and reflect the risk level of strategies.⁹⁰ The directive sets the methods for calculating the synthetic leverage that must be reported. Investment strategies exposed to standard financial contracts⁹¹ must calculate their exposure using the commitment approach, under which derivatives exposures are converted into equivalent underlying positions. The resulting global exposure, including equivalent positions after netting and

⁸⁷ Margin requirements for non-centrally cleared derivatives - Annex A - [Basel Committee on Banking Supervision, September 2013](#)

⁸⁸ See [The Private Equity Boom: Causes and Policy Issues \(OECD\)](#) on private equity business models.

⁸⁹ This legal distinction is not clear-cut however, as some hedge funds are now classified as UCITS.

⁹⁰ Article 83 of [UCITS Directive 2009/65/EC](#)

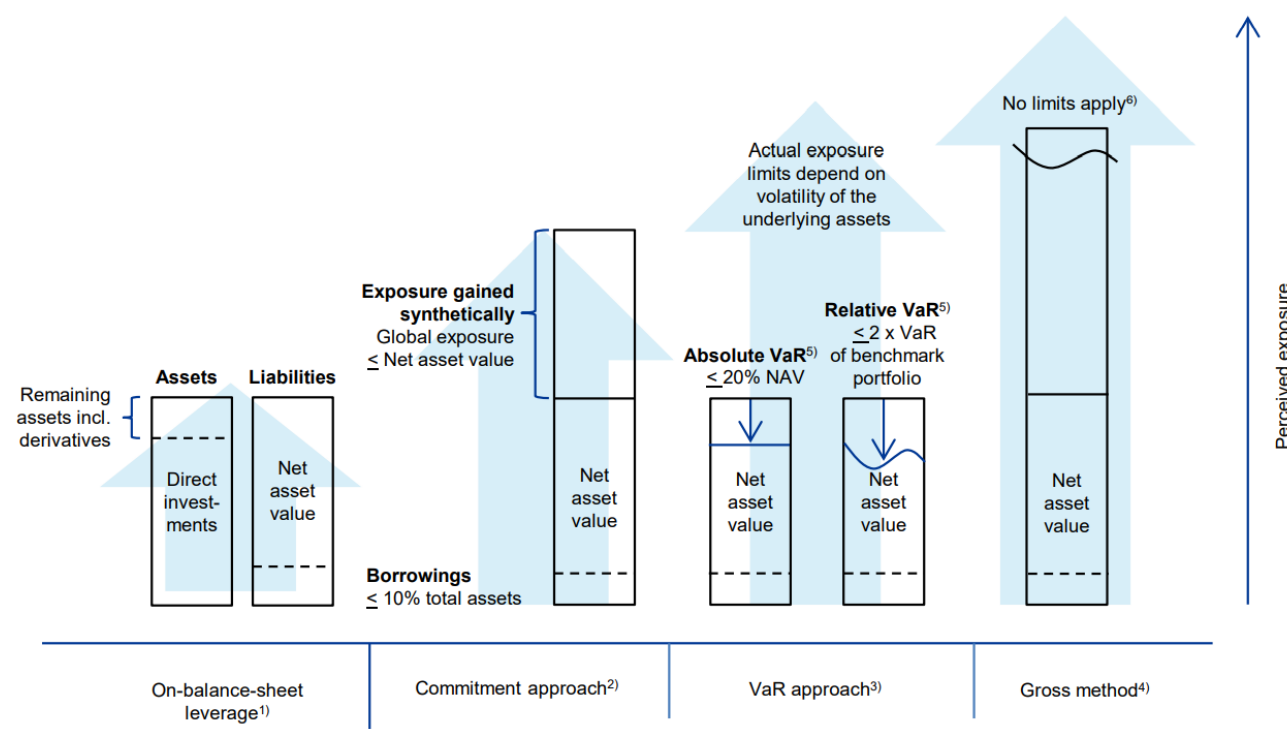
⁹¹ Strategies that make negligible use of exotic derivatives.

reinvested collateral, must not exceed the fund's net asset value (NAV). For more complex investment strategies, UCITS must use the value at risk (VaR) approach and, depending on the type of investment strategy, different types of VaR (absolute or relative) may be used.⁹²

Thus, the UCITS Directive directly limits on-balance-sheet leverage by restricting the amount of debt that may be held. The commitment approach allows for the netting and hedging of equivalent derivative positions with opposite directions, whereas the VaR approach reflects a measure of risk based on portfolio volatility. The gross exposures method is the most conservative approach because it does not allow netting and hedging of positions (cf. Chart 2.5).

The Securities Financing Transaction Regulation (SFTR) seeks to improve the transparency of securities financing transactions such as total return swaps, repos and securities lending. The regulation, which came into force in 2016, imposed transaction reporting obligations on all counterparties, set investor transparency requirements and introduced transparency obligations in respect of collateral reuse arrangements. The SFTR therefore makes it possible to monitor risk and leverage levels at affected entities.

Chart 2.5: Diagram showing total exposure using different calculation methods



Source: ECB Financial Stability Review – May 2015 p93

Notes: Blue areas show exposure using that calculation method.

A regulatory framework that does not limit leverage for alternative funds

The AIFM Directive currently does not set hard leverage limits on AIFs. Asset managers are required only to report leverage, using different methods from those applied under the UCITS Directive.⁹³ The AIFMD allows national authorities to set limits on AIF leverage.⁹⁴ In April 2018, the European Systemic Risk Board (ESRB) published a set of recommendations aimed at regulating leverage in AIFs.⁹⁵ In March 2020, the European Securities and Markets Authority (ESMA) consulted market participants as part of drafting guidelines to clarify the

⁹² CESR's Guidelines on Risk Measurement and the Calculation of Global Exposure and Counterparty Risk for UCITS

⁹³ cf. Art. 23 and 24.

⁹⁴ cf. Art. 25.

⁹⁵ Recommendation on leverage and liquidity in investment funds - ESRB 2018

arrangements, which were released in June 2021. The guidelines cover the assessment of systemic risk related to leverage and seek to ensure that national competent authorities adopt a uniform approach when determining leverage-related measures. AIFs using leverage must incorporate risk management arrangements to manage the impact of potential limits on their activities.

However, current measures are not uniform across international jurisdictions and changes are needed. Residual risks remain for investment funds, notably including i) the lack of reliable and accessible data on leverage, ii) the absence of consistent standards for measuring leverage both within and across jurisdictions, iii) the need to improve systems to aggregate and analyse the information provided to supervisory authorities, and iv) the variation across jurisdictions in regulatory restrictions on financial and synthetic leverage.

The Solvency II Directive seeks to ensure the solvency of insurers. The first of the directive's three pillars comprises quantitative requirements, that is, rules for valuing assets and liabilities, along with capital requirements and their calculation method. There is no explicit constraint in terms of maximum leverage under Solvency II, but capital requirements capture risks related to leverage. Calculation of the solvency capital requirement (SCR) includes the application of market shocks to the total exposure of insurers to different risks. For derivatives, the calculation is not based on the market value of instruments and therefore incorporates risks linked to the exposures taken through these products. Furthermore, application of the look-through principle when measuring capital requirements associated with UCITS positions makes it possible to capture their leverage. Accordingly requirements are based on the sensitivity of equity to returns on positions and thus cover the risks associated with leverage. Solvency II also imposes governance requirements (second pillar) and transparency requirements (third pillar) to round out the oversight of insurers' risks. Ultimately, these provisions restrict the leverage of insurers.

Supplementary occupational retirement funds are subject to the Institutions For Occupational Retirement Provision (IORP II) Directive. This directive establishes less strict calculation methods than those of Solvency II to measure capital (Solvency I-type regime supplemented by ten-year stress tests), but transparency and governance obligations are similar.

International institutions are proposing changes to the regulatory framework

To address leverage-related vulnerabilities, the Financial Stability Board (FSB)⁹⁶ published several recommendations in 2017,⁹⁷ including the following: i) identify and/or develop consistent measures of leverage in funds to facilitate more meaningful monitoring of leverage for financial stability purposes and help enable direct comparisons across funds at a global level; ii) give consideration to appropriate netting and hedging assumptions, and iii) national competent authorities should collect data on leverage in funds and monitor the use of leverage by funds not subject to leverage limits or which may pose significant leverage-related risks to the financial system.

In response to these recommendations, the International Organization of Securities Commissions (IOSCO) proposed a new framework to assess leverage in investment funds.⁹⁸ IOSCO recommends that regulators conduct a two-step analysis to assess and monitor leverage in funds. The purpose of step one is to offer regulators a means of determining leverage metrics that may be used to identify and analyse funds that pose risks to the financial system, while the second step consists in conducting a more in-depth analysis of this subset of funds. IOSCO recommends calculating gross exposure by asset class and breaking out exposure by long and short positions. This analysis may be supplemented by net exposure metrics, using a rules-based netting and hedging approach. In addition, each regulator shall determine appropriate risk measures for its jurisdiction, taking into account market, counterparty and liquidity risks and the fund's characteristics, such as availability of assets to meet margin calls, percentage of cleared and uncleared transactions, posted/received collateral or margin as a

⁹⁶ Financial Stability Board (FSB).

⁹⁷ Policy Recommendations to Address Structural Vulnerabilities from Asset Management Activities - [FSB - January 2017](#)

⁹⁸ Recommendations for a Framework Assessing Leverage in Investment Funds - [IOSCO - December 2019](#)

percentage of NAV, holding of cash or cash equivalents, and the amount of borrowing and financing available to the fund.

Significant analytical work on hedge funds, family offices and prime brokers has also been undertaken under FSB supervision. The results of this work are expected to be released in the first quarter of 2023 and will help to inform ongoing discussions that were launched in the aftermath of the Archegos case and that are aimed at strengthening the regulatory framework for leverage in the asset management sector. Proposals may be put forward in the near future. **The Banque de France is backing efforts to continue and deepen international work on leverage.** As part of this, it supported the explicit inclusion of leverage as one of the key amplifiers identified in the event of a liquidity shock on the markets⁹⁹ and has called for special attention to be paid to leverage resulting from transactions that cannot be properly identified and monitored by financial stability authorities due to insufficient data.

Full implementation of guidelines drawn up under the supervision of the FSB, CPMI-IOSCO¹⁰⁰ and ROC¹⁰¹ on the collection of critical data in trade repositories should make it possible to address a number of limitations relating to the calculation and use of leverage data referred to in this chapter.¹⁰² A progress report on the adoption of these elements was published in January 2022¹⁰³ and adoption timeframes in ROC member jurisdictions with large derivatives markets range from the second quarter of 2023 to the first quarter of 2024.

2.3 Analysis of leverage in investment funds and insurance companies

Vulnerabilities stemming from leverage may be difficult to measure for public authorities and market participants

There are challenges around the availability of the data needed to measure leverage Whereas some jurisdictions, such as the EU and the United States, require detailed reports on leverage measures, others do not. This means that there are potential gaps in the data on the size – or absence – of leverage in financial institutions outside certain jurisdictions.

Leveraged financial institutions are diverse and subject to differing reporting obligations, with some, such as family offices, potentially exempt from the scope of legislation. There are also difficulties relating to the manner in which various metrics capture on- and off-balance-sheet leverage. Comparability may be affected by the wide variety of institutions and proposed investment strategies, as leverage metrics that are appropriate for one type of institution or strategy may be less appropriate or informative when applied to others. Data interpretation is further complicated because derivatives usage metrics, which may increase a given participant's market exposure metrics, may reflect the use of hedging techniques and not only the amplification of risk and potential returns.

The use of derivatives, which may increase certain market exposure metrics, should not therefore be equated with risk amplification. Although derivatives may be used to magnify risk and the potential returns from a fund portfolio, they do not necessarily create leverage and are commonly used for other purposes, such as i) hedging risks, ii) reducing exposure to certain risk factors, such as portfolio duration or sensitivity to changes in credit spreads or the structure of interest rates, iii) obtaining greater liquidity when derivatives are more liquid than their underlying reference assets; iv) gaining exposure to less accessible markets; v) managing cash.

⁹⁹ Enhancing the Resilience of Non-Bank Financial Intermediation, Progress Report - [FSB, November 2022](#)

¹⁰⁰ Committee on Payments and Market Infrastructures, International Organization of Securities Commissions.

¹⁰¹ Regulatory Oversight Committee.

¹⁰² Harmonisation of critical OTC derivatives data elements - [ROC, September 2021](#)

¹⁰³ Progress Report [ROC, January 2022](#)

Reporting data on leverage gathered from alternative investment funds (AIFs) are not always sufficient to assess leverage-related risks, insofar as they are in the hands of market participants and the quality and accuracy of the information cannot be checked. However, following the introduction of the European Market Infrastructure Regulation (EMIR), European market authorities now have information allowing them to estimate the synthetic leverage of investment funds, although some limitations persist. For example, to accurately measure fund exposures to derivatives, the notional value of contracts needs to be converted to the equivalent underlying position (using the delta of options or the duration of bonds, for example) or the composition of netting sets needs to be known, but this information is not always available.

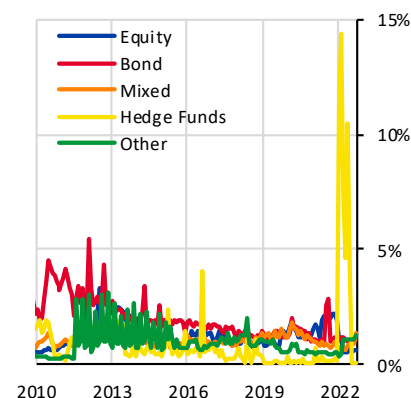
There are several ways to define and measure an investment fund's synthetic leverage. Two methodologies are presented: gross synthetic leverage and net synthetic leverage. Gross synthetic leverage sums short and long securities positions, divided by net asset value. This is an extremely conservative metric, because it considers long and short positions as independent exposures, whereas in many cases they are part of a single position and tend to cover each other. As a result, gross leverage tends to overestimate economic exposure. Net leverage is the difference between long and short positions, which corrects the bias that comes with gross leverage, but does not take account of the risk created by long or short positions that are effectively independent or imperfectly correlated positions. This metric is therefore prone to underestimating economic exposure.

French investment funds are not heavy borrowers, and some prefer to use derivatives to increase the exposure of their investments

An analysis of the balance sheets of French investment funds shows that financial leverage has been relatively low and stable since 2008. This is primarily because synthetic leverage is less costly than borrowing, encouraging funds to prioritise the use of derivatives. In addition, the UCITS Directive states that funds may not borrow more than 10% of their net asset value, and only on a temporary basis, which sets a ceiling for funds subject to the directive. Financial leverage may be estimated using balance sheet data by dividing total borrowing, including securities financing transactions, by investor assets: this shows that leverage levels of French equity, bond and mixed funds have not changed much since 2008 and averaged 1% at end-September 2022. Hedge funds domiciled in France are likewise not heavy users of financial leverage, despite a contained increase in borrowing between January and May 2022, with an average of 9.6% observed over the period (cf. Chart 2.6).

Chart 2.6: Financial leverage in French funds, by fund type

x: time / y: financial leverage

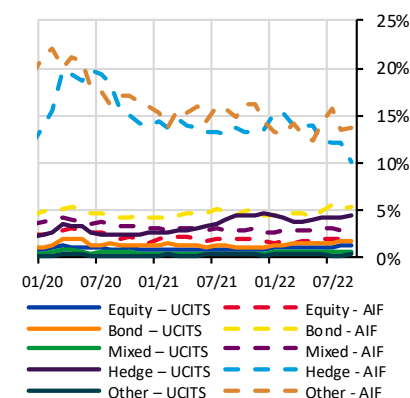


Source: ECB (SDW). Most recent value: 30/09/2022.

Note: Financial leverage is defined as the ratio of borrowing to funds belonging to investors.

Chart 2.7: Financial leverage in European funds, by fund type and directive

x: time / y: financial leverage

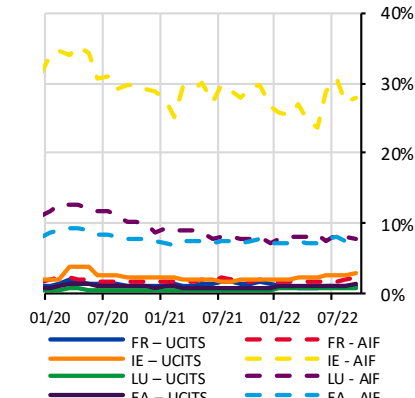


Source: ECB (SDW). Most recent value: 30/09/2022.

Note: Financial leverage is defined as the ratio of borrowing to funds belonging to investors.

Chart 2.8: Financial leverage in European funds, by directive

x: time / y: financial leverage



Source: ECB (SDW). Most recent value: 30/09/2022.

Note: Financial leverage is defined as the ratio of borrowing to funds belonging to investors.

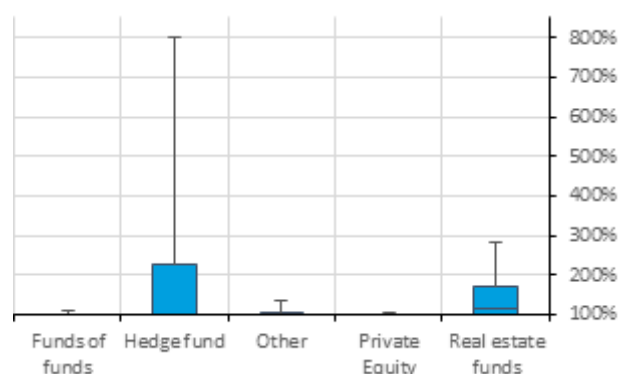
European AIFs make more use of financial leverage than funds governed by the UCITS Directive. In Europe, the average level of borrowing is higher among AIFs (7.8%) than among funds governed by the UCITS Directive (1.3%). This trend is observed among most fund types, with hedge funds and other funds subject to the AIFMD displaying

significantly higher leverage levels than peers governed by the UCITS Directive (cf. Chart 2.7). Irish AIFs, of which there are a substantial number, are set apart by significantly greater use of financial leverage than their European peers. In France, the situation is more uniform, with AIFs and UCITS exhibiting similar levels of leverage (cf. Chart 2.8).

Some AIFs report more substantial levels of synthetic leverage. The AIFM Directive introduced the obligation to report a synthetic leverage metric such as commitment leverage, for which exposures must be converted to the equivalent underlying position and positions are netted and adjusted for risk hedging. An analysis of the data reveals that most funds report low use of commitment leverage, i.e. close to 100%. However, some hedge funds and real estate funds report more substantial levels (cf. Chart 2.9). The directive also gives managers the option of reporting certain risk measures, such as the liquidity level of their portfolio. As at 30 June 2022, hedge funds administered by French managers reported holding a portfolio in which 94% of assets could be liquidated within one day, as compared with 76% and 54% respectively for “other” funds and funds of funds. Conversely, in less liquid funds, such as real estate funds and private equity funds, fewer than 5% of assets may be liquidated within one day (cf. Chart 2.10).

Chart 2.9: Commitment leverage reported by French AIF managers

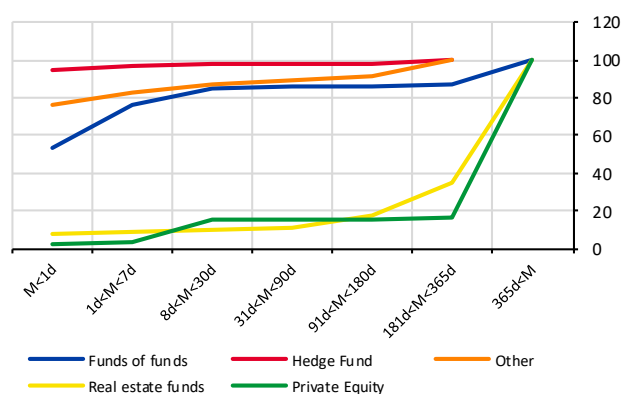
x: funds / y: commitment leverage



Source: AMF. AIFMD reporting data at 30/06/2022.

Chart 2.10: Liquidity profile reported by French AIF managers

x: liquidation periods / y: total % of net assets capable of being liquidated

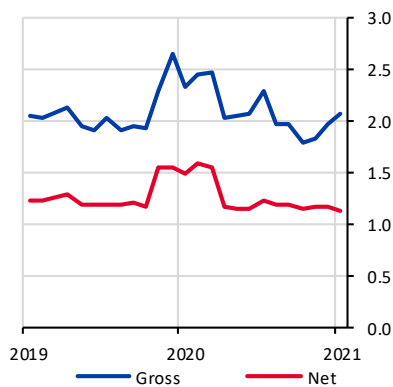


Source: AMF. AIFMD reporting data at 30/06/2022.

Estimates based on granular balance sheet data and derivatives positions suggest that the synthetic leverage of funds domiciled in France remains stable and relatively low. Gross synthetic leverage, which sums long and short positions, may be treated as an upper-end estimate (as some positions with opposite directions may cancel each other out), while net leverage, which considers the difference between long and short positions, may be used as a low-end estimate (as some positions with opposite directions may have the same risk direction). Funds domiciled in France tend to have a stable and low level of synthetic leverage, averaging between 117% (net) and 257% (gross) between January 2020 and December 2021 (cf. Chart 2.11). Over this period, “other” funds had higher gross leverage than mixed and equity funds on average. However, their level steadily declined and converged towards that of the latter, reaching approximately 2.5 at end-2021 (cf. Chart 2.12). Similar to what was revealed by AIFM reporting data, some funds make much more substantial use of leverage and increase their exposure to investments five or even tenfold through derivatives (cf. Chart 2.13).

Chart 2.11: Gross and net synthetic leverage of French investment funds

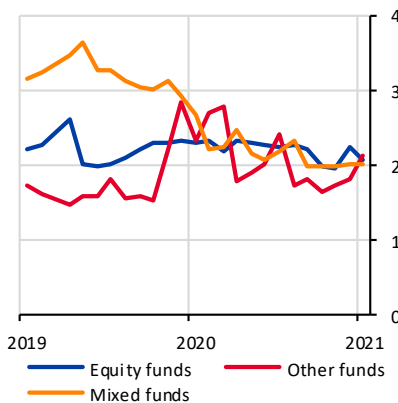
x: time / y: %



Source: EMIR (DTCC France), CIS data collection. Banque de France calculations. Most recent value: 31/12/2021.

Chart 2.12: Average gross synthetic leverage, by fund type

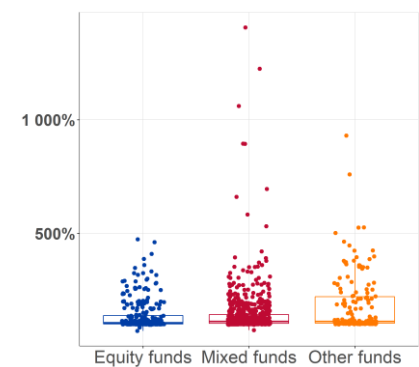
x: time / y: gross synthetic leverage



Source: EMIR (DTCC France), CIS data collection. Banque de France calculations. Most recent value: 31/12/2021.

Chart 2.13: Fund distribution

x: fund type / y: gross synthetic leverage



Source: EMIR (DTCC France), CIS data collection. Banque de France calculations. Most recent value: 31/12/2021.

Despite the lack of regulatory restrictions, reporting data from managers and estimates based on portfolio composition data indicate that, on average, French funds¹⁰⁴ make little use of synthetic leverage, with the average lying between 110% (net) and 220% (gross). Nonetheless, some entities may make more substantial use of leverage, which does not necessarily mean that their risk is amplified. Any assessment must be supplemented using risk metrics, which may be subject to optional reporting obligations or about which little information is sometimes provided, or for which the authorities cannot obtain the data required for calculation. However, the collection of new metrics such as those identified by CPMI and IOSCO to harmonise critical data on OTC derivatives,¹⁰⁵ some of which may be implemented within the framework of the EMIR review, should enable authorities to strengthen their assessment of leverage-related vulnerabilities.

French insurers make little use of financial debt and have low exposure to risk through derivatives

Use of financial debt is limited and represents on average 4.5% of insurers' total assets. Due to the inverted cycle of their business, characterised by the fact that they earn premiums before paying out claims, insurers make little use of borrowing to finance their activities (cf. Chart 2.14). Their main liability items are technical provisions (equivalent to 77% of total assets) and equity (13%). The outstanding amount of repo transactions has not changed much over time and was stable during 2020 and 2021. Repos account for approximately 6% of investments among entities carrying out such transactions.

Insurers have low risk exposure through derivatives, which are mainly used to hedge against the risk of higher interest rates. The crisis that affected UK pension funds highlighted the vulnerability of some long-term institutional investors to leverage and the liquidity risk associated with margin calls. For French insurers, which manage the lion's share of retirement savings, the bulk of derivatives held are made up of interest rate hedges (72%) via call options, which accounted for 54% of the notional value of the positions taken by insurers in June 2022 (cf. Chart 2.15). Call options are mainly interest rate caps that, in their simplest form, are used by insurance undertakings to hedge against the risk of interest rates increasing beyond a predetermined level, in return for the immediate payment of a premium. They do not create exposure to potential loss or to margin calls. Owing to the liquidity of French products that may be redeemed at any time, these instruments are primarily intended to ensure an additional return, in order to protect against the potential risk of surrenders by policyholders. Repos allow insurers to obtain cash without having to sell assets and may be used in the event of margin calls on other types of derivatives, such as interest rate swaps. Overall, however, French insurers were able in 2022 to cover margin

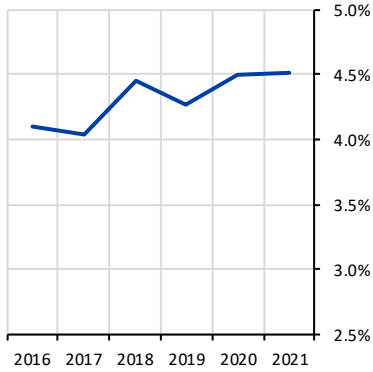
¹⁰⁴Namely UCITS domiciled in France and AIFs whose managers are domiciled in France although the funds may be domiciled somewhere other than France.

¹⁰⁵ Harmonisation of critical OTC derivatives data elements - [ROC_20210922](#)

calls with their cash and liquid assets. Taken as a whole, most of the securities held by insurers may be easily and immediately converted into cash: the liquidity ratio of assets held by life insurers is close to 50%¹⁰⁶ (cf. Chart 2.16).

Chart 2.14: Financial leverage in insurance companies

x: time / y: %

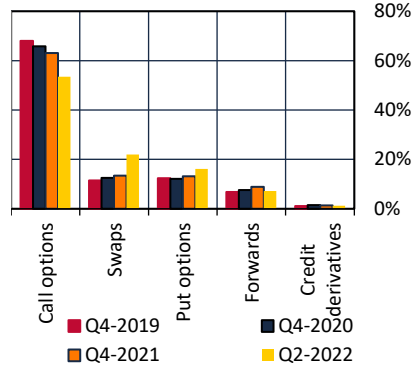


Source: ACPR.

Note: Financial leverage is defined as the ratio of financial debt and subordinated liabilities to total assets.

Chart 2.15: Types of derivatives used by French insurers

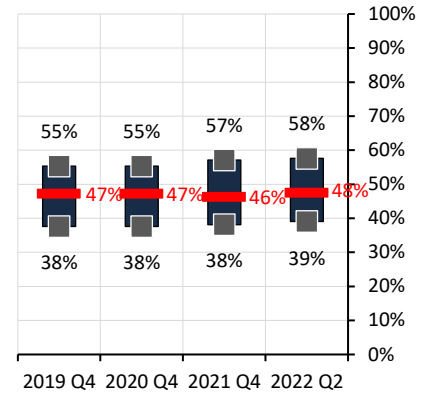
x: time / y: % of notional amount of derivatives positions



Source: ACPR.

Chart 2.16: Share of liquid assets in the portfolios of French insurers

x: time / y: %



Source: ACPR.

¹⁰⁶ The calculation method for this ratio is inspired by the standards developed by the Basel Committee under the Basel III framework, which introduced a liquidity coverage ratio (LCR) whose purpose is to promote banks' short-term resilience to liquidity risk. This ratio, which is used for example by the European Insurance and Occupational Pensions Authority (EIOPA), represents the share of unencumbered high quality liquid assets (HQLA) that may be converted into cash quickly and easily in private markets in the event of a liquidity crisis lasting three calendar days, relative to all investments.

3. Nature-related risks and risks linked to biodiversity loss

The effects of the Covid-19 pandemic on the economy and the financial system are still apparent almost three years after the outbreak of the crisis. Irrespective of the final cost of Covid-19 and its route of transmission to humans,¹⁰⁷ the pandemic offers an illustration of the financial risks connected with the “Pandemic Era” foreseen by the researchers of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)¹⁰⁸ if nature continues to be destroyed.

Beyond the increased pandemic risk, loss of nature and the potential responses to this carry risks for the economy and the financial system, whose materiality is now recognised by the community of central banks and supervisors. In particular, a consensus is emerging as to the distinction between physical and transition shocks, based on a typology echoing that used for climate risks, but in which the focus is shifted to dependencies on ecosystem services and different types of impact on nature, respectively.

The first part of this chapter seeks to define nature-related risks and the main challenges in this area, including their interaction with climate risks. The second part gives an overview of certain nature-related physical risks to which the economy and the financial system are exposed, in particular by exploring the example of freshwater supply and several extreme risks, including pandemic risk. The final section considers transition risks, which are increasing as policies aimed at preventing nature loss pick up speed.

3.1 Definition of nature-related risks

In March 2022 the Network for Greening the Financial System (NGFS), of which the Banque de France is a founding member and for which it acts as secretariat, recognised that nature-related risks come under the mandate of its members due to their macroeconomic, microeconomic and microprudential materiality.¹⁰⁹ This statement followed on from research work conducted with the academic community,¹¹⁰ drawing on analyses performed by a number of private and public institutions, including the Banque de France (cf. Boxes 3.1 and 3.2), or in other international fora.¹¹¹

Outside the community of central banks and supervisors, nature-related risks are the subject of growing attention, alongside climate change. According to the IPBES, nature and biodiversity are experiencing an “unprecedented” decline, driven by (starting with those with most impact) changes in land and sea use, direct exploitation of organisms, climate change, pollution, and invasion of alien species.¹¹² In the face of this situation, Part 2 of the Fifteenth Meeting of the Conference of the Parties to the United Nations Convention on Biological Diversity (COP15) was held in Montreal in December 2022, with the aim of reaching an ambitious global agreement on policies to protect nature and prevent biodiversity loss.

Loss of nature and its attendant effects are partly due to climate change, which nature can help to attenuate and build resilience against. Some of the economic and financial impacts of these developments can already be identified through the assessment of climate-related physical risks (cf. cross-cutting chapter). However, the causes and consequences of the decline in nature are not confined to climate change, and other questions need to be considered, particularly that of land use, including deforestation, which straddles the two issues. More generally, the nine “planetary boundaries”¹¹³ identified to characterise and quantify the main types of environmental

¹⁰⁷ According to the World Health Organisation, evidence suggests that Covid-19 has a zoonotic source but the route of transmission to humans has not yet been identified. Cf. OMS (2021), *WHO-convened Global Study of Origins of SARS-CoV-2: China Part*.

¹⁰⁸ The IPBES is an equivalent body to the Intergovernmental Panel on Climate Change (IPCC), with responsibility for biodiversity and ecosystem services. Cf. IPBES (2020), *Workshop Report on Biodiversity and Pandemics of the Intergovernmental Platform on Biodiversity and Ecosystem Services*.

¹⁰⁹ NGFS (2022), *Statement on Nature-Related Financial Risks*.

¹¹⁰ NGFS-INSPIRE (2022), *Central banking and supervision in the biosphere: An agenda for action on biodiversity loss, financial risk and system stability*, NGFS Occasional Paper.

¹¹¹ Cf. in particular Sustainable Insurance Forum (2021), *Nature-related risks in the global insurance sector*. The ACPR contributed to this research.

¹¹² Cf. its most recent assessment report: IPBES (2019), *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*.

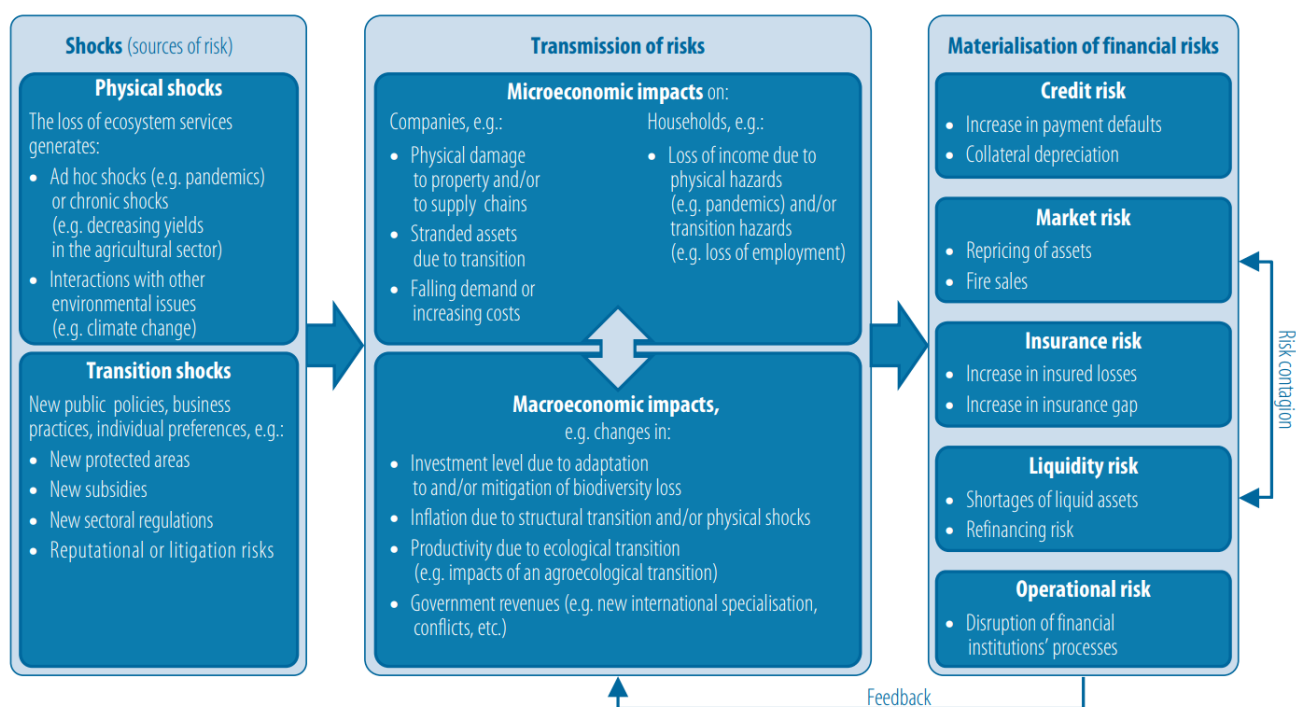
¹¹³ The planetary boundaries define the safe operating space for humanity and are associated with the planet's biophysical subsystems or processes. They concern biodiversity loss, change in land use, climate change, ocean acidification, global freshwater use, interference with the nitrogen and phosphorus cycles,

damage underway and the associated risks are interconnected, with climate change representing just one aspect. Furthermore, these effects raise questions about the dependence of human activities on the services provided by ecosystems, i.e. ecosystem services, and about the impact of these activities on the capacity of ecosystems to continue providing services. This then leads to the question of managing resources and ecosystems as such, beyond the question of the carbon budget that may affect them, among other factors.

Work by various fora generally classifies nature-related financial risks, and notably the risks linked to biodiversity loss, into two groups, according to the type of shock responsible for the risk:

- **Physical risks result from the reliance of economic activities on ecosystem services.** Loss of diversity affects the resilience of ecosystems, resulting in a decline in these services. This may lead to chronic risks, such as a gradual decline in water resources or in pollinator populations, affecting harvests, or to acute risks, such as an increased probability of pandemics or of exceeding an environmental tipping point.
- **Transition risks are linked to the impacts of economic activities on ecosystems.** Mismatches between, on the one hand, corporate assets and strategies, and, on the other, changes in public policies, consumer preferences and technologies aimed at mitigating adverse impacts on ecosystems, may create risks for firms that have such impacts.

Chart 3.1: Transmission channels of financial risks linked to biodiversity loss



Source: Svartzman et al., 2021.

The risks to businesses may then create risks for companies' creditors and investors due to their micro or macroeconomic impacts. This occurs through an increase in conventional financial risks, such as credit risk, including sovereign risk, market, liquidity and operational risks, as well as risks specific to the insurance sector.

More extensive work is being done in this area, notably by the Task Force on Biodiversity Loss and Nature-related Risks set up by the NGFS in spring 2022. Given a two-year mandate and co-chaired by the Banque de France and

stratospheric ozone depletion, atmospheric aerosol loading, and chemical pollution. Overstepping these planetary boundaries could lead to massive and uncontrollable changes in the Earth system. The threat is even greater because the boundaries are linked. Cf. Rockström et al. (2009), "A Safe Operating Space for Humanity." Nature.

De Nederlandsche Bank, the task force includes members from some 60 different institutions. Its overall goal is to promote systematic recognition of nature-related risks in the work of the NGFS by ensuring that, by the end of its mandate, these risks are integrated in the NGFS standing workstreams, including those tasked with preparing and promoting climate change-related scenarios and encouraging the recognition of climate and environment-related risks in supervisory frameworks and practices. The task force is pursuing its work in several different focus areas:

- **Mapping initiatives in nature-related risks** by central banks, supervisors and other public and private actors, in order to leverage existing work as far as possible.
- **Defining a conceptual framework** to facilitate recognition of these risks by central banks and supervisors. A specific aim of this focus area is to provide a precise definition of nature-related risks, to identify the different key risk types and factors, to identify the main transmission channels for these risks and those that need to be analysed in greater depth, and to determine the potential impact of nature-related risks on central banks and supervisory activities.
- **Exploring ways to develop nature-related scenarios**, including the possibility of integrating such scenarios with existing NGFS climate scenarios. This work raises a number of questions: Which narrative should be developed? Can existing models be used to assess the risks (which metrics?)? Which methodologies should be used to capture the indirect effects linked to depletion of natural capital?

3.2 Although physical risks appear locally at first, they can spread to the whole financial system

Reliance on certain ecosystem services may create shared risk for numerous entities.

Of these ecosystem services, freshwater supply, which is hard to substitute and increasingly under pressure throughout the world, offers a prime example of the economic and financial risks associated with nature. The quantity of available freshwater is dependent on the climate, which notably affects rainfall, but also on evapotranspiration¹¹⁴ and water flows and the use of water. Biodiversity and land use may thus affect both the quantity and quality of water available in a given location. According to the IPBES, ecosystem services involved in regulating the quantity and quality of water (the latter with a lower degree of confidence) are declining globally.¹¹⁵ According to a 2022 study, the planetary boundary relating to the water cycle is now considered to have been overstepped.¹¹⁶ Furthermore, faced with the increase in water demand due to population growth and higher living standards, supply challenges may increase even where the quantity of water does not change.¹¹⁷ By 2040, the level of water stress¹¹⁸ is thus expected to increase significantly in many parts of the world (cf. Chart 3.2), reaching high or extremely high levels in some areas, including Europe and the Mediterranean basin (cf. Chart 3.3), with 44 countries already experiencing high or very high levels of water stress.¹¹⁹

¹¹⁴ Evapotranspiration is the evaporation of water from land, watercourses, water bodies and plant transpiration.

¹¹⁵ IPBES (2019), *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*.

¹¹⁶ Wang-Erlandsson et al. (2022), *A planetary boundary for green water*, *Nature Reviews Earth & Environment*.

¹¹⁷ IPBES (2019), *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*.

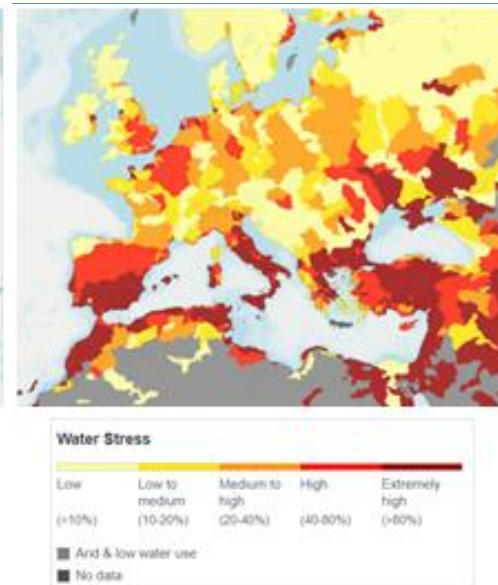
¹¹⁸ Water stress charts the relationship between water use and available renewable water resources. The risk of water stress is considered to be high when it is between 40% and 80% and very high beyond 80%.

¹¹⁹ World Resource Institute (2019), *Aqueduct 3.0*. Projection based on the Business As Usual scenario (IPCC SSP2-RCP8.5 scenario).

Chart 3.2: Change in water stress by 2040



Chart 3.3: Water stress in 2040



Source: World Resource Institute, *Aqueduct Water Risk Atlas*.

Source: World Resource Institute, *Aqueduct Water Risk Atlas*.

In France, the quantity of available water is set to continue declining, while aquatic environments are subject to multiple pressures affecting water quality. Renewable water resources¹²⁰ shrank by 14% between the 1990-2001 and 2002-2018 periods, while autumn rains, which replenish water tables, declined across 49% of the country over the 1990-2018 period, and evapotranspiration increased across much of France's territory during the autumn, winter and spring seasons of the 1958-2018 period.¹²¹ Over the next 30 to 50 years, watercourses are expected to see a significant decrease in average annual flow, ranging from 10% to 40% relative to the 1961-1990 period, while the replenishment of water tables is expected to decrease by between 10% and 25%.¹²² As regards water quality, just 44% of surface water bodies were in good environmental condition in 2015 and 69% of ground water bodies were in good chemical condition.¹²³

Uses of freshwater, which vary across different sectors and parts of France's territory, are already leading locally and periodically to use conflicts, which may be exacerbated by water stress. In metropolitan France, the cooling of electric power plants accounts for half of withdrawals, compared with 8% for other industrial uses. Of these, key users are the chemicals, gas and heat distribution, waste processing, paper and agrifood sectors.¹²⁴ In terms of the water that is actually consumed,¹²⁵ i.e. 20% of withdrawals excluding the supply of canals, agriculture is the heaviest consumer and also the source of numerous pressures on water quality.¹²⁶ These pressures and use conflicts are set to increase as water stress rises in numerous regions.¹²⁷ The increasing electrification of the economy as part of the energy transition is likely to push up demand for water. In addition, France's water footprint exceeds the volume of water consumed in the territory, such that it also depends, through imports, on the water resources of other countries and on their potential exposure to water stress and pollution risks.¹²⁸

¹²⁰ Renewable water resources are defined as all freshwater that enters a territory over a given period due to the natural water cycle. These resources comprise the sum of incoming flows, i.e. the volume of freshwater provided by flows upstream of each sub-basin, and internal flows, which correspond to the volume of precipitation, net of evapotranspiration.

¹²¹ Ministry for the Ecological Transition (2022a), *Évolutions de la ressource en eau renouvelable en France métropolitaine de 1990 à 2018*.

¹²² Ministry for the Ecology, Sustainable Development and Energy (2012), *Explore 2070* project.

¹²³ Ministry for the Ecological Transition (2022a), *Évolutions de la ressource en eau renouvelable en France métropolitaine de 1990 à 2018*.

¹²⁴ Ministry for the Environment (2017), *Les prélèvements d'eau douce en France : les grands usages en 2013 et leur évolution depuis 20 ans*.

¹²⁵ Water consumption corresponds to the portion of water withdrawn and not returned to aquatic environments.

¹²⁶ Cf. website of France's nuclear safety authority: <https://www.asn.fr/l-asn-informe/actualites/modification-temporaire-des-prescriptions-encadrant-les-rejets-thermiques-de-5-centrales-nucleaires>

¹²⁷ Ministry for the Ecological Transition (2022b), *Bilan environnemental de la France 2021*; Ministry for the Ecological Transition (2020a), *Bilan des Assises de l'eau*.

¹²⁸ Ministry for the Ecological Transition (2020b), *Eau et milieux aquatiques - Les chiffres clés*.

Table 3.1: Breakdown of water withdrawals and consumption, by use type (% of volume)

| Use | Water withdrawn (2018) | Water consumed (average 2008-2018) |
|-------------------------------|------------------------|------------------------------------|
| Cooling electric power plants | 50% | 31% |
| Supplying canals | 17% | - |
| Producing drinking water | 16% | 21% |
| Agriculture | 9% | 45% |
| Industry | 8% | 4% |

Source: Ministry for the Ecological Transition (2022b).

Given the key role of water-related ecosystem services, the deterioration in the quality and quantity of available water could affect many sectors, including finance. From a macroeconomic perspective, challenges in water access could cause GDP to decline by 6% in some countries, chiefly in Africa, the Middle East and Asia, by 2050, and lead to migration and conflicts.¹²⁹ Pollution of water sources, meanwhile, could cut economic growth in downstream regions by up to one-third.¹³⁰ The economic and financial impact on a given country depends on its level of reliance on this ecosystem service and its level of water stress. For example, Brazil, which experienced its worst drought in decades in 2021, generates 65% of electricity from hydropower, while almost one-quarter of GDP depends on agriculture.¹³¹ The International Monetary Fund (IMF) has therefore identified the risk of drought as a relevant risk for Brazil¹³² and one that could also have economic repercussions for other countries owing to Brazil's key role as a producer of commodities. But even in countries where the farming sector plays a smaller role, ecosystem services linked to water quantity and quality remain crucial. In France, these are the services on which the largest number of economic sectors (accounting for 60% of jobs) depend.¹³³ Surface and ground water supplies are the two ecosystem services on which the financial system depends most: 89% of the securities portfolio of the French financial sector depends directly to some extent on these services: 60% of securities are at least moderately dependent on ground water (17% are highly to very highly dependent on this service in particular) and 57% are dependent on surface water (29% highly to very highly dependent) (cf. Box 3.1). Sectors that are very highly dependent on these services include agriculture and agrifood (including beverage production, a major sector in the portfolio), activities related to water as such (collection, purification, distribution and processing) and a number of industrial sectors, including textiles, cement and plaster production, and power production (nuclear is especially reliant on surface water). Mining activities, meanwhile, are highly dependent on these services. Several sectors that are most heavily represented in the portfolio are moderately dependent on these services, including chemicals, which is the sector with the greatest representation. Globally, cases of water-related stranded assets have already been observed, particularly in the energy (coal, oil and gas, electricity) and mining sectors. CDP estimates future risks at USD 225 billion for companies disclosing via CDP¹³⁴.

Box 3.1: Direct and indirect dependencies of the French financial sector on ecosystem services

A Banque de France working paper (Svartzman et al., 2021) estimated that 42% of the value of the securities (equities and bonds) held at end-2019 by French institutional investors (chiefly funds, insurers and, to a lesser extent, banks) came from issuers that were highly or very highly dependent on at least one ecosystem service. The main ecosystem services involved were water supply (surface and ground) and regulatory services, such

¹²⁹ World Bank (2016), *High and Dry: Climate Change, Water, and the Economy*.

¹³⁰ World Bank (2019), *Quality Unknown: The Invisible Water Crisis*.

¹³¹ Getirana et al. (2021), *Brazil is in water crisis — it needs a drought plan*. Nature.

¹³² International Monetary Fund (2021). IMF Country Report No. 21/217.

¹³³ Delannoy (2016), *La biodiversité, une opportunité pour le développement économique et la création d'emplois*. Ministry for the Environment, Energy and the Oceans.

¹³⁴ CDP (2022), *High and Dry: How Water Issues Are Stranding Assets*.

as erosion control and climate regulation. These findings are consistent with those of other studies analysing other financial systems, such as those of the Netherlands (van Toor et al., 2020), Brazil¹³⁵ and Malaysia.¹³⁶

These results were obtained through the ENCORE database,¹³⁷ which estimates the direct dependencies of 86 production processes on 21 ecosystem services and rates these dependencies using five levels, ranging from “very low” to “very high”. For example, the “large-scale arable crops” production process depends is highly dependent on the “water supply” ecosystem service.

It is important to note that these results exclusively consider businesses’ direct dependencies (i.e. scope 1) and do not integrate the impacts or dependencies of their suppliers or customers. In reality, all economic activities depend in one way or another on ecosystem services. The study’s authors reflect this by also considering indirect dependencies arising from value chains (i.e. scope 2 and scope 3 dependencies). They find that all security issuers in the portfolios reviewed are at least slightly dependent on all ecosystem services.

Some extreme physical risks, which are challenging to model but which are becoming more likely to materialise, have systemic characteristics.

Pressures on the environment facilitate, among other things, the emergence of infectious diseases and lead to an increase in pandemic risk, which can only be managed at the systemic level.¹³⁸ Approximately 70% of emerging diseases observed in the last 50 years, including virtually all pandemics, are zoonoses, i.e. caused by microbes of animal origin. Land-use changes, including deforestation, agriculture expansion and intensification and urbanisation, are thought to be behind at least 30% of the new diseases studied since 1960. This change, combined with the trade and consumption of wild animals, bring wildlife, livestock and people into closer contact while also increasing contact among each species, thus making it more likely that pathogens may be transmitted between individuals of the same species or different species. Climate change and biodiversity loss, also linked to changing land use, contribute to increased pandemic risk as well. For example, species carrying pathogens may move into new areas. According to the IPBES, there is solid evidence that the ecosystem service of regulating detrimental organisms and biological processes is declining worldwide, in particular due to the reduced size of natural habitats in agricultural zones and reduced diversity of possible host species.¹³⁹

Since the Spanish flu of 1918, the annualised cost due to the emergence of zoonoses is estimated to exceed USD 1 trillion.¹⁴⁰ Given the difficulties that the private sector would face in insuring pandemic risk on an extensive basis (e.g. modelling difficulties, diversification issues, potentially prohibitive premium costs), and particularly business interruption losses due to measures to prevent transmission, governments must absorb at least a portion of the cost of pandemic risk.¹⁴¹ As Covid-19 illustrated,¹⁴² pandemic risk may also cause an increase in public debt and impact the sovereign risk level of certain issuers. Owing to its macroeconomic impact and increased liquidity needs among private participants, such a shock could affect the level of credit risk more generally and lead to a spike in market and liquidity risks. By comparison, the cost associated with pandemic prevention policies focused on underlying environmental factors is estimated at between USD 22 billion and USD 31.2 billion annually (without

¹³⁵ Calice, P., Díaz Kalan, F., Miguel, F. (2021), Nature-Related Financial Risks in Brazil. World Bank Group.

¹³⁶ World Bank Group and Bank Negara Malaysia (2022). An Exploration of Nature-Related Financial Risks in Malaysia.

¹³⁷ <https://encore.naturalcapital.finance/en/data-and-methodology/data>

¹³⁸ IPBES (2020), *Workshop Report on Biodiversity and Pandemics of the Intergovernmental Platform on Biodiversity and Ecosystem Services*.

¹³⁹ IPBES (2019), *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*.

¹⁴⁰ IPBES (2020), *op. cit.* Estimate derived from several studies, taking into account the estimated costs of Covid-19 at the time of the report and assuming similar costs for pandemics that have occurred over the last 102 years, such as the 1918 Spanish Flu epidemic and HIV, and adding the cost of the main emerging diseases, such as Ebola, and moderately severe to severe flu epidemics.

¹⁴¹ Cf. in particular, Ministry of the Economy, Finance and the Recovery (2020), *Rapport du groupe de travail sur la gestion des risques exceptionnels*; EIOPA (2020), *Issues paper on Shared Resilience Solutions for Pandemics*.

¹⁴² Cf. notably IMF (2022), *World Economic Outlook* (April 2022); IMF (2022), *Global Financial Stability Report* (October 2022).

factoring in other positive externalities linked to reduced deforestation), which is far lower than the cost resulting from the materialization of pandemic risk.¹⁴³

Some major ecosystems are reaching tipping points that could have severe global or regional impacts, notably by interacting with climate change. The IPCC has found that high-impact phenomena such as the melting of Antarctic ice could occur at highly likely levels of warming.¹⁴⁴ The IPBES has also noted that ecological regime shifts at large regional scales are already underway, notably for marine ecosystems (coral reefs, Arctic), permafrost and tundra, which are expected to gather momentum due to climate change.¹⁴⁵ Furthermore, other pressures, such as deforestation, could contribute to changes, including dieback of the Amazon forest, whose regional cost is estimated to be at least USD 256 billion by 2050.¹⁴⁶ Researchers have shown that these factors could themselves generate a snowball effect, with self-perpetuating climate warming, and that some of them have already reached the zone where tipping points become possible.¹⁴⁷ Climate and nature-related physical risks could be significantly increased by this, potentially becoming extreme and having systemic consequences.¹⁴⁸

3.3 Public policies aimed at containing these physical risks are set to be strengthened, potentially resulting in transition risks

In the absence of a single solution to contain these risks, a wide array of measures are being implemented or envisioned

Ambitious legislation has already been adopted or is in the process of being adopted at international level. As mentioned earlier, an output of COP 15 was the adoption of a global framework covering the 2021-2030 period,¹⁴⁹ with objectives covering several broad fields of action, including reducing the threats to biodiversity, meeting the needs of populations through shared and sustainable use of biodiversity, and implementing operational tools and solutions with cross-cutting recognition of diversity. In the first of these fields, for example, this has translated into various targets to be met by 2030, such as protecting 30% of land and sea, eliminating plastic waste, or cutting pesticide use by 66%. The implementation measures proposed under the global framework include objectives such as identifying and eliminating subsidies with an adverse impact on biodiversity.

A biodiversity preservation framework is also being implemented in Europe, where the European Green Deal, which comprises a series of initiatives designed to cut net greenhouse gas emissions by at least 55% by 2030.¹⁵⁰ The deal includes a number of biodiversity protection objectives for 2030. The most significant objectives, which were set out in 2020 in Europe's "Biodiversity Strategy for 2030" and "Farm to Fork" strategy, concern the farming sector. They include a target of 25% of European agricultural land dedicated to organic farming, compared with 9% currently, a 50% reduction in pesticides and a 20% reduction in fertiliser use. Targets also include protecting 30% of land and sea, compared with 26% and 11% currently in Europe, and the gradual phase-out of European subsidies that are harmful to biodiversity. In November 2021, the European Commission also presented a draft regulation¹⁵¹ aimed at banning imports of a series of products, including soy, palm oil and beef, and their derivative

¹⁴³ IPBES (2020), *op. cit.*

¹⁴⁴ IPCC (2021), *Summary for Policymakers*. In: *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*.

¹⁴⁵ IPBES (2019), *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*.

¹⁴⁶ Inter-American Development Bank (2021), *An Amazon tipping point: The economic and environmental fallout*.

¹⁴⁷ Armstrong McKay et al. (2022), *Exceeding 1.5°C global warming could trigger multiple climate tipping points*. *Science*.

¹⁴⁸ Kemp et al. (2022), *Climate Endgame: Exploring catastrophic climate change scenarios*. *PNAS*.

¹⁴⁹ At the time of writing, the conference had not yet taken place, so the objectives that are ultimately adopted may differ from those proposed initially and referred to in this chapter.

¹⁵⁰ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_fr

¹⁵¹ European Commission, Communication 2021/0366. This instrument is the subject of an agreement by the European Parliament and the Council of the European Union.

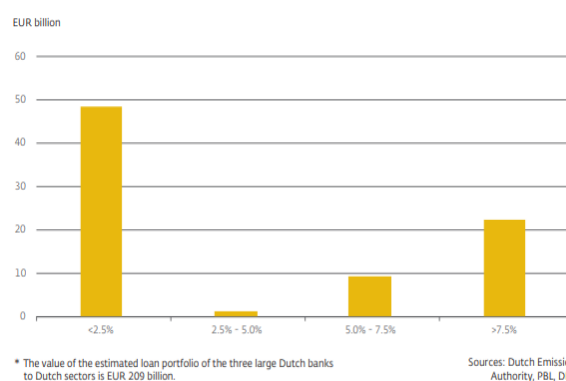
products that contribute to deforestation. Under the new regulation, companies that want to place one of these products on the EU market must demonstrate that the product has undergone a due diligence process and was produced on land that was not subject to deforestation after 2020. Europe has also already adopted standards in several areas, such as restoration of natural spaces, and is expected to adopt them in others, including soil health.¹⁵²

While no overall trend is discernible, examples of the impacts of these transition policies can already be identified in certain countries and sectors

The farming sector is among the main sectors exposed to transition risks, as illustrated by the recent “nitrogen crisis” in the Netherlands. Excess nitrogen and phosphorous in the environment are identified as a planetary boundary that has already been overstepped.¹⁵³ With one of the highest livestock densities in the EU (3.8 units per hectare for the 2016–2019 period,¹⁵⁴ compared with around 0.8 of a unit in France and on average in the EU¹⁵⁵), water and soil pollution linked to overuse of nitrogen in agriculture¹⁵⁶ is a particularly pressing issue in the Netherlands. Over the 2016–2019 period, 14% of Dutch groundwater had excessive levels of nitrogen (> 50 mg/L) and 58% of surface water was eutrophic¹⁵⁷ (in France, the percentages were 13% and 8% respectively). To address these elevated levels of pollution, the Dutch government has introduced increasingly restrictive rules. An initial nitrogen management programme, that took place between 2015 and 2019 and implied requiring government permits for all projects involving nitrogen emissions, from pig farming to airport construction, was cancelled by the country’s State Council. In June 2022, the government released a new nitrogen plan that notably targeted intensive farming. The plan includes cuts in nitrogen emissions of between 30% and 70% approximately in 131 agricultural zones, with the aim of halving pollutant emissions by 2030. Its goals include encouraging farmers conversions via subsidies and promoting the relocation of some activities. The Dutch government has earmarked a budget of EUR 24.3 billion to implement the plan over a period that could run to 2035.

Chart 3.4: Exposure of the three largest Dutch banks to nitrogen-emitting sectors (2017)

x: share of total nitrogen emissions in the Netherlands / y: EUR billion



Source: “Indebted to nature: exploring biodiversity risks for the Dutch financial sector” (2020), De Nederlandsche Bank.

Dutch financial stakeholders are thus exposed to transition risks linked to excess nitrogen production. Following the announcement of the government's new nitrogen plan, Rabobank, which is particularly exposed to the agricultural sector (35% of its total credit portfolio), wrote down the value of its loan portfolio linked to dairy farms (EUR 10.3 billion), migrating said portfolio to IFRS stage 2. The bank also set aside an additional EUR 76 million to cover further losses potentially created by the nitrogen plan for farmers.¹⁵⁸ Beyond the increase in credit risk borne by the portfolio, the bank said that the volume of loans requested by farmers had fallen by more than half amid

¹⁵² https://environment.ec.europa.eu/topics/soil-and-land/soil-strategy_fr

¹⁵³ Steffen, W., K. Richardson, J. Rockström, S.E. Cornell, et.al. 2015, *Planetary boundaries: Guiding human development on a changing planet*. Science 347: 736, 1259855

¹⁵⁴ European Commission (2021), Report to the Council and the European Parliament on the implementation of Council Directive 91/676/EEC concerning the protection of waters against pollution caused by nitrates from agricultural sources based on Member State reports for the period 2016–2019.

¹⁵⁵ https://eur-lex.europa.eu/resource.html?uri=cellar:d168a73d-2a8b-11ec-bd8e-01aa75ed71a1.0001.02/DOC_18&format=PDF

¹⁵⁶ Livestock production is responsible for an estimated 81% of agricultural nitrogen input to aquatic systems and 87% of the ammonia from agriculture emissions in the atmosphere.

¹⁵⁷ Percentage of eutrophic surface water bodies (rich in built-up nitrogen and phosphorous-type nutrients), according to the European Commission report.

¹⁵⁸ Rabobank, *Interim report 2022*: <https://media.rabobank.com/m/40a724896dac5e0a/original/Interim-Report-2022-EN.pdf>

uncertainty about the government's agriculture policy.¹⁵⁹ Rabobank is not the only bank potentially affected by transition risks linked to public policies aimed at cutting nitrogen emissions. According to the "Indebted to Nature" (2020) report by De Nederlandsche Bank (DNB), in 2017 the largest three Dutch banks made loans worth EUR 81 billion to nitrogen-emitting sectors (see Chart 3.4), accounting for 39% of the total value of loans made in the Netherlands. The exposure of their portfolios to sectors accounting for over 7.5% of nitrogen emissions, such as dairy farming, stands at EUR 20 billion.

Direct impacts on the primary sector may be accompanied by indirect impacts on other sectors. A factor contributing to the difficulty of analysing nature-related risks, especially in high-income countries such as France, is that the macrofinancial impacts linked to the primary sector (the main sector affected) are generally indirect. This is because agriculture and the other segments of the primary sector, such as fishing, account for a small share of GDP and the balance sheets of financial participants in developed economies. This might suggest that the consequences of a transition by these sectors will be limited if the indirect impacts are disregarded. But multiple effects may occur. For example, the failure of companies in the agricultural sector or constraints on their production could result in increased input costs for the secondary sector and higher prices for consumers.

But the effect of these indirect impacts remains hard to assess. In the case of the fight against imported deforestation,¹⁶⁰ for example, the challenge is to understand how different French economic and financial stakeholders might be exposed to a sudden halt in the import of these commodities or processed products, as provided for at the French and European levels.¹⁶¹ Different methodologies may be used to analyse value chain disruptions, but they raise many questions. For example, input-output analysis methods offer an interesting avenue to understand the mechanisms that potentially enable shocks to spread through global value chains in the short term,¹⁶² but they do not offer criteria to analyse the capacity of participants to adapt in the medium term.

Nature-related transition risks also depend to a large extent on geographical location, as pressures on biodiversity vary from one location to another. In France, for example, the conversion of land to artificial surfaces, including soil sealing due to urban spread, is a major cause of ecosystem destruction and fragmentation. Focusing on land taken by urban areas and infrastructure, the European Environment Agency (EEA) says that between 2000 and 2018, over 2,100 km² of land was converted to artificial surfaces in France (0.4% of the metropolitan territory), such that France ranks second for land converted to artificial surfaces among EU countries over that period.¹⁶³ The pace of increase of land converted to artificial surfaces is also estimated to be faster than the population growth rate, at 7.1% compared with 5.4% between 2006 and 2016.¹⁶⁴ But, as the EEA points out, when land is taken by urban areas and infrastructure, this is generally irreversible, consumes agricultural land and reduces space for habitats. The conversion of land to artificial surfaces is an issue at the crossroads of several environmental challenges, as healthy land may be used to store carbon (this is particularly true for peatlands and prairies) and to filter or store water, thereby mitigating the risk of flooding during heavy rainfalls. Conversely, land that has been converted to artificial surfaces either does not provide these ecosystem services or provides them only partially.

France responded to these considerations by adopting the 2021 Climate and Resilience Act, which sets targets including zero net land take by 2050 and a 50% reduction by 2030 in the pace of land take relative to that observed over the last decade.¹⁶⁵ This objective is also expected to be discussed at European level in connection with the proposed Soil Health Law announced by the European Commission for 2023, since the EU's soil strategy¹⁶⁶

¹⁵⁹ <https://fd.nl/financiele-markten/1454635/rabo-ziet-kredietaanvragen-van-boeren-dalen-nmj2ca6Rgmf4>

¹⁶⁰ The importing of commodities or processed products whose production contributed, directly or indirectly, to deforestation, to the degradation of forests or to the conversion of natural ecosystems in producer countries.

¹⁶¹ Ecology, Energy and Territories Ministries (2022), *Lutte contre la déforestation importée*. <https://www.ecologie.gouv.fr/lutte-deforestation-importee-SNDI>

¹⁶² See for example Hallegatte (2008), *An Adaptive Regional Input-Output Model and its Application to the Assessment of the Economic Cost of Katrina*. Risk Analysis: An International Journal, 28(3), 779-799.

¹⁶³ Corine Land Cover data <https://www.eea.europa.eu/data-and-maps/dashboards/land-take-statistics>; Consulted on 7 November 2022.

¹⁶⁴ France Stratégie (2019) <https://www.strategie.gouv.fr/sites/strategie.gouv.fr/files/atoms/files/fs-rapport-2019-artificialisation-juillet.pdf>

¹⁶⁵ Act No. 2021-1104 of 22 August 2021 on fighting climate change and strengthening resilience to its effects, Articles 191 to 226, [Act No. 2021-1104 of 22 August 2021 on preventing climate change and strengthening resilience to its effects\(1\) - Légifrance \(legifrance.gouv.fr\)](https://www.legifrance.gouv.fr/eli/loi/2021/8/22/2021-1104)

¹⁶⁶ https://environment.ec.europa.eu/publications/eu-soil-strategy-2030_en

also sets a target of zero net land take for 2050. By that time, no land may be taken, as defined by French law as the partial or total alteration of the functions of that land, unless this is compensated for by restoring an equivalent area of land to natural state. France Stratégie (2019) estimates that restoring previously taken land following remediation, desealing and technosol construction,¹⁶⁷ costs between EUR 95-390/m², not including deconstruction costs. Accordingly, the biodiversity transition will involve major changes for the construction sector (which will, for example, get the opportunity to switch to densification and renovation of existing land) and could have upside effects on residential and commercial real estate. Companies whose business models involve heavy consumption of space at the edges of cities could also be exposed to these changes and see their future expansion affected. The EEA says that while 37.8% of the land take observed in France between 2000 and 2018 was due to expansion of residential real estate, 30.7% was connected with the expansion of industrial and commercial sites, 11.7% with the expansion of quarries and mines, while a further 8.6% was due to the expansion of construction sites. The zero net land take goal will therefore provide impetus for these different sectors to rethink their development approaches.

Box 3.2: Impacts of the French financial sector on biodiversity

A Banque de France working paper (Svartzman et al., 2021) estimates the impacts of the equity and bond portfolio of French financial institutions via the companies financed. The authors found that, at end-2019, this terrestrial (marine impacts were not measured) biodiversity footprint was comparable to the loss of at least 130,000km² of “pristine” nature, which may be compared theoretically to the total conversion to artificial surfaces of 24% of the area of metropolitan France. Land use was the main factor of pressure on biodiversity accounting for these results. Economic sectors contributing the most to this footprint were chemicals and gas production, manufacturing of dairy products and food processing. Their impact on biodiversity stemmed primarily from scope 3 (upstream) impacts, with relatively little effect from scope 1 (direct) impacts.

In addition to the cumulative impact, the portfolio of securities analysed had, through its constituent companies, an additional annual (or dynamic) terrestrial biodiversity impact comparable to the loss of 4,800 km² of “untouched” nature, corresponding theoretically to the total conversion to artificial surfaces of an area 48 times the size of Paris.

The model used to achieve these results (BIA-GBS, developed by CDC Biodiversité and Carbon4 Finance) assesses the biodiversity footprint (or impact on biodiversity) using an aggregate metric: MSA.km². Mean species abundance (MSA) describes the mean abundance of species in a given ecosystem relative to their abundance in the same ecosystem that is not disturbed by human activity. It ranges from 0% (completely destroyed ecosystem) to 100% (untouched ecosystem). MSA.km² integrates MSA with the surface area studied and is read as follows: x MSA.km² is equivalent to the loss of x km² of untouched nature. Although the translation of multiple pressures on biodiversity, such as changes in land use, overuse of organisms, climate change, etc., into a single metric such as MSA.km² offers an interesting comparison with the CO₂-equivalent metric for climate change, it remains a methodological construction (while the emissions captured by CO₂-equivalent actually exist); its use must therefore be accompanied by a precise analysis of the underlying pressures and impacts, and must not overlook the fact that many aspects of biodiversity (notably concerning genetic diversity) are not taken into account.

¹⁶⁷ Technosol is soil that is influenced by humans (e.g. via its composite materials).

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