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European Financial Stability and Integration Review (EFSIR)

This document has been prepared by the European Commission's Directorate-General for Financial Stability, Financial Services and Capital Markets Union (DG FISMA).

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LIST OF ABBREVIATIONS

Countries (in alphabetical order)

AT	Austria	IT	Italy
BE	Belgium	JP	Japan
BG	Bulgaria	LT	Lithuania
CN	China	LU	Luxembourg
CY	Cyprus	LV	Latvia
CZ	Czechia	MT	Malta
DE	Germany	NL	Netherlands
DK	Denmark	PL	Poland
EE	Estonia	PT	Portugal
EL	Greece	RO	Romania
ES	Spain	SE	Sweden
FI	Finland	SG	Singapore
FR	France	SI	Slovenia
HR	Croatia	SK	Slovakia
HU	Hungary	UK	United Kingdom
IE	Ireland	US	United States

Others

AML	Anti-money laundering	GDP	Gross domestic product
BIS	Bank for International Settlements	HICP	Harmonised index of consumer prices
bps	Basis points	ICT	Information and communication technology
CBCC	Central-bank cryptocurrency	IT	Information technology
CEE	Central and Eastern Europe	KYC	Know-your-customer
CFT	Counter-terrorism financing	MFIs	Monetary financial institutions
CLOs	Collateralised loan obligations	MiFID II	Markets in Financial Instruments Directive
CMU	Capital markets union	MREL	Minimum requirement for own funds and eligible liabilities
DLT	Distributed ledger technology	NBER	The National Bureau of Economic Research
EBA	European Banking Authority	NFC	Non-financial corporation
ECB	European Central Bank	NPLs	Non-performing loans
EIOPA	European Insurance and Occupational Pensions Authority	PSD	Payment Service Directive
EMIs	Electronic money institutions	TLTROs	Targeted longer-term refinancing operations
ESMA	European Securities and Markets Authority		

EXECUTIVE SUMMARY

The annual European Financial Stability and Integration Review reports on recent economic and financial developments, and their impact on financial stability and integration in the EU. This report covers in particular the developments in 2020.

2020 was very strongly marked by the COVID-19 pandemic. The pandemic is an unprecedented health challenge that caused severe economic disruptions. Lockdowns and other measures to contain the outbreak have sent an unparalleled shock through EU economies that also tested financial stability and integration. The effects of the crisis are still unfolding. The unique character of the recession triggered an exceptional policy response. Authorities introduced a mix of fiscal, monetary regulatory and other measures to cushion economic disruptions, stimulate recovery and manage social impacts. Chapter 1 and Chapter 2 describe how the pandemic affected the macroeconomic environment and financial markets, and reviews the implications for financial stability and integration.

While it is necessary to put a particular focus on dealing with the pandemic, other, and often more long-term challenges remain, particularly those related to sustainability such as climate change and biodiversity loss. At EU level, the European Commission adopted the European Green Deal that aims to build a climate-neutral EU by 2050 with a modern, resource-efficient and competitive economy. The transition towards a more sustainable society requires significant investment by the public and private sector. Financial markets can help by attracting sustainable investors, foster risk-sharing and properly price climate and other sustainability risks. At the same time, climate change and other forms of environmental degradation also pose significant economic and financial risks that should be monitored actively during the transition towards a more sustainable society. The last two chapters of the report look at these issues. Chapter 3 analyses recent developments in the sustainable fund and green bond market. Chapter 4 reviews the financial stability risks, focusing on climate change.

Chapter 1 reviews the devastating economic effects of the COVID-19 pandemic. Most Member States introduced lockdowns to contain the spread of the virus. These lockdowns compounded the effects of the virus and largely paralysed EU economies for some time. This sudden shock immediately eroded macroeconomic fundamentals and triggered severe uncertainty and liquidity shortages that disrupted financial markets. The timely and comprehensive mix of fiscal, monetary and regulatory measures was vital to cushion the impact of the pandemic. It was essential to support the stability and functioning of financial markets and it helped banks to continue to provide loans to the real economy.

Chapter 2 reviews the impact of the pandemic on financial stability and integration. Decisive policy action has so far been effective in avoiding the risks of harmful financial disruption and fragmentation, but significant risks remain and require careful monitoring to avoid that the crisis leaves deep permanent scars. The orderly and gradual unwinding of support measures, and structural and financial imbalances will be important to limit financial stability risks over time.

The pandemic has put significant stress on all sectors, with some more affected than others. The financial sector is now more exposed to economic shocks, although the roots of certain vulnerabilities were already present before the crisis.

Three financial stability concerns deserve particular attention. Firstly, the risk of disruptive repricing increased because financial market valuations became very stretched and credit risk

could be underpriced. Consequently, sudden changes in investor sentiment or rising inflation expectations could trigger a market correction. Secondly, debt levels reached new highs, putting corporate and sovereign debt sustainability under further pressure. Finally, EU banking sector stress threatens to pick up amid concerns about low profitability and deteriorating asset quality caused by the economic fallout of the pandemic. The COVID-19 outbreak also tested financial integration in the EU, but disruptive financial fragmentation remained manageable thanks to policy measures.

Chapter 3 reviews developments in the market for sustainable investments. The growing popularity of sustainable funds and green bonds shows that sustainable investments have become more mainstream, although their share in total fund and bond markets remains limited.

Regulatory changes, including establishing a framework under the EU Taxonomy Regulation to facilitate sustainable investment and other measures to increase transparency, supported further market growth. Investors appear more open to investing sustainably. This, together with other factors, has contributed to the growth in the market. Products branded as sustainable are also key as they catch investors' attention. There is therefore an incentive to offer these types of products so as to attract new investment.

Despite the strong growth in the market, significant challenges remain. More readily available, consistent, accurate and clear sustainability-related information (at economic activity level, firm level and portfolio level) would increase the transparency and integrity of the market. It would also limit search costs for investors and ensure that sustainable investment products have a clear impact on the real economy. Building on its 2018 action plan for financing sustainable growth, the European Commission has already taken several initiatives to increase market transparency. Further work in this area is needed to support market developments and continue improving market integrity and transparency in the post-COVID-19 period.

Chapter 4 discusses the implications of climate change on financial stability. It points out that there are significant economic and financial risks related to climate change and the transition to a more sustainable economy. Methodological challenges, data limitations and uncertainty about future climate change developments hinder accurate risk estimates, which points to possible under-pricing. The timing and magnitude of these impacts differ according to the scenario being considered. The lack of adequate policy and pricing frameworks prevents financial markets from fully reflecting external climate-related factors in prices.

Climate-related financial exposures and potential changes in asset prices do not pose direct substantial risks to financial stability according to available data, but the high concentration of risks makes some countries, sectors and individual financial institutions highly vulnerable. Risk related to climate change and other sustainability challenges such as environmental degradation may have a destabilising effect on the financial system if they come on top of other risks.

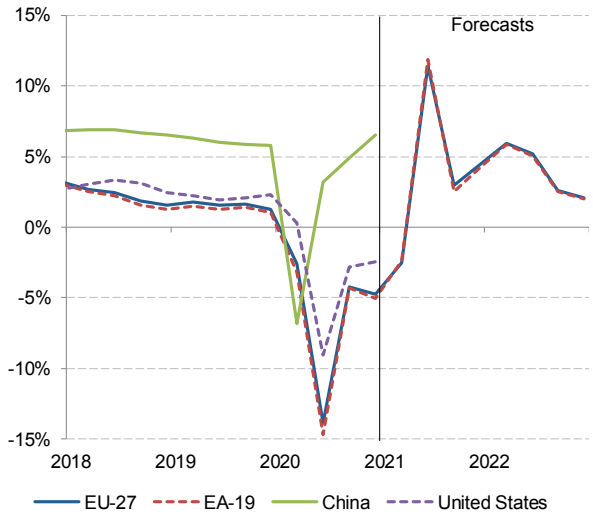
Continued collective effort is needed to enhance the measurement of these risks via risk monitoring frameworks, stress tests and scenario analysis. The Commission's proposal for a Corporate Sustainability Reporting Directive will be instrumental in this respect. It will further harmonise firm-level reporting by developing new EU sustainability reporting standards taking into account parallel initiatives such as the EU Taxonomy. It is also important to explore means under the prudential framework to better integrate environmental risks and to support more sustainable and resilient banking and insurance sectors.

Chapter 1 MACROECONOMIC AND MARKET DEVELOPMENTS

1.1 Macroeconomic developments

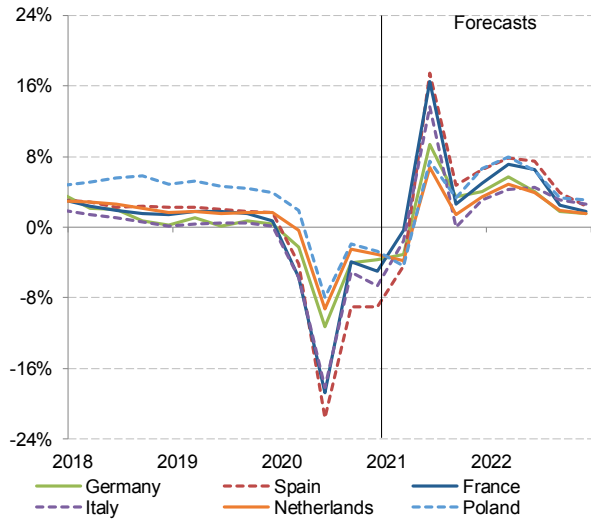
The ongoing COVID-19 pandemic is first and foremost an unprecedented health challenge. However, it has also had severe economic consequences deepened by lockdowns that largely paralysed EU economies and increased uncertainty. Other economic effects are still unfolding. In the EU, the pandemic has caused the biggest economic contraction since World War II[1].

Chart 1.1: Real GDP growth worldwide



Source: OECD. European Commission (2021), European economic forecast. Winter 2021 (Interim), *Institutional Paper* 144, February 2021.
Note: Quarterly, year-on-year data.

Chart 1.2: Real GDP growth in the EU



Source: European Commission (2021), European economic forecast. Winter 2021 (Interim), *Institutional Paper* 144, February 2021.
Note: Quarterly, year-on-year data.

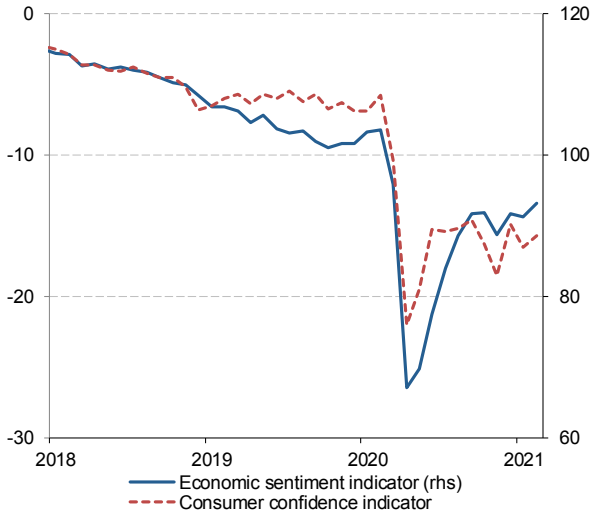
The COVID-19 crisis first hit EU economies in March 2020[2]. It had a dramatic and immediate macroeconomic effect and also completely modified the macroeconomic outlook, requiring public intervention measures of an unprecedented scale (see Box 1). Lockdowns, which were introduced in most Member States, reduced supply by disrupting supply chains and suspended non-essential activities. Demand also decreased, as the lockdowns led to an increase in precautionary saving due to income uncertainty. Firms postponed or cut investment because of uncertain future sales and profitability. In March, economic activity dropped by around one third in several Member States, practically overnight. Heightened overall economic uncertainty also resulted in a liquidity shock due to interrupted cash flows, and increased stress in the financial sector (see Section 1.2 and Section 2.1).

In the EU, GDP in 2020 dropped by 6.1%[3]. More specifically, Q1-2020 GDP (seasonally adjusted) dropped by 3.3% on a quarter-on-quarter (q-o-q) basis (see Chart 1.2). The strongest hit to economic output occurred in the second quarter with real GDP contracting 11.2% in the EU. Following the trough in April, the economy rebounded strongly in the third quarter

[1] Macro-economic conditions and growth already weakened in the second half of 2019. For further details, See European Commission, *European Financial Stability and Integration Report* (EFSIR), SWD(2020) 40 final of 3 May 2020.
[2] See also Jollès, M. and Meyermans, E. (2021), The structural economic impact of the COVID-19 pandemic on the euro area: a literature review, *Quarterly Report on the Euro Area* 20(1).
[3] Based on estimations by Eurostat published on 19 April 2021.

(+11.7%) amid the gradual easing of containment measures, and made up about two thirds of the contraction in the first half of the year. GDP contracted 0.5% (q-o-q) in Q4 2020, just as the second wave of the pandemic hit the continent[4]. GDP is expected to rebound by 3.7% in 2021 and by 3.9% in 2022, with a return to pre-pandemic levels around mid-2022[5]. Economic sentiment and consumer confidence plummeted in the first half of the year and recovered partially since (see Chart 1.3).

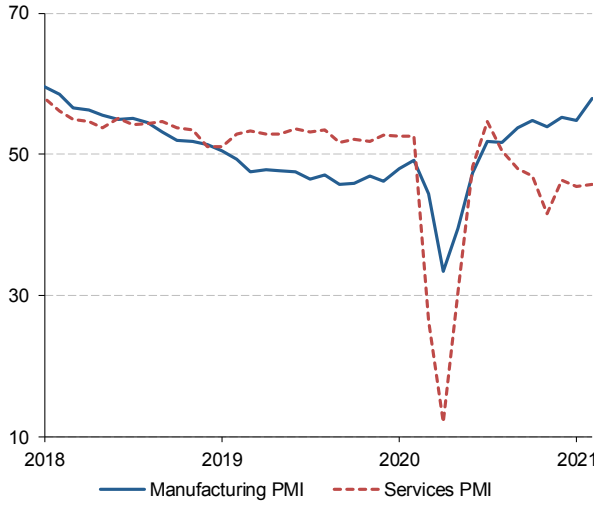
Chart 1.3: EU economic sentiment and consumer confidence indicator



Source: European Commission (2021), *Business and consumer survey results*, DG ECFIN, 25 February 2021[6].

Note: The economic sentiment indicator is a composite indicator combining judgements and attitudes of businesses and consumers. The consumer confidence indicator reflects overall perceptions and expectations by households.

Chart 1.4: Euro-area activity of manufacturing and services purchasing managers



Source: Markit.

Note: Activity level is measured by the euro-area purchasing managers' (PMI) manufacturing and services indexes.

Inflation was significantly affected by the pandemic due to a sharp fall in energy prices and reduced aggregate demand, particularly for services[7]. Inflation in the EU was 0.7% (on average) over the summer but dropped to 0.3% at the end of 2020, before picking up to 1.7% in March 2021.

The pandemic affected unemployment, but increases in average unemployment rates remained contained, thanks to the widespread use of job retention schemes, supported by the EU SURE instrument (instrument for temporary Support to mitigate Unemployment Risks in an Emergency) and other measures. Following an increase of about 1.4 percentage points over the first half of the year, the EU unemployment rate stabilised in the second half to 7.5% in December 2020, 1 percentage point above the unemployment rate in February 2020[8] (see

[4] For the euro area, GDP growth in 2020 dropped by 6.6%. GDP in Q1 2020 dropped by 3.8% (on a q-o-q basis) and by 11.6% in Q2 2020. In Q3 2020, GDP recovered by 12.5%. In Q4 2020 GDP contracted slightly by 0.7%. In comparison, global GDP (excluding the EU) is projected to have contracted by 3.4% in 2020, which is a sharper downturn than during the 2008 financial crisis. Global GDP is expected to rebound by 5.2% in 2021 and by 3.8% in 2022, implying that global output should recover above its 2019 level at the end of 2021.

[5] In the euro area, GDP is expected to rebound by 3.8% in 2021 and by 3.8% in 2022.

[6] https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/business-and-consumer-surveys/download-business-and-consumer-survey-data/time-series_en.

[7] Temporary VAT reduction in Germany also weighed on inflation.

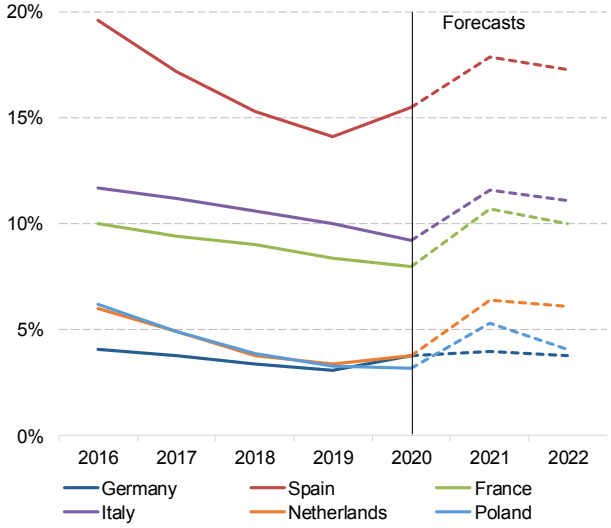
[8] The value in February 2020 was the lowest since May 2008.

Chart 1.5). The Commission's 2020 autumn economic forecast projects a rise in the unemployment rate to 8.6% or 18.5 million unemployed people in 2021.

The depth of the recession varied widely between Member States (see Chart 1.2). Over the full year 2020, it is expected that Spain (-11%) and Greece (-10%) will have had the strongest GDP decline, while other larger Member States like Italy (-8.8%), France (-8.3%), Germany (-5.0%) also are expected to have experienced significant declines. Several Member States with already heightened macroeconomic and financial vulnerabilities have been hit strongly. Differences between Member States reflect differences in the severity of the pandemic, economic structure and containment measures. Such differences heighten concerns about economic divergence, especially as they will also carry over to the recovery. Unemployment and inflation rates also developed asymmetrically between Member States (see Chart 1.5 and Chart 1.6). Unemployment rates in Member States with already elevated rates before the pandemic increased more than in Member States with low initial unemployment rates. At the end of 2020, Spain and Greece had unemployment rates around 16%, while the Netherlands, Poland and Czechia had rates between 3 and 4%.

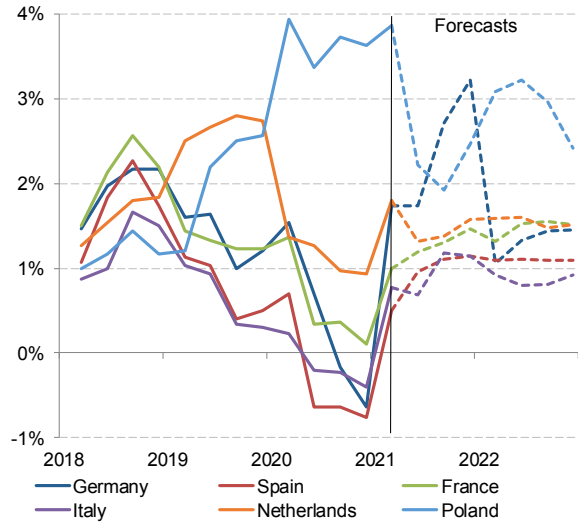
Economic developments were also very uneven across industry sectors (see Chart 1.4). For instance, restrictions on social activities and mobility affected the leisure and travel sector profoundly. As a result, activity in the services sector was more affected compared to the manufacturing sector.

Chart 1.5: Unemployment rate



Source: Eurostat, European Commission (2020), European economic forecast Autumn 2020, *Institutional Paper* 136, November 2020.

Chart 1.6: HICP inflation



Source: Eurostat, European Commission (2021), European economic forecast. Winter 2021 (Interim), *Institutional Paper* 144, February 2021. DG FISMA calculations.

Note: HICP refers to harmonised index of consumer prices. Quarterly, year-on-year data.

Box 1: Key policy measures taken in response to the pandemic

Comprehensive national and EU measures were taken quickly in response to the outbreak[9]. Measures were diverse and included containment, fiscal, monetary and regulatory actions.

EU Member States took drastic measures to contain the virus and put their economies into a state of hibernation. Lockdowns were implemented in most Member States. Comprehensive programmes were set up to keep the economic tissue of economies intact during lockdown. This included liquidity support for firms to avoid bankruptcies, targeted tax relief measures, and income support for those that became (temporarily) unemployed. In the financial sector, (partial) government guarantee schemes for bank loans were introduced. These measures were essential for limiting permanent damage as they cushioned unemployment, halted a reversal in investment, and prevented widespread bankruptcies. Proactive fiscal policy has been widely used.

Actions at EU level were taken gradually over time and complemented national measures. In March the EU activated the 'general escape clause'[10] in its fiscal rules, which enabled Member States to provide a strong fiscal response to the crisis. In April 2020, the European Council Summit set out a Joint European Roadmap towards lifting containment measures. It agreed on several important EU support instruments, including a European Stability Mechanism (ESM) pandemic credit line, European Investment Bank (EIB) credit guarantees, a EUR 25 billion guarantee fund for small and medium-sized enterprises (SMEs), and a temporary labour market support tool (SURE), worth EUR 100 billion. On 21 July 2020, EU leaders agreed on the adoption of the NextGenerationEU recovery fund (EUR 750 billion)[11] to help repair the immediate economic and social damage of the pandemic, and safeguard the cohesion within the EU. This includes the Recovery and Resilience Facility that will release up to EUR 672.5 billion in loans and grants to support reforms and investments of Member States, and to facilitate a sustainable and equitable economic recovery. On 17 December, the next long-term EU budget was agreed.

Finally, decisive action by the ECB has strongly reduced tail risks[12] in the EU economy. In mid-March, the ECB took a broad range of monetary and credit policy measures to ensure the flow of liquidity and credit to the private and public sectors. The new temporary pandemic emergency purchasing programme (PEPP) was set up, enabling the ECB to purchase private and public sector securities. The total PEPP envelope was initially set at EUR 750 billion (ending end-2020), but was later extended to EUR 1.85 trillion (running until at least March 2022)[13].

The ECB's measures were complemented by measures from the Single Supervisory Mechanism (SSM). The SSM measures relaxed regulatory bank requirements and provided temporary capital and operational relief to euro-area banks that could be used to absorb losses or to provide loans to the real economy.

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[9] Also at global level governments initiated massive support programmes that surpass those made in response to 2008 financial crisis. Across the G20 economies, in total USD 7.6 trillion in fiscal commitments have been made (11% of GDP).

[10] EU Member States are constrained by fiscal rules in place at EU level, in particular by the Stability and Growth Pact (SGP). The SGP, however, contains a clause, the 'general escape clause', allowing Member States to undertake appropriate budgetary measures, and so deviate from parts of the Pact in the face of exceptional circumstances. The magnitude of the fiscal effort necessary to protect people and businesses in the EU from the effects of the pandemic, and to support the economy in the aftermath, justified the activation of the general escape clause.

[11] EUR 390 billion in the form of grants and the remainder in loans to Member States.

[12] The risks associated with severe events that have a small probability of happening.

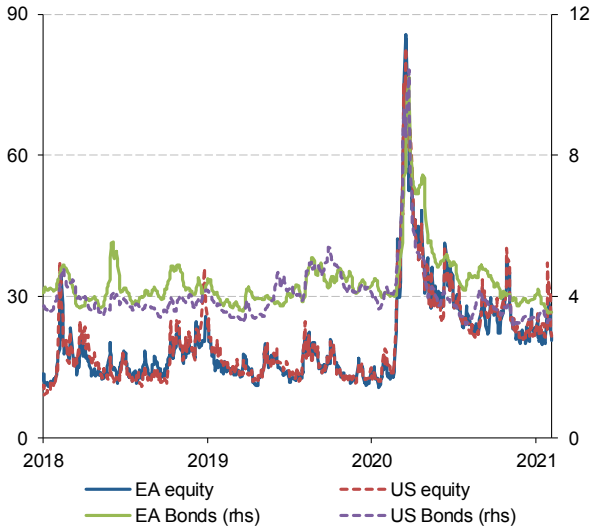
[13] In addition, the ECB expanded and eased the conditions for its targeted refinancing operations (among others targeted longer-term refinancing operations (TLTRO III)), and launched a new series of non-targeted pandemic emergency longer-term refinancing operations (PELTROs) to support liquidity in the euro-area financial system and to help preserve the smooth functioning of money markets by providing an effective liquidity backstop.

1.2 Financial-market developments

At the beginning of 2020, before the pandemic hit, investors had already shown a willingness to take on risk, despite some unfavourable conditions (including softening macroeconomic conditions, uncertainty over ongoing trade tensions, Brexit and wider political uncertainty). As a result, prices in riskier market segments soared to new highs and risk spreads tightened amid a continued search for yield. At the same time, volatility in EU financial markets remained subdued (see Chart 1.7).

In the second half of February 2020 investor sentiment changed profoundly (see Chart 1.3) as it became clear that COVID-19 could not be contained to China and was spreading across all continents. Uncertainty about the magnitude of the pandemic and its economic impact triggered a sharp market reaction and led to a short-term liquidity shock in key market segments that tested the resilience of markets and financial institutions.

Chart 1.7: Volatility in EA and US bond and stock markets



Source: Bloomberg. DG FISMA calculations.

Note: Equity volatility is measured by the EA and US volatility indices (VIX). Bond volatility is measured by the 3-month implied volatility computed at 100% moneyness by Bloomberg. EA bonds are represented by German bonds.

Developments in sovereign bond markets in 2020 were strongly driven by ECB monetary support actions[14] (see Chart 1.9). In late February and early March, the downward trend in the German benchmark bund yield strengthened as investors sought refuge in the safest assets. The 10-year German Bund yield reached a historic low of -0.85% on 9 March amid extreme risk aversion. Yields of some other sovereigns, however, started to climb as investors incorporated the effect on public finance due to fiscal policy responses to the pandemic. Later in March, investors started to sell off even the safest sovereign bonds to turn to cash and money market assets as they were disappointed that the ECB decided not to step up its interventions in government bond markets. For instance, over 8 trading days, the 10-year German Bund yield shot 66 basis points (bps) higher to -0.19%, while by 17 March the yield on the 10-year Italian sovereigns had risen to 2.80%[15].

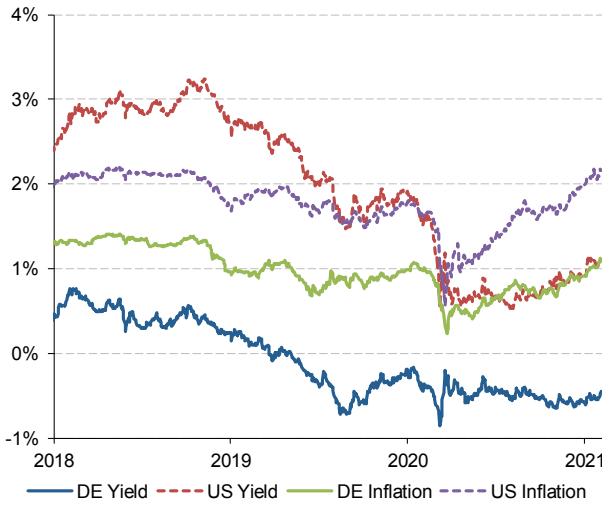
It was only after the PEPP support was announced on 18 March that benchmark bond yields softened. Since then, German bond yields have oscillated between -0.6% and -0.3% in a tight slightly downward moving channel. Peripheral sovereign bond yields experienced another but generally less pronounced surge in April, before easing in view of the prospects offered by a European recovery fund. Thereafter, sovereign bond yields declined over the remainder of the year back to 2019 levels, also largely driven by the ECB's asset purchase programmes and the strong coordinated policy response at EU level. The latter includes the agreement for common

[14] Also the instalment of the ESM pandemic credit line, and the announcement of the NextGenerationEU fund have positively impacted sovereign bond prices. For details, see *Communication from the Commission, Europe's moment: Repair and Prepare for the Next Generation*, SWD/2020/98 final of 27 May 2020.

[15] A spread of 300 bps to the Bund compared with 160 bps at the start of 2020.

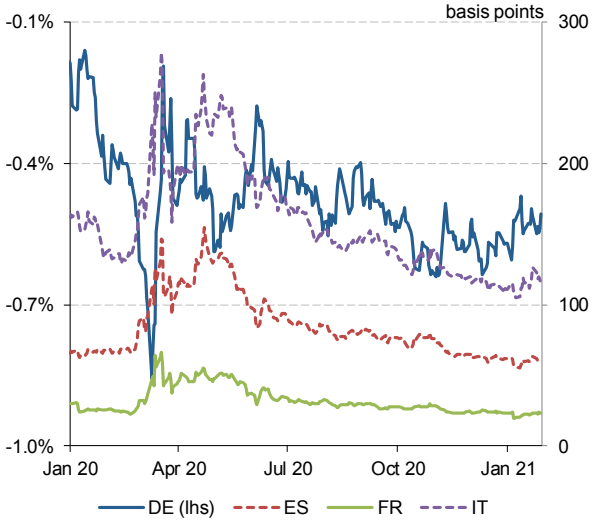
EU debt issuance to assist in particular those countries most heavily affected by the virus, which reduces the pressure on national debt issuance programmes. Most non-euro area (EA) sovereign bond yields have followed a similar path as their EA equivalents. While the sovereign bonds of these Member States cannot directly benefit from ECB monetary support measures, such as the PEPP, they have benefited indirectly. Lower yields were further supported by the general search for yield by investors.

Chart 1.8: Sovereign-bonds yields and expected inflation.



Source: Bloomberg.
Note: 10-year maturity bond data. 10-year inflation expectations based on the break-even inflation rate on inflation-linked bonds.

Chart 1.9: Sovereign-bond spreads



Source: Bloomberg. DG FISMA calculations.
Note: Spreads are calculated against the 10-year German Bund.

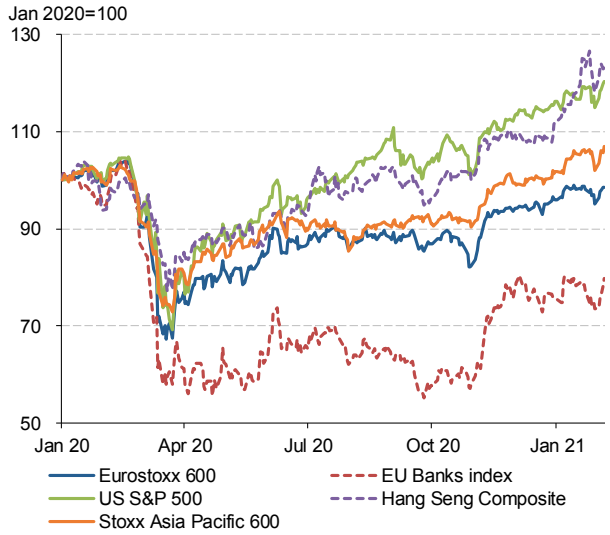
In riskier market segments, such as equities and high-yield corporate bonds, investors cut their exposures sharply at the start of the COVID-19 outbreak, when unfolding lockdown measures raised concerns about liquidity, profitability and solvency. This led to the fastest market sell-off since the 2008 financial crisis. Equity markets collapsed, with major market indices tumbling by 35-45% in the 20 trading days between mid-February and 19 March 2020 (see Chart 1.10). Volatility spiked, with the European volatility index (VSTOXX) reaching an intraday high of 90% on 18 March (compared with levels of around 15-20% until mid-February). Around mid-March, financial market authorities in several Member States adopted temporary emergency short-selling prohibitions, and the European Securities and Markets Authority (ESMA) decided that net shorters that established a position in excess of 0.1%[16] in shares traded on an EU regulated market had to notify the relevant national competent authority.

From March to April, financial markets reversed course and equity markets witnessed a remarkable rebound as investor optimism increased following the monetary and economic support measures described above. Overall, EU equity markets increased by 20% in Q2 2020, the best quarterly performance since 2015. Yet, sectoral performance has varied quite significantly. While at the end of June the EU aggregate equity index (Eurostoxx 600) was still 11% lower than at the beginning of January, the drop was much sharper for EU airlines (36%) and banking (30%). In Q3 2020, EU equity markets remained broadly stable, although some

[16] Following the entry into force of the decision.

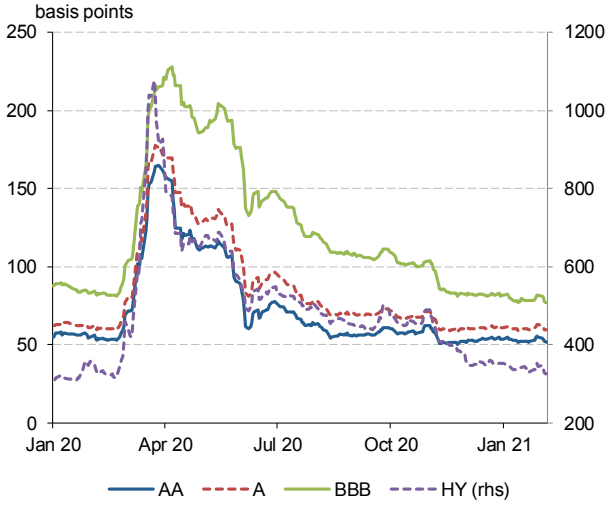
national stock exchanges of Member States whose economies had been relatively less affected by the pandemic (e.g. Germany and Ireland) showed record gains, while those of the hardest hit economies underperformed. Markets increased further in late autumn, driven by encouraging vaccine news and largely unaffected by the second wave of COVID-19 infections and the partial lockdowns across Europe.

Chart 1.10: Stock market performance



Source: Bloomberg.

Chart 1.11: Euro-area corporate bond spreads



Source: Bloomberg. DG FISMA calculations.
Note: 5-year maturity bond data. Spreads are calculated against the 5-year German sovereign bond yield.

European corporate bond markets mirrored equity market developments (see Chart 1.11). At the beginning of 2020, spreads were at historically low levels and volatility was low. Primary market activity was very strong, with high levels of issuance. At the end of February, however, corporate bond spreads widened significantly. Corporates turned to banks to tap credit facilities, as primary markets shut down. In the secondary markets, corporate bond yields spiked amid low market liquidity. Some leveraged investors were forced to sell their assets in order to meet margin calls on their repo and derivatives positions, exerting downward pressure on bond and other prices. Both investment-grade and high-yield bonds experienced the steepest all-time decline in market value. Spreads on AA investment grade bonds increased from 50 bps to over 150 bps, while high-yield bond spreads widened from 350 bps to more than 1 050 bps in a span of 4 weeks (from mid-February until 19 March).

The ECB responded by easing its policy so that bonds that had recently been downgraded from investment grade to high-yield status ('fallen angels') remained eligible as collateral for liquidity providing operations, as long as their rating remained equal to or above 'BB'. This supported the corporate bond market, which started to recover in April. Bond spreads narrowed in the secondary market and issuances in the primary market increased. Over the remainder of 2020, spreads steadily declined, but differences between sectors remained. Healthcare and technology recovered easily, which was not the case for instance for the automotive or energy sectors. At the end of 2020, corporate bonds spreads in all segments were around pre-COVID-19 levels.

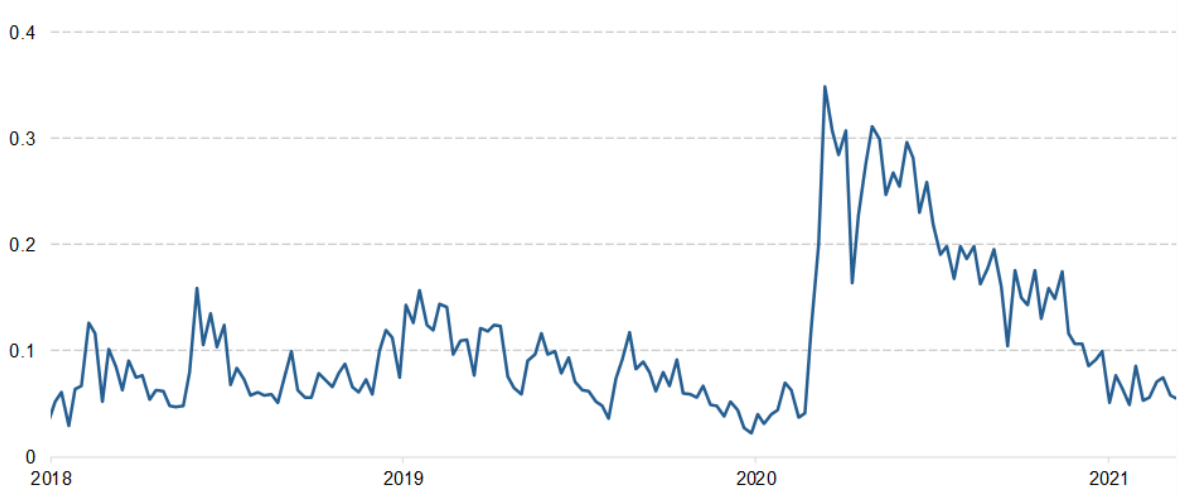
All in all, the V-shaped recovery in financial markets over 2020 was remarkable, but, towards the end of the year it raised concerns about a growing misalignment with macroeconomic fundamentals (see Section 2.1.1).

Chapter 2 FINANCIAL STABILITY AND INTEGRATION

2.1 Financial stability

The COVID-19 crisis has put significant stress on the balance sheet of households, firms, banks and governments, and exacerbated certain vulnerabilities that were already elevated pre-crisis[17]. As summarised in Chapter 1, policymakers took unprecedented policy measures to smooth out the impact of the crisis and stimulate the recovery. The decline of the ECB systemic stress indicator is a good illustration of how successful policy makers were in containing financial risk in 2020 (see Chart 2.1).

Chart 2.1: Composite indicator of systemic stress



Source: European Central Bank (ECB) Statistical Data Warehouse[18].

Note: Euro area, CISS - Composite Indicator of Systemic Stress. Figures measured in pure numbers. Figures can take values between 0 and 1.

However, three main risks to financial stability prevail. The first risk is that certain asset classes in major financial markets may be repriced disruptively, thereby affecting the broader financial system. Second, concerns about debt sustainability in the sovereign and the non-financial corporate sector have increased. Finally, stress in parts of the EU banking sector may resurge.

2.1.1 *Disruptive repricing in major financial market asset classes*

Financial markets performed strongly in the second half of 2020 (see Section 1.2) despite substantial economic uncertainty and lower growth and corporate earnings. This trend was largely attributable to the continued coordinated monetary and fiscal support measures. These measures have been powerful and ensured that market players had more than sufficient access to low-cost funding. On the other hand, they increase moral hazard risk - with investors speculating that central banks will continue to intervene in current and future market crises - and the risk that market valuations become decoupled from fundamentals. This 'decoupling',

[17] Pre-crisis vulnerabilities include debt sustainability; stretched risk premia in asset markets; underpriced credit and interest rate risk; low banking sector profitability; stretched monetary policy; and investors' exposure to less liquid and risky assets as a result for the search-for-yield in the very low interest rate environment. See European Commission, *European Financial Stability and Integration Report* (EFSIR), SWD(2020) 40 final of 3 May 2020.

[18] https://sdw.ecb.europa.eu. Series key CISS.D.U2.Z0Z.4F.EC.SS_CI.IDX.

together with a possible under-pricing of credit and interest rate risks, may increase market volatility and the risk of sharp price corrections.

Valuations in March 2021 (when this report was drafted) were high, especially in more risky market segments. Valuations in stock markets are quite elevated and corporate bond spreads, especially in the high-yield segment, were compressed. In autumn 2020, US market valuations surpassed the already elevated levels observed in early 2020 and mirrored levels associated with the market bubbles of 1929 and 2000. While European stock market valuations are more moderate, they could experience negative spillover effects from sell-offs elsewhere.

Fixed income markets have also become more risky. Bond prices are more sensitive to changes in yield due to the extreme low interest rates and the longer duration of outstanding bonds[19], increasing the risk of pronounced and costly decreases in valuation over time.

The risk of disruptive repricing also depends upon investors' willingness to take risk. If investors' willingness fades, high valuations and too-low risk premiums can result in steep market sell-offs. In addition, the possible economic and broader consequences of COVID-19, like potential widespread corporate defaults, an unexpected rise in inflation and interest rates, or increased political and policy uncertainty, could further trigger significant asset price adjustments.

2.1.2 *Sustainability of sovereign, household and non-financial corporate debt*

Massive fiscal support led to sizeable budget deficits and all-time-high debt-to-GDP ratios. The EU's aggregate government deficit increased from 0.5% of GDP in 2019 to 5.6% in Q3 2020[20]. In line with this, the aggregate debt-to-GDP ratio increased from 79.2% in 2019 to 89.8% in Q3 2020.

The swift and strong response by the ECB and the EU to support low-cost financing has prevented a sovereign debt crisis. Member States have lengthened the average maturity of their outstanding debt to reduce rollover risk and spread financing costs over time in view of the low interest rate environment. Low interest rates also reduce interest costs and will help reduce the debt-to-GDP level over time. However, it will be important for Member States to achieve sufficient growth. The substantial EU support measures and other structural reforms, together with the recovery and resilience programmes that Member States will put in place, will be key to stimulate investment and growth. A balanced fiscal discipline that does not compromise growth or put the sustainability of debt at risk is also required.

Investors are still confident that sovereign debt in Member States will remain sustainable. Accordingly, sovereign bond spreads have narrowed, credit default swap (CDS) spreads have gone back down to pre-COVID-19 levels, and sovereign credit ratings have remained stable.

Debt sustainability risks continue to linger, however, given the unprecedented nature of the crisis and uncertainty about how it will unfold in the future. Government guarantees put in place to support firms, the self-employed and households are one source of risk. Government

[19] The duration of the global bond market has increased by approximately 5%, to a record high, as both corporates and governments have taken advantage of low yields to extend maturity (calculations based on data by Bloomberg). The market value of the global bond market has risen by 27% in the past 2 years.

[20] Figures based on Eurostat.

guarantees are on average above 15% of GDP across the euro area, representing a significant potential risk to public finances if some of them were to be called.

Government support, such as social transfers and temporary relief from tax burdens, has helped households to cushion the drop in disposable income. The European Commission launched several measures, including the COVID-19 Banking Package, targeted 'quick fix' amendments to EU banking rules, and a set of best practices for banks and insurers, to facilitate bank lending and to alleviate the impact of COVID-19 on consumers[21]. Payment moratoria have been effective to address short-term liquidity needs. Debt repayment concerns nevertheless remain present due to expected increases in unemployment[22] (see Section 1.1) and the ending of loan moratoria in the future. Bank loan moratoria in several Member States are limited in time (6 to 12 months), and the European Banking Authority (EBA) recommended that regulators return to normal[23].

In the non-financial corporate sector, exceptional policy measures[24] helped to maintain favourable financing conditions and alleviated immediate corporate liquidity constraints that contained insolvencies. Loans to non-financial corporations (NFCs) expanded strongly despite the sharp decline in real activity. This reflected firms' increased demand for working capital and more relaxed credit standards. Supported by banks loans, the external financing gap[25] of corporates, including SMEs, remained positive[26].

In this crisis, lower-rated issuers and SMEs have relied more heavily on revolving bank credit facilities than stronger-rated issuers. Meanwhile, investment-grade issuers have issued considerably more debt, especially those issuers from relatively resilient sectors. However, on average, the quality of debt declined. Larger firms with weak corporate fundamentals were still able to attract funding relatively easily, partially because investors in search for yield were willing to provide it. This increased concerns about debt sustainability, especially given that pre-crisis debt levels of non-financial corporations were already high. Credit rating downgrades of non-financial corporates in the euro area peaked in March and April 2020 (mainly in the speculative grade segment). The downgrades eased since their peak in the spring but many firms remain at risk, as evidenced by the historically large number of negative outlooks[27].

Also for the corporate sector, concerns have risen about cliff-edge effects when fiscal and supervisory measures will expire and may negatively affect credit supply. Overall, it is expected that as a result of support measures the peak in insolvencies will start later in 2021. In addition, the rise in non-performing loans will weigh on credit standards. Tighter funding

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[21] For further details, see https://ec.europa.eu/commission/presscorner/detail/en/ip_20_740.

[22] In particular, households' debt sustainability is likely to be more impacted in those Member States, with a strong rise in unemployment (ES), very high unemployment rates (EL), a high debt-to-disposable-income ratio (DK, SE, LU, CY and EL), or a limited capacity of households to resort to existing savings (NL).

[23] For further details, see https://www.eba.europa.eu/regulation-and-policy/credit-risk/guidelines-legislative-and-non-legislative-moratoria-loan-repayments-applied-light-covid-19-crisis.

[24] Besides the accommodative monetary policy, guaranteed loans, job-retention programmes, and debt moratoria were most important to lower the liquidity gap.

[25] The external finance gap refers to the difference between the change in demand for and the change in availability of external financing.

[26] For more detailed information on the availability of sources of finance and the demand for funding by NFCs, including SMEs, see the ECB survey on the access to finance of enterprises in the euro area. https://www.ecb.europa.eu/stats/ecb_surveys/safe/html/index.en.html.

[27] For further details, see Section 2.3 in European Central Bank (ECB) (2020), *Financial Stability Review*, November 2020.

conditions and risks of rating downgrades will also limit corporates' ability to roll over maturing bonds. Large firms with access to capital markets may avoid solvency problems because they can tap markets on favourable terms. Nevertheless, half of large publicly listed firms in the euro area had an interest coverage ratio below one at the end of 2020, indicating that they need to borrow to pay interest. Smaller firms and those that are more financially vulnerable are more at risk, especially in certain sectors like accommodation and food, education, and arts and entertainment.

The economic uncertainty and the uncertainty about the development of the COVID-19 crisis makes it harder to distinct viable from non-viable firms. For viable firms in temporary distress, preventive restructuring[28] could help to avoid that these firms are forced into premature liquidation when crisis support measures (like moratoria on the obligation to file for bankruptcy proceedings) are lifted. It would help them to survive until earnings pick up. Preventive restructuring is important because insolvency frameworks tend to become less efficient in times of crisis. It would thus be relevant to re-assess the viability of firms regularly over time[29] to avoid that viable firms in temporary distress are forced into bankruptcy or zombie firms are created over time[30].

2.1.3 *EU banking sector stress*

Overall, the EU banking sector was resilient, but concerns about deteriorating profitability and asset quality are present. The banking sector benefited from monetary policy support and regulatory measures[31] such as ECB liquidity provisioning, government loan guarantees, capital and operational relief measures, and the Capital Requirements Regulation (CRR) quick fix provisions[32]. There is ample liquidity available in the banking system[33].

Banking sector vulnerability due to low profitability has increased. Bank profitability was already subdued before the COVID-19 crisis and has been hit in the recent crisis. Bank profitability dropped sharply in Q2 2020 due to higher loan loss provisions, impairments and banks' reduced ability to generate income. At least a quarter of euro-area banks recorded a loss in Q2 2020 and the gap between good- and bad-performing banks is widening. Bank profitability is likely to remain under pressure, as lending activity is expected to decrease and provisioning is expected to be required. Tighter credit standards, lower demand from borrowers and the ending of public guarantees will weigh on lending volumes, while margins are low.

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[28] Directive (EU) 2019/1023 of the European Parliament and of the Council of 20 June 2019 on preventive restructuring frameworks, on discharge of debt and disqualifications, and on measures to increase the efficiency of procedures concerning restructuring, insolvency and discharge of debt, and amending Directive (EU) 2017/1132, 20 June 2019.

[29] OECD (2020), Insolvency and debt overhang following the COVID-19 outbreak: Assessment of risks and policy responses, *Tackling Coronavirus Series*, November 2020.

[30] In this respect, a viability test that, on top of the traditionally considered factors, would also account for specific factors like changes resulting from a permanent shift in customer behaviour, regulation or a shift in values could help to better apply preventive restructuring.

[31] Banks also benefited indirectly from fiscal support measures that helped firms.

[32] For further details, see Regulation (EU) 2020/873 of the European Parliament and of the Council of 24 June 2020 amending Regulations (EU) No 575/2013 and (EU) 2019/876 as regards certain adjustments in response to the COVID-19 pandemic. https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_757; and https://www.eba.europa.eu/coronavirus.

[33] With the targeted longer-term refinancing operations (TLRTO) operations, the ECB is assuring banks of funding at an interest rate as low as -1%, as long as the banks lend the amounts to companies and households. The TLTRO (now EUR 1.7 trillion outstanding) has become one of the ECB's most important crisis tools because it more than compensates banks for the official policy rate of -0.5% that the ECB charges on its deposit facility.

Provisions will be required given that the economic outlook has worsened since September, and the adverse impact on asset quality is not yet captured by provisions.

The economic fallout from COVID-19 will significantly impact banks' asset quality. Government support to borrowers (moratoria[34]) and public guarantees[35] may mean that the effects become apparent more slowly than in past recessions, possibly only in 2021. Signs of deteriorating asset quality are already noticeable. The capital cost to EU banks could reach half a trillion in loan loss provisions. According to ECB estimates, non-performing loans in the EU could reach EUR 1.4 trillion[36] in a severe scenario, exceeding the amount during the 2008 financial crisis. Despite the low profitability, it is important to avoid under-provisioning given that asset quality is expected to deteriorate further over time. The magnitude of the decline in asset quality is uncertain, however, as reflected in the different provisioning policies adopted by banks. It is also a matter of supervisory concern.

Looking at the effect of the crisis on capital, banks have performed reasonably well since the onset of the pandemic, but the crisis impact deserves further monitoring. The results of the ECB's vulnerability analysis in July 2020[37] showed that, overall, the sector could withstand pandemic-induced stress, but depletion of bank capital would be materially significant if conditions worsen[38]. In contrast to the reduction in Q1 2020, aggregate-common-equity tier-1 (CET1) capital ratios of euro-area banks increased in Q2 2020 to around 14.5%, thanks to rising capital and contracting risk weighted assets (RWAs).

More generally, the economic support measures strengthened the interplay between the corporate, sovereign, household and banking sectors. This could increase banking sector vulnerabilities due to spillover effects and feedback loops. Government transfers, bank loan moratoria, sovereign corporate loan guarantees and other fiscal support measures were key to help banks maintain asset quality, but this implies that the ending of such measures could have an adverse effect. Already weak corporate fundamentals may weaken further and fuel corporate defaults particularly in case of a premature withdrawal of policy support. In turn, widespread corporate bankruptcies may contribute to a repricing of credit risk and reduce banks'

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[34] EU banks reported around EUR 850 billion loans under moratoria on June 2020 (260 billion (FR), 190 billion (ES), 160 billion (IT)), which corresponds to around 7.4% of total loans towards households and non-financial corporations (12% in IT; 10% in ES; and, 8% in FR). The use of eligible moratoria schemes was widely dispersed, with some banks reporting close to 50% (CY) of their total loans to households and NFCs being under moratoria. Small and Medium Enterprises (SMEs) and Commercial Real Estate (CREs) exposures had the highest percentage of loans under moratoria (16% and 13% resp., measured as share of total SME and CRE loans), while just 6% of housing mortgages were under moratoria. Around 50% of loan moratoria had an initial expiry date in September, and close to 90% expire before year-end 2021.

[35] EU banks reported that EUR 180 billion of loans were subject to public guarantee schemes in June 2020, in particular in Spain and France that both had between EUR 70-80 billion.

[36] See Enria, A. (2020), Bank asset quality: this time we need to do better, *Opinion Piece*, 27 October 2020, https://www.bankingsupervision.europa.eu/press/interviews/date/2020/html/ssm.in201027~31fda4bb8e.en.html.

[37] See European Central Bank (ECB) (2020), Euro area banking sector resilient to stress caused by coronavirus, *ECB Press Release*, 28 July 2020.

[38] The results should be taken with caution as the ECB points out that the exercise was performed using ECB top-down models that did not incorporate interactions with banks. Under the baseline scenario (still the most likely, even with the current second wave), banks' aggregate capital (CET1) ratio will be depleted by approximately 1.9 percentage points to 12.6%. This implies that the euro-area banking sector will remain, in aggregate, well-capitalised and can continue to fulfil its core function of lending to the real economy. In the severe scenario, however, banks' CET1 ratio is depleted by approximately 5.7 percentage points to 8.8% by end-2022. The development is largely driven by impaired credit exposures, market risk losses and lower profitability. Such a pronounced reduction in the bank sector's own funds would prove challenging. Several banks would need to take action to continue meeting minimum capital requirements. The analysis shows that capital depletion would be stronger at diversified lenders, G-SIBs and universal banks, and small domestic and retail lenders.

willingness to lend. On the other hand, prolonged government support schemes could lead to zombie firms that rely on policy support while exhibiting anaemic growth. Generous guarantee programmes that continue over an extended period of time could also jeopardise the sustainability of public finances if defaults eventually materialise. This could lead to further bank losses, especially given that many banks have increased their sovereign exposure through higher domestic sovereign debt holdings. Finally, the gradual phasing out of household income support and loan moratoria could affect households' ability to service mortgages and might affect residential real estate prices[39].

2.1.4 *Other EU financial stability risks*

The prolonged low-yield environment also affects investors and insurers. Investors are pushed into riskier and less liquid assets such as real estate funds and high-yield bonds[40]. Low-interest-rate conditions also weigh on insurers' profitability and solvency and may lead to further shifts in investment towards riskier and less liquid assets.

Cyber risk is also a source of significant systemic risk with potentially serious adverse consequences for the real economy. The total cost of cybercrime is growing quickly and outpacing investment in cyber security. The financial sector is highly exposed to cyber threats. Attacks on a significant financial institution, financial market infrastructure or public institution are a threat on their own, but can also have spillover effects to other parties. Corporates can also be affected by cyber risk and the sharp increase in remote working during the COVID-19 crisis makes firms more exposed to cyber-attacks. With the release of the Digital Operational Resilience Act (DORA), the EU has been taking measures to better arm the financial sector against major ICT-related incidents[41].

Furthermore, climate and other environmental risks could turn into systemic financial stability risks if markets do not price these risks correctly. Estimates of the impact of physical risks on asset prices appear reasonable, but they vary considerably according to the expected degree of global warming or environmental degradation. In addition, a disorderly transition to a low-carbon economy could have a destabilising effect on the financial system (see Chapter 4).

All in all, financial stability risks will have to be monitored closely in view of the prevailing economic environment and the unfolding consequences of the pandemic. An orderly and gradual unwinding of structural and financial imbalances in the system over time will be important. Early withdrawal of support when recovery is still too premature could have immediate effects on financial stability due to adverse effects on macroeconomic conditions, banks' balance sheets and financing conditions[42]. A too cautious approach in which support

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[39] Financial stability risks related to the housing market are high in Member States with particular vulnerabilities in terms of household indebtedness and/or debt servicing costs, loan-to-value ratios and overvalued housing prices.

[40] Some of the investment funds in the EU had to temporarily suspend redemptions at the height of the crisis. Ensuing central bank interventions could lead to moral hazard issues in the future, to the extent that market participants do not fully internalise their own liquidity risk. These funds might also be prone to difficulties in valuing their underlying assets, for instance, due to progressive corporate downgrades or challenges related to the fair value determination of real estate assets during the COVID-19 crisis.

[41] Proposal for a Regulation of the European Parliament and of the Council on digital operational resilience for the financial sector, COM/2020/595 final of 24 September 2020.
See also, https://ec.europa.eu/commission/presscorner/detail/en/IP_20_1684.

[42] Effects include reduced growth, higher unemployment, increased non-performing loans, increased insolvencies, and increased borrowing costs.

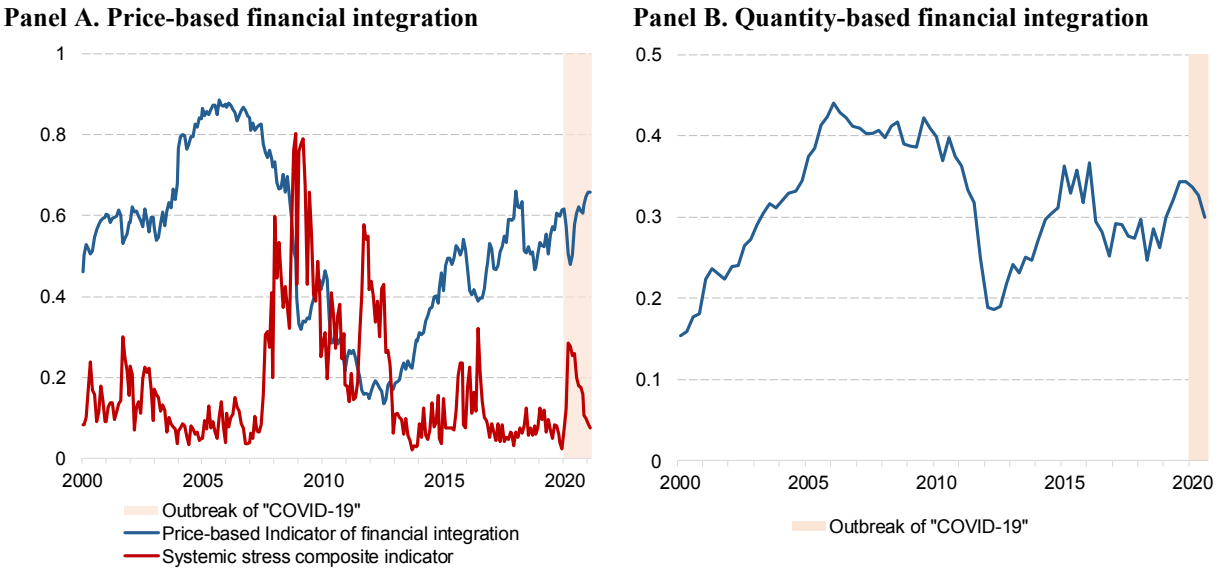
measures are maintained longer than necessary slows down structural adjustments, puts unnecessary pressure on fiscal resources and distorts financing and investment decisions. This would create an environment in which financial stability risks could build up over time. Policymakers have to face these trade-offs in a time of heightened uncertainty as the consequences of the ongoing pandemic are still unfolding. Economic recovery and higher growth would help to further reduce vulnerabilities and increase the resilience of the financial system.

2.2 Financial integration

Financial integration was also tested by the COVID-19 outbreak. Disruptive financial fragmentation and systemic stress remained manageable[43] thanks to the support measures taken by public authorities at EU and national levels. At the outbreak of the pandemic, several indicators showed a sharp decline in financial integration. The negative relationship between systemic stress and financial integration that was typical for the previous crises reappeared (Chart 2.2 panel A)[44]. However, there was a very fast rebound of financial integration and many of the indicators for financial integration (albeit not all) have recovered to their pre-crisis levels following the policy measures that were taken.

In contrast, by the beginning of 2021, the price-based sub-index for the money market recovered somewhat, but not yet to its pre-COVID-19 level, while the sub-index for the equity market recovered initially but then declined again, 'signalling differences in equity prices between Member States.

Chart 2.2: Euro-area composite financial integration indicators



Source: European Central Bank (ECB), Financial integration and financial structure indicators, April 2021[45]. DG FISMA calculations.

Note: A value of 1 corresponds to the highest degree of integration. Price-based indicator based on monthly data. Quantity-based indicator based on quarterly data.

[43] The scale and proportions of these disruptive fragmentation and systemic stress was lower than what was observed during the two previous recent major crises episodes.

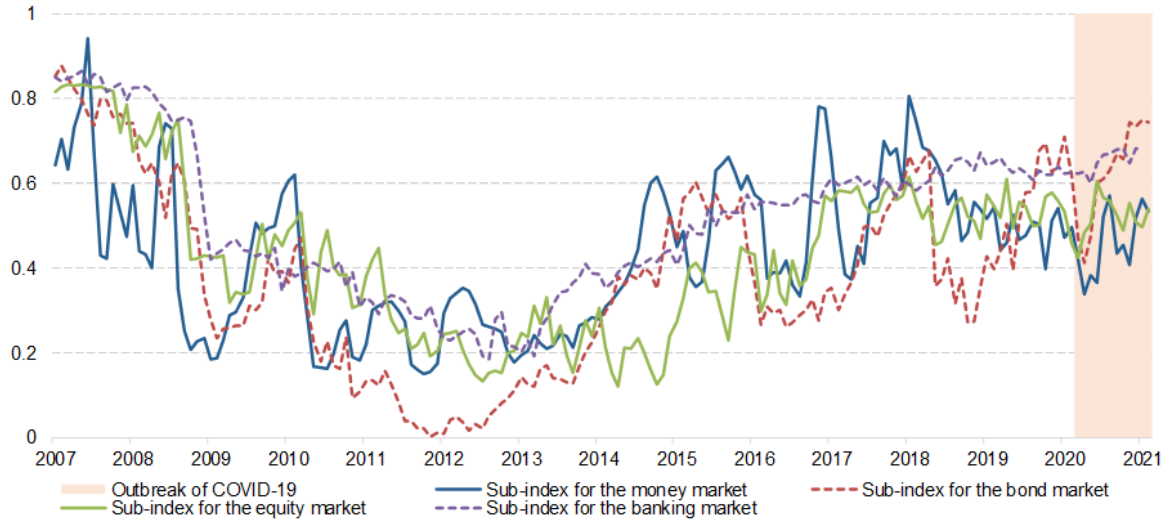
[44] Borgioli, S., Horn, C.-W., Kochanska, U., Molitor, P. and Mongelli, F.P. (2020), European financial integration during the COVID-19 crisis, *ECB Economic Bulletin* 7.

[45] https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/financial_integration/html/index.en.html

The ECB's quantity-based composite financial integration indicator evolves more slowly over time. The indicator also declined sharply at the onset of the crisis and was still almost 13% lower in Q3 2020 than in Q4 2019 (see Chart 2.2, Panel B). By the summer of 2020 (the latest available data point), the downward trend had not yet reversed.

The indicator that assesses risk sharing based on consumption smoothing also deteriorated sharply at the beginning of 2020 before recovering partially by Q4 2020 (the latest available data point) (see Chart 2.4). This indicator measures the correlation between domestic consumption and output. In integrated markets, domestic consumption should not be constrained by domestic output and, therefore, the correlation between those macroeconomic variables should be low. At the beginning of 2020, following the onset of the COVID-19 crisis, this coefficient almost doubled for the euro-area Member States. Although the increase was lower than during the 2008 financial crisis and the sovereign debt crisis of 2012-2014, it still illustrates the profound impact of the pandemic and the need for the containment measures that were introduced. Households were largely unable to continue their normal spending patterns during the COVID-19 pandemic, which helps explain the distinct pattern of the consumption-smoothing indicator during the crisis[46]. It was therefore considered sensible to also study income-consumption patterns, and it was noted that during the early months of the crisis, euro-area Member States managed to smooth income[47].

Chart 2.3: Euro-area price-based financial integration composite indicator by market segment



Source: European Central Bank (ECB), Financial integration and financial structure indicators, April 2021[48]. DG FISMA calculations.

Note: A value of 1 corresponds to the highest degree of integration. Monthly data.

Looking at cross-border capital flows as another quantity-based indicator of financial integration, the effect of the crisis depends on their composition and more specifically on the relative importance of foreign direct investments (FDI). FDI is considered to be more stable than portfolio investment, and a higher relative share of FDI can increase the resilience of the economy.

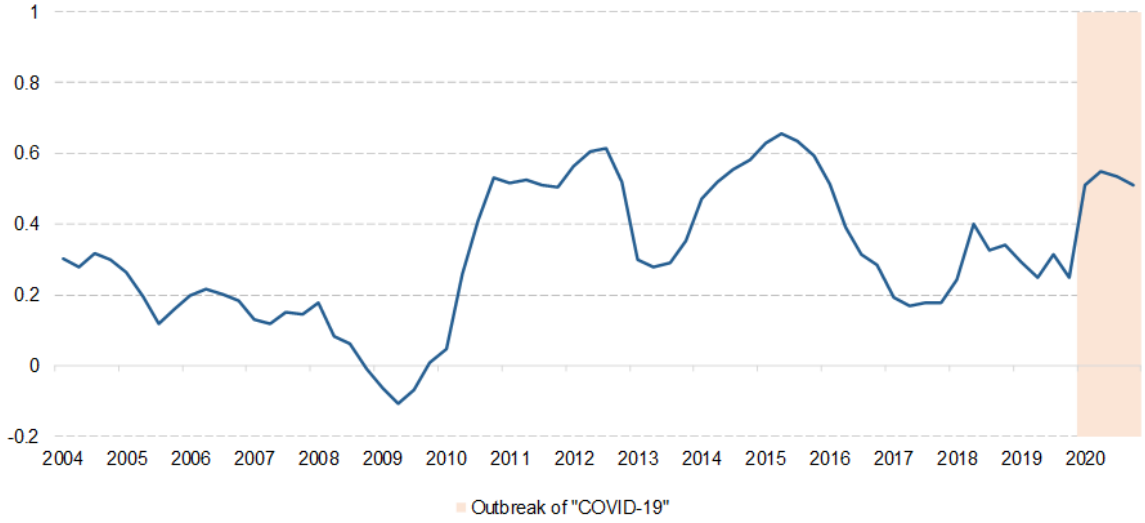
[46] Dossche, M., and Zlatanos, S. (2020), COVID-19 and the increase in household savings: precautionary or forced? *ECB Economic Bulletin Issue* 6.

[47] Giovannini, A., Horn, C. and Mongelli, F. (2021), An early view on euro area risk sharing during the COVID-19 crisis, 10 January 2021, https://voxeu.org/article/early-view-euro-area-risk-sharing-during-covid-19-crisis.

[48] https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/financial_integration/html/index.en.html.

At the beginning of 2020, the share of intra-EU-27 FDI in total equity investment (the sum of intra-EU-27 FDI and portfolio investments) declined. FDI has been steady due to the increased uncertainty, while portfolio investment rebounded already in Q2 2020 (see Chart 2.5). The share of intra-EU-27 FDI in total investment was already decreasing before the start of the pandemic. This was largely the result of rising portfolio investments, whereas FDI had been levelling out somewhat. This resulted in a slight downward trend in the ratio which reached levels close to those of 2011 and below the trough of 2014.

Chart 2.4: Consumption-output correlation across the euro-area Member States



Source: European Central Bank (ECB), Financial integration and financial structure indicators, April 2021[49]. DG FISMA calculations.

Note: Ireland is excluded due to the major change in its GDP reporting in 2015.

Turning to the composition of intra-EU-27 foreign claims by type of financial instrument, Chart 2.6 shows that since the onset of the pandemic the ratio of equity to debt instruments has been declining due to the rapid increase in cross-border debt instruments. This changed the long-term trend observed before the COVID-19 outbreak in which the ratio of equity to debt foreign assets increased rapidly. This pointed to improvements in the resilience of EU financial integration and more diversified EU (cross-border) funding structures[50]. However, the COVID-19 pandemic interrupted these improvements and the longer-term impact of the crisis on the resilience of financial integration remains uncertain. Finally, integration in cross-border equity and debt holdings is discussed by comparing indicators for intra-EU-27 and global portfolio investment integration[51] which measure the shares of foreign investments located within the EU-27 and globally in total portfolio investment holdings, including domestic holdings[52].

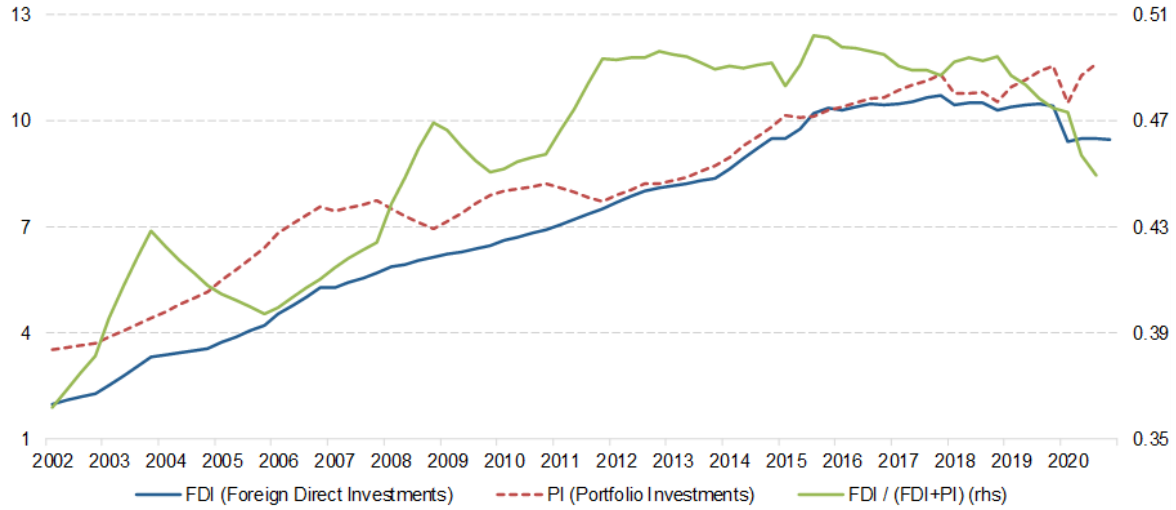
[49] https://www.ecb.europa.eu/stats/financial_markets_and_interest_rates/financial_integration/html/index.en.html

[50] Equity instruments are considered to have higher risk-sharing and risk absorption capacity and can therefore improve the resilience of financial integration.

[51] The intra-EU-27 integration index aims to assess the role of home bias for financial integration, as it monitors how much EU countries invest in each other instead of investing domestically. It therefore provides a measure of how much EU countries are connected to each other through their foreign financial investments.

[52] The assessment is based on bilateral cross-border portfolio stocks compiled in JRC-ECFIN FinFlows dataset for the periods 2013-2015 and 2017-2019. For further details, see https://data.jrc.ec.europa.eu/collection/id-00149.

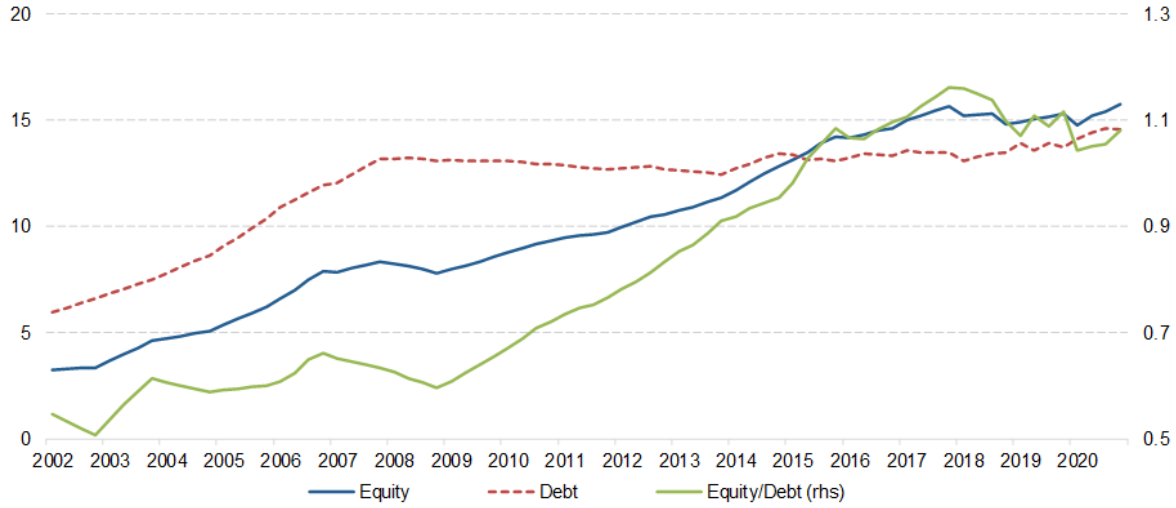
Chart 2.5: Intra-EU foreign direct investment and portfolio investment



Source: Eurostat (BoP data) and FinFlows database[53]. CEPS (2020), *Developments in EU Capital Flows in the Global Context*, December 2020. DG FISMA calculations.

Note: Figures refer to end-of-period positions based on quarterly data for EU-27 (changing composition). Foreign direct investments and portfolio investments in EUR trillion on left-hand scale. Ratio (green line) on right-hand side.

Chart 2.6: Intra-EU cross-border holdings of equity and debt instruments



Source: Eurostat (BoP data) and FinFlows database[53]. CEPS (2020), *Developments in EU Capital Flows in the Global Context*, December 2020. DG FISMA calculations.

Note: Equity and debt figures refer to end-of-period positions, reported in EUR trillion on the left-hand side. Ratio of equity to debt on the right hand side. Equity is defined as the sum of foreign direct equity investments (FDI), portfolio equity investment and equity investment funds. Debt is defined as debt securities in portfolio investment and other investment loans. Debt securities in FDI, which are intra-group operations and cannot lead to default, are excluded. Data for EU-27 (changing composition).

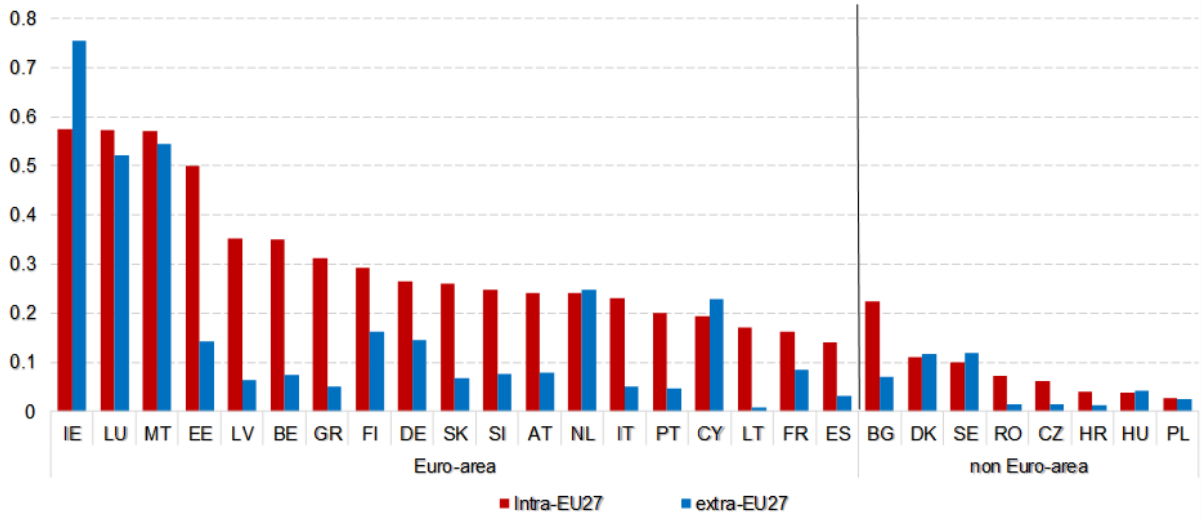
Looking at 2017-2019, the most recent period for which data is available (see Chart 2.7), the level of the intra-EU-27 portfolio investment integration is rather diverse[54]. For most countries, the levels of the indicator are still relatively low or medium and below 0.35, with a few exceptions (EE, IE, LU and MT have higher levels), which indicates that home bias in investment portfolio investments is still relatively high. On the other hand, the value of

[53] https://data.jrc.ec.europa.eu/collection/id-00149

[54] The more diversified and the larger the volume of foreign investments compared to domestic ones, the higher the integration would become (close to 1). Technically, when no foreign investment is held, the integration would be absent and reach the value of 0.

portfolio investment extra-EU-27 integration is much lower. The integration of portfolio investments differs significantly between euro-area and non-euro-area Member States, where this last group (except BG) shows lower levels of integration both within the EU-27, and with non-EU global partners. Both types of integration indices are below 0.12 (except for BG). Compared with 2013-2015[55], the average value of the integration indicators have slightly increased: for euro-area Member States the average level of the indicators for integration within the EU-27 increased from 0.26 to 0.30 in 2017-2019, while global integration with respect to non-EU countries rose, on average, from 0.15 to 0.17. The improvements for non-euro-area Member States were much smaller[56].

Chart 2.7: Intra- and extra-EU integration in equity and debt portfolio investment per Member State



Source: JRC-ECFIN FinFlows database[57] (foreign portfolio investment). Bank for International Settlements (BIS) (debt securities market capitalisation). Eurostat national accounts (equity market capitalisation). Joint Research Centre (JRC) calculations.

Note: Integration index is the computed as 1 – home bias where Home bias measures domestic investors' preference for domestic portfolio investments. Intra-EU and extra-EU integration index per Member State are reported, with values closer to 0 indicating that the Member State overweighs domestic investments in its portfolio. Intra-EU integration index is calculated as 1 - the proportion of domestic portfolio investments over portfolio investments within the rest of the EU, scaled by the ratio of a Member State's bond and equity capitalisation to the world portfolio, bond and equity market capitalisation. Extra-EU integration index is calculated as 1 - the proportion of domestic portfolio investments over portfolio investments outside the EU, scaled by the same ratio as for the intra-EU home bias. The value reported is the average of integration index for debt and equity, averaged for the years 2017-2019. Foreign portfolios include portfolio foreign investment debt and equity including listed, non-listed and investment funds. Equity includes listed equity, non-listed equity, other participations and investment funds. Data for EU-27 (changing composition).

Overall, the prompt policy response and the longer-term impact of regulatory and institutional reforms since the 2008 global crisis have helped to increase the resilience of financial integration and have therefore helped to mitigate the immediate socio-economic impact of the COVID-19 pandemic. However, the longer-term effects of the pandemic still remain to be seen and will depend, among other factors, on the effectiveness of national and EU level policy measures aimed at underpinning the post-crisis economic recovery.

[55] Based on unreported figures. Available upon request.

[56] From 0.07 to 0.08 for the integration of portfolio investment within the EU-27, and no increase for the global integration index that measures integration with non-EU countries.

[57] https://data.jrc.ec.europa.eu/collection/id-00149

Chapter 3 EU MARKET FOR SUSTAINABLE INVESTMENT

Climate change and other forms of environmental degradation are an existential threat to Europe and the world[58]. Individuals, firms and society at large increasingly face the consequences of these changes, which backs up the call to act now and to move towards a more sustainable society. At EU level, the European Green Deal, the European Climate Law[59], and the EU Biodiversity Strategy[60], together with earlier commitments[61] illustrate the EU's commitment and policy response to achieving this transition[62].

The transition requires significant investment. At EU level, the annual investment gap to reach the 2030 EU climate and environmental targets is estimated at EUR 470 billion[63], with an additional amount needed to cover other aspects of sustainable development. The required financial flows to support this transformation cannot be met through public financing alone. Scaling up investment also requires private sector involvement.

Financial markets have an important role to play. Research suggests that the carbon footprint shrinks faster in economies with relatively more market-based equity financing compared with bank financing[64]. Financial markets also attract investors interested in sustainable investment products, even in periods of market stress. They can further support the transition by fostering risk-sharing, pricing climate and other sustainability risks, or tackling broader sustainable development goals (SDG)[65] through impact investing or shareholder activism.

On the other hand, economic and financial risks related to climate change could significantly affect financial markets and the financial system as a whole. These concerns are discussed in greater detail in Chapter 4.

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[58] Climate science warns that that emissions would have to nearly halve by 2030 and fall to net zero by 2050 to keep temperatures at safer levels. For details, see IPCC (2018), Summary for policymakers. In: *Global warming of 1.5°C. An IPCC special report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*, Intergovernmental Panel on Climate Change. Biodiversity loss threatens food systems, putting food security and nutrition at risk. For instance, more than 75% of global food crop types rely on animal pollination. For further details, see e.g., World Economic Forum (2020), *The global risks report*, 15 January 2020.

[59] The European Green Deal and the European Climate Law increased the EU's climate and environmental policy ambitions. For details, see Communication from the Commission, The European Green Deal, COM/2019/640 final of 11 December 2019. Proposal for a Regulation of the European Parliament and of the Council, establishing the framework for achieving climate neutrality and amending Regulation (EU) 2018/1999 (European Climate Law), COM/2020/80 final of 4 March 2020.

[60] Communication from the Commission, EU Biodiversity Strategy for 2030 - Bringing nature back into our lives, COM/2020/380 final of 20 May 2020.

[61] See the commitment to implement the United Nations 2030 Agenda for sustainable development and the Paris agreement. The Agenda was adopted by all United Nations Member States in 2015. See https://sdgs.un.org/2030agenda. The European Commission is also committed to the Agenda. For details, see https://ec.europa.eu/info/strategy/international-strategies/sustainable-development-goals/eu-holistic-approach-sustainable-development_en. The Paris agreement was adopted by 196 Parties in 2015, including the European Commission. It is a legally binding international treaty on climate change and aims to limit global warming to well below 2°C, preferably to 1.5 °C, compared to pre-industrial levels. See, https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement and https://ec.europa.eu/clima/policies/international/negotiations/paris_en.

[62] Transition refers to the transition to a safe, climate-neutral, climate-resilient, more resource-efficient and circular economy, consistent with a pathway to limit the temperature increase to 1.5°C above pre-industrial level, and where natural capital is protected, conserved and restored.

[63] See Communication from the Commission, Europe's moment: Repair and prepare for the next generation, SWD/2020/98 final of 27 May 2020. The investment gap of EUR 470 billion is modelled on a 40% reduction target and does not account for the 55% reduction target yet.

[64] See De Haas, R. and Popov, A.A. (2019), Finance and carbon emissions, *ECB Working Paper* 2318, September 2019.

[65] https://sdgs.un.org/goals

This chapter looks at the role of financial markets in supporting the transition, focusing in particular on the market for sustainable investment products. This market has shown potential to channel private capital. The chapter provides an overview of market developments in the relevant mutual fund and bond market segments, and discusses barriers and drivers. The last section considers the role of sustainable investment in financing a sustainable recovery following the COVID-19 outbreak.

3.1 Market outlook

There has been a growing interest in investing sustainably. While the trend is clear-cut, market descriptions and comparisons between data providers can be a challenge due to the absence of universally accepted definitions and standards. Sustainable investment often considers environmental, social and governance (ESG) factors[66], but the scope and integration of these factors in investment strategies varies[67]. The market outlook described here is based on developments in two important market segments: sustainable investment funds[68] and green bonds, which are considered to be promising to channel private capital. Both help to move sustainable investments into the mainstream. Green bonds help to directly finance green projects, while sustainable funds facilitate retail investment.

3.1.1 *Sustainable investment funds*

Over the last years, sustainable investment funds ('sustainable funds') have become increasingly popular with both retail and institutional investors. The EU-27 is the most important sustainable fund market (see Chart 3.1), with a stable global market share of 69% (based on assets under management (AuM)). At the end of 2020, the EU-27 market included around 2 650 sustainable funds, with EUR 943 billion in AuM. The market grew by 173% since 2015 (37% on a y-o-y basis). As a result, sustainable funds outgrew their niche status, to reach around 11% of total AuM of investment funds in Europe in 2020, up from approximately 5% at the end of 2015[69]. The strong inflow in 2020 accelerated this development. Net sustainable fund flows have hit new records in 2020 (EUR 200 billion), which marks an 88% increase compared with 2019.

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[66] According to United Nations Environment Programme (UNEP) Inquiry and the UN-backed principles for responsible investment (UNPRI), ESG factors are broadly defined as follows: (*i*) Environmental (E) issues relate to the quality and functioning of the natural environment and natural systems; (*ii*) Social (S) issues relate to the rights, well-being and interests of people and communities; and (*iii*) Governance (G) issues relate to the governance of companies and other investee entities.

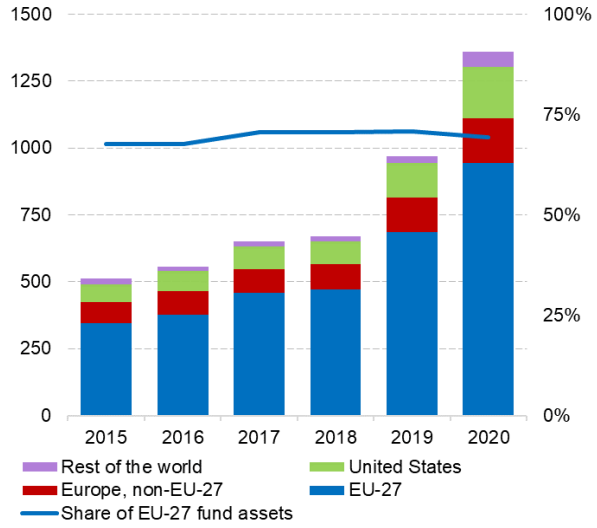
[67] Sustainable investing is situated between a traditional investment strategy, with limited or no regard for ESG practices, and philanthropy that addresses societal challenges that cannot generate a financial return. Investment styles include those that mitigate sustainability risks based on screened exclusions or norms, over strategies that incorporate ESG considerations based on positive or best-in-class screens, and thematic approaches, or impact investing that targets specific non-financial outcomes, possible at below market returns or disproportional risk for investors (see, among others, Boffo, R. and Patalano, R. (2020), *ESG investing: Practices, progress and challenges*, OECD Publishing; de Bruin, C., Biermans, M. and Kangisser, S. (2017), *SDG investing: Advancing a new normal in global capital markets*, C-Change.

[68] In view of the data analysis in this chapter, sustainable funds are those that comply with sustainability criteria set out by Morningstar. This definition includes funds that according to their prospectus: (i) state they use ESG criteria as a key part of their security selection process; and/or (ii) indicate they pursue a sustainability-related theme and/or (iii) seek measurable positive impact alongside financial return. This definition excludes funds that employ only limited exclusionary screens, funds that state they consider ESG factors but do so in a non-definitive way as well as certain types of funds (money market funds, feeder funds, funds of funds).

[69] Based on market data from Morningstar research.

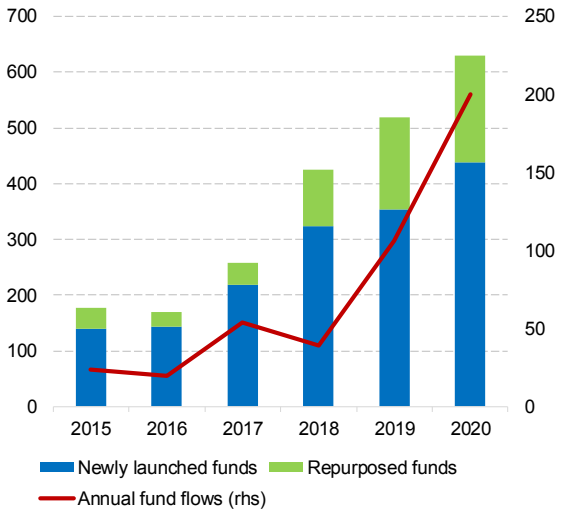
The increasing popularity of sustainable funds has fuelled the launch of new funds and funds that integrate sustainability by changing their mandate to repurpose[70] themselves as sustainable (see Chart 3.2). In 2020, 439 new funds were launched in the EU-27 and 190 funds were repurposed, some of which were also rebranded. Passive funds in this area are gaining significant interest. These funds currently account for around 22% of the European sustainable funds market, while their 2015 market share was only 13%[71].

Chart 3.1: EU and global sustainable fund assets



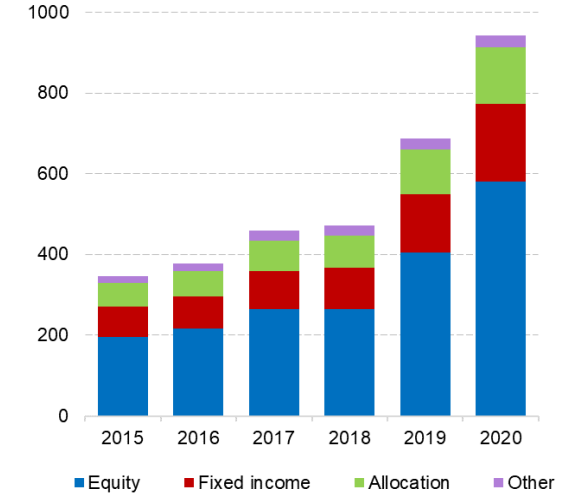
Source: Morningstar. DG FISMA calculations.
Note: Figures in EUR billion (lhs), based on assets under management (AuM) in December of the reported year. Share of EU fund assets to total (rhs).

Chart 3.2: EU sustainable fund flows, new and repurposed funds



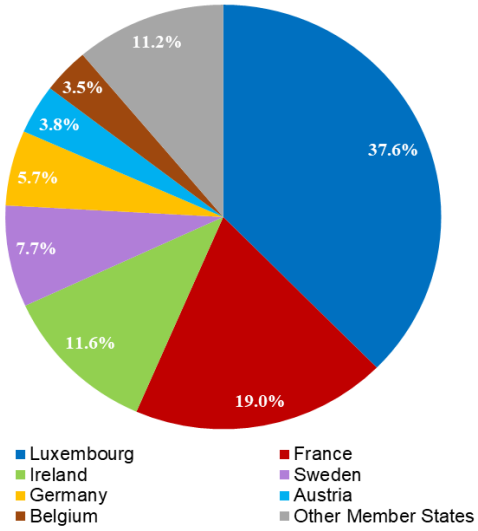
Source: Morningstar. DG FISMA calculations.
Note: Net fund flows (rhs) aggregated per calendar year in EUR billion. Number of funds that are newly launched or repurposed/rebranded based on Morningstar research (lhs).

Chart 3.3: EU sustainable funds by asset type



Source: Morningstar. DG FISMA calculations.
Note: Assets under management (AuM) in EUR billion based on December figures.

Chart 3.4: EU sustainable funds by domicile



Source: Morningstar. DG FISMA calculations.
Note: Figures refer to number of funds based on December 2020 data.

[70] Sometimes the name of the fund is also change to rebrand the fund.
[71] Based on data provided by Morningstar research.

The EU market is characterised by sustainable funds that invest in equity (62% of AuM). Fixed income (20%) and mixed funds (15%) are far less important (see Chart 3.3). They are therefore more equity-focused than conventional funds. Luxembourg is the main sustainable fund domicile (38% of funds), followed by France (19%), Ireland (12%) and Sweden (8%) (see Chart 3.4). About half of the funds (48%) are only sold in their EU domicile, while others are more widely distributed in the EU-27. For instance, 33% of the funds are sold in at least three Member States.

3.1.2 *Green bonds*

Since the European Investment Bank issued the first green bond in 2007, the market has grown significantly. Green bonds combine standard bond characteristics with a commitment to use the proceeds to finance green projects and assets. They are therefore considered important for mobilising private financial resources to achieve a decarbonised and sustainable society[72].

The green bond market is developing from a niche market into a more mainstream one. The market has grown strongly over the past 5 years (see Chart 3.5), although it still represents a small share of the total bond market. Worldwide, the green bond market share stood at 0.4% in 2020. Meanwhile, green bonds reached a 2.6% share in EU issuance in 2020, a significant increase compared with the 0.5% in 2015 (see Chart 3.6)[73]. Green bond issuance in the EU has increased five-fold over the last 5 years. The total green bond market value in 2020 stood at EUR 129 billion in the EU and EUR 253 billion worldwide. Globally, the market cooled off in 2020, while issuance activity in the EU increased[74].

The EU has built up a dominant position in this market. The majority (51%) of global green bond issuance in 2020 took place in the EU, an increase compared with 2019 issuance activity and well above the market share of the US (18%) and China (8%) (see Chart 3.5). The EU market position has increased over time and is now slightly above 2015 figures, while the US market share declined by 8 percentage points. China's share of green bond issuance first skyrocketed from 3% in 2015 to 23% in 2016 before declining over time to 8% in 2020. In 2020, about half (48%) of green bonds in the world were issued in EUR compared with 28% in USD. Within the EU, 83% of bond issuances are in EUR. The share of global issuance denominated in EUR has increased over time (up from 34% in 2015) at the expense of USD issuance, which dropped from 51% in 2015. The EU has further strengthened its position in 2020. While green bond issuance in the EU rose by 21% (to EUR 129 billion[75]) compared to 2019, issuance decreased by 6% outside the EU. Emerging markets especially witnessed a strong reduction in activity.

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[72] See e.g. OECD (2017a), Mobilising bond markets for a low-carbon transition, *Green finance and investment*, OECD Publishing and Sartzetakis (2020).

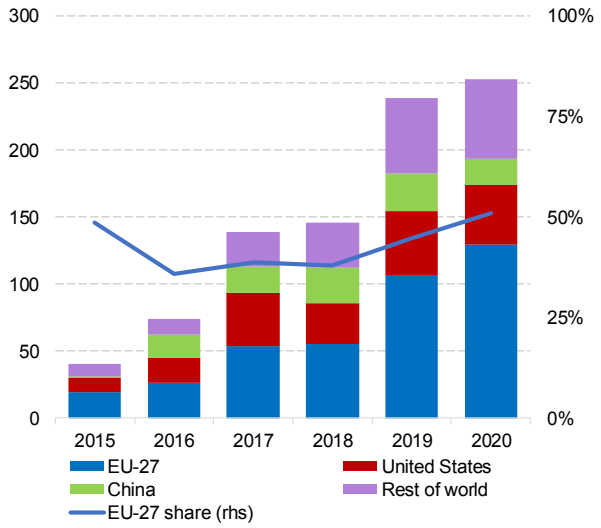
[73] Figures are based on Bloomberg data. Bloomberg defines green bonds as fixed income instruments for which the proceeds will be applied to projects or activities that promote climate change mitigation or adaptation, or other environmental sustainability goals. Bloomberg includes only labelled green bonds in their definition, similarly to the Climate Bonds Initiative. For further details, see Bloomberg (2020), *Guide to green bonds on the Bloomberg terminal*: *Understanding the Bloomberg green bond universe*, December 2020.

[74] Looking forward, analysts expect a strong increase in market activity in 2021. See Nauman, B. (2021), Analysts expect as much as $500bn of green bonds in bumper 2021, *Financial Times*, 4 January 2021.

[75] Based on figures from the Climate Bonds Initiative database, consulted on 8 February 2021. USD figures are converted into EUR based on daily exchange rates from the ECB.

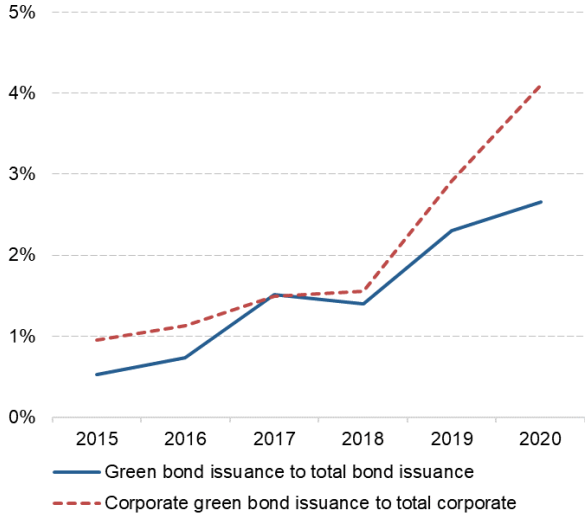
The EU green bond market is not homogenous. There are differences between Member States, and between types of issuers and types of projects financed. Green bond issuers are mainly situated in Germany, France, the Netherlands, Sweden and Spain, which collectively account for 82% of total EU issuance in 2020 (see Chart 3.7). Nevertheless, the use of green bonds has become more widespread over time. In 2020, issuers from 15 Member States issued green bonds, up from eight in 2015.

Chart 3.5: Global green bond issuance



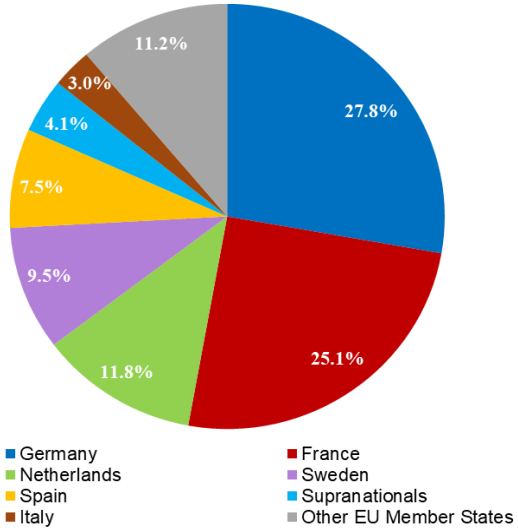
Source: Climate Bonds Initiative. DG FISMA calculations.
Note: Issuance figures in EUR billion (lhs). EU-27 share based on issuance size relative to global issuance (rhs).

Chart 3.6: EU green bond issuance as share of total EU bond issuance



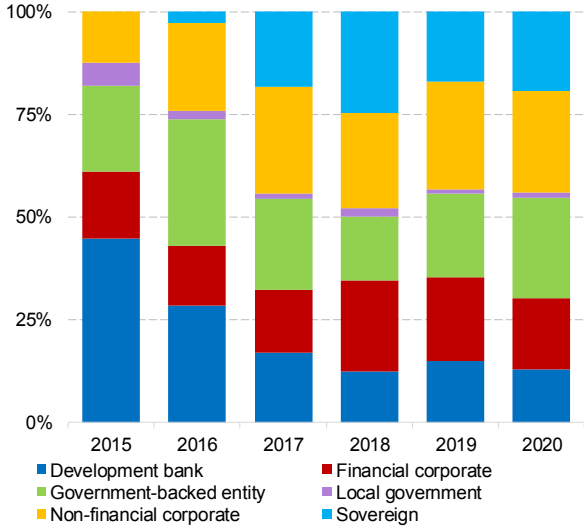
Source: Bloomberg. DG FISMA calculations.
Note: EU share based on EU-27 issuance size in EUR billion.

Chart 3.7: Green bond issuance by Member State



Source: Climate Bonds Initiative. DG FISMA calculations.
Note: Market share is based on issuance size in 2020.

Chart 3.8: EU green bond issuance by issuer type



Source: Climate Bonds Initiative. DG FISMA calculations.
Note: Market share is based on issuance size.

Green bonds in the EU are mainly issued by non-financial companies, which issued 169 green bonds or 36% of total issuance in 2020. 4% of corporate bonds are now issued as green bonds. In terms of value, non-financial companies and government-backed entities accounted for a quarter of total green bond issuance or approximately EUR 32 billion each, followed by

sovereign and sub-sovereign issuers (EUR 27 billion), financial corporations (EUR 22 billion) and development banks (EUR 17 billion) (see Chart 3.8)[76]. Issuance grew the fastest y-o-y for government-backed entities (44%) and sovereign and sub-sovereign issuers (38%), while growth was more muted for non-financial companies (15%) and financial companies (3%). Across the globe, proceeds of green bonds mainly helped finance energy-related projects (34% of issuance in 2020), followed by projects related buildings (27%) and transport (23%). Water and waste accounted for 8% of issuance. Over the last years, the share of transport- and buildings-related use of proceeds has been growing relative to energy-related projects[77].

3.2 Drivers and challenges of sustainable investing

Market developments reflect the actions of investors and issuers with sustainability preferences. In turn, their behaviour is shaped by demand and supply factors, the role of intermediaries and service providers and the prevailing institutional environment. The sustainable investment ecosystem is therefore a natural starting point to explore the drivers and challenges in this market.

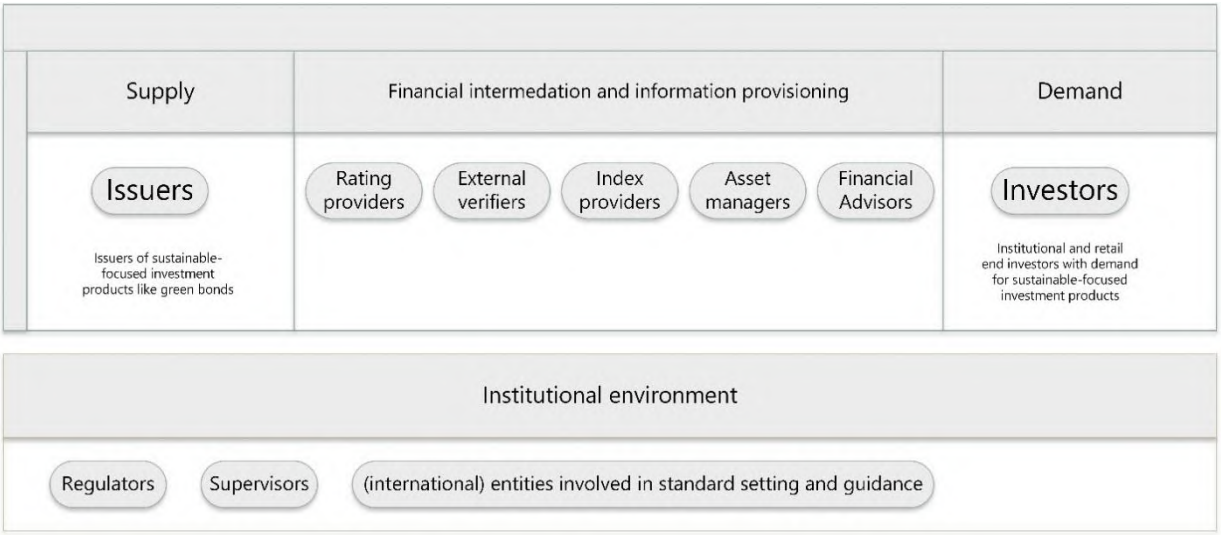
Not surprisingly, the specific ecosystem (see Figure 3.1) contains elements of traditional capital market ecosystems. Over time, the sustainable investment market has however become more complex, with new unique financial products and services often being created to increase transparency in the market (by meeting specific information and data needs) and to respond to growing demand[78]. As a result, specialised service providers, such as ESG rating providers and index providers, are now part of the ecosystem. In addition, asset managers offer sustainable investment products such as sustainable investment funds. Finally, regulators together with (international) framework providers and standard setters have stepped up efforts to increase transparency and tackle undue risks while at the same time enabling market developments. The actions of each actor in the ecosystem affects market developments directly or indirectly. The remainder of this section reviews the main drivers and challenges.

[76] Issuance by non-financial companies includes issuance by non-financial companies that was categorised as 'other debt instrument' in the Climate Bonds Initiative database; issue by government-backed entities includes some companies that are partially government-owned (such as EDF and Orsted); financial corporations; issuance by financial corporations includes asset-backed security (ABS) issuance by financial companies.

[77] For instance, based on Climate Bonds Initiative data, use of proceeds related to energy accounted for 53% of green bonds issued globally in 2015, while buildings accounted for 16% and transport for 14%. See https://data-platform.climatebonds.net/.

[78] See OECD (2020b), *OECD business and finance outlook 2020 sustainable and resilient finance: Sustainable and resilient finance*, OECD Publishing.

Figure 3.1: Ecosystem of sustainable finance investments



Source: DG FISMA. Adapted from OECD (2020b), OECD business and finance outlook 2020 sustainable and resilient finance: Sustainable and resilient finance, OECD Publishing.

3.2.1 *Drivers*

The increasing demand for sustainable investment products reflects investors' non-financial investment preferences and beliefs about the performance, risk and resilience of such investments. The market growth is further fuelled by supply-side and institutional factors like the regulatory environment.

Retail investors may increasingly seek sustainable investment products to better align their investment portfolio with their personal and societal values[79]. Such preferences are also visible beyond the individual level. For instance, the majority of millennial investors indicate that they are interested in investing sustainably. Millennials are reported to be twice as likely as traditional investors to invest in companies that incorporate sustainability (ESG) practices[80]. Although such sustainability considerations are not new in the asset management industry, they are becoming increasingly mainstream[81], fuelled by the need to act now on environmental challenges and the growing attention to governance and social concerns[82].

An important, but still not fully settled issue is whether, on average, sustainable investments have lower or higher returns than conventional ones. Overall, the scientific evidence on whether sustainable investments over- or underperform is mixed, showing little signs of a

[79] In line with this, 95% of individuals that participated in the 2020 public consultation on renewed sustainable finance strategy indicated that - provided the product suits their other needs - they would like to be systematically offered sustainable investment products as a default option by their financial adviser. Results should be interpreted with caution as the survey could be subject to selection bias. See https://ec.europa.eu/info/consultations/finance-2020-sustainable-finance-strategy_en.

[80] See Morgan Stanley Institute for Sustainable Investing (2019), *Sustainable signals- The individual investor perspective*; Seelan (2019).

[81] Martin, M., ESG: a trend we can't afford to ignore, *Financial Times*, 26 November 2020.

[82] See, among others, Chapter 5 Investing in SDGs in UNCTAD (2020), *World Investment Report 2020: International production beyond the pandemic*, United Nations Conference on Trade and Development; or Principles of Responsible Investing (PRI) (2020), *Investing with SDG outcomes: A five-part framework*.

consistent premium or discount for green bonds[83] (compared to conventional bonds) or the over performance of sustainable funds[84]. For instance, Flammer (2021) reports no pricing differential for corporate green bonds, while others[85] do. Earlier mutual fund studies conclude that many socially responsible funds underperform compared with their conventional benchmarks[86]. However, most studies find the performance of socially responsible funds to be comparable with that of conventional mutual funds[87].

Two other factors can support market growth. First, products branded as sustainable are more noticeable or salient[88] for investors. For instance, funds categorised as 'highly sustainable' tend to be more popular and attract additional inflows[89]. Recent preliminary evidence shows that equity funds that adopted ESG strategies attracted five times more net flow in the 10 months after conversion than in the 10 months before[90]. This effect incentivises investment product providers to offer such products. A private sector global survey revealed that in Europe the perception that society expects market actors to focus on the environment and society is the highest (63% of European respondents compared with a global average of 48%)[91].

Finally, regulatory and other institutional factors impact market developments[92]. 58% of European asset managers and other investors that participated in a recent private sector survey reported that regulatory pressure is a driver of sustainable finance developments[93]. This is not surprising since there has been a continued acceleration of sustainability-related policy interventions, also at EU level (see e.g. Box 2). This trend is also noticeable internationally[94]: a review of global responsible investment regulation across 50 countries showed that by 2019 over 730 hard and soft-law policy interventions which support, encourage or require investors to consider long-term value drivers, including ESG factors, had been put in place. The pace at

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[83] See e.g. Flammer (2021) for a discussion. See also, Fatica et al. (2021) who suggest that the lack of consensus may be related to the heterogeneity of issuers. They find a negative yield premium for green bonds issued by supranational institutions and non-financial corporates, and no price differences for green securities issued by financial institutions, all other factors equal.

[84] See Junkus and Berry (2015); OECD (2020b), *OECD business and finance outlook 2020 sustainable and resilient finance: Sustainable and resilient finance*, OECD Publishing; Friede, *et al.* (2015). The evaluation of sustainable investment faces some general and specific methodological challenges. There is a lack of consistency in the applied sustainability metrics. OECD (2020b) indicates that loosely defined sustainability metrics might explain superior returns reported in market research. There is also a wide variety of practices to integrate sustainability concerns into the investment decision, and the performance effect depends on the practice used, making it difficult to draw aggregate conclusions. The relationship also depends on the state of the economy and funds that rebalance portfolios over time might increase the dynamic nature of the relationship. Finally, the performance evaluation of sustainable investments faces the same issues as traditional performance analyses, with results depending on model specification, benchmark selection and sample characteristics (time, countries). Note that at firm level, results regarding the relationship between corporate social/environmental performance and corporate financial performance are more positive. See e.g. Orlitzky, *et al.* (2003); Friede, *et al.* (2015).

[85] See Gianfrate and Peri (2019); Fatica and Panzica (2021).

[86] See e.g. Renneboog, *et al.* (2008).

[87] See Junkus and Berry (2015). See also Derwall, *et al.* (2011); Rathner (2013); Friede, *et al.* (2015); OECD (2020b), *OECD business and finance outlook 2020 sustainable and resilient finance: Sustainable and resilient finance*, OECD Publishing.

[88] The salience and availability effects refers to the fact that people favour information that stands out or is mentioned often. The salience effect has a significant effect on investment decisions. See e.g. Yalcin, *et al.* (2016); Kaniel and Parham (2017); Chaudary (2019).

[89] See Hartzmark and Sussman (2019); Durán-Santomil, *et al.* (2019); ESMA (2021), *ESMA report on trends, risks and vulnerabilities* 1, March 2021.

[90] ESMA (2021), *ESMA report on trends, risks and vulnerabilities* 1, March 2021.

[91] HSBC (2019), *Sustainable financing and investing survey 2019*, September 2019.

[92] See, among others, Bengtsson (2008b); Bengtsson (2008a); Scholtens and Sievänen (2013).

[93] The global average is 58%. See HSBC (2019), *Sustainable financing and investing survey 2019*, September 2019.

[94] For further details, see PRI responsible investment regulation database, https://www.unpri.org/policy/regulation-database, consulted on 1 February 2021.

which new initiatives are taken has also accelerated over time. These developments can support market growth. Over time, a more mature sustainable investment market (with more available sustainable investment products and active financial intermediaries) together with financial innovation could itself contribute to sustaining market growth.

3.2.2 *Challenges*

Despite the strong growth in the sustainable investment market, significant challenges remain. These challenges relate mostly to information (availability, consistency, comparability, accuracy and clarity) as well as regulatory changes and uncertainty about the exact magnitude and local impact of future environmental changes. As a result, market participants may lack the necessary information to make well-informed decisions, and market efficiency and integrity is not as high as it could be. The effectiveness and impact of sustainable investment on the economy also remains to be evaluated.

The lack of transparency and comparability of information in the sustainable investment market is a key concern and stems from different sources. First, market participants still cannot all rely on a common definition of what a sustainable investment really is, as the EU taxonomy has not entered into application yet[95]. Second, industry-based methodologies to assess the level of sustainability of investment products and firms are inconsistent. This becomes clear when looking at ESG ratings. Although investors and asset management companies often rely on them, ratings from different rating agencies do not match[96]. Third, sustainability-related disclosures, for instance at firm level, are not readily available and transparent for end-investors. Fourth, inconsistent or inadequate firm-level sustainability data put further strains on the market[97]. Taken together, these shortcomings hinder market integration and increase search costs for investors[98]. They could also lead to greenwashing practices and are a source of reputational risk.

More fundamentally, the above-mentioned barriers could curtail the extent to which sustainable investment through public markets can help 'green' the real economy. For funds, the question remains as to what extent the invested money supports sustainable activities at firm level. Also, the investment gap will only be closed or reduced by real additional inflows. For instance, the rebranding of funds might overstate the contribution to reducing the investment gap[99]. Without

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[95] There might also be ambiguity at the lower end of the sustainable investment space if no minimum thresholds are set for a product to be considered a sustainable investment product.

[96] A recent study prepared for the European Commission reveals that the correlation of ratings across the four major ESG data providers is low (0.48) and the process to arrive at sustainability ratings is opaque. In addition, it is not straightforward to gauge the effect on the real economy as the relationship between environmental scores ('E') and carbon emission exposures is highly variable within and between ratings, with in some cases high environmental scores being correlated positively with high carbon emissions. For further details, see Environmental Resouces Management (ERM) (2021), *Study on sustainability-related ratings, data and research* and OECD (2020b), *OECD business and finance outlook 2020 sustainable and resilient finance: Sustainable and resilient finance*, OECD Publishing. For a further discussion on the market for ESG ratings, see the chapter ESG ratings: Status and key issues ahead, in ESMA (2021), *ESMA report on trends, risks and vulnerabilities* 1, March 2021.

[97] For instance, OECD (2020b) reports that, based on Refinitiv ESG data, only around 10% of firms in the EU have ESG coverage. In addition, firm-level sustainability data is not standardised.

[98] A private sector survey reveals that 72% of investors are confused by the language of sustainable investing and less than half are very familiar with the term itself.

[99] For instance, if the fund only dropped a few firms from its portfolio as a result of additional screening criteria (or was already investing sustainably), the net positive contribution to further greening would be very limited, while the full amount of assets under management would show up in sustainable investment statistics. In 2015, there were 38

minimum thresholds for sustainable investment products the extent to which they contribute to financing sustainable activities differ. Results from corporate green bond issues are also mixed, but there are encouraging research findings showing that firms issuing green bonds improve their environmental ratings and lower their CO_2 emissions post-issuance, consistent with the idea that firms use green bond issuance to signal their commitment to protecting the environment[100].

The transparency of the sustainable investment market and the credibility of sustainable investment products are essential to build trust, facilitate the comparison of sustainable investment products, ensure market integrity, support demand and facilitate the integration of sustainability concerns in the asset allocation and risk management practices of market participants[101]. Therefore, many recent EU initiatives and other international standard setting initiates aim to address information-related concerns in this market. The current EU initiatives (see Box 2) are important milestones in increasing transparency in the market and improving the availability of comparable sustainability information for investors and market participants. In particular, the EU taxonomy aims to provide a common language to identify which economic activities can be considered to be environmentally sustainable. Other initiatives aim to further improve sustainability-related disclosures in order to increase the availability, consistency and comparability of sustainability information and strengthen the effectiveness of sustainability-related disclosure at the point of sale of investment products. Transparency and increased comparability of sustainable investment products are also at the heart of the ongoing work on the green bond standard and ecolabel for the investment fund industry. More broadly, further international convergence and the development of globally accepted standards would facilitate the identification of sustainable investment and the integration of sustainability concerns into portfolio management. Well-designed regulatory actions can help address information-related concerns in this market, considering also the costs of regulation and the need to provide regulatory certainty.

In sum, sustainable investment has become increasingly mainstream, which is a welcome complement to the public financing of the transition towards a more sustainable society. The strong growth however does not imply that this market segment is mature. Many financial market products are currently not taxonomy aligned[102], but the share is expected to increase in the future. The strong demand for sustainable financial instruments may for example also put stress on the availability of eligible assets and prices[103]. There is therefore a need to monitor progress on the issues discussed above and general market conditions.

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repurposed/rebranded sustainable funds compared with 139 newly launched funds, while in 2020 this number has grown to 190 compared with 439 newly launched funds.

[100] Supportive evidence is provided in Flammer (2021) and Fatica and Panzica (2021). For instance, the latter show that corporate green bonds that are not issued for refinancing purposes are associated with a marked and significant reduction in CO_2 emissions. Ehlers, *et al.* (2020), however, do not find evidence that at firm level green bond projects have necessarily translated into comparatively low or persistently falling carbon emissions.

[101] Verougstraete, M. and Spiegel, S. (2020), How can investors move from greenwashing to SDG-enabling?, *UN Department of Economic and Social Affairs (DESA) Policy Briefs* 77, June 2020.

[102] Available estimates indicate that only 1% of European financial markets might be aligned with the Taxonomy criteria for climate change mitigation. See Alessi, L., Battiston, S., Melo, A.S. and Roncoroni, A. (2019), The EU sustainability taxonomy: a financial impact assessment, *Joint Research Centre Technical Report*.

[103] For instance, if investors prefer to concentrate their investment in a limited pool of sustainable assets (for instance, those assets of firms that disclose certain sustainability information).

Box 2: Overview of EU measures to increase transparency in the sustainable investment market

The **EU taxonomy**[104] is a robust, science-based[105] classification system and transparency tool for companies and investors. It introduces clear performance criteria for determining which economic activities make a substantial contribution to EU climate and environmental objectives[106]. The EU taxonomy creates a common language for businesses and investors, allowing them to communicate about green activities with increased credibility.

From 2022, undertakings subject to the Non-Financial Reporting Directive (NFRD) must disclose certain indicators that show the extent to which their activities are environmentally sustainable as defined by the taxonomy. Providers of investment products marketed as sustainable will be obliged to disclose their EU taxonomy alignment, once relevant rules become applicable. It must also be used by Member States and the EU when setting out labels for financial products or corporate bonds that claim to be environmentally sustainable. This classification system can also be used on a voluntary basis by any other market actors.

The EU taxonomy is dynamic and will evolve over time. A permanent expert group, the platform on sustainable finance (PSF)[107], was set up to advise the European Commission on developing the EU taxonomy. This includes advising on the technical screening criteria and their usability, exploring extensions (including social objectives), monitoring and reporting on capital flows towards sustainable investments and advising on broader sustainable finance policy.

In April 2021, the Commission published a package on sustainable finance[108] which included the first EU taxonomy delegated act, a proposal for a Corporate Sustainability Reporting Directive (CSRD) and six amending Delegated Acts on fiduciary duties, and sustainability preferences as part of investment and insurance advice. The Commission also published an accompanying Communication[109].

Non-Financial Reporting Directive review. Since 2018, the NFRD[110] has required large listed companies, banks and insurance companies with more than 500 employees to disclose certain non-financial information on their environmental and social impacts. In April 2021 the Commission put forward a legislative proposal for a Corporate Sustainability Reporting Directive (CSRD), to revise and strengthen the provisions introduced by the NFRD and increase the

[104] Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, 22 June 2020. See also, Communication from the Commission, Taxonomy, corporate sustainability reporting, sustainability preferences and fiduciary duties: Directing finance towards the European Green Deal, COM(2021) 188 final of 21 April 2021.

[105] Preparatory work of the high-level expert group on sustainable finance (HLEG) and the technical expert group on sustainable finance (TEG) informed the development of the EU taxonomy. Member States have been involved via the dedicated Member States expert group on sustainable finance (MSEG). In 2020, the TEG was replaced by the platform on sustainable finance (PSF). For further information, see https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en.

[106] The Taxonomy Regulation establishes six environmental objectives: climate change mitigation; climate change adaptation; the sustainable use and protection of water and marine resources; the transition to a circular economy; pollution prevention and control; and the protection and restoration of biodiversity and ecosystems. An economic activity is taxonomy-aligned if the activity makes a substantial contribution to a given environmental objective; does not significantly harm the other objectives; complies with minimum social and governance safeguards; and with scientific-based technical screening criteria.

[107] https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/overview-sustainable-finance/platform-sustainable-finance_en

[108] https://ec.europa.eu/commission/presscorner/detail/en/IP_21_1804

[109] Communication from the Commission, Taxonomy, corporate sustainability reporting, sustainability preferences and fiduciary duties: directing finance towards the European Green Deal, COM(2021) 188 final of 21 April 2021.

[110] https://ec.europa.eu/info/business-economy-euro/company-reporting-and-auditing/company-reporting/non-financial-reporting_en

relevance, comparability and reliability of reported information. The Commission's proposal expands the scope of companies subject to the reporting requirements, introduces an assurance requirement for reported information, and requires companies under its scope to report according to common EU sustainability reporting standards.

These standards will be developed to ensure consistency with global efforts to harmonise sustainability reporting, including on climate-related risks. The proposal will include proportionate standards for SMEs, which would be mandatory for small and medium sized companies listed on EU regulated markets, and voluntary for all other SMEs.

European green bond standard. The European Commission plans to adopt a legislative proposal for a voluntary standard in 2021. The proposal aims to provide a standard that facilitates the issuance of high-quality green bonds and seeks to address certain shortcomings in existing market standards, in particular:[111]

- the lack of a common definition of 'green';
- fragmented approaches to external review procedures and reporting; and
- potential conflicts of interest of external reviewers and related risks to market integrity (which might especially arise when other ancillary services are offered).

This standard will closely build on current best market practices and the recommendations of the Commission's technical expert group on sustainable finance (TEG). It will offer an alternative standard that provides a clear and standardised definition of 'green' (as per the EU taxonomy) and common transparency and reporting requirements.

Ecolabel. To further help investors make more informed sustainable investment choices, the European Commission decided to expand the EU ecolabel framework to cover sustainable financial products[112] where they can be considered as services for distribution or use to retail clients.

Disclosure Regulation. The EU Regulation on sustainability-related disclosures in the financial services sector (SFDR)[113] requires manufacturers of financial products (large institutional investors, such as asset managers, insurance companies or pension funds) and financial advisers to disclose relevant sustainability-related information to end-investors in order to improve the comparability of sustainable investment products. The Regulation also includes disclosure obligations regarding adverse impacts on sustainability matters.

Benchmarks. Since the end of 2020, benchmarks used in the EU must be accompanied with an explanation of how they reflect ESG factors in their methodology[114]. In this area, the EU has also sets out minimum criteria for new types of EU climate benchmarks.

[111] Following internal Commission analysis and input from technical experts and industry stakeholders. The Commission started assessing the potential merits of an EU green bond standard under the 2018 action plan.

[112] https://susproc.jrc.ec.europa.eu/product-bureau//product-groups/432/home; https://susproc.jrc.ec.europa.eu/product-bureau//product-groups/432/documents

[113] Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability- related disclosures in the financial services sector.

[114] Regulation (EU) 2019/2089 of the European Parliament and of the Council of 27 November 2019 amending Regulation (EU) 2016/1011 as regards EU climate transition benchmarks, EU Paris-aligned benchmarks and sustainability-related disclosures for benchmarks.

3.3 The role of sustainable bonds and funds in financing the post-COVID-19 recovery

The pandemic does not change the need to act urgently and vigorously on climate change and sustainability[115]. The COVID-19 outbreak is not only an almost unprecedented health crisis, it also is a severe shock for global and EU economies, disrupting economic activity and lowering employment (see Chapter 1). Despite the swift and comprehensive policy response[116] at EU and national levels, the pandemic has a widespread and ongoing impact on societies. This goes beyond the economic impact and also affects other sustainable development goals[117]. In terms of climate impact, the pandemic has only resulted in a short-term reduction of emissions but no significant long-term effects are expected[118]. Finally, large-scale recovery measures will influence societies and sustainability levels beyond the short term.

Focusing on sustainability aspects when designing recovery measures is therefore crucial[119]. The large recovery packages[120] that are being introduced to contain the effects of the pandemic and to relaunch the economy create an opportunity to green the economy and fight climate change. An analysis of over 30 countries worldwide conducted in August 2020 concluded that most governments have included green recovery measures (often in the energy and transport sectors) in their response plans, but many of them have also included measures that have a direct or indirect negative impact on sustainability outcomes[121].

Early crisis-fighting measures that aim to provide general relief to affected households and corporates might present fewer opportunities to incorporate sustainability concerns and transformational changes into policy responses. Conversely, policymakers can more easily do so in recovery measures that take effect over longer periods of time[122]. Not doing so will certainly increase the cost for future generations[123].

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[115] A growing body of scientific research also suggest that environmental degradation increases the likelihood that infectious diseases spreading from animals to humans. For further details, see e.g. United Nations Environment Programme (UNEP) (2020*), Preventing the next pandemic*, 23 October 2020; or Settele, J., Diaz, S., Brondizio E., and Daszak, P., *COVID-19 stimulus measures must save lives, protect livelihoods, and safeguard nature to reduce the risk of future pandemics*, 27 April 2020.

[116] https://recovery.smithschool.ox.ac.uk/tracking/

[117] See OECD (2020c), *Global outlook on financing for sustainable development 2021: A new way to invest for people and planet*, OECD Publishing. For further details on sustainable developing goals (SDG), see https://sdgs.un.org/goals.

[118] See United Nations Environment Programme (UNEP) (2020), *Emissions gap report* 2020, 9 December 2020; IMF (2020), Greening the Recovery, *IMF Special Series on Fiscal Policies to Respond to COVID-19*, April 2020.

[119] See, among others, von der Leyen, U. (2020), State of the Union Address 2020, European Parliament Plenary, 16 September 2020; International Monetary Fund (IMF) (2020), Greening the Recovery, *IMF Special Series on Fiscal Policies to Respond to COVID-19*, April 2020; European Investment Bank (2021), *EIB investment report 2020-2021: Building a smart and green Europe in the COVID-19 era*, 21 January 2021; Engström *et al.* (2020); OECD (2020a), Making the green recovery work for jobs, income and growth, *OECD Policy Responses to Coronavirus (COVID-19)*, 6 October 2020.

[120] As of January 2021, global fiscal support reached nearly USD 14 trillion. For details, see International Monetary Fund (IMF) (2021), Government support is vital as countries race to vaccinate, *Fiscal Monitor Update*, January 2021. For an overview of fiscal measures in response to the COVID-19 pandemic in the world, see https://www.imf.org/en/Topics/imf-and-COVID-19 /Fiscal-Policies-Database-in-Response-to-COVID-19.

[121] More specifically, at least 30 OECD and key partner countries (Brazil, China, India, Indonesia, and South Africa) included positive measures, while 24 included negative measures. For details, see OECD (2020a), Making the green recovery work for jobs, income and growth, *OECD Policy Responses to Coronavirus (COVID-19)*, 6 October 2020.

[122] See also IMF (2020), Greening the recovery, *IMF Special Series on Fiscal Policies to Respond to COVID-19*, April 2020.

[123] It can for instance result in longer-term economic costs, both in terms of stranded assets, and increased costs associated with climate or other environmental impacts. Buckle, S., Ellis, J., Jaber, A.A., Rocha, M., Anderson, B. and Bjersér, P. (2020), Addressing the COVID-19 and climate crises: Potential economic recovery pathways and their implications for climate change mitigation, NDCS and broader socio-economic goals. *OECD climate change expert group paper* 4, December 2020.

Apart from consciously selecting recovery measures that integrate sustainability concerns, the question arises as to what role market-based financing can play in achieving a sustainable recovery.

A first general observation is that the COVID-19 crisis demonstrates that further developing private risk-sharing mechanisms in order to smooth out shocks is valuable. Some have pointed to the need for risk-sharing to respond adequately to asymmetric shocks, while others stress the need for private risk-sharing to complement public-sector efforts, or argue that more risk-bearing funding is needed to boost financial-sector resilience[124]. The capital markets recovery package[125] tries to accommodate some of these concerns[126], and progress on the Capital Markets Union is an important next step. Increased private risk-sharing is part of a wider call to boost financial-system resilience and to make capital markets more dynamic so they can better withstand external shocks such as pandemics or climate change.

In addition, it is important to further reorient finance for sustainable investment in order to support a green recovery. In this respect, its challenges (see Section 3.2.2) must be addressed, to ensure that flows in sustainable investment products contribute more to greening the real economy. The renewed sustainable finance strategy that is currently being developed[127], considers these challenges. The strategy builds on earlier work by the Commission in this area[128] and aims to further mainstream sustainability into the financial and corporate sector to facilitate a green and equitable recovery and foster long-term sustainability.

Overall, the low-for-longer interest rate environment creates an opportunity for funding more long-term sustainable investment opportunities. Indeed, bonds, and notably green bonds, have been identified as a relevant source to finance the recovery[129]. In line with the ambition to drive a sustainable and transformational recovery, President von der Leyen announced in her State of the Union speech that 30% of the EUR 750 billion NextGenerationEU fund will be raised through green bonds[130].

While green bonds has been the most popular sustainable bond market instrument (see Section 3.1), the pandemic also triggered an unprecedented growth in other bond issuance like social bonds and sustainability bonds[131]. Social bonds were issued 13 times[132] more often in 2020

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[124] See Camous and Claeys (2020); Knot, K. (2020), *Europe recovery fund needs to be temporary*, 3 November 2020, https://www.reuters.com/article/uk-ecb-policy-knot-idUKKBN27J0UV. See also Bats, J., A. Houben and D. Schoenmaker (2020). *Boosting the resilience of Europe's financial system in the coronavirus crisis*, Bruegel Blog, 17 July 2020, https://www.bruegel.org/2020/07/boosting-the-resilience-of-europes-financial-system-in-the-coronavirus-crisis/.

[125] https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1382

[126] More specifically, it contains targeted amendments to securitisation rules that aim to enable banks to expand their lending and to free their balance sheets of non-performing exposures.

[127] The strategy was announced as part of the 2019 European Green Deal that significantly increased the EU's ambition on climate action and environmental policy and, in turn, the investment efforts to finance the transition. See Communication from the Commission, The European Green Deal, COM(2019) 640 final of 11 December 2019.

[128] Communication from the Commission, Action plan: financing sustainable growth, COM(2018) 097 final of 8 March 2018.

[129] See Nauman, B. (2021), Analysts expect as much as $500bn of green bonds in bumper 2021, *Financial Times*, 4 January 2021.

[130] See von der Leyen, EU. (2020), State of the Union Address 2020, European Parliament Plenary, 16 September 2020.

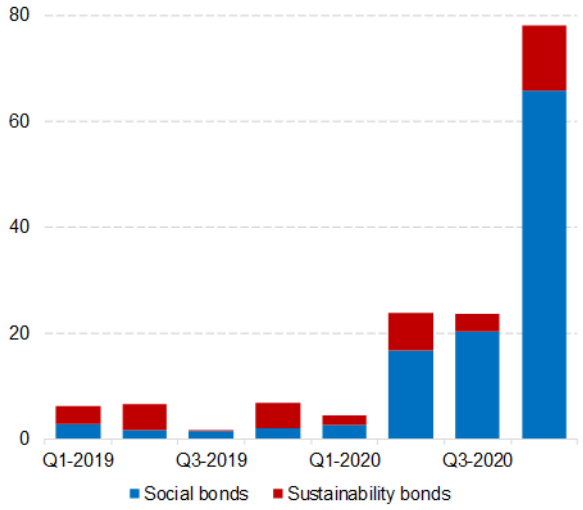
[131] Social bonds are bonds that finance or re-finance elible social projects. Sustainability bonds finance projects with both social and environmental benefits. For further details, see e.g. https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/Sustainability-Bonds-Guidelines-June-2018-270520.pdf. The strong growth of such bonds is also noticeable internationally. See e.g. UNCTAD (2020), *World investment report 2020: International production beyond the pandemic*, United Nations.

[132] Figures are based on Bloomberg data.

than in 2019 as COVID-19 shifted issuer's attention to social issues[133]. Sustainability bond issuance more than doubled in 2020 to EUR 24 billion, although they remain relatively less important. Most of the issues are likely to be one-time issuances in response to the crisis, so current growth rates might revert back to pre-crisis levels instead of signalling permanent changes in these market segments.

The EU was responsible for a significant part of the issuance activity. The European Commission issued social bonds via the EU support to mitigate unemployment risks in an emergency (SURE) framework[134]. Between October and November 2020, three SURE bonds were issued that allowed 15 Member States to receive nearly EUR 40 billion in back-to-back loans. Between January and March 2021, the Commission issued an additional EUR 36 billion under the SURE framework[135]. Overall, the social bond issues generated significant interest from investors[136].

Chart 3.9: EU social and sustainability bond issuance



Source: Bloomberg.
Note: Figures are in EUR billion. Quarterly data.

Apart from the ability to raise new funding, sustainable investments will help to smooth shocks if they are more crisis-resilient than traditional investments. There are a number of factors that can help explain why sustainable investments could be more crisis-resilient. Sustainable investors are less likely to sell off their investments during crisis periods because they also have non-financial motives[137] (see Section 3.2) and might have longer investment horizons. As a result, their investment decisions are less sensitive to negative financial performance in crisis times[138]. To gain further insight, it is necessary to go beyond the general evidence on the performance of sustainable funds discussed in Section 3.2 and examine how they perform during times of crisis. Indeed, earlier research suggests that sustainable funds outperform or match the performance of conventional funds in crisis times, but underperform in normal times,[139] indicating that crisis resilience may come at a

[133] Social bond issuance in 2020 was EUR 105 billion. Before the pandemic, social bond issuance activity grew strongly (approximately 74% per year), but well below the exceptional rate observed in 2020.

[134] This was split into several issuances of which the first took place on 20 October. Two bonds were issued, one with EUR 10 billion due for repayment in October 2030 and another with EUR 7 billion due for repayment in 2040. Both of which were more than 13 times oversubscribed, resulting in favourable pricing terms. This was followed by further issuances on 10 November and 25 November 2020.
See https://ec.europa.eu/commission/presscorner/detail/en/IP_20_2196. For further details regarding the SURE framework, see https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/financial-assistance-eu/funding-mechanisms-and-facilities/sure_en.

[135] Besides the initiatives from the European Commission, also supranational banks like the European Investment Bank and national development banks have issued such specific bonds following the COVID-19 outbreak.

[136] Besides the initiatives from the European Commission, also supranational banks like the European Investment Bank and national development banks have issued such specific bonds following the COVID-19 outbreak.

[137] In line with this, results in Alessi *et al.* (2021) suggest that investors that buy European stocks of greener and more transparent firms are willing to accept lower returns.

[138] Several studies find that investors are willing to sacrifice return in order to invest in accordance with their sustainability preferences (see e.g. Riedl and Smeets (2017); Rossi, *et al.* (2019)).

[139] See Nofsinger and Varma (2014); Leite and Cortez (2015).

cost in terms of underperformance in normal times. Second, retail investors appear to be less sensitive to performance considerations than institutional investors and asset managers, suggesting that the reaction of retail investors in crisis times might differ[140]. Professional investors increasingly recognise that sustainability risks can have a material impact on risk-adjusted returns and long-term value creation[141]. Thirdly, fund characteristics matter. Research shows that the type of screens used by funds or how sustainable funds are (as measured by sustainability ratings) are relevant criteria for explaining the performance in crisis and non-crisis times[142].

Sustainable investors hold portfolios with different characteristics than traditional portfolios and investors may believe that the industry allocation or firm selection of their underlying portfolio limits downside risk in crisis periods[143]. An analysis of euro-area ESG funds during the COVID-19 crisis shows that these funds were less exposed to underperforming sectors like energy - which suffered from declining oil prices - and overexposed to well-performing sectors like information and communication technologies (ICT) (see Chart 3.10)[144].

At firm-level, evidence from the 2008 financial crisis demonstrates that firms with higher environmental and social scores perform better,[145] a result which is confirmed by preliminary findings for this crisis[146].

Previous research shows that, compared to non-ESG funds, flows into ESG funds are less sensitive to negative returns[147]. Sustainable funds also remained popular during the pandemic[148], although preliminary results suggest that retail and institutional investors had different appetites[149]. Overall, these results show that further detailed analyses would be welcome to disentangle aggregate effects and provide more insights into changes in sustainability preferences.

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[140] In the 2016 public consultation on long-term and sustainable investment of the European Commission, risk management purposes was indicated as the main reason to consider ESG risks. https://ec.europa.eu/information_society/newsroom/image/document/201644/feedback_final_pc_30068_en_19173.pdf See e.g. private-sector surveys. Improvement of long-term returns was indicated as the main driver for ESG integration in the 2019 BNP survey. See BNP (2019), *The ESG global survey 2019*.

[141] See e.g. OECD (2020b), *OECD business and finance outlook 2020 sustainable and resilient finance: Sustainable and resilient finance*, OECD Publishing. The risk materiality, in turn, explains the attention devoted to integrating sustainability considerations into the investment process for risk management purposes or other duties. For further details, see also Mugnier, E., Delerable, C., Tan, A. and Hélouin, A. (2014), *Resource efficiency and fiduciary duties of investors* on fiduciary duty and Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability- related disclosures in the financial services sector, 9 December 2019 on disclosure obligations.

[142] See e.g. Ilhan, *et al.* (2021), Nofsinger and Varma (2014), Ilhan, *et al.* (2021), or Döttling and Kim (2020), Sustainability preferences under stress: Evidence from mutual fund flows during COVID-19, *Working Paper*, September 2020.

[143] More generally, Albuquerque, *et al.* (2019) argue that if sustainable firms have more loyal customers, the demand for the products is less price-elastic. This customer resilience would then reduce the firms' exposure to systematic risk. See also Ilhan, *et al.* (2021).

[144] See also ESMA (2021), *ESMA report on trends, risks and vulnerabilities* 2, September 2020.

[145] See Lins, *et al.* (2017).

[146] Recent research finds that that firms in the United States with a high environmental and social rating had significantly higher returns in Q1 2020. See Albuquerque, R.A., Koskinen, Y., Yang, S. and Zhang, C. (2020), Love in the time of COVID-19: The resiliency of environmental and social stocks, CEPR Discussion Papers 14661.

[147] See Bollen (2007); Renneboog, *et al.* (2008).

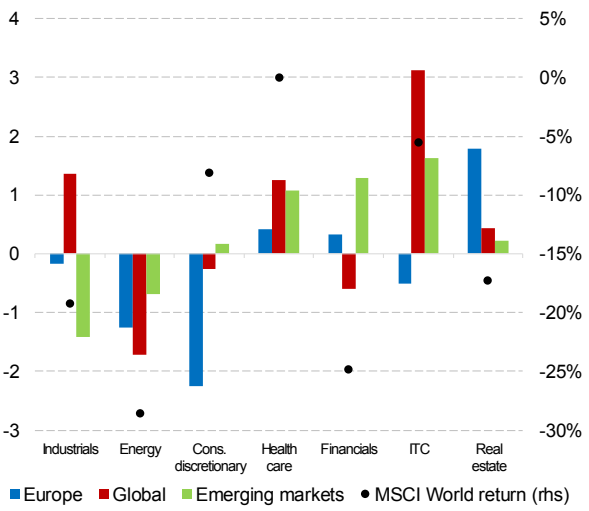
[148] In the first half of 2020 ESG equity funds in the EU attracted net inflows compared with large net outflows for other equity funds. For details, see ESMA (2020), *ESMA report on trends, risks and vulnerabilities* 2, September 2020.

[149] With positive flow being attributable to investments by institutional investors, while retail investors' preferences shifted away from sustainable investments in times of economic distress. See Döttling, R. and Kim, S. (2020), Sustainability preferences under stress: Evidence from mutual fund flows during COVID-19, *Working Paper*, September 2020.

Other sustainable investments also show signs of crisis resilience. Euro-area investors increased their holdings of green bonds in Q1 2020 to EUR 197 billion[150]. In addition, a recent study that analysed 6 700 firms across 61 economies concluded that firms that engaged in more corporate socially responsible activities prior to the pandemic were more resilient in the sense that their stock performed better in response to the pandemic[151].

In general, the analysis in this section reveals that market-based sustainable investments are relevant during the recovery phase and can help align climate and wider sustainability concerns. The demand for such products is encouraging, although also fuelled by the low-for-longer interest rate environment.

Chart 3.10: Difference in sectoral exposure of sustainable and conventional funds



Source: Belloni, *et al.* (2020).
Note: The bars represent the difference in sectoral exposure of ESG and non-ESG equity funds in Q1 2020. Share of total equity and percentage points.

3.4 Conclusion

The transition towards a more sustainable society requires significant investment that goes beyond the public sector capacity. Financial markets can help by attracting investors that invest sustainably, foster risk-sharing and help price climate and sustainability risks.

The growing popularity of sustainable funds and green bonds shows that sustainable investments have become more mainstream, although the relative fund and bond market shares remain limited.

Market developments are driven by investors' non-financial investment preferences, risk materiality and performance beliefs, and further supported by institutional factors like regulatory changes. In addition, products branded as sustainable are salient and provide an incentive for investment product providers to offer such products in an attempt to attract investments.

Despite the strong growth in the sustainable investment market, significant challenges remain. These challenges relate mostly to information. More readily available, consistent, accurate and clear sustainability-related information (at economic activity level, firm level and portfolio level) would increase the transparency of the market.

The pandemic has invigorated the ambition to align climate and wider sustainability concerns when designing recovery measures. The unprecedented size of the recovery measures provides an opportunity to create effective measures to manage the significant societal challenges.

[150] See Belloni, *et al.* (2020), The performance and resilience of green finance instruments: ESG funds and green bonds, *Financial Stability Review*, European Central Bank, November 2020.
[151] See Ding, *et al.* (2020).

Financial instruments with a sustainability focus like green and social bonds can contribute to a sustainable recovery.

Notwithstanding the rapid growth in these market segments it remains important to enhance market transparency, comparability of sustainable investment products, increase market integrity and limit search costs in this market segment to support market growth and ensure that such investments impact the real economy. Given the information-related challenges, many recent policy initiatives aim to improve the information environment in which investors take decisions. More broadly, this chapter underlines the need for the European Commission to continue the efforts that started with the 2018 action plan for financing sustainable growth and that aim to provide a comprehensive and integrated policy response in this area.

Chapter 4 CLIMATE CHANGE AND FINANCIAL STABILITY

This chapter complements Chapter 3 by outlining the financial stability implications of climate change and of a transition towards a climate-resilient economy. Instead of reviewing developments in specific market segments in terms of their sustainability, it takes a systemic perspective and seeks to answer the question as to whether climate-related risks can pose a threat to the financial system's stability and what policy action is being or should be undertaken to address this challenge.

The chapter focuses on climate change in view of its importance and the availability of data and methodologies to identify and quantify related risks. Other environmental risks such as loss of biodiversity and degradation of ecosystems are also important, but the analysis of possible financial stability implications goes beyond the scope of this chapter.

4.1 Brief overview of typologies of climate-related risks for financial stability

Environmental degradation, including in particular arising from climate change, is a source of structural change that may affect economic activities and the financial system in the EU as well as worldwide. In parallel, the environmental policies to mitigate the degradation carry risks. Two main types of climate-related risks relate to the financial system.

- *Physical risk* refers to the impact on the value of financial assets/liabilities of frequent extreme or acute weather events, such as droughts, floods and storms, as well as of more chronic changes such as progressive shifts in climate or more broadly in the surrounding environment, temperatures, sea-level, biodiversity, land use, land pollution, deforestation, habitat capability to support species and resource availability[152].
- In turn, *transition risk* refers to a potential financial impact that can result from the process of adjustment towards a lower-carbon and more environmentally sustainable economy. The main concern is that certain assets in the energy and fossil-fuel sector, as well as in related sectors such as transport, manufacturing, the automotive industry, construction, agriculture, and ultimately banking and insurance, could be subject to sudden repricing. This could be triggered, for example, by an abrupt adoption of climate and environmental policies, by technological progress or by changes in market sentiment and preferences.

Physical and transition risks interact and materialise in parallel. An increased materialisation of physical risks can prompt more significant policy action to stem them. In case the market is not ready to adsorb this change, it could give rise to a disorderly transition to a lower-carbon

[152] See Network for Greening the Financial System (NGFS) (2020), Guide for Supervisors: Integrating climate-related and environmental risks in prudential supervision, *NGFS Technical Document*, NGFS, May 2020; Network for Greening the Financial System (NGFS) (2020), Guide to climate scenario analysis for central banks and supervisors, *NGFS Technical Document*, June 2020.

economy, and the crystallisation of transition risks. Such a hypothetical situation is referred to by some[153] as a 'too-little-too-late scenario'.

The impacts of climate change can be divided into direct and indirect impacts. *Direct impacts* concern primary effects from climate change on production or consumption, such as damage to property or reduced productivity, leading to related financial losses. *Indirect impacts* reflect changes in production or consumption on the whole economy, through their effects on supply chains and on relative prices, including factor prices (income). This requires assessing how climate change affects other sectors or regions than those initially impacted and takes into account links between sectors[154].

Alongside physical and transition risks, there may sometimes be losses that stem directly or indirectly from legal claims, or there may be a reputational loss as a result of public opinion, the institution's counterparties or investors associating the entity with adverse environmental impacts. *Liability risks* might arise when parties are held liable for losses related to environmental damage that may have been caused by their actions or omissions. To the extent that this might reduce the value of such firms' liabilities, it might also have implications for the financial system.

4.2 Impact on the economy and on the financial system

Physical and transition risks affect economic activities in various sectors. Sectors of the real economy that are most likely to be physically impacted are: agriculture, energy, forestry, fisheries, human health, mining, transport and infrastructure, and tourism. The indirect impacts are much broader, notably through supply chains. Sectors that can be particularly impacted by the transition to a low-carbon economy include energy, fossil fuel sector, transport, manufacturing, the automotive industry, construction and agriculture[155]. The financial system is exposed to the mentioned risks mainly via market, credit, liquidity and operational risks. This impact can occur directly, through for example lower corporate profitability or the devaluation of assets, or indirectly, through macro-financial changes. Individual and institutional investors are particularly vulnerable through their equity and bond portfolios as well as their commodity positions. For banks, the main source of risk is loan portfolios as well as securities holdings while the insurance sector is exposed on both the liabilities and assets side.

Furthermore, sovereign risks could increase for countries with carbon-intensive industries. Research[156] has found that a country's vulnerability or resilience to climate change can have a direct effect on its creditworthiness, its costs of borrowing, and, ultimately, the likelihood it might default on its sovereign debt, even after taking into account conventional macroeconomic determinants of sovereign bond spreads and credit worthiness. More specifically, an increase of

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153 Green European Foundation, The price of doing too little too late: The impact of the carbon bubble on the EU financial system, report prepared for the Greens/EFA Group of the European Parliament, February 2014: https://www.reinhardbuetikofer.eu/wp-content/uploads/2014/03/GND-Carbon-Bubble-web1.pdf.

154 Indirect costs are more complex to assess than direct costs but they can be calculated using modelling techniques. Both partial equilibrium and general equilibrium approaches are possible to account for sectoral interdependencies.

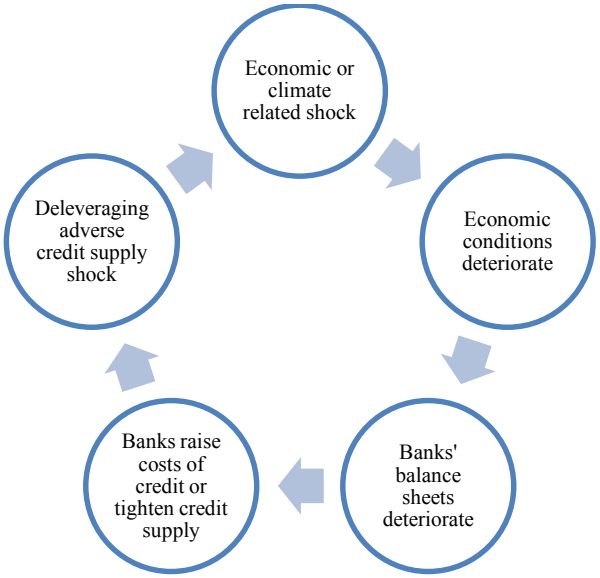
155 See e.g. European Commission (2018), *In-depth analysis in support of the Commission communication COM (2018) 773: A Clean Planet for all. A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy*, 28 November 2018.

156 See International Monetary Fund (IMF) (2020), Feeling the heat: Climate shocks and credit ratings, *IMF Working Paper* 2020/286, December 2020.

10 percentage points in climate change vulnerability is associated with an increase of about 30 bps in 10-year government bond spreads relative to the benchmark in a sample of countries, while an improvement of 10 percentage points in climate change resilience is associated with a decrease of 7.5 bps in long-term government bond spreads.

In addition, second round effects may amplify the described risks (see Figure 4.1). In a situation where banks suffer losses as a result of crystallising physical risks, this could cause an increase in their leverage and reduction in their lending, magnifying the shock to the real economy. This effect might be exacerbated by higher funding costs for banks and their lower profitability, further straining bank solvency and reducing lending. Schüwer et al. (2019) find that some banks' risk-based capital ratios increased following Hurricane Katrina, but Cortés and Strahan (2017) argue that large banks are able to accommodate an increase in the demand for credit in areas affected by natural disasters, and do not reduce lending in other areas.

Figure 4.1: Climate-induced feedback loop between the real economy and banks



Source: DG FISMA. Adapted from European Systemic Risk Board (ESBR) (2020), *Positively green: Measuring climate change risks to financial* stability, June 2020.

Overall, research shows that, while there are clear long-term benefits to act urgently, the macroeconomic cost of both policy inaction and action is high. This creates trade-offs, as policy action taken to minimise physical risks may increase transition risks over short term. The magnitude of the resulting costs depends on the specific approach chosen to quantify them. For physical impacts, studies such as Burke *et al.* (2015) find that climate change might reduce GDP levels by up to 23% by 2100 relative to a no climate change scenario. As to the economic impact of transition risks, a literature review[157] suggests that the economic costs of limiting global warming to 2°C by 2030 would be between a 1 and 4% loss in global aggregate consumption over the same period[158]. If the time frame is extended to 2050, some studies find a

[157] A summary of 31 models and 1 184 scenarios is provided in IPCC (2014), *Climate change*, Intergovernmental Panel on Climate Change. For more recent studies, see e.g. https://epic.uchicago.edu/wp-content/uploads/2021/ 04/ Greenstone. Costs-of-Inaction-Testimony.4.14.21.pdf.

[158] The Paris Agreement is a legally binding international treaty on climate change, adopted by 196 Parties at COP 21 in Paris on 12 December 2015, and which entered into force on 4 November 2016. It aims to limit global warming to well below 2, preferably to 1.5°C, compared to pre-industrial levels: https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement.

positive impact on GDP[159]. More recently, commitments to climate neutrality have been increasing, leading to questions of policy design: how can policy action be structured so that transition risks are minimized?

The potential financial outcomes related to climate change vary considerably, depending on assumptions on the future path of global emissions, the discount rate, the time horizon of the study, the choice of scenarios, valuation methods, spatial aggregation and distributional effects (see Box 3). Academic researchers have tried to estimate the so-called damage functions[160], which translate physical impacts into quantifiable financial damage. Damage functions play an important role in informing decision-making about the diversity and magnitude of future financial impacts resulting from climate change and how adaptation and other actions can affect them. In its simplest form, a climate damage function is a simplified expression of financial damages as a function of climate inputs, such as changes in temperature.

Table 1: Estimated impact of physical risks on the value of global financial assets by 2105

	Scenario Temperature increase	**Discount rate** (%)	**Mean impact** (%)	**97th percentile** (%)	**99th percentile** (%)
Dietz *et al.* (2016)	by 2°C	7	-0.7		-4.0
		4.1	-1.2		-9.2
	by 2.5°C	7	-1		-7.7
		4.1	-1.8		-16.9
EIU (2015)	by 2°C	5.5	-1.5	-2.3	
		3.8	-4.2	-7.5	
	by 4°C	5.5	-2.9	-9.7	
		3.8	-9.7	-30.1	

Source: Economist Intelligence Unit (EIU) (2015), *The cost of inaction*, 24 July 2015. Dietz *et al.* (2016).

Estimates of the impact of physical risks on asset prices appear reasonably contained, but they vary considerably with the expected degree of global warming. Under a scenario where the increase in global mean temperature above pre-industrial levels is likely to remain within 2ºC, estimates of the mean reduction in global financial asset can reach 4.2% (or up to EUR 5 trillion), depending on the study. In contrast, under a baseline scenario in which policies to mitigate climate change that were in place in 2010 are extended indefinitely but there is no additional action to reduce emissions, the expected temperature increase amounts to 4ºC and the estimated mean reduction in asset prices can get as high as 9.7% (EUR 11.5 trillion), depending on the chosen discount rate.

Box 3: Methodological issues in measuring climate impacts

A number of parameters determine the estimated economic and financial outcome of climate change. One of them relates to the choice of a discount factor which helps convert all monetary values to 'present values' so that they can be compared. This issue is intensively debated in the academic literature as well as among policy makers because it affects the estimated costs of

[159] See e.g. OECD (2017b), *Investing in climate, investing in growth*. OECD Publishing.

[160] These functions are based on regressions analyses that use only the damage output of more detailed and complex sectoral models. The more detailed models are designed to reflect complex structural, biological, physical, and economic relationships that define the pathways through which climate change affects economic and financial impacts. Climate damage functions are a less resource-intensive approach to estimating the relationship between temperature change and the magnitude of climate-related damages than re-applying the full multidisciplinary research frameworks with more complex sectoral models.

climate change. A higher discount rate usually leads to lower estimated costs as larger future negative effects are reduced through discounting. The influential Stern Review on the Economics of Climate Change warned that global GDP was at future risk of a 20% reduction if there was a failure to invest 1% of world GDP now to reduce global warming. However, critics questioned the findings on the basis that they were partly arrived at using an extremely low pure discount rate of 0.1% in standard economic modelling. Given the exceptional scale of the risk, the appropriate discount rate is a key policy decision. The choice is related to the level of climate change risk a society is willing to accept.

The choice of the modelling horizon for the study is also important. If one constrains the time-scale, even to 100 years, this gives only a partial view of the future effects of climate change, even if predicting a climate and socio-economic scenario that exceeds this limited time-scale is already extremely challenging. If, on the contrary, one extends the time horizon, even with discounting, the economic cost of climate change increases substantially, not least because one captures impacts in the distant future.

The choice of scenarios, climate parameters and impact categories also play a key role. Baseline climate and socio-economic scenarios provide information on climate parameters and on the 'stock at risk' in terms of current financial outcomes. Future climate and socio-economic scenarios are modelled so as to provide a future business as-usual or an alternative scenario reflecting the future 'stock at risk', technology, production, consumption and emissions. The choice of modelling techniques and the selection of types of extreme events are key for the choice of scenarios. Equally important is the choice of non-climate scenarios, which determine the vulnerability of social and economic systems to climate change and the global greenhouse gas emissions. Climate economic models typically do not model more uncertain climate dynamics such as tipping points and therefore are likely to underestimate future climate impacts.

Another critical issue is how climate change impacts are quantified and then valued into monetary terms. The valuation is undertaken using market data, if available. It is more challenging, however, to provide valuation estimates where there are no market values, as is the case for human health, non-commercial ecosystems, or behaviours related to environment and natural resources. The contingent valuation methods used are those that are derived from revealed preferences or from values based on stated preferences. These techniques collect information on preferences by asking households how much they are willing to pay for some change in the provision of an environmental good or the minimum compensation they would require if the change was not carried out. This issue is closely related to the mismatch between individual consumer time preference and societal time preference. Research by the Climate Impact Lab suggests that non-market impacts of climate change might well exceed market impacts of climate change[161].

Lastly, spatial aggregation and distributional effects are an important issue. The comparison of financial losses resulting from climate change across countries with different levels of impacts and also different income levels remains problematic. The European Environment Agency (EEA) projected that the most costly effects resulting from climate change in Southern Europe will be increases in energy demand and heat waves, in Western Europe coastal flooding and heat waves, in Northern Europe coastal and river flooding, and in Eastern Europe river flooding. An aggregation of the above-mentioned estimates inevitably implies combining effects across winners and losers over different regions. One method is to apply distributional weights to allow the impact of a policy on an individual's well-being to be adjusted according to income. The

[161] See Hsiang *et al.* (2017).

rationale behind it is that an extra euro gives more benefit to a person who is deprived than to someone who is well off, or conversely the loss of a euro will have a greater effect on someone who has less. The use of distributional weights increases the aggregate economic costs of climate change, as it gives greater emphasis to the larger impacts that occur in developing countries.

A recent European Commission report[162] reviews the numerous uncertainties surrounding the economic impact of greenhouse gas emissions, discusses the choice of parameters needed to design damage functions, and presents results of simulations showing that pricing carbon might enable decarbonisation at little aggregate economic cost.

4.2.1 *Market pricing of climate-related risks*

Aside from long-term predictions, the monitoring of climate-change related physical risks to date suggests that they are already playing a growing role in eroding collateral and asset values, in particular for (non-life) insurers. Insurance liabilities are particularly exposed to the frequency and severity of climate and weather-related events that damage property or disrupt trade. The EU insurance sector recently faced the highest-ever levels of weather-related costs. These weather-related losses amounted in the EU to EUR 537 billion between 1980 and 2018, and only 35% of them were insured, leaving a large insurance protection gap. While the related loss magnitudes are still manageable, a continuation (or exacerbation) of this upward trend could place greater collective strain on insurers and re-insurers.

As to transition risks, while these could in theory be avoided through policy inaction, this would come at significant economic costs through higher levels of physical damage and risk in the future[163]. IPCC estimates[164] indicate that the investment needed to achieve the Paris Agreement target of a less than 1.5˚C temperature increase could amount to between EUR 625 and 1 280 billion yearly until 2050, depending on the exact modelling technique chosen. Other studies[165] on the costs of the transition to a low-carbon economy estimate an investment requirement of between USD 1 trillion and USD 4 trillion (in constant terms) when considering the energy sector alone, or up to USD 20 trillion when looking at the economy more broadly. However, if delayed, action will need to be even more radical to keep temperature increases in check, further raising transition risks. An additional consideration is that the transition also has positive economic benefits and is associated with a higher aggregate growth potential.

Several dedicated metrics have been proposed to price in climate-related risk. One of these is the social cost of carbon, which measures in monetary terms the economic damages that would result from emitting one additional tonne of greenhouse gases into the atmosphere. It relies on an array of assumptions that contain value judgements, including on the discount rate, the

[162] Dimitríjevics, A., Döhring, B., Varga, J. and in 't Veld, J. (2021), Economic impacts of climate change and mitigation, *Quarterly Report on the Euro Area* 20(1).

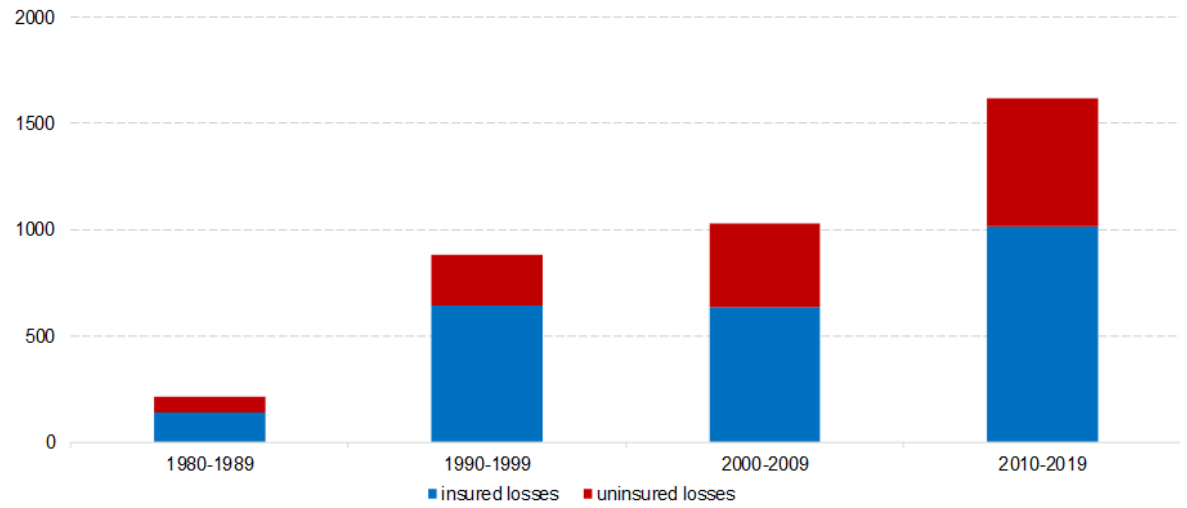
[163] See European Systemic Risk Board (ESRB) (2016), Too late, too sudden: transition to a low-carbon economy and systemic risk, *ESRB Reports of the Advisory Scientific Committee* 6, February 2016; Bowen A. and Dietz, S. (2016), *The effects of climate change on financial stability, with particular reference to Sweden*, Finansinspektionen, 26 February 2019.

[164] See IPCC (2018), Summary for policymakers. In: Global warming of 1.5°C, Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty.

[165] See International Energy Agency (IEA) (2017), *World energy outlook* 2017; International Energy Agency (IEA), International Renewable Energy Agency (IRENA) (2017), Perspectives for the energy transition: Investment needs for a low-carbon energy system, March 2017.

geographic scope, and the ethically-laden Value of Statistical Life. In early 2002, a pioneer study by the UK Government Economic Service (GES) defined the social cost of carbon (SCC) as the marginal global damage cost of carbon emissions, estimated as the net present value of the impact over the next 100 years (or longer) of one additional tonne of carbon emitted to the atmosphere today. The analysis yielded an estimate of approximately 28 EUR/tCO_2, with a range of 14 to 56, as an illustrative estimate for the global damage cost of carbon emissions.

Chart 4.1: Global losses resulting from weather-related catastrophes



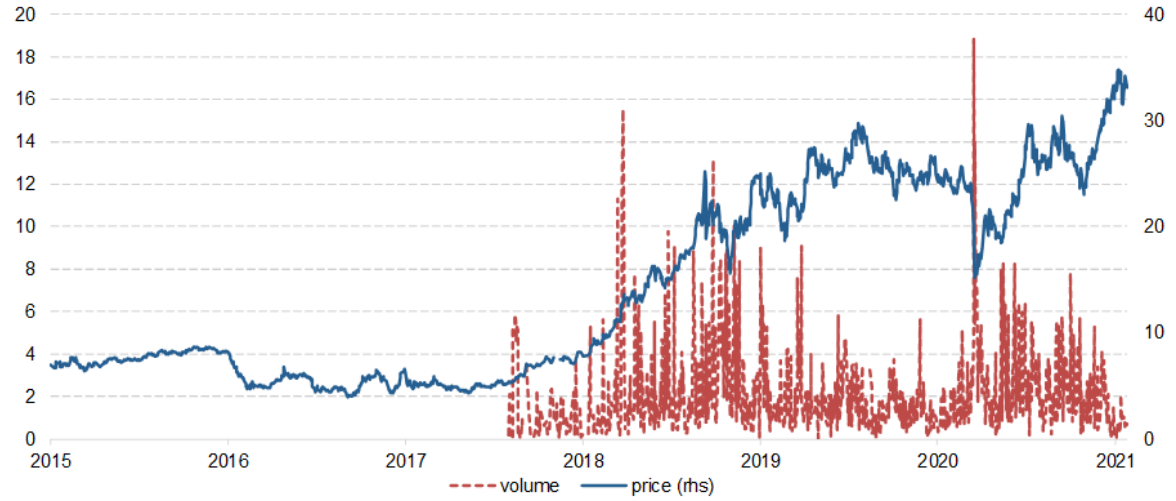
Source: Swiss Re[166].
Note: Figures are expressed in USD billion.

More recently, the estimates of the social cost of carbon (SCC) range from as high as USD 417 tCO_2[167] to as low as USD 54 tCO_2[168]. Meta-analysis[169] shows that a lower discount rate implies a higher estimate, and that there is a steady decrease in the economic impact estimates of the climate. There is also substantial uncertainty about the social cost of carbon. The SCC has been criticised as being extremely uncertain. The wide range of estimates is explained mostly by underlying uncertainties in the science of climate change, different choices of discount rate, different valuations of economic and non-economic impacts, treatment of equity, and how potential catastrophic impacts are estimated. Consequently, the SCC is currently of limited use for policy appraisal, also because climate policy objectives, such as those set out in the Paris Agreement, are increasingly linked to temperature and therefore limits greenhouse gas emissions.

The dynamically developing market for greenhouse gases emissions trading provides an observable, market-based price of emissions (see Chart 4.2). This suggests that in recent years financial market forces trends have been moving towards more stringent rationing of emissions

166 See https://www.swissre.com/institute/research/sigma-research/sigma-2018-01.html.
167 See Ricke *et al.* (2018).
168 See Wang *et al.* (2019).
169 See meta-analysis in Tol (2008) that encompasses 211 estimates of the social cost of carbon.

Chart 4.2: ETS trading volumes and prices



Source: Refinitiv data. Intercontinental Exchange Climate Phase 3 European Union Allowance Daily Electronic Energy Future.
Note: ETS trading volume (number of contracts, thousands) on left-hand scale. ETS close prices in EUR on right-hand scale.

At the same time, the emission trading system (ETS) price remains low and interest in emissions trading on derivatives markets is still limited - with the emission allowances market still negligible compared with other derivative asset classes. The lack of carbon pricing that adequately captures external climate-related factors hinders the ability of financial markets to fully reflect this risk in prices owing to disclosures that are incomplete (selection bias in firm reporting), inconsistent (lack of accepted methodology for defining green and brown assets) and insufficient (virtually no reporting on downstream emission intensity of products in portfolios).

4.2.2 *Exposures by financial institutions to transition risks*

The degree of financial exposures to climate-change related risk can be measured at firm, sectoral and country level. Each of these levels is bound to suffer some degree of reporting gap, even in the case of simple summary statistics of climate change risk such as CO_2 emissions, where parameters like data granularity, coverage or accuracy already present considerable challenges. The lack of accurate data can preclude a rigorous analysis of these risks. Although progress has been made at global level to establish voluntary frameworks for the disclosure of climate-related risks, including among non-financial firms, the proportion of companies disclosing climate-related information remains low in absolute terms[170]. The persistent data quality issues described above further constrain adequate risk measurement. To address these problems, in June 2017 the European Commission published guidelines to help companies disclose environmental and social information[171], followed by further guidelines, in June 2019, on reporting climate-related information[172]. In April 2021, the Commission proposed a

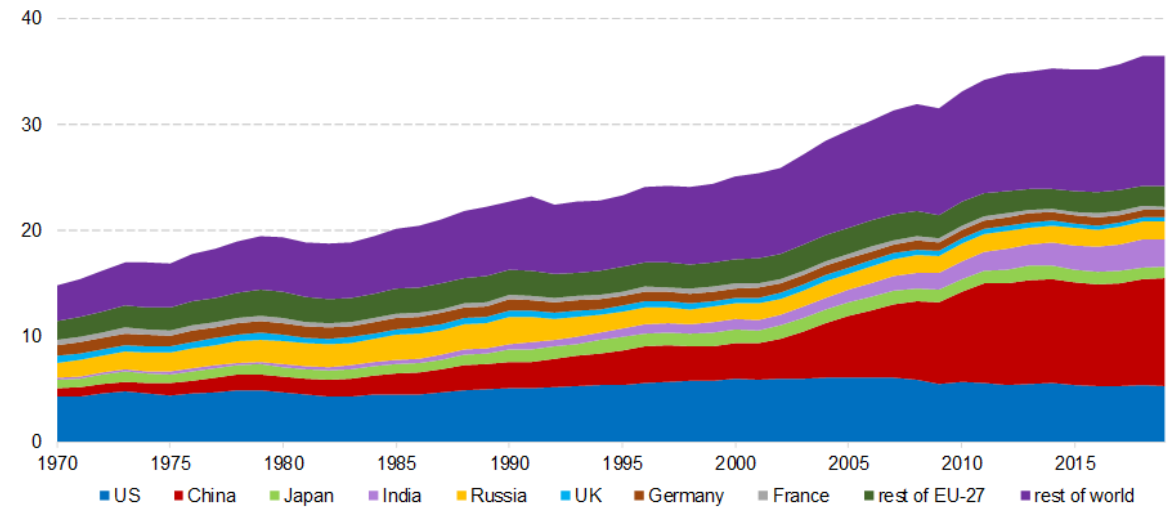
[170] Task Force on Climate-related Financial Disclosures (2019), *Status report*, June 2019.
[171] Communication from the Commission, Guidelines on non-financial reporting (methodology for reporting non-financial information), C/2017/4234 of 5 July 2017.
[172] Communication from the Commission. Guidelines on non-financial reporting: Supplement on reporting climate-related information, 2019/C 209/01 of 20 June 2019.

Corporate Sustainable Reporting Directive[173] in order to increase the relevance, comparability and reliability of reported information.

At country level, CO_2 emissions appear quite concentrated. At global level, the top five emitters account for more than half of the total emissions (see Chart 4.3). Most striking is the rapid rise of China to account for more than a quarter of global CO_2 emissions, followed by the US, India, Russia and Japan. In contrast, the EU's share of global emissions has shrunk. The EU-27 represents only 8% of global emissions. Germany and France are the largest contributors, accounting for around 2% and 1%, respectively.

At firm level, one indicator of transition risk is bank exposures to high carbon-emitting firms that would be vulnerable if the transition to a low-carbon economy is delayed and disorderly. Non-financial firms differ when it comes to GHG emissions, depending mainly on the industrial sector they belong to. For instance, firms in the electricity or manufacturing sectors are more directly polluting on average than service-oriented segments of the economy, including finance and insurance. However, there are wide variations within the same industry sector. Even for companies carrying out the same activities, some companies manage to conduct their business in a more emissions-efficient or environmentally-friendly way than others. Although sectoral classification allows for a more comprehensive view as more data is available than for individual firms, it ignores the differences in production processes and technologies, and consequently from pollution propensities of firms within sectors. Importantly, sectoral classification ignores any dynamics within firms over time.

Chart 4.3: CO_2 emissions, selected countries/regions



Source: Global Carbon Project[174].
Note: CO_2 emissions are expressed in million tonnes.

At the level of financial institutions, estimates as to current exposures to climate-related risks vary due to differences in the estimation of exposures to carbon-intensive production, and in the assumed path of transition to a low-carbon economy. The scope of losses that are

[173] https://ec.europa.eu/info/business-economy-euro/company-reporting-and-auditing/company-reporting/non-financial-reporting_en
[174] https://www.globalcarbonproject.org/carbonbudget/

considered also varies, with some estimates only including those stemming from reductions in the value of firms' existing capital (sometimes referred to as 'stranded capital'), while others also account for broader losses that might result from reductions in expected future cash flows. Mercure *et al.* (2018) find that fossil fuel owners would need to write off their balance sheets by up to USD 4 trillion as a result of stranded assets, a loss comparable to the 2008 financial crisis[175]. Other studies[176] estimate the effects on financial sector aggregate equity and corporate bond portfolios at 2-4% of aggregate portfolio values were the transition to occur by 2030. This relatively benign finding reflects the fact that the equities and bonds issued by firms included in this study comprise only 7% of global listed equity and bonds. Reductions in the value of these securities alone could, however, reach up to 50% of their current market value. If the more acute price reductions were to occur, the potential implications for financial stability would be greater.

For Europe, Weyzig *et al.* (2014)[177] quantify the exposure in high-carbon assets of 43 of the EU's largest banks, insurance companies and pension funds and calculate their potential losses under various scenarios. The results suggest that exposures for EU pension funds were approximately 5% of their total assets, for banks 1.3% of their total assets and for insurance companies 4.4% of their total assets. For individual institutions or specific EU countries, risks can be much larger. While the study did not include a precise ranking of countries according to risk, a number of individual pension funds showed large exposures for some Dutch and Finnish entities, which were found prone to lose approximately 3-7% of their assets due to exposures to fossil fuel firms and commodities. In the banking sector, a number of French banks were found to be particularly vulnerable, with an estimated 0.6-0.8% of total assets on their exposures to oil, gas and coal mining firms.

The efforts to measure financial institutions' exposures to transition risk are often based on sectoral classification of economic activities[178]. Among attempts to analyse the resilience of the EU financial system to such risks, Battiston *et al.* (2017) found that the direct equity portfolio exposures of financial players to the fossil-fuel sector were limited but that the exposures to all climate-policy relevant-sectors were large (that is, ranging from 45.2% for insurance and pension funds to 47.7% for governments). The authors highlighted the importance of indirect exposures (e.g. pension funds hold significant exposures in equity shares of investment funds and in bonds and loans to banks).

The ECB[179] applied the approach developed by Battiston *et al.* (2017) to the ECB's Securities Holdings Statistics by Sector database (SHSS). The evolution of portfolio investments showed that investment and pension funds reduced their relative exposures to securities issued by climate policy-relevant sectors in recent years. By contrast, banks and insurance corporations kept their exposures relatively constant. However, the analysis of the banking sector is

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175 See Mercure *et al.* (2018).

176 International Energy Agency (IEA) (2017), *World energy outlook* 2017.

177 Weyzig, F., Kuepper, B., van Gelder, J.W. and van Tilburg, R. (2014), The price of doing too little too late. The impact of the carbon bubble on the EU financial system, *Green New Deals Series* 11.

178 Typically, the most climate-sensitive sectors are selected on the basis of an aggregate environmental metric, such as carbon emissions. The Statistical classification of economic activities, abbreviated as NACE, is the classification of economic activities in the EU. Various NACE versions have been developed since 1970. For details, see https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Statistical_classification_of_economic_activities_in_the_European_Community_(NACE)

179 See European Central Bank ECB (2019b), *Financial stability review*, May 2019.

incomplete given that loans are not included in the SHSS. The ECB also used the database containing large exposures[180] by EU banks to illustrate bank exposures to carbon-intensive firms in terms of their potential impact. The obtained results accounted for less than 5% of total exposures, and the median exposure to the most carbon-emitting firms, either through lending, bond or equity holdings, was below 9% of assets in 2017.

Similar analysis performed for euro-area insurance companies, pension funds and investment funds, using SHSS data showed exposures to carbon-sensitive sectors of between 2% and 8% of their overall portfolios. Although exposures to transition risk, on the basis of this limited data, seem contained in relative terms on average, a high degree of concentration is observable as a sizeable part of the emissions is centred on a very small number of large polluters. Roughly 50% of all emissions are generated by only 15 firms out of a sample of over 2 000. In addition, analysis using large exposure data showed that exposures to the 20 largest emitters represented 20% of total large exposures, or 1.8% of the total assets of the banks in the sample. These exposures may pose risks to the specific banks which bear them. Regarding equities and corporate bonds, a report of the Joint Research Centre[181] finds that on average, the exposure of European investors to sectors which will be impacted by the low-carbon transition is relatively high, ranging from 30% to 45% for equities. For bonds, the exposure to relevant sectors ranges from 35% to 50%. The direct exposure to the fossil fuel sector lies between 10% and 30%.

Analysis by the ECB[182] shows that traces of banks' corporate lending portfolios became greener from 2014 to 2017 as median emissions of non-financial corporations (NFCs) to which banks are exposed through lending, bond or equity holdings declined over that period. Although NFCs marginally reduced carbon emissions over time, most of the change is associated with banks preferring not to lend to high polluters.

National studies have also been conducted to measure the possible impact of climate-related risks on the financial system. A study by Banque de France and ACPR (2019)[183] finds French banks' and insurers' exposure to climate-related physical risks to be minimal. However, French financial institutions have a more significant exposure to transition risks. For example, in the case of banks, the share of the 20 most carbon-intensive sectors represented 12.2% of net outstandings exposed to credit risk in 2017, a slight decrease compared with 2015, while around 10% of the investments of French insurers would be invested in transition risk sectors (sectors producing or consuming fossil fuels, electricity or gas). A study on the impact of climate-related risks on the Dutch financial sector by DNB[184] disaggregates EUR 2.3 trillion in assets of more than 80 Dutch financial institutions by industry. The calculations show that financial losses for the Dutch financial system may be sizeable, as insurance sector portfolio values can decline by up to 11% and banks' core equity ratio by about 4% under a disruptive

[180] Caution should be taken when interpreting the results as large exposure data only offer a partial view into bank portfolios. Data cleaning and matching with the available carbon data also reduce the sample.

[181] See Alessi, L., Battiston, S., Melo, A. S. and Roncoroni, A. (2019) The EU sustainability taxonomy: a financial impact assessment, *Joint Research Centre Technical Report*.

[182] For further details, see Section 3 of European Central Bank (ECB) (2019a), *Financial stability review*, November 2019.

[183] Banque de France, ACPR (2019), French banking groups facing climate change-related risks, *Analyses et Synthèses* 101, 4 October 2019.

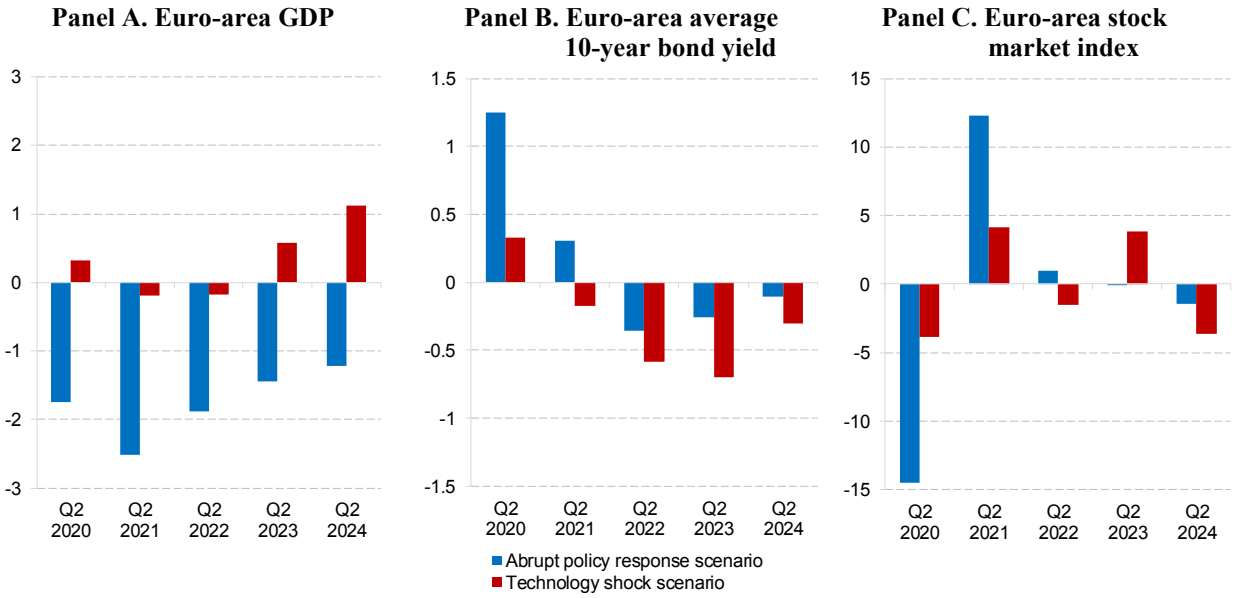
[184] Vermeulen, R., Schets, E., Lohuis, M., Kölbl, B., Jansen, D.-J. and Heeringa, W. (2019), the heat is on: a framework for measuring financial stress under disruptive energy transition scenarios, *DNB Working Papers* 625, de Nederlandsche Bank, February 2019.

climate scenario. These outcomes suggest that climate-transition risks warrant close and timely attention from a financial stability perspective.

4.2.3 *Results of forward-looking scenario analysis*

In 2020, an ECB/ESRB-led joint inter-institutional group conducted a forward-looking scenario analysis looking at the next 5 years[185]. The study used existing macro stress test models to identify short-term impacts of transition risk emanating from either a sharp policy tightening or strong technological adjustments, which are benchmarked against a baseline scenario with non-disruptive policies. In the abrupt policy response scenario, the policies aimed at achieving the goals of the Paris Agreement are deferred and only introduced later in a disorderly way. In this scenario, the private sector and financial sector have insufficient time to accommodate the abrupt changes. The scenario focusing on strong technological adjustments anticipates rapid adaptation to asymmetric technological innovation.

Chart 4.4: Estimated effect of an abrupt policy response and asymmetric technological innovation shock on euro-area GDP, bond yield, and stock market



Source: European Systemic Risk Board (ESBR) (2020). *Positively green: Measuring climate change risks to financial stability*, June 2020.

Note: The abrupt policy response scenario considers the case in which the policies aimed at achieving the goals set out in the Paris Agreement are deferred. The asymmetric technology shock considers a case of a positive breakthrough in energy storage technology.

The impact of the scenarios on the real economy (GDP) and on financial markets (bond yields, stock market valuations) is presented in Chart 4.4. An abrupt increase in energy prices (by USD 100 per tonne at the global level) leads to a sharp devaluation of trading assets, reflected in the drop of stock and bond prices, and the deterioration of economic conditions for the entire five-year time frame. In the first 2 years, euro area output would drop to almost 2.5% below its baseline level. The level of output would then gradually recover, signifying that the costs of sharply introducing climate-mitigating fiscal policies can be pronounced but also transitory. Under the technological innovation shock scenario, where the share of renewable energy

[185] European Systemic Risk Board (ESBR) (2020). *Positively green: measuring climate change risks to financial stability*, June 2020.

doubles over 5 years, economic output slows down temporarily, driven by old-technology industries but new technology supports economic growth. Consequently, short term GDP losses are limited and are followed by an improvement in economic conditions towards the end of the five-year period.

As to the impact on the financial sector,[186] immediate mark-to-market losses for the banking sector amounted to 0.6% of CET1 capital on average in the abrupt policy response scenario and half of this impact for the technology innovation shock scenario. For insurers, the biggest impact derives from equities (with possible average losses of up to 3.5%). The described transitory losses look more limited than the potential economic losses associated with the manifestation of broad physical risk over the medium term, described earlier. This suggests that early action to tackle climate risk, including adaptation and mitigation measures should have net benefits, which creates a clear case for relevant policy action.

4.3 Climate-related policy action

4.3.1 *Challenges to incentives for policy action*

Policy makers argue that 'the catastrophic impacts of climate change will be felt beyond the traditional horizons of most actors – imposing a cost on future generations that the current generation has no direct incentive to fix'[187]. This observation, which was coined as the *tragedy of the horizon*, illustrates a significant lag in discerning the benefits of mitigation measures[188], which makes it much harder to impose costs on society today if measurable results are available much later. Consequently, climate-related costs may not be well reflected in market prices and valuations, and as a result, sustainability is often not considered to be important now.

Separately, a growing number of people[189] see climate change as an example of the *tragedy of the commons*[190], a situation where overconsumption of a particular product/service resulting from individual rational decisions leads to an outcome that is damaging to overall social welfare. While in theory individuals could limit their use so as not to deplete the common resource, there is a free-rider problem where producers/consumers rely on others to cut back their production or consumption. As a consequence, free markets fail to internalise the costs that climate change imposes on current and future societies. In the absence of a (global) policy framework that puts into effect a price for emitting greenhouse gases, financial markets tend to overestimate the returns of carbon-intensive assets, and hence allocate capital sub-optimally.

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[186] The banking sector exploratory scenario analysis is applied to the 91 largest euro area credit institutions and involves two direct transmission channels: credit risk and market risk. The propagation of transition scenarios into banks' banking and trading books depends on a sectoral breakdown of their exposures. An analogous exploratory scenario analysis for the insurance sector is applied to 100 EU insurance companies, which is static and involves only the market risk channel. For further details, see European Systemic Risk Board (ESBR) (2020). *Positively green: measuring climate change risks to financial stability*, June 2020.

[187] See Carney, M. (2015), *breaking the tragedy of the horizon – climate change and financial stability*, speech at Lloyd's of London, London, 29 September, page 3. Mark Carney was Governor of the bank of England when he delivered the speech.

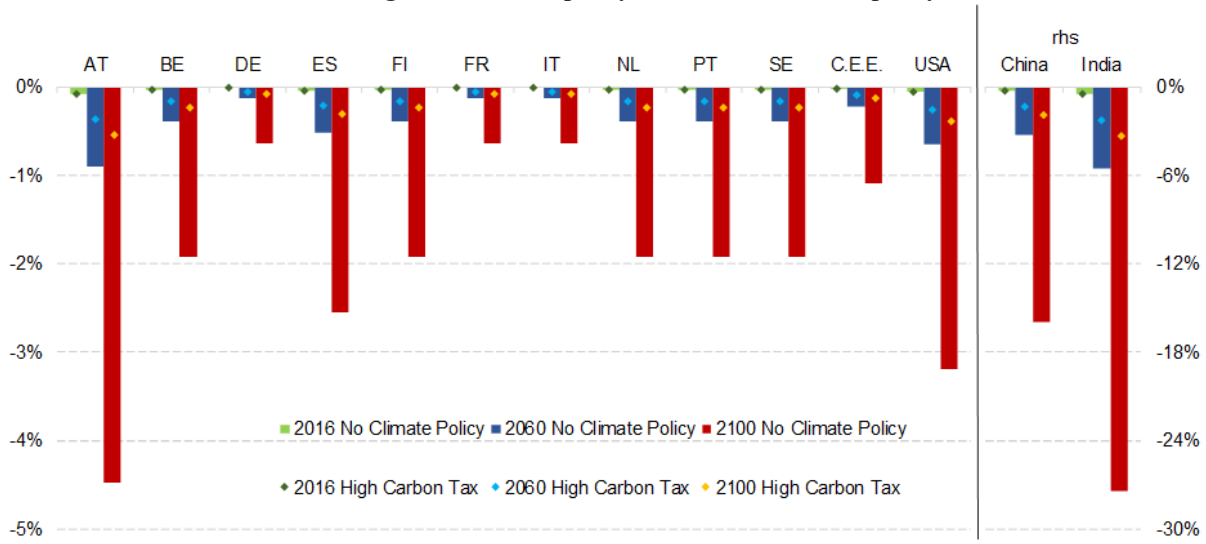
[188] See Samset *et al.* (2020).

[189] One of the earliest climate change activists, Nicholas Stern, called global warming 'the greatest market failure of all time'.

[190] The tragedy of the commons was first mentioned by the Victorian economist William Forster Lloyd in 1833. He used a hypothetical area of common grazing land to which all villagers took their cows, but this led to overgrazing and hence a loss of the resource.

An analytical tool[191] developed by Banque de France can be used to model the long-term impact of climate change and mitigation policies. A simple simulation exercise illustrates the two important phenomena (tragedies) discussed above. Chart 4.5 shows that net benefits from policies tackling climate change materialise (in the form of avoided economic and financial losses) only over long time periods. In addition, climate change damages are widely dispersed both within the EU and globally, which affects incentives for policy action. Emerging market and developing economies (EMDEs) are particularly vulnerable. These observations underline the need for global cooperation on climate change. In particular, mitigation policies should be implemented in advanced economies, which to date are only modestly affected by climate change but which have historically been responsible for a large share of CO_2 emissions.

Chart 4.5: Potential climate damage in case of no policy action and remedial policy action



Source: DG FISMA calculations.

Note: Climate damage is expressed in % of GDP. Simulation based on ACCL scenario building model with default parameter settings. For further details on ACCL, see footnote 191. Values for China and India displayed on right-hand side.

4.3.2 *Overview and assessment of policy actions*

At EU level, the Commission's action plan on financing sustainable growth[192] gave mandates to the European Banking Authority (EBA) and European Insurance and Occupational Pensions Authority (EIOPA) to assess how environmental, social and governance (ESG) risks can be incorporated into the three pillars of prudential supervision. The Commission has also advanced work on the taxonomy of activities contributing to climate change mitigation and adaptation. The platform on sustainable finance is developing the EU taxonomy further, by developing the criteria for activities contributing to other environmental objectives and

[191] The advanced climate change long-term (ACCL) scenario building model is a global projection tool (30 countries/regions) to forecast both GDP damage due to climate change and the GDP impact of mitigation measures. It adopts a supply-side, long-term view, with 2060 and 2100 horizons. the total factor productivity (TFP), which is a major source of uncertainty on future growth and hence on CO_2 emissions, is endogenously determined, with a rich modelling encompassing energy prices, investment prices, education, structural reforms and decreasing return to the employment rate. it offers three policy scenarios: 'Business as usual' with no changes to climate policy, 'Low carbon tax' with CO_2 emitting energy relative prices increasing by 1% per year; and 'High carbon tax' with CO_2 emitting energy relative prices increasing by 3% per year. For details, see Alestra, C., Cette, G., Chouard, V. and Lecat, R. (2020), Long-term growth impact of climate change and policies: the advanced climate change long-term (ACCL) scenario building model, *Banque de France Working Paper* 759, April 2020.

[192] Communication from the Commission, Action plan: financing sustainable growth, COM(2018) 097 final of 8 March 2018.

activities with a low or negative impact on climate. The latter could lead to a taxonomy comprising activities that negatively affect the climate and the environment. The Commission also introduced measures to strengthen and further harmonise climate-related disclosures (See Box 2 and Section 3.2.2).

On climate-related disclosures, in 2017 the Financial Stability Board's Task Force on Climate-related Financial Disclosures highlighted the need for comparable and consistent disclosures about the risks and opportunities of climate change, and issued recommendations to this effect[193]. In July 2020, the Financial Stability Board (FSB) published a report summarising financial authorities' experience of including climate-related risks in financial-stability monitoring[194]. Around three quarters of survey respondents consider, or are planning to consider, climate-related risks as part of their financial-stability monitoring. Most of them focus on the implications of changes in asset prices and credit quality. A minority of authorities also consider the implications for underwriting, legal, liability and operational risks.

In parallel, European supervisory authorities have taken substantial action to incorporate climate-related risks into financial risk management and monitoring. The EBA published an action plan on sustainable finance[195] and a discussion paper on integrating ESG risks into the regulatory and supervisory framework[196]. The EBA encourages financial institutions to incorporate ESG factors into their business strategies, and to identify, measure and monitor ESG risks, including via simple metrics such as a green asset ratio. The recent EBA work programme on sustainable finance committed the agency to developing climate-related stress tests. This year a voluntary sensitivity analysis is planned, while plans for incorporating ESG risks into supervision are more tentative and may not take place until 2024.

Meanwhile, the ECB finalised and published a set of guidelines on how banks should manage and disclose climate risks[197]. As a follow-up, the ECB expects banks to conduct a self-assessment in light of the supervisory expectations and to draw up action plans on that basis. The ECB will then benchmark the banks' self-assessments and plans, and challenge them in the supervisory dialogue. In 2022, the ECB plans to conduct a full supervisory review of banks' practices and take concrete follow-up measures where needed. While banks have reportedly made progress on disclosure of climate-related and environmental risks, they need to make further efforts to improve their disclosures with relevant quantitative and qualitative information. As of now, only 3% of euro-area banks are disclosing climate information that would fully match ECB's recommendations[198]. Further emphasising its attention to climate issues, in January 2021 the ECB set up a climate change centre that will bring together the work on climate issues in different parts of the bank. This decision reflects the growing

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[193] See Task Force On Climate-Related Financial Disclosures (TCFD) (2017), *Recommendations of the Task Force on Climate-Related Financial Disclosures: Final report*, 15 June 2017.

[194] See Financial Stability Board (FSB) (2020), *Stocktake of financial authorities' experience in including physical and transition climate risks as part of their financial stability monitoring*, 22 July 2020.

[195] European Banking Authority (EBA) (2019), *EBA action plan on sustainable finance*, 6 December 2019.

[196] European Banking Authority (EBA) (2020). On management and supervision of ESG risks for credit institutions and investment firms, *EBA Discussion Paper* EBA/DP/2020/03, 30 October 2020.

[197] See European Central Bank (ECB) (2020), *Guide on climate-related and environmental risks: Supervisory expectations relating to risk management and disclosure*, November 2020.

[198] See European Central Bank (ECB) (2020), *ECB report on institutions' climate-related and environmental risk disclosures*, November 2020.

importance of climate change for the economy and the ECB's policy, as well as the need for a more structured approach to strategic planning and coordination.

In the insurance and occupational pensions sector, EIOPA's 2019 biennial stress test assessing the resilience and potential vulnerabilities of the European occupational pension sector covered, for the first time, the analysis of ESG exposures for institutions for occupational retirement provision (IORPs). The results of qualitative and quantitative analyses indicated a high-carbon footprint in the sample's equity investments while the exposure to greenhouse gas-intensive industries of debt investments was relatively low. This can be explained by the high proportion of manufacturing companies in publicly traded equities and by the high share of government bonds within the debt asset class. IORPs in Greece, Ireland, Italy and Slovenia had the highest equity exposures to greenhouse gas-intensive activities, ranging from 45% (Ireland, Slovenia) to 53% (Italy), while IORPs in Greece, Slovenia and Slovakia have the highest debt exposures, ranging from 15% (Slovakia) to 31% (Slovenia). While the majority of IORPs indicated that they consider ESG factors in risk management and governance processes, less than 20% of the IORPs assessed the impact of ESG factors on risks and returns.

From a macro-financial perspective, the ESRB's Advisory scientific committee highlighted in 2016[199] the potential impacts of physical and transition risks on the European financial system and recommended that authorities consider developing climate stress-test methodologies. Following up on this, the ESRB/ECB inter-institutional team already conducted a preliminary scenario analysis[200] and is currently working on a more comprehensive approach that aims to implement a risk monitoring framework for climate-related systemic risks in the EU financial sector and a stress test or scenario analysis, focusing on physical and transition risks related to climate change. At national level, the French and Dutch central banks have conducted quantitative top-down studies and found substantial potential risks. A number of EU central banks are also developing climate-related stress tests or sensitivity analyses.

At global level, the Network for greening the financial system[201] (NGFS) called for climate-related risks to be integrated into standard financial stability monitoring and supervision. NGFS developed a set of scenarios that explore the transition and physical impacts of climate change under varying assumptions with the aim of providing a common reference framework for central banks and supervisors. NGFS also developed a set of scenarios and guidelines[202] facilitating the conduct of climate stress tests by supervisors and financial institutions.

More broadly, Dikau and Volz (2018)[203] distinguish between five different policy areas where central banks can support a transition to a low-carbon economy: (*i*) micro-prudential regulation to assess and disclose climate-related risks or to adjust reserve holdings; (*ii*) macroprudential regulation; (*iii*) financial market development (by participating in the creation of an enabling

[199] See European Systemic Risk Board (ESRB) (2016). Too Late, Too Sudden: Transition to a low-carbon economy and systemic risk, *ESRB reports of the advisory scientific committee* 6, February 2016.

[200] See European Systemic Risk Board (ESBR) (2020), *Positively green: Measuring climate change risks to financial stability*, June 2020.

[201] The Central Banks and Supervisors Network for Greening the Financial System (NGFS) was launched in December 2017 during the One Planet Summit. On 23 November 2020 it had 77 members and 13 observers.

[202] Network for Greening the Financial System (NGFS) (2020), Guide to climate scenario analysis for central banks and supervisors (June 2020), Overview of Environmental Risk Analysis by Financial Institutions, *NGFS Technical Document*, September 2020.

[203] See Dikau, S. and Volz, U. (2018), Central banking, climate change and green finance, ADBI *Working Paper Series* 867. Asian Development Bank Institute (ADBI), September 2018.

environment for the issuance and trading of green securities, such as those described in Chapter 3); (*iv*) credit allocation, and (*v*) central bank soft power and guidelines.

Although external environmental factors should be primarily corrected by first-best policies such as taxes, central banks - including the ECB - agree on the need to include climate issues in monetary policy considerations. This is because climate change fits into the monetary policy framework as it affects the way the financial system reacts to shocks, increases the likelihood of extreme events, and influences the way monetary policy propagates through the economy. However, views differ as to what exactly central banks should be doing to prevent climate change. Matikainen *et al.* (2017)[204] look at the climate impact of quantitative easing (QE), arguing that central banks should consider how their operation of monetary policy could affect the transition to a low-carbon economy. The reasoning is that supposedly market-neutral interventions by central banks may show an unintended structural bias towards carbon-intensive industry incumbents. The recommendation is for central banks to increase transparency around the purchasing and selection process, to investigate the impact of their interventions on both high-carbon and low-carbon investment, and consider options for changing their purchasing strategies by revising eligibility criteria and using monetary policy more effectively to support long-term sustainable growth.

The ECB is now actively supporting the transition to a low-carbon economy by improving the pricing of climate change and transition risks through its joint work with industry on risk monitoring. The ECB also seeks to promote the reorientation of financial flows towards sustainable investment products by incorporating climate and, more broadly, environmental, social and corporate governance considerations into its own investment activities. As to the potential use of asset purchases to pursue climate-related goals, so far, ECB's Governing Council considers that the best way to achieve its monetary policy objective is to follow the market neutrality principle for this kind of operation. This principle does not preclude the ECB from supporting environmental objectives, as the ECB has been purchasing green bonds both under its public sector and corporate sector purchase programmes.

Outside Europe, the Federal Reserve acknowledged in November last year for the first time in its Financial Stability Report that global warming 'is likely to increase financial shocks and financial system vulnerabilities'. The Japanese equivalent authority, the Financial Services Agency (JFSA), is working on a climate scenario analysis and a two-part stress testing pilot covering the country's five biggest banks. The Bank of England published a consultation on its proposals for stress testing the financial stability implications of climate change in the framework of the 2021 biennial exploratory scenario exercise. Australian financial regulatory authorities plan to introduce mandatory stress tests that will look at the impact of climate change on banks, insurers and the pension fund industry, based on the methodology being developed in the UK.

The described policy efforts across sectors and world regions underline the need to tackle climate change implications for financial stability early enough and in an orderly fashion. A significant effort has been made in the area of climate-related risk measurement, yielding estimates of the magnitude and distribution of risks and initial risk monitoring frameworks. It will be important in future to go beyond these analytical efforts and reflect on how micro and

[204] Matikainen, S. Campiglio, E., and Zenghelis, D., The climate impact of quantitative easing, *Policy Paper*, May 2017.

macro supervision can contribute more practically to reducing climate-related financial risks. In this respect, it will be key to ensure cooperation across jurisdictions as joint effort is a prerequisite for success. Consistency of approaches across financial sectors is also important to prevent risks of unintended fragmentation in regulatory and supervisory practices. Macroprudential policies should be considered for any material systemic climate-related risks.

4.4 Conclusion

The high level of uncertainty related to large-scale irreversible climate-related events makes it is difficult to quantify precisely their impact on financial stability. Methodological challenges as well as data shortages further magnify this difficulty, particularly when it comes to second-order effects. Consequently, the future path of climate change and its impact on the financial system remain highly uncertain. The lack of policy and pricing frameworks that would adequately capture external climate-related factors prevents financial markets from fully reflecting the risks in prices.

Nevertheless, available estimates point to significant economic and financial risks that surround both climate change itself as well as the needed transition to a low-carbon economy. The timing and magnitude of these impacts look different depending on the scenarios considered. Although the resulting financial exposures and potential changes in asset prices may not pose direct risks to financial stability in the time periods considered in the current assessments, the high concentration of risks makes specific countries, sectors and individual financial institutions highly vulnerable. It is also important to distinguish central estimates, showing modest impacts, from tail risk estimates, suggesting more severe and destabilising effects. Finally, climate-related risks may have a destabilising effect on the financial system if they come on top of other risks.

The market failure linked to climate change as well as the significant lag in discerning the benefits of mitigation measures calls for timely global cooperation in this area. Precautionary measures may be needed in view of the urgency to act now climate. The measurement of these risks based on risk monitoring frameworks, stress tests and scenario analysis needs to become standard practice in the short term. It is important to determine what the results of climate stress tests will imply for prudential requirements. In parallel, better harmonised firm-level reporting, to be achieved with the proposed Corporate Sustainable Reporting Directive and initiatives such as the EU Taxonomy, are instrumental in this context. The upcoming renewed sustainable finance strategy will serve as a further instrument to address remaining issues.

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