Derivatives in Sustainable Finance

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Karel Lannoo
Apostolos Thomadakis

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Authors: Karel Lannoo is CEO of CEPS, and General Manager of ECMI. Apostolos Thomadakis, Ph.D. is Researcher at ECMI and CEPS.

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CEPS and ECMI
Place du Congrès 1, B-1000 Brussels
Tel: 32 (0) 2 229.39.11
e-mail: info@ceps.eu and ecmi@ceps.eu
internet: www.ceps.eu and www.ecmi.eu

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Executive Summary

Sustainability is one of the most pressing topics of our own and future generations. It requires the quality of not being harmful to the environment or depleting natural resources, so as to support long-term ecological, social and good governance balances. To achieve the transformation towards a more sustainable economy also requires enormous investments (in clean energy, mobility and so on). For companies to be resilient, the management of ecological, governance and social risk factors becomes increasingly a prerequisite and, therefore, a factor of utmost importance for the financial system as a whole. Traditional investment criteria do not adequately cover these risks because of the long-lasting nature of the environment, its resources and the impacts of climate change, and the lack of disclosure of performance against these criteria.

Financial markets, as an intersection for capital allocation, can play a major role in promoting sustainability and sustainable resource management. One market that will play an important role in this transition is the derivatives market – one of the largest global markets and a vital component of the world's financial system. This market has been tightly regulated since the 2007-08 financial crisis, making it safer and more transparent.

Derivatives perform a critical role in economic activity by enabling and helping businesses and investors better manage the risks to which they are exposed, and to more effectively align their exposures with risk tolerance and risk management requirements. The derivatives market also plays a major role in enhancing transparency, through the provision of forward information on the underlying commodities, securities or assets, and this ultimately contributes to long-term sustainability objectives.

In the context of the EU's flagship European Green Deal, a derivatives market can – through its forward dimension, its global and consolidated nature, and its proper regulation – contribute to the significant capital raising and investing that will be required to transition to a low carbon economy. Issuers of and investors in the greater than €1 trillion of capital that is expected to be required to support this transition will want and need to manage the associated interest rate and other risks of these investments, and derivatives are the most efficient way to do so. In addition, environmental, social and governance (ESG) products that link returns with sustainability performance and impact are increasing in importance, while new ESG derivative offerings have made their appearance in the markets in recent times to satisfy growing demand.

The response to the Covid-19 pandemic has put the European Green Deal at the heart of the EU's recovery plan.[1] Sustainability-linked products – whose liquidity, price transparency and attractiveness to investors can be further enhanced through the use of derivative instruments – can attract much-needed investment for research and the low-carbon transition. Such investments have long-term objectives and require a long-term orientation. To this end, derivatives contracts can play a very important role in achieving the goals of the Sustainable Finance Action Plan (SF Action Plan). This is because derivatives:

i) can enable the EU to raise and channel the necessary capital towards sustainable investments;
ii) help firms hedge risks related to ESG factors;
iii) facilitate transparency, price discovery and market efficiency; and
iv) contribute to long-termism.

Following the introduction, Chapter 2 describes sustainable finance in the EU and its three main aims. Chapter 3 examines the role of derivatives in sustainable finance, and Chapter 4 focuses on the most derivatives-relevant regulatory initiatives of the SF Action Plan. Chapter 5 highlights the evolution of derivatives markets over the years and the regulatory actions undertaken since the 2007-08 financial crisis, and Chapter 6 concludes.

[1] See https://ec.europa.eu/commission/presscorner/detail/en/ip_20_940.

1. Introduction

Over the past years, sustainability has risen in scope and importance on the agenda of global policymakers and other key constituencies, particularly in Europe. There is a growing movement to align the financial system with sustainable development. In September 2015, the United Nations (UN) '2030 Agenda for Sustainable Development' laid down 17 sustainable development goals (SDGs) to guide international action on economic, social and environmental targets (UN, 2015). A few months later, in December 2015, the Paris Agreement sealed the deal between 196 parties (195 countries and the European Union) in adapting and building resilience to climate change, as well as limiting global warming.[2] These two initiatives set the path towards a sustainable economic future that ensures stability, a healthy planet, fair, inclusive and resilient societies and prosperous economies.

Sustainability refers to the preservation of resources, the tackling of climate change and the creation of long-term value in the economy. As with any other kind of development, financing must be provided for sustainable development. Sustainable finance can generally be described as the process of taking due account of environmental and social considerations in investment decision-making, leading to increased investments in longer-term and sustainable activities. This means that financial market participants identify sustainable investment opportunities and manage the risks that arise as a result of climate change and the transition to a more sustainable economy, while ensuring transparency and long-term value creation.

To that end, in March 2018 the European Commission (EC) announced the EU Sustainable Finance (SF) Action Plan, to support the European Union's efforts to meet its climate and energy commitments under the Paris climate agreement. In particular, the EC seeks to encourage capital flows into areas that promote the UN SDGs, as well as managing the financial risks from climate change.[3] The SF Action Plan aims to: i) reorient capital flows towards sustainable investment in order to achieve sustainable and inclusive growth; ii) manage financial risks stemming from climate change, resource depletion, environmental degradation and social issues; and iii) promote transparency and long-termism in financial and economic activity.

The Covid-19 pandemic – one of the greatest global challenges in generations – has important economic, political, social, but also environmental implications. While in the short run, governments and central banks are mobilising resources to avoid a deep recession, growing unemployment and corporate failures, the greatest challenge is the transition to a post-pandemic world. The Covid-19 crisis represents a tangible opportunity to accelerate the transition to a more sustainable society in the long run. Therefore, financial markets have an important role to play as the main mechanism for redirecting capital towards sustainable investments, as well as the distribution of risk.

A market that could play a significant role towards green transition is the derivatives market. A derivative is a financial instrument that derives its value over time from the performance of an underlying (e.g. equity price, interest rate, commodity price, foreign exchange rate, credit/bond price, index of prices or rates, or another variable). Because the cash flows from a derivative contract are derived from the performance of the underlying, derivatives can provide the payments associated with a financial instrument without requiring the holder of the derivative to actually own the instrument. Moreover, they facilitate the transferring of risks from those who do not wish to carry them to those who are willing to do so.

[2] See http://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf.

[3] These areas include cutting greenhouse gas emissions by a minimum of 40% by 2030 compared to 1990 levels and increasing the share of renewables in final energy consumption to at least 32%, versus current levels of around 17%.

Derivative financial instruments are an effective tool for risk management purposes and allow market participants to hedge against the various types of common financial risks (e.g. currency, credit, interest rate risks etc.), as well as those risks now emerging as a result of climate change. As the transition to a low-carbon economy will require significant financial resources, and reallocation of risk and capital, derivatives can significantly contribute to hedging the risks associated with green investments, and hence support the financing of the European Green Deal. Indeed, raising money in the capital markets necessitates the hedging of the various risks attached (particularly interest rate and foreign exchange risks through the use of cross-currency swaps).

On the regulatory side, the 2007-08 financial crisis led to a massive change in the regulation covering over-the-counter (OTC) and exchange-traded derivatives (ETD). With the goal of making derivatives markets safer and more transparent, the key commitments of regulators focused on: i) trade reporting; ii) central clearing; iii) platform trading; iv) margins; and v) higher capital requirements for non-centrally cleared derivatives. Ten years on from the Pittsburgh G20 meeting, derivatives markets have now become much more transparent, risks and exposures are more centrally managed, large buffers are in place to withstand shocks, and more data is available.

2. Sustainable finance in the EU

Sustainable development in its economic, social and environmental dimensions has long been at the heart of the European Union (e.g. Article 3.3 of the Treaty of the European Union). It is a prominent building block of the renewed Capital Markets Union (CMU) 2.0 project to unlock public and private investments to support the transition towards a low-carbon, circular and resource-efficient economy (EC, 2017). In March 2018, the EC committed to the SDGs and the Paris Agreement by launching a detailed action plan on financing sustainable growth (EC, 2018a).[4]

The SF Action Plan sets out a strategy to encourage the integration of ESG factors into investment decision-making, and facilitate the mobilisation of private capital (up to €290 billion per year) towards sustainable activities. In particular, it aims to:

- reorient capital flows towards a more sustainable economy
- mainstream sustainability in risk management
- promote transparency and long-termism.

In December 2019, the EC adopted the European Green Deal, a growth strategy towards making Europe the first climate-neutral continent by 2050.[5] The Green Deal aims to increase the financial resilience of the economy, companies and citizens through the adoption of the Sustainable Europe Investment Plan.[6] The aim of this is to channel private and public financial resources into sustainable economic activities to mobilise more than €1 trillion of sustainable investments over the next decade. Owing to the perceived slow pace of transition to a low carbon economy, a Renewed Sustainable Finance Strategy was launched in April 2020.[7]

The Renewed Sustainable Finance Strategy focuses on three areas:

- Strengthening the foundations for sustainable investment by creating an enabling framework, with appropriate tools and structures;
- Increased opportunities for citizens, financial institutions and corporates to actively engage in the sustainable finance debate regarding green investments and investor protection;
- Reducing and managing climate and environmental risks and integrating them into financial institutions and the financial system as a whole, while ensuring social risks are duly taken into account where relevant.

This Chapter discusses Europe's path to reorienting capital flows towards climate-related expenditures, the need to mainstream sustainability in risk management, and to promote transparency and long-termism.

[4] See Action Plan: Financing Sustainable Growth.

[5] See the European Green Deal.

[6] See the Sustainable Europe Investment Plan.

[7] See the Consultation of the Renewed Sustainable Finance Strategy.

2.1 Reorienting capital flows towards a more sustainable economy

For Europe to meet its climate and energy goals by 2030, it needs an estimated €11.2 trillion in investments – a gigantic amount.[8] According to the latest estimates, **Europe is not on track** to deliver this target. There is an investment gap of around €177 billion per year between 2021 and 2030, or €1.77 trillion by 2030 (HLEG, 2018). While this gap refers to climate and energy alone, other needs in sustainability-related areas (e.g. water treatment and supply, circular economy, waste, transport and logistics, information and communications technology) are estimated to add an extra €315 billion per year (EIB, 2016; HLEG, 2018).

Under the current 2014-20 Multiannual Financial Framework (MFF), the EU agreed to make at least 20% (or €206 billion) of its budget directly climate relevant.[9] More specifically, climate-related spending amounted to €210 billion or 19.7% of Europe's budget, according to the latest EC estimates (Table 1). But this is not sufficient for achieving the EU's 2030 climate and energy goals. A more ambitious target has now been set for 2021 to 2027 for **the European Green Deal**, which has climate mainstreaming across all EU programmes at 25%, that amounts to an estimated €320 billion (EC, 2018b).[10]

Table 1. Financing of climate action at the EU budget (€ billion)

	2014	2015	2016	2017	2018	2019	2020 (draft budget)	**Total 2014-2020**	**Proposal for 2021-2027**
Total EU Budget	118.1	158.6	151.5	155.9	156.7	162.1	164.1	**1,067.0**	**1,280.0**
Climate Change finance	16.2	28.4	33.0	31.6	32.4	33.8	34.5	**209.9**	**320.0**
Share of climate	13.7%	17.9%	21.8%	20.2%	20.7%	20.9%	21.0%	**19.7%**	**25.0%**

Notes: Figures before 2020 refer to actual expenses, while figures for 2020 refer to the target level. Financing commitment appropriations are tracked and reported under the annual budget procedure. The budget estimate for the period 2021-27 will be further reinforced by an emergency "Next Generation EU" instrument of €750 billion.
Sources: Statement of Estimates of the European Commission for the financial year 2020, and EC (2018b).

The Investment Plan is part of the ongoing negotiations on the EU's 2021-27 MFF, which are now complicated by the **impact of the Covid-19 pandemic**. Concerns have been raised that the EU's green transition could be derailed, or at least deprioritised.[11] However, the recently agreed Sustainable Finance Taxonomy, the Disclosures Regulation, the EU Green Bond Standard, the EU Ecolabel, and the Paris-aligned and climate transition benchmarks should guide public and private sector plans for the pandemic recovery. This was

[8] The figure refers only to meeting the needs of climate and energy, via the "Clean Energy for All Europeans" package. See https://ec.europa.eu/energy/en/topics/energy-strategy-and-energy-union/clean-energy-all-europeans.

[9] See https://ec.europa.eu/clima/policies/budget/mainstreaming_en.

[10] The Commission's latest communication on 27 May 2020, "The EU budget powering the recovery plan for Europe", highlights that achieving the target of at least 25% of spending contributing to climate action is necessary for a balanced European recovery.

[11] See https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/649371/EPRS_BRI(2020)649371_EN.pdf.

highlighted by both the EU Technical Expert Group on Sustainable Finance (TEG) and confirmed by the European Council in its recently announced Roadmap to Recovery.[12]

But for Europe to achieve its ambitious climate objectives, the EU budget by itself is not sufficient and **more capital is needed**. The EU funds are intended to be used to leverage private funds and create an enabling framework to facilitate and stimulate public and private investments needed for the transition to a climate-neutral economy, in a similar vein to the Juncker investment plan (2014-19).[13] In 2019, European investors poured a record €120 billion into sustainable funds, bringing the total assets under management of the 2,405 funds to €668 billion.[14] The amount of green bonds issued in Europe in 2019 increased by 74% year-on-year to €104 billion, representing 45% of the global issuance,[15] while ESG index-based derivatives (futures and options) are one of the fastest growing segments for exchanges and an increasingly popular hedging and trading tool.[16]

ESG investments generally represent a limited fraction of the bond or stock markets. With the EC's upcoming taxonomy, it is anticipated that this selection could become even more reduced as the definition of investments as ESG is standardised. As a consequence, institutional and retail investors will most probably opt for portfolio diversification solutions that allow them an appropriate market-risk mitigation. One traditional way of achieving that is the use of ESG indices. The successful adoption of ESG index-tracking strategies is highly dependent on the simultaneous development of related hedging solutions, whether through OTC swaps in an ESG construct or – increasingly – through regulated derivative market products (such as index-futures/options), allowing financial market participants to hedge their risks.

ESG indices are key for enhancing the access to ESG strategies to the public at large with sufficient liquidity and appropriate portfolio diversification. A variety of such indices currently on offer are designed to represent the performance of companies with high ESG ratings. Moreover, new ESG indices are even being developed that allow market participants to hedge or gain exposure to the most liquid segments of the European credit default swaps (CDS) market with an ESG focus (e.g. ESG-screened corporate or sovereign bond indices).[17] In this light, ESG indices constitute a very effective mechanism to induce companies to adopt a greener agenda, notably one in line with the EC's taxonomy.

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[12] See the Statement issued on 27 April 2020 by the EU TEG on "Sustainable Recovery from the Covid-19 Pandemic Requires the Right Tools", and the Joint Statement of the Members of the European Council on 26 March 2020 on "A Roadmap for Recovery: Towards a more Resilient, Sustainable and fair Europe".

[13] The Juncker Investment Plan for Europe, proposed in November 2014, had three main goals: i) to boost investment; ii) to increase competitiveness; and iii) to support long-term economic growth in the EU. The European Fund for Strategic Investments (EFSI), one of the main elements of Juncker's plan, established in 2015, intended to use public funds to mobilise private investments in a broad range of sectors, including energy and climate-related actions.

[14] At the same time, assets in these funds grew to €668 billion in 2019, up by 56% compared to 2018. See https://www.morningstar.co.uk/uk/news/199190/record-shattering-year-for-sustainable-investments.aspx.

[15] See the 2019 Green Bond Market Summary by Climate Bonds Initiative.

[16] It is important here to make a distinction between 'standard' derivatives within an ESG construct, and ESG derivatives. The former are an essential risk transference tool without which large-scale capital raising would be more inefficient. The latter can help develop the transfer and price discovery of ESG-related risks.

[17] Among the factors affecting the performance of a corporate/sovereign bond (e.g. payment structure, duration, market risk, interest rate, etc.), is credit risk (i.e. credit quality of the issuer). Given that ESG risks are increasingly considered part of the credit-rating process, it is equally important to integrate ESG metrics in the corporate/sovereign bond market by focusing on those companies/sovereigns incorporating ESG into their business practices.

So while the funds and political determination are available to advance the transition towards a sustainable economy, a public-private partnership is still urgently needed to ensure Europe lives up to its climate and energy commitments.

2.2 Mainstream sustainability in risk management

All known risks of the financial system (i.e. credit risk, market risk, liquidity risk and operational risk) have a sustainability dimension: physical risk, transitional risk, financial stability risk (CISL, 2016; DNB, 2019). Sustainability risks are due to climate change, resource depletion, environmental degradation, introduction of new public policies or social matters, and can significantly affect companies at an existential level (Anderson, 2009).[18] Inadequate understanding and management of such risks increases exposures for financial institutions and limits progress towards sustainable growth and a green transition (CCSF, 2016).[19]

If environmental risks are being underestimated, over-allocation of capital to higher risk activities may impact the efficiency and effectiveness of markets, as well as the safety and soundness of market participants and the wider financial system (Batten *et al*., 2016; G20, 2016; NGFS, 2018; ECB, 2019). In addition, it may give rise to a sudden reassessment of the value of a large range of financial assets as costs and opportunities become apparent. The speed of – and probably the disorder in – repricing that might occur could be decisive for financial stability.[20]

Much of the rationale underpinning the regulatory actions in sustainable finance comes from the identification of climate incidents and hazards for the financial system. There are several studies illustrating how sustainability risks can be transmitted to the financial sector and the impact they may have. In the 1880s, economists argued that financial crises were the result of sunspots and soil erosion, which impacted agricultural production, causing a downturn in international trade and significant bank losses (Jevons, 1884; Gallegati and Mignacca, 1994; Hornbeck, 2012). More recently, hurricanes (e.g. Hurricane Andrew, Rita, Wilma, Katrina) have caused widespread and extensive damage to the economies they hit with high loan losses and provisioning for banks (Malmstadt *et al*., 2009; McChristian, 2012; Lambert *et al*., 2019), while the European heatwave of the summer of 2003 resulted in a loss of around €13 billion to the European agricultural sector (De Bono *et al*., 2004). The 2011 floods in Thailand resulted in a direct loss of €33 billion (or 12% of GDP) and shrank the national economy by 2.5% (Haraguchi and Lall, 2015).

While some of the financial losses materialised by climate-related physical risks are borne by insurers, others remain uninsured. Thus, the transmission of environmental and climate disasters, as well as the magnitude of the financial loss, depends largely on the extent to which losses are covered by insurance. In fact, between 1980 and 2015 only about 26% of the losses from the largest natural catastrophes had been insured, and only

[18] In fact, eight of the most important risks that companies are facing are risks directly related to environmental or social issues (Schulte and Hallstedt, 2017). Risks arising from changes in the climate, geology or in the equilibrium of the ecosystem, can be classified as physical risks (e.g. extreme weather/temperature changes, earthquakes, volcanoes, erosion, changes in the quality of soil or the marine ecology). Yet risks arising from efforts to address environmental changes and the transition to a lower-carbon economy are classified as transition risks. For example, the introduction of a new regulation, a technological change, a shift in investors' sentiments, or a disruptive business model innovation.

[19] While divestment can be the right way forward in some cases, risks can typically be managed efficiently. This is even more relevant, given that seeking to achieve sustainability goals could result in increased exposure to other environmental or social risks.

[20] See the speech by Mark Carney, the former Governor of Bank of England, on 29 September 2015: https://www.bankofengland.co.uk/speech/2015/breaking-the-tragedy-of-the-horizon-climate-change-and-financial-stability.

50% of the largest storm events had been insured (Batten *et al.*, 2016). Protection gaps in low- and middle-income countries mean that even greater costs are being borne by the uninsured. In 2017, a record €117 billion in insured losses was eclipsed by an additional uninsured €167 billion (IMF, 2019). In 2018, the insured financial losses from threats to the climate (e.g. record temperatures across Europe and North America, wildfires in the Amazon basin, tropical storms in Asia, rising sea levels) have been estimated at €80 billion: this is double the inflation-adjusted average for the past 30 years.[21] For 2019, overall estimated losses from natural disasters were at €135 billion, from which around €48 billion were insured.[22]

Improved risk management, taking sustainability duly into account, can thus shield the financial sector and the economy at large from ESG risks. But this should be done in due time, with a holistic view, on the basis of a broader set of reliable and comparable data.

2.3 Enabling transparency and long-termism

Disclosures in relation to information about ESG practices are a fundamental element of sustainability. Transparency is a necessary condition for well-functioning financial markets, and the lack of it means that information is not readily available to market participants when they need to take investment decisions. Furthermore, transparency can demystify complex supply chains, help different actors identify and minimise risks, and inform whether and where progress is being made. Thus, it is a prerequisite to enable financial market actors to properly assess the real long-term value creation of companies and the management of sustainability risks. In fact, there is no sustainability and long-term value creation without transparency (Fung *et al.*, 2007; Mooij, 2017). The question, however, is how to implement such transparency.

Several corporates have been at the forefront of disclosing non-financial information over recent years. These efforts have been structured through voluntary initiatives of self-regulatory organisations, which have set standards for their signatories' incorporation of ESG criteria in their disclosure practices. The same applies to institutional investors, who have enhanced their efforts to integrate ESG factors into investment practice.

In recent years concerns have been raised about the perceived short-term focus of capital markets (Levitt, 2000; Graham *et al.*, 2006; Dallas, 2012).[23] Studies have shown that an excessive corporate focus on short-term results not only has a negative impact on investment and economic growth (Davies *et al.*, 2014; Jarsulic *et al.*, 2015), but also on sustainable development (Laverty, 1996; Atherton *et al.*, 2007; Gavin and Cook, 2009; Sampson and Shi, 2020). Short-termism penalises corporate capital accumulation as it diverts resources traditionally allocated to support long-term development of firms and sustainable financial activities, to maximise shareholder value in the short term.

In its SF Action Plan, the EC includes fostering transparency and long-termism in financial and economic activity as one of its three main aims. The Commission observes that sustainability and long-termism are inextricably linked, as investments in environmental and social objectives require a long-term orientation. Financial market participants are more likely to make longer-term investments if they are able to efficiently hedge the risks of such investments. The liquidity-provision function of 'market makers' plays a central role in that regard, as the

[21] See https://www.imf.org/external/pubs/ft/fandd/2019/12/a-new-sustainable-financial-system-to-stop-climate-change-carney.htm.

[22] See Munich RE: https://www.munichre.com/topics-online/en/climate-change-and-natural-disasters/natural-disasters/natural-disasters-of-2019-in-figures-tropical-cyclones-cause-highest-losses.html.

[23] While early works by Stein (1989) and Shleifer and Vishny (1990) argued that short-termism is the result of myopic managerial behaviour, recent studies (Hackbarth *et al.*, 2018) show that it is rather a result of shareholder value maximisation.

long-term sustainability of their involvement is highly dependent on their capacity to hedge their global-netted positions on derivatives markets (in addition to their no-less sizable hedges on cash markets). However, current market practices often prompt market participants to focus on short-term performance rather than medium to long-term objectives. It is therefore a central aspect of the sustainability agenda to reduce the undue pressure for short-term performance in financial and economic decision-making so that investors are able to make informed and responsible investment decisions (ESMA, 2019c). Better and more comprehensive ESG disclosures should allow them to do so.

3. The role of derivatives in sustainable finance

The transition to a more sustainable global economy requires scaling up of investments that provide environmental and social benefits, while it demands sound and effective risk management, and transparency and disclosure from issuers of capital instruments. Such investments have long-term objectives and require a long-term orientation. To this end, derivative contracts and financial instruments can play a very important role in achieving the three main goals of the SF Action Plan. This is because derivatives can:

i) enable capital to be channelled towards sustainable investments;
ii) help firms hedge risks related to ESG factors;
iii) facilitate transparency, price discovery and market efficiency; and
iv) contribute to long-termism.

This is discussed in more detail below.

3.1 Derivatives enabling capital to be channelled to sustainable investments

Over the past 30 years, the use of derivatives as hedging instruments has become more significant as the role of derivatives in global financial markets has grown. The use and availability of derivatives – a tool to manage exposures and hedge risk – can encourage investment activity, supply and demand, and protect more vulnerable or liquid assets from volatile market conditions (Kubas *et al*., 2017).

In particular, when external capital is costly or difficult to obtain (e.g. bank financing of a long-term renewable energy or organic agriculture investment), firms may have an incentive to hedge with derivatives (Froot *et al*., 1993).[24] Firms with sustainable projects and high research and development (R&D) expenditures are more likely to hedge with derivatives and thus raise the necessary capital by reducing financial constraints (Allayannis and Mozumdar, 2000).

It is an undisputable fact that a substantial capital-raising exercise cannot be performed without the ability to hedge risks and exposures. Derivatives, as one of the biggest global markets that constitutes a very important component of the world's financial markets,[25] can be used to assist the ability to tap funding sources, by appropriately adapting the risk profile for both issuers and investors.[26] Being an efficient risk management instrument, derivatives can be channelled towards environmentally friendly investments. They allow two

[24] In this case, firms use derivatives to increase the correlation between internal funds and their investments to reduce their dependence on external capital. Such action would indicate that a well-developed derivatives market can overcome some of the constraints imposed by a less-developed capital market (Adam, 2002).

[25] With approximately €668 trillion in notional amount outstanding (this is the notional value of all derivatives contracts concluded and not yet settled) as of June 2019, the global derivatives market is more than four times larger than the global equity and bonds markets combined. At the same time, the estimated gross market value (i.e. the potential scale of market risk) of all derivatives outstanding is around €12 trillion, which is markedly lower than the equity and bond markets with capitalisation of €65 trillion and €90 trillion respectively. Gross market value is the sum of absolute values of all outstanding derivatives contracts with either positive or negative replacement values. In other words, it provides a measure of economic significance that is readily comparable across markets and products. Data on derivatives include OTC and ETD, and are obtained from BIS, while data equity and bond markets are measured by their market capitalisation and are obtained by SIFMA.

[26] See https://www.isda.org/2017/05/10/how-do-derivatives-benefit-the-global-economy/.

parties with different tolerances and expectations about climate risks to transact for their mutual benefit and, in so doing, finance climate adaptation.

For example, financial institutions such as banks use derivatives (such as CDS)[27] to hedge their credit risk exposure to borrowers, and thus potentially increase the supply of credit to firms with sustainable and environmentally friendly investment projects. Empirical evidence suggests that the ability of lenders to hedge their credit exposures makes them more willing to extend credit (Hirtle, 2009; Saretto and Tookes, 2013; Shan *et al.*, 2014; Culp *et al.*, 2016). In particular, the use of CDS is associated with increased availability of credit (larger and longer-dated loans) and decreased borrowing costs for 'reference entities'.[28] It allows such entities to use those additional funds to finance productive investment opportunities, thereby increasing aggregate investment and economic growth (Jarrow, 2011).

Examples of how the derivatives market is developing to further align with ESG incentives involve new ESG derivatives, which could be used to assist and enhance capital raising for investing in a climate adaptation or mitigation strategy. ESG derivatives can be used in conjunction with traditional funding instruments (e.g. equities, bonds, loans), by appropriately adjusting the risk profiles of these instruments to suit the specific requirements of issuers and investors. To give a contemporary example, an ESG foreign exchange (FX) derivative could be used to hedge a company's FX exposure related to a wind farm construction project and commit the provider of the derivative to reinvest the premium it receives in a reforestation project, in line with the UN's SDGs principles.

SDG-linked derivatives have only recently started being used as a tool for channelling capital towards companies focused on ESG issues.[29] Sustainability-linked derivatives transfer the risk associated with an SDG investment in the form of sustainability-linked bonds (SLBs) and loans (SLLs), to a financial intermediary in exchange for a fixed, recurring payment. These are primarily cross-currency swaps used to hedge against the potential exchange rate volatility and interest rate risk of the investment. In addition, they include a dedicated incentive mechanism that is fully aligned with the sustainable performance indicators outlined in the product's financing solution.

Asset managers and other institutional investors investing directly in taxonomy-compliant companies may use derivatives to hedge their investment against the (to-be-created) ESG taxonomy index (indices), or to reduce transaction costs.[30] To attain such objectives, institutional investors will seek to enter into performance swaps (or total return swaps (TRSs)).[31] By doing so, these institutions apply an ESG investment policy (investments

[27] A credit default swap (CDS) is a type of derivative that transfers the risk of certain defaults of a particular borrower referenced in the CDS contract (e.g. a financial, corporate or sovereign entity), from the buyer to the seller. The buyer makes periodic payments to the seller and in return receives a settlement upon the occurrence of a default (a credit event) with respect to the referenced entity.

[28] CDS contracts reference a borrower (typically financial, corporate, or sovereign entity) and its debt. The borrower is known as the 'reference entity'.

[29] The first ESG-linked sustainability-improvement derivative (SID) was launched in August 2019. This is a financial instrument that hedges the risk (e.g. against moves in interest rate or currency) of a sustainable investment. The price of such a derivative is not only linked to the company's trading risk, profit and capital requirements, but also to its ESG performance.

[30] As is the case today for conventional asset management, institutions investing in indices seek to optimise their trading costs and/or limit their tracking error with the indices that they use as benchmarks.

[31] A total return swap (TRS) is a derivative contract that replicates the cash flows of an investment. It allows the investor to receive the total economic return of an asset without actually buying it. A TRS involves swapping an obligation to pay

are exclusively filtered with ESG criteria), and reduce their trading costs, but also offer to investors the returns corresponding to the agreed ESG underlyings. In this regard, synthetic replication through the conclusion of performance swaps by the ESG funds from a passive management perspective would allow the derivative provider to hedge its position and thus bring more liquidity to the ESG underlyings. This strategy is also considered less costly for the end investor because of the optimisation allowed by the derivatives (ESMA, 2020).

Derivatives can also act as an asset-management intervention tool. For example, a tool that allows firms to manage the 'funding' risk of species' recovery and restoration (Mandel *et al.*, 2010; Little *et al.*, 2013). In the absence of such a source, recovery efforts from an environmental or climate catastrophe would require unbudgeted expenditure from government, public entities, or forgone income, and may potentially lead to prolonged, severe losses borne by those that rely on the natural asset. In the context of a more sustainable financial system, derivatives could also contribute to mitigating existing and future risks linked to biodiversity loss and health emergencies, such as the Covid-19 outbreak.[32]

In that respect, derivatives will support public and private entities to free up capital that could be reoriented towards preventative and recovery efforts. For example, by buying a derivative whose value is based on the population viability of a species prior to becoming distressed, a government or municipality could transfer the risk of such an event and thus free up capital reserved for recovery efforts, should these be needed (Mandel *et al.*, 2010).

3.2 Derivatives hedge risks associated with sustainable investments

While derivatives are widely used to manage or hedge risk in financial markets, they can also play a very important role in helping firms manage financial risks related to ESG issues. By enabling the exchange of risks, derivatives offer an effective tool to hedge climate risks (either direct physical risks or related to required financial transition) by reducing the uncertainty on future prices. In other words, they provide a shield to a portfolio from climate or environmental risk and transform erratic cash flows into predictable sources of return. For instance, ESG derivatives offer a liquid and cost-efficient alternative for managing undesired sustainability risks and integrating ESG into investment decision-making.

Financial institutions can use derivatives to hedge a series of risks. A bank can use derivatives to manage the credit risk of counterparties whose financial results may suffer because of climate change or whose viability might be threatened. In that respect, CDS can serve two different purposes: i) to hedge future potential losses that would be realised following the occurrence of a catastrophic event (that leads to bankruptcies/defaults); and ii) to hedge the risk of changes in the market value of ESG bonds/loans' obligations, resulting from the market's expectations on future potential losses/damages and other market factors (ISDA, 2019b). For example, by entering a cross-currency swap (with a bank) in connection to its SDG-linked bond or loan, an

interest (based in a specified fixed or floating interest rate) in return for an obligation representing the total return (including appreciation/depreciation) on a specified reference asset or index.

[32] Derivatives (alongside bonds) were used by the World Bank in 2017 (through the Pandemic Emergency Financing Facility (PEF)) to help developing countries against the risk of future pandemic outbreaks, as a response to the 2014 Ebola epidemic. See: https://www.worldbank.org/en/news/press-release/2017/06/28/world-bank-launches-first-ever-pandemic-bonds-to-support-500-million-pandemic-emergency-financing-facility.

electricity company could hedge the exchange rate and interest rate risk[33] of its new investment in a renewable energy generation capacity and thus ensure its emissions target (UNGC, 2019).

In a similar way, an asset manager specialising in commercial and residential mortgage-backed securities may be willing to use derivatives as an interest rate duration hedge to combat prepayment risk (e.g. from an earthquake, storm or hurricane) in its portfolio. The portfolio manager of a fund that is denominated in one currency and invests in commodities/financial securities denominated in another, may want to use foreign exchange derivatives to mitigate the foreign exchange risk that arises from potential extreme weather phenomena that can cause unexpected swings in foreign exchange rates.

Derivative instruments can also be used by long-term investors such as pension funds, for example, as a substitute to direct investment in the underlying asset (due to liquidity, tax purposes, market timing, etc.), as a risk control mechanism (e.g. hedge the risk exposure to specific financial instruments, both on the asset and liability side, and smoothen short-term liquidity), or to alter the characteristics of the fund's portfolio investments (e.g. the duration of the fixed income portfolio).

One particular type of derivative that has gained significant interest over the past 20 years, and has been expanded rapidly to assist resilience in the face of climate change, is the weather derivative.[34] The market was jump-started during the El Niño winter of 1997-98, when many companies faced the risk of significant earning losses because of an unusually mild winter (Hess *et al*., 2002; Jewson and Brix, 2005; Jones, 2007). Today the market still plays a very important role, as 25% to 30% of the global economy (in terms of GDP) is sensitive to weather conditions (Dutton, 2002; EUMETSAT, 2016). Thus, companies whose business depends heavily on the weather (e.g. power companies, ski resorts) use weather derivatives to hedge against the risk of extreme weather (Damm *et al*., 2014; Ballotta *et al*., 2020).

Such a pre-emptive approach is more cost effective than traditional insurance policies and disaster relief (Cui and Swishchuk, 2015). In particular, unlike an insurance contract whose holder can claim a loss only after providing a proven assessment of losses directly caused by a weather event, a weather derivative offers a direct payment simply based on weather index value. This eliminates the need for the company to prove that the loss is weather related and the possibility that the payout could be influenced by incorrect financial statements (Tang and Jang, 2016).

3.3 Derivatives enhancing transparency

Global markets provide transparency around market pricing and risk, with or without the regulatory overlay. Markets at their most fundamental level provide critical and real-time pricing information that can highlight risk exposures. The Covid-19 outbreak has further highlighted the critical importance of open and transparent markets for the functioning of the global economy through the continuous adjustment of prices to new information, and the provision of liquidity to the benefit of investors by allowing them to rebalance portfolios

[33] Created by the different denomination of the bond repayments and the source of repayments.

[34] A weather derivative covers businesses from rather 'moderate departures' from expected weather conditions as opposed to traditional insurance protection, which covers 'large departures and catastrophes' (Dischel, 2002). Rather than insuring against a specific observable loss, the payout in a weather derivative is instead triggered when particular meteorological conditions, as written into the contract, are detected in vast indices of weather observation data (Bates and Goodale, 2017).

and meet contractual obligations.[35] While there was initial consideration by the public authorities as to whether securities markets should close, this would have made investors extremely worried, and would have made reopening even more difficult. And it would have had knock-on effects for the derivatives markets.

Derivatives change the wealth of information publicly available and contribute in establishing the market price based on the equilibrium of supply and demand. Thus, they impact the underlying markets by playing a price-discovery role (Gereben, 2002; Capelle-Blancard, 2010). This price-discovery process benefits the capital markets as it enables traders to make better assessments of risk, portfolio management and budget planning decisions (Kavussanos *et al.*, 2008). In addition, it has been shown that the process of price discovery is led by markets where the number of participants is higher and more liquid (Garbade and Silber, 1983; Booth *et al.*, 1999; Bohl *et al.*, 2011; Hauptfleisch *et al.*, 2016).

Individual and institutional investors are more likely to predict future prices of underlying assets by examining the activities within the derivatives market (Hawkesby, 1999). This is due to the forward-looking nature of derivatives and the fact that information is absorbed rapidly in the derivatives markets (Black, 1975; Easley *et al.*, 1998; Cao, 1999; Yan and Zivot, 2010). Introducing derivatives creates new hedging opportunities, increases allocational efficiency, and thus tends to decrease price volatility. Moreover, the prices of new derivative securities provide additional signals for investors about other investors' private information, making the market informationally more efficient (Huang and Wang, 1997). With regard to CDS, empirical evidence supports the notion that the CDS market is highly efficient in processing credit-related information, as it responds significantly before downgrades announcements made by credit rating agencies (Norden and Weber, 2004; Finnerty *et al.*, 2013; Wang *et al.*, 2014).[36]

While higher transparency can improve liquidity (Pagano and Roell, 1996; Boehmer *et al.*, 2005; Bessembinder *et al.*, 2006; Goldstein *et al.*, 2007; Edwards *et al.*, 2007),[37] it can also benefit competition, in particular between dealers (Nystedt, 2004; Duffie, 2009).[38] Moreover, the efficacy of electronic venues at facilitating trading in OTC markets has a positive impact on competition among dealers, and thus results in better prices while limiting information leakage (Hendershott and Madhavan, 2015).

[35] See the statement by ESMA Chair Steven Maijoor on "EU Financial Markets and COVID-19", as well as the IOSCO'S statement on "Securities Regulators Coordinate Responses to COVID-19 through IOSCO".

[36] CDS provide a clearer indication of the financial health of a firm compared to bonds and stocks. In particular, it has been found that the CDS market leads the bond market so that most price discovery occurs in the CDS market (Blanco *et al.*, 2005). This is because: i) a CDS is already quoted as spread, avoiding the complication of adjustment by a benchmark risk-free rate faced by using bonds (Hull *et al.*, 2004), and ii) since CDS only measure the probability of default; the implication of events to CDS contract holders should be more straightforward than that of the bond holders.

[37] However, reduced transparency (e.g. imposing anonymity on trading activity) might also have a positive impact on liquidity and thus increase it (Foucault *et al.*, 2007; Friederich and Payne, 2014). A possible reason for such a relationship can be the possibility of predatory trading under transparency (i.e. when identities are revealed).

[38] However, and as has been recognised by regulation (i.e. MiFIR), transparency may inhibit liquidity at large trade sizes (e.g. the size specific to the instrument (SSTI) and the large in scale (LIS)) and this permits waivers and delays as regards transparency. Similarly, real-time transparency does not apply to thinly traded pure OTC trades, as it may not be in the interest of potential counterparties to these trades. Transparency appears most appropriate to quite liquid instruments at medium and small size.

3.4 Derivatives enabling long-termism

Financial regulation since the 2007-08 crisis has created incentives for asset holders to reduce the risk and duration of their investments. As a result, investors tend to concentrate their holdings in the shorter-term and lower-risk spectrum of investable assets. However, the resultant abundance of short-term investors, as well as the shortage of long-term investors, may be a factor influencing sustainable long-term decision-making (ISDA, 2019b). While short-term gains can be garnered from businesses taking excessive risks in governance, environmental or social standards, such strategies could often end in calamity for long-term investors.

It is crucial to distinguish short term from short duration. An investment or a financing operation with shorter duration or lower maturity (e.g. short-term trading, liquidity management, treasury, or trade credit) should not be confused with short-termism (ESMA, 2019a). Investing in shorter duration could be a sound long-term strategy for investors. Short-term market liquidity is a vital factor in allowing long-term investors to value their assets appropriately and invest. Derivatives are a tool that can support both long-term and shorter-term investment strategies, rather than an indicator of the type of strategy undertaken.

However, the misuse of derivatives by market participants – like the misuse of any financial instrument – could give rise to short-termism.[39] Opting for most liquid positions to gain exposure to one market segment, even when there is no underlying risk to hedge, does not prove an intent to trade short-term. Derivatives may have to be rolled or renewed but the exposure may be maintained over a long-term period. Moreover, all financial instruments carry the risk of loss. Thus, as long as derivatives are not misused, to artificially influence pricing of the underlying asset, they cannot fuel short-termism.

Derivatives offer firms a tool to manage their business risks for the long term by smoothing volatility that may arise from a variety of factors. Insurance companies, for example, can use derivatives to effectively manage long-term risks (Shiu, 2011; Hee and Song, 2017). A life insurer with a large portfolio of guaranteed minimum death benefit (GMDB) annuities may use derivatives to hedge against a stock market crash, while a life insurer offering interest rate guarantees on life savings products may use derivatives to hedge against a prolonged period of low interest rates. Alternatively, property and casualty insurers can transfer some of their catastrophic risk (due to environmental and climate reasons) to the capital markets via swap transactions (e.g. a catastrophe or CAT swap).[40]

Another area in which derivatives can hedge long-term risks is agriculture. Weather derivatives, for example, offer a risk-management tool to reduce volatility or revenues and/or costs caused by volatility of weather conditions (Vedenov and Barnett, 2004; Spaulding *et al*., 2003; Torriani *et al*., 2008; Zara, 2010; Marković and Jovanović, 2011).

One type of derivative that has been criticised for potentially promoting short-termism is CDS. As described above, these products offer an efficient and effective way to manage the credit risk of a portfolio. The use of CDS to buy or sell credit protection by firms (e.g. asset managers, investment funds) does not necessarily

[39] The EC defines short-termism as the focus on short time horizons by both corporate managers and financial markets, prioritising near-term shareholder interests over long-term growth of the firm (Mason, 2015). More loosely, short-termism defines decisions and outcomes that pursue a course of action that is best for the short term but suboptimal over the long run (Laverty, 1996).

[40] Catastrophe (CAT) swaps are financial contracts that can be structured to act in the same way as insurance, but investors, not necessarily reinsurers, provide the protection. A CAT swap is a contract used by investors to exchange (swap) a fixed payment for a certain portion of the difference between insurance premiums and claims. In other words, such a swap creates risk capacity for the insurer by transferring a portion of its catastrophe portfolio to the investor/reinsurer. Thus, it can be thought as the financial equivalent of a reinsurance contract or of securitisation, but it avoids the structural complexities and costs associated with facultative agreements or full catastrophe bond issuance.

contribute to short-termism in markets. This has been acknowledged by the European Securities and Markets Authority (ESMA) in the context of its recent report on undue short-term pressure on corporations (ESMA, 2019c). Instead, rather than fuelling short-termism, CDS can facilitate the lending that is crucial for long-term economic growth. They allow institutions to invest in fixed income assets with more certainty, as they can hedge against the risk of a default by the borrower (ISDA, 2019b).

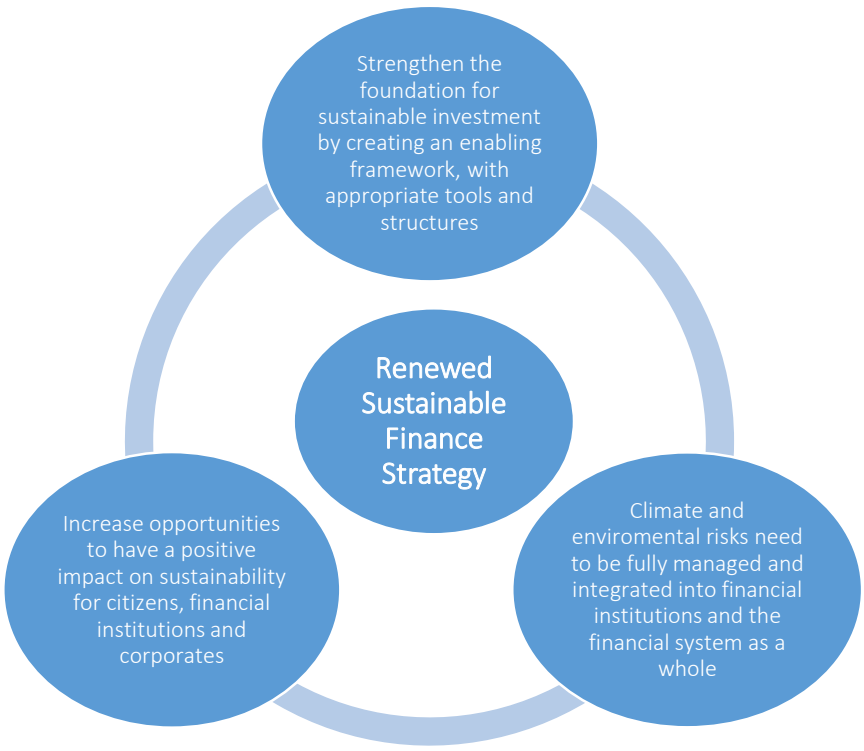
In particular, CDS can be used to address the scarcity or mispricing in the bond market. For example, certain bonds (including green bonds) may only be traded in markets characterised by shallow liquidity, thus making it difficult for an investor to get the right price or find a market for the full size of its investment. In such case, an investor may use the more liquid CDS market by selling CDS protection rather than trading in an illiquid and fragmented bond market (Braunsteffer *et al*., 2019). When the bond is tradable on more favourable terms, the investor can then choose to switch exposure from CDS into the specific bond (ESMA, 2019a). Selling CDS protection can be viewed as being equivalent to the credit exposure from taking a long bond position. Such derivatives exposures are crucial to diversification and risk mitigation, offer an added layer of protection against tail risk, and facilitate long-term growth.

4. Derivatives in the Sustainable Finance Action Plan

To achieve its three main aims, the SF Action Plan sets out an ambitious tern-stream work plan (Figure 1). Progress has been made in some of these streams, but others are still to be developed. Given that the transition towards sustainability has not been fast enough, the Renewed Sustainable Finance Strategy published in April 2020 sets out a more comprehensive and ambitious strategy. This Chapter examines the most relevant policy initiatives from a derivatives' perspective.

Figure 1. Reform areas of the Sustainable Finance Action Plan (top) and the Renewed Sustainable Finance Strategy (bottom)

Reorient capital flows towards a more sustainable economy	Mainstream sustainability in risk management	Foster transparency and long-termism
• A unified classification system for sustainable activities (i.e. EU taxonomy)	• Sustainability in market research and credit ratings	• Disclosure and accounting
• Standards and labels for sustainable financial products (i.e. EU Ecolabel)	• Institutional investors' and asset managers' sustainability duties	• Corporate governance and undue capital market short-termism
• Fostering investment in sustainable projects	• Prudential requirements for banks and insurance companies	
• Sustainability considerations in financial advice		
• Sustainability benchmarks		



4.1 EU Taxonomy

- The EU Taxonomy is the flagship project of the SF Action Plan.

Sustainable investing can mean many different things to different stakeholders, so a unified EU classification system that defines what can be considered an environmentally sustainable economic activity (TEGSF, 2019a) is at the core of the strategy. This is a first and essential step in the efforts to channel investments into sustainable activities. Alongside the Disclosures Regulation (DR), the EU Taxonomy will require firms to disclose the degree of sustainability of financial products that are promoted as environmentally friendly, or to include disclaimers where they do not. However, the taxonomy is not granular enough to determine which activities in a given economic sector would qualify as sustainable. This will be subsequently defined by the development of the technical screening criteria.

4.2 EU Ecolabel

- The EU draft Ecolabel for retail financial products proposes requirements for the use of derivatives by retail investment funds.

Another important aspect of the SF Action Plan is the development of an EU Ecolabel framework for certain financial products to be applied once the EU sustainability taxonomy is adopted. Ecolabelling defines the minimum environmental performance of such products and is expected to contribute to, and encourage retail investors to invest in, sustainable economic activities. The EU Ecolabel does this in two ways: i) by defining green thresholds on portfolio level for funds, and ii) by defining whether companies' green economic activities fulfil thresholds.

One of the main criticisms that the draft EU Ecolabel has received to date is that its various thresholds are not flexible enough to allow a sufficiently large pool of funds to obtain it. This heading for a niche contradicts the end goal for the EU Taxonomy to be widely applied.

The draft report on the development of the EU Ecolabel criteria proposes a number of requirements for the use of derivatives by retail investment funds. In particular, undertakings for collective investment in transferable securities (UCITS) or retail alternative investment funds (AIFs) may invest in derivatives if their use is in line with the fund's (environmental) investment objectives, and it is for either hedging or exposure management (JRC, 2019). The criteria shall be assessed and verified based on the documentation provided by the fund manager. Moreover, the underlying asset(s) shall also comply with EU Ecolabel criteria, including on environmental and social exclusions as well as consumer information.

However, it has been acknowledged that the assessment and verification of the criteria for the use of derivatives could prove to be very complex and challenging as it would be difficult to relate them to EU Taxonomy-eligible activities or capital investment. On the other hand, excluding derivatives for which verification of greenness is not required from the total portfolio asset value would result in a portfolio with only a very small portion of qualifying green assets that could qualify for the EU Ecolabel. Currently, national labels have adopted different approaches to the use of derivatives. For example, while the French Greenfin label puts on restrictions, the Luxembourg's LuxFLAG Environment Label considers derivatives as part of the portfolio total asset value, but at the same time excludes them as an eligible green asset class.

The proposed requirements allow the use of derivatives by retail funds to increase exposure to the underlying assets, which should be temporary and respond to significant subscriptions. This would exclude synthetic replication in the context of passive management through the conclusion of performance swaps by ESG funds

from the Ecolabel. Given that these kinds of derivatives help achieve two objectives of the ESG markets: a) performing an 'ethical' investment while b) ensuring the financial performance of those products (considering that the financial performance is a prerequisite to mainstream ESG products), this does, however, raise concerns.

4.3 Prudential treatment of green assets

- Supervisors calling for an alignment of the prudential treatment of greens assets with the current credit risk framework.

The revised Capital Requirements Regulation (CRR) II/Capital Requirements Directive (CRD) V package includes a mandate (Article 501c of CRR 2) for the European Banking Authority (EBA) to assess by June 2025 whether a dedicated prudential treatment of exposures related to assets or activities associated substantially with environmental and social objectives would be justified (as a component of Pillar 1 capital requirements). In particular, it should determine: i) the effective riskiness of exposures related to assets and activities associated with environmental and social objectives compared with the riskiness of other exposures; ii) the appropriate criteria for the assessment of physical risks and transition risks and how to develop them, and; iii) the potential effects of a dedicated prudential treatment of exposures associated with environmental and social objectives and activities on financial stability and bank lending in the EU (EBA, 2019).

Notwithstanding the EBA assessment, the Commission has been seeking feedback in the context of the future CRR III package on "*whether further measures, if any, could be taken to incorporate environmental, social and governance (ESG) risks into prudential regulation without pre-empting ongoing work to this effect*".[41]

In addition, the Renewed Sustainable Finance Strategy is currently consulting on whether the current macroprudential policy toolbox for the EU financial sector is fit for purpose to identify and address potential systemic financial stability risks related to climate change. A number of prudential supervisors have stressed the importance of maintaining prudential treatment aligned with the current credit risk framework and in the absence of evidence of the correlation between assets' risk profile and degree of sustainability.[42] Indeed, the latest survey analysis (NGFS, 2020) reveals that the lack of granular data, clear taxonomy and the limitations of backward-looking analyses, represent challenges for banks and insurers in assessing their exposure to climate and environmental risks.

4.4 Disclosure

- The draft Regulatory Technical Standards (RTS) under the Disclosure Regulation (DR)[43] require market participants to demonstrate how their use of derivatives aligns with the ESG characteristics of the product.

Integrating ESG considerations into the decision-making process of investors and asset managers does not only increase the attractiveness of sustainable investments – it also ensures consumer protection and financial

[41] See the public consultation on "Implementing the Final Basel III Reforms in the EU".

[42] See the speech by Andrea Enria, Chair of Supervisory Board of the ECB on "Regulation, Proportionality and the Sustainability of Banking", or the opinion on sustainability within Solvency II by the European Insurance and Occupational Pensions Authority (EIOPA, 2019).

[43] See https://www.esma.europa.eu/press-news/esma-news/esas-consult-environmental-social-and-governance-disclosure-rules.

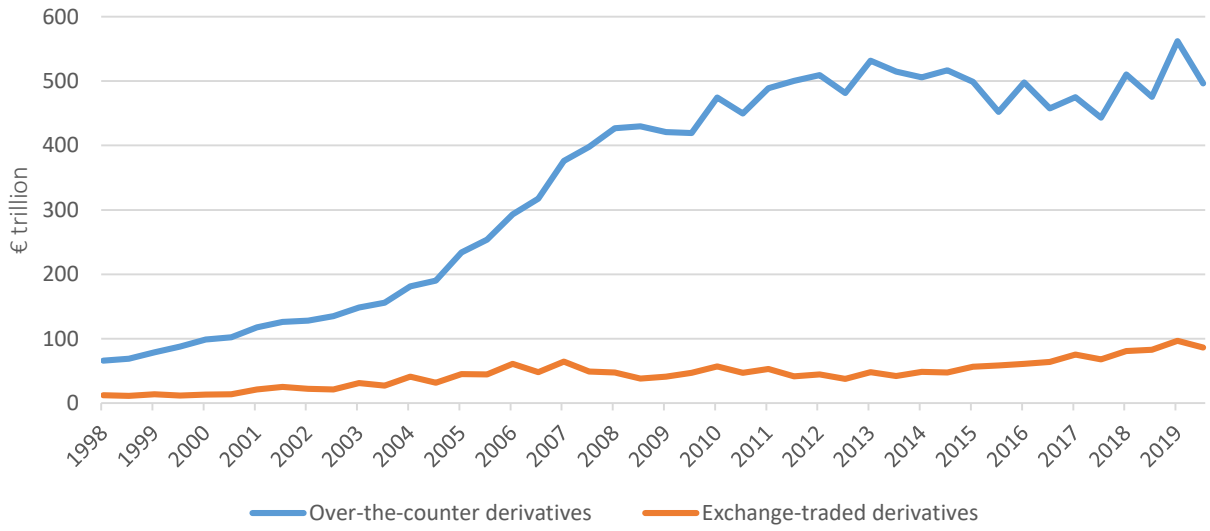
stability. To this end, the DR aims to harmonise existing provisions on disclosures to investors in relation to sustainability-related disclosures by imposing requirements on financial market participants (e.g. alternative investment fund managers (AIFMs) and UCITS management companies and investment firms carrying out portfolio management) and financial advisers (firms authorised under the Markets in Financial Instruments Directive (MiFID) to give investment advice and credit institutions) in relation to financial products (e.g. AIFs and UCITS). Specific requirements include pre-contractual disclosures, disclosures on websites, and disclosures in periodic reports in relation to financial products.

Given the widespread use of derivatives, the proper disclosure of their use in a sustainable finance context is of great importance. The draft RTS under the DR proposes that financial market participants should explain and disclose whether the use of derivatives is compatible with the environmental or social characteristics of the financial product being promoted, or with the sustainable investment objective pursued. They should also be transparent on adverse impacts. The proposed requirements would directly impact financial market participants as they would have to demonstrate how their use of derivatives aligns with the ESG characteristics of the product.

5. Evolution of derivative markets

While derivatives have been traded for centuries, derivatives markets were small until the 1970s.[44] This is when economic conditions and developments in the pricing of derivatives laid the basis for the massive growth in derivatives markets that we have since experienced. The volatility in stocks, interest rates and exchange rates, along with the globalisation of capital markets, has spurred demand for financial instruments to unbundle risks.[45] Furthermore, the deregulation of several industries, the growth in international trade and finance, as well as advances in financial theory (e.g. options' pricing) and technology, have increased the demand for financial products to manage risk further.

Figure 2. Global derivatives market, notional amounts outstanding (€ trillion, 1998-2019)



Notes: BIS reports data in US dollars at end-June and end-December of each year. For the conversion in euros, the bilateral exchange rate EUR/USD at the end of each quarter has been used.
Sources: Bank for International Settlements and Eurostat.

Over the past 20 years, global derivatives markets have grown dramatically, despite experiencing a slowdown after the onset of the global financial crisis in 2008 (Figure 2). The global aggregate size of the OTC and ETD[46] markets combined, in terms of notional amounts outstanding (this is the gross nominal or notional value of all derivatives contracts concluded and not yet settled on the reporting date), grew from €78 trillion to €583 trillion between 1998 and 2019. OTC derivatives grew significantly during that period too, reaching €497

[44] While historically the first contract involved commodities, since the 1970s standard financial assets (e.g. interest rate, equity, currency) are the main underlyings. The introduction of index-based derivatives is considered by many as the single most significant development in contemporary financial markets (Chance, 1995; Arditti, 1996; Millo, 2007).

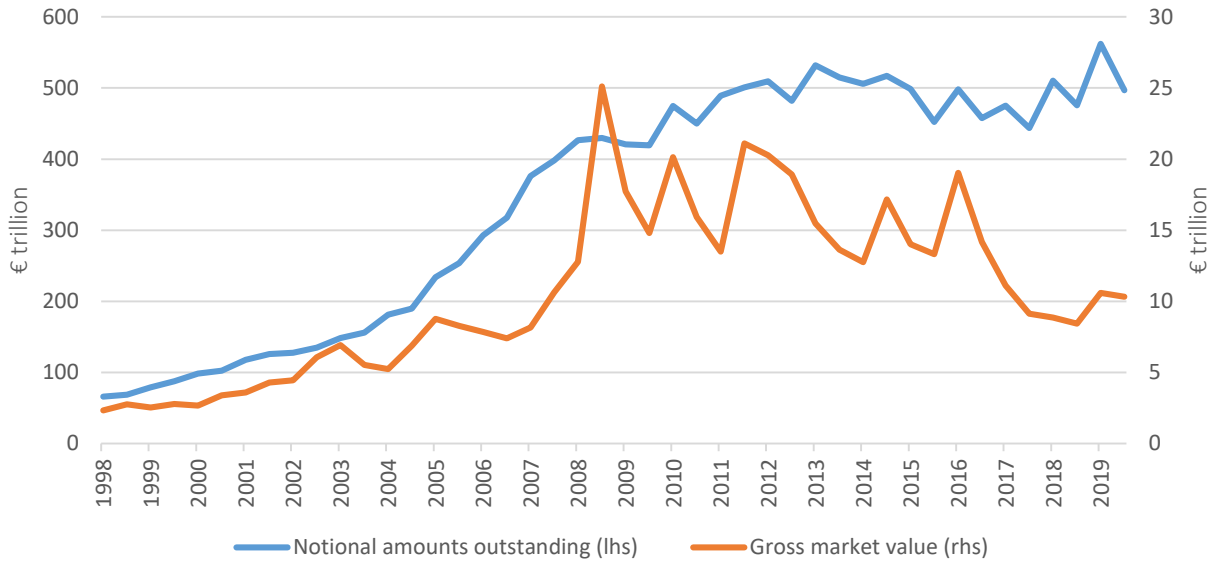
[45] The collapse of the Bretton Woods system of fixed exchange rates in 1971 increased the demand for hedging against exchange rate risk. But FED's change in its monetary policy and the adoption of a target for money growth in 1979 also led to increased interest rate volatility of Treasury bonds. Thus, the demand for instruments to hedge against adverse movements in interest rates increased.

[46] ETD derivatives are standardised contracts that are traded on organised exchanges; OTC derivatives are customisable products, which are traded either on trading platforms or bilaterally (either by voice or electronically).

trillion by the end of 2019.[47] In general, OTC derivatives activity constitutes approximately 88% of the total derivatives activity (as measured by gross notional volume), with the remaining 12% made up of ETDs.

While notional amounts provide a measure of the size of the market, they do not provide a measure of risk. Instead, the gross market value, which measures the cost of replacing outstanding contracts, offers a better indication of the market and counterparty risk in the derivative markets (Figure 3). At the peak of the global financial crisis, the gross market value reached €25.1 trillion in December 2008. However, since then, and largely because of the implementations of the G20 commitments, the gross market value of outstanding contracts has declined significantly to pre-crisis, to around €10.3 trillion in December 2019. Thus, gross market value is less than 2% of the notional amount.

Figure 3. Over-the-counter derivatives market (€ trillion, 1998-2019)



Notes: The notional amount of outstanding OTC derivatives contracts determines contractual payments and is an indicator of activity in OTC derivatives markets. The gross market value represents the maximum loss that market participants would incur if all counterparties failed to meet their contractual payments and the contracts could be replaced at current market prices. BIS reports data in US dollars at end-June and end-December of each year. For the conversion in euros, the bilateral exchange rate EUR/USD at the end of each quarter has been used.
Sources: Bank for International Settlements and Eurostat.

5.1 Regulatory actions covering derivatives markets and their impact

Derivatives regulation has long been a challenging area. On the one hand, derivatives allow for risk-sharing, a welfare-enhancing activity. This is because they facilitate the transferring of risks from those who do not wish to hold risk to those who are willing and able to do so. On the other hand, derivatives trading (particularly OTC derivatives) can create concentrated pools of risks in financial institutions. As the 2007-08 crisis showed, the

[47] Since reaching their peak of €532 trillion in June 2013, notional amounts of OTC derivatives have been fluctuating downwards. A major factor fuelling this trend has been trade compression and the elimination of redundant contracts. In particular, a number of jurisdictions have taken steps to encourage a more widespread use of other risk-mitigation measures for non-centrally cleared derivatives (NCCDs), e.g. trade compression and portfolio reconciliation (Thomadakis, 2018). Compression allows the combining and offsetting of trades with compatible economic characteristics, resulting in a reduction in notional outstanding amount. This technique results in the reduction of the number of individual positions in the portfolio, while maintaining the same risk profile. (BIS, 2017; FSB, 2017). Such compression reduces capital charges and trading costs by shrinking notional amounts outstanding, while leaving net exposures unchanged (BIS, 2015).

combination of leverage and volatility can threaten not only individuals and institutions, but the entire financial system. That is why regulation plays a very important role, and as the derivatives market has evolved over the years, so has regulation.

The financial crisis revealed serious weaknesses in financial regulation.[48] In an effort to strengthen the infrastructure of the financial markets and enhance the transparency in OTC derivatives markets, in 2009 the G20 leaders announced their intention to fundamentally reform the regulatory framework for derivatives markets (FSB, 2010). Thus, five key commitments were made in the areas of: 1) *reporting* (OTC derivatives should be reported to trade repositories), 2) *central clearing* (standardised OTC derivatives should be centrally cleared), 3) *collateral and margining* (non-centrally cleared derivatives should be subject to minimum standards for exchange of collateral to cover risk), 4) *capital* (non-centrally cleared derivatives should be subject to higher capital requirements), and 5) *trading* (standardised OTC derivatives should be traded on exchanges or electronic trading platforms where appropriate).

In the US, the Dodd-Frank Act (Title VII) and associated agency rule-making introduced a series of reforms broadly aimed at bringing the swaps market under a regulatory regime more closely resembling that of the futures markets. US regulation now mandates centralised clearing for eligible contracts, reporting to swap data repositories (SDRs), real-time reporting and public dissemination of transactions and trading of 'made available to trade' (MAT) transactions on swap execution facilities (SEFs) – a form of multilateral electronic trading venue.[49]

In the EU, three pieces of legislation reflect the G20 commitments:

- First, the European Market Infrastructure Regulation (EMIR), which entered into force in August 2012, lays out the framework of principles under which liquid, standardised derivatives are subject to mandatory central clearing. EMIR mandates reporting of derivatives to trade repositories, thus enabling regulators to obtain greater visibility on risk build-up in derivatives business. Derivatives that were not suitable for mandatory clearing would also be subject to a regime for exchange of collateral under margining rules.[50] EMIR also provided for a registration and supervision regime for EU trade repositories and an EU authorisation regime (for the first time) for EU central counterparties (CCPs),[51] as well as a recognition regime for non-EU CCPs used by EU regulated entities (this regime was recently updated in EMIR 2.2).
- Second, the MiFID II/Markets in Financial Instruments Regulation (MiFIR), which has been applicable since January 2018, sets out a derivatives trading obligation and a transparency regime. It mandates that certain derivatives (i.e. those that are both cleared through a CCP and deemed sufficiently liquid) must be traded on EU (regulated markets, multilateral trading or organised trading facilities) or

[48] For example, lack of transparency, failures in enforcing and adapting regulatory standards, as well as in providing effective supervision of traditionally siloed markets that had grown interconnected through globalisation, deregulation and technological advances.

[49] SEF trading effected a marked increase in trade transparency for a large subset of swap contracts. Swaps that were subject to the SEF-trading mandate saw significant improvements in liquidity. For example, relative to EUR mandated swaps (where SEF trading is much less prevalent), measures of liquidity for USD mandated swaps improved by 12-19%. This translates to daily execution costs for end investors in USD mandated swaps falling by about €2-€5 million relative to EUR mandated swaps (Benos *et al.*, 2020).

[50] Margin rules require financial firms and systemically important non-financial entities to exchange the initial and variation margin for non-cleared derivatives transactions. See Footnote 53 below for a description of the margins.

[51] Central counterparty (CCP) is an entity that interposes itself between the counterparties to trades – buyer(s) and seller(s) – acting as the buyer to every seller and the seller to every buyer.

equivalent third-country venues (subject to an EC equivalence decision). The derivatives contracts that are subject to the trading obligation are also subject to the EMIR mandatory clearing obligation and must also satisfy certain criteria relating to margining, liquidity and venue. The scope of derivative contracts includes interest rates swaps (IRS) and CDS as well as FX, equity and commodity derivatives. MiFID II also contains a position limit for commodity derivatives – this is the maximum order for a futures contract on commodities. This latter element is currently under review with ESMA, which is examining its impact on liquidity and price transparency.

- Third, the CRD/CRR sets out the rules applicable to capital treatment of non-centrally cleared derivatives.[52] Under this regulatory framework, financial institutions must set aside sufficient capital to cover market and credit valuation adjustment (CVA) risks for derivative transactions.[53] Thus, they are required to hold capital against adverse market movements and the potential falls in the market value of counterparty exposures. Both market and counterparty risk prudential capital framework have been subject to significant change following the global financial crisis, and there are still elements that have not been implemented as part of the Basel III regulatory reform package (e.g. fundamental review of the trading book (FRTB), revisions to CVA framework, capital output floor).

5.2 Recent market trends

More than 10 years since the Pittsburgh G20 meeting, central clearing has become the mantra in derivatives markets and one of the successes of the coordinated response to the financial crisis. According to data from the Bank of International Settlements (BIS), at the end of 2019 the central clearing rate stood at 63% of the total outstanding. In the most important asset class (interest rate derivatives (IRD)) central clearing reached 77% (up from 38% in 2009), while for cleared credit derivatives there was a significant increase, from 10% in 2010 to 56% in 2019.[54]

The post-crisis mandatory clearing requirements for a set of standardised derivatives (e.g. IRS and Index CDS), in addition to the higher capital and margin requirements for uncleared contracts, have contributed to the increase in the share of OTC derivatives that are centrally cleared (FSB, 2018; ESMA, 2019b; Aramonte and Huang, 2019). However, and because the EMIR regulation was implemented in stages (Lannoo, 2017), the entry into force of the clearing obligation occurred in mid-2016 and was complete for all asset classes and counterparties in mid-2019.

One of the key benefits of central clearing is that it allows for multilateral netting, a process that sums up all offsetting positions to create one overall position. The effect is not only to reduce a clearing member's exposure and margin requirements compared to an uncleared counterfactual, but it also makes the OTC derivatives system (as well as other centrally cleared markets) less complex and less prone to contagion (FSB, 2018). Indeed, the OTC derivatives reforms have not only made the market simpler and more transparent, they have also allowed market participants to manage more effectively evolving counterparty credit risks (FSB,

[52] Since the original CRD I framework, there have been four sets of amendments made to the Directive (CRD V) and a review of the original Regulation (CRR II). The CRD V and CRR II entered into force in June 2019. CRD V will be transposed in national laws by 28 December 2020.

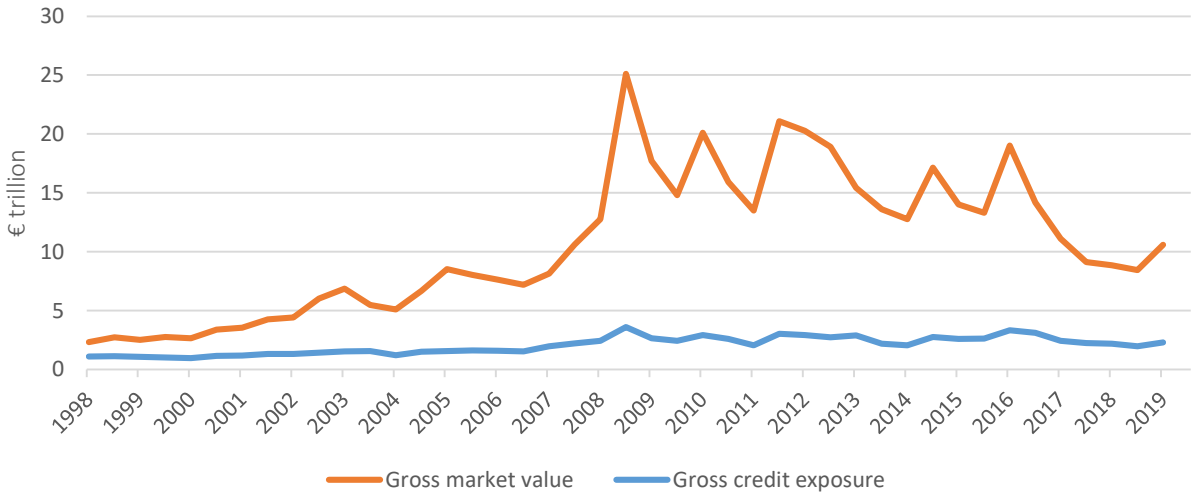
[53] CVA measures the current value of the credit risk of the derivative counterparty, and is recognised as a deduction of the value of the derivative contract.

[54] Clearing of interest rate swaps for mandated currencies even reached 98%, according to CCP12 (2019).

2020). Thus, having the CCP as the counterparty of each trade it clears, multilateral netting of each clearing member's exposure to the others can be facilitated in a legal, operational and efficient manner.[55]

Gross credit exposure, which adjusts the gross market value for legally enforceable bilateral netting agreements, but not for collateral, stood at €2.1 trillion (or 0.5% of notional outstanding) in December 2019 (Figure 4).[56] Moreover, gross credit exposure as a share of gross market value has declined over the past years, reaching 20% in December 2019 (23% at year end-2018). This implies that the benefit of netting for market participants is a reduction of their 'mark-to-market' exposure of about 80%.[57] This exposure would be further reduced by exchange of collateral, as prescribed under EMIR in Europe (as described later in this section).

Figure 4. Impact of netting and gross credit exposure in OTC derivatives markets (€ trillion, 1998-2019)



Notes: The gross market value represents the maximum loss that market participants would incur if all counterparties failed to meet their contractual payments and the contracts could be replaced at current market prices. Gross credit exposure is defined as the gross market value minus amounts netted with the same counterparty across all risk categories under legally enforceable bilateral netting agreements. It provides a measure of exposure to counterparty credit risk (before collateral). BIS reports data in US dollars at end-June and end-December of each year. For the conversion in euros, the bilateral exchange rate EUR/USD at the end of each quarter has been used.
Sources: Bank for International Settlements and Eurostat.

Transparency has also been improved and continues to progress (ESMA, 2017; ESMA, 2019b; FSB, 2020), despite the relative complexity of derivatives products and the fact that the EMIR reporting requirements came into force in February 2014. According to the Financial Stability Board (FSB), trade-reporting requirements have improved the post-trade transparency of the OTC derivatives markets to those authorities that have access to trade repository (TR) data, and are thus able to monitor systemic risk (FSB, 2019).

[55] The magnitude of the multilateral netting advantage depends on the number of CCPs in a market segment, the interoperability of CCPs and the portfolios of market participants (Deloitte, 2014).

[56] The credit exposure of OTC derivatives offers a more accurate measure of counterparty credit risk. Following the implementation of the margin rules for non-cleared derivatives, the vast majority of the gross credit exposure is collateralised (ISDA, 2019a).

[57] Mark-to-market refers to the process of revaluing positions on a continuous basis, at least once a day or intra-daily as close as possible to real time. Its value is the difference between the closing price from the previous day and the current closing price. Prior to the 2007-08 financial crisis, OTC forwards and swaps did not have an official daily settlement price, so it was not possible to know the daily variation of a position (except as described by a theoretical pricing model). Futures markets are the opposite of forwards and swaps, and have an official daily settlement price set by the exchange.

Moreover, market transparency has increased in those jurisdictions, thanks to the transparency requirements under MiFID II.

In a further effort to reduce systemic risk from OTC derivatives (but also to promote central clearing), one of the G20 reforms was the introduction of prescriptive regulation of margin requirements for non-centrally cleared derivatives.[58] Margin rules require the mandatory posting of initial margin (IM) and variation margin (VM) for non-cleared derivatives transactions.[59] The amount of regulatory IM has been increasing as margin rules for non-cleared derivatives have been phased in since September 2016 and more firms and new transactions have become subject to the requirements.[60]

According to the latest margin survey conducted by the International Swaps and Derivatives Association (ISDA) (ISDA, 2020), the 20 largest market participants (phase-one firms) collected approximately €154 billion of IM for their non-cleared derivatives transactions at year-end 2019 (Table 2). Of this amount, €94 billion was collected from counterparties currently in scope of the regulatory IM requirements. A further €61 billion of IM was collected from counterparties and/or for transactions that are not in scope of the margin rules (independent amount (IA)), including legacy transactions.

Table 2. Phase-one firms regulatory IM and IA (€ billion)

	2019	2018	2017	2019 vs. 2018	2018 vs. 2017
Regulatory IM Received	93.6	73.2	61.5	25%	14%
IA Received	60.5	64.7	47.4	-8%	30%
Total IM Received	154.2	137.9	108.9	10%	21%
Regulatory IM Posted	94.0	72.7	62.7	27%	11%
IA Posted	8.5	8.8	5.3	-7%	57%
Total IM Posted	102.4	81.5	68.1	23%	14%

Note: For the conversion in euros, the bilateral exchange rate EUR/USD at the end of each quarter has been used.
Sources: ISDA Margin Survey Year-End 2019 and Eurostat.

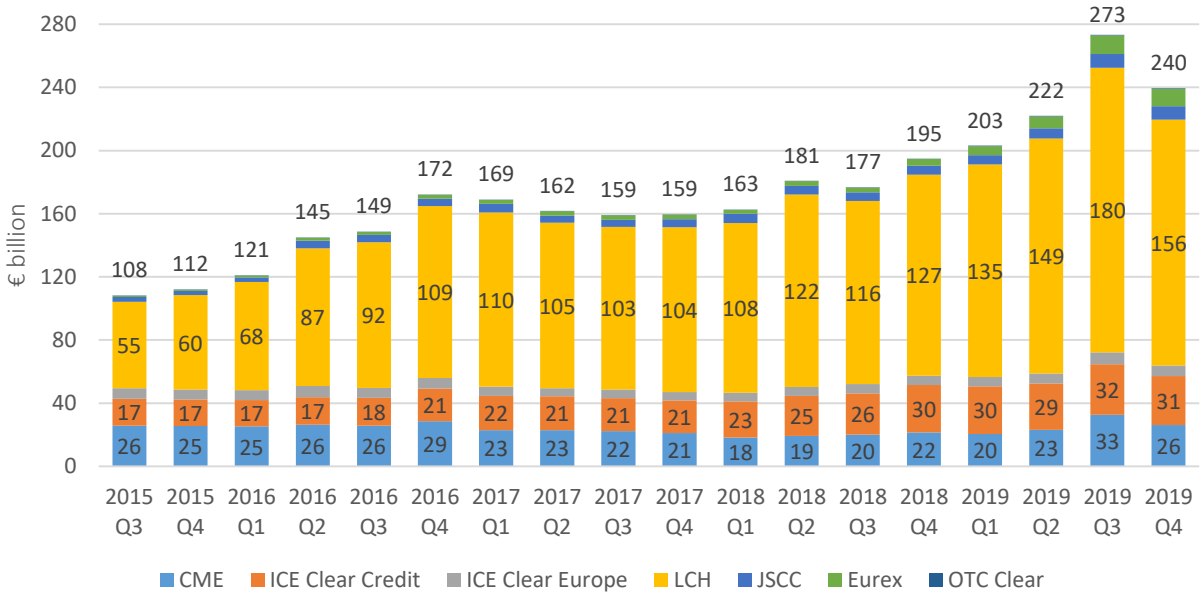
Moreover, the survey also finds that €240 billion of IM was posted by all market participants to major central counterparties (CCPs) for their cleared interest rate derivatives (IRD) and CDS transactions at the end of 2019 (Figure 5).

[58] Margin requirements are typically designed to cover potential price changes over a period of five to 10 days with a probability of 99% or higher.

[59] Initial margin (IM) is the primary protective layer of collateral (placed by the clearing members at the beginning of a trade) intended to protect the CCP against unexpected credit and operational risks (Knott and Mills, 2002). Variation margin (VM) is the collateral exchanged during the life of a contract, reflecting daily changes in the market value of the trade (Bernanke, 1990).

[60] There are six phases to the margin rules for non-cleared derivatives. Currently, firms in phases one, two, three and four are required to exchange margin. The IM and VM requirements for phase-one entities with aggregate average notional amount (AANA) of uncleared derivatives of over €3 trillion (under EMIR RTS) took effect on September 1, 2016 in the US, Canada and Japan, and on February 4, 2017 in Europe (AANA threshold €2.25 trillion). VM requirements came into effect for a wider universe of entities from March 1, 2017. Phase-two firms became subject to the IM rules on September 1, 2017. Phase-three (AANA threshold €1.5 trillion) and phase-four implementation of IM requirements went into effect on September 1, 2018 and September 1, 2019 respectively. The IM requirements for other entities subject to the rules will be phased-in by September 1, 2022, in line with the updated BCBS-IOSCO schedule.

Figure 5. Initial margin for cleared IRD and CDS (€ billion)



Notes: The figures refer to publicly available margin data from two US CCPs (CME and ICE Clear Credit), four European CCPs (Eurex Clearing, ICE Clear Europe, LCH Ltd and LCH SA) and two Asian CCPs (Japan Securities Clearing Corporation (JSCC) and OTC Clearing Hong Kong Limited (OTC Clear)). The collected data only reflects IM for IRD and CDS. This data is published by CCPs under public quantitative disclosure standards set out by the Committee on Payments and Market Infrastructures (CPMI) and the International Organization of Securities Commissions (IOSCO). For the conversion in euros, the bilateral exchange rate EUR/USD at the end of each quarter has been used.
Sources: ISDA Margin Survey Year-End 2019 and Eurostat.

The strong upward trend in IMs – which is expected to increase further (Cominetta *et al.*, 2019) – suggests that post-crisis rules are having a significant impact. By ensuring that collateral is available to offset potential losses caused by the default of a derivatives counterparty, margin requirements contribute in reducing contagion and spillover effects, as well as counterparty credit and systemic risk (Acharya and Bisin, 2014; Loon and Zhong, 2014). Yet concerns have also been raised about margin requirements potentially increasing procyclicality[61] (Heckinger *et al.*, 2016; Glasserman and Wu, 2018) and liquidity risk (Bakoush *et al.*, 2019).

[61] Procyclicality refers to the situation in which periods of high volatility tend to coincide with increased liquidity demand. Initial margin requirements are usually determined by risk-based models, which typically require increased margin (i.e. liquidity) in stressed conditions (i.e. volatile times): they are procyclical. This procyclicality causes a liquidity burden on market participants which sometimes falls when they are least able to bear it. There are tools that have been proposed to mitigate the procyclicality of initial margin requirements, and several empirical studies test their effectiveness (Murphy *et al.*, 2016; ESRB, 2017; Maruyama and Cerezetti, 2019; Cominetta *et al.*, 2019; ESRB, 2020).

6. Conclusion

Derivatives are a core component of financial markets and have become more transparent and standardised since the 2007-08 financial crisis. Derivatives markets can play a significant role in the context of the European Green Deal and the transition towards a low-carbon economy. They facilitate capital raising via the hedging of risks related to sustainable investments. Moreover, they enhance the transparency and the price formation process of the underlying securities, and thus foster long-termism.

The use of derivatives by market participants is being examined in the context of the EU sustainable regulatory framework that is currently being developed. The EU Taxonomy sets the framework for what is regarded as sustainable, while the disclosures framework will enhance the transparency surrounding sustainable investments. Derivatives will be developed to reference these new measurements and metrics with a view to contributing to the financing of projects and funding of companies in the transition to a sustainable future.

The European Green Deal is the cornerstone of the EU's response to the Covid-19 pandemic, given the massive amounts required for a sustainable and green recovery. ESG products have demonstrated their resilience during the market decline caused by the pandemic and will play a pivotal role in accelerating the transition to a sustainable economy.

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Annex – Derivatives types and uses

What is a derivative?

A derivative can be defined as a financial instrument that derives its value over time from the performance of an underlying (e.g. equity price, interest rate, commodity price, foreign exchange rate, credit/bond price, index of prices or rates, or another variable).[62] Because the cash flows from a derivative contract are derived from the performance of the underlying, derivatives can provide the payments associated with a financial instrument without requiring the holder of the derivative to actually own the instrument. A derivative is traded between two parties, who are referred to as the counterparties. These counterparties are subject to a pre-agreed set of terms and conditions that determine their rights and obligations.

Origins of derivatives

Derivatives can be traced back to antiquity as instruments developed to secure the supply of commodities and facilitate trade, as well as to insure farmers against crop failures (Weber, 2008; Kummer and Pauletto, 2012).[63] Aristotle, for example, explains in his Politics (Part XI, Book I) how the philosopher Thales from Miletus (624-547 BC) benefited from an option-type agreement with the local olive press owners, which gave him the right but not the obligation to hire all olive presses for the following autumn. When Thales' prediction for an unusually large olive harvest came true, he was able to lease the presses at a substantial premium and thus made a fortune. Later, during the Roman Era and the Middle Ages, derivatives also continued to play an instrumental role in facilitating trade.

In modern times, and as Antwerp became the centre of local and international trading (from around 1500),[64] there was widespread use of contracts for future delivery, which mainly took the form of bills of exchange.[65] First records of an organised market for derivatives trading can be traced back to Osaka in Japan in the 17th century. With rice being the main agricultural commodity (and the basis of national income), 'rice bills' became standardised and a regulated trading activity started at Dojima Rice Exchange. Derivatives, in the form of stock call options, also made their appearance in England during the 18th century. However, the South Sea Bubble resulted in a governmental ban of share options, as well as on the short selling of shares (Shea, 2007).[66]

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[62] While the underlying is often a financial asset, it does not necessarily have to be. For instance, derivatives exist with payments based on political developments in a certain region, box office revenues of a movie (which was later banned by the Dodd-Frank Act), temperature in the state of Philadelphia, or the number of bankruptcies among a group of selected companies (Stulz, 2004).

[63] In particular, law 48 (of 282) of the Code of Hammurabi – a Babylonian code of law in ancient Mesopotamia (King Hammurabi reigned from c1792 to 1750 BC) that includes economic provisions (prices, tariffs, trade and commerce), as well as criminal law (assault, theft) and civil law (slavery, debt) – claims that: "If any one owe a debt for a loan, and a storm prostrates the grain, or the harvest fail, or the grain does not grow for lack of water; in that year he need not give his creditor any grain, he washes his debt-tablet in water and pays no rent for this year."

[64] Antwerp preceded major cities such as Amsterdam and London as a trading and financial centre.

[65] These contracts were structured as commodity options related to delivery dates and quality at delivery, among other things. Some options offered the possibility for the buyers to take up the delivery at the agreed conditions or to pay a fixed fee instead of taking the delivery. The concentration of trade and the liquidity of the commodity market furthered the development of a secondary market. Many merchants began to move from trading commodities into dealing with bills of exchange.

[66] The South Sea Company, a joint stock company which was given the exclusive right to trade with Spain's South American colonies, was issuing new shares which had to be bought in cash, but they could also be settled by instalment payments. Call options called 'refusals', gave the right to the holder, when making the payment of an instalment, to pay the next

The oldest organised futures market was the Chicago Board of Trade (CBOT), which opened in 1848 and is still operating.[67] Chicago – a centre for the storage, sale and distribution of grain – was the place where forward contracts that allowed farmers to lock in the price and later deliver the crop were negotiated. These contracts permitted producers and large-scale consumers of agricultural products to hedge against price changes, while allowing speculators to make profits by anticipating changes (MacKenzie and Millo, 2003). In particular, CBOT is responsible for three important innovations in derivatives trading: i) the establishment of defined areas specifically for futures contracts on agricultural commodities,[68] ii) the establishment of clearing houses, which reduced the counterparty risk that had plagued over-the-counter (OTC) trading, and iii) the introduction of the margining system.

Types of derivatives

Broadly speaking, there are three ways to differentiate between derivatives: i) by type of contact, ii) by asset class, and iii) by trading techniques.

By type of contract

Derivatives can be classified by the type of contract payment flows between the counterparties. The most common types of derivatives are options, futures/forwards and swaps.

Options are exchange-traded standardised contracts whereby one party has a right – but not the obligation – to purchase something at a pre-agreed strike price at some point in the future.[69] The cost of buying an option is the seller's premium which the buyer must pay to obtain the option right. There are two main types of option contracts that can be either bought or sold (call options and put options).[70]

Futures are exchange-traded standardised contracts for a pre-determined asset to be delivered at a pre-agreed point in the future at a price agreed today. The buyer makes margin payments reflecting the value of the transaction. The buyer is said to have 'gone long' and the seller to have 'gone short'.[71] Futures coverage includes currencies, bonds, agricultural and other commodities such as gold.

Forwards are non-standardised contracts between two parties to buy or sell an asset at a specified future time at a price agreed today. For example, pension funds commonly use foreign exchange forwards to reduce foreign exchange (FX) risk when overseas currency positions are required at known future dates.[72]

instalment (thus keeping the option). But in the event of share price fall below a certain level, the holder could refuse to make the next instalment payment, thus giving up the option on the share.

[67] CBOT merged with the Chicago Mercantile Exchange in 2007 to become the CME Group.

[68] Contracts were standardised in terms of quality, quantity, time and location of delivery.

[69] The right is not an obligation, as the buyer can allow the contract to expire and walk away.

[70] The buyer of a call (put) option has the right but not the obligation to buy (sell) the asset at the strike price at a future date. A seller has the obligation to sell (purchase) the asset at the strike price if the buyer exercises the option.

[71] Counterparties can exit a commitment by taking an equal but offsetting position with the exchange, so that the net position is nil, and the only delivery will be a cash flow for profit or loss.

[72] A forward is the OTC equivalent of a future.

Swaps are agreements to exchange one series of future cash flows for another. Although the underlying reference assets can be different (e.g. equity or interest rate), the value of the underlying asset will characteristically be taken from a publicly available price source.[73]

By asset class

Derivatives can be classified by the type of the underlying asset. Underlyings can be financial instruments themselves, physical assets, or any risk factors that can be measured. Common examples are interest rate, foreign exchange rate, credit risk, equities and commodities. For example, credit derivatives are contracts that allow parties to trade credit risks in much the same way that they can trade market risks. Under an interest rate derivative, a counterparty's payment obligation for the floating leg depends on the level of interest rate, while under a stock option the value depends on the price of a stock.

By trading

Derivatives can be classified by whether they trade on or off venue. On-venue trading includes derivatives that are traded on a trading platform or on an exchange. The latter are standardised contracts traded on a recognised exchange, with the counterparties being the holder and the exchange. The contract terms are non-negotiable, and their prices are publicly available. Off-venue trades include derivatives that are traded bilaterally (either by voice or electronically) between two counterparties.

By clearing status

Derivatives can also be classified by their clearing status. Exchange traded derivatives are cleared. Many swaps and forwards that trade on a trading platform or bilaterally are also cleared, in which case a trade between two counterparties is novated into trades between each counterparty and the CCP.

Usage of derivatives

Understanding the use of derivatives is important, as these types of instruments do not only allow risk diversification, but also enhance liquidity management, supplement cash markets at lower funding costs, and ensure the transmission of funds from lenders to borrowers. In general, we can categorise the use of derivatives as: i) hedging, ii) investment/exposure, and iii) arbitrage/market making.

Hedging

Hedging can be perceived as the most common – and perhaps the most beneficial – use of derivatives. Derivatives allow individuals and companies to hedge risks associated with a specific exposure.[74] Through hedging, the cash flows from the derivative are used to offset or mitigate the cash flows from a prior market commitment (Sundaram and Das, 2011). Thus, the risk is not eradicated, but instead it has been moved from those unwilling to hold it to those that are best able to bear it. This makes it possible for individuals and companies to take on riskier projects (with higher promised returns) and hence create more wealth by hedging those risks that can be hedged.

[73] For example, under an equity swap the amount that is paid or received will be the difference between the equity price at the start and end date of the contract.

[74] This implies that because not all risks can be completely eliminated, a firm needs to decide which risk exposures should remain and which should be neutralised or reduced through hedging.

While the primary users of derivatives are financial institutions such as banks, insurance companies and money managers, derivatives have also been used by non-financial firms. Thus, the type of risk that a financial and a non-financial firm is willing to hedge might be different. A bank for example, which acts as an intermediary by allocating financial resources from savers to borrowers, is particularly interested in managing interest rate risk.[75] To reduce such exposure, banks use interest rate derivatives (IRD). Indeed, theoretical and empirical evidence shows that hedging interest rate risk through IRD not only lowers the probability of bank failure (Diamond, 1984), but also allows banks to provide more efficient intermediation than unhedged banks (Brewer *et al.*, 2000; Brewer *et al.*, 2001).

Non-financial institutions may also use derivatives for a variety of reasons, for example: to reduce one or more risks associated with an existing (or future) asset or liability on their balance sheet[76] (Bodnar *et al.*, 1995; Allayannis and Weston, 2001; Barton, 2001; Bartram *et al.*, 2009); to reduce their tax costs (Smith and Stulz, 1985; Leland, 1998; Graham and Rogers, 2002; Donohoe, 2015); to respond to the underinvestment problem (Bessembinder, 1991; Froot *et al.*, 1993; Gay and Nam, 1999); or to reduce the volatility of executive compensation (DeMarzo and Duffie, 1995). Mitigating the risk associated with these factors has implications not just for the firm but also for the overall economy.

Investment/exposure

Derivatives contracts can also be used to make profits by taking views on a specific market direction (i.e. anticipating changes in market prices/rates/credit etc.), as they provide more leverage than a direct investment in the related underlying.[77] In that aspect, derivatives provide a more efficient means of investing than cash trading in the underlying financial instrument or index. For example, an asset manager may use derivatives for investing to achieve exposure equivalent to another investment when the derivatives markets are more liquid, less volatile, or more price-competitive compared to the cash market for the underlying security.

Moreover, investment in derivatives can also be for cash management purposes, and to affect intertemporal changes in the fund's risk exposure, as a response to cash flows from investor purchases and redemptions. By equitising the cash on hand in a fund, a manager can purchase highly liquid futures to obtain equity exposure equivalent to the fund's cash position. In addition, managers investing in derivatives may improve net portfolio performance, thanks to either lower transaction costs or better utilisation of information (i.e. reducing information asymmetry) (Koski and Pntiff, 1999).

[75] In a traditional model, bank's assets are long term, while liabilities are short term. A maturity mismatch between assets and liabilities subjects the bank to interest rate risk. Thus a change in interest rate affects the bank's earnings and returns because much of its profit comes from the difference between interest received on loans and interest paid on deposits. A bank may therefore be willing to hedge its banking book exposures (Purnanandam, 2007; Esposito *et al.*, 2015; Rampini *et al.*, 2019), or exposures acquired through the provision of financial services or market making to clients (Flannery and James, 1984; NBB, 2017; Infante *et al.*, 2018).

[76] Changes in asset values arising from market movements can have negative impact on future cash flows.

[77] Leverage is a fundamental principle of speculative financial transactions as it provides its holder the possibility of trading with a whole range of rate risk (a risk that is often difficult to estimate). In other words, leverage consists of disposing borrowed funds in the hope of deriving speculative returns that are greater than the cost of borrowing.

Arbitrage/market making

Derivatives can also be used for market making when the goal is to make a profit by providing liquidity to other traders, while avoiding accumulating a large net position (i.e. posting limit buy and sell orders simultaneously on both sides of the limit order book). A market maker uses derivative contracts to capture riskless profits based on pricing anomalies among financial markets and products. Thus, they allow market participants to 'fill gaps' left by the unavailability of particular types of financial instruments.[78]

While market making can sometimes be thought of as arbitrage, there is a significant difference between the two. The former is based on the willingness to always quote competitive buy and sell prices, but with the goal of minimising directional risk. This means that the market maker is averse to acquiring a large net long or short position, since in doing so there is a risk of large losses should the price move in the wrong direction. In other words, a pure market-making strategy has no 'view' or 'opinion' on which direction the price 'should' move. The most profitable scenario for a market maker is one in which there is virtually no overall directional movement in the price of the asset, but rather a large amount of non-directional volatility. Conversely, and so the opposite of a market-maker, an arbitrageur intends to make deliberately directional bets and acquire large net positions. Directional bets rather than price volatility are therefore the source of profitability (or loss).

[78] For example, if a sovereign does not have a long-term corporate debt market, investors may use interest rate or currency swaps to generate fixed liabilities.

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ECMI conducts in-depth research aimed at informing the debate and policy-making process on a broad range of issues related to capital markets. Through its various activities, ECMI facilitates interaction among market participants, policymakers and academics. These exchanges are fuelled by the various outputs ECMI produces, such as regular commentaries, policy briefs, working papers, statistics, task forces, conferences, workshops and seminars. In addition, ECMI undertakes studies commissioned by the EU institutions and other organisations, and publishes contributions from high-profile external researchers.

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In recent years, sustainability has risen in scope and importance on the agenda of policymakers. In Europe, this has translated into the EU Sustainable Finance Action Plan, which aims to: i) reorient capital flows towards sustainable investments; ii) manage financial risks stemming from climate/environmental/social issues; and iii) promote transparency and long-termism in financial and economic activity.

A market that could play a significant role towards Europe's green transition is derivatives. The market has been tightly regulated since the 2007-08 financial crisis, making it safer and more transparent. Derivatives facilitate capital-raising via the hedging of risks related to sustainable investments. Moreover, they enhance the transparency and the price formation process of the underlying securities, and thus foster long-termism.

This report highlights how derivatives markets can – through their forward dimension, their global and consolidated nature, and their proper regulation – contribute to:

i) enabling the EU to raise and channel the necessary capital towards sustainable investments;
ii) helping firms hedge risks related to ESG factors;
iii) facilitating transparency, price discovery and market efficiency; and
iv) contributing to long-termism