

Greening monetary policy

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Abstract

Central banks and prudential supervisory authorities (where different) have already started to look at climate related risks at the financial stability side. Should they also take carbon intensity of assets into account at the monetary policy side? So far, the guiding principle has been 'market neutrality' in the implementation of monetary policy. However, the market has a carbon bias, as capital-intensive companies are more carbon intensive.

This paper, first, examines the legal mandate. The secondary objective of the Eurosystem is to support the general economic policies in the European Union, which include sustainable development and a high level of protection and improvement of the quality of the environment. Next, the paper explores how the Eurosystem could steer their asset and collateral policy towards low carbon assets and thus support the greening of the economy. Our initial findings suggest that such a low carbon allocation can be done without interference with the transmission mechanism of monetary policy. Price stability, the primary objective, is, and should remain, the priority of the Eurosystem.

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1. Introduction

To guide the transition towards a sustainable and inclusive economy, the United Nations (UN) has developed the 2030 Agenda for Sustainable Development (UN, 2015). The UN Sustainable Development Goals are the global strategy of the governments under the auspices of the United Nations and provides direction towards (future) government policies, like regulation and taxation of environmental and social challenges. The global strategy is boosted by technological change (e.g. the development of solar and wind energy and electric cars at decreasing cost), which supplements government policies (e.g. carbon pricing). Some companies are preparing for this transition to a low-carbon, inclusive economy. Other companies are waiting for the transition to unfold before acting. A final category of companies is unaware of this transition and continues business as usual (Mercer, 2015).

Central banks have traditionally a long-term perspective on economic and financial developments and play an important role in the economy (monetary policy) as well as in the financial system (financial stability). In the second role, central banks have started to examine the impact of climate related risks on the stability of the financial system (Carney, 2015). The Financial Stability Board initiated the Bloomberg Task Force on Climate-related Financial Disclosures (TCFD, 2017), which developed consistent climate-related financial disclosures for financial reporting by companies and financial institutions. The Task Force also recommended reporting on the financial outcomes in a scenario of two degrees global warming (versus the current trajectory of four degrees). In that way the financial sector can assess the risks and opportunities of the transition to a low carbon economy in their investment and lending portfolio. Central banks and supervisors also established the Network for Greening the Financial System (NGFS).¹

However, in the first role, central banks have a long-standing policy of market neutrality. Taking from a speech on monetary policy implementation of Wuermeling (2018), Member of the Deutsche Bundesbank Board: “Another reason is that purchases should remain market-neutral wherever possible. The Eurosystem is at pains not to impair the functioning of the markets and price formation.” However, there is evidence that the market has a bias towards carbon-intensive companies. Monetary policy is thus not climate neutral (Matikainen, Campiglio and Zenghelis, 2017). The appropriate role of central banks in monetary policy operations is part of the wider debate of the role of appointed central bankers versus elected policymakers (Tucker, 2018).

Section 2 discusses the central bank mandate for greening monetary policy. The primary responsibility of central banks is to maintain price stability, with a secondary responsibility to support economic growth. Interestingly, the European Union applies a broad definition of economic growth. Article 3(3) of TEU states that “The Union shall establish an internal

¹ See, for example, <https://www.banque-france.fr/en/financial-stability/international-role/network-greening-financial-system> and <https://www.dnb.nl/en/news/news-and-archive/Nieuws2018/dnb374348.jsp>.

market. It shall work for the sustainable development of Europe based on balanced economic growth and price stability, and a high level of protection and improvement of the quality of the environment.". This broad definition of sustainable economic growth could provide a basis for greening monetary policy.

Section 3 provides some pathways how central banks could green monetary policy operations, if they were to decide to do so. In this paper, we take a broad definition of central bank core operations: i) conducting monetary policy operations; ii) managing foreign exchange reserves; and iii) operating (large value) payment systems (Article 127(2) TFEU). These core operations, for which we use the shorthand of monetary policy operations, involve allocation decisions on purchasing assets and taking collateral (through the so-called 'eligibility criteria'). The basic idea of greening monetary policy is to steer the allocation of assets and collateral towards low carbon sectors, which could lower the cost of capital for these sectors in comparison to high carbon sectors (Heinkel, Kraus and Zechner, 2001). This allocation policy should be designed and executed in such a way, that it does not interfere with the effective implementation of monetary policy (i.e. the transmission mechanism of monetary policy should not be affected). Price stability is and should remain the top priority for central banks. Finally, Section 4 concludes with some policy reflections.

2. Central bank mandate

The central bank mandate discussion can be split in three parts. The first refers to a broad interpretation of economic growth. Should this only include economic goals or also wider social and environmental goals (Stiglitz Report, 2009)? The second concerns the legal debate on the extent to which central banks are allowed to green monetary policy operations in their responsibility to support economic policies of the government. The third part is more political about how far central banks should go on greening monetary policy, if they decide to do so.

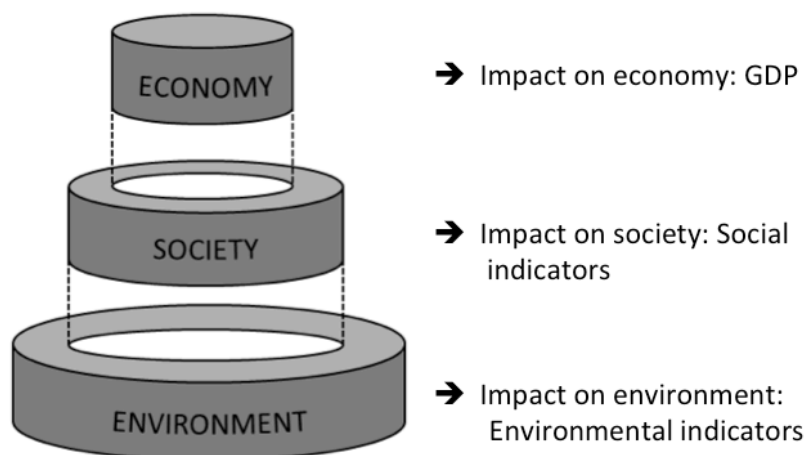
2.1 Broad interpretation of economic growth

Traditionally, economic policies are geared towards economic growth, including full employment. The yardstick to measure economic growth is gross domestic product (GDP). This yardstick is unidimensional and not uncritically accepted these days. The concept of sustainable growth or development recognises that economic policies also affect society and the environment. The Brundtland Report (1987) argues that "...the "environment" is where we live; and "development" is what we all do in attempting to improve our lot within that environment. The two are inseparable." The report defines sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

How to make the concept of sustainable development operational? Following Rockström and Sukhdev (2015), we classify the UN Sustainable Development Goals (SDGs) according to the levels of the economy, the society and the environment (or biosphere). Figure 1

illustrates the three levels and the ranking between them. While it is tempting to start working on partial solutions at each level, the environmental, societal and economic challenges are interlinked (Norström *et al.*, 2014). A liveable planet is a precondition or foundation for humankind to thrive. Next, we need a cohesive and inclusive society to organise production and consumption in order to ensure enduring prosperity for all (Acemoglu and Robinson, 2012). In this paper on greening monetary policy, we focus on the reduction of carbon emissions to mitigate climate change.

Figure 1 Sustainable development integrating different levels



Source: Adapted from Rockström and Sukhdev (2015).

The Stiglitz report (2009) looked at the appropriate measurement of economic performance. The Stiglitz report argues that what we measure affects what we do; and if our measurements are flawed, decisions may be distorted. Choices between promoting GDP and protecting the environment may be false choices, once environmental degradation is appropriately included in our measurement of economic performance. On the measurement, Stiglitz concludes that sustainability assessment requires a well-identified dashboard of indicators (see right-hand side of Figure 1). The distinctive feature of the components of this dashboard should be that they are interpretable as variations of some underlying “stocks”: quantities and qualities of natural resources, and of human, social and physical capital. Furthermore, Stiglitz proposes to start modestly with focusing the monetary aggregation on items for which reasonable valuation techniques exist, such as physical capital, human capital and certain natural resources. In so doing, it should be possible to assess the ‘economic’ component of sustainability, that is, whether or not countries are over-consuming their economic wealth.

Placing a monetary value on the natural environment is often difficult and separate sets of physical indicators will be needed to monitor the state of the environment. This is in particular the case when it comes to irreversible and/or discontinuous alterations to the

environment. For that reason, the Stiglitz Commission argues that there is a need for a clear indicator of increases in atmospheric concentrations of greenhouse gases associated with proximity to dangerous levels of climate change.

Finally, the High Level Expert Group on Sustainable Finance (2018) made recently suggestions how to finance a sustainable European economy. Similar to the Stiglitz report, the High Level Expert Group recommends including sustainability considerations into financial decision-making.

2.2 Legal mandate

Across the world, the core task of central banks is to maintain price stability. In addition, central banks are often asked to support economic growth. The precise division and wording of these functions differs across countries. In the United States, the Federal Reserve has a dual mandate of stabilising prices and maximising employment. In the European Union, there is a clear ranking between the two responsibilities according to Article 127(1) of the Treaty on the Functioning of the European Union (TFEU) of 2012: *“The primary objective of the European System of Central Banks (hereinafter referred to as ‘the ESCB’) shall be to maintain price stability. Without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Union with a view to contributing to the achievement of the objectives of the Union as laid down in Article 3 of the Treaty on European Union.”*

Next, Article 3(3) of the Treaty on European Union (TEU) specifies that: *“The Union shall establish an internal market. It shall work for the sustainable development of Europe based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment.”*

The history of the legal mandate is instructive. First, the draft statute of the ESCB and the ECB prepared by the Committee of Governors in 1990 contains no reference to the achievement of the objectives of the Union (see Article 2 of the draft statute reproduced in the appendix). The central bank governors only refer to the primary objective of price stability and secondary objective of supporting the general economic policy. The Intergovernmental Conference on Economic and Monetary Union added the clause *“to contributing to the achievement of the objectives of the Union as laid down in Article 3 of TEU”* (Van den Berg, 2005). It was thus a political decision that the secondary objective of supporting economic growth should contribute to achieving the ultimate objectives of the Union. Second, Smits (1997) notes that the ESCB should support the general economic policies in the Union. This means that the ESCB’s action cannot be measured in terms of specific policy actions, but rather by the support for underlying trends in economic policy.

While price stability is the top priority of the ESCB, the ECB is also making reference to the secondary objective. In a speech, Solans, Member of the ECB's first Executive Board, states that

"The Treaty on European Union or Maastricht Treaty states that "the primary objective of the ESCB shall be to maintain price stability" and adds that "without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Community with a view to contributing to the achievement of the objectives of the Community".

Among others, these Community objectives are "sustainable and non-inflationary growth respecting the environment" and "a high level of employment and of social protection".

It is, therefore, clear that the ECB must focus its decisions, as a matter of priority, on the objective of stability which is its real "raison d'être"; in addition, and without prejudice to this aim of stability, the ECB also has responsibilities relating to economic growth, employment and social protection. These responsibilities are general, conditional and secondary, if you like, but responsibilities nevertheless."

Solans (1999)

Nevertheless, the official line of the ECB is that "Maintaining price stability is the best contribution that monetary policy can make to an environment of economic stability conducive to the wider objectives of the European Community, such as economic growth and employment creation" (ECB, 2001, p.7). In a later speech, Bini Smaghi, Member of the ECB's Executive Board, underpins the priority of price stability with a reference to possible tradeoffs between price and output stability (Bini Smaghi, 2007). In these cases, Article 127(2) TFEU assigns indeed priority to price stability. But it is not clear whether there are such tradeoffs between price stability and environmental policies.

In response to a letter from the European Parliament on the ECB's support for the European Union's environmental policies, the current ECB president, Draghi, refers to the secondary objective and acknowledges that the Eurosystem² should support the general policies in the Union, including "the sustainable development of Europe based on balanced economic growth [...], aiming at [...] a high level of protection and improvement of the quality of the environment." (Draghi, 2017). He adds that "the ECB recognises the challenge posed by climate change and shares the view that achieving the environmental goals of the Union, including those set out in the Paris Agreement, is of great importance to our societies. Whereas the ECB will fully respect any decisions taken at the EU level to implement the Paris Agreement, in line with the division of competences within the EU – in first instance – it falls to the political authorities to define and decide on the appropriate measures to achieve the objectives of the Paris Agreement."

Summing up, the primary responsibility of the Eurosystem is maintaining price stability and the secondary responsibility is supporting general economic policies. Consistent with the Stiglitz report (2009), the economic policies of the EU refer to sustainable development

² The Lisbon Treaty changed the wording from the ESCB to the Eurosystem, which consists of the ECB and the NCBs of the countries whose currency is the euro. See Article 282(1) TFEU of 2012.

based on balanced economic growth, aimed at full employment, social progress and protecting and improving the quality of the environment. The legal mandate derived from the EU Treaties seems to allow the Eurosystem to green its monetary policy operations. It can even be argued that the Eurosystem should support the transition to a low carbon economy, without prejudice to price stability.

2.3 Central bank reach

While a broad interpretation of the legal mandate is possible, the question is whether central banks should take such a wide remit. Tucker (2018) raises the valid point of delegation of (economic policy) powers from elected policymakers to unelected, albeit democratically appointed, technocrat central bankers. He argues that a central bank can be seen as a co-manager of the government's consolidated balance sheet, as the profits and losses of central bank operations (seigniorage) largely fall to the government.³ Allocation decisions on assets and collateral have thus a bearing on the riskiness of the government's consolidated balance sheet and on the seigniorage income for the government. At the same time, central banks are independent in the setting and implementation of monetary policy, which forbids them taking government instructions in their monetary policy operations. So, how far should central banks go in their operations?

A minimalist approach is to restrict monetary policy operations to open-market operations with short-term Treasury paper (Goodfriend and King, 1988; Goodfriend, 2011). In that way, the central bank remains fully neutral towards the private sector. By contrast, in a maximalist approach, the central bank would be given free rein to manage the consolidated balance sheet, which would involve risks related to different groups of companies and households. Tucker (2018) argues that the maximalist approach would "take central banks close to being the fiscal authority and cannot be squared with any mainstream ideas of central banking competences in democracies".

Neutrality

The current policy of market neutrality (Wuermeling, 2018; Bindseil *et al.*, 2017), discussed in the introduction, is consistent with the minimalist conception of monetary policy operations. Nevertheless, the Eurosystem did already accept private sector paper (corporate bonds from financial and non-financial companies and bank loans) for asset purchases and collateral prior to the Global Financial Crisis. This credit policy practice has been intensified under Quantitative Easing. The Eurosystem's asset purchase programme (APP) includes all purchase programmes under which private sector securities and public sector securities are purchased to address the risks of too prolonged a period of low inflation. The asset purchase programme shows that the Eurosystem is not following the minimalist approach, but already

³ In most countries, the government holds the shares in the national central bank (NCB). The central bank is typically allowed to add a small fraction of profits (say 1 to 5%) to its reserves with the remainder paid-out as dividends to the [ultimate] shareholders (in casu the government) – to reflect the Eurosystem situation where the NCBs own the ECB, not the governments directly.

conducts credit operations with the private (and public) sector to foster economic growth⁴ (although the stated aim is addressing the risk of prolonged low inflation).

The issue at hand is whether the Eurosystem should remain market neutral with respect to the carbon intensity of its assets and collateral, or not. A first question is whether the current approach towards private sector companies is carbon neutral. As carbon intensive companies, such as fossil fuel companies, utilities, car manufacturers and airlines, are typically capital intensive (Doda, 2016; Cole and Elliott, 2003), market indices for equities and corporate bonds are overweight in high carbon assets. A market neutral approach thus leads to a relatively high carbon intensity of the Eurosystem's private sector asset and collateral base (Matikainen, Campiglio and Zenghelis, 2017). Doing nothing is therefore a decision that hinders the general policies of the European Union towards achieving a low carbon economy.

While the carbon intensity of non-financial companies issuing corporate bonds can be assessed directly, that is more difficult for synthetic or financial institution securities. The look-through approach can be applied, whereby the underlying beneficiary instead of the intermediary is assessed. In the case of asset-backed securities, the carbon intensity of the assets in the vehicle (e.g. real estate underlying mortgage backed securities) is measured. In the case of bank loans, the carbon intensity of the borrower is taken. In the more general case of bank bonds, the carbon intensity of a bank's total portfolio of borrowers (and other assets) should be taken. Using empirical data of the Euro area, Battiston *et al.* (2017) show that while direct equity exposures to the fossil fuel sector are small (3-12 per cent of banks' market capitalisation), the combined equity exposures to climate-policy relevant sectors are large (40-54 per cent) and heterogeneous.

A second question is whether the price formation of carbon risk works smoothly. Andersson, Bolton and Samama (2016) argue that there is little awareness of carbon risk among investors and the market thus does not price it. Hong, Li and Xu (2018) investigate whether stock markets efficiently price risks brought on, or exacerbated, by climate change. Their findings support regulatory concerns that markets that are inexperienced with climate change underreact to such risks.

The first best solution to these concerns is to tax the climate change externality caused by carbon emissions. An appropriate carbon tax would provide an 'official' price for carbon risk spurring the move from high to low carbon investments. Be that as it may, this paper takes the lack of a sufficiently high carbon tax as given and poses the question what other actors (private companies and investors as well as semi-public government agencies) could contribute to reducing carbon emissions in this second-best world.

⁴ In a recent working paper, ECB economists analyse the effects of unconventional monetary policy (Ampudia *et al.*, 2018). An important finding is that the Asset Purchase Programme has contributed to a reduction in unemployment.

A final question is thus whether the Eurosystem should (actively) support the EU's general policies of transitioning to a low carbon economy. Following Smits (1997) and Tucker (2018), the Eurosystem should refrain from favouring assets of particular sustainable projects, agencies or companies. It would then clearly assume the role of elected policymakers. But should the Eurosystem adopt a general approach towards low carbon assets supporting the EU's general policies on reducing carbon emissions?

Policy responsibility

This is a political contentious issue. Our legal analysis in Section 2.2 suggests that the Eurosystem has a responsibility to support the EU's policies on low carbon, provided that it does not interfere with price stability. As long as the Eurosystem followed a general approach,⁵ it would not assume an active policy role. It would only support (instead of hinder) the EU's policy decision to move to a low carbon economy.⁶ In that way, the risk that appointed technocrats take policy decisions with distributional consequences (as highlighted by Tucker (2018)) is minimised. Nevertheless, even a general approach towards low carbon assets would have distributional consequences in the economy, as assets of low carbon sectors become 'more' eligible than those of high carbon sectors. But these distributional consequences are intended by the EU's policies on reducing carbon emissions.

Another distributional issue is that a low carbon allocation could lead to lower profits. But new insights indicate that companies that perform well on material ESG issues also show a good financial performance (Friede, Busch and Bassen, 2015). Moreover, several central bank governors have started to warn against the risk of a carbon bubble, whereby high-carbon assets can become stranded assets. While central banks are not for profit (Goodhart, 1988), they should have appropriate risk management procedures in place.

Another counterargument is that once a central bank starts to support general government policies on the environment in its monetary policy operations, the door may be open to further requests for support of other government goals. That is why it is important that the Eurosystem remains fully independent in the choice and design of their allocation policies (i.e. setting of eligibility criteria). And any secondary responsibilities should not interfere with price stability, which is the top priority on the monetary policy side. It should be noted that the ECB has already designed and adopted environmental standards for some of its activities. The ECB is, for example, committed to maintaining and improving the sustainability of euro banknotes by gradually increasing the amount of sustainable cotton in euro banknote paper (ECB, 2017). It has also recently become a member of the Central Banks and Supervisors Network for Greening the Financial System.

⁵ It could be argued that the ECB's carbon policy in the asset and collateral framework for its monetary policy operations should be discussed (and perhaps also approved) in the European Parliament. EP Members have already asked questions on this topic (see, for example, Draghi, 2018).

⁶ In a related context of financial stability, the Bank of England governor, Carney (2015), also warns that "Financial policymakers will not drive the transition to a low-carbon economy. It is not for a central banker to advocate for one policy response over another. That is for governments to decide."

Finally, Carney (2015) raises the issue of the ‘tragedy of the horizon’. The impact of climate change will be felt beyond the horizons of most actors: politicians, corporates and technocratic authorities. The horizon for monetary policy, for example, extends to 2-3 years. While monetary policy has indeed a short to medium-term outlook, the underlying assets that central banks purchase or take as collateral can have a longer maturity. Moreover, the allocation policy affects the cost of capital of the security issuers, which is the topic of the next section.

3. Greening monetary policy operations

If central banks were to decide to green monetary policy operations, how could they do that? The first part discusses the overriding need to avoid interference with the monetary transmission mechanism of monetary policy. The second part sketches general pathways to green the operations. It is important that central banks do not get involved into financing particular projects, which could threaten their independence from government. The third part examines the effects of a possible greening of central bank operations.

3.1 No interference with price stability

The Treaty is very clear. The Eurosystem shall support the general economic policies in the EU, without prejudice to price stability (see Article 127(1) TFEU). Maintaining price stability is thus the overriding objective, which should not be compromised by a possible greening of monetary policy operations. So, a monetary policy decision and its implementation should not be affected by a possible low carbon allocation of assets and collateral (in line with the Tinbergen rule of one policy objective for each policy instrument).

Monetary policy can be seen as a two-stage process. In the first stage, the relevant policy decision is taken. As this paper adopts a broad definition of central bank operations, policy decisions refer to monetary policy (in casu the interest rate), to reserve management (in casu the currency composition of the official reserves) and to large value payment systems (in casu the safe collateral for real-time gross settlement). In the second stage, policy decisions are implemented through market transactions following operational procedures. A common element of these procedures is that central banks aim to remain market neutral wherever possible in order not to impair the functioning of the markets and price formation (Wuermeling, 2018; Bindseil *et al.*, 2017). Central banks have therefore a preference for a broad and liquid asset base in their transactions to avoid market distortions and ensure a smooth conduct of monetary policy.

Eligibility criteria

As part of the operational procedures, central banks determine the eligibility criteria for assets and collateral. These criteria are important for the market, as eligible securities become more liquid through their possible use by banks in their operations with their central bank (see Nyborg (2015) for an overview). The increased liquidity service translates into a higher security price and lower yield (Nagel, 2016). The cost of capital thus decreases

for the issuer of the security. The same mechanism is at work for haircuts on collateral. A lower haircut increases the liquidity of the security and reduces the cost of capital for its issuer (Ashcraft, Gârleanu and Pedersen, 2011).

The greening of monetary policy operations would involve steering the eligibility criteria towards low carbon assets. The intended effect is that the cost of capital for low carbon sectors/institutions would reduce relative to high carbon sectors/institutions. Section 3.2 discusses several pathways to incorporate ESG ratings into the eligibility criteria. How could this be done without affecting price stability? The current market-neutral approach contributes to a smooth transmission of monetary policy.

We suggest two conditions to avoid disruptions in the monetary transmission mechanism. The first is not to make major adjustments in the asset mix (i.e. the mix of government bonds, agency bonds, bank bonds, corporate bonds and bank loans), currency denomination and maturity, which are chosen to smooth the conduct of monetary policy and the management of reserves. Term spreads, and thereby the shape of the yield curve, would, for example, be affected, when maturities are varied (Aksoy and Basso, 2014).

The second is to keep the list of eligible assets within each asset class as broad as possible. A broad asset and collateral base contributes to minimising the impact on the functioning of markets and price formation (Bindseil *et al.*, 2017). It is thus very important not to ‘target’ particular assets or even asset prices of low carbon sectors. That would impair the price stability objective of monetary policy and may erode the support for central bank independence (Mishkin, 2001).

3.2 Greening operations

We start with the general policies and objectives of the EU. A cornerstone of the EU’s climate strategy is the 2050 roadmap for moving to a competitive low carbon economy in 2050 (European Commission, 2011). The low carbon economy roadmap states that

- By 2050, the EU should cut greenhouse gas emissions to 80% below 1990 levels;
- Milestones to achieve this are 40% emissions cuts by 2030 and 60% by 2040;
- All sectors need to contribute;
- The low carbon transition is feasible and affordable.

While climate policies are frequently updated with further specific and sectoral policy options, the general direction is clear: a transition to a low-carbon economy in order to reduce carbon emissions. We take this general objective of EU climate policies as a guide for a possible greening of monetary policy operations.

Indicator

In this paper, we use carbon emissions as shorthand for all greenhouse gas emissions, which include carbon dioxide CO₂, methane CH₄ and nitrous oxide N₂O. Carbon emissions are the most widely used metric on the environmental side. Several companies nowadays report on

their scope 1, scope 2, and scope 3 emissions. The Greenhouse Gas Protocol (WRI, 2015) distinguishes between direct emissions from sources that are owned or controlled by the reporting entity and indirect emissions that are a consequence of the activities of the reporting entity, but occur at sources owned or controlled by another entity. The GHG Protocol further categorises these direct and indirect greenhouse gas (GHG) emissions into three scopes:

- **Scope 1:** All direct GHG emissions of an organisation.
- **Scope 2:** Indirect GHG emissions from consumption of purchased electricity, heat or steam.
- **Scope 3:** Other indirect emissions - the full corporate value chain emissions from the products they buy, manufacture and sell (e.g. if a car manufacturer sells cars, this represents the emissions of the cars in use).

What matters are not only the emissions of a company across the value chain, but also the emissions of products and services, that it produces. The relevant question is whether companies are in transition to applying low carbon technologies and creating low carbon products and services, or are making preparations for that transition (Schoenmaker and Schramade, 2019). So, it is important not only to assess current carbon emissions but also expected future carbon emissions (TCFD, 2017). In this forward-looking perspective, investments from currently high carbon sectors into low carbon technologies and products can be accommodated.

Thurm, Baue and Van der Lugt (2018) argue that current sustainability practices are too incremental and fail to take a system approach. As a result, we simply do not know whether individual companies are doing enough, or not. Instead, Thurm *et al.* (2018) argue that one should connect the micro (organisation), meso (industry or portfolio), and macro (system) levels to determine individual company contributions. Starting from what is needed at the system level, one can determine the thresholds that should not be crossed, and the allocations of resources that individual companies are allowed to use.

McElroy (2008) has developed the footprint method to measure the sustainability performance of an organisation. He defines the sustainability quotient as follows:

$$S = A/N \tag{4.1}$$

where S represents the sustainability performance, A the net actual impact on the carrying capacities of vital capitals (such as natural capital) and N the normative impact on the carrying capacities of vital capitals. The sustainability quotient can be applied to the ecological ceiling of carbon emissions (i.e. the carbon budget), whereby a company with $S \leq 1$ is sustainable. The innovation of the threshold and allocation approach is that a company's actual impact is measured against its normative impact (derived from system thresholds). Environmental, social and governance (ESG) ratings measure only the impact of a company (the numerator), but without relation to system thresholds (the denominator).

Which method?

Which perspective should central banks adopt towards carbon emissions? Does climate change pose a risk or should it be seen as an opportunity to achieve the transition to a low carbon economy (Schoenmaker, 2018)? It is often argued that central banks should manage the carbon risk in their operations, just like managing credit and market risks. While the risk perspective may be relevant for the financial stability side (ASC, 2016), the relevant perspective for the monetary policy side is support for the transition to a low carbon economy, as argued in Section 2.

Amel-Zadeh and Serafeim (2018) distinguish several methods for considering ESG issues to which Thurm *et al.* (2018) add an eighth method:

1. **Exclusionary / negative screening:** a method of deliberately not investing in companies that do not meet specific ESG criteria.
2. **Best in class:** an approach to sustainable investing that focuses on investing in companies that perform better on ESG issues than their peers do.
3. **Portfolio tilt:** the use of certain investment strategies or products to change specific aggregate ESG characteristics of a fund or investment portfolio to a desired level (e.g. tilting an investment portfolio toward a desired carbon footprint).
4. **Active ownership:** use of shareholder power to engage with companies to improve their ESG performance.
5. **Thematic investing:** focusing on those parts of the universe that benefit from and provide solutions for certain ESG trends.
6. **Impact investing:** an approach to investing that deliberately aims for both financial and societal value creation, as well as the measurement of societal value creation.
7. **Full ESG integration:** the explicit integration of E, S and G issues into the valuation and selection of securities.
8. **Threshold and allocation:** an approach that determines the threshold (e.g. the carbon budget for business) and allocates fair, just and proportionate shares of the carbon budget to individual companies.

While the first three and last methods are generally applicable, the other four methods require specific choices, valuations or actions. Full ESG integration, for example, would require that central bank officials investigate individual companies and come to a judgement on their ESG performance and transition preparedness (Schoenmaker and Schramade, 2018). In Section 2, we argue that appointed central bankers should avoid specific policies on the environment; that is the remit of the government. It should be noted that the Eurosystem confines itself to corporate bonds for its monetary policy portfolio, while national central banks also hold equities as part of their own reserves.⁷

⁷ The Dutch central bank, for example, incorporates ESG criteria in its investment policy for its non-monetary policy portfolio and regularly checks the sustainability of its investments in equities and corporate bonds (De Nederlandsche Bank, Annual Report 2017, p.132).

Amel-Zadeh and Serafeim (2018) report that negative screening is the most used method among investment professionals. At the same time, however, investment professionals perceive negative screening as the least useful method. Moreover, negative screening aims to avoid the worst performers from a risk perspective. The best in class and portfolio tilt methods are more opportunity driven. These methods can be used to select relatively low carbon assets or to tilt the asset and collateral portfolio towards less carbon intensive assets. The threshold and allocation approach is also opportunity driven, but is not yet fully operational.

Examples

We provide some examples of how these methods could be used by central banks for illustrative purposes. The best in class method selects the X per cent of best performers in a sector. That means the X per cent companies with the lowest carbon emissions in this sector. To keep a broad asset and collateral base for central bank operations, X should be chosen relatively high, say 50 to 60 per cent.

The tilting method can be applied in different ways. A straightforward application is to relate the relative share of a company's securities inversely to its carbon intensity (measured, for example, as carbon emissions relative to sales). A central bank would then overweight low carbon companies and underweight high carbon companies in its asset purchases. For collateral, the haircut could be directly related to carbon intensity, just like credit risk. A central bank would then apply lower haircuts for low carbon assets (and vice versa).

Central banks can also follow a passive approach by using a low carbon index as guide for asset purchases and collateral haircuts. Examples are the MSCI Low Carbon Index or the S&P 500 Carbon Efficient Index, which measures the performance of companies in its underlying index while overweighting companies with lower levels of carbon emissions and underweighting companies with higher levels of carbon emissions.

From a system perspective, the threshold and allocation approach is very promising. However, it is not yet clear how many companies operate within their allocated share ($S \leq 1$). A universe of sufficient companies is needed to ensure smooth implementation of monetary policy. Further research is recommended to investigate the impact of the various methods of adapting the eligibility criteria on the investment universe and the smooth functioning of the monetary transmission mechanism.

Central banks can also use combinations of methods to green the eligibility criteria. For example, negative screening to avoid the worst performers and/or sectors and then tilting the remaining companies. Also best in class can be combined with tilting. For all methods, it is important to use general criteria, such as carbon intensity, to implement a possible greening of monetary policy operations. Appointed central bankers should stay away from discussions about targeting, or avoiding, specific companies and sectors.

3.3 Cost of capital

Would an allocation bias towards low carbon assets support the general environmental policies of the EU? To put it more directly, would a low carbon allocation support the transition to a low carbon economy? In Section 3.1, we already discussed that increased eligibility and/or reduced haircuts for low carbon assets generate a liquidity premium lowering the cost of capital. The cost of capital for high carbon companies would then become higher than that of low carbon ones. This primary effect would already give low carbon companies a funding advantage and thus contribute to the transition. Moreover, central bank efforts to green monetary policy operations would also give a powerful signalling effect to other financial markets participants, boosting the case for greening finance (Braun, 2018).

Heinkel, Kraus and Zechner (2001) examine the equilibrium effect of transition. If the higher cost of capital more than overcomes the cost of reforming (i.e. a polluting company cleaning up its activities), then high carbon companies will transition their production technologies and products to low carbon. A key determinant of the incentive for high carbon companies to reform is the fraction of funds controlled by green investors. In an empirically calibrated model, Heinkel, Kraus and Zechner (2001) indicate that more than 20 per cent of green investors are required to induce any polluting companies to reform. By greening their monetary policy operations, central banks would then increase the fraction of green investors and thus speed up the transition.

4. Concluding policy reflections

Central banks have a long-term perspective (often making reference to sustainable economic growth) and are therefore mindful of the impact of climate change on stability. On the financial stability side, they have already started to examine the impact on the stability of the financial system. On the monetary side, there is no comparable direct impact on price stability, which has a medium term horizon. Nevertheless, the legal mandate states that ‘the Eurosystem shall support the general policies in the EU, without prejudice to price stability’. The transition to a low carbon economy is a cornerstone of the EU’s general economic policies.

The Eurosystem could support the EU’s climate policy by greening monetary policy operations. The basic idea is to tilt the asset and collateral base for these operations towards low carbon assets. This paper shows how this can be done without interfering with the smooth conduct of monetary policy. That is all technical.

The real question is whether central bankers are prepared to cross the Rubicon. Similar deliberations have taken place in other sectors. Should auditors examine a company’s integrated report with social and environmental indicators? Or should they stick with the financial part, which is within their professional realm? Should institutional investors include sustainability considerations in their investment policies? The High Level Expert Group on

Sustainable Finance (2018) has recommended incorporating sustainability in the fiduciary duty of investors, which is now put into legislation by the European Commission.

If the Eurosystem were to pick up the challenge of greening its monetary policy operations, it would be of utmost importance to do that in full independence. The Eurosystem could adjust the eligibility criteria for assets and collateral in a general way, using a transparent and objective indicator, such as current and future carbon emissions (TCFD, 2017). It should refrain from favouring specific projects or setting sectoral targets. That is government policy. The EU and the member states can use their multilateral development bank (the European Investment Bank) and their national development banks to steer financing to specific green projects, if they wish to do so.

References

- Acemoglu, D. and J. Robinson (2012), *Why Nations Fail*, Crown Business, New York.
- Advisory Scientific Committee (ASC) (2016), 'Too Late, Too Sudden: Transition to a Low-Carbon Economy and Systemic Risk', Report No. 6 of the Advisory Scientific Committee of the European Systemic Risk Board, Frankfurt.
- Aksoy, Y. and H. Basso (2014), 'Liquidity, Term Spreads and Monetary Policy', *Economic Journal*, 124(581): 1234-1278.
- Amel-Zadeh, A. and G. Serafeim (2018), 'Why and How Investors Use ESG Information: Evidence from a Global Survey', *Financial Analysts Journal*, forthcoming.
- Ampudia, M., D. Georgarakos, J. Slacalek, Or. Tristiani, P. Vermeulen and G. Violante (2018), Monetary policy and household inequality, ECB Working Paper Series No. 2170.
- Andersson, M., P. Bolton and F. Samama (2016), 'Hedging Climate Risk', *Financial Analysts Journal*, 72(3): 13-32.
- Ashcraft, A., N. Gârleanu and L. Pedersen (2011), 'Two Monetary Tools: Interest Rates and Haircuts', in: D. Acemoglu and M. Woodford (eds), *NBER Macroeconomics Annual 2010*, 25: 143-180.
- Battiston, S., A. Mandel, I. Monasterolo, F. Schütze and G. Visentin (2017), 'A climate stress-test of the financial system', *Nature Climate Change*, 7(4): 283-288.
- Bindseil, U., M. Corsi, B. Sahel and A. Visser (2017), 'The Eurosystem collateral framework explained', ECB Occasional Paper Series No. 189.
- Bini Smaghi, L. (2007), 'With or Without Prejudice to Price Stability?', Speech by Lorenzo Bini Smaghi, Member of the Executive Board of the ECB at the Barclays Capital Annual Conference London, 24 May.
- Braun, B. (2018), 'Central banking and the infrastructural power of finance: the case of ECB support for repo and securitization markets', *Socio-Economic Review*, 16, forthcoming.
- Brundtland Report (1987), *Our Common Future*, The United Nations World Commission on Environment and Development, United Nations, New York.
- Carney, M. (2015), 'Breaking the tragedy of the horizon: climate change and financial stability', Speech at Lloyd's of London, 29 September.
- Chava, S. (2014), 'Environmental externalities and cost of capital', *Management Science*, 60(9): 2223-2247.
- Cole, M. and R. Elliott (2003), 'Determining the trade–environment composition effect: the role of capital, labor and environmental regulations', *Journal of Environmental Economics and Management*, 46(3): 363-383.
- Doda, B. (2016), 'Sector-level carbon intensity distribution', Centre for Climate Change Economics and Policy Working Paper No. 281.
- Draghi, M. (2017), 'Letter to the European Parliament', L/MD/17/383, Frankfurt, 10 October.
- Draghi, M. (2018), 'Letter to the European Parliament', L/MD/18/207, Frankfurt, 12 June.
- ECB (2001), 'The Monetary Policy of the ECB', Frankfurt.
- ECB (2017), '2017 update of the ECB's Environmental Statement', Frankfurt.
- European Commission (2011), 'A Roadmap for moving to a competitive low carbon economy in 2050', Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2011) 112 final, Brussels.

- Friede, G., T. Busch and A. Bassen (2015), 'ESG and financial performance: aggregated evidence from more than 2000 empirical studies', *Journal of Sustainable Finance and Investment*, 5(4): 210-233.
- Goodfriend, M. (2011), 'Central Banking in the Credit Turmoil: An Assessment of Federal Reserve Practice', *Journal of Monetary Economics*, 58(1): 1-12.
- Goodfriend, M. and R. King (1988), 'Financial Deregulation, Monetary Policy, and Central Banking', *Federal Reserve Bank of Richmond Economic Review*, 74(3): 3-22.
- Goodhart, C. (1988), *The Evolution of Central Banks*, Cambridge, MIT Press, Massachusetts (Cambridge).
- Heinkel, R., A. Kraus and J. Zechner (2001), 'The Effect of Green Investment on Corporate Behavior', *Journal of Financial and Quantitative Analysis*, 36(4): 431-449.
- High Level Expert Group on Sustainable Finance (2018), 'Financing a Sustainable European Economy', Final Report, European Union, Brussels.
- Hong, H, F. Li and J. Xu (2018), 'Climate Risks and Market Efficiency', *Journal of Econometrics*, forthcoming.
- Matikainen, S., E. Campiglio and D. Zenghelis (2017), 'The climate impact of quantitative easing', Grantham Research Institute on Climate Change and the Environment, Policy Paper.
- McElroy, M. (2008), *Social footprints: measuring the social sustainability performance of organizations*, Thetford Center, Vermont, USA.
- Mercer (2015), 'Investing in a Time of Climate Change', New York.
- Mishkin, F. (2001), 'The Transmission Mechanism and the Role of Asset Prices in Monetary Policy', NBER Working Paper No. 8617.
- Nagel, S. (2016), 'The Liquidity Premium of Near-Money Assets', *Quarterly Journal of Economics*, 131(4): 1927-1971.
- Norström, A. V., A. Dannenberg, G. McCarney, M. Milkoreit, F. Diekert, G. Engström, R. Fishman, J. Gars, E. Kyriakopoulou, V. Manoussi, K. Meng, M. Metian, M. Sanctuary, M. Schlüter, M. Schoon, L. Schultz and M. Sjöstedt (2014), 'Three necessary conditions for establishing effective Sustainable Development Goals in the Anthropocene', *Ecology and Society*, 19(3): 8.
- Nyborg, K. (2015), 'Central bank collateral frameworks', CEPR Discussion Paper No. 10663.
- Rockström, J. and P. Sukhdev (2016), 'How food connects all the SDGs', Stockholm Resilience Centre.
- Schoenmaker, D. (2018), 'A Framework for Sustainable Finance', CEPR Discussion Paper No. 12603.
- Schoenmaker, D. and W. Schramade (2018), Investing for Long-Term Value Creation, Working Paper.
- Schoenmaker, D. and W. Schramade (2019), *Principles of Sustainable Finance*, Oxford University Press, Oxford, forthcoming.
- Smits, R. (1997), *The European Central Bank: Institutional Aspects*, Kluwer Law International, The Hague.
- Solans, E. (1999), 'The euro and the activities of the European Central Bank', Speech by Eugenio Domingo Solans, Member of the Executive Board of the European Central Bank,

- at the luncheon conference organised by the Money Matters Institute and The European Institute at the Boston Harbor Hotel, Boston, 15 November.
- Stiglitz Report (2009), 'Report by the Commission on the Measurement of Economic Performance and Social Progress', Paris.
- Task Force on Climate-related Financial Disclosures (2017), 'Recommendations of the Task Force on Climate-related Financial Disclosures: Final Report (Bloomberg Report)', Financial Stability Board, Basel.
- Thurm, R., B. Baue and C. van der Lugt (2018), 'Blueprint 5 The Transformation Journey: A Step-By-Step Approach to Organizational Thriveability and System Value Creation', Reporting 3.0, Berlin.
- Tucker, P. (2018), 'Pristine and parsimonious policy: Can central banks ever get back to it and why they should try', in: P. Hartmann, H. Huang and D. Schoenmaker (eds), *The Changing Fortunes of Central Banking*, Cambridge University Press, 48-64.
- United Nations (2015), 'UN Sustainable Development Goals (UN SDGs) - Transforming our world: the 2030 Agenda for Sustainable Development', A/RES/70/1, New York.
- Van den Berg, C. (2005), *The Making of the Statute of the European System of Central Banks: An Application of Checks and Balances*, Rozenberg Publishers, Amsterdam.
- World Resources Institute (WRI) (2015), 'Greenhouse Gas Protocol', Washington DC.
- Wuermeling, J. (2018), 'Prospects for monetary policy implementation', Speech by Joachim Wuermeling, Member of the Executive Board of the Deutsche Bundesbank, at the 2018 Banking Evening at the Deutsche Bundesbank's Regional Office in Baden-Württemberg, Stuttgart, 6 February.

Appendix: Relevant legal texts

In Section 2.2, we discuss the legal mandate of central banks. This appendix contains excerpts from the relevant legal texts for the European System of Central Banks (ESCB) from the Treaty on the Functioning of the European Union (TFEU) and the Treaty on European Union (TEU) as well as the history of the mandate.

Monetary policy

Article 127 TFEU

1. The primary objective of the European System of Central Banks (hereinafter referred to as 'the ESCB') shall be to maintain price stability. Without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Union with a view to contributing to the achievement of the objectives of the Union as laid down in Article 3 of the Treaty on European Union. The ESCB shall act in accordance with the principle of an open market economy with free competition, favouring an efficient allocation of resources, and in compliance with the principles set out in Article 119.

2. The basic tasks to be carried out through the ESCB shall be:

- to define and implement the monetary policy of the Union,
- to conduct foreign-exchange operations consistent with the provisions of Article 219,
- to hold and manage the official foreign reserves of the Member States,
- to promote the smooth operation of payment systems.

3.

Economic policies

Article 3 TEU

1.

2.

3. The Union shall establish an internal market. It shall work for the sustainable development of Europe based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment. It shall promote scientific and technological advance.

4.

History

The Committee of Governors prepared the Draft Statute of the ESCB and the ECB (published in Europe, Document No 1669/1670, 8 December 1990).

Article 2 - Objectives

2.1 The primary objective of the System shall be to maintain price stability.

2.2 Without prejudice to the objective of price stability, the System shall support the general economic policy of the Community.

2.3 The System shall act consistently with free and competitive markets.