Institut Veblen pour les réformes économiques

"The ECB at a time for decisions (1/2)"

A "*whatever it takes*" climate strategy in central banking

Wojtek Kalinowski* & Hugues Chenet**

DECEMBER 2020

By including "environmental sustainability" in the strategic review launched in early 2020, the European Central Bank (ECB) signalled that it was taking seriously calls to integrate monetary policy into the fight against climate change and, more broadly, against the ecological crisis threatening our societies and economies. To contribute to this exceptionally important debate, we are publishing two notes on the role of monetary and prudential authorities in the ecological transition.

In this note, Wojtek Kalinowski & Hugues Chenet reveal ways of overcoming the obstacles that have so far prevented the monetary and prudential authorities from taking action, namely a persistent attachment to the "neutrality" of monetary policies, the fruitless quest for answers to the climate crisis using financial risk modelling, and finally the use of scenarios limited to purely quantitative exercises, such as the climate stress test. A more qualitative approach would allow the ECB to signal its determination to take precautionary measures, without waiting for climate risks to materialise. While a central bank cannot fight global warming on its own, it has many tools with which to align financial flows with the objectives of the Paris Agreement.

In the following note*, Jézabel Couppey-Soubeyran offers an overview of the options available for greening monetary policy, making environmental sustainability a genuine objective of the ECB.**

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* Wojtek Kalinowski is Co-Director of the Veblen Institute.

**Hugues Chenet is a Research Associate at University College London (UCL Institute for Sustainable Resources) and the Energy and Prosperity Chair (Risk Foundation). With a PhD from the Institut de Physique du Globe in Paris, he has been a researcher at the Japanese Space Agency, then a consultant in risk management in finance, and co-founded the think tank 2° Investing Initiative. This note continues the reflection initiated in: Chenet, H., J. Ryan-Collins, F. van Lerven (2019) "Climate-related financial policy in a world of radical uncertainty: towards a precautionary approach?", UCL Institute for Innovation and Public Purpose, Working Paper Series (IIPP WP 2019-13).

*** "The Role of Monetary Policy in the Ecological Transition: An Overview of Various Greening Options", Note by the Veblen Institute, December 2020.

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Dossier “The ECB at a time for decisions (1/2)”

The need for a “whatever it takes” climate strategy

Wojtek Kalinowski & Hugues Chenet

NOVEMBER 2020

The Veblen Institute for Economic Reforms is a non-profit think tank promoting policies and civil society initiatives for the ecological transition. We believe the current economic model is profoundly unsustainable and should be transformed in the spirit of social justice and respect of planetary boundaries.

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Our work is supported by the Charles-Léopold Mayer Foundation.

Fondation Charles Léopold Mayer pour le Progrès de l’Homme

SUMMARY

This note warns of the danger of allowing the action of monetary and prudential authorities to become mired in endless modelling, where any intervention is conditional on a calculation of the financial risks at play in the climate crisis. This path is certainly the one favoured by the existing institutional framework, but it leads to a deadlock: the risk-based approach collides with the radical uncertainty that surrounds the whole problem.

Without prejudging the outcome of the strategic review, we want to warn of three factors that could delay decision-making or water down concrete measures.

- A persistent attachment to the **doctrine of "neutrality"** and its corollary, the mistrust of closer coordination with climate policies.
- A **narrow** view of **climate risk, considering only the financial calculation**. A calculation that will probably never be possible, or only when it is too late to take action.
- The **use of scenarios limited to exploratory climate stress tests**, when the latter pose more problems than they solve.

This diagnosis seems to be confirmed by our analysis of the responses of the most advanced central banks to date. While the NGFS publications show an understanding of the complexity of the problem, most of the proposals remain stubbornly focused on calculating financial losses in order to guide the markets, and simply call for new modelling.

This note opens the debate on the actions to be taken by monetary and prudential authorities in situations of radical uncertainty, in order to break the deadlock. Precautionary measures must be taken while there is still time.

- Take the **materiality of environmental impacts** into account in monetary policy and financial supervision, irrespective of the associated financial risks.
- Experiment with **qualitative risk management**: just because climate-related financial risk is difficult or impossible to calculate does not mean that it does not exist, and the complexity of the phenomenon may exceed our analytical capacities without reducing the reality of this risk.
- **Prioritise speed over comprehensiveness**, for example by immediately tackling the financing of the most harmful activities and by using all the tools available to central banks: asset buybacks, collateral eligibility, credit control, etc.
- **Develop adaptive strategies**, recognising from the outset that action taken immediately will have to be constantly adjusted, and accept flexibility rather than setting in stone a single, static strategy.
- **Make a public commitment to a "whatever it takes"** climate policy:
    - coordinate monetary programmes with EU and Member State investment plans based on European climate targets;
    - reduce funding to banks that support fossil fuel-related activities;
    - adopt a plan to redirect financial flows towards climate objectives within the euro zone, guided by dedicated indicators;
    - integrate into financial supervision a standard method for measuring the alignment of bank balance sheets and portfolios with decarbonisation strategies;
    - regularly measure the alignment of the balance sheets of the members of the Eurosystem: of the ECB itself and of each national central bank. Make the results public.

CONTENTS

1. Introduction

The Paris Climate Agreement of 2015 commits signatory countries not only to meet their climate targets but also, in Article 2.1(c) thereof, to make finance flows "consistent with a pathway towards low greenhouse gas emission and climate-resilient development"1 . The Paris Agreement is the best illustration of the – belated – awareness of the role of the financial system in relation to global warming. Since then, the world of finance has finally begun to integrate climate and environmental issues into its activities, seeing in them not only threats – such as in the stranded asset debate – but also opportunities, as evidenced by the rise of green finance.

Thus, in the wake of COP21, we have seen a growing number of declarations and commitments from banks, investors and insurers: commitments to support climate policies, to stop financing coal, to invest in renewable energies, to align portfolios with the climate target, etc. At the same time, new "green" financial products – "low-carbon" stock market indices, green bonds, "renewable" thematic funds, etc. – have rapidly developed2.

For their part, legislators have introduced reporting obligations, strengthened the mandate of prudential authorities and begun to improve the quality of non-financial information, in the hope that market transparency will be enough to steer financial flows in the desired direction[3]. Five years later, however, it seems clear that this is not the case; we are still just as far from the objective set out in the Paris Agreement, or almost. On the one hand, the financing dedicated to the ecological and energy transition remains below the necessary levels[4]; on the other hand, the financing of polluting investments and fossil fuels has not dwindled since the signing of the agreement[5].

This inertia results from a combination of many factors: the inadequacy of the commitments made by private stakeholders, the timidity of the constraints imposed by prudential authorities and legislators, the constant pressure on State finances and the weak role played by public structures such as development banks, and even the hesitancy of the monetary and prudential authorities, which have been questioning their own role for several years while being strongly mobilised against immediate economic crises such as the Covid-19 pandemic.

This note focuses on the role of the monetary and prudential authorities and is intended as a contribution to the debate on the European Central Bank's (ECB) ongoing strategic review of its monetary policy, which will address, inter alia, the question of how to integrate "environmental

[1] Article 2.1, paragraph c: "Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development".

[2] See for example "Unpacking the finance sector's climate-related investment commitments — First analysis of financial sector climate-related investment pledges"; New Climate Institute (Lütkehermöller et al., 2020); "The Alignment Cookbook — A Technical Review of Methodologies Assessing a Portfolio's Alignment with Low-Carbon Trajectories or Temperature Goal", Institut Louis Bachelier (Raynaud *et al*., 2020); "173 nuances of reporting — Climate spin-off - Season III", Novethic (Redon *et al.*, 2019).

[3] In France, Article 173 of the 2015 Energy Transition Law created, for the first time, reporting requirements for investors on climate issues. The lawmakers are also strengthening the powers of the prudential authorities in this area. At European level, the Commission has initiated the Sustainable Finance Action Plan, which has so far also focused on market transparency and investor information.
"Making the Green Deal work: a social and environmental programme to lead Europe out of crisis", Wojtek Kalinowski, Julien Hallak & Mathilde Dupré, Note by the Veblen Institute, March 2020.

[5] Source: Oxfam reports. For example, since the signing of the Paris Agreement at the end of 2015, banks have lent or invested some $1.9 trillion more in these sectors around the world, according to the 2019 edition of Banking on Climate Change.

sustainability” into the operational framework and strategy of the central bank[6]. The note argues that, faced with the urgent need to act against climate change, the monetary and prudential authorities must take precautionary measures[7] against threats that are certain, i.e. be proactive, by prioritising any provisions aimed at preventing the destabilisation of the system over those that would only delay the necessary measures.

The monetary and prudential authorities are currently favouring an approach based on climate-related financial risk. This consists in developing methodologies to accurately calculate the financial risks generated by both long-term physical climate change and the shorter-term measures implemented to mitigate its effects; only on the basis of such calculations could market participants adjust their strategies or, if they still fail to do so, could the authorities adopt prudential or regulatory measures. We intend to show, in this note, that this approach leads to a deadlock and further delays the responses of monetary and prudential authorities.

We will do this through an in-depth review of key documents on central banks, drawing in particular on the work of the NGFS[8]. These publications generally demonstrate an understanding of the complexity of the problem and the potentially impassable technical and theoretical obstacles that we are highlighting. And yet, most of the proposals that emerge are stubborn in their determination to calculate and quantify climate risk in terms of financial losses and call for increasingly sophisticated modelling, while recognising their many profound limitations and without really proving their usefulness.

The precautionary approach to the climate threat calls for a different strategy, based on a heuristic of immediate action, for the concrete purpose of supporting the decarbonisation of the economy imposed by the ratification of the Paris Agreement, and thus constituting a genuine paradigm shift capable of unblocking the decision to intervene and mobilise the tools available to central banks.

2. Trying to define “climate risk” leads to a deadlock

It is easy to understand why the monetary and prudential authorities are attracted by a quantitative and financial approach to climate risk. By showing that climate change represents a material financial risk to individual institutions and to the financial system as a whole, they expect to be able to introduce this new issue into the pre-existing prudential framework without having to rethink their mandates – focussed on price stability and, since the 2007-2008 crisis, financial stability – or to question the fundamentals of the current doctrine.

2.1. The doctrine of “market neutrality”

The first of these “fundamentals” that impede action is the principle of “market neutrality”, i.e. the idea that monetary intervention should not have the effect of changing the structure of the

[6] See https://www.ecb.europa.eu/home/search/review/html/index.fr.html

[7] The concept of precaution, and in particular the principle attached to it, are the subject of fierce debate in the sphere of public decision-making between philosophical, scientific and economic points of view. Aware of the controversy, we deliberately do not use the term “precautionary principle”, which tends to be used in conjunction with economic calculation, but prefer the word “precaution” alone, in its more literal sense, which is above all a state of mind in the face of imminent disaster. See, for example, “A Critical Review of the Precautionary Principle” (Larrère, 2003).

[8] NGFS, “The Network of Central Banks and Supervisors for Greening the Financial System”.

economy or of creating conditions favourable to some economic agents over others – "*picking winners and losers*", to use the expression preferred by many central bankers. Established as a "doxa" in Western countries since the 1980s, this doctrine implies a separation between monetary policy and economic policies, the former being limited to validating market trends and investors' existing expectations as they stand. A clear example of this is the Corporate Sector Purchase Programme (CSPP[9]) conducted as part of monetary easing and continuing to this day: following the principle of neutrality to the letter, the ECB calibrated its purchases to accurately reflect the structure of the current bond market, regardless of the fact that this "neutrality" resulted in 63% of its asset purchases relating to the most greenhouse gas-intensive sectors[10].

This doctrine was imposed in parallel with the reforms of the 1980s, which made central banks independent of political powers (Harnay and Scialom, 2016). Since then, central banks in developed countries have, in theory, ceased to coordinate their actions with those of governments (see for example van 't Klooster and Fontan 2020). Admittedly, in times of serious crisis, the coordination reflex returns automatically, even in Europe. And coordination still exists in many "emerging" economies, where central bank action actively and explicitly supports government action. For several years now, this coordination has extended to climate action and environmental objectives are being integrated into monetary policy in countries such as China[11]. And even in Europe, the possibility of coordination has not been totally eradicated since Article 127 TFEU states that part of the ECB's mandate is to "support the general economic policies in the Union". This legal basis is enough[12] to at least contest the flagrant contradiction between the ECB's action and the EU's objectives: the latter involve actively "decarbonising" the economic fabric of Europe within a very short period of time, while the former merely reproduces the current state of the market.

This doctrine has recently begun to falter under fire from many critics, and ECB leaders are sending increasing signals that it will now be interpreted more flexibly, if not rethought. As an example of how far we have come in a relatively short period of time, let us recall the speech of Jens Weidmann, President of the German Central Bank, who stated in 2017 that "neutrality is an important principle of the Eurosystem's operational framework. […] To avoid opening Pandora's box, we must not give preferential treatment to green bonds, for example, either in the CSPP or in the collateral framework. The Eurosystem's mandate is to maintain price stability. And in order to safeguard its ability to maintain price stability, monetary policy should not be overburdened by other policy objectives (Weidmann, 2017). On this point, three years later, the ECB acknowledged, through Isabel Schnabel, a German economist and member of the ECB's Executive Board, that "market neutrality may not be the appropriate benchmark for a central bank when the market by itself is not achieving efficient outcomes", and concluded: "Central banks' actions should not "reinforce market failures that threaten to slow down the decarbonisation objectives of the global community" (Schnabel, 2020). Hers is not a lone voice, as evidenced by the latest statements by Christine Lagarde, President of the ECB, or the recent announcements on the acceptance of sustainability bonds as collateral (Arnold, 2020; ECB, 2020).

[9] CSPP: Corporate Sector Purchase Programme.
[10] "Aligning monetary policy with the European Union's climate objectives", Wojtek Kalinowski & Stanislas Jourdan, Veblen Institute policy note, March 2019.
[11] See Dikau and Ryan-Collins (2017), Dikau and Volz (2020).
[12] See Y. Fischer, "Global warming: Does the ECB mandate legally authorise a "green monetary policy"?" (2018) and D. Schoenmaker "Greening monetary policy" (2019).

The overall trend is a very positive one, but it has not yet produced concrete results, and Jens Weidmann has just reiterated his position[13], which suggests that the debate is not clear-cut and that tensions persist. As will be shown below, the first concrete responses to the climate challenge suggest that the doctrine continues to influence the thinking of monetary and prudential authorities.

2.2. Financial risk modelling the only focus

Pending a more fundamental challenge to the doctrine of market neutrality discussed above, the major Western central banks are clinging to a purely "risk-focussed" outlook, wanting at all costs to calculate the financial risk associated with climate change before taking action. The solution is convenient but has a significant downside, as any intervention will then depend on the ability to estimate these financial risks *ex ante*. The underlying assumption here is that climate risk represents an identifiable and measurable financial risk; that it is simply a matter of developing adequate methodologies to capture (calculate) it and act accordingly, at the level of financial portfolios or bank balance sheets. However, by the NGFS' own admission, these methodologies are in their early stages of development and are not currently operational (NGFS, 2020d); hence the constant calls for "more research" and refinement of the modelling exercises that abound in central bank publications (see next section). But it is a misunderstanding to think that the challenge is a methodological one.

This approach to climate risk is all the more dominant among central bankers as it corresponds to the reflexes of finance itself. After all, while the financial sector is finally taking an interest in climate change – long after the industrial sectors[14] – it is mainly from the perspective of the financial losses and the risk of default that it could cause. This logic may seem virtuous at first glance: if banks and investors realise that climate change may set them on the road to ruin, chances are they will do everything they can to avoid it. This is the idea put forward by Mark Carney in 2015, then Governor of the Bank of England and Chairman of the Financial Stability Board (FSB): the time horizon used by financial players is far too short for them to be able identify the climate-related risks to be faced by the financial sector over the coming decades. Thus, blind to the ravine ahead, the financial sector continues on its way as if nothing is wrong; it will recognise the risk once it materialises, and it will then be too late (Carney, 2015). The idea is that by revealing the existence of this risk, of which it has been unaware until now, it will be able to correct the situation. It is simply a matter of rendering transparent the climate-related economic risks affecting the various industrial sectors in which finance operates so that the markets can value these risks, and finance will change course, taking the economy of the future with it.

This reasoning is attractive but it is fragile. Firstly because it implicitly assumes that finance does not already have access to the information available to everyone, namely that climate change is a dramatic threat to our societies, or, conversely, that it has access to it but does not consider the information sufficiently credible. However, a plethora of reports, some of them from the major

[13] "Bundesbank chief: How central banks should address climate change", *Financial Times*, 19 November 2020.

[14] Until recently, the "climate" section of financial institutions' annual reports did not deal with the impact of the financing/investment itself, but focused on the GHG emissions of buildings, offices and employee travel, with the changing of light bulbs in their premises being one of the most cited actions. The IPCC was created in 1988.

banks themselves[15], have shown since the mid-2000s that the vast majority of financial institutions are not climate sceptics.

The fragility of Carney's reasoning also lies in the fact that it does not question the very functioning of financial markets. It is based on the principle that this correction of the markets, through the provision of new information, will render them efficient again with regard to climate change pricing, and that the market's risk/return mechanism will then work on its own. Moreover, it assumes that once they are aware of the new types of risk to which they are exposed, market participants will do everything they can to protect themselves from risks they genuinely believe in. This assumption is rather optimistic given the history of financial crises[16].

"**Show them the figures for the financial risk, and they'll follow," is Mark Carney's basic argument**. While some actors in the investment chain operate "by feel", by intuition, most decisions taken by financial institutions are in fact made on the basis of calculations, models, and a whole range of quantitative indicators defining the characteristics of financial assets in terms of probabilities of loss (risk) and probabilities of gain (return).

The financial institution then says, "Let's calculate the risk, and we'll see".

However, climate change does not have the characteristics of a quantifiable financial risk.

Firstly, the calculation of a financial risk is typically based on probabilities established using data, both past and extrapolated into the future. This is the dominant approach to financial risk, the basis for almost all financing and investment decisions, based on the known, and therefore past, characteristics of various types of financial assets and products. The problem is that, when it comes to climate change, the past cannot be used to establish future probabilities. The nature and scale of the phenomenon is unprecedented in our economic history. There are no data or statistics from which to assess how climate change will affect the economy.

Secondly, it is the long time horizon of climate risk that poses a problem in itself: how should the economic performance of a company, the solvency of households or the borrowing capacity of a government be estimated over a period of twenty or thirty years or more? Yet this is the exercise in which both the financial profession and the monetary and prudential authorities are currently engaged.

Finally, by the NGFS's own admission (2020c, p. 57), the financial risk induced by climate change is not necessarily where we expect it to be. A company with a high-carbon business, but with sufficient capital and the right decarbonisation strategy, can manage the transition successfully and hope – as many oil companies do today – to be the one to "sell the last drop". From the financial analyst's point of view, this strategy may make the financial securities of the company in question financially attractive.

[15] Note one of the first major reports on the issue, produced by Lehman Brothers in 2007 (Llewellyn, 2007; Llewellyn and Chaix, 2007)just before its demise.

[16] An optimistic hypothesis in which the interests of the institutions' senior managers are perfectly aligned with those of the institutions themselves and of investors/ shareholders/savers. In reality, many financial bubbles have shown that the quest for short-term gains can lead managers to make decisions that result in losses for the institutions.

Climate change[17] does not present us with a risk but with radical uncertainty, due to the immense complexity of the mechanisms at work involving both socio-economic and natural systems and the multiplicity of futures possible over very long time horizons (Chenet *et al*., 2019). Contrary to Knight’s notion of risk (1921), traditionally used in finance, the term “radical uncertainty” refers to situations where there is no calculable probability of a particular future occurrence. The future is unknown[18]. In other words, if radical uncertainty prevails, financial risk is not calculable. The whole logic of taking financial risk into account is then undermined[19].

So we need another approach, one that recognises the uncertainty of the future and tries to imagine what might happen beyond what has already happened. The scenarios and stress tests developed in recent years by monetary and prudential authorities and market participants intuitively offer an attractive alternative.

2.3. A purely quantitative use of scenarios

Scenario-based approaches are today used as prospective analysis tools by many companies[20] as well as by governments[21]. They allow us to imagine potential situations and futures and to analyse the impact and responses of the entity in question (project, company, country, etc.). Applied to the financial sector, these scenarios should represent the “state of the world” at different points in the future for a number of parameters useful for characterizing financial variables. Various agencies and institutions are working on developing scenarios that could serve as a basis for such exercises; in particular, the NGFS now offers a frame of reference consisting of four families of scenarios and an implementation guide (NGFS, 2019b, 2020d)[22].

The use of scenarios does not presuppose the type of analysis conducted; it can involve mathematical models as well as qualitative data from, for example, expert panels. The point of the exercise is to move beyond the objective of a single forecast and to explore possibilities. In absolute terms, therefore, such an approach is particularly relevant to climate change. However, when monetary and prudential authorities invite the institutions within their jurisdiction to use it, it is

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[17] These remarks are valid for any major long-term system change, and are even more applicable to still more complex phenomena such as the decline of biodiversity (Kedward *et al*., 2020).

[18] We then talk about unknown unknowns (in the mathematical sense). In many “simple” computational situations (i.e. without chaotic system interactions), especially in the short term where the near future can be considered an extension of the present state, or in situations where physical laws and conditions are determined, one can indeed estimate the future in a relatively precise way: for example, one can calculate the duration of fall of an object with known characteristics, or predict the trajectory of a celestial object over millennia.

[19] To go further, see for example Aglietta and Espagne, 2016; Christophers, 2017; Thomä and Chenet, 2017; Ameli *et al*., 2019; Chenet *et al*., 2019; Kedward *et al*., 2020.

[20] Many oil companies have been using it since the 1970s.

[21] Created by military or intelligence agencies at the end of the Second World War.

[22] Recently, the Bank of England (Bank of England, 2019) and the Banque de France/ACPR (ACPR, 2020) have developed comprehensive and ambitious scenario analysis exercises. The ACPR generates three transition risk scenarios and one physical risk scenario from a stack of four different modelling layers: (1) an economy-climate model defining the levels of GHG emissions and carbon price levels corresponding to each trajectory, (2) a multi-country macroeconomic model (called NiGEM) illustrating the corresponding productivity shocks, in terms of macroeconomic variables (GDP, inflation, unemployment, etc.), (3) an internally developed sector-specific model that disaggregates these variables in terms of value added and turnover for 55 economic sectors, and (4) the financial layer itself, consisting of the Banque de France financial rating model giving the associated probabilities of default, and several financial modules giving stock market returns and corporate rate spreads for each scenario/sector/region (ACPR, 2020; Allen et al, 2020).

mainly to conduct stress tests, i.e. as part of a purely quantitative exercise aimed at generating numerical estimates for 2030, 2040 or 2050. Designed on the model of "traditional" financial stress tests, climate stress tests are now being promoted as a new tool for the supervision of financial institutions (Bank of England, 2019; ACPR, 2020; NGFS, 2020d). The NFGS' work certainly suggests that scenarios can be used in qualitative approaches (NGFS, 2020d), but only quantitative approaches based on climate-economy-finance modelling have been promoted to date.

As no methodological framework has so far proposed a truly integrated analysis of the problem incorporating climate, macroeconomy, sectoral/regional levels and finance, modelling takes the form of a series of steps in which the outputs of the previous model become the inputs of the next model. A number of limitations and sources of uncertainty are associated with each of these steps, which then pile up on top of each other with each step of the modelling process. In the end, the scenarios do generate figures, but at the same time they suffer from thorny methodological problems, which are well-known and almost insurmountable. Let's look at the main ones.

- In order to calculate the "cost of inaction" or the present value of future losses relative to the costs of policies adopted today to avoid them, and as such the carbon prices needed to alter a particular economic trajectory, a discount rate must be set. This is an arbitrary choice that profoundly influences the final outcome and on which there will certainly never be a consensus among economists.

- Climate change risks are systemic and affect society as a whole. It is extremely complex to isolate its specific effects on individual companies and sectors. The analysis of these transmission channels and interaction networks, which largely ignores the – endogenous – reactions of consumers and possible changes over time, remains rudimentary, meaning that it is difficult to predict which sectors will be able to absorb a transition shock better than others.

- It is fundamentally difficult to **integrate climate and broader physical parameters into macroeconomic modelling**. Changes in climate or ecosystems are not linear and often prove irreversible; there are many points of no return and feedback loops can suddenly accelerate changes in unexpected ways. The damage functions used by economy-climate models cannot account for these phenomena.

- **Historical data reflecting comparable phenomena**, which could be used to test correlations between variables and corroborate or invalidate model predictions, **do not exist**.

- **Technical progress**, modelled as a variable with an increasing trend within total factor productivity, is equivalent to assuming the emergence of "clean" alternative technologies thanks to the "price signal" of the carbon tax. This is a highly questionable hypothesis that can bias the results obtained, and ignores the role of public funding of innovation (Mazzucato *et al.*, 2018).

- Especially since we do not know which **technologies** will be the **"winners" and "losers**". For example, the risk of stranded assets may also affect "clean" technologies, the limits of which are being discovered (as in the case of agrofuels or the current batteries of electric vehicles), or because they will be competing with others as yet unknown or so far

overlooked. At the level of economic sectors and the multitude of micro-sectors and companies within them, it is doubtful whether technologies such as carbon capture and storage or the storage of energy from renewable sources will offer solutions that can be generalised as extensively in reality as in the models, given other limitations that have not been taken into account (for example, the availability of mineral resources such as certain rare-earths needed to manufacture current batteries, or other possible obstacles of a geopolitical, sociological or institutional nature).

- **Another source of uncertainty is of a political nature: the “green paradox”** shows, for example, that a rise in the carbon price in fossil fuel-importing countries could cause a fall in prices in exporting countries, with ultimately a very limited effect on demand.

- Applying a shock or series of “shocks” to a financial asset or portfolio can make sense to simulate the effect of, for example, a carbon tax applied abruptly to an entire sector of the economy. On the other hand, it is much less suitable for representing a gradual decarbonisation of the economy, in part or as a whole over one or more decades, with all the structural modifications and adaptations that would accompany it (sociological, industrial, technological, etc.), according to linear or non-linear dynamics, unidirectional or with backtracking, regional bifurcations, etc. In addition to the concept of shock or succession of shocks, the only variable in the traditional stress test, we need to incorporate the more or less progressive and profound adaptation and transformation of the system, which is probably more representative of real processes.

- Similarly, the dynamics “easily” captured at the level of companies is only captured at a sectoral classification level that does not allow for differentiation between two firms within the same sector that might have totally different activities in terms of the transition (e.g. renewable electricity generation vs. coal, regional vs. international transport, livestock vs. crop agricultural production), or have varying exposures to climate change due to the geographical distribution of their productive assets or place of sale, etc. Thus, with no specifics in terms of companies or physical assets, the portfolios of two different banks with broadly the same sectoral exposures will show the same climate risk, while one may only finance/invest in transition-oriented and climate-resilient companies, and the other may have a high-carbon portfolio with a high level of physical risk. While this example is something of an exaggeration, the value of the information provided at sector level should be examined.

- Lastly, and more broadly, **the number and representativeness of the scenarios** selected should be questioned, since the feasibility of the exercise is based on the use of a small number of scenarios from among the infinite number of possible futures. How can we be sure that three or four scenarios adequately represent the universe of possibilities?

These limitations are so numerous and fundamental that one may wonder what the point of the exercise actually is. Surprisingly, the central bank documents explaining the climate stress test exercises largely repeat these various reservations and warnings concerning the significance of the hypotheses and the interpretability of the results. Most of the time, these limitations are listed at the end, after the entire exercise has been developed and detailed. Wouldn’t it be more relevant to look at the possibilities and limitations from the outset, to ask what kind of exercise would be both useful and compatible with the complexity of the problem being addressed?

Finally, ACPR has expressed reservations about the methodology that it is proposing to banks and insurers: "Since scenario-based approaches need to be quantified in order to be relevant to the targeted community (i.e. central banks and financial institutions), they then often rely on the very same models that they were supposed provide an alternative to"[23]. We are aware of the very "quantitative-leaning" culture that prevails within these institutions, but in our view that is part of the problem and should not be used as a pretext to lock ourselves into quantitative modelling as the only possible approach; after all, the emergency measures adopted by the ECB in response to the Covid-19 crisis do not seem to have been calibrated using modelling as sophisticated as that proposed to combat climate change. If the scenario-based approach ends up relying on the same models to which it was supposed to offer an alternative, what is the point of the exercise?

3. Analysis of central bank responses to date

As mentioned above, the difficulty of identifying and measuring the financial system's exposure to climate risks has not escaped the attention of monetary and prudential authorities. It is fairly widely acknowledged and discussed in reports published by the NGFS and by central banks that have tackled the issue (NGFS, 2019b, 2020e; Allen *et al*., 2020; Bolton *et al*., 2020). However, it has not yet prompted a proactive search for alternative approaches, despite the growing number of academic works in this field and proposals from civil society (Schoenmaker and Van Tilburg, 2016; Dafermos *et al*., 2018; Chenet *et al*., 2019; D'Orazio and Popoyan, 2019; Krogstrup and Oman, 2019; Schoenmaker, 2019; Kedward *et al*., 2020; van 't Klooster and Van Tilburg, 2020).

Among NGFS member central banks, only the "Green Swan[24]" report, published by the Bank for International Settlements (BIS) and the Banque de France in 2020, is an exception to the rule. Its authors carefully analyse the methodological problems and attempt to formulate a philosophy of central bank action adapted to the context of the climate crisis, stressing in particular the need to invent new forms of coordination between central banks and public authorities. While this report is certainly a key contribution to general reflection on the matter, to our knowledge it currently remains disconnected from operational discussions within the institutions. When it came to proposing a concrete approach in terms of banking supervision or monetary policies, only climate stress tests and, more broadly, the quantitative approach to financial risk have so far been systematically put forward.

This is not surprising, given the very narrow view of central banks' mandates and the very "quantitative" culture that dominates within these institutions, but it is an intellectual obstacle that must be overcome in order to arrive at an action plan that is commensurate with the stakes and the urgency.

Let's focus on the recommendations of the NGFS, which was created explicitly to reflect on the role of central banks in greening the financial system. Since its creation in 2017, its secretariat has issued some 15 technical reports and notes to date. There is therefore a wealth of material and the following analysis does not claim to be exhaustive. We will highlight the passages that refer to the

[23] "*Since scenario-based approaches need to be quantified in order to be relevant to the targeted community (i.e. central banks and financial institutions), they then often rely on the very same models that they were supposed to provide an alternative approach to*" (Allen *et al*., 2020).

[24] See also the following report: L. A. Pereira da Silva (2020) "Green Swan 2 - Climate change and Covid-19: reflections on efficiency versus resilience", Bank for International Settlements.

various possibilities for central bank intervention on behalf of climate objectives, whether through banking supervision, through monetary policy or otherwise.

3.1. A standing request for "additional research"

The NGFS reports and technical appendices repeatedly call for more research, more data collection and more robust modelling to enable appropriate action on climate change. The NGFS' first progress report published in 2018 begins by reminding us that we must act now to limit the long-term impacts[25], echoing the IPCC's calls, but immediately notes that the intellectual capacity to translate climate science into "decision-useful financial risk assessment information" remains to be built[26] (NGFS 2018a, p. 3). The NGFS joins the calls for "urgent action" against climate change, while at the same time asking for more time for central banks to think... So ultimately, the lack of reliable quantitative information appears to be a kind of justification for a "wait-and-see" attitude.

This is the impression given, for example, by the way the NGFS addresses climate change as a source of systemic risk. Whether discussing physical impacts or transition policies, the reports struggle to go beyond the observation that "more research is needed" (NGFS, 2019b, 2020e). The NGFS essentially says that there may be a risk, and that this risk must be taken into account by the monetary and prudential authorities, but that it is difficult to identify the risk due to the lack of adequate data and models for quantifying it; and therefore that all these areas need to be improved on before they can be fully addressed. This is why, in September 2020, two new NGFS working groups (workstreams) were created, dedicated to data gaps and research[27].

3.2. The quantitative approach at the heart of the proposals

To estimate this new type of financial risk, the NGFS basically proposes to adapt the financial stress tests – which have become mandatory since the 2007-2008 financial crisis – to the climate problem and use the scenarios produced by economy-climate modelling to explore the various possible futures. It is in this context that we should appreciate the NGFS' insistence on the need for additional data and refined modelling: the task is first and foremost to develop climate stress tests that are as representative as possible of the entire system and its component entities, and to make financial projections up to 2040, 2050, or even beyond (Bank of England, 2019). This approach makes the production of figures a prerequisite, if not a *sine qua non*, for any decision making. Indeed, the quantification of climate-related financial risks is the anchor point for all work involving the NGFS and its members, quantification that is intended to provide not only the monetary and

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[25] "*And while the financial risks may be realized in full over extended time horizon, the risks call for action in the short-term to reduce impact in the long-term"* (NGFS, 2018); The 2019 report is even clearer: "Dependency on short-term actions: the magnitude and nature of the future impacts will be determined by actions taken today, which thus need to follow a credible and forward-looking policy path. This includes actions by governments, central banks and supervisors, market participants, firms and households. While today's macroeconomic models may not be able to accurately predict the economic and financial impact of climate change, climate science leaves little doubt: action to mitigate and adapt to climate change is needed now" (NGFS, 2019d).

26 "*There is a need to build intellectual capacity in translating the science into decision-useful financial risk assessment information*."

[27] The three NGFS workstreams created in 2018 are dedicated to (respectively): microprudential and supervision, macroprudential, and scaling up green finance. Two new cross-cutting groups were launched in September 2020, on data gaps and on research (both with a primary focus on the risk dimension).

prudential authorities but also the financial institutions themselves with food for thought, in terms of governance, business models and transparency.

The use of qualitative approaches, or of those not exclusively based on the type of models described above, is well documented in the literature on scenario analysis (NGFS, 2020d) and substantially detailed in terms of the phases of preliminary diagnostic questionnaires to institutions (NGFS, 2020c), but is not geared towards intervention by the monetary and prudential authorities. More broadly, the clear recognition contained in all reports produced by the NGFS and its members of the threat posed by climate change to the economic and financial systems is not matched by action, and does not prompt any recommendations extensive enough to curb this threat; at this stage, the reports restrict themselves almost exclusively to promoting the need, first and foremost, to measure financial risk, recommending the development of "voluntary guidelines" for financial institutions on how to do so (NGFS, 2019c).

The systemic risk linked to climate change, which justified the creation of the NGFS and the mobilisation of the central banks and financial supervisors, is by definition "scenario-dependent": depending on the scenario selected, it will materialise more or less soon and more or less strongly, but the type of analysis encouraged from all sides obviously tells us nothing about what will actually happen and does not concretely recommend how to react or anticipate, which simply encourages a certain "wait-and-see" attitude, until we obtain the "right figures" – the complete opposite of the "call to action" (subtitle of the 2019 report[28]) promulgated by the NGFS (NGFS, 2019d). It is precisely to prevent the materialisation of systemic risk that central banks must act without delay.

3.3. The "dual materiality" excluded from the analysis

As a logical consequence of the quantitative approach, most of the work carried out within the NGFS focuses on estimating financial risk in the sense of climate-related financial risks, whether at the level of portfolios, entire institutions or the financial system as a whole (systemic risk). This is made explicit in the first full report, entitled "Climate Change as a Source of Financial Risk" (NGFS, 2019d).

On the other hand, little mention is made of the financial system as a source of climate risk through its role and impact on socio-economic activity. This "dual materiality" (climate change is a source of financial risk and the financial system is contributing to the climate crisis) – as defined by the European Commission in the Non-Financial Reporting Directive and specified by the AMF[29] – is

[28] A Call for Action — Climate change as a source of financial risk. Available at: https://www.ngfs.net/sites/default/files/medias/documents/ngfs_first_comprehensive_report_-_17042019_0.pdf.

[29] Guidance on Non-Financial Reporting Directive (NFRD), and the AMF's remarks on this subject (AMF, 2020): "*When assessing which information should be disclosed in the non-financial statement [... should] consider whether the information is material from both the following perspectives*:
- The perspective of financial materiality [... which] aims at reflecting most important non-financial factors for the company's ability to remain solvent and profitable as well as to create value in the short, medium and long term [...;]
- The perspective of environmental and social materiality [... which] aims to report on the external impact of the company on the preservation of its eco-socio system, beyond any consideration relating to the impact on its activity. The AMF also explains the need to clarify this materiality because *"[...] companies can be legitimately accountable for their impact on this value [the intrinsic value of nature*...]*"* (AMF, 2020).

certainly mentioned by the NGFS in a technical paper[30], but the authors simply invoke the mandate of central banks to explain why they pay so little attention to the impact that finance can have on climate. This choice is then decisive for everything else, because it is by integrating this “dual materiality” into the monetary and prudential framework that central banks would find the legitimacy for rapid and resolute action.

3.4. The risk differential remains undetectable

This narrow focus on risk also explains why the question of whether polluting assets are riskier than “green” assets is so central to the work of the NGFS (NGFS, 2020a). Establishing a potential differential in risk assessment is a prerequisite for triggering any prudential or monetary measures. The NGFS itself concludes, on the basis of a survey of some 50 financial institutions worldwide, that it is so far impossible to measure such a risk differential between “green” assets and polluting assets. At present, it seems to be difficult to explain why a “green” company would be less at risk of default than a polluting company. “Green” assets will only be less risky when we are truly on a transition trajectory, and vice versa for the most carbon-intensive assets. However, this trajectory is for the moment only one hypothesis among others, while the fossil fuel sectors are still doing rather well economically. While this trend may well be rapidly reversed as a result of any “swing” caused by a political decision or the major movement of a significant player, there is no reason why any risk differential would be observed until such a swing is perceived by the actors involved.

Here again, the risk-based approach makes little headway: it is not a question of justifying stricter regulation because one type of asset is measured as riskier at this point, but rather of strengthening regulation to penalise the assets that are, by definition, riskier for the climate – because they are more carbon-intensive – and will become riskier financially by force of circumstance as the transition progresses.

3.5. Supervisory measures conditional on stress tests

The many reports published by the NGFS contain few recommendations on concrete measures and interventions to be implemented. One document goes further, a guide for supervisors published in 2020: where a climate stress test reveals a high vulnerability of establishments, the NGFS suggests a series of measures that supervisors could impose on the most exposed establishments (NGFS, 2020c, p. 51):

- implementation of risk mitigation tools (third party guarantees, reinsurance or other forms of protection);
- balance sheet adjustments to reduce exposure to assets related to the most exposed sectors or regions;
- restriction or prohibition of certain categories of activities (the financing of clients/purchase of securities in a specific region or economic sector; exposure to certain types of risks);

[30] NGFS, Technical document, “A sustainable and responsible investment guide for central banks’ portfolio management”, October 2019 (NGFS, 2019a).

- reduction of the leverage effect for certain categories of assets;
- adjustments to the banks' business model towards long-term management.

These measures are one of the few examples of recommendations for purposeful interventions in the NGFS publications. However, the precondition is the supervisor's assessment of the level of risk to which institutions are exposed, and nothing other than quantitative stress-test approaches are put forward, despite the limitations outlined above.

The same goes for capital requirements, which are reviewed in detail in the same guide for supervisors (NGFS, 2020c): the idea of identifying them is currently dismissed due to the lack of quantified evidence and robust quantitative risk assessment methods (NGFS, 2020c, p. 52). The NGFS acknowledges that it would be more relevant to target polluting assets negatively than "green" ones positively, but adds that the degree to which an asset is polluting or not is not the only criterion that affects, a priori, the financial risk attached to the asset: a polluting but solid company, sufficiently capitalised and well managed with regard to long-term issues, could very well succeed in the transition – and conversely, a "green" company may make a wrong technological bet, be badly managed in other respects, etc. (ibid., p. 57).

3.6. The potential of monetary policies remains under-explored

Finally, it should be noted that the NGFS is particularly cautious in addressing the question of the role that monetary policies could play in responding to the climate challenge. The first report (NGFS, 2018) merely observes that only the Chinese central bank has implemented a monetary policy specifically dedicated to the promotion of green finance. No specific recommendations are given beyond the general observation that the identification of climate-related financial risks is central to monetary policy frameworks.

The following version of the report (NGFS, 2019c) clearly considers the option of broadening the mandate of central banks beyond financial stability to include climate action within the monetary policy framework, but for the moment the discussion remains focussed on the contradictions between the two. In a short exploratory report on this topic (NGFS, 2020b), the NGFS observes that climate change could call into question the effectiveness of conventional monetary policies, particularly in terms of objectives and the time horizons by which these objectives must be achieved, and of the degree of flexibility attached to monetary strategy. Interestingly, this report addresses the possibility of more interventionist monetary approaches, for example by integrating economy-climate scenarios into monetary projections or decisions in order to mobilise the power of the central bank to encourage climate change mitigation and adaptation (NGFS, 2020b, p. 10[31]). At this stage, however, no concrete recommendations are made, the only suggestion being to call – once again – for additional research and, in particular, modelling of "climate shocks" on central banks' portfolios and market operations.

[31] "*Central banks that wish to pursue a more proactive policy stance could analyse the potential scope for concrete measures to foster climate change mitigation and adaptation, within each central bank's mandate*. *One option could be for central banks to start signalling how climate change may affect their projections or monetary policy decisions under various climate-based scenarios*", (NGFS, 2020b, p. 10).

BOX: Static or dynamic balance sheets for stress tests? Comparison of the ACPR and Bank of England pilots

One particular difficulty associated with climate stress testing is the choice of assumptions regarding the evolution of the bank balance sheet during the period in question. The authors of stress tests have a choice between two main options, both of which seem poor. Given that the aim is to measure exposures over a twenty or thirty year horizon, the assumption of a static balance sheet (identical to the year in which the test is conducted, here 2020 for 2050) creates "all things being equal" conditions that are so unrealistic[32] that one might question whether any lessons may actually be drawn from the exercise. A dynamic balance sheet is probably preferable in absolute terms because it is more logical (the bank's balance sheet is unlikely to remain the same for three decades), but it shifts the problem to the adjustment assumptions: for example, aligning the balance sheet in 2050 with a 1.5°C scenario (i.e. an assumption of strong adaptation, corresponding to an institution within an economy in strong transition) would fail to represent significant exposure to transition risk and could therefore justify the status quo in terms of the changes to be made today, assuming that the institution has a robust adaptation strategy. How can we determine the way in which the balance sheet will actually evolve, in absolute terms and relative to the economy?

For the exercise launched by the Bank of England in 2019 (Bank of England, 2019), the assumption of a static balance sheet is used: both its size and composition are frozen at 2020 and analysed over a 30-year window. However, a comparison with historical developments casts doubt on the approach: the last thirty years have seen UK bank balance sheets double in size and their composition change dramatically (Jordà *et al.*, 2017). Whatever the macroeconomic scenario used in the stress test, there is nothing to indicate that these transformations will not be repeated in the future; so applying the fixed balance sheet assumption to such long periods is akin to analysing the effect of the smartphone and Web 2.0 revolution on a bank balance sheet from the 1980s. Only if the low-carbon transition were to be achieved rapidly, over a time horizon of just a few years, might the static balance sheet assumption appear satisfactory.

It is therefore for good reason that, in the pilot exercise designed by the ACPR, the supervisor chose a dual approach, using a static balance sheet until 2025 before progressing to a dynamic balance sheet. But the dynamic balance sheet assumption introduces a risk of moral hazard. Moral hazard can be observed in banks' behaviour when facing conventional stress tests: one study revealed that banks sold some of their riskiest securities before the stress test was carried out and bought them back as soon as the test was finished (Abbassi *et al.*, 2020). Climate stress tests offer still more opportunities for such, allowing institutions to adjust their hypothetical future balance sheets according to the scenarios selected, particularly when they are based on assumptions of balance sheet adjustments over time that are excessively optimistic or incompatible with the objectives sought.

4. Acting under conditions of radical uncertainty

To sum up the discussion so far, there is no need for further modelling in order to take action; the state of scientific knowledge on the climate and the environment is sufficient to legitimise central bank interventions in the financial system, be it via financial supervision or monetary policy. This does not, of course, exclude further research, but it is crucial to disconnect the two issues and stop insisting that the move to action should be conditional on models that would "prove" the materiality of climate risk. The transmission channels and interconnections are so numerous – and uncertain, if not unknown – that a calculation of the risk of loss of value does not make sense;

[32] For example, only climate conditions or the price of carbon change, but not the economy, society or ecosystems.

polluting assets are not always financially risky or less profitable in the short term, and their longer-term financial characteristics depend primarily on the industrial policies and strategies that will be implemented to achieve the objectives of our governments.

It also means that another basis for decision making is needed, but what should it be? This is a complex question, and one that concerns both the doctrine and practical aspects of the professions of central banker and supervisor, as well as legal mandates, conventional thinking and the intellectual tradition that has emerged strongly since the 1980s, at least in Western countries. Without claiming to settle the debate or to be able to offer ready-made solutions, we propose below some steps that are, in our opinion, key to finding an alternative approach. It is actually a "debate about the debate", in that it is not so much a matter of defining monetary tools or policies – questions that form the subject of Jézabel Couppey-Soubeyran's note – but of describing the conditions under which this debate could move forward.

4.1. Recognise Dual Materiality

One option that we consider both simpler and more effective than the approach described above is to recognise environmental criteria as criteria in their own right, regardless of whether or not they converge with financial risk analysis. This approach would be in line with both scientific evidence and public opinion. Adjusting refinancing conditions between sectors on this basis would then be possible using an environmental assessment, which in many cases already exists.

On the theoretical level, a good introduction to this debate is offered by work in ecological economics[33], which provides a very different notion of the relationship between the economy and nature from those of the economy-climate models discussed above and, more generally, of environmental economics as it is usually taught. Above all, ecological economics calls for the "dual materiality" excluded from the NGFS analysis (see Section 3.3) to be taken seriously; this term expresses the idea that "financial risk" and "impact on nature" should be treated as equal factors, which is far from the case in financial regulation and monetary policies[34].

Monetary and prudential authorities cannot avoid this debate on the grounds that tackling the impacts is a matter only for States and other areas of economic policy, for example through carbon taxation or environmental regulations. Each actor has a responsibility to act in the face of the climate crisis and all policies must contribute to finding solutions; independent status does not alter this fact. On the other hand, everyone seems to recognise that, sooner or later, these impacts will eventually affect the stability of the financial system, even if the exact calculation of the associated risks is absolutely impossible today. For this twofold reason, we believe that this approach – based on the impacts of finance on the climate instead of focusing solely on the impacts of climate on finance – will sooner or later find its place in the doctrine of central banks; as we have seen above, the change seems to have already begun, but tangible results are yet to appear.

4.2. Experiment with qualitative risk management

Pending the change in doctrine that we are calling for – and which does not necessarily imply a questioning of independence – it is the assumptions associated with the notion of financial risk itself

[33] In the sense of the theoretical trend, currently represented in particular by the journal *Ecological Economics*.
[34] This is evidenced by, inter alia, our recent meetings with the heads of the French supervisory authorities. See "Environmental Assessment in Finance", Veblen Institute/IDIES Report, November 2020.

that must be questioned in order to break the current deadlock. Just because climate risk is difficult or impossible to calculate at the institutional level does not mean that it does not exist: the fact that complexity of the phenomenon may exceed our analytical capacities does not diminish the reality of the risks themselves, a reality demonstrated by science (Masson-Delmotte *et al*., 2018) and recognised in each introduction to the NGFS reports (for example NGFS, 2018, 2019b).

How, then, can we prevent financial risks that are completely beyond the reach of traditional risk management tools? Rather than remaining locked into calculation-based approaches that always seek the financial materiality of the risk, central banks could accept the state of scientific knowledge on climate as a sufficient basis for recognising that the climate crisis will undoubtedly have consequences for the financial system. Information that is not useful, or whose robustness and reliability cannot be estimated, should be ignored. Experience, interpretation and discernment must prevail over data and the alleged objectivism of the current paradigm, which is no longer relevant[35]. While some elements are certainly complex to determine, the calculation of financial risk will not help here, especially given the obstacles we have reviewed.

Central banks could draw inspiration from the so-called "no-regrets" strategies mobilised in climate change adaptation policies, both in the decision-making process and in the content of the decision itself[36]. Such an approach requires thinking about the future in qualitative terms. This "imaginative" process is the basis of scenario approaches – which should not be discarded – and constitutes the narrative framework of possible futures, which is as important, if not more important, than the quantitative (numerical) layer that accompanies it.

4.3. Prioritise speed over comprehensiveness

Action must be taken without delay, even if it means being content, in the short term, with the most obvious actions – exclusion of the most polluting assets from refinancing, higher capital requirements, etc. – in order to create some momentum[37]. In the face of the irreversible effects of the climate crisis, it is better to be approximately right than precisely wrong[38]. Instead of looking for an optimal solution, from an economists' perspective, we simply need to resort to a priori satisfactory measures, ground rules (or rules of thumb[39]) drawn from accumulated knowledge and experience of crisis management. An example of a rule of thumb would be to start by tackling the financing of the most harmful activities, where a broad consensus exists at least in some jurisdictions (coal-fired power plants, oil sands development, etc.), using the arsenal of tools available to central banks, including asset buybacks, eligibility of collateral, credit control, etc. For example, the Swedish central bank has just announced that it will only accept bonds issued by

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[35] See King (2016); Kay and King (2020).

[36] See Hallegatte (2009) and Siegel (2011) and the methods for "Decision Making Under Deep Uncertainty", https://blogs.worldbank.org/ppps/embracing-uncertainty-better-decision-making

[37] Once again we quote Mervyn King, and the British economist John Kay: "[...] It is the problem of context – the impossibility of knowing all the feasible choices and the full detail of the environment in which these choices will take effect. The human brain is not a computer implementing an axiomatic decision-making process, and as a result is a better decision-maker in many complex situations." (Kay and King, 2020).

[38] Among the many users of this famous saying is, once again, Mervyn King, former Governor of the Bank of England, on the calculation of regulatory capital in a situation of uncertainty: "If the nature of the uncertainty is unknown... it is better to be roughly right than precisely wrong, and to use a simple but more robust measure of required capital" (King, 2016, chap. 4).

[39] https://en.wikipedia.org/wiki/Rule_of_thumb

companies "deemed to comply with international standards and norms for sustainability[40]". The measure is quite modest and its effectiveness will depend on the concrete definitions and sustainability standards adopted, but it is nonetheless evidence of a move towards action in the right direction.

4.4. Develop adaptive strategies

The decision-making dynamic thus set in motion will necessarily be one of trial, error and adjustment. The complexity of the climate problem requires adaptive, flexible and iterative strategies, as opposed to a single, immobile strategy, fixed *ex ante* and offering no exit or possible deviation. The strategic review launched by the ECB in 2020 is the second in its history; the previous one took place in 2003. The climate strategy, on the other hand, needs to be reviewed very regularly.

The "learning-by-doing" model is particularly relevant in our case, where the urgency to act takes precedence over any other consideration. Rather than waiting to be certain of the right tool and the perfect calibration for an ideal intervention, it seems much wiser and more astute to take action without delay, starting with the decisions that make the most sense and are consistent with the objectives, and being ready to adjust them according to the effects and reactions they generate.

This is, moreover, how the ECB acted when faced with the Covid-19 pandemic. On 12 March 2020, it announced a massive €120 billion asset buyback operation on the markets. Faced with the negative reaction of stakeholders and the lack of confidence – which this announcement was supposed to restore –, less than a week later, on 18 March 2020, the institution multiplied the amount of its intervention by more than six, bringing it to €750 billion, and then extended it again (to €1.35 trillion to date). This is a particularly instructive example of a heuristic of action in a situation of radical uncertainty and emergency, based on learning by doing and the use of a certain amount of discretion. While it is conceivable that the first figure is the result of a modelling exercise, working in the dark in the context of a situation that was as new as it was radically uncertain, it is highly likely that the second figure of €750 billion was determined by quite different procedures. This pragmatic, humble approach, recognising trial and error but resolutely focussed on action, makes perfect sense. It is not the relevance of the intervention itself that is important here, but rather the ability, in a given situation, to mobilise a decision-making method that is totally contradictory to the one that has been used thus far in relation to climate risk. This highlights the importance of state of mind when it comes to decision making.

It can be argued that the comparison does not hold water, because in the case of the pandemic central banks are faced with financial variables that are collapsing or spiralling before their very eyes, going beyond acceptable limits. As the climate crisis has not yet been translated into financial variables, it might therefore seem important to wait. But this would be to forget that by the time the financial variables reflect physical realities, it will be too late: we must take precautionary action, which in this case means acting without delay.

[40] "Zero policy rate and extended asset purchases", Riskbanken, press release of 26 November 2020.

4.5. Make a public commitment to a “whatever it takes climate” strategy

The more complex a situation is, the more we need a simple narrative and a concrete plan of action (Boyer, 2018[41]). At this point in the discussion, the narrative should be clear: recognising the power and position of the financial system in steering the economy, the challenge is to shape it to help move us closer to a +1.5°C trajectory, and to use all the means available to a central bank. In contrast to doom-mongering, “catastrophist” approaches, a precautionary approach informed by knowledge must lead to action, precisely to avoid the realisation of the catastrophic scenario (Dupuy, 2002; Dupuy and Grinbaum, 2005).

As for the action plan, it is not our ambition here to present a turnkey action plan for integrating environmental objectives into the work of central banks. Let’s just say that such a plan should make use of all the room for manoeuvre offered by the ECB’s current mandate, and that it could confirm that the ECB will do whatever it takes to achieve objectives such as those listed below, since we are facing the risk of the collapse, or “ruin” of the system (Taleb *et al*., 2014). The list is not exhaustive and the proposed objectives are indicative, an illustration of how a “whatever it takes” mindset towards climate change can be translated into concrete actions.

- Develop coordination with the European climate targets via dedicated purchasing programmes and credit terms, for example to facilitate the financing of the European “Rail Renaissance” programme or other components of the European Green Deal where private funding is lacking. Or, on the contrary, via conditionalities on access to existing programmes. This is contrary to the doctrine, but some room for manoeuvre exists even under the current mandate; an example was recently given by Yves Mersch, member of the Governing Council of the ECB, who announced last November that the ECB would be obliged to “react” if certain euro area Member States tried to “circumvent” the European Recovery and Resilience Facility (RRF)[42]. Mersch publicly called on Member States not to “undermine this new European solidarity approach[43]”, while a few days earlier the ECB had let slip the idea that it would reduce its purchasing programmes in countries not on board[44]. The same type of measures – or simply of communication – could be used to encourage Member States to comply with national low-carbon plans or other commitments adopted at European level.
- Gradually reduce and then definitively abolish the financing granted to European banks that support fossil fuel projects, starting with existing tools such as the Coal Global List;
- Introduce more granular information requirements to enable supervisors to monitor such financing effectively (information on corporate loans and not just project loans, turnover

[41] “The higher the uncertainty and complexity, the more urgent the need for simple narratives” (Boyer, 2018).
[42] The RRF consists of taking out joint loans via the EU, thereby mutualising the interest rate and the guarantee against default, and lending the funds back to the Member States. The problem is that some states could forego the loans and borrow directly from the markets, which could be done more cheaply and without the conditions attached to RRF loans.
[43] The ECB would need to act if countries “circumvent” EU loans, Reuters, 9 November 2020.
[44] “ECB may cut support for indebted countries in nudge towards EU loans”, Reuters, 3 November 2020.

from the financial services sold to these companies, e.g. arranging fund-raising on the financial markets);

- Redirect financial flows towards climate objectives within the euro area, using indicators such as the proportion of bank loans contributing to the European Green Deal objectives or compatible with the EU's "green" taxonomy;
- Develop a standard method for measuring the alignment of bank balance sheets and financing flows with EU objectives and incorporate it into financial supervision.

5. Conclusion

Precautionary action is not just a set of ready-made precepts, and precaution does not prejudge the appropriateness of the tools implemented in its name. Taking precautionary action signals, first and foremost, an attitude towards complex problems concerning which any decision – to act or not to act – could have irreversible consequences. This is particularly the case for the problem posed by the climate crisis, but the critical discussion presented in this note applies equally to the other dimensions of the environmental crisis. It is perhaps even more applicable here, as biodiversity lends itself even less to the quantitative approaches discussed in this note, and the need to integrate dual materiality is even greater[45].

In addition to the concrete measures that it may propose, the strategic review, above all, offers the opportunity to mark a change of approach, an awareness that the challenge of climate change requires new responses. Certain points of the debate show that the time is right: the Covid crisis is forcing the ECB even further along the path of "unconventional" policies, debate on the doctrine of "market neutrality" is now permitted, and Christine Lagarde's recent speeches have assigned a central place to climate issues.

The success of the strategic review is not only a matter for Frankfurt; much of the responsibility lies with the national central banks of which the Eurosystem is composed. They participate in decision-making at all levels, from technical working groups to voting in the Governing Council. The Banque de France, which co-chairs the working group on environmental sustainability and whose Governor has often displayed a high level of ambition in this debate, has a duty to provide impetus.

This is therefore an opportunity to send a new type of "whatever it takes" message, signalling to financial system participants that the ECB is determined to ensure compliance with Article 2.1(c) of the Paris Agreement. A central bank obviously cannot fight global warming on its own, but it has many tools to succeed where "green finance" has failed. Jézabel Couppey-Soubeyran's note provides an overview of these tools and shows how they could serve climate objectives.

[45] See Kedward *et al.*, 2020.

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