

WORKING PAPER

Better Safe than Sorry: Macroprudential Policy, Covid 19 and Climate change

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The crisis of 2007-2008 called for a renewal of banking regulation that took the shape of a shift toward macroprudential policy. However, a comprehensive assessment of the current state of financial regulation reveals that this shift is incomplete. In particular, the notion of risk that lies at the heart of the Basel framework is still blind to extreme events. Climate risk and pandemic risk fall into this category. The purpose of this article is twofold. On the one hand, we point out why current banking regulation is not adequate to face risks whose origin is grounded outside financial markets – as is the case for both the pandemic and the climate risk – on the other hand, we offer avenues for reforming macroprudential regulation in a way that would allow to take those risks into account.

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1 Introduction

Following the 2007-08 financial crisis, the conception of financial stability policy has changed. Prior to the crisis, the common belief was indeed that the combination between microprudential policies focusing on the soundness of financial institutions and monetary policies keeping inflation low was sufficient to ensure financial stability. Such an approach proved irrelevant once the crisis struck. The need for a renewed conception of financial stability policy, as for instance expressed by the G20, has therefore been the catalyst for the adoption of macroprudential policies whose purpose is to stabilize the monetary and financial system at the macro level. The main objective being to contain the systemic risk.

Macroprudential policies thus aim to reduce the likelihood of systemic financial crises, and to limit their intensity and their costs when they occur. If financial stability was already a policy objective before the financial crisis, it greatly gained consistency following the crisis when mechanisms explicitly meant to ensure it were implemented (Aglietta and Scialom, 2010; Claessens, 2015; IMF, 2018). These latter aim to protect the economy from systemic risk in its two dimensions (Borio, 2003): through time (temporal dimension), and at every moment (cross-sectional dimension). On the one hand, systemic risk indeed materializes through the procyclicality of economic behaviors; and, on the other hand, it can spread thanks to the interconnections between financial institutions and the concentration of risk at a given point in time. Without being exhaustive, the main macroprudential instruments are the following (Cerutti et al., 2017): countercyclical capital buffer, leverage ratio for banks, dynamic provisioning rules, caps on loan-to-value or debt-to-income ratios, limits on foreign currency loans, limits on risk concentration and capital surcharges for systemically important banking institutions. Surprisingly, while the adoption of macro-prudential instruments has been based on the diagnosis of the procyclicality of existing micro-prudential rules and their failure to prevent a systemic financial crisis, many of the former instruments are merely an extension of previous micro-prudential rules. Therefore, post-crisis macro-prudential policy does not embody a paradigm shift concerning the assessment of risks both in their temporal and cross-sectional dimensions.

The promotion of countercyclical microprudential rules meant to fulfil a macroprudential objective – i.e. designed and calibrated to “lean against the wind” – is widely accepted because of the now known procyclicality of prudential rules. These countercyclical rules also seek to face the well-known paradox according to which any balance sheet item that serves as a shock absorber (liquid assets and/or capital) against adverse and unpredictable shocks ceases to fulfil this function as soon as regulatory pressure – through the definition of minimum requirements – is put on it. Only capital exceeding those minimum requirements constitutes a real absorber of unanticipated losses. Indeed, when capital strictly reaches minimum requirements, additional losses deplete regulatory capital and

induce credit rationing or other procyclical balance sheet adjustments such as fire sales. From shock absorbers, regulatory minima consequently become shock amplifiers. From a macroprudential perspective, the countercyclicality of prudential rules contradicts the invariance over time of liquidity and capital ratios (Kleinnijenhuis et al., 2020). This is the reason why countercyclical components have been defined in the Basel 3 framework through the capital conservation buffer and the countercyclical capital buffer.

As for the cross-sectional dimension of systemic risk, the imposition of capital surcharges for global systemically important banks (G-SIBs) is a flagship measure. The philosophy of this measure was jointly developed by the Financial Stability Board and the Basel Committee in 2011 and was adjusted in 2013. The idea is that each G-SIB is assigned a composite score based on a set of five categories of quantitative indicators meant to indicate how systemic those banks are (size, interdependence, substitutability, cross-border activities, complexity). Scores are then associated with additional capital requirements: the higher the score, the higher the amount of capital required. There are 5 tranches ranging from a 1% capital surcharge to a 3.5%. The last tranche is deliberately left empty, the purpose being to dissuade banks from becoming “too systemic”, hence the idea of a stigma associated with the simple fact of being in this last tranche.

The Total Losses Absorbing Capacity ratio (TLAC) and the Minimum Requirement for own funds and Eligible Liabilities (MREL) are also two instruments meant to control the global risk borne by G-SIBs. Their aim is to require systemic banks to issue securities able to be used as bail-in instruments, either by conversion into equity or depreciation. In the event of large and repeated losses, a bank may see its capital level fall below regulatory minimum requirements. At this point, the bank may be deemed unsustainable. In this case, a resolution process occurs and taxpayers are protected because of the activation of bail-in instruments to absorb the bank's losses.

The various macroprudential instruments outlined in this introduction, whether they address the temporal or the cross-sectional dimension of systemic risk, are certainly innovative compared to the purely microprudential framework that prevailed until the 2007-08 crisis. They are nevertheless in line with this latter since most of them are computed as a function of risk-weighted assets, whose problematic calculation was at the heart of the outspread of systemic risk during the crisis.

This article starts from the hypothesis that the Covid crisis, at least in its financial dimension, can be interpreted as the prefiguration of certain aspects of the financial risks linked to the climate crisis. The purpose of this article is then, on the one hand, to assess how this health crisis partly undermines the foundations of the macroprudential policy framework as it has been structured since the financial crisis; and, on the other hand, to explore the paths of a possible paradigmatic shift in risk assessment. To do so, we show, in the first section, how the regulatory transformations that have followed the

2007-08 crisis lie in fact in the continuation of pre-crisis prudential regulations and therefore do not propose a true macroprudential revolution. In the second section, we show how the Covid crisis highlights the blind spots of the current macroprudential framework. In the third section, we offer avenues for reforms that could enable this framework to cope with climate risks whose shape is likely to be close to that of those materializing today with the Covid crisis.

2 Basel 3: an unfinished revolution

As it has been implemented in the aftermath of the 2007-08 crisis, macroprudential policy does not radically renew the foundations of pre-crisis banking regulation (Baker, 2013). In fact, the macroprudential instruments presented in the introduction appear more as extensions added to a regulatory corpus whose general intention remains microprudential, than as real breakthroughs.

2.1 The definition of risk: nothing new under the sun

The main instrument of prudential regulation still consists in a risk-weighted capital ratio. The problem of this ratio is that its computation is based on a definition of risk that does not allow to capture either fat-tailed risks and/or risks with no historical record, which are precisely great sources of systemic risk. Such a definition entirely rests on mathematical models that define upcoming risk as the mere reflection of risk as it materialized in the past. Implicitly, the capital constraints to which banks are subject are thus calculated according to a risk that is not supposed to differ radically from the way it has historically materialized. Such a hypothesis is completely irrelevant when the risks considered are, by nature, too rare to be statistically significant and thus accounted for in probabilistic models. This is the case for both climate risk and pandemic risk as highlighted in a recent working paper jointly published by the Banque de France and the Bank for International Settlements:

“[...] traditional approaches to risk management consisting in extrapolating historical data based on assumptions of normal distributions are largely irrelevant to assess future climate-related risks. Indeed, both physical and transition risks are characterised by deep uncertainty, nonlinearity and fat-tailed distributions.” (Bolton et al., 2020, p. 10).

What is implied by the conservation of the same definition of risk in the Basel 3 framework is the permanence of the reference to the market as the basis of banking regulation. What lies behind such a definition of risk is, in fact, the implicit recognition of the ability of the market to determine, through prices, the value of all the assets that are traded (Chiapello and Walter, 2016). Risk can then be measured as the volatility of these prices and estimated using Value-at-Risk models. Far from having been ruled out after the crisis, such a definition of risk is now used for regulatory purposes that go beyond the sole regulation of banks. Indeed, with Solvency 2, insurance companies now have to comply with capital requirements whose computation is based on the same methodology as that for banks. More precisely, under Solvency II, the Solvency Capital Requirement (SCR) is calculated as

the capital required to absorb one-year expected losses in 99.5% of cases, those latter being extrapolated from historical data on the assets held by insurance companies. Such a replication of the methodology used to compute capital requirements for banks to insurance companies is problematic for at least two reasons. On the one hand, it extends to other financial institutions the risk management methods that have already shown their limits in the case of banks (Danielsson et al., 2004). On the other hand, the application to insurance companies of rules similar to those that banks must comply with may lead to an excessive homogenization of financial behaviors, whose impact on financial stability could be potentially very negative (Wagner, 2010, 2008).

2.2 *The microprudential ground of financial regulation*

The importance given to market prices goes beyond the sole calculation of prudential constraints. Those prices indeed lie at the heart of the main concept of the IAS/IFRS accounting framework, namely fair value. The principle of the latter is that assets should be measured and recorded at their market value. Fair value accounting is, however, broader than mark-to-market accounting since it is possible to compute the fair value of an asset even if no market price exists for this asset. In this case, according to the three-level definition of fair value proposed by IFRS 13, fair value is estimated using a model, either based on public information (Level 2 fair value) or on the basis of information privately held by the company that holds the asset (Level 3 fair value). In any event, the central element associated with the massive adoption of IAS/IFRS standards since the early 2000s is the affirmation of the overriding importance attached to market prices. This affirmation has been recently renewed by the implementation of the new accounting standard for financial instruments, IFRS 9, in January 2018 since fair value is still presented as the accounting valuation method to privilege. As already indicated, such a method entirely rests on the well-functioning of financial markets and proves to be much more difficult to implement in times of crisis.¹

Despite the call for reform expressed in the early 2010s, financial regulation remains largely imbued with microprudential assumptions, whose limits have been put in the limelight during the financial crisis. The great attention still assigned to the concept of market discipline may be one of the most obvious signs of such a continuity. Market discipline is indeed by nature a microprudential instrument (Stephanou, 2010). The idea behind market discipline is that prices have an informative and incentive power capable of driving banks, and more generally financial institutions, to adopt the right behaviors in terms of risk management. In the recent period, market discipline has been reactivated through two sets of measures: on the one hand, increased constraints in terms of

¹ “During the crisis, the fraction of assets with Level 1 inputs decreased, while those valued using models and unobservable inputs (Level 3) increased. Presumably, as the crisis unfolded, fewer assets were traded in active markets, requiring banks to use models to value their assets.” (Laux and Leuz, 2010, p. 100).

transparency and information disclosure as defined by the third pillar of the Basel 3 framework and, on the other hand, bail-in standards such as the TLAC and the MREL. Let us focus on bail-in standards. The former aims to compel G-SIBs to fund a certain proportion of their activities using instruments with a high loss absorbing capacity, and the latter extends this constraint to all European banks. These instruments, also referred to as subordinated debt, should allow unsustainable banks to be bailed in instead of bailed out. The problem with these instruments is that they could ultimately act as channels through which systemic risk propagates, as revealed in a recent empirical paper on coco bonds (Bologna et al., 2018). Theoretically, it is possible to account for such a mechanism by revealing the complex interlacing of incentives associated with certain forms of subordinated debt. As Corcuera et al. (2014) demonstrate it, coco bonds indeed exhibit a death-spiral effect. To hedge the conversion risk, coco bonds' holders are incentivized to short sell shares. Doing so they may find themselves in a position of selling shares whose price is decreasing and therefore they may contribute actively to the materialization of the conversion risk. By hedging the conversion risk, investors thus make it more likely. Hence the spiral effect.

In sum, the regulatory corpus put in place in the aftermath of the crisis is deeply impregnated by the microprudential conception of banking regulation. Risk is still defined as an asset-specific characteristic that can be determined using probabilistic models based on the exploitation of historical data. While the financial crisis could have motivated a shift away from market-oriented banking regulation, since the procyclicality of the Basel 2 rules was unanimously denounced, such a shift has in fact been very modest. The simple leverage ratio added in Pillar 1 to the risk-weighted capital ratio is indeed set at a very low level (3%). Far from being the linchpin of banking regulation, the leverage ratio, which has the advantage of cutting banking regulation dependence on the well-functioning of financial markets, is reduced to the role of a mere backstop relative to the risk-weighted capital ratio. Basel 3 is thus a corpus whose spirit is still that of a regulation of banks largely dependent on market prices and their volatility. Although new instruments have been introduced, such as the countercyclical buffer, they appear more as extensions added to a regulatory framework that does not break with the tradition inherited from Basel 2 than as signs of a genuine revolution.

3 The blind spots of the current macroprudential framework

In the previous section, we showed that the prudential instruments put in place in the wake of the 2007-08 crisis are based on a definition of risk that remains deeply linked to the well-functioning of financial markets. While this definition has been enriched in Basel 3, since it now includes liquidity risk and systemic risk, it remains blind to all risks whose origin lies outside the market. The recent Covid crisis highlights the extent to which risk can, in a hyper-connected world and, moreover, at the verge of a climate crisis, materialize outside the market.

3.1 Wait and see, or how to become collectively unprepared

The unpreparedness of our economies for a pandemic and the climate crisis reflects the lack of attention paid by decision-makers and economists to the major and foreseeable dangers inherent to the destruction of ecosystems caused by human activities (Aglietta and Arrondel, 2019). Epidemiologists and health ecologists have alerted for more than twenty years that there exists a real risk of a zoonotic pandemic. The link between zoonoses and the loss of biodiversity due to human activities is indeed well documented (Hurst, 2018; Jones et al., 2008; Smith et al., 2014). Zoonoses are infectious diseases in which the pathogen (virus, bacteria, or parasite) spreads from animals to humans. They include other coronaviruses such as MERS or SARS, but also HIV, Zika virus, Ebola virus, Nipah virus or Marburg virus. The increasing risk of a zoonotic epidemic becoming a pandemic because of the current collapse of biodiversity – documented by the successive reports of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) – is therefore well known. In the same vein, for more than thirty years, the reports of the Intergovernmental Panel on Climate Change (IPCC) have given us a refined understanding of the harmful effects of human activity on the climate. However, in both the prevention of global warming and the adaptation to its effects, a wait-and-see attitude prevails and testifies to our collective unpreparedness.

The Covid crisis calls for a radical rethinking of macroprudential policy in that it prefigures what could be a future dominated by radical uncertainty, where the accurate evaluation of climate-related financial risks is impossible. This uncertainty does not so much relate to the occurrence of a health or climate crisis – whose predictability is proven –, as to the quantification of its effects on the economy and finance. In the health crisis, not all economic sectors are indeed equally affected. Some, such as aeronautics, are in a situation close to that defined by Mark Carney (2015) through the phrase “stranded asset”. Stranded asset is a concept introduced by the NGO Carbon Tracker (2013) to refer to the massive depreciation of certain assets resulting from the transition to a low-carbon economy. This depreciation may be the result of legislative or regulatory changes, environmental constraints or technological innovations that render certain assets obsolete. The academic community as well as central banks have quickly adopted this concept (Cahen-Fourot et al., 2019; Caldecott, 2017). The parallel between the health and climate crises is striking. In the current health crisis, it is less the virus that causes the failure of certain sectors than the public action to shut down the economy and the restrictions put on mobility to protect human life. Some sectors proved resilient to the health crisis while others collapsed (Pagano et al., 2020). Similarly, an ambitious climate policy aligned with the commitments of the Paris agreements, which is a public policy aimed at protecting human life on a longer time scale, will lead to the accelerated failure of the carbon sectors. The transition to a low carbon economy indeed implies large-scale structural transformations of economies: some sectors will rapidly increase their relative weight while other sectors will decline or even disappear.

Specifically, carbon-intensive sectors are likely to see their competitiveness collapse rapidly. These rapid changes in economic structures will have major repercussions on financial stability through sharp price depreciations of certain assets and defaults on debts resulting from the loss of income, profits and jobs in declining sectors (Battiston et al., 2017). This is a new issue in terms of financial stability. Economic literature and economic historians have long identified speculation on sunrise industries and asset overvaluations (bubbles) as a source of financial crisis (Kindleberger, 2005; Schumpeter, 1939; Shiller, 2005), paying little attention to – or minimizing – the role of declining industries as a triggering or amplifying factor of financial crisis (Semieniuk et al., 2020). On the contrary, works on systemic financial risks related to the transition to a low-carbon economy focus on the financial risks related to declining industries (van der Ploeg and Rezai, 2020).

3.2 Covid crisis and climate risk: reality strikes back

Macroprudential policy should take into account the transformation of the nature of risk as presented in subsection 3.1. From this perspective, the Covid crisis could act as a “dress rehearsal” and as such inspire the future structuring of macroprudential policy to prevent and mitigate climate-related financial risk. We indeed showed in what extent the consequences of the Covid crisis on some sectors of activity resembles what is expected to be the impact of stranded assets on the economy. The response of central banks and states has so far been to take some activities off the market. Massive supports to non-financial firms and financial intermediaries, through programs whose conditions do not reflect any evaluation coming from the market, are the proof that some risks cannot be fully dealt with by the market. This disqualification of market valuations probably foreshadows what could happen with the prevention and management of climate-related financial risks.

Such a step back from the logic of the market is not specific to the very recent period. In fact, the unconventional monetary policies pursued for nearly a decade by central banks, notably the Fed and the ECB, have consisted in withdrawing a very large number of assets from the market. Consequently, central banks’ balance sheets have inflated. The fact that these massive injections of liquidity do not fuel inflation illustrates the strong disconnection between the banking system and the real economy. Indeed, the excess reserves created by quantitative easing policies remain mostly in the banking system and are not accounted for in the money supply and do not directly feed the demand coming from non-financial agents. This disconnection between the financial and the real spheres has certainly increased with unconventional monetary policies, but it is rooted in the complexification of financial activities that has roughly begun in the 1980s. The constitution of a shadow banking system, in which banking activities are mingled with financial activities, bears witness to this complexification. Such a complexification of banking and financial activities harms any attempt to regulate them. Indeed, the ever-increasing possibilities of escaping regulatory constraints, either because of regulatory arbitrage

(Carruthers and Lamoreaux, 2016), or because of the complexity associated with the implementation of rules which leaves great room to “manipulate” regulatory ratios (Mariathasan and Merrouche, 2014), offers banks an unquestionable advantage over their regulator. Because of the process of deregulation of banking and financial activities that has begun in the 1980s, the banking and financial systems have come to function as a world on their own, apart from the real world. Crises are precisely the moments when those two worlds come to remember each other: either because of an overflow from the world of finance into the real world as at the end of the 2000s, or because of a real crisis that does not spare finance as is currently the case with the Covid crisis.

The foreseeable multiplication – attested by scientific works – of crises of the type of the Covid crisis thus calls for a “re-embedding” of finance that should go “down to earth” to put it like Bruno Latour (2018). Such a re-embedding can begin with the elaboration of prudential rules that take note of the need to ground banking regulation not only on the functioning of financial markets, but also on instruments whose effectiveness is guaranteed even when financial markets fail. In this respect, a simple instrument, such as the leverage ratio, seems to be a good starting point. In the longer term, it is surely necessary to envisage structural reforms that go beyond the simple recasting of the prudential framework. The next section details the paths that macroprudential policy could follow in the coming years.

4 In the light of the pandemic and climate crises: paths to a reinvention of macroprudential policy

In this section, we detail proposals that could serve as a basis for a refoundation of macroprudential policy that integrates the lessons of the health crisis and anticipates the manifestation of climate-related financial risks.

4.1 Rethinking the implementation of macroprudential policy

The Covid crisis calls into question the appropriateness of the current structuring of the macroprudential policy both in its institutional and operational dimensions. This crisis marks the great return of the real economy and state decisions in finance and the risks it carries. It is indeed the voluntary slowing down of the economy to fight the pandemic that induces a rise in global risks in the financial sphere and not the endogenous risk that characterizes its functioning. From this point of view, the financial side of this crisis is totally different from that of the 2007-08 crisis. The sources of systemic risk are to be found in business failures, in the consequences of the pandemic on household incomes, and in the overall loss of confidence, which increases recessive and deflationary pressures on the economy. They do not stem from the credit drifts and bubbles that they feed, nor do they stem from the illiquidity of the balance sheets of financial intermediaries or the concentration of financial risks. However, these are aggravating factors that are pushing for the consolidation of certain

developments that are already well under way in macroprudential policy.

In particular, the health crisis reinforces the pivotal role of central banks on financial stability issues and illustrates the interdependence between global financial risk management and risk prevention. The narrow conception that had prevailed since the 1990s regarding the contribution of central banks to macroeconomic stability through the sole objective of price stability (Betbèze, 2011; Carney, 2020) had already been challenged. The recognition of the interdependence between the orientation of monetary policy and credit and asset price drifts (Borio and Lowe, 2002; Greenwood et al., 2020) had strongly shaken it. The health crisis confirms this evolution. Prior to the crisis, it was recognized that episodes of severe macrofinancial imbalances generally develop when monetary conditions are relaxed and, symmetrically, that macroprudential decisions aimed at moderating the credit cycle affect economic activity and price dynamics through the credit channel. This diagnosis of endogenous macrofinancial risks has led to discussions and even calls into question the institutional arrangements separating the central banks in charge of the monetary target from the agencies responsible for financial stability, notably through the supervision of banks. The health crisis and the key role of central banks in the management of its financial dimension consolidates their pre-eminence in terms of financial stability and the recognition of the interdependence between the management and prevention of global risks.

However, despite these changes, the obstacles to an effective structuring of macroprudential policy remain strong. The non-directly observable nature of macroprudential policy successes (financial cycle smoothing and financial crisis avoided) and the time lag between its immediate costs and its more difficult-to-measure and time-displaced benefits are among the notable difficulties facing its implementation. This problem of temporal inconsistency provides an incentive to relax macroprudential regulations – or not tighten them sufficiently – during periods of financial booms, when financial risks are perceived as minimal and risk aversion is itself low. There is thus a “bias to inaction” specific to macroprudential policy (Houben et al., 2014). This form of temporal incoherence is further reinforced in policies aimed at protecting the financial system from the systemic risks generated by the transition to a low-carbon economy, i.e. in the design and implementation of “green” or “climate” macroprudential policy. This is the famous tragedy of the horizons popularized by Marc Carney (2015).

The “inaction bias” inherent in macroprudential policy is thus exacerbated in the case of climate macroprudential policy. The temptation to wait for a better analytical understanding and appreciation of climate risks and their dynamics leads to inaction. This translates into a sequential approach marked by a first phase of improving the transparency of information on companies' exposures to climate risks in both qualitative and quantitative terms. This first stage of building an informational

prerequisite converges with the recommendations of the Task Force on Climate-related Financial Disclosure (2017). From this perspective, the European “green” taxonomy is a step forward in terms of information availability and standardization, which should be complemented by a “brown” taxonomy. This sequential approach leads to the implementation of a climate macroprudential policy only once substantial informational improvements are obtained. The resulting delays in action are incompatible with the catastrophic irreversibility effects and tipping points against which the IPCC warns us. It reflects the inertia of the representations of the policy makers and the difficulty of making a paradigmatic break in risk assessment even though the urgency to act is recognized by all.

The alternative approach, which is the only one consistent with scientific knowledge on the catastrophic effects of global warming, would be to break with the sequential approach and to implement a climate macro-prudential policy simultaneously with the constitution of knowledge on the nature and dynamics of climate financial risks. While our knowledge is still limited, we know with certainty that the price of inaction in the short term will be the reinforcement of climate disasters. Even if our models are unable to precisely quantify the costs, we nevertheless know that these will be massive and not limited – potentially infinite – given the effects of the positive feedback loops that characterize the crossing of planetary limits. The simple recognition of the consensual scientific knowledge – carried by the IPCC (2014) – on the “material” effects of global warming, on the hysteresis bifurcations characterizing the tipping points and the irreversible changes in the climate system that they induce, even if our knowledge on the “conversion” of these into financial risks is very insufficient, should lead to the application of the precautionary principle.

4.2 Decision-making under radical uncertainty

Taking seriously the fact that we live in a world of radical uncertainty must lead to an equally radical transformation in the methods of economic and financial policy decision-making. In particular, the risk of catastrophic damage associated with a very low probability of occurrence – but with a considerable and irreversible impact – argues for a very ambitious transition to a low-carbon economy implemented as soon as possible (Weitzman, 2009). This recommendation, which is guided by the “generalized precautionary principle”, is hampered by the “tragedy of the horizons” (Carney, 2015) that paralyzes political decision-makers. In a world of radical uncertainty, the idea of a trade-off between more ecological damage and more growth becomes obsolete. It is this type of trade-off that motivates inaction in both climate policy and macroprudential policy. If we admit that by mobilizing data from the past, we cannot infer from current scientific knowledge the exposure to a potentially unlimited risk (the tail end of damage distribution), we must also recognize that no market mechanism can guide collective action. Consequently, collective action must be shaped by an ethical principle that integrates the well-being of future generations (Aglietta and Arrondel, 2019). When risk theory

is no longer able to guide the actions of governments, central banks and regulators, an approach based on “enlightened catastrophism” can take over. It must result in the implementation of a generalized precautionary principle in the structuring of public policies and thus of macroprudential policy. Jean Pierre Dupuy (2004) has clearly circumscribed the difficulty of this posture. To succeed in countering a disaster, one needs to believe in the possibility of its occurrence, but if this belief induces virtuous behaviors that prevent it, its non-fulfilment keeps the disaster in the realm of the impossible and neutralizes prevention efforts that appear to be useless in retrospect. This is the paradox of “enlightened catastrophism”, which bears a similarity to the figure of the murderous judge who murders criminals before they commit their crimes. In doing so, the crimes do not exist and therefore the motivation for action does not exist either.

The lack of reliable quantitative indicators to calibrate climate macroprudential policy should be compensated by more qualitative and analytical approaches. This does not contradict the need to improve transparency, quality and standardization of information in parallel. However, this information cannot be used to assess climate-related financial risks according to current risk assessment methodologies. Climate-related financial risks have a longer time horizon than traditional financial risks and cannot be inferred from past data. Non-linear and subject to tipping points, their materialization has irreversible consequences and their costs are potentially infinite (Lenton et al., 2008). The usual partition between the time dimension (procyclicality) and the cross-sectional dimension of systemic risk (common exposures and interconnections) is irrelevant for preventing climate-related systemic financial risks. More precisely, the issue of procyclicality is not relevant. We do not observe a carbon cycle that could be defined as a succession of periods of overfinancing of industries with high greenhouse gas (GHG) emissions and periods of contraction/correction of these drifts to which would correspond a cyclicality of GHG emissions. Carbon emissions have been steadily increasing and accelerating since the end of the Second World War due to “carbon lock-in” (Unruh, 2000). This “carbon lock-in” reflects the dependence on the path of Techno-Institutional Complexes based on fossil fuels. Conversely, the cross-sectional dimension of systemic risk must be central to the structuring of a “climate” macroprudential policy. This part of financial stability policy focuses on the interrelationships between different markets and between different financial institutions to account for common exposures, risk concentration, and credit relationships at a given point in time. Insofar as transition risk must be understood through cascades of failures due to the upstream and downstream interdependencies of the fossil fuel extraction and consumption industries, it is indeed the cross-sectional dimension of systemic risk that is relevant for structuring a “climate” macroprudential policy.

4.3 *Rethinking instruments*

The definition of a macro-prudential policy that takes into account the specificities of climate and pandemic risks requires the development of instruments that go beyond the restrictive conception of risk embedded in current prudential regulations and in particular the risk-weighted capital ratio. Various instruments can be mobilized (Dikau and Volz, 2019; D’Orazio and Popoyan, 2019; Schoenmaker and Van Tilburg, 2016).

A first track consists in acting on the regulatory capital ratio of banks as defined by Pillar I. Two options are possible: reducing capital constraints for “green” financing or increasing them for “brown” financing. The green supporting factor, which is favored by the banking industry, is inspired by the small and medium-sized enterprise (SME) supporting factor model. It would consist in reducing the capital requirements of banks for the “green” financing they provide by reducing the risk weightings in the calculation of the denominator of the capital ratio. In other words, projects considered as “green” would be financed with more leverage and therefore less capital. There are several objections to this arrangement. It has already been tested to favor credits to SMEs with very mixed results, particularly with regard to the desired effect of stimulating SME financing (Dietsch et al., 2016; European Banking Authority, 2016). Moreover, such a measure could alter the robustness of banks by increasing their leverage. The “brown penalizing factor” seems more consistent with the objective of sustainable finance. Indeed, on the one hand, this instrument reinforces capital requirements for the financing of activities that are very harmful to the climate and therefore encourages a reallocation of financial flows and, on the other hand, it reinforces the resilience of banks through higher capital requirements when the risk of stranded asset is higher (Dafermos et al., 2018). In both cases, the weightings could not be based on internal ratings, which are themselves directly derived from past data. Weightings can only be conventional and imposed by regulators to orient financial flows from brown to green. In reality, European regulations on banks' capital requirements already state that higher weightings may be applied in situations where the risk of loss cannot be precisely assessed even if its occurrence is certain (Capital Requirements Regulation, Article 128). It is for this reason that Finance Watch (Philipponnat et al., 2020) recommends a 150% weighting on existing fossil asset exposures. Furthermore, noting that new exposures to fossil fuels accelerate climate change and thus create a new systemic risk, it also advocates for a differentiation between old and new exposures, which is very penalizing for the latter, through an amendment to Article 501 of the regulation on bank capital. From a macroprudential perspective, the weighting should be chosen on a qualitative basis and set at 1250%, which amounts to financing new exposures entirely with equity capital.

A second option, which also integrates the non-measurable nature of climate-related financial risks, pleads for sectoral leverage ratios to supplement the brown penalizing factor by limiting excessive

debt on asset classes backed by carbon-intensive sectors (D’Orazio and Popoyan, 2019) and therefore presenting a greater stranding risk. Basel III introduces, within Pillar 1, a leverage ratio that requires banks to finance at least 3% of their assets, regardless of the associated risk, with equity. We believe that greater weight should be given to such a ratio within Pillar 1 with a sectoral differentiation integrating the differentiated risk of stranding. The leverage ratio is more transparent and easier to determine than the risk-weighted capital ratio and thus limits the risk of undercapitalization due to the adoption of opportunistic behaviors by banks (Mariathasan and Merrouche, 2014). Moreover, a constraining leverage ratio should, by definition, make it possible to limit the build-up of the excessive leverage that was at the heart of the crisis of the late 2000s. However, the banking industry systematically opposes the implementation of such a constraint, arguing that it would have a negative impact on the ability of banks to carry out their activities by increasing the cost of financing them. As Admati et al. (2013) show, however, this is a contestable argument. Gambacorta and Shin (2018) show that a 1 percentage point increase in the ratio of common equity to total assets leads to a 4 basis point decrease in the cost of debt. This result is corroborated by Durand and Le Quang (2020), who show that the ratio of common equity to total assets has a positive impact on banks' performance when measured by Return On Assets. Jordà et al. (2020) confirm the importance of high capitalization levels in the banking sector for the speed of recovery from major economic shocks. A pronounced increase in hard capital requirements would thus have a positive impact on banks' activity, particularly in the post-crisis period, and the sectoral differentiation of leverage could contribute to the reorientation of financial flows from “brown” to “green”.

Sectoral capital requirements (SCR) are already part of existing macroprudential instruments. By requiring additional capital to cover exposures to a given sector, they are designed to complement the countercyclical capital cushion. The objective is to improve the resilience of banks to excessive growth in debt in the targeted sector and to provide incentives for banks to reduce their exposure to that sector. These SCRs can take different forms, but in all cases the capital surcharge is expressed as a percentage of risk-weighted assets. As noted above, the specificity of climate financial risk makes this type of metric obsolete. Hence the idea that sector-specific additional capital requirements should not be risk-weighted, but should follow the logic of the leverage ratio. The effect of sectoral leverage ratios is quite similar to the maximum credit limits associated with credit guidance policies. The difference, however, is that they have an impact on the composition of liabilities (capital enhancement) and not only on the bank's assets. In addition to direct protection against the risk of stranding, to the extent that information on these sectoral leverage ratios would be public, they could be used by the banks' counterparties in assessing their resilience to climate-related financial risks.

Another option could be to define minimum floors and maximum credit limits and/or to pursue a

policy of credit guidance (Bezemer et al., 2018). This involves the reactivation/modernization of tools specific to the so-called “financial repression”. These could channel financing towards sectors considered to be priorities to the detriment of less sustainable sectors and from which banks would thus be forced to progressively withdraw. This type of instrument has the advantage of tackling an essential dimension of the finance-climate doom loop that is a blind spot of the work of central banks on climate financial risks. In fact, central banks and regulators, following Mark Carney's speech (2015), only address the issue from a risk perspective. In other words, they assess the risks that global warming poses to finance (Aglietta and Espagne, 2016) without questioning the risks that finance poses to the climate. After an in-depth examination of the key documents of the Central Banks and Supervisors Network for Greening the Financial System (NGFS), Kalinowski and Chenet (2020) indeed stress that these documents essentially concern the estimation of climate-related financial risk at the level of portfolios, financial institutions or the financial system as a whole (systemic risk). But little mention is made in the NGFS work of the financial system as a source of climate risk. This blind spot in the reflection and prudential proposals relating to the finance-climate doom carries the seeds, through a boomerang effect, of a massive increase in financial climate risks.

An instrument to restrict the concentration of exposures to the same type of counterparty could also be considered. This prudential instrument exists and aims to limit the maximum possible losses in the event of default by a counterparty or a group of counterparties with the same risk. It is an instrument that complements the risk-weighted capital ratio and helps to avoid an alteration in a bank's solvency as a result of the default of a large counterparty. This type of measure applied to high-carbon emitting sectors would be a protection against transition risk and therefore against highly correlated losses on brown sectors. From this perspective, banks' exposures to high-carbon sectors could not exceed a certain fraction of their core capital.

The activation of the systemic risk buffer (SRB) would also be a possible way of protecting against climate related financial risks. Defined in Article 133 of the capital requirement directive IV (CRD IV), the SRB “aims at preventing or mitigating systemic risks of a ‘long-term non-cyclical’ nature which could disrupt the financial system and have serious negative consequences on the real economy of a given Member State”. The SRB offers a great flexibility of use: its rate is not capped, it can be applied at differentiated rates to all or some of the supervised institutions, and it is not limited to domestic exposures only (Gabrieli and Jimborean, 2020). The European Systemic Risk Board (2017) recommends that the latter be used for “structural risks arising from the real economy and likely to affect the banking sector”, which appears to be the case for transition risk. Thus, it would be possible to use the SRB to gradually increase the capital of banks most exposed to transition risk in order to increase their resilience as transition becomes more pressing (Deyris, 2020).

5 Conclusion

The great financial crisis initiated a process of revision of the prudential corpus which led to the introduction of a number of regulatory innovations. However, these are in line with the previous regulatory corpus, no major break has occurred. The unconditional support given to the financial system, notably through unconventional monetary policies, has led to a postponement of the recognition that market logic alone cannot constitute the cornerstone of regulation guaranteeing financial stability. The revival of the theme of market value in recent years, whether through market discipline as defined by the prudential corpus or fair value as defined by accounting standards (IFRS and US GAAP), paradoxically illustrates a reinforced confidence in the proper functioning of the market, while the swelling of central banks' balance sheets testifies to its malfunctioning.

If the financial crisis was brought under control thanks to the unconditional support of public finances and central banks to the financial sector, it is precisely because it was caused by internal financial dysfunctions and excesses. The Covid 19 crisis and the climate crisis are, as such, of a completely different nature. Indeed, they have their origin in processes which are, by their very nature, external to the functioning of financial markets. There is therefore no need to attempt to establish a measure of the climatic and/or pandemic risk in their reference frame. On the contrary, it is advisable to become aware of the specificity of financial risk within a global environment whose complexity largely outflanks any probabilistic measure.

As such, we must learn the lesson of the Covid 19 crisis, which seems in many ways to prefigure what the climate crisis will impose. The main lesson is the need for a re-embedding of finance in socio-economic realities. In the emergency, the prevalence of socio-economic realities has resulted in a clumsy but revealing rhetoric around the definition of activities deemed “essential”. Ideally, this re-embedding in reality could take the form, more profound and structuring, of a harmonious inclusion of economic and financial activities within planetary boundaries (Rockström et al., 2009). This requires a redefinition of the role of banks and finance. Indeed, if global warming induces systemic financial risks and, in return, if finance does not massively reallocate financial flows from sectors harmful to the climate to sectors that promote ecological reconversion, it feeds global warming and thus amplifies the financial risks associated with it. The recognition of this perverse loop must guide the structural reforms to be undertaken in the long term in order to completely put financial processes back at the service of real activities while respecting planetary limits. In the shorter term, macro-prudential regulation has a definite role to play. To this end, there are many options, as shown by the diversity of instruments presented in the last section, but all are based on the same principle: a definition of risk that goes beyond financial risk. This is perhaps the most immediate challenge facing macro-prudential policy, namely to define risk in a way that is commensurate with the problems it

faces.

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