Are Loans to Carbon Intensive Firms the New Subprime?

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Through the Network for Greening the Financial System (NGFS), the international regulatory community has developed a series of template scenarios that incorporate both transition and physical risks. These scenarios are being used by regulators and financial institutions worldwide to assess climate-related risks. One scenario specifies a "hothouse world" where temperatures rise significantly, resulting in severe physical risk events. Another scenario outlines a disorderly transition to a low-greenhouse-gas economy. There is an increasing focus in the disorderly transition scenario because the stresses in financial and economic variables occur over a relatively short time horizon, resulting in a less challenging exercise and lower uncertainty in the projections.

Although the NGFS provides standardized climate scenarios, regulators have started to make their own adjustments to those scenarios and there is a concern that banking regulators may be tempted to make those scenarios more severe in somewhat arbitrary ways. For instance, the "late action" scenario in the Bank of England's Climate Biennial Exploratory Scenario (CBES) assumes the U.S. would experience a recession as severe as the 2007–2009 global financial crisis as a result of a sudden and disorderly change in environmental policies. This is a sharp contrast to the NGFS's disorderly transition scenario that projects a much more modest decline in economic growth as the U.S. transitions towards a low-carbon economy despite high emitting industries being significantly affected.

In this post, we look at some of the macroeconomic outcomes included in the Bank of England's disorderly transition scenario and describe some of the channels that could lead to such outcomes. Our main takeaway is that it is highly unlikely that changes in environmental policies would result in a six-percentage point increase in the unemployment rate over the course of two years. Although an abrupt increase in carbon prices could depress economic growth, the increase in investment directed toward green projects and spending of revenues generated by higher carbon prices by the government, will boost aggregate demand and offset some of the negative effects. In addition, as demonstrated by a series of stress test results, the banking sector is extremely well capitalized and can sustain higher credit losses and continue to lend to creditworthy borrowers under a disorderly transition.

Overall, we conclude that more research is needed to evaluate how disorderly transition risk may impact the macroeconomy. It is important to quantify the impact of changes in environmental policies on economic outcomes to avoid giving the impression that the severity of climate transition scenarios is overstated in order to increase the size of climate-related credit losses. Also, the level of transparency that we already see in the discussion of economic models of global warming needs to be extended to the macroeconomic models used to generate the paths of the macroeconomic and financial variables typically included in climate scenarios.

CLIMATE SCENARIO ANALYSIS

Scenario analysis is a forward-looking tool to help banks and regulators understand climate-related financial risks at the firm level as well as for the entire financial system. According to the recent FSOC Report on Climate-Related Financial Risk, scenario analysis is the leading approach to assess climate-related financial risks to inform banks in their strategic and business decisions and to measure alignment to a low-carbon pathway. Scenario analysis is also being used by regulators to assess the financial stability risks to the macroeconomy posed by climate change. Recent exercises undertaken by or underway at the Bank of England, the European Central Bank, and the Autorité de Contrôle Prudentiel et de Résolution (ACPR, the French Prudential Supervision and Resolution Authority) have all used scenario analysis to assess these different aspects of climate-related financial risk.

Any scenario analysis starts with identifying relevant scenarios to be used. The scenarios need to capture the complex synergy between and among climate policy, energy systems, and global warming and consider a range of possible future climate pathways and associated macroeconomic and financial developments. For example, a scenario would include pathways associated with current or planned policies and expectations for the development of abatement technologies that eliminate the effects of carbon. Constructing climate scenarios for scenario analysis is challenging. It requires the construction of many climate and economic variables and involves a broad set of economic tools: economic models of global warming (or integrated assessment models), computable dynamic general equilibrium models, input-output analyses, and reduced-form damage functions linking weather to economic outcomes.

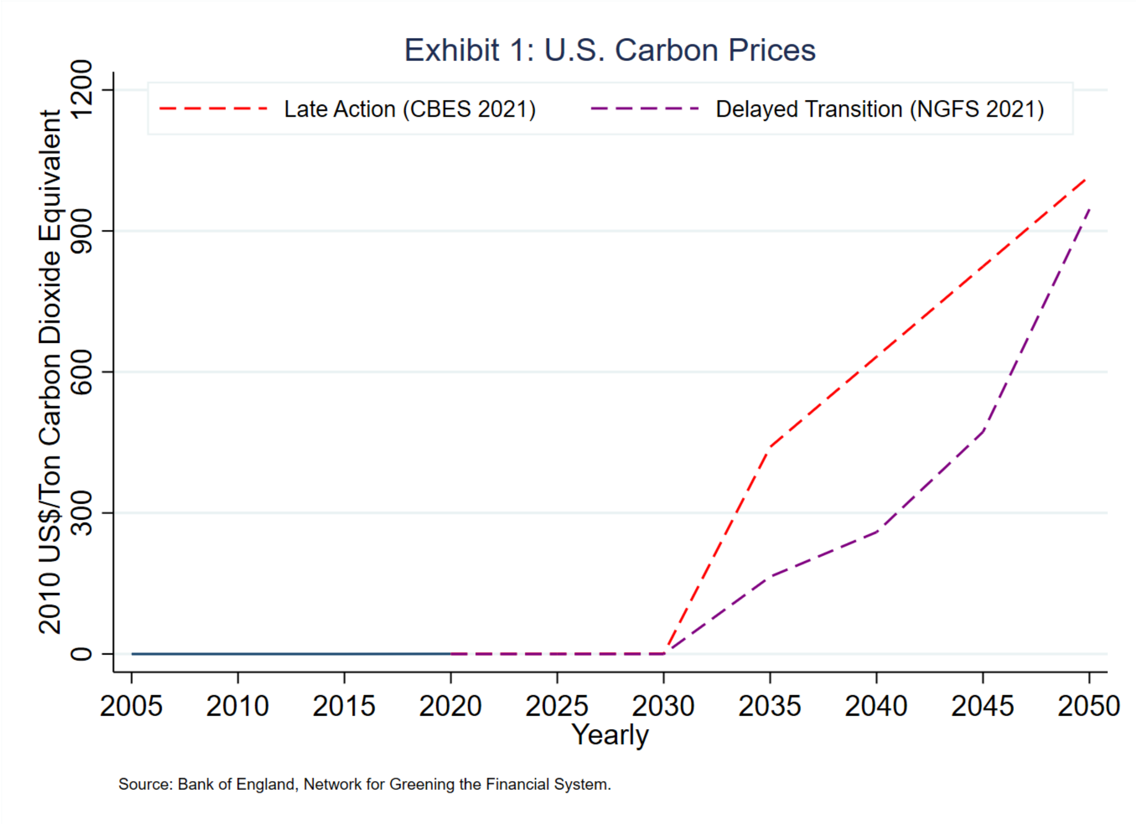
Scenario analysis focuses on transition risks, physical risks (acute and/or chronic), or a combination of both sets of risks occurring simultaneously. Transition risks materialize as economies transition to a low-GHG emission regime. These risks may arise from a change in economic policies, adoption of new technologies, disruptions in supply chains, and a shift in consumer preferences to low-carbon products. Transition risks will also bring banks opportunities as the economy shifts to alternative forms of energy. Transition risks will have an impact on inflation, relative prices, demand for energy, and the competitiveness of firms and their profitability, as well as on government tax revenues through carbon prices. An important feature of transition risk scenarios is whether the adjustment to a low-carbon regime is done gradually or if it occurs in a sudden, disorderly fashion. As discussed in greater detail below, some of the disorderly transition scenarios feature a severe recession because of large changes in the market values of assets and liabilities of entities exposed to transition risk. Physical risks can be defined as those risks that arise from increases in the frequency and severity of extreme weather events such as hurricanes, wildfires, droughts, heavy precipitation, and the like. These risks are also known as acute physical risks. The increase in the global temperature also causes more chronic events like sea-level rise. Physical risks tend to mostly affect the productive capacity of an economy and could increase losses on bank loans through the reduction of collateral values.

To some extent scenario analysis is like prudential stress tests: It includes multiple scenarios and uses data and models to translate those scenarios into outcomes. However, there are two important differences that distinguish scenario analysis from stress tests. First, scenario analysis is exploratory in nature and does not have direct regulatory implications like the stress tests directly linked to capital requirements. Second, the economic changes associated with meeting climate goals will occur over several decades. Therefore, scenario analysis needs to cover long time horizons. However, near- or medium-term scenarios help us understand the possibility of a disorderly adjustment in financial markets.

MACROECONOMIC OUTCOMES IN A DISORDERLY TRANSITION SCENARIO

In this post, we analyze the disorderly transition scenario, because the severity occurs over a relatively short time horizon and is instructive as to how sudden changes in environmental policies might impact banks' current balance sheets (to note, these scenarios use a static balance sheet similar to what would be done in a traditional stress test). The main distinguishing feature of the disorderly transition scenario (also referred as "late action") is that it includes an abrupt increase in carbon prices when climate policies are introduced.

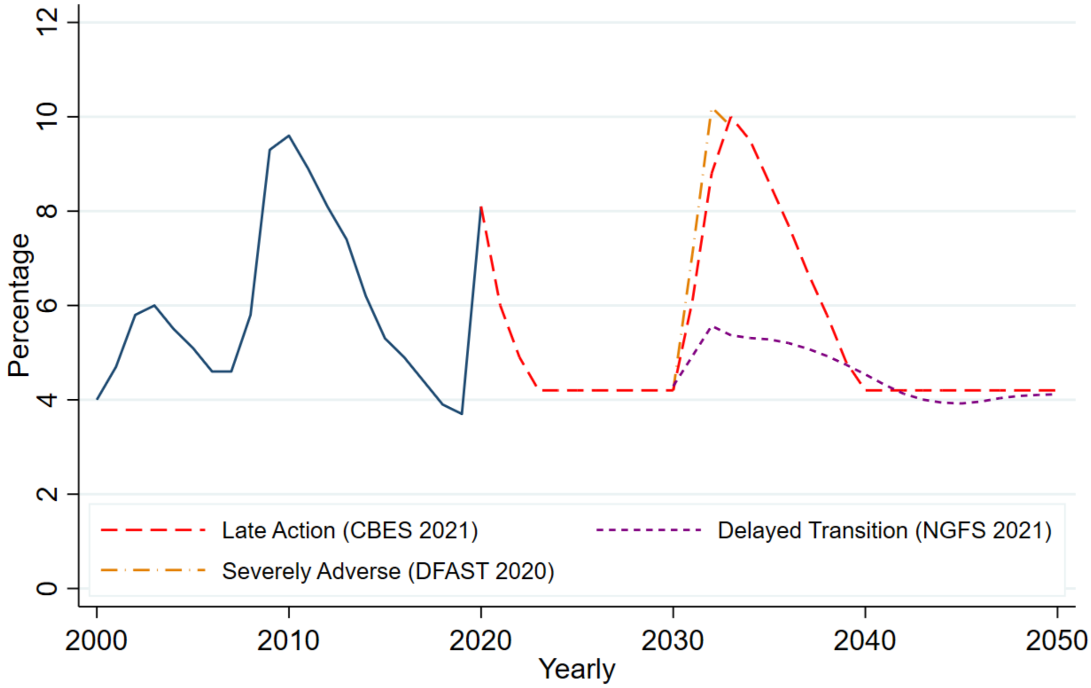
Exhibit 1 shows the path of U.S. carbon prices in the CBES 2021 late action scenario (red line) and in the delayed transition NGFS 2021 scenario (purple line). Carbon prices are zero before 2030 in both scenarios. After that, carbon prices increase to $440 per ton in 2035 and $1,016 per ton by 2050 in CBES 2021. The increase in carbon prices in the NGFS 2021 scenario is less abrupt when initially compared with CBES's late action scenario, but it approaches $1,000 per ton by 2050.



Environmental policies can alleviate some of the negative impacts of global warming. The increase in carbon prices in the climate scenario analysis is a simplification of those policies. In addition, increases in carbon prices could also lead to a loss in value of carbon-intensive investment and result in large declines in asset prices. It is also routinely assumed that revenues collected via environmental policies can be rebated back to the economy through lower income taxes, subsidies on clean energy, or an increase in government spending.

After the specification of climate policies, temperature, and carbon prices are established in the scenarios it is necessary to map the impact of such scenarios (e.g., an abrupt increase in carbon prices) to broader macroeconomic aggregates and financial variables. The NGFS uses a multi-region macroeconomic model (NiGEM, the National Institute Global Econometric Model) to generate the path of the unemployment rate, GDP, inflation, various asset prices, and interest rates. The model also includes a government and a monetary authority for each region to model their endogenous responses to changes in climate policies, macroeconomic aggregates, and inflation. In practice, jurisdictions can use their own macroeconomic models to generate internally consistent macroeconomic and financial variables.

Exhibit 2: U.S. Unemployment Rate Paths in Disorderly Transition Scenario



Source: Federal Reserve Board, Bank of England, Network for Greening the Financial System.

Exhibit 2 shows the path of the U.S. unemployment rate across two disorderly transition scenarios. In the CBES scenario, the unemployment rate climbs to a peak of 10 percent in 2033. According to CBES (2021), the sharp climb in the unemployment rate reflects the need for a rapid sectoral adjustment affecting the labor market. This leads to large declines in asset prices in some sectors, with knock-on consequences for demand and spending, and a rise in risk premia on many assets.

Notably, the increase in the unemployment rate in CBES is considerably higher relative to the path assumed in the NGFS delayed transition scenario. In the NGFS scenario, the unemployment rate increases from 4.2 percent to 5.5 percent. The rise in the unemployment rate in the CBES scenario is also accompanied by significant drops in commercial real estate and house prices, as shown in Exhibit 3. U.S. CRE prices are projected to decline 28 percent between 2030 and 2032, while house prices decrease 25 percent through the end of 2033. The NGFS does not present a scenario for CRE prices, and house prices show modest declines in the delayed transition scenario.

Exhibit 3: Key Asset Price Variables in Disorderly Transition Scenario (2020 = 100)

Source: Federal Reserve Board, Bank of England.

Based on the results of a recent NGFS report, the Bank of England adjusted the NiGEM outputs to simulate the impact of larger financial market shocks and incorporated labor frictions that would result from a reallocation of labor toward low-carbon sectors. The adjustments performed by the Bank of England effectively increased the severity of the late action scenario. Whether or not by coincidence, the severity of the effect on unemployment rates, house prices, and CRE prices is quite similar to what we saw during the 2007–2009 global financial crisis. The level of stress is also in line with the Federal Reserve's severely adverse scenario in DFAST 2020 (yellow lines in Exhibits and 3).

Quantifying the impact of a sharp increase in carbon prices on employment, GDP growth, and asset prices is important to validate the assumptions embedded in disorderly transition-type scenarios being developed by the various authorities. Some empirical studies have been done on the economic impact of carbon taxes. Sweden has the highest carbon tax in the world, at around $130 per ton. Metcalf and Stock (2020) showed that moderate increases in carbon taxes have a zero to modest *positive* impact on employment and GDP. These results underscore the need to specify carefully how disorderly changes in the environmental policies would result in a very large decline in economic activity considering the existing empirical evidence showing the opposite result, albeit under normal conditions.

The models used by the NGFS to construct the climate scenarios assume frictionless labor *and* financial markets. Those assumptions are not ideal when trying to simulate the response of employment, GDP growth, and asset prices to an abrupt rise in carbon prices. However, as we argue in the next two paragraphs, including labor and financial market frictions such as those in the CBES in a model of the U.S. economy is unlikely to result in the large amplification and propagation mechanisms that would account for the differences between the macroeconomic variables in the NGFS and CBES.

Although most macroeconomic models assume that the formation and breakdown of employment relationships occur instantaneously, that is often not what actually happens. For this reason, labor market frictions can be an important source for the amplification and propagation of shocks. It takes time for unemployed workers to find new jobs, and employers incur search costs to find suitable employees. These search-matching frictions can amplify and propagate the impact of an abrupt increase in carbon prices on employment and economic growth. This shock would lead to a breakdown of many employment relationships, meaning it would take some time to reallocate labor to different sectors in the economy. However, the inefficiencies in job search can be ameliorated with programs that reduce information frictions between workers and firms. For this reason, the quantitative effects of labor market frictions in advanced economies are typically small.

As was evident during the 2007–2009 global financial crisis, financial market frictions can play an important role in the amplification and propagation of shocks. For example, an abrupt increase in carbon prices leads to a decrease in demand for carbon-intensive products and a rise in defaults by the firms that produce those goods. Those defaults would lead to bank losses. If the banking sector is not sufficiently capitalized, the increase in loan losses would force banks to reduce lending to all firms, not just those in high-GHG sectors. The reduction in lending would amplify the impact of the carbon price shock and reduce further economic activity. However, this is unlikely to happen in an economy like that of the United States. The capital requirements of U.S. banks are derived from stress tests that require banks to continue to lend to creditworthy borrowers under stressful economic conditions. Therefore, adding financial frictions to standard macroeconomic models and calibrating those models to the U.S. banking sector would likely result in a modest amplification of the carbon price shock.

CONCLUSION

In the medium term, an emerging threat of climate change to the banking sector is coming from a disorderly transition scenario. Therefore, more research is needed on the effect of abrupt increases in carbon prices on macroeconomic outcomes. Differences between the NGFS and the Bank of England's paths of macroeconomic variables in the disorderly transition/late action scenarios underscore the need to better understand the role of financial and labor market imperfections in those macroeconomic models.

Above all, the various authorities must foster more transparency about how a disorderly/late action scenario would affect the world's economy. One possibility would be for jurisdictions to publish the models and the calibrations used to simulate the macroeconomic and financial variables, analogous to what is already being done with economic models of global warming.
