Is it too late to address climate change?

No, but the risk is exploding.

By Bob Litterman

I spent the better part of my career assessing risk for major financial institutions and often used mathematical modeling to understand potential outcomes. More recently I have applied the same risk assessment methodology to ask how serious is climate change, and I find that the rate at which climate change risk is growing is startling.

And, of course, I am not alone. For example, the IPCC recently released a report calling for emissions reductions of a scale requiring unprecedented systems change. In other words, according to a global scientific consensus, it is time to slam on the brakes.

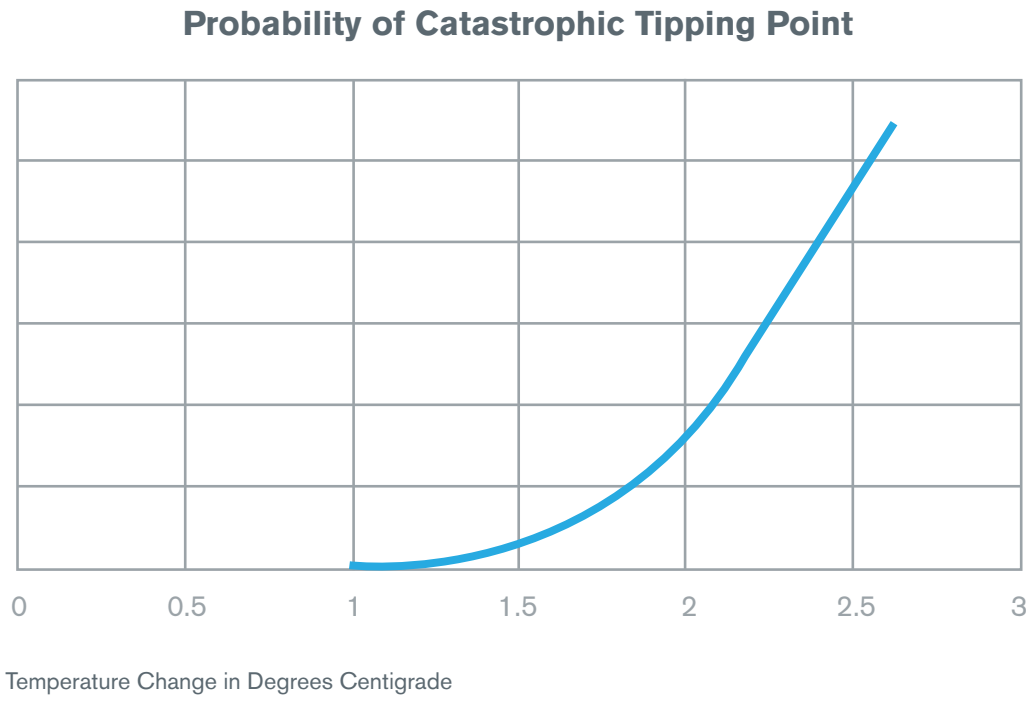
The reason it is time to slam on the brakes now is that the risk created by not doing so is exploding.

What it means to slam on the brakes in the context of climate change is that it is time to create appropriate, which is to say very strong, incentives to reduce greenhouse gas emissions and to suck carbon dioxide out of the atmosphere. The solution to this problem is incredibly straightforward.

Today the incentives to reduce emissions embedded in tax codes are backwards. Globally governments heavily subsidize the production and consumption of fossil fuels which create emissions of carbon dioxide that pollute the atmosphere. Those subsidies dwarf the meager incentives that support the production of sustainable sources of energy such as wind, solar, hydro, geothermal, and nuclear.

The fossil fuel emissions create risk that the planet crosses a tipping point at which some unforeseen chain of events leads to a positive feedback that gets out of control. Imagine a worst-case scenario, and how the risk of such an event increases over time if we don't slam on the brakes.

Start with measuring risk. We do that by imagining the distribution of an event.

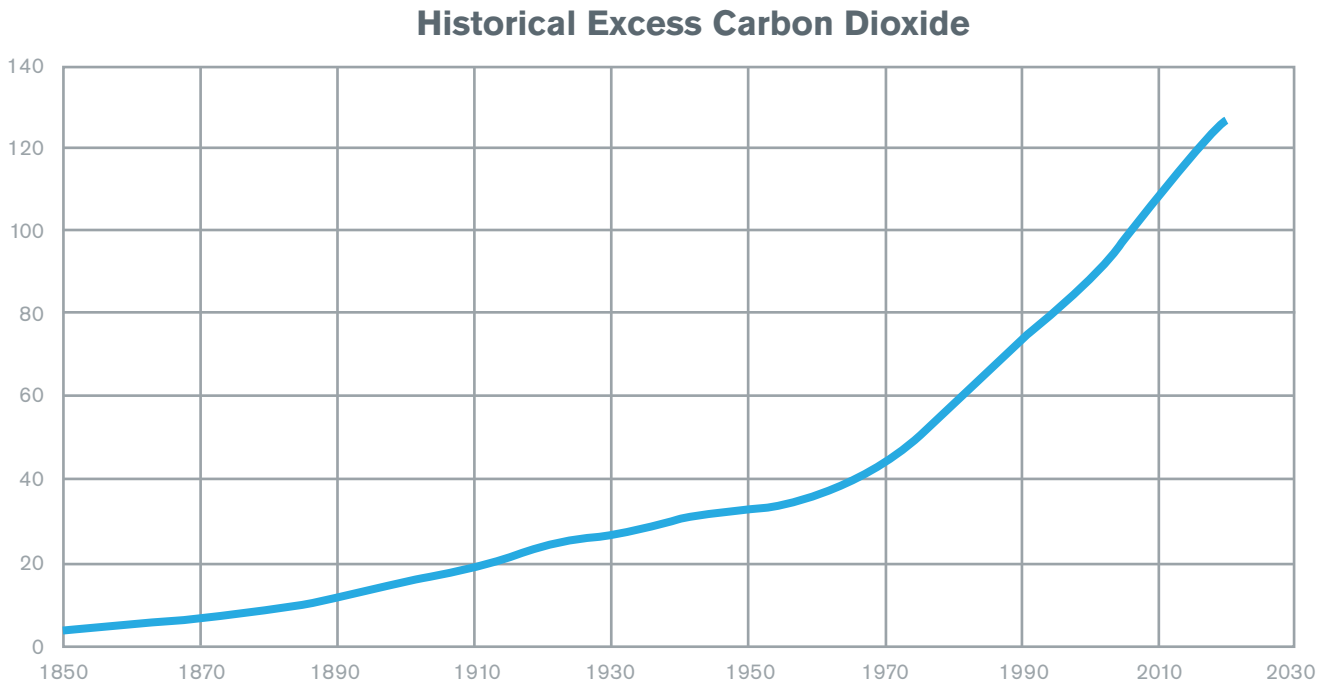


continued . . .

We don't put any units on the graph because no one knows how the risk of a disaster increases with temperature. In our imagination we can do an experiment: over and over we slowly heat up the planet and record what the temperature is when there is a catastrophic impact. How often that happens at different temperatures is a probability distribution. Scientists have suggested that a world in which temperature change is below 2 degrees is probably safe. One might thus expect that the area under the curve below 2 degrees is quite small. The fact that we have only a vague idea what this distribution looks like, however, is itself a source of additional risk.

Next you have to think about how emissions impact warming through the increasing concentration of carbon dioxide in the atmosphere. The excess of carbon dioxide concentration measured in parts per million, relative to the historical level of 280, more or less determines the rate of warming at each point in time.

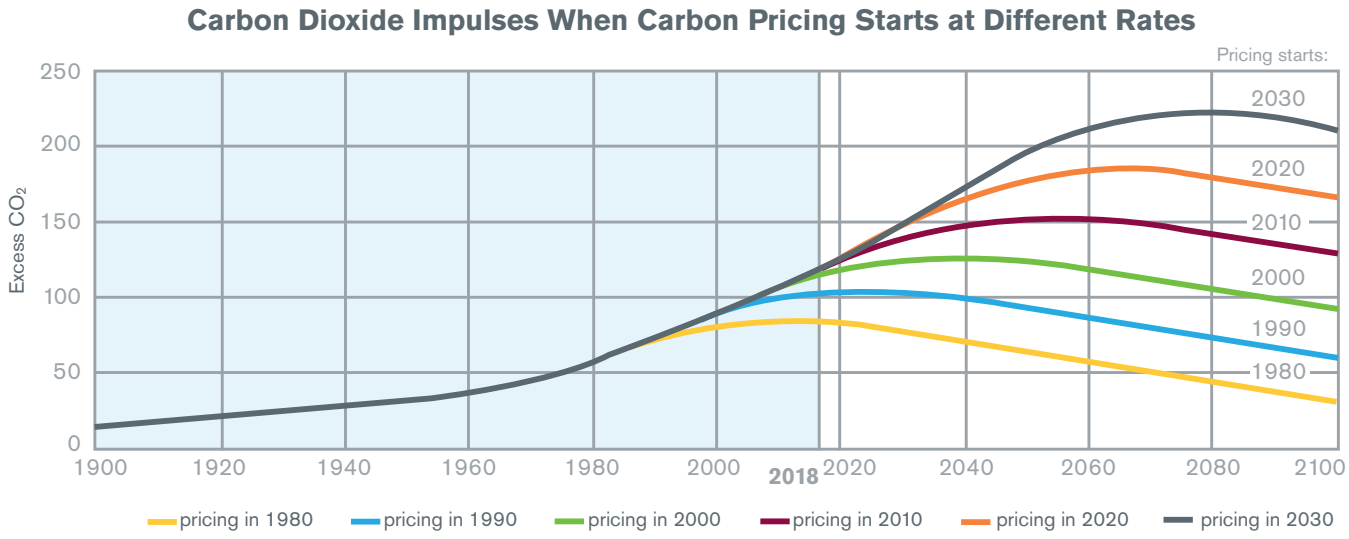
Thus, the total warming experienced by the planet is the area under a Keeling curve of historical concentrations of carbon dioxide, only shifted downward, which is shown here.



Now consider what would happen if humanity were to slam on the brakes at different points in time. The best case we can hope for is that as soon as appropriate incentives are put in place the global economy has a phase change, all economic actors without even knowing why, but facing the new incentives, make appropriate decisions to reduce emissions and to suck carbon dioxide out of the atmosphere. Even then, as illustrated below, it will take decades to reduce emissions to net zero.

continued . . .

The result in terms of excess carbon dioxide in the atmosphere looks something like this:

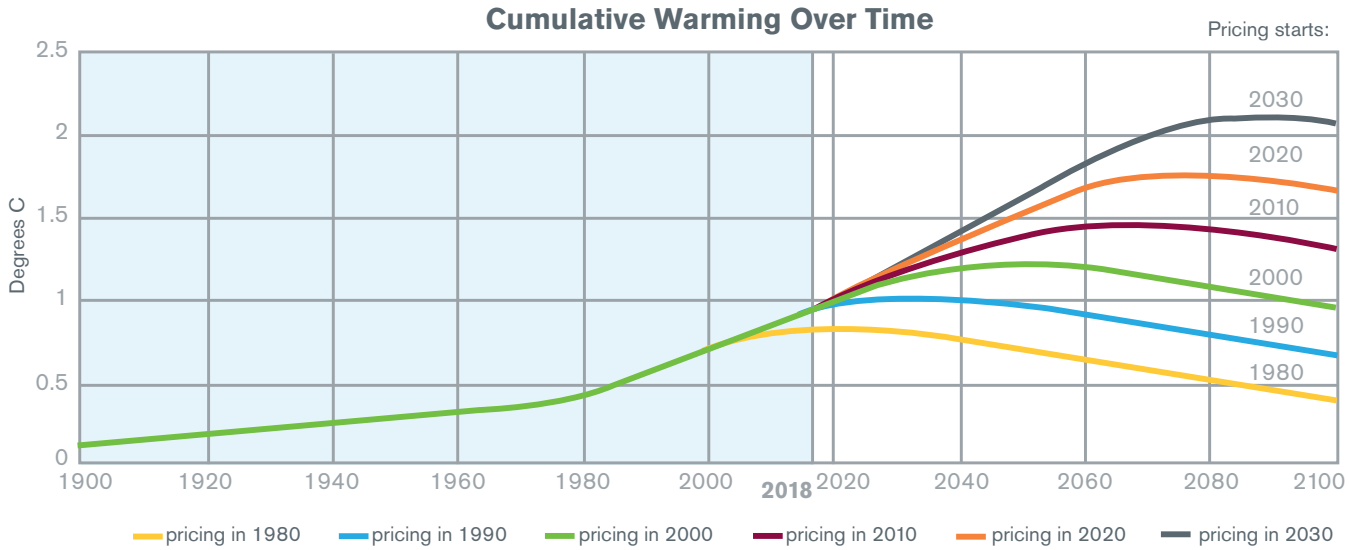


Sadly it is too late to start pricing in 1980 or even in 2000, we can only imagine a world facing the scenarios in yellow or green, when the size of the warming impulse would have been much smaller. The best we can do now is to slam on the brakes immediately and approximate the orange curve. If we wait another ten years the outcome moves to the grey curve.

Next consider the implication of these different scenarios for global temperature in the future. The ultimate impact on temperature is complex because of inherent lags in how the earth system responds, but it takes around a decade after emissions hit net zero before the planet reaches a new equilibrium and the temperature stabilizes.

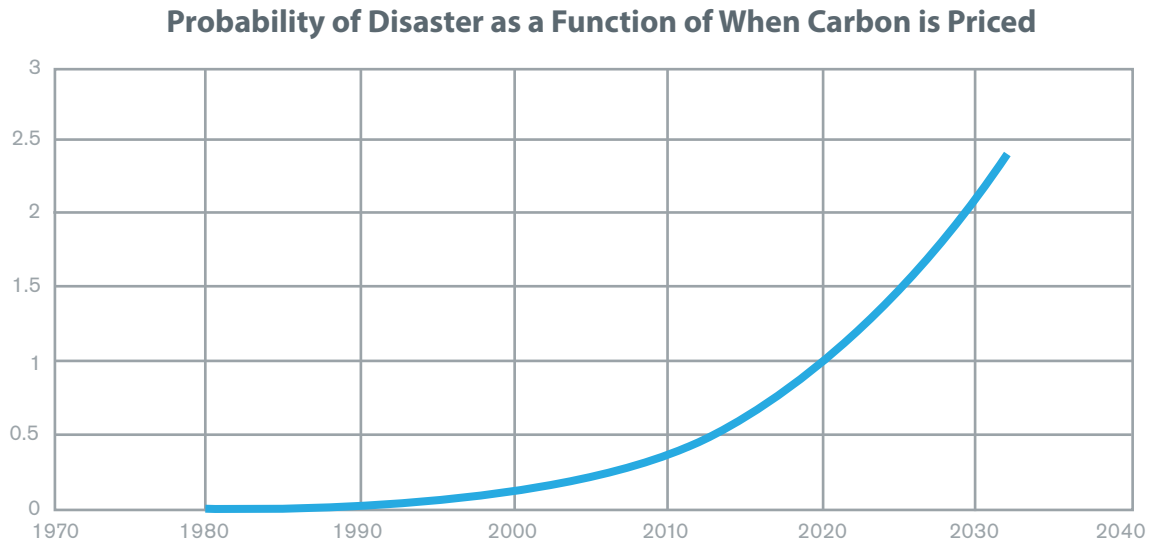
Pricing carbon in 1980, shown as the yellow curve, could have led to a temperature stabilizing now and implied a maximum warming of less than what we have experienced to date.

Instead, the lack of pricing to date means that as of today the world is most likely destined to experience well over 1.5 degrees of warming and if we don't act soon more than 2 degrees.



continued . . .

Finally, consider what happens if we map these implications for temperature change into the first graph of how the probability of a disaster rises with temperature change. This mapping then tells us how the probability of a catastrophe varies as a function of when we slam on the brakes through a strong carbon price:



No one knows what the probability of a climate change driven disaster is, which is why there are no units on this graph. What we can say with some confidence is that the risk of a disaster will grow rapidly between now and 2030 if we don't slam on the brakes. We can also say with confidence that had we done so as recently as 2001, when John McCain and Joe Lieberman introduced their climate legislation, the maximum temperature would have been well below 1.5 degrees and the problem would be only a small fraction of what is today.

There is a clear message here: It is not too late, but it is long past time when we should have slammed on the brakes. There is no excuse for delay now.

Bob Litterman is a founding partner of Kepos Capital and Chairman of the Risk Committee. He previously headed risk management for Goldman, Sachs & Co. and is the co-developer of the Black-Litterman Global Asset Allocation Model. He is also a member of the board of ASU's Julie Ann Wrigley Global Institute of Sustainability.