April 2022

Back from the Future:
Reverse Engineering a Recession

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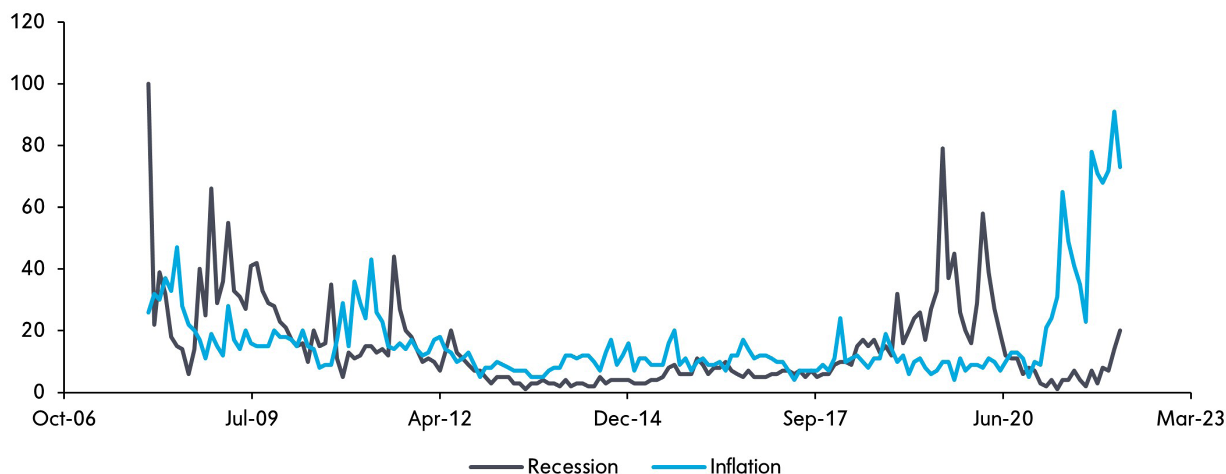
Federal Reserve (Fed) Chair Jay Powell offered at his most recent press conference that "...the probability of a recession within the next year is not particularly elevated."[1] Pardon us if we demur. His reassurance has not gotten much traction with other members of the public, in that Google news searches on the topic have shot up (as in the chart). The subject, however, has yet to resonate as strongly as the chair's other problem, inflation, which scores much higher as a topic of interest. Still, both are up to levels last seen when both were policy concerns.

Of course, central banks and other official institutions never predict recessions, in part on the fear of feeding a self-fulfilling prophecy by cratering confidence and, in part because recessions are nonlinear events that push an economy out of the groove of incremental changes that underpin most forecasts.[2] Something breaks, and then we learn that some sector or the other was not as resilient as previously thought. Add in the usual slowness of policymakers to respond to outcomes outside the norm and output contracts for a few quarters. In the event that aggregate data catch up to some people's lifestyles, the results may be pockets of distress and permanent scarring.

News Search Interest in "Inflation" and "Recession"

Peak interest equals 100



Source: Google Trends. Accessed March 22, 2022.

What are the odds of such a break in the near future?

Considering a scenario outside the perimeter of usual forecasts can sometimes be done most effectively by looking at the problem from an oblique angle. Actually, backwards. This note works through a reverse-engineering exercise by assuming the answer to the questions is yes—the US economy is in recession by the end of this year—and examines all possible chains of events that arrive there. If each node of the decision tree leading to recession seems improbable, we would be reassured that the assumed event is unlikely. Unfortunately, that is not the case, which is why we put the probability of recession in the next 1-½ years in the US at three out of eight.

The rest of this note:

- Runs through the outlook briefly and examines a few traditional indicators of recession;
- Spells out the advantages of backward induction to study the issue—that is, reverse engineering;

- Draws the decision tree backward from the assumed calamitous future event to today; and,
- Offers some concluding comments about asset choice.

Along the way, the note will also offer observations on the risks surrounding some of the key trading partners of the US.

The Outlook in Brief

In our view, the foundation of the US expansion is shaky. The coronavirus is not behind us, as reflected in the lingering hesitancy of some people to return to the workforce and to engage in person-to-person market activity. The former is putting upward pressure on wages in a market where job vacancies outpace the unemployed by a 1-¾-to-1 margin.[3] The latter poses an ongoing drain on the service sector, which historically represents two-thirds of economic activity. While the federal budget remains large and supports the level of aggregate demand, it is shrinking, implying a net drag on the growth of demand this year absent legislative action.[4] We believe the absence is almost assured with a midterm Congressional election looming. The federal government and the household sector piled on considerable debt during the Pandemic Depression and its aftermath, and debt relief for the latter mostly took the form of forbearance, not forgiveness, which will strain balance sheets as interest rates rise and relief programs roll off.

The Russian invasion of Ukraine worsens a difficult situation by further impeding global supply chains and withdrawing key commodities from the market, adding to cost pressures and elevating uncertainty and risk aversion. These additional cost pressures will push inflation further above the Fed's goal, a pre-existing problem that officials have belatedly recognized with their recent pivot to firming. While Fed officials assert that the economy is robust enough to weather the removal of accommodation, those plans are predicated on an optimistic reversal of inflation as additional supply fills in as firms work around trade-chain disruptions and as people become more at ease with the pandemic. In our view, the more likely event is that these do not fully eventuate, and more abrupt rate hikes will be needed to quell inflation. Even in the Fed's hopeful case, the plane that is the US economy will be flying slower and closer to the ground. That is, it will be more vulnerable to shocks, including pilot error.

Shocks abound beyond a too-abrupt turn toward tightening by the Fed, including a broadening of the Russian-Ukrainian war, a sharp correction in financial prices worsened by adverse market dynamics, and an outbreak of inflation jitters. The path of the coronavirus, of course, remains as a wild card in the outlook even if the Fed downplayed its role in the most recent statement of the Federal Open Market Committee (FOMC). The length and seriousness of this list leads to a rethinking of recession risks.

When it comes to recession calls, analysts often rely on single-bullet explanations. The charts on the following page offers four such indicators, or popular predicators of recession, that individually have predictive power for business-cycle turning points.[5]

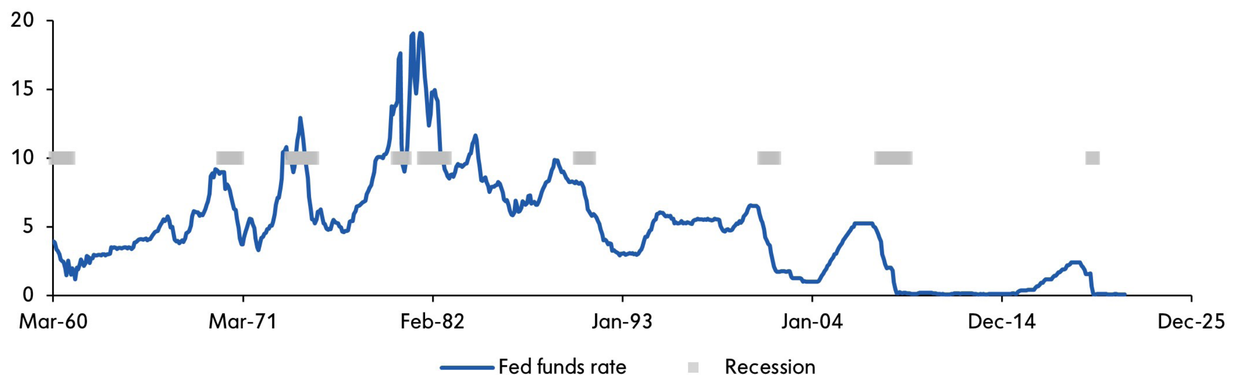
Popular Predictors of Recession

Chart 1 cuts to a policy explanation: Economic expansions do not die of old age, but rather the Fed kills them. In the figure, the eight distinct post-1961 recessions were preceded by or coincident with a spell of Fed tightening. Indeed, only one hiking regime was not associated with a downturn, when the Fed of Alan Greenspan tightened

preemptively in 1994 and 1995. This episode ranks highly in the Fed canon, as it showed that a soft landing was achievable and, marking the birth of FOMC announcements, openness was in order. What is less remembered is the unevenness of the upward ascent of the policy rate. The Fed moved in increments of one-quarter, one-half, and three-quarters percentage points and even tossed an intermeeting move into the mix. The result was favorable for the macro economy, but the volatility of financial prices was quite elevated. But that 1994-95 was the sole exception is enough evidence for some to argue that monetary policymakers cannot reliably tap on the brakes in removing accommodation. The attendant tightening of financial conditions, hit to confidence, and the accumulated imbalances triggering the Fed to move all conspire to produce a recession.[6]

1. Federal Funds Rate

Percent

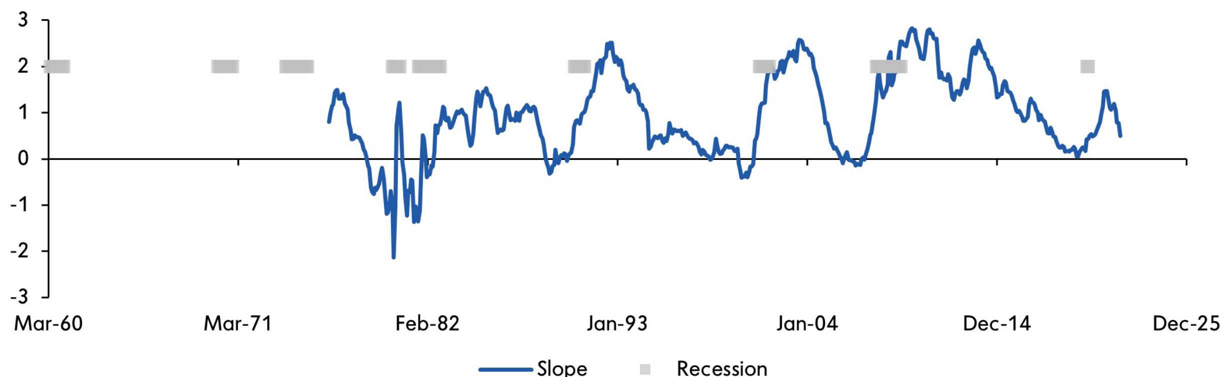


Source: National Bureau of Economic Research, Bureau of Economic Analysis and Federal Reserve. Firm analysis. Accessed March 21, 2022 via Federal Reserve Economic Data (FRED).

Chart 2 plots the slope of the Treasury yield curve, or the percentage point difference between the ten-year and two-year yields.[7] This pattern may be part causal and part predictive. By the expectations approach to the term structure, the ten-year yield embodies the discounted expected path of the short-term interest rate plus a premium for bearing risk. The causal part is the same as in the first panel, in that when the Fed raises the short rate for a spell above its longer-term level to impart restraint, the two-year yield, which is more heavily influenced by the near-term outlook, rises relative to the ten-year yield, which has much more of its weight on the medium-to-longer term. The predictive part is that investors might see recession coming and anticipate a Fed course correction to easing, with more of those lower future rates priced into the longer- as opposed to shorter-duration asset.

2. Ten-Less Two-Year Treasury yield

Percentage points



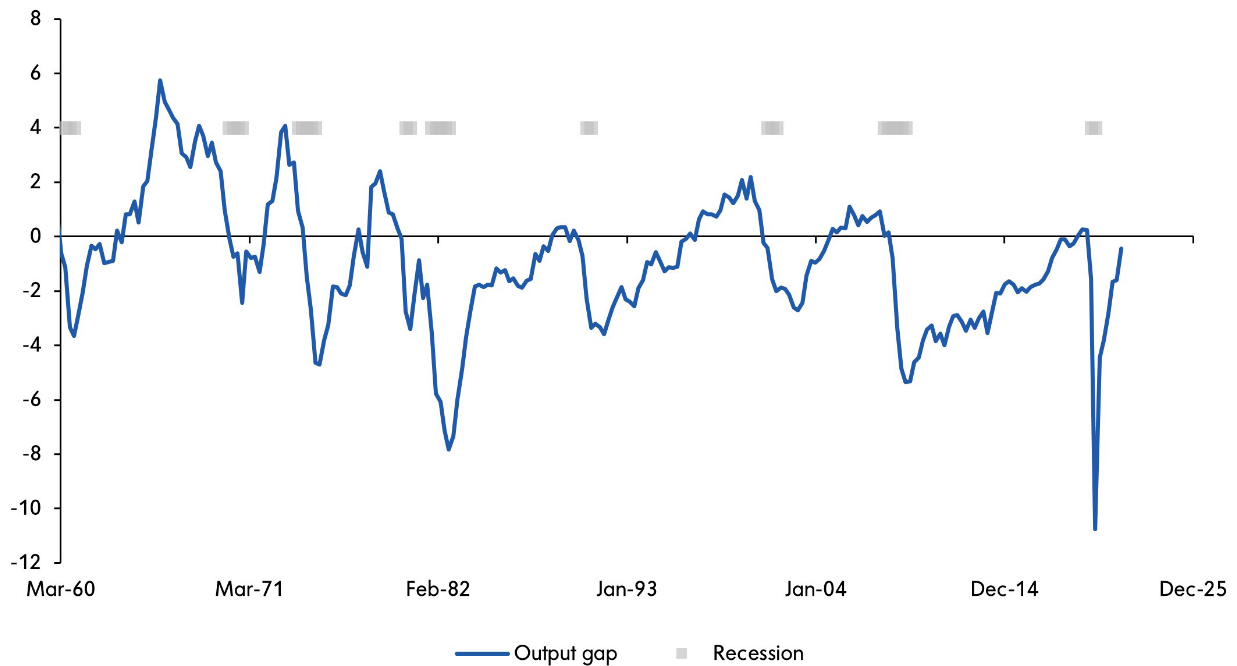
Source: National Bureau of Economic Research, Bureau of Economic Analysis and Federal Reserve. Firm analysis. Accessed March 21, 2022 via FRED.

PAST PERFORMANCE IS NOT NECESSARILY INDICATIVE OF FUTURE RESULTS.

Chart 3 explores the reason behind Fed action and the possibility that the economy builds up imbalances as the expansion ages. The line plots an estimate of the output gap, or real GDP relative to the Congressional Budget Office's assessment of its efficient maximum (at full employment). The gap of actual to potential output holds some sway in the turning-point conversation because recessions are often coincident with the US economy moving into the territory of excess demand. Trees do not grow to the sky, so when output nears or surpasses its potential level, the Fed steps up to rein in demand (back to Chart 1), and economic excesses make the system less resilient.

3. GDP Relative to Potential

Percent

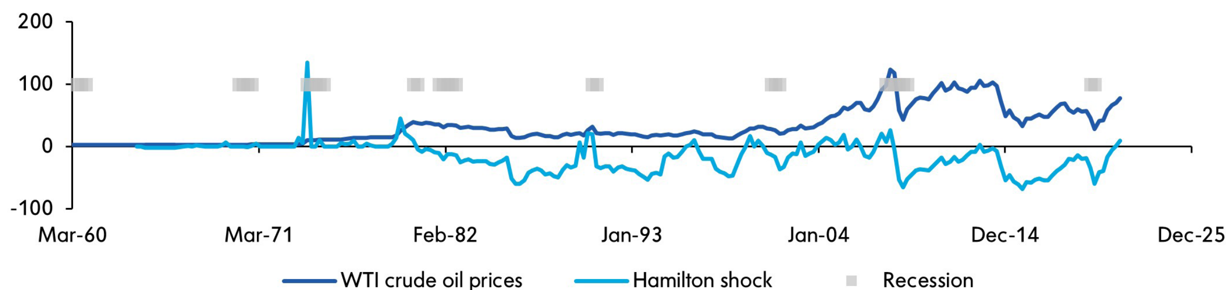


Source: National Bureau of Economic Research, Bureau of Economic Analysis and Federal Reserve. Firm analysis. Accessed March 21, 2022 via FRED.

Chart 4, on the following page, posits an entirely causal mechanism, often associated with James Hamilton of the University of California San Diego.[8] Sudden and sharp increases in oil prices (shown by the dark blue line) pose shocks to aggregate supply, by adding to costs, and aggregate demand, by reducing purchasing power on discretionary items, rendering some of the existing capital stock outmoded and transferring income to foreign producers (for much of this period when the US was a net importer of oil). Hamilton's work suggests that the effect is nonlinear—that spikes relative to previously prevailing levels matter, not smaller quarter-to-quarter swings. The light blue line operationalizes this notion by comparing the current quarterly average level of oil prices to its maximum value over the prior three years (in percent terms). Shocks crossing the zero threshold are uncommon and uncommonly associated with recession. The table on the following page places current experience in perspective. The run-up in oil prices since the Russian invasion of Ukraine puts the average observation for the first quarter into the $100 per barrel range, producing a shock that has been bettered only twice before in the last sixty years.

Thus, there is more talk about recession because an articulated outlook and traditional indicators are triggering warning flares.

4. WTI Crude Oil Prices and "Hamilton" Shocks
$ per bbl. and percent



Shock for Various First-quarter Prices ($ per bbl and percent)					
Price per bbl. ($)	75	87.5	100	112.5	125
Shock (%)	6.2	23.9	41.6	59.3	77.0
Current average quarterly price per barrel: $92.19					

Source: International Energy Agency, Congressional Budget Office, National Bureau of Economic Research, Bureau of Economic Analysis and Federal Reserve. Firm analysis. Accessed March 21, 2022 via FRED. Current average price is year-to-date as of March 14, 2022. Note: A "Hamilton" shock is the difference between the current quarterly average price and the maximum value over the prior three years owing to James Hamilton.

The usual caution is warranted: Past results do not always indicate future ones. We would be more confident about a recession call if we could detail the path that the US economy goes down, part by unfortunate occurrence and part by policy mishap, to produce one. The challenge is that a modern economy is complicated, and the potential avenues it may follow from here branch into a dense bush of possibilities. The engineering profession, however, offers a framework to prune that bush into something more manageable. Work backward from the future event that is feared along the only routes that produce that outcome. If we exclusively focus on recession, all the possibilities of slow, moderate, or even robust expansion are excluded from the frame.

Reverse Engineering in Principle

Reverse engineering builds the decision tree of future events from the bottom up, assuming the outcome at the end.

An important rule of the exercise is to never fight the scenario, even if the ending seems a remote possibility. The hope is that whatever the probability believed a priori, thinking about how the world would get there might influence the posterior probability.

For instance, prior to each launch of the space shuttle, officials at the National Space and Aeronautics Administration (NASA) believed that mission would succeed. However, if NASA engineers were asked what would cause a catastrophic failure, however improbable, then they mostly identified problems with the “o” rings on a cold liftoff day or with the tiles on the heat shield on reentry. The probabilities of such failures were deemed de minimis. The probabilities they were the problem conditioned on failure were not.

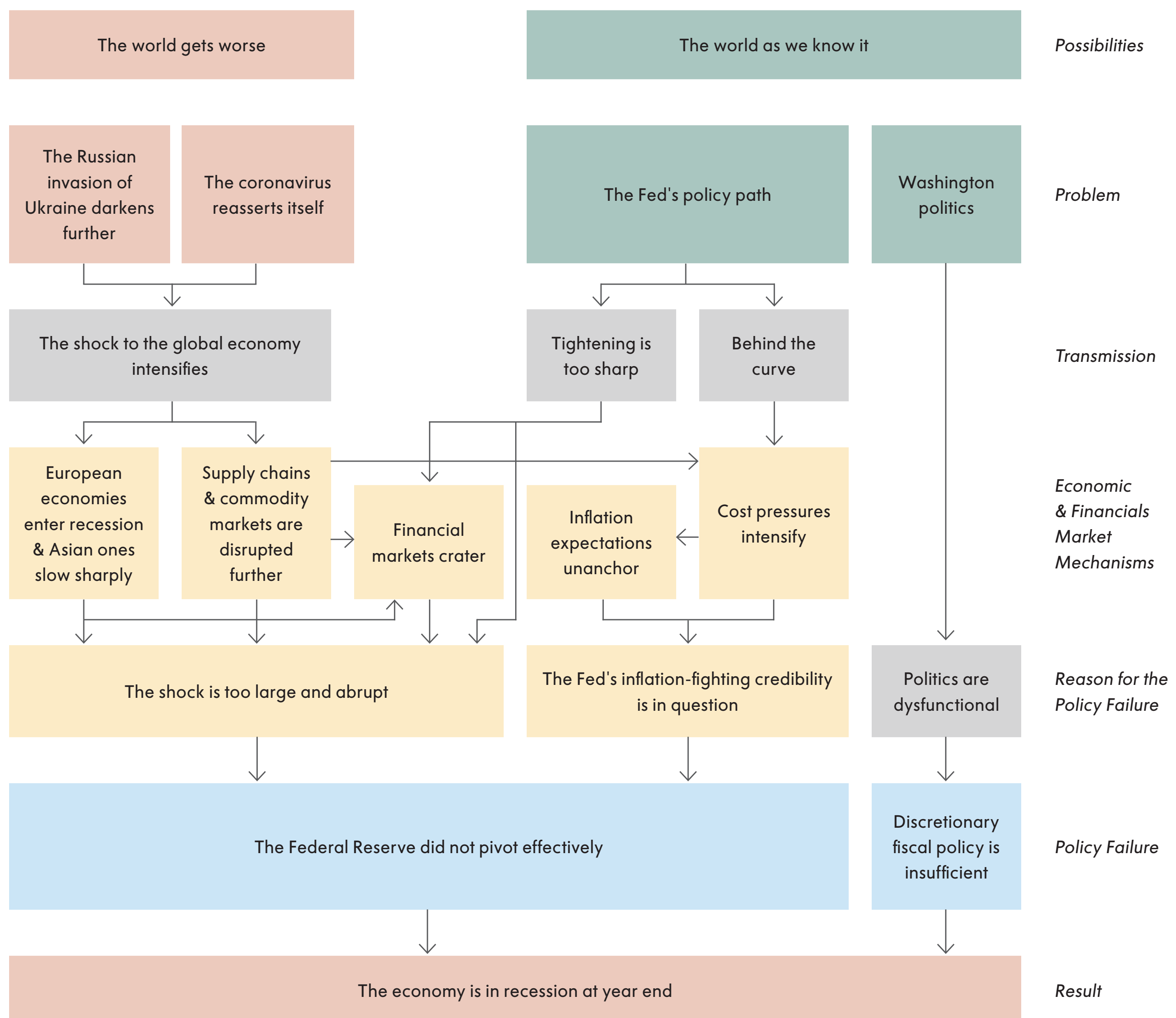
Another advantage of failure analysis is to reduce the dimensionality of the possibilities. We are only interested in the routes to failure, not the many paths to success. If the probabilities attached to each node of the decision tree leading to the assumed event are near zero, the bad outcome is improbable. If they are not, then it is time to prepare for the worst.

Reverse Engineering in Practice

The decision tree below should be read from the bottom up. Assume the adverse result in red that the US economy is in or near recession at the turn of the year. How did we get there?

Subsequent histories would read that there was a policy failure, in that officials with discretionary tools did not wield them successfully to avoid a downturn. This implies two things: (1) the Fed did not throttle back on firming and pivot toward easing effectively, and (2) sufficient discretionary fiscal stimulus was not put into play.

Reverse Engineering why the US Economy is in Recession at the End of the Year
March 2022



Source: Firm hypotheticals.

PAST PERFORMANCE IS NOT NECESSARILY INDICATIVE OF FUTURE RESULTS.

The reason for the latter is painfully obvious. US politics is mostly dysfunctional, making it hard for the political class to agree that there is a problem and harder still for them to offer an effective and timely remedy. Maneuvering in a divided government in the run-up and aftermath of the November elections sufficiently lengthens such recognition, enactment, and implementation lags as to rule out a discretionary fiscal remedy.

We believe the Fed may not pivot effectively for two reasons. For one, the negative shock to aggregate demand may be too large and abrupt to counter. After all, the nominal policy rate would have only recently been lifted from its zero floor, implying that the stimulus provided by rate cuts would be limited. Unconventional policy in the form of asset purchases would be working from a still-large balance sheet, suggesting that the proportional change in the Fed's footprint in private sector holdings would be small. For another, the Fed will likely be fighting a two-front war having to weigh a potential shortfall from its goal of maximum employment against inflation that will still almost surely remain well above its two-percent definition of price stability. Any question about the Feds commitment to the price-stability goal might tip the balance in decision-making away from full employment.

The easiest way of understanding how the world arrives at that unfortunate juncture is to divide the rows above into two groups, the world as we know it now and one that might get worse.

Working from right to left, Washington politics is what it is, explaining why a discretionary fiscal policy offset is not in the cards. The Fed's policy path may be off kilter. As already noted, the Fed is conditioning its rate-hiking plans on a virtuous, and unlikely, decline in inflation. While we believe inflation will probably peak sometime soon, a decline of 4 percentage points over the next two years even as the real policy rate mostly tracks in negative territory, seems a stretch in our view. A harsher characterization comes from no-lesser authority than Larry Summers, who referred to this as the "central absurdity" in the Fed's forecast.[9] The Fed may be behind the curve in letting cost pressures intensify and risking an unanchoring of inflation expectations. The effort to restore its credibility might make it even more reluctant to tackle a downside threat to economic activity.

But there is also the first chart under *Popular Predictors of Recession*. A policy firming is hard to pull off. The tightening might be too sharp if it reveals previously unforeseen weaknesses on the balance sheets of firms and households, especially as unprecedented government aid rolls off. In that regard, in a succession of reports on financial stability, Fed officials fretted that equity prices were overvalued. What if they are right and even modest firming tips them over? Even on current plans, plans may go awry.

On a darker note (reddish in the diagram), a repeated lesson of the past 1-½ decades is that events can always get worse. The identifiable threats include a renewal in the virulence of the pandemic and a further deterioration in the Russian-Ukrainian war. Both pose adverse shocks to global aggregate supply (in terms of impeding already frayed supply chains and the precarious balance in commodity markets) and to aggregate demand (which would be especially problematic for our trading partners).

It might all work out, but there are sufficient interconnections among events to worry otherwise about the near-term path of the US.

The same logic holds, but more so, for some important trading partners. Pre-existing conditions make the economic situation in Europe more perilous than that in the US. Coping with the coronavirus has been decidedly uneven, with the Omicron variant sending the confirmed caseload rate well above that of the US, especially so in its largest economy, Germany. Supply disruptions, evidenced in markedly higher energy prices, contribute to pushing Euro area inflation higher. Indeed, staff of the European Central Bank (ECB) predicts that inflation will run at 5.1

percent in 2022, considerably above goal, and its policy makers are navigating as precarious a path as their Fed counterparts.[10] Real economic growth has been slowing and some balance-sheet strains of the private sector have been showing.

The Russian invasion of the Ukraine makes matters worse. Europe trades more with Russia, has larger banking exposures, and the European Union is the likely destination of the lion's share of the staggering number of Ukrainian refugees. Moreover, the impairment of global trade bulks larger in trade-centric Europe. As a result, we put the probability of recession in the Euro area within the next 1-½ years at near one-half.

The outlook for the Chinese economy is also darker, absent a material, encouraging, and surprising change in the current world order. Russian President Putin's attempt to redraw the political map of Europe has led other governments to choose sides. In between will be a high wall of approbation in the form of direct sanctions, the indirect reach of those restrictions to third parties, and market stigma to those seen as breaching the barrier. For now, China has chosen to be on the opposite side of the US and other major powers. A distrust of Chinese global intent was already a bipartisan feature of the US and its important allies, and recent events only add to that camp's conviction and ranks.

Global trade has been set back and reoriented so as not to cross the wall. This will be especially so for technology. Finance is being similarly bifurcated, including the currency composition, clearing, and settlement of transactions. By siding with Russia, China will have more assured access to important commodities and a client for the use of the yuan, but not much more. The export market of Russia is small for China, and it was already Russia's largest creditor post-Crimea, with a problematic loan book as a result. True, there are Russian assets available at fire-sale prices, but their recovery value in the new world order is suspect, as is their potential as ongoing entities located in a nation with a nationalist bent and few friends. As a result, the expected future growth of Chinese firms has been hit hard as they will interact with a smaller global market and have less access to innovation from the other side of the wall. Their market value will be impaired as foreign investors deal with them at a greater arm's length.

The status quo is not sustainable, in that Russia will be increasingly dependent on China and the rest of the world increasingly hostile. (This would be especially so if China aids the military ambitions of the Russian government.) A better outcome would ensue if Russia reigned in its territorial ambitions or the Chinese leadership distanced itself from the aggressor, but neither seems immediately likely. And the longer it lasts, the less likely will there be a return to the situation ante bellum.

Even with these serious medium-term reservations, the People's Bank will likely increase policy accommodation given that economic growth appears well short of the Central Committee's 5-½ percent goal, and the Chinese economy tracks along a much higher growth trajectory than its other large competitors. In the event, a recession there is unlikely, but GDP growth is likely to be subpar, even as reported by the statistical agency.

Conclusion

Putting probabilities on these various nodes is beyond our ken. The next diagram suggests that they are seriously above zero because they are a matter of public discourse. The quotes line up with the second row of the flow chart and offer something and someone for everyone.

Some Outside Views about the Possibilities
March 2022

The Russian Invasion of Ukraine deteriorates	The coronavirus reasserts itself	The Fed's policy path		Washington politics
"ECB President Christine Lagarde warned at a news conference that the Ukraine war could significantly damp the region's economic growth by dragging on trade and sentiment, while also pushing inflation considerably higher in the near term." *The Wall Street Journal*, 3/10	"Relatively few people have natural immunity and China's health system is not equipped to handle a large wave." *The Economist*, 3/18	"I suspect that you can't get above 2.5 to 3 percent before you crack the economy again." Bill Gross as quoted in the *Financial Times*, 3/19	"The committee will have to move quickly to address the situation or risk losing credibility on its inflation target." FRB St. Louis President Jim Bullard as quoted in the *Financial Times*, 3/18	"Biden and Democrats have been struggling to find a message that will resonate with voters, and face long odds in retaining their slim majorities in Congress after November's elections." *Los Angeles Times*, 3/11

Source: As noted in the boxes.

Christine Lagarde, president of the ECB, worries about the shocks pushing output and inflation away from their desired levels. The editorial writers of the Economist point out that China's longstanding zero-tolerance of the coronavirus leaves few of their population with natural immunity. Given that the national-champion vaccine is relatively ineffective against new variants, the world's largest population is quite a distance from herd immunity. Bill Gross and Fed President Jim Bullard have opposing doubts about the central bank's policy path.

Expert opinion often winds up inapt. But at this juncture, it would seem that if asked why a recession happens sometime soon, they have identified contributing factors before the event. Indeed, there are many plausible routes to the bad outcome. For that reason, we have upped the probability of recession in the US in the next 1-½ years to three-in-eight. (This more than doubles the unconditional chance of a downturn in the post-World-War-II period.)

This is not a reason to stock up on meals-ready-to-eat rations, but it is a reason to view corporate credit warily. It is similarly cause to suspect that the volatility of financial prices will be elevated (akin to 1994 to 1995). On the other side of the recession, interest rates and inflation will be lower. But arriving to there from here probably involves a trip upward for nominal yields while inflation remains high. Because the further impairment of global trade run through many of the routes to recession, emerging market economies, which traditionally have a high exposure to the US (bar the exception of 2008 onward when China was the locomotive that is now losing steam), would be pulled down. Cash, despite a nominal return lagging behind inflation for a time, seems to be the best house on our bad block.

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Previously, Vincent served as the Chief US Economist and a managing director at Morgan Stanley. For the prior four years, he was a resident scholar at the American Enterprise Institute (AEI). Vincent also worked in several roles at the Federal Reserve over 24 years, including Director of the Division of Monetary Affairs and Secretary and Economist of the Federal Open Market Committee (FOMC). His responsibilities at the Federal Reserve included directing research and analysis of monetary policy strategies and the conduct of policy through open market operations, discount window lending and reserve requirements. Prior to these roles, he was the principal liaison with the domestic desk at the Federal Reserve Bank of New York and was responsible for preparing a document outlining policy alternatives for each FOMC meeting. He was Deputy Director in the Division of International Finance and Associate Economist of the FOMC and spent five years at the Federal Reserve Bank of New York in both the domestic and international research departments.

His academic publications primarily concern the conduct of policy and issues related to the monetary transmission mechanism as well as an analysis of alternative auction techniques and Treasury debt management. After an undergraduate training at Fordham University, he received graduate degrees in economics at Columbia University.

Endnotes

[1.] Federal Reserve. Transcript of Chair Powell's Press Conference. March 16, 2022.

[2.] Consider, for instance, the work of the International Monetary Fund's Independent Evaluation Office. IMF Forecasts: Process, Quality and Country Perspectives. March 18, 2014.

[3.] Number of unemployed persons per job opening, seasonally adjusted. US Bureau of Labor Statistics. As of February 2022. Accessed April 8, 2022 at https://www.bls.gov/charts/job-openings-and-labor-turnover/unemp-per-job-opening.htm

[4.] President Biden's Economic Strategy and Fiscal Responsibility Decreasing Deficit by More Than $1.3 Trillion—Largest One-Year Decline in U.S. History. March 28, 2002. Press Release. Accessed at www.whitehouse.gov on April 8, 2022.

[5.] In the chart, periods called out as recessions by the official arbiter, the National Bureau of Economic Research (NBER), are marked by squares. The more typical procedure is to note them by shaded areas or vertical lines. Such a presentation, however, creates the visual impression of the economy hitting a brick wall, tending to overstate the strength of the association. The small squares remind that many forces are at play, placing the predictive power of a single indicator in better, reduced, perspective.

[6.] Alan Blinder offers a narrative history with more nuance. Many of those square dots are associated with events outside the Fed's control, including spikes in oil prices, the invasion of Iraq, and the pandemic. Also, a couple of those episodes toggled the zero-one switch of a recession call but were small in their output loss or short in duration. This more subtle reading suggests that soft landings were more common in the record and are more possible in the future than commonly thought. The point of our exercise, however, is to recap the unsubtle lessons most analysts take from the simple time series. Princeton University. Alan Blinder on Landings Hard and Soft: The Fed, 1965-2020. February 2022.

[7.] James Mackintosh. "The Yield Curve Almost Flashes Recession Maybe But Who Knows When?" Wall Street Journal. March 24, 2022. Some more nuance has been offered by James Mackintosh in the Wall Street Journal, who points out that the evidence is underwhelming in current circumstances if the three-month Treasury bill yield is chosen as the short rate. In a recent appearance, Chair Powell similarly swam up to the idea that using a short-term rate makes the term structure less scary. We offer the same disclaimer as in the prior footnote.

[8.] What is an Oil Shock?* James D. Hamilton. May 1999. Revised: December 2001.

[9.] Larry Summers. "The stock market liked the Fed's plan to raise interest rates. It's wrong." March 2022. Writing about the Fed after its release of its outlook, Summers held that "It has an obligation to display more intellectual rigor and honest realism than it did this week."

[10.] ECB Sees 'Significantly Higher' Inflation Outlook, Hitting 5.1% In 2022: Lagarde. As of March 10, 2022. Accessed at https://www.barrons.com/news/ecb-sees-significantly-higher-inflation-outlook-hitting-5-1-in-2022-lagarde-01646920206 on March 31, 2022.

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