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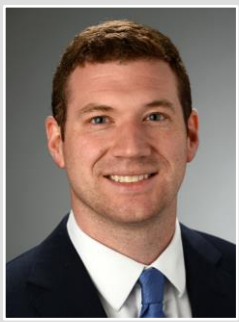

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Is Higher Global Inflation Around the Corner?

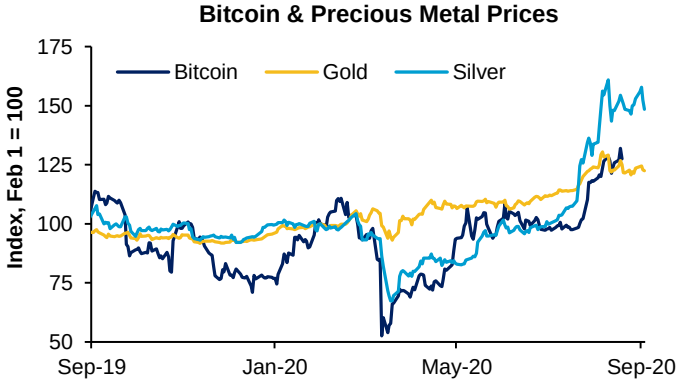
- *The monetary and fiscal stimulus implemented since the coronavirus erupted has been sizable, and policymakers around the world have acted with unprecedented speed. While it is broadly recognized that this stimulus was necessary, the resulting increases in government debt and central bank liquidity have given rise to concerns that an upsurge in global inflation may be around the corner.*
- *Looking at a range of global data, we find little evidence to support such fears. In recent decades, inflation has become increasingly divorced from money growth. This is true in the advanced economies and, to a somewhat lesser extent, in the emerging markets as well. We also find evidence suggesting that rather than fueling demand for goods and services, and thus higher inflation, the rising money stock has driven demand for financial assets.*
- *As for government debt levels, the data for the advanced economies suggest that heavier debt burdens have brought lower inflation and slower GDP growth. The cost of high debt is not inflation but rather seems to be disinflation and weak economic performance, reflecting increased uncertainties for the private sector. For the emerging markets, in contrast, higher debt levels do appear to be associated with increased inflation, but the relationship falls well short of statistical significance.*
- *These results are broadly consistent with our reading of economic performance since the global financial crisis. The cumulative stimulus adopted during that episode was also substantial, which elicited similar warnings about surging inflationary pressures. Instead, inflation remained stubbornly low, falling short of central bank targets in many countries.*
- *This discussion raises the question of what factors have restrained inflation. In our view, deep structural forces, such as aging demographics, the advance of innovation and automation, and increasingly entrenched inflation expectations, have driven inflation down and kept it low. We expect the restraint from these factors, if anything, to become more pronounced in the years ahead. Many central banks across the world will be valiantly leaning in the opposite direction, trying to push inflation up, but their task will not be easy.*

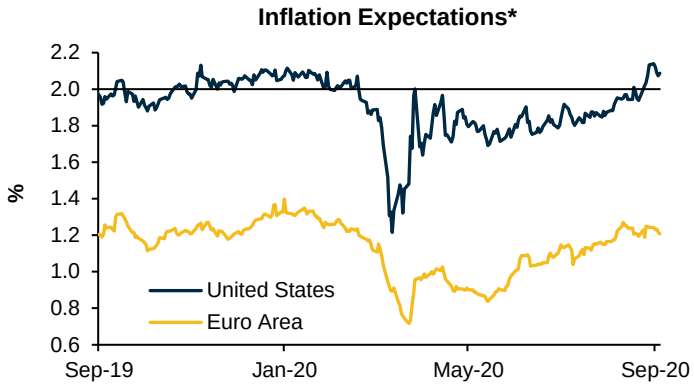
With central banks around the world vigorously stimulating and government debt levels surging to new highs, there is good reason to ask whether higher inflation—perhaps much higher inflation—is around the corner. Similar economic conditions have driven inflation up in many previous episodes, and the conceptual linkages between budget deficits, money growth, and inflation are well-established. Milton Friedman famously quipped, "Inflation is always and everywhere a monetary phenomenon."[1]

These fears are further buttressed by evidence that globalization is facing increased headwinds. With the recent double blow of trade wars and the coronavirus, firms could pull back from their cross-border operations and internalize their supply chains. Countries could increasingly close or restrict their borders and—in the name of "essential security"—require key goods to be produced domestically. As such, there is legitimate concern that the efficiencies that globalization has brought could be unwound. A process of "de-globalization" could kick up production costs and push inflation higher.

Reinforcing these concerns, the prices of gold, silver, and bitcoin have surged upward in recent months (Figure 1). The prices of these assets reflect a variety of factors, including perceptions of economic uncertainty, but their recent increases may signal that some investors fear a rise in inflation. Further, over this period, measures of break-even inflation in the United States and the euro area have crept up, albeit only to the levels that prevailed before the virus.

Figure 1: Commodity and Bitcoin Prices May Reflect Inflation Concerns

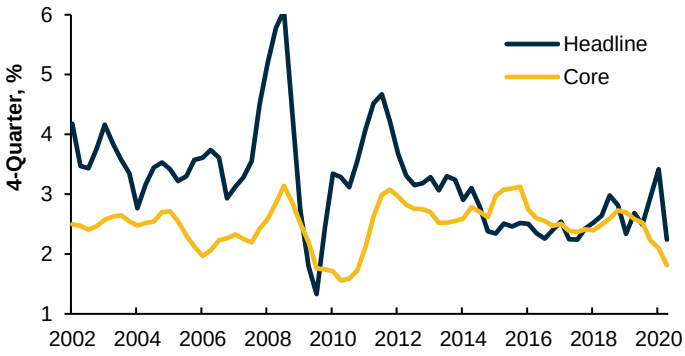




*Source: Bloomberg, Haver *Inflation swaps, 5 years, 5 years forward.*

In this paper, we consider the interplay of such factors. While recognizing the inflationary risks, we emphasize that similar concerns were expressed in the aftermath of the global financial crisis. In that episode, central banks' balance sheets also expanded significantly and government debt levels rose. Many observers warned of upward pressures on prices. But, global inflation—and inflation in most major countries—remained subdued (Figure 2). If anything, inflation ran a notch softer than in the years before the financial crisis, despite the efforts of some major central banks to push it higher.

Figure 2: Global CPI Inflation



Source: PGIM Fixed Income, National Statistical Agencies, Haver

Our paper provides empirical evidence showing that in recent decades the link between money growth and inflation has broken down in a broad set of countries. Further, we find little evidence that higher debt levels are associated with rising inflation. Indeed, for the advanced economies (AEs), higher public debt seems to be contractionary, depressing growth and inflation. An important caveat is that our results for the emerging markets (EMs) are less crisp than those for

[1] *M. Friedman, "The Counter-Revolution in Monetary Theory," in Explorations in Economic Liberalism, 1966.*

the AEs. Our work points to declining inflation risks in the EMs as well, but the increase in their indebtedness in recent months is unprecedented and may pose challenges going forward.

We conclude with some thoughts on factors that we believe have driven inflation. In our view, deep structural forces such as aging demographics, the advance of innovation and automation, and the entrenched persistence of inflation expectations have dragged inflation down and kept it low. We expect these downward pressures, if anything, to become more pronounced in the years ahead. *As such, for many countries, the challenge in the years ahead will not be inflation that is too high, but rather inflation that is too low.*

The Classical View of Inflation Determination

Classical macroeconomic theory posits that rising money growth carries pronounced inflationary risks. More specifically, increasing money growth fuels an acceleration in bank credit. As bank credit accelerates, demand for goods and services expands as well—the aggregate demand curve shifts out. With the economy's productive capacity broadly unchanged, higher inflation ensues. This causal chain has been supported by decades of historical experience.

In this context, high and rising government debt levels have been seen as particularly noxious. Rising debt, at a minimum, increases concerns about the burden of debt-service and repayment risks. This, in turn, may stoke inflation by creating macro uncertainties, which weigh on the currency (triggering inflationary pass-through) and push up inflation expectations. If fiscal performance continues to deteriorate, it may prompt concerns about monetization and lead to further currency weakness and increases in inflation expectations.

These observations are undergirded by the reality that, as debt levels rise, countries ultimately face just three options to restore sustainability—fiscal austerity, faster economic growth, or lower real interest rates. For example, the United States successfully used all three approaches in the deleveraging episode that occurred after World War II. Economic growth was rapid; fiscal policy was remarkably disciplined; and the government's debt-management policies, especially before the Treasury-Fed Accord in 1951, constituted "financial repression" to keep rates low.[2] If such approaches prove insufficient, or are not politically viable, monetization and higher inflation often ensue.

Below, we evaluate this classical theory of inflation determination with an eye toward what it may, or may not, tell us in the current context. Two upfront comments are helpful. First, it seems that over the past decades, market financing-constraints have been relaxed. Many countries are now able to carry higher levels of sovereign debt at lower real interest rates and risk premiums than previously.[3] Debt sustainability constraints have been less binding and concerns about inflation risks less pronounced. This has particularly been the case for the advanced economies, but for the emerging markets as well.

Second, in response to systematic undershooting of inflation targets, many of the major central banks are actively purchasing government debt in an effort to accommodate the government's fiscal stimulus. While central bankers would not call this "monetization"—their actions are observationally equivalent. Going forward, these central banks are likely to continue to purchase large quantities of government securities for some years to come. Stated bluntly, such efforts seem to be one of the few remaining approaches that may yet stoke inflation in these countries.

Big-time Macro Stimulus

The fight against the coronavirus has prompted central banks and governments around the world to move with unprecedented speed to provide monetary and fiscal stimulus. Central bank balance sheets and government debt levels have climbed to new peaks in many countries.

Notably, as shown in Figure 3, in the months since the coronavirus erupted, four major central banks—the Fed, the

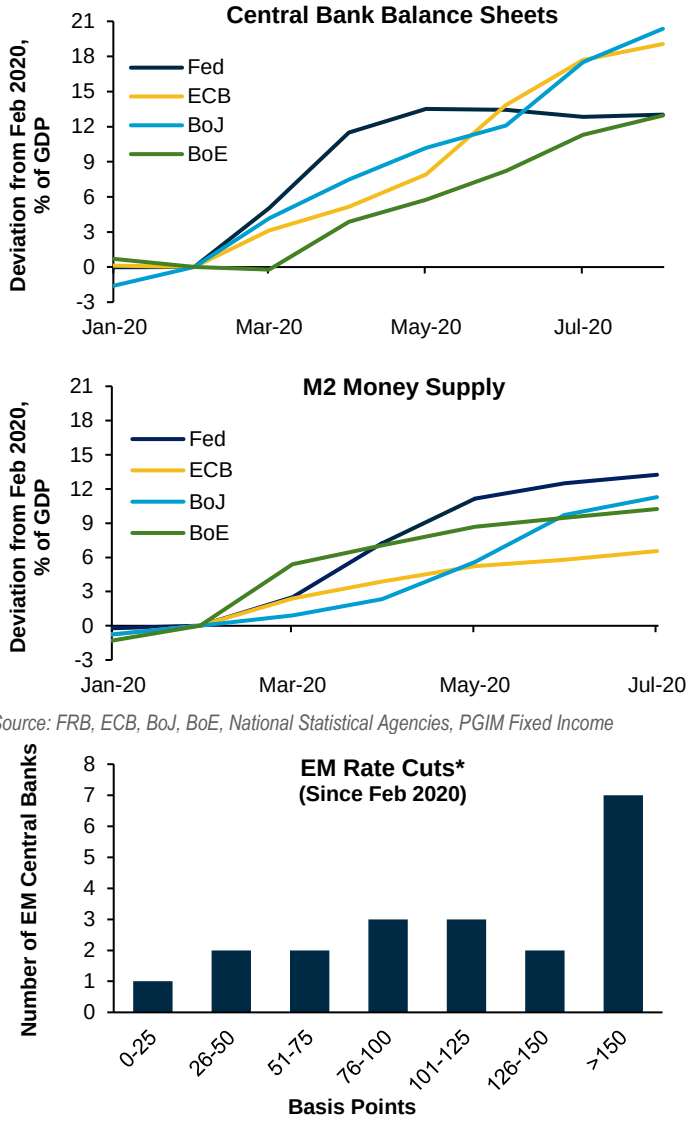
[2] *For more details see, N. Sheets, "Back to the Future: Lessons from U.S. Fiscal Deleveraging after World War II," Citi GPS Opinion Article, July 2012.*

[3] *The underlying explanations for this remain an open issue. One possibility is that the rapidly aging global population has increased demand for fixed income securities to finance retirement. A complementary explanation is that in the low inflation environment that prevails in many countries, investors are less concerned about monetization and macro instability. As yet another perspective, some observers have argued that elements of financial repression are again taking hold. Central banks are driving down interest rates and monetizing risk premiums in their efforts to reach their inflation objectives. In order to achieve return hurdles, investors have had to accept higher levels of risk in their portfolios.*

ECB, BoJ, and the BoE—have each expanded their balance sheets by 10-20% of GDP. To put this into context, the balance sheet expansion over this short period is comparable to (or exceeds) the size of each central bank's entire balance sheet at the onset of the global financial crisis.[4] M2 has also posted large increases.

In addition, the Fed has cut its policy rate by 150 basis points and the Bank of England by 65 basis points. The ECB and Bank of Japan entered this episode with rates already in negative territory, so had limited scope for further rate cuts.

Figure 3: Expanding DM Central Bank Balance Sheets



Source: FRB, ECB, BoJ, BoE, National Statistical Agencies, PGIM Fixed Income

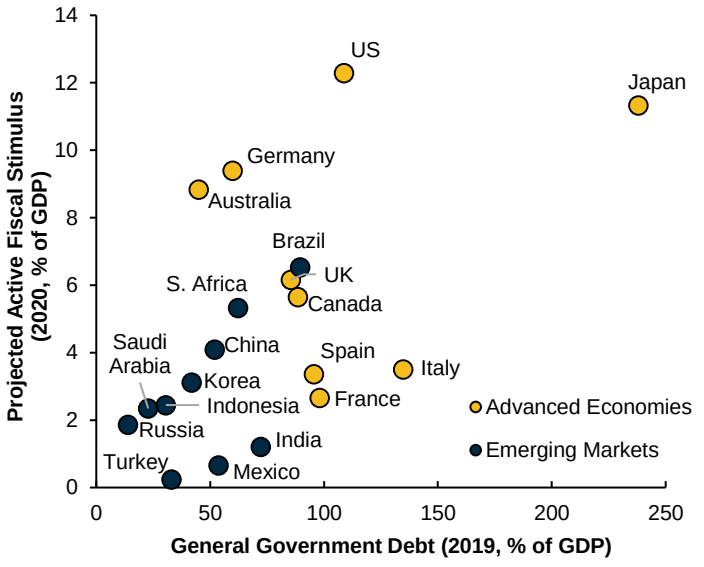
Source: National Statistical Agencies, Haver, PGIM Fixed Income
** 20 major emerging-market central banks.*

The emerging-market central banks are vigorously stimulating as well. Across a panel of 20 major EMs, all have lowered their policy rate, and 15 have cut by 100 basis points or more. To complement rate cuts, a number of EM central banks have also begun QE programs. Purchases are ongoing in Poland, Chile, Turkey, Colombia, South Africa, and elsewhere.

Central banks have implemented this stimulus against a backdrop of sustained weakness in global inflation. In the DMs, inflation in recent years has often run below target, and this has provided an additional rationale for an aggressive response to the virus. The need to raise inflation has been a complementary justification for action. In the EMs, the story is somewhat different, but inflation has been sufficiently contained that central banks there have seen scope to ramp up stimulus.

Sizable fiscal measures have also been quickly implemented. As shown in Figure 4, the IMF estimates that "active" fiscal stimulus, i.e., increases in expenditures and foregone revenues, will exceed 10% of GDP in the United States and Japan. In Germany and Australia, the stimulus will be 8-10% of GDP. Many of the emerging markets are also providing support.

Figure 4: "Active" Fiscal Stimulus*



*Source: IMF, PGIM Fixed Income *Additional spending and foregone tax revenues.*

[4] *Specifically, the Fed's balance sheet has expanded 13% of GDP versus a 2007 balance sheet of 6% of GDP. The numbers for the ECB are 19% and 13%; for the Bank of Japan, 20% and 21%; and for the Bank of England, 13% and 5%.*

What's striking is that the data in this figure seem to have a positive slope—some countries with higher debt levels have approved larger fiscal stimulus packages. This pattern is particularly strong for the emerging markets, where Brazil and South Africa (both with heavy debt burdens) have adopted aggressive packages. In contrast, less-indebted countries (including Russia, Indonesia, and Korea) have been more measured.

Similarly, for the advanced economies, high debt levels have not dissuaded the United States and Japan from providing sizable stimulus. In contrast, Australia and Germany, two low-debt countries, have taken advantage of their room to maneuver in order to also provide significant support through this episode.

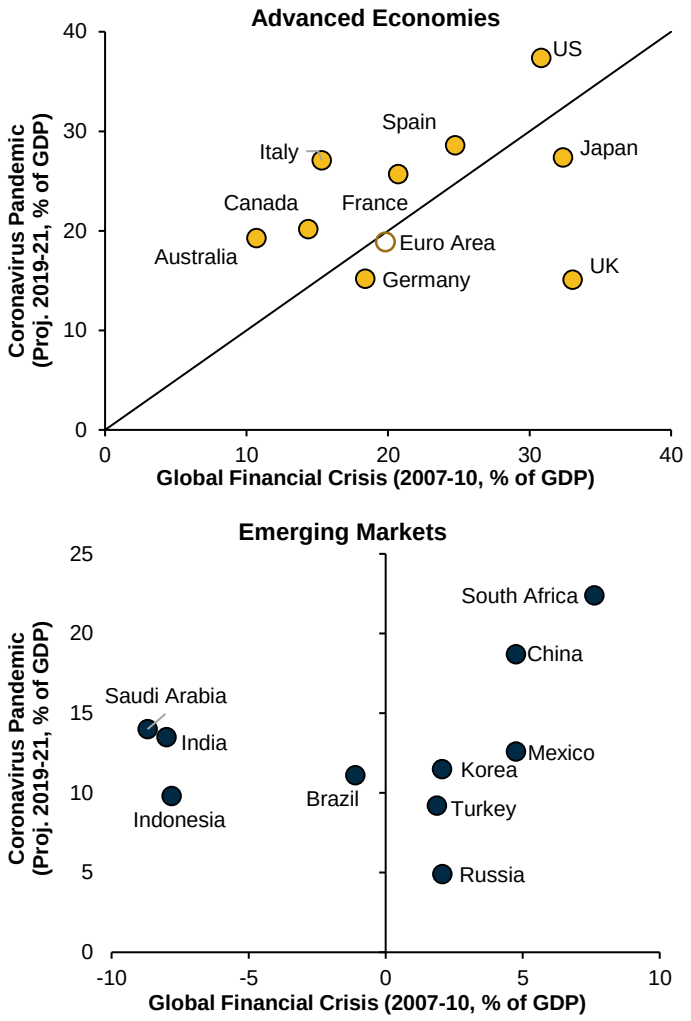
In the remainder of this paper, we consider the possible inflationary implications of these developments. Flying in the face of many analysts, we are unconvinced that this stimulus is poised to drive inflation higher. Our conviction on this issue is particularly strong for the advanced economies. For the EMs, the situation should be closely monitored, but we also are not expecting inflation in these countries to move higher in any sustained way.

Now vs. Then: A Comparison with the Global Financial Crisis

As shown in the previous section, the monetary and fiscal stimulus put into place since the coronavirus erupted has been sizable, and policymakers have acted with unprecedented speed. That said, it's easy to forget that stimulus during the global financial crisis was also significant, although it was implemented somewhat more slowly. Looking at data for the two episodes closely, we conclude that at least in some respects the current experience is less unprecedented than it might initially seem.

For example, Figure 5 shows changes in public debt levels from 2007-10 versus IMF projections for the current episode (2019-2021).[5] As shown in top panel, the data for the advanced economies fall roughly along a 45 degree line. This indicates that debt increases across the two episodes are broadly comparable, with all nine of the countries posting a deterioration of at least 10% of GDP in both episodes.

Figure 5: Change in Public Debt Levels—Virus vs. GFC



Source: IMF, PGIM Fixed Income

What's interesting is that the nature of the debt is somewhat different. This time it has been concentrated in programs to support spending by consumers and firms. During the global financial crisis, such efforts were also significant, but pressures on the banking sector required large expenditures for recapitalization to protect the financial system from collapse. In both instances, the stimulus was structured to minimize long-lived economic damage.

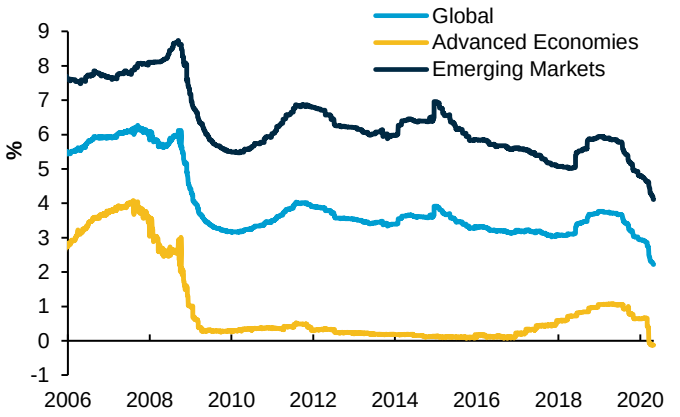
The story for the EMs, however, differs from the GFC. The increases in EM government debt then were centered around zero—with observations ranging from around +10%

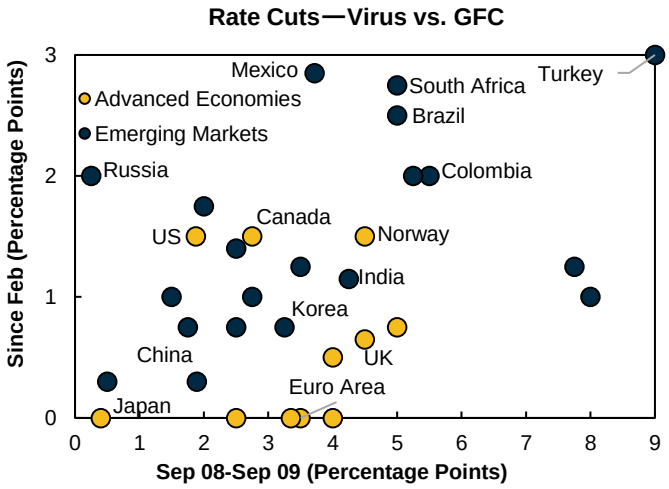
[5] *We note that these windows are asymmetric—three years for the GFC and only two years for the current episode. This reflects that IMF forecasts currently only go out to 2021. But more important, the shorter window for this episode is consistent with the rapid, front-loaded nature of both the downturn and the subsequent stimulus.*

to -10% of GDP. In contrast, in the current episode, these countries are posting much larger increases in their debt levels. In some cases, particularly Brazil and South Africa, this mainly reflects explicit fiscal stimulus packages. In many countries, it's also because collapsing nominal GDP is driving up debt ratios. No doubt in all cases, it reflects an assessment that under current conditions the markets will accommodate these higher debt levels without significant penalties. In this respect, the current episode differs from the GFC when market conditions remained tighter and financing constraints more binding.[6] In any event, the upward surge of debt in these countries has few, if any, historical parallels and may yet pose challenges to their economic performance.[7]

The story for monetary policy is a little different. The upper panel of Figure 6 shows that policy rates in both sets of countries are now significantly lower than at the onset of the GFC. While rates were cut by larger amounts in the previous episode, this mainly reflects that the higher level of rates provided greater scope for such cuts. This is especially true in the advanced economies, where the average policy rate is now slightly negative.

Figure 6: Global Policy Rates





Source: PGIM Fixed Income, National Statistical Agencies, Haver

This point is echoed by the lower panel, where several the of the advanced economies have not cut rates at all in recent months—reflecting that they were already in negative territory (the ECB, BoJ, Swiss National Bank, National Bank of Denmark) or at zero (the Riksbank).

Consistent with this theme, for the EMs, there is a clear 3:1 ratio between rate cuts in the previous episode and those at present—i.e., rate cuts in the GFC were three times larger. This again reflects that the higher setting of rates at that time provided additional scope for cuts. But it also hints that some of these countries might have only limited room to cut further, if conditions again deteriorate.

[6] *China provided a massive stimulus package during the global financial crisis, but it came largely through a build-up of debt and leverage outside the government's balance sheet. From late 2008 through mid-2010, the debt of China's non-financial sector increased by 34% of GDP.*

[7] *For a more detailed discussion of this issue, see our paper, "The Prospects for the Emerging Markets—Looking Beyond the Storm," July 2020.*

Of course, DM central banks also have relied heavily on balance sheet policy in each of the last two crises to satisfy surging liquidity demand from the private sector and provide stimulus to the economy (Figure 7). Three specific observations are important. First, for all of these central banks, the size of the balance sheet is now much larger than during the global financial crisis.

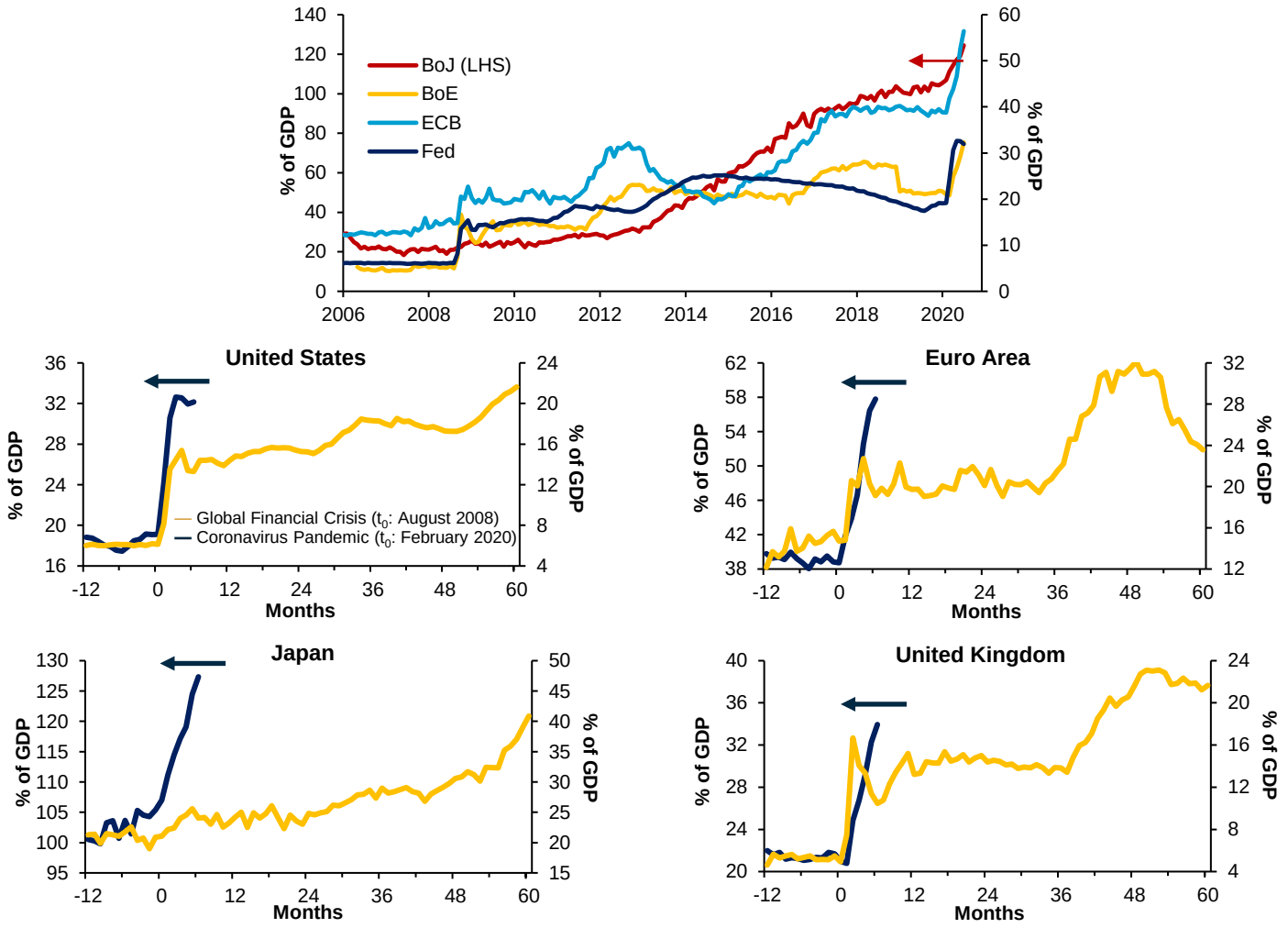
Second, for all four central banks, the surge in the balance sheet over the past six months has outstripped that following the Lehman Brothers crisis. The current episode has seen an unprecedented infusion of central bank liquidity.

Third, in the years following the financial crisis, these balance sheets experienced further growth. While the increases in the current episode have typically been much more immediate and front loaded, the years after the GFC saw a comparable balance sheet expansion, but it took time to accrue.

In sum, our examination of the stimulus in these two episodes has yielded a number of important conclusions. On the fiscal side, the increase in indebtedness for the AEs seems similar to the financial crisis, while differing some in its composition (more for direct stimulus and less for bank bailouts). For the EMs, in contrast, the current episode has brought a much larger deterioration in debt levels, which may pose financing risks for them going forward.

On the monetary side, policy rates have typically been cut by less than during the GFC, reflecting that rates were set at lower levels when the pressures began. The increase in balance sheets has been more front loaded—rising roughly as much since the virus' onset as during the three to five years following Lehman's collapse. However, both episodes

Figure 7: Central Bank Balance Sheets—Virus vs. GFC



Source: FRB, ECB, BoJ, BoE, National Statistical Agencies, PGIM Fixed Income

saw increases in central bank liquidity that were sizable by any metric.

We thus conclude that, although the stimulus across the two episodes is not exactly identical, it at least rhymes. There are some quantitative differences but many qualitative similarities. Given that inflation remained soft following the GFC, notwithstanding the substantial stimulus, this gives good reason to be cautious in extrapolating rising stimulus into higher inflation today. With this in mind, the next two sections examine the relationship between money, debt, and inflation more closely.

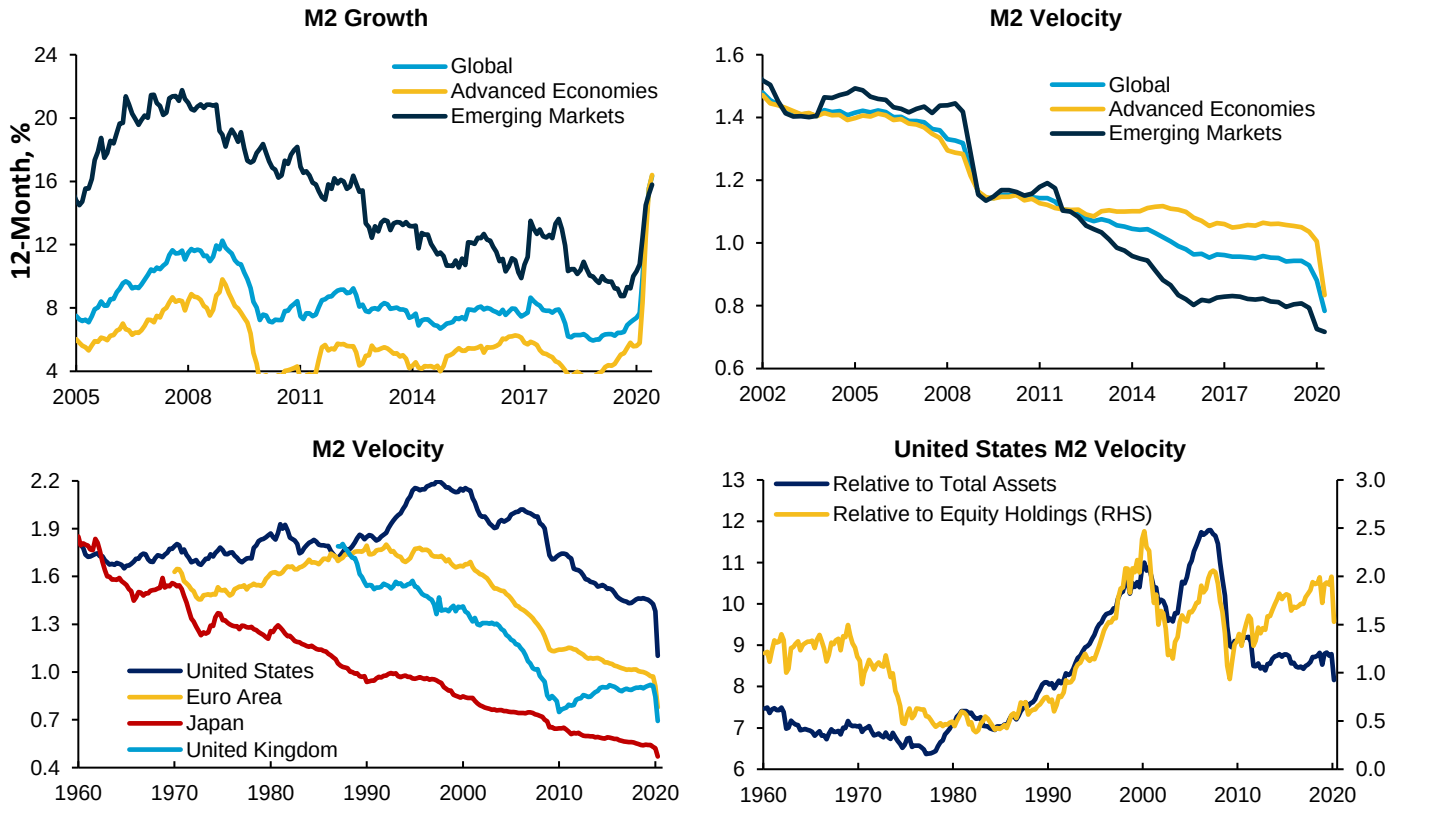
But Money Doesn't Create Inflation—At Least Not Anymore

Classical theory argues that an accelerating money stock will fuel an expansion of bank credit; expanding bank credit, in turn, will drive growth in aggregate demand; and the growth in aggregate demand will ultimately be inflationary—"too much money chasing too few goods."

Notably, however, money growth—proxied here by M2—moved up during the global financial crisis and has surged even more significantly in recent months (Figure 8). But rather than driving inflation higher, it has been reflected in a sustained drop in money velocity in both the advanced economies and the emerging markets.[8] Velocity fell sharply during the GFC, generally eased down somewhat further in the decade that followed, and has again plunged during the covid episode. People have simply held the money.

The lower left panel of Figure 8 provides a longer time series for the major advanced economies. (We consider further evidence for the emerging markets in a separate section below.) For the United States, M2 velocity was roughly constant from 1960 until 1990. It increased a notch during the first half of the 1990s, but it has since been on a steep downward trajectory. For the euro area, velocity edged up

Figure 8: Declining Money Velocity



Source: FRB, ECB, BoJ, BoE, National Statistical Agencies, PGIM Fixed Income

[8] *The classical velocity equation is MV=PY, where M is money, V is money velocity, and PY is nominal GDP. Thus, money velocity is the number of times that the money stock must turn over to support nominal spending in the economy.*

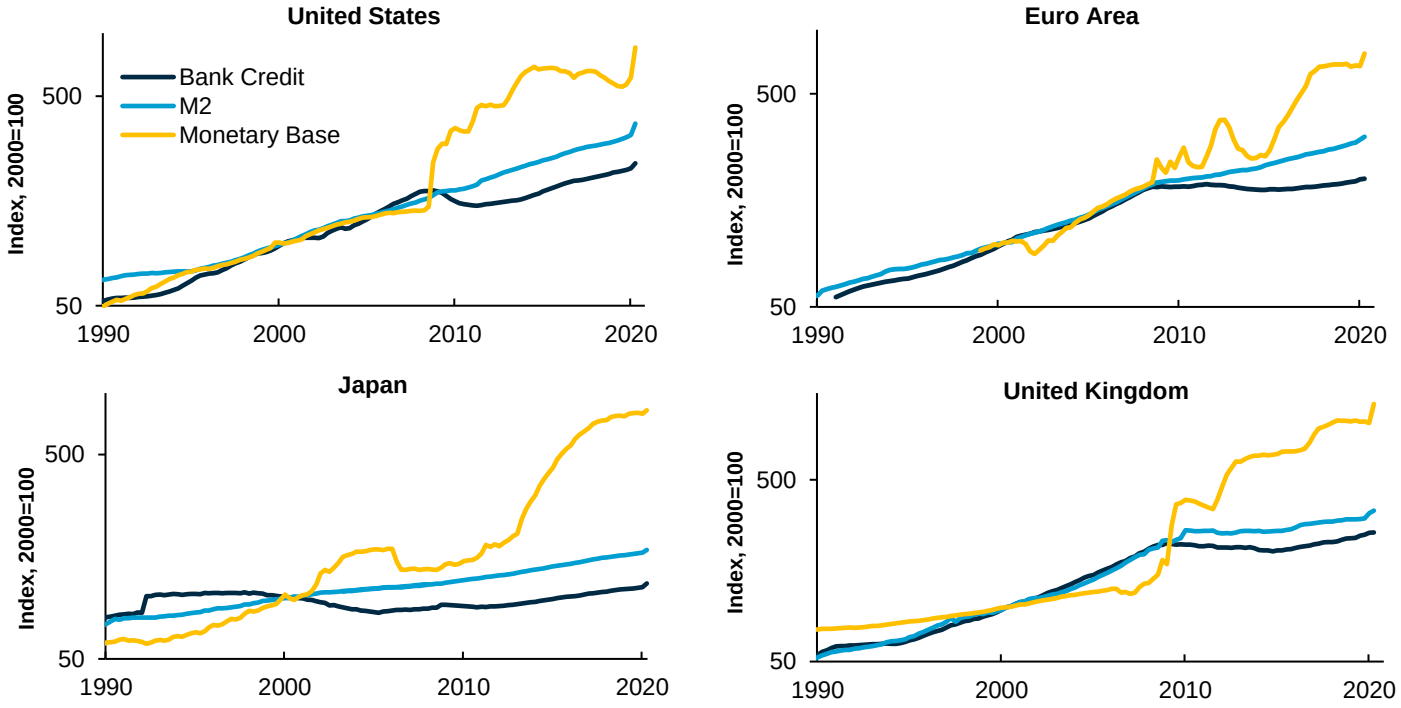
from the 1970s through the early 1990s, but has since fallen sharply as well.[9] Japan's experience is even more striking—with velocity recording an essentially uninterrupted decline over the past six decades. The data for the United Kingdom start later, but have shown a uniform decline since the 1990s.

This widespread slowdown in money velocity reflects a number of underlying factors. The shifting regulatory and institutional environment has no doubt been at work, including the increasing role of market-based intermediation (or "shadow banking") and the tightening of bank regulation following the crisis.

Similarly, the gradual deceleration in global GDP growth, shifting demographics, and the downward trend in interest rates (which has reduced the opportunity cost of holding money) have likely also contributed.[10]

One provocative hypothesis is that instead of fueling demand for goods and services, and thus higher inflation, the rising money stock has driven purchases of financial assets. With this in mind, the lower right panel reports the velocity of M2 relative to the value of U.S. assets. Specifically, the graph shows how many times M2 would need to turn over to support the equity holdings and total asset holdings of households.[11] What's notable is that in 1990, as M2 velocity was beginning its descent, these measures of financial velocity rocketed upward, and were then volatile through the decade of the 2000s. Subsequently, the velocity for total asset holdings has been relatively stable, as it generally was until 1990. In contrast, the velocity for equity prices has climbed back up during the last decade.[12] In any event, these data hint that in recent years money growth is much more likely to express itself in rising (and perhaps more volatile) asset prices than in conventional inflation. In this respect, the economy seems to have shifted significantly since the 1990s. These observations underscore the need for central banks to continue to watch for financial stability risks and develop their macro-prudential tools.

Figure 9: Bank Credit & Measures of the Money Stock



Note: Graphs are on a log scale. Source: *FRB, ECB, BoJ, BoE, PGIM Fixed Income*

[9] *Before the introduction of the euro in 1999, the data are the aggregate money stocks of 11 major European countries (expressed in ECUs).*

[10] *For more discussion see R. Anderson, M. Bordo, and J. Duca, "Money and Velocity During Financial Crises: From the Great Depression to the Great Recession," 2016; R. Judson, "Demand for M2 at the Zero Lower Bound: The Recent U.S. Experience," 2014; and B. Bernanke, "Monetary Aggregates and Monetary Policy at the Federal Reserve: A Historical Perspective," 2006.*

[11] *Algebraically, this would be MV=Value of Asset Holdings.*

[12] *The value of household's holdings of non-financial assets (mainly real estate) has lagged over the past decade.*

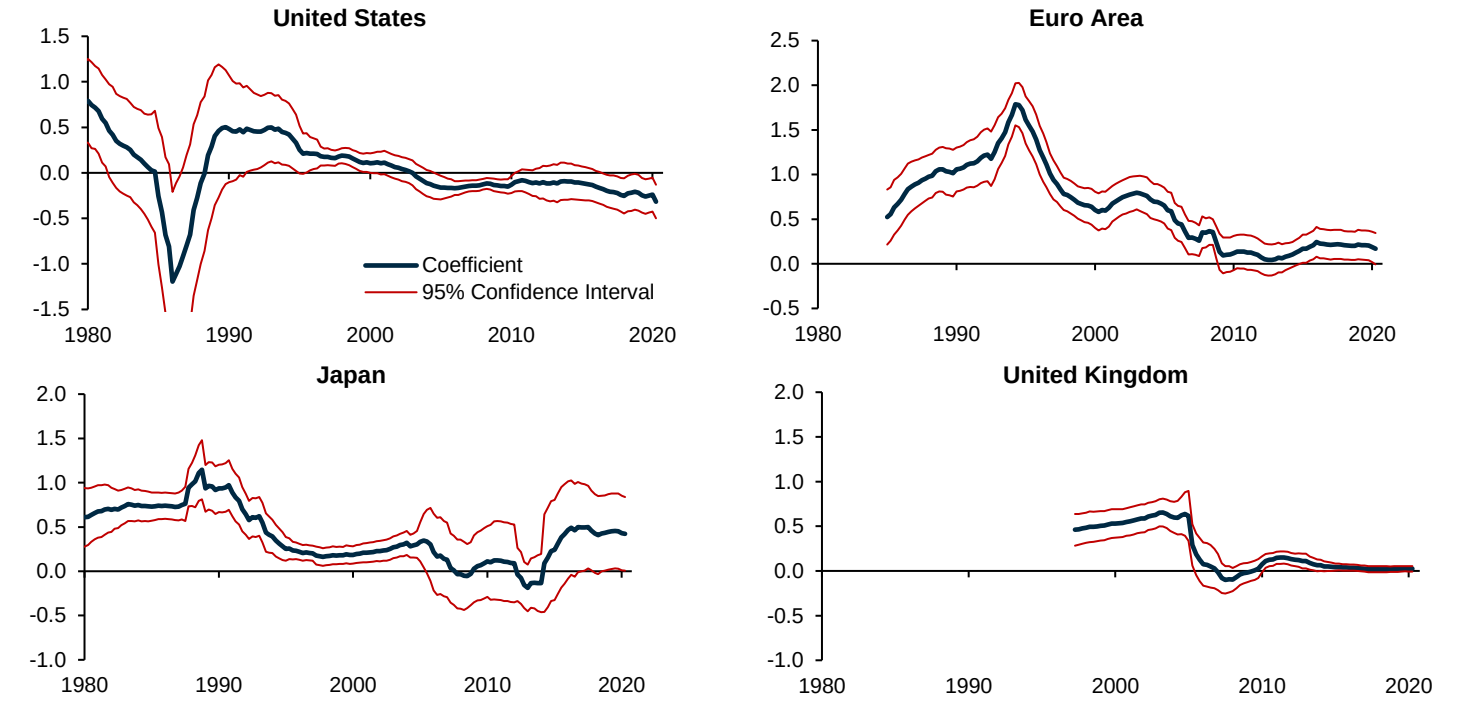
As another nail in the coffin of the "money causes inflation" theory, Figure 9 looks at the relationship between central bank balance sheets (proxied here by the monetary base), M2, and commercial bank credit. We find that rapid increases in the monetary base have not translated into proportionate growth of M2, and growth of M2 has not translated into proportionate growth of bank credit. Especially since the financial crisis, these relationships have broken down. It remains an open issue to what extent this reflects a hesitancy of banks to lend (e.g., due to concern about the economic outlook, compressed intermediation margins, and intensified regulatory constraints) versus an anemic demand for credit (reflecting softer economic growth and private-sector balance sheet challenges). In any event, increased liquidity has tended to sit in the financial system, rather than fuel demand for goods and services.

As an alternative look at the data, Figure 10 graphs the coefficients obtained from rolling regressions of inflation on M2 growth for these same four economies.

Each observation represents the estimated coefficient for a rolling 15-year sample. In all four cases, the coefficient was somewhat bouncy but typically positive and statistically significant until at least 2000. Since the global financial crisis, however, the relationship has gone off track—with the coefficient near zero and generally not statistically significant. Japan, however, is an exception. Since the onset of Abenomics and the BOJ's exceptional efforts, the coefficient has bounced back up and is again statistically significant. Given that Japan's inflation performance has remained subdued, this result doesn't call into question our broader findings that rising money growth is unlikely to trigger sustained inflation. Rather, it provides a ray of hope for central banks struggling to counteract disinflationary pressures.

The evidence in this section is well known by central banks. In recent decades, they have pushed aside various kinds of monetary targeting regimes to focus instead on inflation targeting frameworks, often guided by Taylor rules. While it is always possible that a relationship between money and inflation may re-assert itself in the aftermath of the current crisis, such an outcome would be a sharp deviation from the recent historical experience.

Figure 10: DM Money Growth & Inflation*

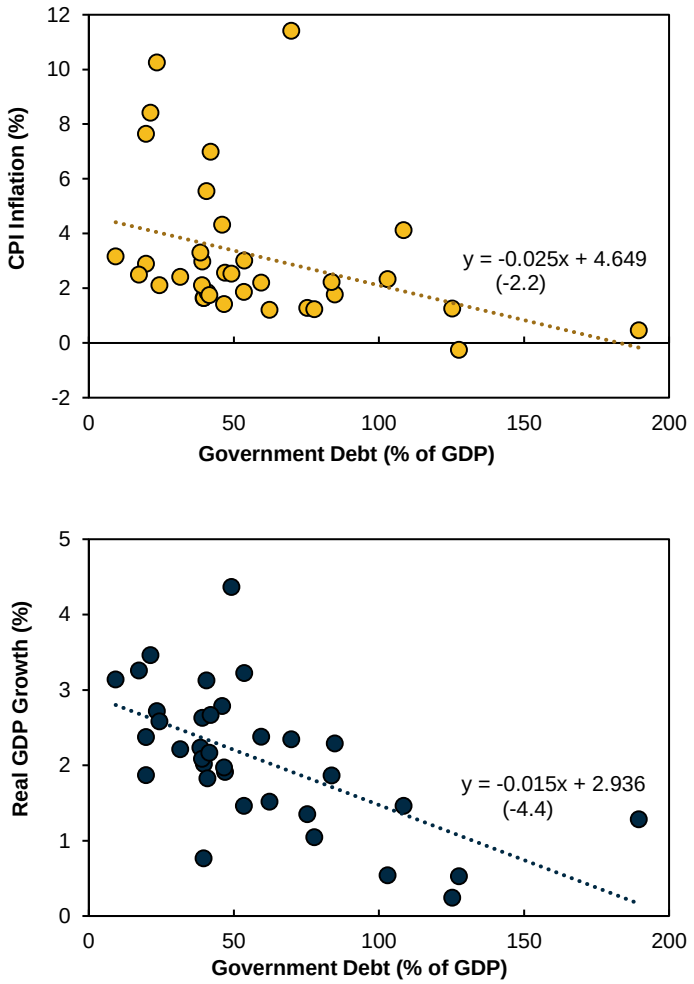


*Source: PGIM Fixed Income *15-year rolling regression; sum of quarterly lags 0-12.*

And Rising Debt Doesn't Stoke Inflation

In this section, we turn to the question of whether higher levels of government debt have been associated with rising rates of inflation in the advanced economies. The scatterplot on the upper panel of Figure 11 provides some useful evidence. Each observation represents a country's experience over the course of a decade. For example, the dot in the southeast corner is Japan in the 2010s. The data include nine countries and begin in the 1980s.[13]

Figure 11: Debt & Inflation



Note: Decadal observations for 9 countries; t-stats are in parentheses. Source: IMF, National Statistical Agencies, PGIM Fixed Income

As mentioned above, classical theory posits an upward sloping relationship between debt and inflation. Rising debt levels are expected to kick off increasing concerns about repayment prospects, currency depreciation, and (ultimately) the risk of monetization. In the process, inflation expectations are pushed higher. In stark contrast, however, we actually find a statistically significant *negatively sloped* pattern in the data. Government debt has been associated with *lower*, rather than higher, inflation.

The lower panel provides some further insight. Using the same format, we also obtain a negative relationship between government debt and real GDP growth. This suggests that rising government debt levels may be contractionary and weigh on growth and, thus, inflation as well. This contractionary impulse could flow from weaker sentiment and spending among households and firms, as they struggle to assess uncertainties about the paths of future taxes and spending, the government's ability to manage the debt, the sustainability of the debt over the longer term, and whether fiscal policy still has scope to stabilize the economy in the event of a downturn.[14]

Of course, to the extent that higher debt levels actually prompt fiscal retrenchment, the headwinds for growth are concrete and direct. In recent years, we have seen this occur in several notable instances. For example, Japan's high debt levels have led to several rounds of increases in the country's consumption tax, and these tax hikes have created powerful headwinds for growth. In the United States, fiscal policy swung toward austerity in the years after the financial crisis. This was implemented through a series of highly politicized fiscal cliffs and government shutdowns, which stoked uncertainties for the economy and markets. Similarly, in Europe, fiscal policy in a number of countries was tightened appreciably in the aftermath of the peripherals crisis with an eye toward meeting the requirements of the Stability and Growth Pact. None of these countries have seen inflation break out on the upside.

Our results echo those of Reinhart and Rogoff (2010). They found for a broad sample of countries over a period of 200 years that high levels of government debt were associated

[13] *The countries are the United States, Canada, Japan, Australia, the United Kingdom, Germany, France, Italy, and Spain.*

[14] *While governments have provided substantial fiscal stimulus in the current episode, the availability of fiscal space was a matter of debate in the years before the virus hit. Moreover, given the massive debt that has been incurred, it's reasonable to question the scope for still further stimulus in the event of another shock.*

with slower subsequent growth.[15] For the countries and time period that we consider, the data suggest that debt may be exerting a more generalized downward pull.

As we consider this evidence, we recognize that causality between debt and real GDP growth could also flow in the opposite direction—countries with slower economic growth might over time accumulate higher debt burdens. Their slower growth could translate into weaker tax revenues and, thus, higher debt levels. Alternatively, some countries may seek to compensate for softening real GDP growth with increased fiscal spending. In short, soft economic performance (low growth and inflation) might result in higher debt levels—rather than the other way around.

With this in mind we examine the relationship between debt, inflation, and growth more formally in Figure 12. In this regression, we consider five year-averages of each of the variables. We regress inflation (and then growth) during a given five-year period, on government debt in the previous five year-period as well as on a lag of the dependent variable and country fixed effects. Thus, holding inflation (or growth) in the previous period constant, do higher debt levels translate into higher or lower inflation (or growth) in the current five-year period?

Figure 12: DM Debt & Inflation

Regression Models	Dependent Variables	
	Inflation	GDP Growth
Government Debt	-0.003	**-0.017**
(First Lag, % of GDP)	(-0.5)	(-2.3)
Inflation	**0.342**	
(First Lag, % AR)	(6.7)	
GDP Growth		-0.110
(First Lag, % AR)		(-0.8)
Adj. R-Squared	0.627	0.162
Observations	61	61

Note: Observations are 5-year averages from 1980-2019; regressions include an unreported constant and country fixed effects; t-stats reported in parentheses; bold indicates statistical significance at the 5% level. Source: PGIM Fixed Income

For inflation, this regression generates a coefficient on government debt that is very close to zero and statistically insignificant. We see no evidence linking debt to higher subsequent inflation in these countries. For growth, we continue to find a statistically significant negative relationship between government debt and economic growth, reinforcing the previous evidence that higher indebtedness creates headwinds for economic activity in these countries.

In sum, we have found surprisingly little evidence to support the classical view that rising debt levels systematically drive higher inflation.[16] If anything, the data for the advanced economies suggest that heavier debt burdens have brought lower inflation and slower GDP growth in recent decades. The cost of high debt is not inflation but may instead be disinflation and weak economic performance, apparently reflecting increased uncertainties for the private sector and the risk of fiscal austerity.

Assessing the EM Experience

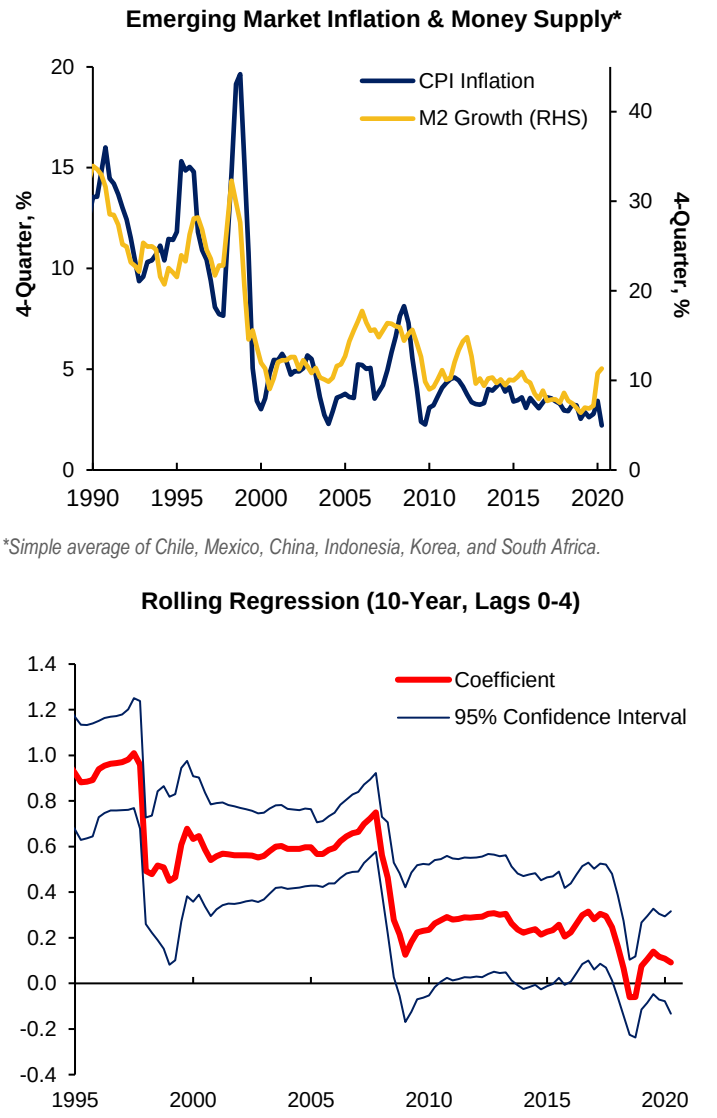
This section considers the experience of the emerging-market economies. We find that since the global financial crisis, the link between money growth and inflation has also weakened relative to a few decades ago, but it has generally continued to show a degree of statistical significance. For debt and inflation, our data indicate a weak positive relationship. Higher debt levels are associated with higher levels of inflation, but the coefficient is not statistically significant.

Figure 13 focuses on inflation and money growth. We look at a set of six relatively strong EMs—Chile, Mexico, China, Indonesia, Korea, and South Africa. We choose these countries because they have data stretching back several decades, which is needed for our empirical work, but they also strike us as capturing a fairly diverse set of experiences. Even so, the extent to which this sample is representative of the EMs more broadly is admittedly an open question. To construct an aggregate, we take a simple average across these countries, which avoids the pitfalls and challenges of more complicated weighting schemes.

[15] *"Growth in a Time of Debt," American Economic Review, May 2010.*

[16] *Consistent with this finding, BoE Deputy Governor Ben Broadbent recently observed that for the UK over the past three hundred years: "The correlation between public-sector indebtedness and inflation—whether that's measured contemporaneously of after the event—is zero." See "Government Debt and Inflation," September 2020.*

Figure 13: EM Money Growth & Inflation*



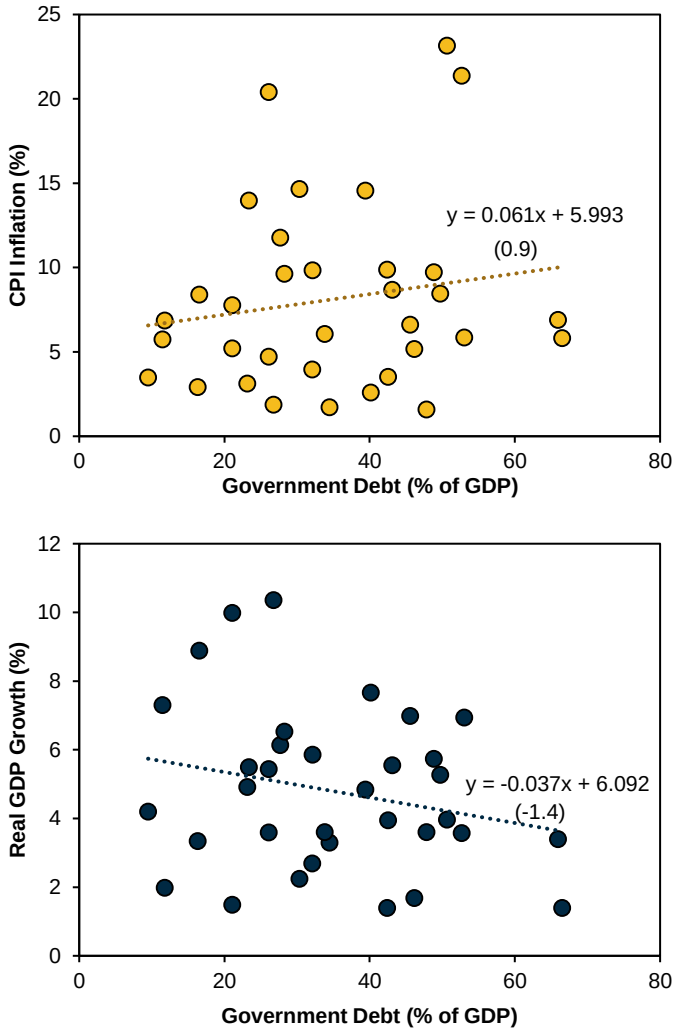
*Simple average of Chile, Mexico, China, Indonesia, Korea, and South Africa.

Source: National Statistical Agencies, Haver, PGIM Fixed Income.

We find that money growth and inflation stepped down together in the late 1990s and have moved more or less in sync thereafter. The lower panel amplifies these issues. Similar to our work for the AEs, we report a rolling regression of inflation on money growth. In the years before the global financial crisis, this relationship was relatively stable, with a coefficient of around 0.6, but it subsequently fell to 0.3 and, more recently, even lower. Nevertheless, through most of the post-GFC period, the coefficient has shown some degree of statistical significance. The relationship appears to have weakened further in the most recent 10-year samples, but it remains to be seen how long-lived that decline might be.

Figure 14 turns to the question of how rising debt levels may influence inflation and growth. Given the surge in debt in recent months, this question is of central importance for EM performance in the years ahead. The scatterplots report data for the six countries in the panel above—plus five others (Brazil, India, Poland, Russia, and Turkey). The observations are decadal averages starting in the 1980s, or as data become available.

Figure 14: EM Debt & Inflation



Note: Decadal observations for 11 countries; excludes decadal inflation rates above 25%.
Source: IMF, National Statistical Agencies, PGIM Fixed Income

We find a weakly positive relationship between debt and inflation. In other words, rising debt levels have been associated with higher rates of inflation. This finding accords with our intuition. Our sense is that the classical channels have been operative in some recent episodes. Argentina is

just one example. Even so, the relationship is also quite noisy—and falls far short of statistical significance.

To amplify this discussion, the lower panel looks at government debt levels and economic growth. For the advanced economies, we found a strong negative relationship, and there are good reasons to expect something similar here. The EMs have continued to face considerable market scrutiny—and have felt financing pressures when concerns have arisen about the sustainability of their fiscal policies. These pressures, sometimes in tandem with an IMF program, have required them to tighten their belts. Broadly consistent with these considerations, we find a negative pattern in the data, similar to our findings for the advanced economies. In this case, however, the relationship comes in a bit below the threshold for statistical significance.

We note that the results in this section are only suggestive. The heterogeneity and variation across the emerging-market economies is significant. Their performance is driven by an array of sometimes volatile economic factors, policies, and shocks, which make it difficult to tease out stable underlying relationships. Indeed, such relationships have likely shifted over time.

In sum, the evidence we present suggests that EM policymakers should not disregard the classical view that rapid money growth and high debt levels may drive an acceleration of inflation. However, as for the AEs, these relationships seem to have become less reliable in recent years. Inflation performance in these countries no doubt bears the imprint of a range of other factors as well.

Concluding Thoughts

This paper casts doubt on the view that monetary and fiscal stimulus implemented to fight the coronavirus is likely to trigger an upsurge in global inflation. We see little evidence of a significant link between money growth, debt levels, and rising inflation. More specifically, we find that inflation has become increasingly divorced from money growth, particularly in the years since the global financial crisis. This has been abundantly true in the advanced economies, but it seems to have been the case, at least to some extent, in the emerging markets as well. Our work suggests that rising debt levels, if anything, tend to exert a contractionary force on activity, which may be disinflationary.

Notably, the discussion in this paper has mostly focused on factors that, in the end, have not driven inflation. This raises the question of what has driven inflation? What forces have been at work in recent decades that have pushed it down and kept it low? By our reckoning, this has reflected some deep structural factors. We would point, in particular, to aging demographics and advancing technology and automation.

The aging of the population, which is being felt in various ways around the world, is sapping aggregate demand, weakening growth, and softening inflation and inflation expectations. This complex of factors has been clear and powerful in Japan, but other countries now seem to be following along this path.

Evolving technology and automation have put downward pressure on inflation as well. They have restrained labor costs and the prices of many products, especially manufactured goods. Further, as a result of advances in information technology and logistics, many firms now compete in a global marketplace. This has limited their pricing power and restrained inflation. This effect has been particularly powerful in retail, where firms around the world must compete against the so-called Amazon price.

These forces have acted against a backdrop of low, increasingly entrenched, inflation expectations. A generation is now coming to maturity who has seen only tepid price increases. This may actually be, in part, the work of central banks themselves. Previous generations of central bankers emphasized their determination to fight inflation. In retrospect, it seems that their efforts may have been too successful. The challenge for many in the current generation of central bankers is figuring out the appropriate mix of tools and words to get inflation back up a notch. It's possible that the Fed's new "Framework" will be a step in that direction.

As we noted in the introduction, globalization—another powerful disinflationary force—is currently facing headwinds. Even so, our judgment is that the forces bringing the world together are also powerful and will not be easily blunted. While the pace of globalization is likely to slow, perhaps significantly, we expect that over time a new synthesis will be hammered out. The next round of globalization will be more pragmatic, socially aware, and equitable.[17] The upshot is that global integration will be a less powerful disinflationary force in the coming decade, but we don't expect a broad reversal.

As a bottom line, our assessment is that such structural factors working together have pushed global inflation and inflation expectations down—and are likely to ensure that price pressures remain muted in the years ahead. In short, these factors generated sustained soft inflation in the decade following the global financial crisis. We see them as generally remaining operative in the coming decade. Central banks across a range of countries will be valiantly leaning in the opposite direction, trying to push inflation up, but their task will not be easy.

[17] For further discussion of these issues, please see our paper, "Globalization 2.0–A New Synthesis," May 2020.

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Source(s) of data (unless otherwise noted): PGIM Fixed Income as of September 2020.

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