# Fiscal Histories

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## Abstract

The fiscal theory states that inflation adjusts so that the real value of government debt equals the present value of real primary surpluses. Monetary policy remains important. The central bank can set an interest rate target, which determines the path of expected inflation, while news about the present value of surpluses drives unexpected inflation. I use fiscal theory to interpret historical episodes, including the rise and fall of inflation in the 1970s and 1980s, the long quiet zero bound of the 2010s, and the reemergence of inflation in 2021, as well as to analyze the gold standard, currency pegs, the ends of hyperinflations, currency crashes, and the success of inflation targets. Going forward, fiscal theory warns that inflation will have to be tamed by coordinated monetary and fiscal policy.

What fundamentally drives inflation or deflation, or the value of money? The *fiscal theory of the price level* offers a novel answer to this age-old question. It is particularly relevant today, with inflation that seems related to large recent deficits, and given the foundational difficulties widely acknowledged in traditional monetary, Keynesian and new-Keynesian theories.

In this essay, I offer narrative discussions of how fiscal theory can account for prominent episodes when inflation did, or did not, occur. Why did inflation rise in the 1970s and fall in the 1980s? Why was inflation quiet in the 2010s, but then rose in 2021? Why does inflation fall in recessions and rise in booms? These stories help us to see how fiscal theory works and how to apply it in practice, more transparently than by staring at forests of equations.

The fact that there are such plausible stories, that fiscal theory can plausibly account for historical episodes, is news, since many economists and commentators seem to think that fiscal theory can be quickly dismissed by well-known episodes. Formal quantitative analysis and evaluation builds on plausible stories, and I hope this essay and my recent book (Cochrane 2023) inspire additional formal analysis.

**Fiscal Theory**

First, I briefly describe fiscal theory and how it contrasts with conventional theories of inflation. The fiscal theory states that *inflation adjusts so that the real value of government debt equals the present value of primary surpluses*.

Most simply, money is valuable because we need money to pay taxes. If, on average, people have more money than they need to pay taxes, they try to buy things, driving up prices. In the words of Adam Smith,

> A prince, who should enact that a certain proportion of his taxes be paid in a paper money of a certain kind, might thereby give a certain value to this paper money. (*Wealth of Nations*, Vol. I, Book II, Chapter II.)

Taxes are a percentage of income. Thus, as prices and wages rise, your dollar income rises, and the amount of money you must pay in taxes rises. A higher price level soaks up excess

money with tax payments. Equivalently, the real value of money, the amount of goods and services a dollar buys, declines as the price level rises. But the real value of taxes does not change (much), so a higher price level lowers the real value of money until it equals the real value of tax payments.

This story is simplistic. We add more realistic ingredients in order to make the theory useful to think about economic events and policy.

First, the government also spends and transfers money to people. So money is soaked up by government *surpluses*, the excess of taxes over spending, not just by taxes.

Second, governments also sell bonds. If you buy a one-year bond, you give the government $1 today, and the government gives you $1 plus interest, say $1.05, in a year. So, the government must print up money to redeem bonds that come due, which pushes toward inflation. But the government can also soak up money by selling new bonds. The government can run deficits, a negative surplus, by selling bonds. But the government cannot keep rolling over its debts forever, issuing new bonds to repay old bonds. Eventually, all of the money outstanding today and all of the money promised by outstanding government debt must be soaked up by surpluses. Thus, prices adjust until the real value of *all government debt*, including money, equals the present value of current *and future* surpluses.[1]

The economic logic is the same as the basic way we think of stock and bond prices. The stock or bond price adjusts so that the value of a stock or bond is equal to the expected discounted present value of dividends or coupons. Government bonds, repaid by surpluses, are effectively stock in the government.

The insight that the *present value* of surpluses matters for inflation quickly surmounts some armchair rejections of fiscal theory, and opens the door to a more interesting

[1] In equations, the price level adjusts so that

$$\frac{B_{t-1}}{P_t} = E_t \sum_{j=0}^{\infty} \frac{\Lambda_{t+j}}{\Lambda_t} s_{t+j}$$

where B=nominal government debt, P=price level, $\Lambda$ is a stochastic discount factor such as marginal utility or the inverse cumulative return, and s is the real primary government surplus. Money (cash and reserves) are part of B.

interpretation of events. One might think fiscal theory predicts a strong correlation between debt or deficits and inflation. Yet while inflation is sometimes linked to debt and deficits, there often is little or even lower inflation with deficits, as in many recessions; and there is often inflation without big deficits. However, fiscal theory does *not* necessarily predict a tight relationship between current debt or deficits and inflation. If the government runs a big deficit, but people trust that deficit will be repaid by higher subsequent surpluses, then people are happy to hold the extra debt rather than try to spend it, and there is no inflation. That hypothesis is sensible. When corporation borrows to build a factory, it runs a big deficit, and then slowly pays off the bonds, a long stream of surpluses. Governments that want to borrow, to raise revenue to fight wars or recessions, and do not want to create inflation, will credibly promise repayment. Fiscal theory only predicts inflation when debt is larger than what people think the government will repay.

Inflation often seems to come from nowhere, or over-respond to small shocks. Well, news or sentiment about long-run fiscal surpluses can change quickly, as do investor's views of stocks. Moreover, dynamics that resemble bank runs underlie the present value. Our government rolls over a lot of short term debt. People may dump government debt today, simply because they fear nobody will roll over the debt next year. Iterating forward, we economists see the present value of surpluses, but that long-term view is not necessarily in the minds of bondholders.

Most of all, *discount rates matter* to present values. When interest rates rise, bond values fall. A higher real interest rate makes the same stream of expected surpluses less valuable. So, higher real interest rates lower the value of debt, and act as an inflationary force even with no surplus news. Equivalently, a higher real interest rate means that the government has to pay more to finance its debt. As we shall see, this variation in discount rates or interest costs is central to understanding postwar US inflation.

The central bank can set a nominal interest rate target in fiscal theory, as our central banks do. If prices are flexible, the nominal interest rate target determines expected inflation. Central banks remain powerful! Shocks to the present value of surpluses then determine unexpected

inflation, devaluing nominal debt to match the lower present value of surpluses. There is nothing central banks can do to stop that.

Sticky prices produce interesting and realistic dynamics, and allow inflation to affect the real economy. The interest rate target then determines the timing of inflation and the long-run level of inflation, while fiscal shocks produce a drawn-out unexpected inflation. Figure 1 presents a simulation of these effects, for concreteness but also for reassurance that fiscal theory really does lend itself to quantitative formal modeling, not just story-telling. I use the simplest standard sticky-price model.[2] Sticky prices are represented in the Phillips curve: Firms can only change prices infrequently, but do so looking forward. If other prices will be higher next year, firms raise prices now. As a result, inflation today is driven by expected inflation next year, plus additional pressure if demand is high.

The top panel simulates what happens to inflation after a 1 percent fiscal shock—the sum of current and expected future deficits rises 1 percent —while the central bank does not change interest rates. The unexpected deficits create a protracted inflation. This is, roughly, what I argue below happened in 2021. Bondholders lose from the long period in which inflation is higher than the interest rate. This is a more realistic prediction than an instantaneous price-level jump.

[2] The model is

$$
\begin{aligned}
x_t &= E_t x_{t+1} - \sigma(i_t - E_t\pi_{t+1}) \\
\pi_t &= E_t\pi_{t+1} + \kappa x_t \\
i_{t+1} &= \eta i_t + \varepsilon_{i,t+1} \\
\rho v_{t+1} &= v_t + r^n_{t+1} - \pi_{t+1} - \tilde{s}_{t+1} \\
E_t r^n_{t+1} &= i_t \\
r^n_{t+1} &= \omega q_{t+1} - q_t
\end{aligned}
$$

where $x_t =$ output gap, $i_t =$ interest rate, $\pi_t =$ inflation, $v_t =$ real value of debt, $\tilde{s}_t =$ real primary surplus scaled by the value of debt, $r^n_{t+1} =$ nominal return on government debt, $q_t =$ price of the government debt bond portfolio. $\omega = 0.9$ describes a geometric maturity structure of debt. $\sigma = 0.5$, $\kappa = 0.5$, $\eta = 1$, $\rho = 0.98$.

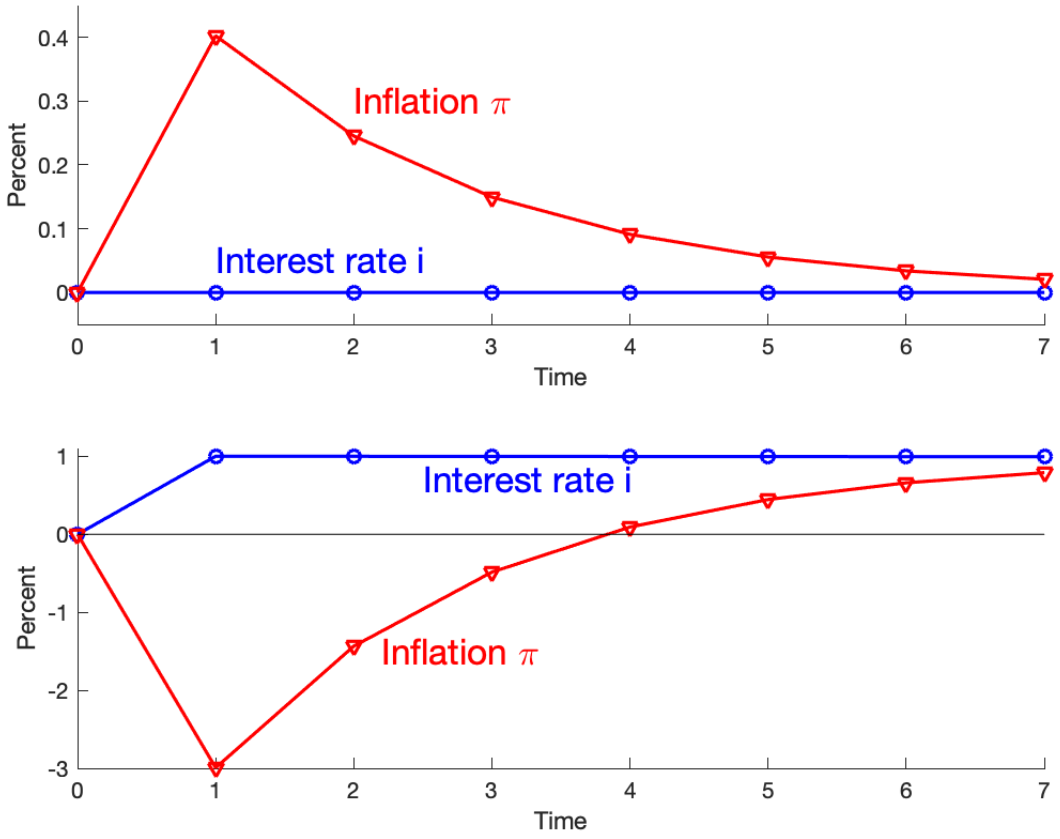


Figure 1: Responses of inflation in a fiscal-theory sticky-price model. Top: 1 percent deficit shock with constant interest rate. Bottom: Interest rate shock with constant surpluses.

Indeed, in continuous time the price level does not move at all on the day of the shock. The entire decline in value of debt comes from this period of drawn-out inflation. It is a fiscal theory of inflation, of the long-run price level, but not of price level jumps, of the initial price level.

The bottom panel presents what happens to inflation and output if the Fed raises interest rates one percentage point, and there is no change in fiscal surpluses. By including long-term debt, this simulation expresses the common idea that an interest rate rise temporarily lowers inflation and output. But higher interest rates eventually raise inflation. In both cases output, not shown, roughly follows inflation.

The two simulations of Figure 1 offer an important benchmark for understanding events and analyzing fiscal and monetary policy. Historical episodes and policies mix fiscal and monetary interventions, and thus mix the two simulations. (Most interest rate hikes die out more quickly, and we do not see the long-run positive effect.)

**Money and Aggregate Demand**

The most familiar theory of inflation is based on money supply and money demand. Inflation comes from too much money chasing too few goods and services.

At first glance, the monetary and fiscal stories sound similar. And that is a good thing for fiscal theory. If you live in a fiscal theory economy, as I think you do, you wouldn't immediately notice anything unusual just by looking out the window, and neither would the generations of smart economists who have come before us.

But there are crucial differences. First, *which* money is inflationary? In the monetarist story, assets such as checking accounts, created by banks, satisfy money demand, so are just as inflationary as government-provided cash. Thus, the government must control checking accounts and other "inside" liquid assets. In the basic fiscal theory, only government money, cash and bank reserves, matter for inflation. Your checking account is an asset to you, but a liability to the bank, so more checking accounts do not make the private sector as a whole feel wealthier and desire to spend more. The government need not control the quantity of checking accounts and other liquid assets. However, in the basic fiscal theory, government debt, which promises money, is just as inflationary as money itself. Reserves and cash are just overnight government debt. [3]

What about episodes in which we see inflation or hyperinflation clearly caused by printing money? In these episodes, governments print money to finance intractable *fiscal* deficits. They

[3] Reserves are accounts that banks hold at the Federal Reserve. Banks may freely convert reserves to cash and back. The Fed issues cash and reserves and invests in Treasury debt, just like a giant money-market fund. Since the interest the Fed pays on reserves comes from the interest it gets from Treasury securities, and since it remits any profits to the Treasury, we really can unite Fed and Treasury balance sheets and consider cash and reserves as very short-term and liquid forms of government debt, at least to first order.

are expansions of government debt relative to the government's ability to repay debt. They are equally inflationary in fiscal theory. Similarly, Milton Friedman once joked that the government could easily cause inflation, by dropping money from helicopters. But dropping money from helicopters is a *fiscal* operation, a transfer payment.

The key question is whether *exchanging* money for debt causes inflation. If the central bank issues reserves or cash, but takes government debt in return, does *that* inflate? This "open market operation" is what central banks do. In the monetarist view, yes. In the basic fiscal view, no. People and banks really do not care much about holding Treasury debt directly versus holding interest-paying reserves that are backed by Treasury debt. It's like taking your $20 bills and giving you two $5s and a $10.

The monetary theory isn't wrong. It just doesn't apply to today's economy. First, monetary theory requires a meaningful distinction between "money," special assets used for transactions and "liquidity" purposes, and "bonds" or savings vehicles, and that money pays substantially less interest than bonds. This precondition is rapidly evaporating. Second, and more importantly, monetary theory requires that the government controls the money supply. But our central banks do not begin to control the supply of money (M1, M2, M3) or liquid assets. The Fed eliminated reserve requirements altogether in 2020. Our central banks set interest rate targets.

By contrast, fiscal theory is consistent with uncontrolled inside money, financial and payments innovation, cryptocurrency, interest rate targets, unstable money demand, elastic money supply policies, and the disappearance of a meaningful distinction between monetary and investment assets, all of which vitiate monetary theory. All that matters, to first order, is total government liabilities—Treasury debt, cash, and reserves—relative to expected repayment.

A Keynesian, looking out the window at a fiscal inflation, sees too much aggregate demand. Fiscal theory agrees, but gives a deeper source of that demand: People can only demand more of all goods, services, and private assets by demanding less government debt.

**US history**

I take a narrative tour of recent US inflation history, to see how events can be interpreted via fiscal theory.

*The Great Inflation*

The United States last experienced a major inflation in the 1970s, which ended swiftly in the early 1980s. Figure 2 presents inflation as measured by the core (less food and energy) consumer price Index, and the federal funds interest rate.[4] Inflation came in three great waves, punctuated by recessions.

The conventional story of this episode focuses on monetary policy: Policy was too loose in the 1960s and 1970s, accommodated the oil price shocks of the 1970s, and reacted too slowly to inflation. Inflation was conquered in the early 1980s by persistently high real interest rates, at the cost of two bruising recessions.

The fiscal side of the 1970s and 1980s is less well investigated, but suggestive. Figure 3 plots the real primary surplus.[5] The graph emphasizes that most variation in deficits and surpluses comes from business cycles: Tax receipts fall in a recession, spending on social programs and discretionary stimulus rises. Surpluses rise in the subsequent expansion. We have to see changes in the present value of surpluses on top of this regular pattern. I plot the inverse unemployment rate to allow some eyeball correction for business cycles.

[4] Federal funds are overnight unsecured loans between banks, borrowing and lending reserves. This is the rate that the Federal Reserve targets most directly.

[5] I plot the primary surplus, not including interest costs on the debt, as the value of government debt equals the present value of real primary surpluses. Interest costs enter the government debt valuation equation through the discount rate. I scale by a linear trend fit to log GDP, as we want to see how greater surpluses induced by greater GDP help to repay debts. I plot NIPA quantities for easy reproducibility, but they are not ideal measures especially of interest costs of the debt.

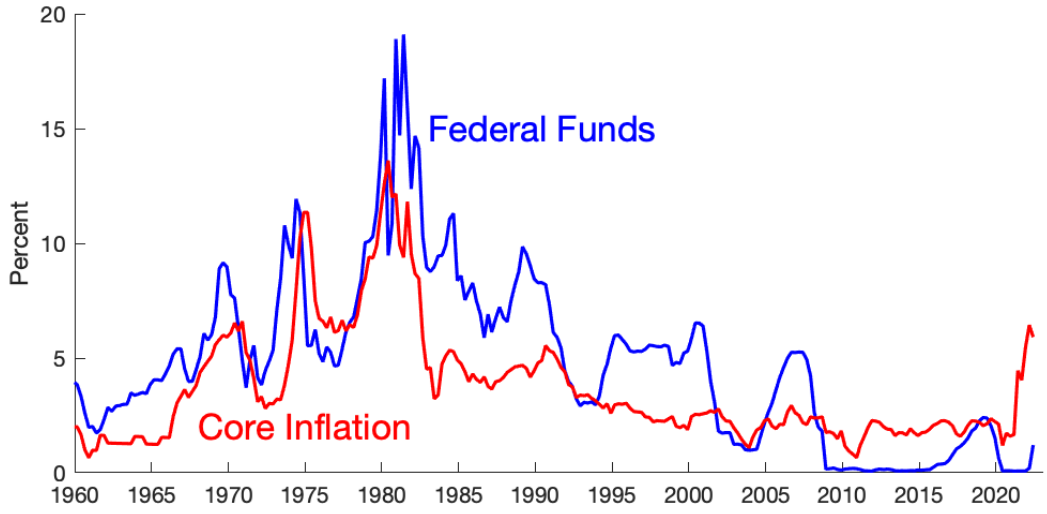


Figure 2: Core CPI inflation and federal funds rate

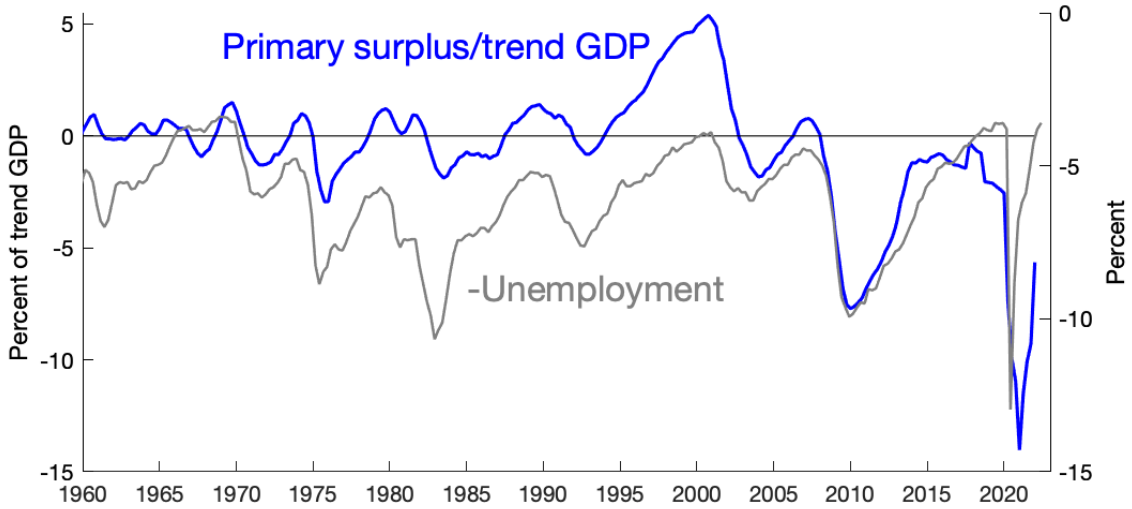


Figure 3: Real primary surplus (left scale) and negative unemployment rate (right scale). Real primary surplus is federal net lending or borrowing plus interest payments, converted to 2012 dollars via the GDP deflator and divided by trend real GDP.

Standard economic history recognizes fiscal deficits of the late 1960s as a cause for inflation, due to President Lyndon B. Johnson's desire to fund both the Great Society and the

Vietnam War without tax increases. However, these deficits are smaller than deficits that came later, and did not cause inflation.

The stresses of the Bretton Woods era are less well studied, and may help to explain why relatively small deficits caused inflation. Under Bretton Woods, the US committed to exchange dollars for gold at a fixed rate with foreign central banks. This system, effectively tying the price *level* to gold, is incompatible with any sustained inflation, even the few percentage points of the 1960s. Moreover, capital markets were largely closed, so the US could not finance trade or fiscal deficits by selling assets abroad. It had to finance trade deficits with dollars and thereby gold. These constraints provoked essentially a foreign exchange and debt crisis in 1971, when the US fully abandoned the gold and currency pegs of Bretton Woods, and thereby abandoned its commitment to running fiscal policy consistent with those pegs. Bretton Woods amounted to a precommitment against persistent trade deficits and foreign financing of fiscal deficits, which the US now practices on a grand scale. Bretton Woods made US currency more fragile when it wished to violate those commitments.

The US suffered an economic slowdown in the 1970s, and a break in fiscal policy. Since World War II, the US government had run moderate deficits in recessions, steady primary surpluses in expansions, and slowly reduced the debt/GDP ratio. The 1970s growth slowdown and severe recessions provoked much larger deficits, lower surpluses in expansions, and less GDP in the debt/GDP denominator. The 1975 deficit in particular was larger than any since World War II. Together with the abandonment of Bretton Woods, concern rose over long-run US debt sustainability.

One can digest the waves of inflation in the 1970s with the two experiments of Figure 1. Fiscal shocks lead to sustained inflation. Monetary policy, tightening interest rates without any change in fiscal policy, alleviates inflation temporarily, but eventually makes inflation worse. Sims (2011) offers this analysis and calls that pattern “stepping on a rake.”

Inflation was not conquered in the 1980s by monetary policy alone. First, though there was much commentary about “Reagan deficits” in the early 1980s, fiscal policy was not in fact tremendously loose. *Primary* deficits, reflecting tax and spending decisions, were

unremarkable, especially given the severe recessions of 1980 and 1981-1982. A big part of the measured deficit was simply higher interest costs on existing debt. Second, economic reforms likely encouraged economic growth and thereby helped the budget. Deregulation, starting with airlines, trucks, and telephones, began under President Jimmy Carter, and it, or simply a halt to the regulatory trend of the 1970s, continued. Tax reforms in 1982 and 1986 improved incentives by slashing federal marginal tax rates--the top personal marginal tax rate fell from 70 percent to 28 percent--while removing many exclusions and "loopholes," and thereby broadening the tax base. Whether for these reasons or just good luck, economic growth rose, tax revenues rose, and so did surpluses. As Figure 3 shows, by the late 1990s, the government was running large primary surpluses, fully justifying the 1980s disinflation. The actual surpluses were larger even then shown in the figure, as trend real GDP was 80% larger in 2000 than in 1980.

The rise in primary surpluses overcame substantial headwinds. Again, higher real interest rates are an inflationary force, raising the discount rate for future surpluses or equivalently raising interest costs on the debt. As Figure 2 emphasizes, the US government had to finance debt at large real interest rates for a decade. Taxpayers paid for that. Moreover, investors who bought 10 year bonds at 15 percent yield in 1980, expecting inflation, got repaid in an environment of 3 percent inflation by 1990, a 12 percent windfall real return. Taxpayers paid for that too.

Thus, the end of inflation in the 1980s was a joint monetary, fiscal, and microeconomic reform. In the context of Figure 1, there was a disinflationary shock to the present value of surpluses, a negative of the top panel, largely resulting from greater long-run economic growth. That allowed the additional temporary disinflationary effect of higher interest rates—the bottom panel of Figure 1—to push down inflation quickly and, this time, durably. Without budget surpluses to pay a windfall to bondholders and high interest costs on the debt, the disinflation would likely have failed again.

The reforms of the 1980s came after the monetary tightening, and surely it was unclear that they would be as durable and successful as they turned out to be. In turn, that uncertainty may help to explain why the recessions of 1980-1982 were so bruising. The high ex-post real

interest rates of the 1980s may similarly reflect some probability that the policy mix would unravel once again. Latin American history is full of examples in which monetary stringency temporarily stops inflations, but fiscal and microeconomic reforms fail to materialize and inflation spirals upward again (Kehoe and Nicolini 2021). On the other hand, as we shall see, an even better outcome was possible. The ends of hyperinflations and the adoption of inflation-targeting regimes, which installed new fiscal, monetary, and microeconomic regimes more quickly and durably, quickly stopped inflation and expected inflation without bruising recessions.

*The 2000s: stable inflation with large deficits*

Fiscal events turned around in 2000. As seen in Figure 3, debt and deficits grew astronomically. The US public debt/GDP ratio rose from 31 percent in 2001 to 105 percent in 2020. Potential causes include a halving of trend GDP growth in 2000, the recessions of 2000, 2008, and 2020, the allure of low debt service costs, or simple political dysfunction. Long-term projections from the Congressional Budget Office point to steady roughly 5 percent of GDP primary deficits, followed by worse deficits as aging boomers drain Social Security and Medicare. And those projections assume we don't have another crisis, war, or pandemic.

Yet inflation stayed subdued until 2022. Why? Discount rates are the most natural candidate: Real interest rates, and consequently debt-service costs, went on a steady downward trend, becoming negative for the 2010s. Policy discussion turned to "$r < g$," the possibility that with interest rates permanently below economic growth, government debt never has to be repaid. Olivier Blanchard's (2019) influential AEA presidential address argued that "public debt may have no fiscal cost." Calls for cost-free fiscal expansion based on "secular stagnation" and "modern monetary theory" grew. Whether true or not, these views captures a widespread set of expectations, that repaying debt would be easy.

At higher frequency, consider the recession of 2008-2009 after the Great Financial Crisis. The deficit widened dramatically, from 1.1 percent of GDP in 2007 to 9.8 percent, 8.6 percent and 8.3 percent in 2009-2011. Yet inflation declined. CPI inflation fell from a peak of 5.5 percent

in July 2008, to 2 percent deflation in July 2009. Inflation stayed below 2 percent for the rest of the decade. Shouldn't those deficits have caused inflation?

Not necessarily. People might have expected that deficits, financing temporary spending to meet an extraordinary crisis, would be repaid by higher surpluses when the crisis was over. The Obama administration promised that debt reduction would follow the stimulus. That's *possible*. However, I don't think that explanation is plausible in this case, and it is not what happened after the fact. Instead, real and nominal interest rates –discount rates, debt service costs –fell like proverbial stones. The Federal Funds rate fell from 5.25 percent in July 2008 to effectively zero, 0.25 percent, and stayed there until 2016. The real short-term interest rate was thus nearly *negative* 2 percent for a decade, and most analysts expected very low interest rates to continue indefinitely. In a quantitative evaluation of events like the 2008 recession (Cochrane 2021, 2023 Chapter 4), I find that this decline in real interest rates accounts quantitatively for the general pattern that inflation is lower in recessions, despite deficits, and conversely in booms. About two-thirds of all inflation shocks corresponds to such discount-rate variation. Similarly, Japan has a debt to GDP ratio of over 200 percent , yet slight deflation. Why? Among other reasons, Japan has had very low real interest rates for three decades.

*Why was there no deflation in 2008, as there was in 1933?*

In 2008, the world experienced the Great Financial Crisis. Many people rightly worried that we would repeat the early 1930s, in which a banking crisis led to a disastrous 30 percent cumulative deflation. Why did it not happen? Many differences between the two episodes have been adduced, but there is an important fiscal difference. Imagine that prices and wages fall 30 percent . Now, government bonds are worth 30 percent more in real terms. The government's tax revenues fall by 30 percent, and more as a result of the deep recession. But the government must make the same payments to bondholders. To avoid default, the government must raise taxes or cut spending.

Now, can you imagine our Congress and administration saying in a painful recession that the government must dramatically *raise* taxes, *cut* spending, subject us to "austerity," all to pay

an unexpected windfall to bondholders? Isn't the government instead likely to pursue fiscal *stimulus*, to regard deflation as a "bubble," a temporary aberration that fiscal policy should ignore, if only because once the desired reflation occurs, government revenues will recover? That is, of course, exactly what governments did with the minor deflation we observed, as you can see in the large 2008 deficits and larger 2021 deficits in Figure 3. And if that is what people expect, a large deflation cannot happen in the first place. Deflation can only happen if the expected present value of surpluses rises.

The deflation of 1933 included the opposite *fiscal* commitment. The US was on the gold standard. When the value of gold and currency rose relative to goods and services– deflation – the US was committed to repay debt in more valuable dollars, which needed tax hikes or spending cuts. By devaluing gold from $20.61 dollars per ounce to $35, and largely abrogating the gold standard in 1933, the US government repudiated this commitment. Deflation stopped immediately (Jacobson, Leeper, and Preston 2019). This new reputation, that the government will *not* raise taxes or cut spending to validate deflation, is exactly, in my reading, why the feared deflation of 1933 did not break out again in 2008.

These episodes clarify a central assumption and theoretical controversy of fiscal theory. Any theory which wishes to determine the price level elsewhere must assume the former sort of "passive" (Leeper 1991) fiscal policy to turn off fiscal theory: Deflation, produced by other means (money growth, etc.) raises the value of debt. Governments respond with fiscal austerity, which raises the present value of surpluses to match the higher value of debt. Here, I make vivid, and I hope plausible, the central contrary "active" assumption of fiscal theory: Fiscal policy does *not* respond one-for-one to arbitrary inflation and deflation, paying bondholders whatever the whims of a changed price level require.

*The zero-bound era: A test of theories*

The zero bound era following the financial crisis of 2008 offers an illuminating test of monetary theories.[6] Interest rates were essentially zero in the US from 2009 to 2016. The episode was longer in Europe, lasting through early 2020, and longer still in Japan where interest rates effectively hit zero 1995.

What happens to inflation if interest rates stay at or near zero for many years, and are expected to remain at zero for more years? In these episodes, *nothing.* The pattern of inflation following the 2008 recession was nearly identical to that following the 2000 recession. If anything, inflation at the long zero bound was *less* volatile than in the earlier period.

Existing theories of inflation make clear and contrary predictions. Conventional theories predict a "deflation spiral:" Lower aggregate demand produces a recession and lower inflation or even deflation. The Fed lowers interest rates to stimulate the economy. But when interest rates hit zero, the Fed can do no more. Now real interest rates are too high. That further lowers aggregate demand, provoking lower inflation or deflation, which raises real interest rates even more, in a never-ending loop. This longstanding view, based on adaptive expectations, goes back to Milton Friedman's (1968) celebrated Presidential Address, which taught that inflation under an interest rate peg is unstable.

*It did not happen.* Deflation spirals never broke out. Even in Japan, deflation bumped around one or two percent at worst.

Rational expectations and new-Keynesian models clearly make a different prediction: At the zero bound, inflation becomes *indeterminate* and thus volatile. The interest rate determines expected inflation, but unexpected inflation wanders randomly. In normal times, the Fed can cut off these "multiple equilibria" by threatening to raise or lower interest rates aggressively. But once interest rates hit zero, the Fed is powerless to do so. This is also a longstanding doctrine. Sargent and Wallace (1975) showed that inflation is stable but

[6] Economists call it the "zero lower bound," because negative interest rates will prompt people to take their money out of banks and hold cash. Several central banks set certain interest rates as low as -1 percent , and the inconvenience of cash kept cash arbitrage from breaking out. Since the bound is not exactly zero, it is sometimes called the "effective lower bound" instead. This section summarizes Cochrane (2018) and Cochrane (2023, Ch. 20).

indeterminate under an interest rate peg with rational expectations. Clarida, Galì, and Gertler (2000) and Benhabib, Schmitt-Grohé, and Uribe (2001) emphasize that this indeterminacy occurs in new-Keynesian models when the Fed does not react and at the zero bound.

*It did not happen.* Again, inflation was if anything less volatile with interest rates stuck at zero than before.

In monetarist thought, the zero bound does not constrain monetary policy. The Fed can still create reserves or print cash, use it to buy bonds, and let more M in MV=PY raise output (Y) and the price level (P). Starting in 2009, central banks embarked on just such a massive "quantitative easing" (QE) program. Reserves rose from $15 billion in 2007 to $2,759 billion by August 2014, an 18,400 percent increase. The monetarist prediction is clear: hyperinflation.

*It did not happen.* Inflation trundled along a bit less than 2 percent. It is hard to see any effect of QE in plots of inflation or long-term interest rates. Instead, we learn that money and bonds are perfect substitutes after all when they pay the same rate of interest. Yes, economists continue to debate whether QE had a few tenths of a percentage point effect on long-term interest rates, but for our purposes the debate is over. An 18,000 percent increase in bank reserves is an atom bomb. If you're debating whether somebody heard a firecracker, it was a dud.

Fiscal theory is consistent with the long quiet zero bound and the silence of QE. The interest rate target determines expected inflation. Unexpected inflation is determined by news to the present value of future surpluses. Inflation is both stable (no spirals) and determinate (no multiple equilibria or sunspots) at the zero bound. If there is no fiscal or discount-rate *news*, there is no unexpected inflation either. That's not proof: I don't have an independent measure of deficit and discount rate expectations. But fiscal theory is at least *consistent* with the episode, in a way that conventional theories are not. And it's at least plausible that the steady recovery after 2009, combined with very low real interest rates, led people not to worry any more or less than before about debt repayment.

The zero bound era is thus a powerful experiment. The predictions of classic Keynesianism, new-Keynesianism, monetarism are large, clear, and fail. Fiscal theory is at least consistent

with—not rejected by—the episode. More generally, the zero bound episode empirically reverses classic doctrines: Inflation can be stable and quiet at the zero bound, and by implication at an interest rate peg greater than zero.

The prediction of long-run neutrality, embodied in the bottom panel of Figure 1, that inflation eventually rises to meet the interest rate, is an inescapable consequence of inflation stability. But "eventually" can take a long time, and it is reasonable that until the zero-bound era central banks and economists never saw interest rates that stayed still long enough, without fiscal news, to observe long-run neutrality. Conversely, the experience of the zero bound era should make us less nervous about the long-run neutrality proposition embodied in Figure 1.

In the theories, stability comes from rational expectations, which I have used in the model and discussion, more than fiscal theory per se. New-Keynesian models are also stable, and inflation eventually rises to meet higher interest rates. One might also pair fiscal theory with adaptive expectations. Such a model will still rule out deflation spirals, but produce much different dynamics.

*Inflation Rises From the Dead in 2021; and How Will it be Contained?*

Inflation rose suddenly in early 2021, reaching 9 percent by June 2022. From a simple fiscal-theory armchair, this event looks like a helicopter drop, a large version of the fiscal shock plotted in the top panel of Figure 1. From 2020 through 2021, the Fed and Treasury together sent people and businesses checks worth about $5 trillion (Cochrane 2023, Chapter 21).

But in fiscal theory, a budget deficit is only inflationary if people do not expect it to be repaid by subsequent surpluses. So we must explore why people apparently did not expect the new debt of 2020-2021 to be repaid, in full or in part, and tried to spend it, where they held the new debt of 2008-2020.

There are many suggestive stories. First, politicians and administration officials in 2020-2021 did not emphasize repayment, while deficit-reduction promises were a constant theme of

the earlier era. Instead they repeated the view that low interest rates allow for fiscal expansion without worrying about repayment. For example, in her confirmation testimony, just before passage of the $1.9 trillion "American Rescue Plan," Treasury Secretary Janet Yellen (2021) opined that "right now, with interest rates at historic lows, the smartest thing we can do is act big."

Second, I argued above that the sharp decline in real interest rates between 2007 and the decade following 2008 helps to account for the lack of inflation from that era's deficits. But it is unlikely that the 2020s will see an *additional* 3 percentage point or so decline in real interest rates.

Third, the 2020-2021 deficits were much larger than the 2008-2009 era stimulus. Moreover, the pandemic recession was largely a reduction in the economy's productive capacity, not lack of demand. Restaurants were not closed because people didn't have the money to go out to dinner. When supply is constrained, a massive increase in aggregate demand shows up more quickly in prices.

Finally, creating bank reserves and sending checks to people may be more quickly inflationary than borrowing in Treasury markets and spending. Who gets debt matters to how quickly it is spent. Whether the additional debt is in the form of Treasury debt or bank reserves may matter to expectations of repayment.

How will inflation be contained? If, as I suggest, we have suffered a fiscal shock, as shown in the top panel of Figure 1, then in this simple model monetary policy alone can only reduce that inflation temporarily, by adding the inflation path produced by higher interest rates shown in the bottom panel of Figure 1. Monetary policy can give us lower inflation now, but at the cost of higher inflation later, a form of Sargent and Wallace's (1981) "unpleasant arithmetic." Postponing inflation is still useful: A smaller but longer lasting inflation is desirable in many economic models, as it reduces the disruptive effects of inflation. A Taylor-type rule in which interest rates react to inflation produces such smooth but long lasting inflation, and reduces output volatility.

But in this analysis monetary policy alone cannot durably eliminate a fiscally-induced inflation. To durably end inflation, monetary, fiscal, and growth-oriented microeconomic policy have to work together, as I argued above they did in the 1980s. And the fiscal headwinds are larger today. In 1980, the debt to GDP ratio was 25 percent. Now it is 100 percent. A 5 percent real interest rate raises interest costs by 5 percent of GDP, $1.2 trillion, for every year it lasts.

On the other hand, the experience of the zero bound era and the top panel of Figure 1 say that inflation from a single fiscal shock will eventually die off on its own, even if the Fed does nothing, so long as fiscal policy does not get worse. As inflation did not spiral downward at the zero bound, it does not spiral upward now. This prediction comes also from rational expectations more than fiscal theory per se, but it contravenes conventional wisdom which says the Fed must raise nominal interest rates above inflation to stabilize the latter, and its slowness to act has added greatly to inflation.

This outlook also assumes that we do not have additional adverse fiscal shocks, and that people maintain faith that the US will pay off the remaining debt. If people did not have faith that the $5 trillion of 2020-2021 debt will all be repaid, will they believe that additional $1 trillion deficits in the next few years will be repaid by later surpluses? If—when—the next crisis hits, and the US wishes to borrow or print $5 trillion of new debt and money, will people hold the extra debt, or will inflation come even more quickly?

Moreover, debt that is viewed as sustainable because of low interest costs is fundamentally unstable. If investors get scared and demand higher real interest rates, interest costs rise, and the debt becomes unsustainable. Inflation surges, seemingly out of nowhere, or far out of proportion to the initial shock. Abundant fiscal space, a background of healthy long-run surpluses, and financing deficits with long-term debt, which passes higher rates more slowly to interest costs, would squelch these worries. But the US government no longer has that fiscal space.

## A Wider and Institutional History

A good theory of inflation should be able to analyze a wide variety of historical episodes and policy regimes, not just postwar US time series. I give a short tour.

### *The Gold Standard*

In an idealized gold standard, the government promises that you can always bring in a dollar and get, say, 1/20 of an ounce of gold. This promise appears to nail down the price level.

The gold standard retains an allure. Monetary policy follows a simple and transparent rule, not requiring divinations by clairvoyant central bankers. The US didn't even have a central bank in most of the 19th century.

But the gold standard is really a case of fiscal theory, not an alternative theory. The government has to have the gold! Governments did not back currency 100 percent with gold, and they certainly never backed debts 100 percent with gold. If they had that much gold, they wouldn't have had to borrow in the first place. So, if people wanted to turn in a lot of currency for gold, the government had to raise taxes or borrow against credible future taxes in order to get the needed gold. Currency and nominal debt were backed by the government's ability to tax, not by vaults of gold.

Sims (1999) cites a nice example:

> From 1890 to 1894 in the U.S., gold reserves shrank rapidly. U.S. paper currency supposedly backed by gold was being presented at the Treasury and gold was being requested in return. Grover Cleveland, then the president, repeatedly issued bonds for the purpose of buying gold to replenish reserves. This strategy eventually succeeded.

Cleveland persuaded bond buyers that the United States would run larger future fiscal surpluses, so those buyers were willing to lend.

The United States' final abandonment of gold in 1971 followed a similar outflow to foreign central banks, who presented dollars for gold. The Nixon administration was unable or unwilling

to take the fiscal steps necessary to buy or borrow gold. In part, it likely did not want to suffer the deflation that restoring gold parity would have implied.

The gold standard is a *fiscal commitment*. The stream of expected future surpluses is, on its own, a bit nebulous and hard to forecast, as stock dividends are hard to forecast. The gold standard offers a commitment of just what that present value will be: The government will raise taxes or cut spending just enough to repay government debt at the gold value (e.g. $20 per ounce), no more and no less. Bond and money holders don't need specific surplus forecasts, they just need to understand the commitment, and a general sense that the government has the fiscal space and the will to do whatever it takes so that the present value of surpluses will, in fact, be the value of government debt.

The gold standard had many flaws, however. First, the gold standard era also featured inflation, devaluation, runs, and crises when governments couldn't or wouldn't tax or borrow to get gold. Those episodes reinforce the fundamentally fiscal nature of the gold standard, and they remind us that all governments have fiscal limits. Second, there was much short-run inflation and deflation under the gold standard. Money does not rise or fall in value relative to gold, but money and gold together can rise and fall in value relative to goods and services. We want a standard that stabilizes the general price level. Third, as above, the gold standard is vulnerable to deflation, when it commits the government to fiscal austerity.

*Currency pegs*

A foreign exchange peg is a lot like a gold standard. A government promises to freely exchange its currency, say pesos, for another, say dollars, at a fixed rate. This peg is likewise a *fiscal* commitment. As with gold, attention often focuses on reserves—how many dollars the central bank has. But, as with gold, no country ever has backed all of its debt with foreign exchange reserves. So in the end, the foreign currency peg depends on the government's ability to tax, to get dollars, or to promise future taxes, to borrow dollars. Even currency boards, which back currency  100 percent , can fail. When the government can no longer borrow to finance deficits, it abrogates the board and grabs its assets. Argentina's (imperfect) currency board,

which pegged the peso to the dollar one for one from 1991 to 2002 with large dollar reserves, fell apart in this way.

An exchange rate peg also suffers the same practical and fiscal problem as the gold standard. A rise in the real exchange rate forces an unwanted deflation, and forces the government to validate that deflation with fiscal austerity.

Gold price or foreign exchange *targets* offer some of the fiscal commitment without the run- or speculative-attack inducing offer to freely buy or sell. But the latter is also a stronger precommitment.

*Foreign or indexed debt; the corporate finance of government debt*

Many governments issue indexed debt,[7] or borrow in foreign currency. A higher price level or a lower exchange rate does not reduce the real value of foreign currency debt or indexed debt. The government must raise surpluses to pay off such debt, or default. Thus foreign or indexed debt act like corporate debt, which must be repaid to avoid default. Domestic currency or nominal (non-indexed) debt acts like corporate equity, whose value can fall to meet lower expected profits.

We can then think of the choice between domestic and foreign currency debt or nominal versus indexed debt as we think of a corporation's choice between debt and equity. Nominal debt, like corporate equity, allows the government to share the risks of fiscal stress, to let inflation or currency devaluation avoid the pain of formal default. On this basis, for example, Sims (2001) argues that Mexico should not adopt the dollar. The same argument lies behind the view that countries like Greece should not join the euro.

But equity invites moral hazard. Surpluses are choices, not exogenous shocks. Countries are tempted to inflate rather than fix fiscal problems. Default is costly, so countries that borrow in foreign currency or indexed debt have an extra incentive to run the surpluses ex-post that

[7] An indexed bond protects investors against inflation. In simple terms, rather than get $1 a year from now, an indexed bond pays $1 adjusted upward for any increase in the CPI. Naturally, you pay more for this protection up front. TIPS (treasury inflation protected securities) are indexed debt in the US.

they promised ex-ante. That precommitment allows them to borrow in the first place, and at a lower rate. So, despite the risk-sharing and default-cost reductions of equity, corporate finance recommends widespread use of debt.

Nominal government debt, like corporate equity, works better when government accounts are more trustworthy, and when the country has other means to commit to repay rather than habitually inflate away debt ex-post. The control rights of shareholders are that mechanism for corporate equity. Most naturally, *voters* are that mechanism for government debt. If inflation devalues nominal government debt and causes chaos throughout an economy, a lot of voters are really mad.

Thus, the standard ideas of corporate finance suggest that countries with precommitment problems, poor fiscal institutions, unstable politics, and untrustworthy government accounts, should issue indexed or foreign currency debt or even dollarize. Countries that have alternative precommitment mechanisms, strong institutions, and stable democracies with a widespread class of people who prefer less inflation, have their own currencies and borrow in those currencies.

Confirming this view, dollarization, currency pegs, and foreign debt are common in the developing and undemocratic world. Successful non-inflating currencies and large domestic-currency debts seem to be the province of stable democracies.

*Inflation targets*

In the early 1990s, several countries that were experiencing inflation instituted inflation targets, including New Zealand, Canada, Sweden, and Israel. The targets usually included a formal agreement between government and central bank, mandating that the central bank focus on inflation. In these and other cases, inflation dropped on the announcement of the inflation targets and stayed there. (Svensson 2011 includes a short history.)

Just how were these miracles achieved? Did previous central banks just lack the guts to do what's right, in the face of political pressure to inflate? Moreover, just what does the central

bank *do* to produce low inflation after the inflation target is announced? One would have thought, and most people did think, that the point is to insulate the bank from political pressure during a long period of high interest rates and painful recession, such as the US experienced in the early 1980s. But nothing of the sort occurred. Inflation simply fell like a stone on the announcement of the target. Well, "expectations became anchored" when the target was announced, but why? The long history of inflation certainly does not lack for speeches and promises from politicians.

Inflation targets are an agreement between central bank and government. They therefore include an implicit commitment by the government to run *fiscal* affairs so as to pay off debt at (say) 2 percent inflation, no more, and no less. Above-target inflation will lead to fiscal tightening. Below-target inflation will lead to stimulus. In this reading, the inflation target is similar to the fiscal commitments of a gold standard or an exchange rate target. But the inflation target aims at inflation directly, not the price of gold or exchange rate, eliminating an unwelcome source of relative price variation. The inflation target also avoids the promise to freely trade cash for gold or foreign currency, which can induce runs or speculative attack.

The inflation targets were part of a suite of fiscal, financial, regulatory, and pro-growth reforms. The latter matter: Tax *revenue* equals tax rate times income, so the surest way to get more tax revenue is to allow more economic growth. Raising tax *rates* is like walking up a sand dune, since each rise in tax rate lowers income.

The fact that inflation fell quickly after the announcement of inflation targets, without a period of high interest rates or recession, is also revealing. Expected inflation can fall quickly when people see the underlying fiscal problems have been addressed in a durable and credible way.

An inflation target failed instructively in Argentina 2015-2019 (Cachanosky and Mazza 2021, Sturzenegger 2019), one of many cases in which Latin American inflation monetary policies failed because the countries did not solve the underlying fiscal problems (Kehoe and Nicolini 2021). These failures reinforce the point that a successful inflation target is as much a fiscal commitment by the government as commandment to the central bank.

This implied fiscal commitment is not written in official inflation targeting agreements, nor is it (yet) much discussed in the economic literature. But it surely seems like a reasonable interpretation of the government's side of the deal, and the fact of fiscal and microeconomic reforms in inflation-targeting events. A more formal fiscal rule, announcing how fiscal policy will and won't react to inflation, might anchor expectations more solidly.

*The Ends of Inflations*

The success of inflation targets echo Sargent's (1982) classic study of the ends of hyperinflations in Austria, Germany, Poland, and Hungary in the early 1920s.

The price level in Germany rose by a factor of $10^{12}$. Germany was printing money to finance intractable deficits. Sargent (1982) writes: "Germany owed staggering reparations to the Allied countries . . . considerably larger sums were initially expected of Germany than it ever was eventually able to pay."

Germany's hyperinflation stopped instantly when the long-term *fiscal* problem was solved. (See Sargent 1982 Figure 2.4.) "The Dawes plan assigned Germany a much more manageable schedule of payments." Germany also made permanent reforms to the government budget, in particular firing many unnecessary government and railway workers. With the fiscal problem solved, "Simultaneously and abruptly three things happened: additional government borrowing from the central bank stopped, the government budget swung into balance, and inflation stopped."

The end of Germany's hyperinflation did not involve any monetary tightening. Indeed, Germany printed *more* money. Absent inflation, people are willing to hold a larger real quantity of money. In the similar Austrian case, Sargent (1982) continues, "circulating notes of the Austrian central bank increased by a factor of over 6" after inflation stabilization. There was also no recession: "By all available measures, the stabilization of the German mark was accompanied by increases in output and employment and decreases in unemployment."

In Sargent's telling, restoring central bank independence was also important, but primarily as a *fiscal* precommitment, to make it harder for the central bank to finance fiscal deficits. After describing how the new Austrian central bank backed note issue by foreign currency and gold, not treasury debt, Sargent continues, that Austrian currency was backed "ultimately by the power of the government to collect taxes . . . by the commitment of the government to run a fiscal policy compatible with maintaining the convertibility of its liabilities into dollars. Given such a fiscal regime, to a first approximation, the intermediating activities of the central bank did not affect the value of the [Austrian] crown "

Sargent emphasizes that a change in *regime* was necessary for people to believe that the present value of surpluses changed. Announcements, decisions, promises, temporary and reversible "austerity" policies by today's politicians don't budge long-term expectations. But with a regime change, people's expectations can shift suddenly, not after a slow period of learning by watching inflation itself.

Successful inflation stabilizations involve joint monetary, fiscal, and microeconomic reform, in a durable new regime. They do not have to involve recessions.

*Currency crises*

Many currency collapses have clearly fiscal underpinnings. But many large debts and deficits have not led to currency devaluation or inflation. Crises, inflations, and devaluations have also happened with few ex-ante fiscal problems (Reinhart and Rogoff 2011).

The insight that expected *future* surpluses and deficits drive the value of currency offers a way to understand many episodes. Burnside Eichenbaum and Rebelo (2001) study the East Asian financial crises of the late 1990s, in which pegged exchange rates suddenly collapsed. Why? The economies were growing well, the governments did not have substantial debts or deficits, and there was no unusual monetary loosening. However, Burnside Eichenbaum and Rebelo show that the crises were precipitated by bad news about *prospective* deficits. Banks had borrowed a lot of short-term foreign-currency debt. The government was poised to bail out banks. A run on banks then became a run on government surpluses.

The episode has broader lessons. The *form* of international investment matters, and endangers the currency when it entangles government finances. Foreign equity investors might decide pull out, and a government may ignore the fact that they sell to locals at low prices. But short-term foreign-currency debt, in banks that the government implicitly or explicitly guarantees, endangers the currency. Contingent, or off-the-books liabilities, such as bailouts of banks, businesses, homeowners, or other debts, make a government more fragile to inflation and devaluation, and are not reflected in conventional surplus and deficit forecasts.

**Concluding comments**

The statement that the real value of government debt is equal to the expected present value of surpluses is an ingredient of a theory, not a complete theory by itself. How "fiscal theory" behaves depends on how one fills out the rest of an economic model. In this essay, I place fiscal theory in the context of simple new-Keynesian models with rational expectations. One can easily embed fiscal theory in more general models, featuring all the frictions and heterogeneities that make macroeconomics fun and interesting. Better models by which higher interest rates can temporarily lower inflation are an urgent agenda item. Though such embedding is technically easy, the questions one is led to ask and the results can be quite different, and counter usual intuition.

One might wish for formal tests of fiscal theory. The history of economics warns against that approach. Attempts to construct formal tests of monetarist vs. Keynesian vs. rational expectations vs. real business cycle vs. new-Keynesian theories *as a class* have never been productive. Instead, each of these models has been evaluated by their ability to plausibly and, later, quantitatively understand episodes and data, and to guide policy, after suitable elaboration. The fiscal theory of the price level will rise or fall in the same way.

Two takeaways: First, monetary and fiscal policy are both important to inflation, as exemplified by the flexible-price case in which the interest rate sets expected inflation and fiscal news determines unexpected inflation, or by the two simulations of Figure 1. Monetary policy is important, as a simplistic reading of "fiscal theory" might not recognize; but fiscal

policy also creates inflation that monetary policy cannot fully control, as a simplistic reading of the dictum “inflation is always and everywhere a monetary phenomenon” might deny.

Second, price-level control requires a well-designed monetary-fiscal regime. The present value of the long stream of future budget surpluses *is* somewhat nebulous on its own. As a result, governments create institutions designed to control, communicate, and commit to that present value. The gold standard, currency pegs, independent central banks, inflation or foreign exchange targets, and the hard-won reputations of governments for repaying debts are examples of such institutions. The fiscal theory of the price level leads us to study such institutions or regimes and think about how to improve them.

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