



ECONOMICS WORKING PAPERS

Inflation and Debt

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Economics Working Paper 26124

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August 21, 2026

This book grew out of the Ninth Karl Brunner Distinguished Lecture, given in October 2025. I am grateful to the Swiss National Bank for the honor of the invitation and for their kind hospitality.

The lecture and this little book distill my thoughts on inflation going back four decades. Those thoughts are now spread over two books and more papers than anyone can possibly be expected to read. Those efforts also, and rightly, focus on mathematical structure of economic models. They delve into what-abouts, what-ifs, theoretical controversies, and other objections that a theory must surmount. They are aimed mostly at practicing economic researchers, focusing on how to do the economics of inflation; how to construct and evaluate models. This book summarizes, applies, and extends the ideas for a nontechnical audience. There are some equations, mostly in footnotes. Academic economists find it hard to understand words without them. But I describe every idea in words. The nontechnical reader can skip the equations entirely with no loss.

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Preface

This book grew out of the Ninth Karl Brunner Distinguished Lecture, given in October 2025. I am grateful to the Swiss National Bank for the honor of the invitation and for their kind hospitality.

The lecture and this little book distill my thoughts on inflation going back four decades. Those thoughts are now spread over two books and more papers than anyone can possibly be expected to read. Those efforts also, and rightly, focus on mathematical structure of economic models. They delve into what-abouts, what-ifs, theoretical controversies, and other objections that a theory must surmount. They are aimed mostly at practicing economic researchers, focusing on how to *do* the economics of inflation; how to construct and evaluate models. This book summarizes, applies, and extends the ideas for a nontechnical audience. There are some equations, mostly in footnotes. Academic economists find it hard to understand words without them. But I describe every idea in words. The nontechnical reader can skip the equations entirely with no loss.

The fiscal theory of the price level organizes my thoughts. It has come of age at a timely moment. Large debts and deficits now weigh over monetary affairs. The 2021-2022 inflation looks like the first fiscal theory exercise. It echoes centuries of inflation stemming from fiscal trouble. The interaction of monetary and fiscal policy is likely to be a central issue going forward. How will central banks raise interest rates if doing so raises interest costs on the debt? Will central banks continue to buy large amounts of government debt and hold down interest rates and interest costs on the debt?

After the publication of Cochrane (2023) *The Fiscal Theory of the Price Level* I gave many talks trying to digest its message and extend its application to current and historical events. I developed a better understanding of the recent bout of inflation and several important episodes, as well as how alternative theories work. I also devoted a lot of effort to understanding the major open question in the theory of inflation: Is there a respectable, simple, economic theory that delivers something like the consensus among central bankers of how interest rates affect inflation? The Brunner Lecture and this book gave me an ideal opportunity to distill and further

extend these ideas.

I focus on the analysis of historical episodes via very simple theories. Why did inflation surge and then largely go away in 2021-2022? Why was inflation so quiet when interest rates were stuck at zero? Why did quantitative easing have no effect on inflation, but the same policy in 2021-2022 seemingly produce huge inflation? And so forth.

Academic economics usually focuses on formal statistical testing of complex models. But as I have thought about these issues over the years, I find that exploring episodes is more illuminating, at least as a first step. Episodes also make it easier to develop and understand a theory. They certainly make for a far more entertaining lecture and book than slides full of equations.

In this, I am influenced by many greats of economic history. Friedman and Schwartz (1963) *Monetary History* applied monetarism to economic history. Tom Sargent in many works such as his Sargent (1982) analysis of the ends of large inflations did the same for rational expectations and fiscal foundations of inflation. I do not attempt their level of historical scholarship, but I hope these suggestive stories can inspire others to do so.

There is another reason for looking at episodes. In physics, the equations often speak for themselves. In economics, our much simpler models are really quantitative parables. Economics thus requires the artful step of *interpreting* what the equations say, applying them to circumstance, making the theory *useful*. That's much harder than the math.

Fiscal theory has not spread as quickly as I hoped it would, especially given recent experience and the evident shadow of sovereign debts. By providing a non-technical, event-driven distillation of the ideas, I hope this book can get that snowball rolling.

I travel to learn as much as to evangelize. I learned a lot about Switzerland during my visit, and I am grateful for education by my hosts. Swiss monetary and fiscal institutions are quite different from those in many other countries and evidently successful. Few other countries have such a record of low inflation and prosperity. Few other countries perennially battle against currency *appreciation*. That success clearly comes from Switzerland's fiscal probity as much as its monetary wisdom.

Chapter 1

Introduction

What determines the level of prices or, equivalently, the value of money? Why do we work so hard for mere pieces of paper or, now, bits in a computer? Where does inflation come from? How can inflation be better controlled?

These seem like largely settled questions, needing only elaboration of “monetary transmission mechanism” epicycles. Central bankers and policy analysts express a verbal doctrine not much changed since the 1970s. They exude an aura of technocratic expertise.

In fact, we live in a moment of great uncertainty in monetary economics. The standard policy doctrine is completely at odds with the actual equations and operation of contemporary economic theory. Events befuddle theory. Low and stable inflation was a puzzle in the 2010s. The great inflation of 2020-2021 revealed that central banks have much less control and understanding of inflation than most people believed. The clear danger of a larger repetition brings advanced-country inflation back to the forefront of our economic agenda. Inflation has bedeviled emerging (or ought-to-be-emerging-but-are-not) countries.

We need a simple economically respectable theory of inflation, consistent with our current institutions—fiat money (no explicit backing like a gold standard), interest rate targets, ample reserves paying market interest rates, no money supply control, and central banks committed to stabilizing inflation—and consistent with historical experience. I’ll show you deep flaws in the standard candidates based on money supply or interest rate targets. At last, as I will show, we have the foundations of such a theory. I’ll show how that theory applies to our recent past, and what it says of our policy challenges.

The job is not complete. We still need a theory of how central banks can affect inflation by changing interest rates. The best theory we have remains quite different from the standard policy doctrine, which reflects long experience. Rather than

descend from the nirvana of beautiful equations to proclaim practical people wrong, I think it is worth first trying hard to see if theory can roughly accord with their experience. I'll show you some progress in that quest.

Like any moment of paradigm shift or radical change, this is an exciting moment to study inflation. Basic questions are up for grabs. You can address them with careful thought about simple economic models and how they apply to events and policy options. And the answers matter.

Chapter 2

The 2021-2022 inflation

Let us start by trying to understand the great inflation of 2021-2022.

2.1 Facts and Puzzles

Figure 2.1 reminds us of this episode in the United States. There was a steep recession in the Covid-19 pandemic. As usual in a recession, inflation eased, and the Federal Reserve set interest rates to zero. Once the pandemic and its short and sharp recession had almost entirely passed, and just as the new Biden administration took charge in late January 2021, inflation took off.

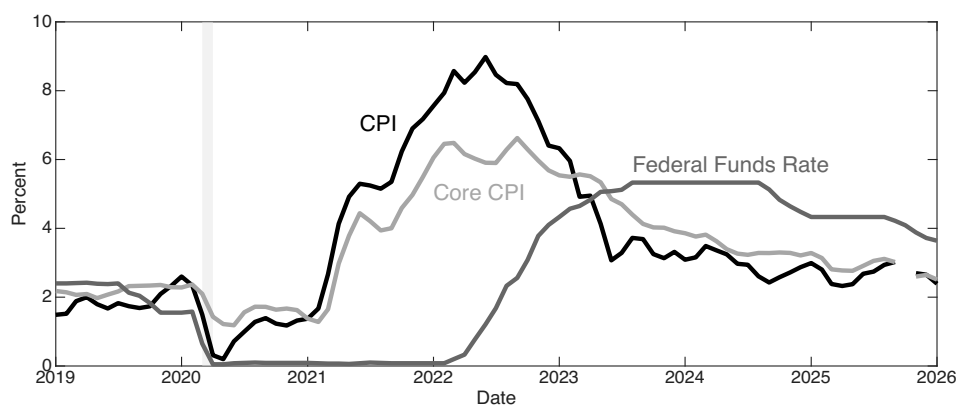


Figure 2.1: CPI inflation and Federal Funds Rate. Shaded area shows the recession.

This episode raises simple and fundamental questions.

- What caused inflation to surge?

Certainly, the Federal Reserve did not do anything unusual to interest rates.

Inflation continued to rise, hitting 9%, a level not seen since 1981. The Fed, along with the European Central Bank, the Bank of England, and many other central banks, did nothing for an unprecedented year. Conventional doctrine says that inflation will spiral upward as long as the interest rate is below inflation. Then only a period of interest rates substantially above inflation, inducing a deep recession like the early 1980s, will bring inflation back down. Yet inflation peaked and started to decline just as the Fed began to raise interest rates. Inflation went quickly back down to 3%, with no high real interest rates and no recession.

- Why did inflation peak and ease, rather than spiral away with interest rates still well below inflation?

The US settled in to a long aftermath with inflation about 3%, above the Fed's 2% target.

- Why is inflation persistent? What happens next? How can we avoid repeating this episode?

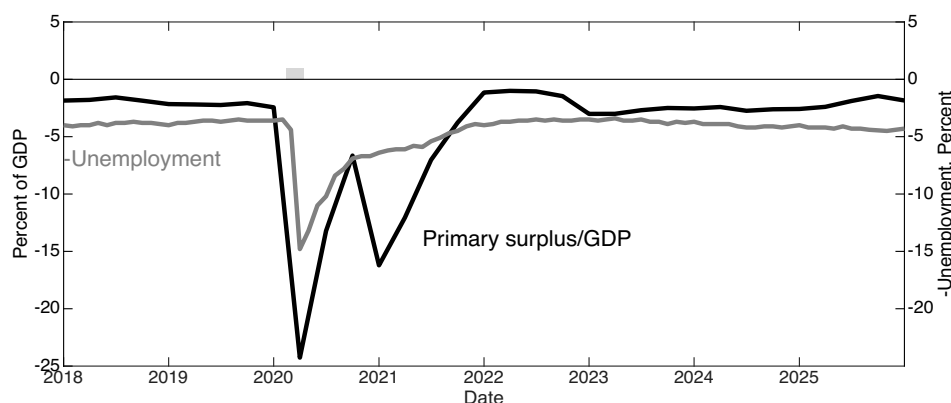


Figure 2.2: Primary surplus as a percentage of GDP and negative of the unemployment rate. Primary surplus is Federal Government Current Receipts plus Interest Payments less Current Expenditures. Shaded area indicates the recession.

Figure 2.2 documents the elephant in this room: the massive fiscal stimulus during and after the Covid-19 pandemic. The primary deficit hit 25% of GDP in the second quarter of 2020. (The primary deficit is spending less tax revenues, not including interest costs on the debt. It is the quantity that enters the theory, and it more directly reflects current policy decisions.) It subsided in the fourth quarter. But it surged again in the first two quarters of 2021, hitting hit 18% of GDP in the first quarter, though the pandemic and its economic impact were largely over, as seen by the recession shaded area and by the the unemployment rate. The primary deficit then settled down near its pre-pandemic level. Federal debt held by the public surged from \$17.2 trillion at the end of 2019 to \$24.5 trillion at the end of 2022, a

whopping \$7.3 trillion or 42% increase. Most of this borrowed and printed money (the Fed bought about \$3 trillion of the debt within days of its issuance) was simply sent to people and businesses as checks.

I do not here criticize this spending. Some response to the economic collapse of the pandemic and associated lockdowns was important. I happen to think that much spending was overdone and wasted, but that's not the point. This is what our government did. The wisdom of the spending is broadly irrelevant for its inflationary effect. (Leeper, 2025 has an excellent detailed history of Covid and post-Covid spending and its aftermath.)

The US was not alone. Many countries embarked on immense fiscal stimulus, and experienced inflation. Others such as Switzerland did very little borrowing, printing, and spending during and after the pandemic, and experienced little inflation. Barro and Bianchi (2026), especially their figure 1, shows a strong correlation. Countries that spent more had a larger cumulative 2020-2023 inflation.

2.2 The Fiscal Theory of the Price Level

We cannot simply point to deficits to explain inflation. Debt and deficits are clearly behind many large inflations. But debt and deficits often do not provoke any inflation. There is usually little correlation between debt or deficits and inflation across countries or over time. In particular, the stimulus of the 2008 recession produced no inflation. Why not? We need a framework to connect debt and deficits to inflation.

The fiscal theory of the price level offers such a framework. It states that the price level adjusts so that the real value of government debt (including money) equals the present value of the primary fiscal surpluses that will repay the debt.

$$\frac{\text{Nominal value of government debt}}{\text{Price level}} = \text{Expected present value of primary surpluses.} \quad (2.1)$$

Too much debt on the left hand side, relative to expected repayment on the right hand side, must drive up the price level. For my fellow economists who prefer symbols,

$$\frac{B_{t-1}}{P_t} = E_t \sum_{j=0}^{\infty} \beta^j s_{t+j}, \quad (2.2)$$

The price level is P_t . Primary surpluses are s_t . I write here the simplest version, with one-period nominal government debt B_{t-1} , a fixed real interest rate r and $\beta = 1/(1+r)$. Cochrane (2023) (and its online appendix) includes just about every generalization you can think of and many measurement and data issues.

Three stories are useful. First, one can think of fiscal theory as a simple application of price equals present value of dividends to government debt. Government

bonds are repaid by primary surpluses. If we quoted prices in Apple shares, we would similarly start to analyze the price of goods and services in terms of Apple shares by the present value of Apple dividends.

If people do not think a corporation will generate enough earnings to justify the value of its debt and equity, they try to sell its stock and bonds. But we cannot all sell, so in the end their effort drives down stock and bond prices. If people do not think the government will fully repay its debt, then people try to get rid of government debt. They try to buy goods and services or real assets instead, driving up prices. I call the present-value relation the “government debt valuation equation” as a result of this logic. It is not an “intertemporal budget constraint,” any more than price equals present value of dividends is a “budget constraint.” Alas, that misleading terminology is often used.

Second, one may say that money is backed by taxes. Inflation always results from too much money chasing too few goods. The government can soak up extra money by levying taxes in excess of spending. The government can also soak up money by selling bonds. But people only buy bonds if they think those bonds will be repaid by future taxes in excess of spending. Thus, the government soaks up today’s excess money by current and future taxes in excess of spending.

Fiscal theory can be seen in the context of the broad historical theories of money. Backing is the first theory: Paper money was a claim to gold, and gained value by the value of the gold. Clamshells is a second broad theory: Money is inherently useless, but limited in supply and used for transactions. Money gains value by that useful liquidity. That theory can apply to Bitcoin today. Viewing money as government debt offers Government debt is a third broad theory. Money is just instant-maturity government debt. So, we value money as a component of government debt, by its present value.

Now, this fiscal theory limits the kinds of stories we can tell, which is the point of a theory. Debts and deficits per se are not inflationary. *Debt and deficits are only inflationary if they are not backed by expectations of repayment.*

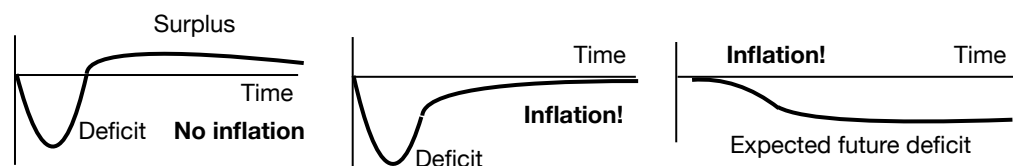


Figure 2.3: Three paths for expected primary surpluses, with different consequences for inflation.

Figure 2.3 illustrates. Each drawing describes how the surplus deviates from its

long-term average value (an impulse-response function). In the first case, a large deficit is accompanied by credible expectations of fiscal surpluses that over many years will repay the debt. The discounted sum of the initial additional deficit and subsequent additional surpluses is zero. This path causes no inflation.

This case illustrates typical and responsible fiscal policy. Governments occasionally face temporary spending needs such as wars or recessions, or they may wish to make valuable public investments like freeways. Governments borrow, and pay back over decades. Doing so spreads out the tax burden or spending retrenchment. Such well-managed debt allows a government to marshal far more resources than current taxes could provide to meet temporary exigencies, and taxes spread out over many years do less economic damage than very high tax rates for a short time.

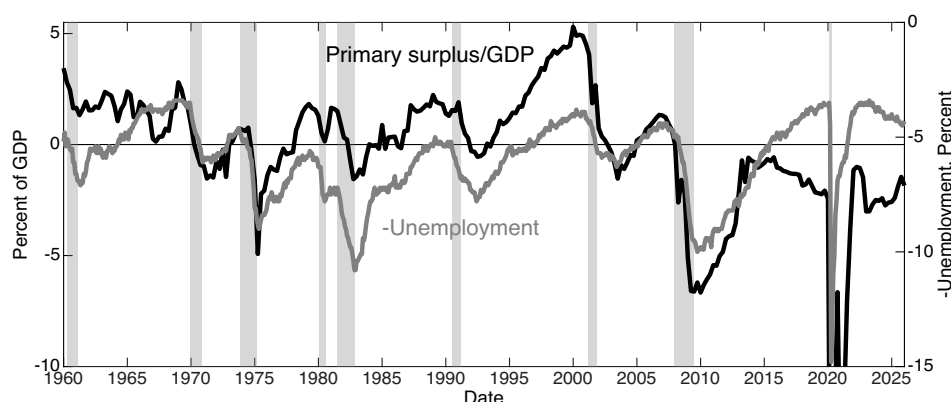


Figure 2.4: Primary surplus as a percentage of GDP and negative of the unemployment rate. Primary surplus is Federal Government Current Receipts plus Interest Payments less Current Expenditures. Shaded areas indicate recessions.

Figure 2.4 plots the primary surplus along with the negative of the unemployment rate for the US. Your first reaction to fiscal theory may have been “Surplus, what surplus? All we ever have is deficits.” But equations (2.1) and (2.2) take the present value of *primary* surpluses. Positive primary surpluses mean that debt grows at less than the interest rate, and therefore the present value holds. And the US, until recently, regularly ran primary surpluses. The government can also run slightly negative primary surpluses when government debt, including money, has a liquidity value, so people are willing to hold it while getting less interest than they demand on private investments. Fiscal theory can apply to a government that only issues non-interest-bearing cash, and thus benefits from seigniorage. I omit that consideration from (2.2) for simplicity, along with other generalizations. And, finally, just wait. If bondholders start to believe that the US will try to run large primary deficits forever, bondholders will run and a large inflation will break out.

You can see in Figure 2.4 the pattern of reasonably good fiscal policy. Primary

surpluses fall in recessions, and then rise to repay debt in the subsequent expansions. The correlation with unemployment shows that most variation in US surpluses or deficits comes from economic expansion or contraction, not changes in tax and spending policies. Variation in long-term economic growth also drives surpluses, such as the slowdown of the 1970s, the growth spurt of the 1980s and 1990s, and the decline in economic growth since 2000. Habitual surpluses have turned to primary deficits in expansions since 2000, which is a worrisome but novel turn.

In the second case of Figure 2.3, a deficit is not paired with credible promises of future surpluses to pay off the debt. The change in present value of surpluses here is negative, so the price level rises. Debt *that people do not expect to be repaid* causes inflation. The government pays for its spending by inflating away outstanding debt.

This is not a scenario we should expect to see frequently. A government that routinely inflates away debt will be unable to borrow in the first place, just like a government that frequently defaults. This scenario clearly does not describe the bulk of advanced-country history: In this scenario, a deficit *lowers* the real value of debt. The present value of surpluses declines, and a bout of inflation wipes out even more debt than the initial deficit. In reality, higher deficits generally *raise* the real value of debt, raise revenue, and do not produce large inflation. 2021 was the exception, not the rule. Moreover, if this were routinely the case, there would be greater inflation in a recession with deficits, and less inflation or deflation in booms with surpluses, the opposite of what we observe. This is all grossly counterfactual.

Wise governments *choose* the first path most of the time, to avoid inflation, and to keep up their reputation so they can borrow in times of need. We *should* see deficits followed by repayment, and deficits that *do not* cause inflation, most of the time, even (especially) under the fiscal theory of the price level. Fiscal inflation should be a rare pathology, not a regular occurrence.

This is all standard public finance 101, except that people tend to forget it once someone says the words “fiscal theory of the price level.” Many people assume that fiscal theory only describes the second case. They describe fiscal theory as applying only to pathological “fiscal dominance,” with the normal pattern labeled “monetary dominance” rather than well-managed fiscal theory. Somehow, corporations and governments that borrow in foreign currency can promise repayment, but governments that borrow in their own currency cannot do so. Many empirical researchers inadvertently specify that a fiscal-theory government *must* follow an unbacked fiscal policy as in the second case, and *may not* follow a responsible fiscal policy of the former case. They specify that a fiscal-theory government must follow a surplus process in which debts are not followed by subsequent surpluses, such as an AR(1). That’s a technical convenience, as it takes a few extra steps to write down an “s-shaped” path for the surplus such as the first case. But that assumption needlessly destroys the capacity of the theory to explain most of history. It causes spurious

statistical rejections of the resulting fiscal theory models. Researchers: do not do it. (Cochrane, 2023 Ch. 4, 24, and appendix, and section 4.9 have a more detailed discussion.)

The third case of Figure 2.3 highlights another unwelcome possibility. With no current debt or deficit at all, people may lose confidence that the government will repay its debts. They flee, forcing an inflation that seemingly comes from nowhere. There is a run-like mechanism to fiscal inflation: People dump debt today fearing that people next year will not roll over today's debt. Since inflation often seems to come from nowhere, or to surge on remarkably small news, such a scenario is a useful warning to governments that their reputations for repayment can be fragile.

Not pictured, present value thinking reveals another important mechanism. The discount rate for government debt matters as much as surpluses. A higher discount rate reduces the present value and can cause inflation just like reduced surpluses. Seen another way, higher real interest costs cause inflation just like reduced surpluses. We can represent this effect with a lower β or higher r in (2.2). Yes, higher real interest rates *raise* inflation, other things held constant. This is a force which we must overcome with other mechanisms if we wish to construct a theory in which higher real or nominal interest rates lower inflation. It is also a warning that sometimes higher interest rates might at times raise inflation in reality.

This effect is quantitatively important. The US has a 100% debt-to-GDP ratio. Each one percentage point higher real interest rate raises interest costs on the debt by one percentage point. That rise is equivalent to a one percentage point decline in the primary surplus to GDP ratio. That's a lot.

Empirically, inflation declines in recessions and rises in booms, despite the larger deficits of recessions and the surpluses of booms, because real interest rates decline in recessions and rise in booms (*Fiscal Theory* Ch. 4.4). Lower interest costs more than offset the lower surpluses of recessions, and vice versa. The discount-rate effect is larger than the cashflow effect, as often is the case in finance.

An important conceptual misunderstanding has led people astray in thinking about the value of debt as a present value of surpluses. A bond is a claim to a stream of coupons and principal, like $\{\$1, \$1, \$1, \dots, \$101\}$. Those payoffs are always positive and nominally risk free (absent default). They are only potentially risky because of inflation. Government debt is a portfolio of such bonds. Yet we describe government debt as the present value of a surplus that can be negative (deficits) and is risky and pro-cyclical—deficits occur in recessions, surpluses in booms. How can a portfolio of bonds, each of which has a positive and stable payoff, be a claim to a sometimes negative, volatile, and procyclical payoff? More directly, a government bond promises a dollar payment, not a share of the primary surplus. Just where did that connection come from?

The answer is that the government debt valuation equation applies to the entire portfolio of government debt, and includes new debt sales and repayment. We are used to applying valuation equations to individual securities. The government debt valuation equation is parallel to the valuation of an entire company rather than an individual share. For example, suppose a company has 10 shares outstanding, worth \$10 each, and pays a constant \$1 dividend per share per year, for a constant 10% return. We could say that \$10 per share is the present value of $\{\$1, \$1, \dots\}$, and the \$100 value of the company is the present value of $\{\$10, \$10, \dots\}$. Suppose now that the company will issue 10 more shares in the first year. It uses that issue to make a \$100 investment that will pay a similar \$10 forever. The value and cashflow per share and total return to the original shares have not changed at all. But we can also express the initial \$100 value of the company as the present value of $\{-\$90, \$20, \$20, \dots\}$. (The $-\$90$ equals the \$10 original dividend less the \$100 additional investment.) Here, we count value as if the initial stockholders had kicked in the \$100 investment themselves—which they might have done. The \$90 “loss” in the first period is compensated by an additional \$10 “gain” in subsequent periods. A negative “cash flow” and an s-shaped cashflow process, like my first example, emerge. The firm will be worth \$200 at the end of the first period, so if one calculates return as $(\text{cashflow} + \text{new value}) / \text{original value} = (-\$90 + \$200) / \$100 = 1.1$, the return is still 10%, riskless.

This is how the government debt valuation equation emerges and how it works. The deficits in the early periods of the debt-repayment case are funded by new debt issues, which are paid off by the extra surpluses that follow. The surpluses are not direct payments to existing bondholders. The accounting is correct. It is the useful way to look at government finances. But if you mistake the equation as the payoffs promised to specific government bondholders, you can be led astray. In particular, the negative cashflow of the first period ($-\$90$) is matched by higher value of the firm (\$200) to produce a constant return. If you miss that higher value, which is the claim to the subsequent higher cashflows, you will notice that deficits are large and procyclical—big deficits in bad economic times—and you will wrongly think that government debt is a risky and procyclical asset which should require a large average return, not the very low average return that government debt in fact has.

Stock dividends behave more like the second case. Dividend changes have a large permanent component. Corporate and personal debt behave more like the first case. Borrowing is followed by repayment. The useful analogy between fiscal theory and stock pricing—the price level rises by the same mechanism that stock prices fall—can lead one to assume falsely that government surpluses behave the same way as dividends. It is better to think of government debt as risky debt, in which initial borrowing is matched by later repayment, an s-shaped cashflow process. “Money as stock” (my own title in Cochrane, 2005) should really be “money as debt.”

2.3 Inflation and Repayment

So, a fiscal story for the 2021-2022 inflation has to think about why people in this case did not expect deficits to be repaid by higher subsequent surpluses or low interest costs, and why they did so in other episodes such as 2008 which did not lead to inflation.

That people did not expect a substantial portion of 2020-2021 deficits to be repaid, unlike the usual pattern, is plausible. In 2008, the US administration promised that current deficits would be followed by debt repayment. Yes, cynics chuckled as this promise is frequently made. But at least the administration made the promise. Return to small surpluses had been the historical norm (Figure 2.4). By contrast, the 2020-2022 fiscal expansion was devoid of any discussion of eventual repayment, let alone institutional mechanisms to guarantee repayment. For example, congress suspended or weakened S-PAYGO rules that require taxes or spending offsets for new spending (Leeper, 2025).

Recall also the economic zeitgeist and policy consensus of the era: “Fiscal stimulus” had been recommended to offset “secular stagnation” and “hysteresis” through most of the 2010s. The “savings glut,” “safe-asset shortage” and “exorbitant privilege” were said to provide an insatiable appetite for US government debt at low interest rates. Blanchard (2019) influentially opined that governments could undertake fiscal expansion without concern about repayment. Since interest costs on the debt would remain below the economy’s growth rate, the ratio of debt to GDP would melt away. Further to the left, but remarkably influential, “Modern Monetary Theorists” such as Kelton (2020) advocated that governments never have to repay debt. Borrow, print, hand out cash, and we will all be prosperous. Reflecting this consensus, Treasury Secretary Janet Yellen (2021), arguing for more fiscal expansion under the American Rescue Plan, said “with interest rates at historic lows, the smartest thing we can do is act big,” with no other mention of repayment. With 10 year treasury rates at 1%, with a decade of *negative* real interest rates in the rear view mirror, who is really going to worry about debt? Europe followed a similar path.

Government finances also benefited following 2008 by persistently low or negative real interest rates. Lower real interest rates act just like higher surpluses to hold down inflation. That good fortune is unlikely to happen again.

Why didn’t inflation jump with the first 2020 interventions, during Covid? The first big deficit was in the second quarter of 2020, yet inflation started February 2021 and peaked in mid-2022. One is tempted to wave one’s hands with the usual “long and variable lags.” Money piled in to checking accounts in 2020, but people did not get around to spending it until the pandemic eased in early 2021. Maybe. And indeed I will introduce a form of price-stickiness below that produces a delayed

response of inflation to a fiscal shock.

But another possibility is intriguing, and in any case illustrates fiscal theory principles and echoes a crucial longer history. In early 2021 the pandemic had passed, and the economy was recovering swiftly. Normally, the US would have passed from emergency deficit to regular government finances. The outgoing Trump administration's \$919 billion "Response and Relief Act" (12/27/20) and the new Biden administration's \$1,857 billion "American Rescue Plan" (3/11/21) brought a new round of transfers, seen in the second deficit surge of figure 2.2. The Biden administration kept going most of the "emergency" pandemic spending programs rather than cancel them. Indeed, it sought to make many permanent such as health insurance subsidies. The administration added more spending, for example with several hundred billion dollars of student debt cancellation. The administration and Congress also added semi-permanent spending initiatives. For example, the humorously named August 2022 "Inflation Reduction Act" added hundreds of billions of additional spending spread out over 10 years. The Biden administration unapologetically aimed to equal or outdo the Roosevelt administration's expansion of government spending programs. Programs that ultimately did not pass, such as the vast "green new deal" nonetheless weighed on people's views of what to expect in the future.

Like the US, the EU continued deficit spending after Covid, including the €750 billion NextGenEU program which started disbursing money in 2021. This new EU borrowing was even less clear about repayment since it did not include new EU taxing authority.

(It is popular in Europe to blame inflation on the energy price rise following Russia's invasion of Ukraine, echoed also in President Biden's memorable "Putin's price hike." However, inflation in Europe also clearly broke out in early 2021, nearly a year before the February 2022 invasion. European inflation was already 5.1% in January 2022. The energy price rise and European fiscal subsidies to help people pay higher prices may well have contributed to the eventual size of inflation, but were not its main initial spark.)

So, here is a more nuanced story for why inflation started in February 2021. While the pandemic was raging and the economy crashing, the US did what it always does in such an event: spend borrowed and printed money like crazy. That's not news—see 2008. But people reasonably expected that once the crisis was over the spending binge would also end and the US would return to at least normal levels of fiscal dysfunction. That the Biden Administration took this moment and the debt-doesn't-matter rhetoric so common at the time to undertake major new spending programs with no serious corresponding revenue was a signal that the US would not return to normal. This is when people surmised that much of the new debt would not be repaid. This is when inflation broke out.

Going along with this story a bit more speculatively, inflation *ended* in mid-2022 as it became clear that the Democrats would lose the House in the 2022 mid-term elections. This meant that the mooted \$6 trillion “green new deal” and similar spending initiatives would not pass.

As I survey in section 5.3 below, it is common that inflation erupts *after* a war or crisis, when a government decides to what extent to repay rather than inflate away debt, rather than the instant of the deficit. 2021 fits that pattern. At a minimum, this discussion helps us to focus on the important question: not so much how much debt or deficit is there, but when do people come to the view that it is not going to be repaid?

In the end, cumulative US inflation was 23% from February 2020 (CPI = 259.3) to February 2025 (CPI = 319.8). If we count expected inflation at 2% per year, then 13% of that price level rise was unexpected, and devalued government debt by 13%. Federal debt in the hands of the public grew from \$17.2 trillion in Q1 2020 to \$28.9 trillion in Q1 2025. Counting the expected deficit at \$1 trillion per year, we have a 39% unexpected fiscal expansion. ($(\$28.9 - \$5) / \$17.2 = 1.39$.) A 39% fiscal expansion with 13% unexpected inflation indicates people expected about two thirds of the new debt to be repaid and one third not. The magnitude of the inflation and the magnitude of the fiscal shock are in the right ballpark. (Barro and Bianchi (2026) calculate closer to one for one relationship between cumulative debt expansion and price level rise. The point is only that the order of magnitude makes sense.)

This fiscal theory analysis is different from standard IS-LM analysis. IS-LM also says that large budget deficits cause inflation. Summers (2021) famously made such a forecast ahead of time. (Less famously, a month earlier, and without IS-LM, so did Cochrane and Hassett, 2021.) But IS-LM predicts inflation via a static multiplier, when aggregate demand exceeds aggregate supply, and even if people expect debt to be repaid. IS-LM relies on the idea that people do not save for their own taxes that must retire debt. Fiscal theory is consistent with completely rational expectations, but only unfunded deficits cause inflation. Keynesian stimulus focuses on the flow deficit relative to each year’s GDP gap. Fiscal theory looks at the stock of debt relative to expected repayment. Fiscal-theory inflation can break out on fears of future inflation, and inflation can end when people learn that future deficits have been cured, all with no change in the flow deficit and Keynesian fiscal stimulus.

I offer this story as possible, maybe even plausible, but certainly not yet as proof. Proof in our business is hard to come by. But possibility or even plausibility of such a story is news, as this is far from the conventional wisdom. Then we sort through competing stories. (Hall and Sargent, 2025 and Leeper, 2025 also have excellent detailed fiscal analyses of the 2021-2022 inflation.)

“Expectations” are contentious and often lead to a fruitless discussion whether people are rational or not and whether they know anything about government bud-

gets. No, when we write down these equations we do not assume that Joe and Jane Doe sit around the kitchen table each night and update a spreadsheet with the latest deficit forecasts before deciding how much to spend the next day.

The bottom line is whether people, in aggregate, decide to save and hold government debt, or try to spend it, thereby driving up prices. That decision is based on a general faith in the institutions of government. In general, people need faith that the government will one way or another repay its debts. The question for bondholders today is whether and when the government will eventually respond to the drumbeat of warnings and the repeated gloomy forecasts, by fixing the underlying long-run fiscal problems.

Strong norms, traditions, and institutions including budget processes and a debt brake help to provide such confidence. A strong norm that repaying debt is sacrosanct helps. When people lose that faith, they try to spend rather than save government debt, and the price level rises. That's the mechanism which we capture by equations with expectations in them.

The save vs spend decision may also be influenced by a long list of frictions. Fiscal theory starts with the underlying supply and demand rather than look only in the frictions. Adding the frictions can be important for quantitative analysis, as we will soon see by adding sticky prices. In particular, the 2020-2022 stimulus may have been more powerful than previous ones because the government sent people checks directly, rather than buy or build things. That's not as obvious as it seems: If government debt and interest-paying reserves were seen as a good investments, then when the original households spent their money, others would increase their savings to hold it. Still, including these sorts of frictions in fiscal theory models is an excellent idea. Integrating heterogenous-agent (HANK) models with fiscal theory is an active and productive area.

You are likely hungry for better "proof." Examine some regression, analyst or CBO deficit forecasts, discount them back, and obtain an independent measure of the present value of surpluses. Contrast that prediction to the value of debt and "test" the theory. It is a natural impulse, commonly followed, and unproductive.

When price equals present value hit asset pricing in the 1960s, researchers had the same instinct. Forecast dividends, discount them back, "test" the present value model like good Popperians. It was a disaster. Without looking at a market price, nobody can calculate it within an order of magnitude. After a tumultuous few decades, asset pricers learned to face two deep theorems 1) Investors have more information than we do. Any empirical application of a model must be robust to that possibility. What if investors use a better dividend forecast? 2) Absent arbitrage, there exists a discount factor such that price equals present value of dividends. It is simply impossible to "test" the present value relation per se.

That does not mean asset pricing is hopeless or devoid of empirical content. Its rich empirical tradition respects these two rules. One capstone, Campbell and Shiller (1988), recognizes that the present value relation, using price-dividend ratios as a forecast variable (as one must do) is an untestable identity. But it is interesting and economically informative to see which terms of the identity account for price variation.

Rather than painfully re-learn the lessons of empirical asset pricing, we can simply adopt their hard-won lessons. That means the longing for an independent measure of what the value of debt should be, with which one can “test” the theory by comparing a prediction to the actual value of debt, will be as elusive as an independent measure of the value of stocks is, with which one can “test” price equals present value. Do not waste your time trying. And be attuned to the errors and hidden assumptions (particularly, agents have no more information than included in a forecast, and a specific discount rate model) that seem to produce such tests.

Chapter 3

A Fiscal Theory of Monetary Policy

A present value relation is part of a theory, not a complete theory in itself. And economics does not just tell stories around an equation. We construct full theories and compare them quantitatively to data. We also need to incorporate central banks into a theory of inflation.

So, let us elaborate the simplest possible full economic theory that incorporates the fiscal theory idea and let us think about how central banks affect the economy by setting nominal interest rates. We can then add complications and frictions as necessary.

3.1 Flexible Prices

The real interest rate is how much you expect to earn after inflation. For example, a 2% real interest rate results from a 5% nominal interest rate less 3% expected inflation. With flexible prices, the real interest rate is determined by real saving and investment opportunities independently of the nominal interest rate and inflation. Thus, if the central bank sets a nominal interest rate, it determines expected inflation with no effect on the real rate, output or any other real quantity.

In sum, our first ingredient is

$$\text{Expected inflation} = \text{Nominal interest rate} - \text{Real interest rate}.$$

With flexible prices, The real rate is unaffected by inflation and the nominal rate, so we can just treat it as a constant for our questions.

The government debt valuation equation (2.1) or (2.2) then determines *unexpected* inflation. I keep it simple to start, specifying short-term debt. Then nominal

debt—the face value coming due, the numerator on the left-hand side of the valuation equation—is fixed, as the number of shares of a stock outstanding is fixed on a day of bad news. So a decline in current and expected future surpluses must result in a higher price level and inflation, which lowers the real value of debt.

$$\text{Unexpected inflation} = -\text{News about present value of surpluses} / \text{Debt}. \quad (3.1)$$

Now, stop and admire what we have accomplished. We have a full, complete, rational-expectations and market-clearing economic theory of inflation, under interest rate targets and without money supply control. The central bank sets the interest rate. The Congress sets taxes and spending. Those two levers fully determine inflation and the price level. This theory is an important achievement, since our central banks follow interest rate targets and do not control money supplies.

Central banks matter! You might have thought that “fiscal theory” left no room for central banks, but that’s not the case. It is nice to have a theory in which central banks matter, and not just for hopes that central bankers will read the theory, invite one to give lectures, and buy one’s books, but because long experience suggests that interest rate targets do matter, and we want a theory that can hope to inform monetary policy.

But central banks do not fully control inflation. *Unexpected* inflation comes all from revisions to the present value of surpluses, fiscal policy. There is nothing that the central bank can do by setting interest rates to stop a fiscal inflation. Fully controlling inflation requires that monetary and fiscal policy cooperate. This is a commonly-stated but frequently-overlooked nostrum of monetary economics.

Box 3.1: Fiscal Theory of Monetary Policy

In equations, the two ingredients of the flexible-price fiscal theory of monetary policy model are

$$\frac{1}{1+i_t} = \beta E_t \left(\frac{P_t}{P_{t+1}} \right) \quad (3.2)$$

$$\frac{B_t}{P_t} (E_{t+1} - E_t) \left(\frac{P_t}{P_{t+1}} \right) = (E_{t+1} - E_t) \sum_{j=0}^{\infty} \beta^j s_{t+1+j}. \quad (3.3)$$

Here i_t denotes the nominal interest rate at time t , P_t is the price level, B_t is the quantity of one-period debt issued at time t and coming due at time $t+1$, r is the real interest rate, $\beta \equiv 1/(1+r)$, and E_t denotes the expected value at time t of whatever comes next. To derive (3.3), move (2.2) one period forward, multiply and divide by P_t , and take the innovation $E_{t+1} - E_t$.

It is often convenient to linearize these equations, leading to

$$i_t = r + E_t \pi_{t+1} \quad (3.4)$$

$$(E_{t+1} - E_t) \pi_{t+1} = - (E_{t+1} - E_t) \sum_{j=0}^{\infty} \rho^j \tilde{s}_{t+1+j} \quad (3.5)$$

where $\tilde{s}$ is the real primary surplus divided by the steady-state value of debt. The interest rate target at time t determines next period nominal debt, B_{t+1} , which is why the interest rate affects the expected future price level P_{t+1} and expected future inflation. If you want to be more formal, you can set these equations up as a representative-agent general-equilibrium economy with a constant endowment. See Cochrane (2023), Ch. 2.

So, in a few steps we have an elegant and complete theory. But it is unrealistic. First, if the central bank raises interest rates and there is no change to fiscal policy, then inflation *rises*. Higher interest rates *raise* inflation? Yes. When you think about it, this prediction makes perfect sense of the flexible-price model we have written down. In the long run, when prices move, higher interest rates and inflation must go together. A country with permanent 10% inflation must have roughly 12% interest rates. Figure 5.1 below shows that over the two decades from 1970 to 1990, interest rates and inflation moved together. In a flexible-price model, you see the long run right away.

A mechanism may help to understand how higher interest rates can drive inflation: If expected inflation does not rise, the higher nominal rate appears to be a higher real rate. People demand less today, and more in the future. That demand lowers the price level today and raises the expected price level in the future.

This model behaves analogously to monetarism with flexible prices. In that case, higher money growth produces higher inflation instantly. The money supply is the nominal anchor for the level of prices. In this model, higher interest rates produce higher inflation right away. Debt vs. the present value of surpluses is the nominal anchor for the level of prices.

If the model's prediction does not fit your intuition or the world, we need additional ingredients. I add sticky prices next. Sticky prices leave long-run neutrality intact. Higher interest rates still mean eventually higher inflation. But sticky prices lead to interesting and more realistic short-run dynamics.

That higher interest rates (with no fiscal change) raise inflation in the long run is still a contentious proposition. But the long run is hard to see. Central banks seldom leave interest rates alone for long enough to see the long run. Practical people and central bankers have little experience with the long run. Milton Friedman's (1968)

insistence that higher money growth only means higher inflation in the long run met similar resistance.

Second, if there is a fiscal shock, a decline in present value of surplus as I argue happened in 2020-2021, then this flexible-price model predicts a one-time price-level increase, a one-time “transitory” inflation. In the continuous-time version of the model, the price level jumps overnight. That prediction too is unrealistic. Again, we need to add sticky prices. Both considerations are also ameliorated by including long-term debt.

In reality, the chain linking the nominal anchor to the inflation boat is full of interesting and flexible links. Sticky prices, sticky wages, information frictions, credit frictions, banking frictions and more constitute the “monetary transmission mechanism.” While there is an immense amount of work on this mechanism based on monetarist or new-Keynesian foundations, adding those links on top of fiscal theory foundations is still wide-open territory. And understanding those frictions is important for quantitative policy advice.

I have decomposed policy to a “monetary policy shock,” a surprise increase in the nominal interest rate with no change in surpluses, and a “fiscal policy shock,” a surprise decrease in the present value of surpluses with no change to interest rates. Real-world events usually combine the two shocks. In response to inflation, both monetary and fiscal policy usually tighten. In the real world there are also feedbacks; higher interest rates lead to endogenous changes in surpluses, both directly and by inducing recessions that lead to deficits. But given the institutional separation between central banks and taxing and spending authorities, it is useful to characterize the theory and understand policy by seeing what each can do alone.

3.2 Sticky Prices and Long-Term Debt

To incorporate sticky prices, I add fiscal theory to the most standard macroeconomic model possible, the two-equation new-Keynesian model (Woodford, 2003 and Galí, 2015). This model includes an IS (intertemporal substitution) curve, which says that higher real interest rates lower consumption and output relative to future consumption and output, and a Phillips curve, which says higher output and higher expected inflation raise inflation.

(In discrete time, the IS-Phillips model is

$$\begin{aligned}x_t &= E_t x_{t+1} - \sigma(i_t - E_t \pi_{t+1}) \\ \pi_t &= \beta E_t \pi_{t+1} + \kappa x_t.\end{aligned}$$

Here x is output, i is interest rate, π is inflation, E_t is expected value, and σ , β , κ are constants.)

Since both IS and Phillips curves involve expected future inflation, this model too only determines expected inflation given interest rates. Thus, I again use the government debt valuation equation to pick unexpected inflation and complete the model.

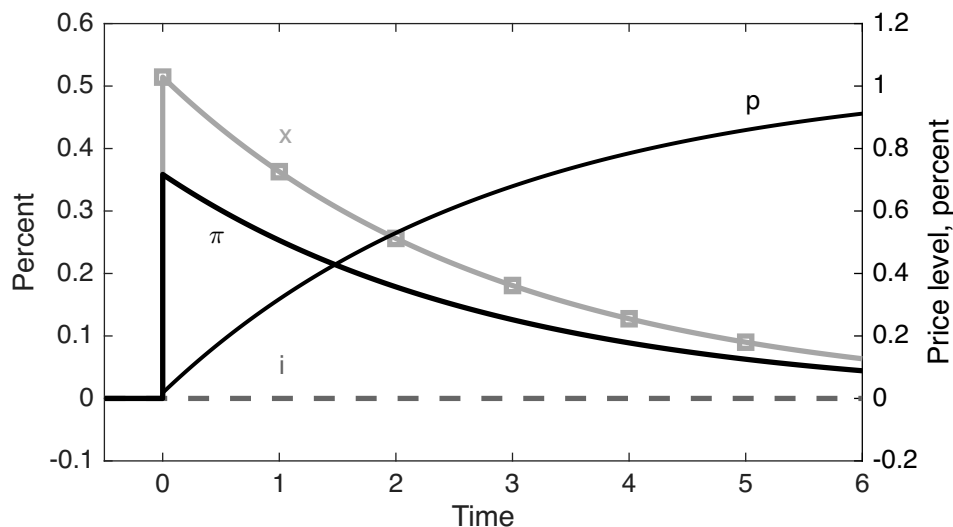


Figure 3.1: Response to a fiscal shock with no change to interest rates. The interest rate is i , inflation is π , the price level is p , and year-on-year inflation is $p_t - p_{t-1}$.

Figure 3.1 presents this model's response to a fiscal shock—an unfunded deficit, a decline in the present value of surpluses—with no change in interest rates. This is what I argue happened in 2020-2021. This is the exercise that produces an instant price level jump and a one-period burst of inflation with flexible prices.

The fiscal shock produces an inflation surge. Instantaneous inflation jumps up on the day of the shock and then declines. The price level rises slowly rather than jump up, resolving that unrealistic prediction of the flexible-price model. Bondholders lose by a long period of inflation above the nominal interest rate, low real returns that eat away at the value of debt.

We often think that inflation reacts to monetary and fiscal policy with a lag. I plot inflation measured year over year, which gives rise to some delayed response. Also, this is a plot of a one-time news event. Also, the extent of fiscal shocks and how much debt will be repaid develop over time. Below I discuss some additional mechanisms for a delayed inflation response.

If you focus on the central bank while ignoring fiscal policy, inflation seems to come from nowhere, as interest rates are constant. Inflation peaks on its own and goes away on its own, even if the central bank does nothing. Once the price level has risen enough to wipe out value of outstanding debt equal to the unfunded deficit,

the force for further inflation is spent. There is no need for high interest rates or a recession to stop inflation from spiraling up, or to bring it down again. The price level is permanently higher, though inflation goes away, a fact that voters seem to have noticed despite central bankers and economists telling them not to worry.

In short, the exercise displays exactly the features of the episode that seem puzzling from the perspective of standard models.

Output also surges. The government undertook the fiscal expansion to offset other shocks that lowered output. Thus, this unfunded fiscal shock creates a real stimulus. It's not "fiscal stimulus," in the standard sense, since it has nothing to do with standard Keynesian or new-Keynesian mechanisms bearing that label. It works more like the monetarist stimulus from printing money and handing it out.

What about monetary policy? Figure 3.2 asks of the same model, what happens if the central bank raises interest rates temporarily, *with no change in fiscal surpluses*? I highlight the qualification. Most analyses of monetary policy include a fiscal contraction—the opposite of Figure 3.1—along with higher interest rates. Taxes rise or spending falls to pay higher interest costs on the debt and a disinflationary windfall to bondholders. Once we see the joint fiscal and monetary essence of such disinflation, though, it seems a misleading measure of what the central bank can do all on its own. Central banks do not have the power to compel higher taxes or lower spending. So I plot responses to interest rates *without* any change in surpluses, to understand what central banks can do alone without induced fiscal policy.

In the top panel, with short-term debt, we see that just adding sticky prices, higher interest rates still *raise* inflation throughout. Sticky prices only slow down that process. Intuitively, with no change in fiscal surpluses, the average over time of interest costs on the debt must be zero. The initial period of high real interest rates (interest rate greater than inflation) must be balanced by a later period of low real interest rates (interest rate below inflation). Thus, the inflation path cannot stray too far from the interest rate path.

The bottom panel of Figure 3.2 adds a second ingredient, long-term debt. With these two ingredients, higher interest rates do temporarily lower inflation and output. In the long run, higher interest rates still raise inflation, as you can see if you look hard at the right-hand side of the graph. But beyond that difference, this looks a lot like the standard response to a monetary policy shock.

The *mechanism* is not that of the standard story, however. With long-term debt, the basic government-debt valuation formula becomes

$$\frac{\text{Nominal market value of debt}}{\text{Price level}} = \text{Expected present value of primary surpluses.}$$

The nominal market value of debt now is the quantity of debt times its price, no longer fixed at one. By raising interest rates persistently, the central bank lowers

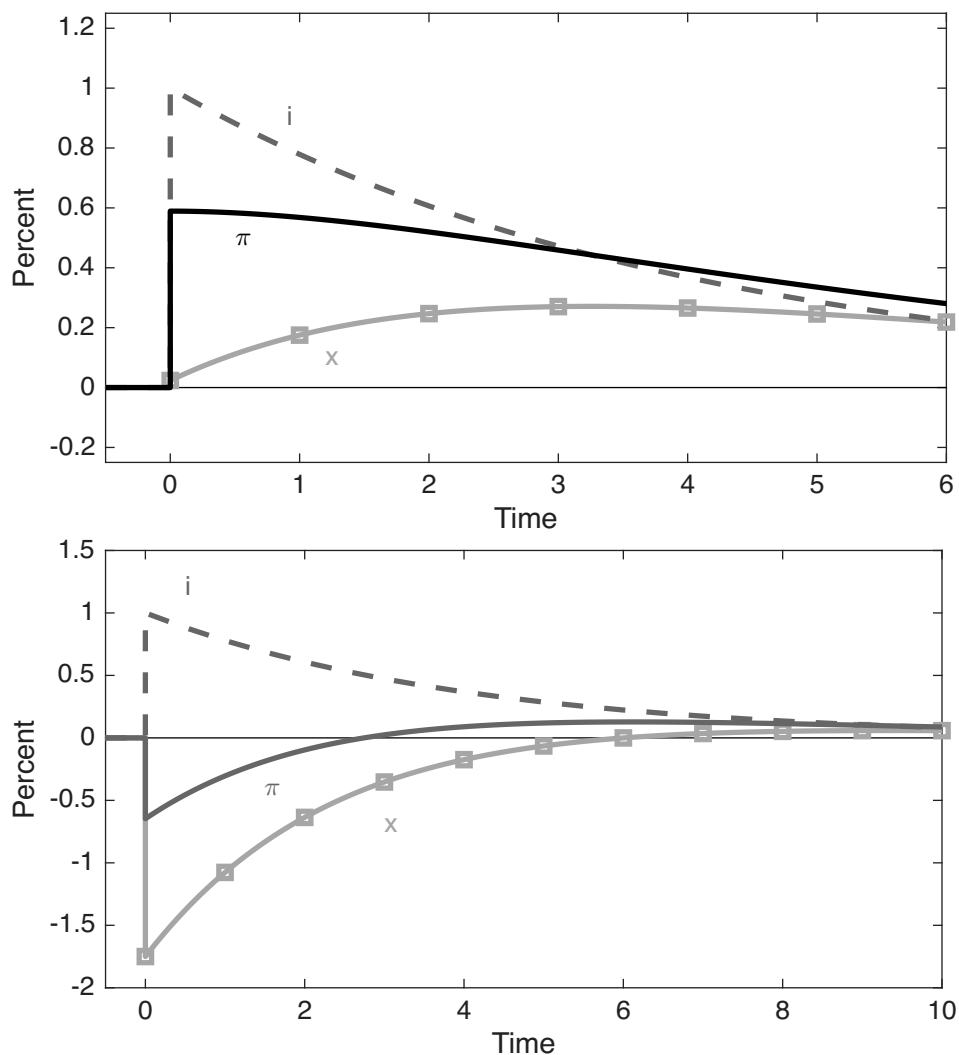


Figure 3.2: Response to a monetary policy shock with no change to fiscal surpluses. Top: short-term debt. Bottom: Long-term debt. The interest rate is i , inflation is π , and the output gap is x .

the prices of long-term bonds, and hence lowers the nominal market value of debt in the numerator of the left-hand side. With no change in surpluses and a constant real rate, the present value of surpluses does not change. Thus, the price level on the left-hand side of the valuation equation must fall.

Intuitively, at the original price level, government debt is a good deal relative to surpluses. People try to buy more government debt and therefore consume less, driving down the price level. Or, the lower value of government bonds means people

are less wealthy. They want to consume less and so drive down prices.

Box 3.2: Unpleasant Arithmetic

With long-term debt and a constant real rate in the flexible-price model, the valuation equation becomes

$$\frac{\sum_{j=0}^{\infty} Q_t^{(j)} B_{t-1}^{(t+j)}}{P_t} = \sum_{j=0}^{\infty} \beta^j B_{t-1}^{(t+j)} E_t \left(\frac{1}{P_{t+j}} \right) = E_t \sum_{j=0}^{\infty} \beta^j s_{t+j}$$

where $B_{t-1}^{(t+j)}$ is the quantity of j maturity debt outstanding and $Q_t^{(j)} = \beta^j E_t(P_t/P_{t+j})$ is the price of j period debt. Raising the interest rate persistently raises the future price level P_{t+j} . That lowers bond prices $Q_t^{(j)}$. With no change on the right-hand side, the numerator on the left has fallen, so the price level must also fall. Equivalently, as expressed in the middle equality, there is a sort of budget constraint on the sequence of price levels. Higher values of far-future prices must imply lower values of near-term prices. This is “unpleasant arithmetic.”

With sticky prices, the price level cannot move instantly. The real interest rate rises instead, so that the present value on the right-hand side declines to match the lower value of bonds. The real interest rate rises through lower inflation, since the central bank fixes the nominal interest rate path. Lower inflation eventually brings about the lower price level.

The different mechanism also leads to different predictions in other circumstance. Inflation eventually rises. With no ability to change surpluses, the central bank can only create less inflation right away by accepting more inflation in the future. I call the mechanism “unpleasant interest rate arithmetic,” in honor of Sargent and Wallace (1981). Sims (2011) calls it “stepping on a rake,” as lower inflation now comes back to bite later. Since the effect comes through lower long-term bond prices, pre-announced policies have no effect. And actually raising the short-term interest rate is not important. All that matters are expectations of higher future short rates, which lower long-term bond prices.

A central banker faced with a fiscal shock such as the one graphed in Figure 3.1, desiring minimal output disruption, may want to promptly raise rates. Doing so, we get the sum of the two responses, a small and roughly permanent inflation rise and very output change. Inflation must rise so bondholders pay for the fiscal expansion, but a more drawn out response has smaller output effects. However, a central bank wishing to smooth output and inflation in response to shocks to the other equations might want to follow a different policy to offset those shocks. Optimal policy in this sort of model is an inviting question. (Kaplan and Miyahara (2026) compute some

optimal policies.)

Still, despite quite different foundations and mechanisms, we have a conventional result for the 2020-2021 episode. If central banks did not want to go along with inflation resulting from a large unfunded fiscal expansion, they could have helped by raising interest rates much more quickly. When central banks did get around to raising rates (Figure 2.1), inflation came down more quickly than the fiscal shock figure 3.1 suggests. Adding the monetary response of Figure 3.2 after a year or so of fiscal response, we get inflation that indeed comes down more quickly. But inflation then settles in to a long and stubborn small inflation, as in the right-hand side of Figure 3.2, which is where we seem to be as I write.

Box 3.3: New-Keynesian FTPL

The model in Figure 3.1 is the continuous-time version of the new-Keynesian model,

$$\begin{aligned}
 E_t dx_t &= \sigma(i_t - \pi_t)dt + u_{d,t} \\
 d\pi_t &= (\rho\pi_t - \kappa x_t)dt + u_{p,t} \\
 dv_t &= (rv_t + i_t - \pi_t - \tilde{s}_t)dt \\
 i_t &= \theta\pi_t + u_{i,t} \\
 du_{j,t} &= -\eta_j u_{j,t}dt + d\varepsilon_{j,t}; \quad j = d, p, i \\
 d\tilde{s}_t &= -\eta_s \tilde{s}_t dt + d\varepsilon_{s,t}.
 \end{aligned} \tag{3.6}$$

I use $\theta = 0$ and $d\varepsilon_{i,t} = 0$, and I plot the response to $d\varepsilon_{s,0}$. I use $\kappa = 0.25$; $\sigma = 0.5$; $r = 0.01$; $\rho = 0.01$. I develop the equations and solution in Cochrane (2025).

To extend this model to long-term debt, replace equation (3.6) with

$$\begin{aligned}
 dv_t &= (rv_t + i_t - \pi_t - \tilde{s}_t)dt + d\delta_{r,t} \\
 dq_t &= [(r + \omega)q_t + i_t]dt + d\delta_{r,t} \\
 E_t d\delta_{r,t} &= 0.
 \end{aligned}$$

Here q_t is the log nominal price of the portfolio of government bonds. I specify a geometric maturity structure with face value at maturity j proportional to $\omega e^{-\omega j}$. $\omega = 0$ is a perpetuity, $\omega = \infty$ is instantaneous debt. The bottom panel of Figure 3.2 uses $\omega = 0.03$ and $\eta_i = 0.25$. I plot the response to a $d\varepsilon_{i,0}$ shock with $d\varepsilon_{u,0} = 0$.

3.3 2021-2025 Inflation

In sum, this simple but complete model offers an interesting match to the puzzling features of the 2020-2025 episode. Inflation surges with a large fiscal expansion featuring little talk of repayment, and with no unusual interest rate movement. Inflation peaks rather than spiral away once the fiscal expansion is over, even though central banks still do nothing. When central banks start raising rates, inflation comes down more quickly. But a stubborn small inflation remains. The 2020-2022 era is unusual because large deficits led to lower, not larger, values of the debt/GDP ratio, as inflation reduced the real value of debt. This inversion of the usual outcome is the mark of an unfunded fiscal expansion.

A large fiscal inflation and central bank inaction were not necessarily a mistake. There was genuine fear of economic collapse during Covid. Inflation can be justified as a Lucas-Stokey state-contingent default, in which existing bondholders shoulder some of the burden of large rare shocks. Now, in my view, the spending was overdone. The pandemic was a snowstorm shock, a simultaneous reduction in supply and demand that would quickly melt, not a long-lasting demand shock needing demand stimulus. The pandemic required public health and insurance functions, but not WWII levels of deficit. There was no need for a rare state-contingent default via inflation. But that argument is not necessary for the analysis of what happened.

Inflation was and always is a *choice*. If we do not want to repeat 2021-2022, we need to face that fact and make different choices in the next crisis.

The 2020-2022 inflation episode was instructive in many additional ways. The economic zeitgeist and policy consensus of the 2010s, featuring constantly insufficient demand for goods and services but insatiable demand for government debt, led many to prescribe deliberate fiscal expansion. In 2020, our policy makers did just what was asked. They got slapped in the face with inflation. We learned a sharp lesson. We are a supply-constrained economy after all, with a finite demand for government debt. If you want growth, you need efficiency, not stimulus.

3.4 Other Views and Methods

There is a large and growing academic literature on the causes of the 2020-2022 inflation. Bernanke and Blanchard (2023), Comin, Johnson, and Jones (2023), Smets and Wouters (2024), Bianchi, Faccini, and Melosi (2023), Alves and Violante (2026), Kaplan and Miyahara (2026), and Andolfatto and Martin (2026) are excellent recent examples. In a superficial reading, many of these efforts seem to disagree with my conclusion that an unfunded fiscal expansion was the main cause of inflation. Instead, they seem to attribute inflation to supply, demand, or other shocks. That impression mostly comes from misreading what the calculations actually say.

3.4.1 Shock Attribution and Counterfactuals

These and other authors write down specific models, similar to but more elaborate than the models in Box 3.3 based on an IS curve, a Phillips curve, and rules for monetary and fiscal policy. The authors add “shocks” to each equation. The shock is just whatever number makes the equation hold exactly. Shocks are seldom independently measured. “Supply” shocks, in particular, are usually shocks to the Phillips curve, which expresses inflation as a function of expected future inflation, output or employment, and the shock. A “supply” shock is then an inflation shock, a movement in inflation outside the economic model, a movement in inflation that we don’t really understand. Saying that a supply shock caused inflation really says that an inflation shock caused inflation.

Solving the model, one can express movement in any variable such as inflation as a sum of past shocks to each of the equations. Then, we can add up how much inflation comes from “demand” (IS curve), “supply” (Phillips curve), monetary (interest rate policy rule), and fiscal (surplus = function of other variables) shocks.

Now, the story I have told agrees that there were large economic dislocations during the pandemic, which show up as shocks to the structural equations of economic models. The government responded to these shocks with monetary and fiscal accommodation, a river of transfers and low interest rates. That *response* caused inflation. Leaders in charge of fiscal and monetary policy did not wake up one morning and send people \$5 trillion worth of checks out of the blue.

The models separate each equation into a rule—how a variable responds to other variables—and a shock. Given my story, the fiscal blowout and monetary tardiness that caused inflation may well have been largely the “rule” part of policy, not the “shock” part, and so are not captured by shock accounting.

But “cause” refers to all the counterfactuals along the way, not just to the initial spark. Had supply and demand shocks not happened, there would not have been inflation. But had monetary and fiscal policy reacted differently, there would equally not have been inflation. Monetary and fiscal policy are not helpless in the face of a shock.

Following shock-accounting logic, one really should say that a lab-leak shock (or, if you prefer, a wet-market bat-eating shock) caused inflation. But that fact does not mean we must focus entirely on lab safety and ignore monetary and fiscal policy if we wish to avoid inflation in the future.

You should also be suspicious on economic grounds as well as statistical philosophy of an interpretation that omits monetary and fiscal policy. Every well-specified economic model has a nominal anchor, which is almost always located in monetary or fiscal policy. Supply and other shocks are the carrots that lead the horse of monetary and fiscal policy to pull the cart of inflation. But the horse pulls the cart, not

the carrot.

Since shocks are almost always measured as the error in an equation of the model, what shocks one measures depends sensitively on the model. These shock-accounting methods take models literally, not as the quantitative parables that they are. The calculations can then seize on model predictions that we may not feel are robust, or that we may not wish to emphasize in our account of the episode.

For example, Kaplan and Miyahara (2026) specify a new-Keynesian model with heterogenous agents. Unlike many other papers, they include explicit fiscal foundations and the possibility of funded vs. unfunded debt, and they include data on fiscal deficits to measure fiscal policy. Therefore they can find fiscal shocks, which many shock-attribution exercises can't do even in principle. They also include the stepping-on-a-rake long-term debt mechanism for monetary policy. Still, Kaplan and Miyahara don't attribute inflation primarily to fiscal shocks. In their model, as in my Figure 3.1, a fiscal shock causes an immediate inflation jump. But in the data, the first big deficits happened in 2020, while inflation only ramped up in early 2021. Their model concludes that the fiscal shock cannot have caused the inflation.

Now, most users of such models do not view an immediate inflation jump as a robust and trustworthy prediction of the model. Maybe people held on to their Covid-era transfers until the pandemic eased, we say. Maybe "pent-up" demand or "excess" money holdings were spent six months later, we say. Many analysts allow "long and variable lags" when interpreting data via such simple models. Though a simple model describes instant inflation, we know that more complex models can account for a six-month. Most empirically-oriented models include ad-hoc lags in IS and Phillips curves to produce lagged responses. Below, I give an example of a modified Phillips curve that produces such a lag. In a HANK setup, delay might result from greater idiosyncratic income volatility during the pandemic. When we use simple models, we account informally for such lags.

But formal shock attribution does not allow this sort of hand-waving and loose interpretation of a six-month lag. If inflation didn't happen instantly with the shock, the shock did not cause the inflation, period. That is logically impeccable, treating the model as a literal description of reality. But once you understand the evidence, and the necessary and valuable simplification inherent in economic models, you might want to weigh the evidence less decisively.

I offered a different story (or epicycle or excuse if you wish) for the lag between the first fiscal expansion and inflation: Initially, people expected the additional debt to be repaid, as recession and crisis borrowing usually are repaid. People changed their expectations of repayment in early 2021 when they saw the unusual additional fiscal largesse of that year, and learned of the government's plans for permanent additional unfunded spending.

None of the above papers can detect such a shock. Kaplan and Miyahara, for example, assume a single value for the fraction of any deficit that is expected to be repaid, applied both in 2020 and 2021. Many other models rule out unfunded fiscal shocks out a priori, or the nominal anchor is implicit so we can't evaluate alternative policies. In particular, a standard new-Keynesian model specifies passive fiscal policy. It thereby assumes that there is no such thing as an unfunded fiscal expansion. Equivalently, it specifies that surpluses adapt to inflation determined by other shocks to the model, so what I call a fiscal shock is defined as a fiscal rule response.

Now, one should rightly resist too many epicycles, complications, model extensions, shocks, and ex-post excuses. I certainly cannot complain that other authors didn't come up with a story that just occurred to me while writing this book. One may dislike my story for many reasons. But now you can see how different assumptions and specifications lead to different conclusions. (Bassetto and Miller (2025) tell a related story, that a bit of inflation causes people to get more information, which if negative can cause inflation to surge.)

Shock accounting is useful. It is useful to know that the pandemic saw big errors in the Phillips curve or technology side of a given model, unlike similar decompositions of 2008 in which "demand" (preference or financial intermediation) shocks predominate. That finding corroborates my interpretation that we got inflation because leaders thought incorrectly that they were seeing a demand shock, and they should pay more attention to the possibility of supply shocks. The de-throning of real business cycle theory in favor of new-Keynesian demand management left some wisdom behind. But do not interpret shock accounting to say what it does not say.

Since "cause" means counterfactuals, one can address the roles of monetary and fiscal policy in these frameworks by asking counterfactual questions. What alternative outcomes would we have seen if monetary and fiscal policy had acted differently; if they had followed different rules, facing the same set of economic shocks, or if governments had introduced policy shocks to offset shocks in other equations?

For example, Kaplan and Miyahara (2026) calculate counterfactual outcomes, including one with no unfunded fiscal stimulus. Absent the stimulus, they find that a larger deflation and GDP decline would have occurred as a result of the initial demand shocks. When supply (productivity) shocks hit, Kaplan and Miyahara find that a short-run inflation would still have occurred, but the long-run price level would not have risen as much. This sort of calculation goes much more to the heart of the matter, but has not so far been the focus of analysis.

3.4.2 An Example

To make these points concrete for readers who like equations, I reduce the typical new-Keynesian model down to the flexible-price limit, consisting of a Fisher equation combining IS and Phillips curves, and an interest-rate policy rule following the Taylor principle. Adding disturbances,

$$i_t = E_t \pi_{t+1} + u_t$$

$$i_t = \phi \pi_t + v_t$$

$$u_t = \rho u_{t-1} + \epsilon_t$$

$$v_t = \eta v_{t-1} + \delta_t.$$

Eliminating the interest rate i_t , the equilibrium condition is

$$E_t \pi_{t+1} = \phi \pi_t + v_t - u_t;$$

Iterating forward with $\phi > 1$, and imposing a rule that expected inflation may not explode, the solution is

$$\pi_t = \frac{1}{\phi - \rho} u_t - \frac{1}{\phi - \eta} v_t \quad (3.7)$$

$$i_t = \frac{\phi}{\phi - \rho} u_t - \frac{\eta}{\phi - \eta} v_t. \quad (3.8)$$

Adding

$$u_t = \sum_{j=0}^{\infty} \rho^j \epsilon_{t-j}$$

$$v_t = \sum_{j=0}^{\infty} \eta^j \delta_{t-j},$$

inflation and output are expressed as a sum of underlying shocks ϵ_t and δ_t .

We can recover a time series of the disturbances and thus shocks from data on interest rate and inflation by inverting the model solution,

$$v_t = i_t - \phi \pi_t$$

$$u_t = \frac{\phi - \rho}{\phi - \eta} (i_t - \eta \pi_t).$$

Now we can compute what fraction of inflation and interest rate outcomes in (3.7) and (3.8) come from the real disturbances u_t and shocks ϵ_t vs. the policy disturbances and shocks v_t and δ_t .

In this model, if data followed $i_t = \eta\pi_t$, interest rates rising somewhat less than inflation, then we would say that a monetary policy shock accounts for inflation. If data follow the policy rule, $i_t = \phi\pi_t$, we would say that the real shock accounts for inflation. Though interest rates moved strongly, they followed the rule, not a shock. In a counterfactual analysis, we can say that if the central bank had followed a different rule, with larger reaction ϕ , the model predicts less inflation for a given real shock. (See the first term on the right-hand side of (3.7).)

Inflation that came with no movement in interest rates, as we experienced in 2021, would be attributed to a real $v_t = -\phi\pi_t$ combined with a monetary-policy shock $u_t = -(\phi - \rho)/(\phi - \eta)\eta\pi_t$. Inaction can also be a shock. However, when two shocks happen at the same time, authors often attribute one as the reaction to the other, so the shock attribution could come out differently. The correlation of such shocks is part of the assumed rule.

Actual decompositions get different results because they use different (and more realistic) models. In particular, they avoid the implication of a big monetary policy shock arising from high inflation and no change in interest rates because the policy rule reacts to the pandemic contraction in output or employment, and moves slowly via lagged interest rates on the right-hand side.

Where is fiscal policy? What if the inflation were due to a big fiscal expansion, as I have argued, undertaken either as a predictable reaction to events or as a “shock,” much bigger than usual given those events? Where is the nominal anchor anyway?

A full specification of this model includes government debt. The price level is connected to the expected present value of surpluses, and unexpected inflation is connected to the revision in that present value,

$$\pi_{t+1} - E_t\pi_{t+1} = (E_{t+1} - E_t) \sum_{j=0}^{\infty} \rho^j [(i_{t+j} - \pi_{t+j+1}) - s_{t+j}] = \varepsilon_{s,t+1}.$$

New-Keynesian models assume “passive” fiscal policy, that surpluses respond to inflation as determined above. Thus all fiscal policy, even the trillions of the covid and post-covid eras, is assigned as part of the “rule” not the “shock,” so shock-attribution analysis ignores it.

3.4.3 Supply and Demand Shocks

To get a more concrete sense of shock-attribution analysis and to tie it to what I have done, Figure 3.3 graphs the effect of transitory (AR(1)) demand and supply shocks with no change to interest rates or to fiscal policy. I use the same new-Keynesian plus fiscal theory model as shown in Box 3.3.

A “demand” shock is a shock to the IS curve, a change in the natural real interest

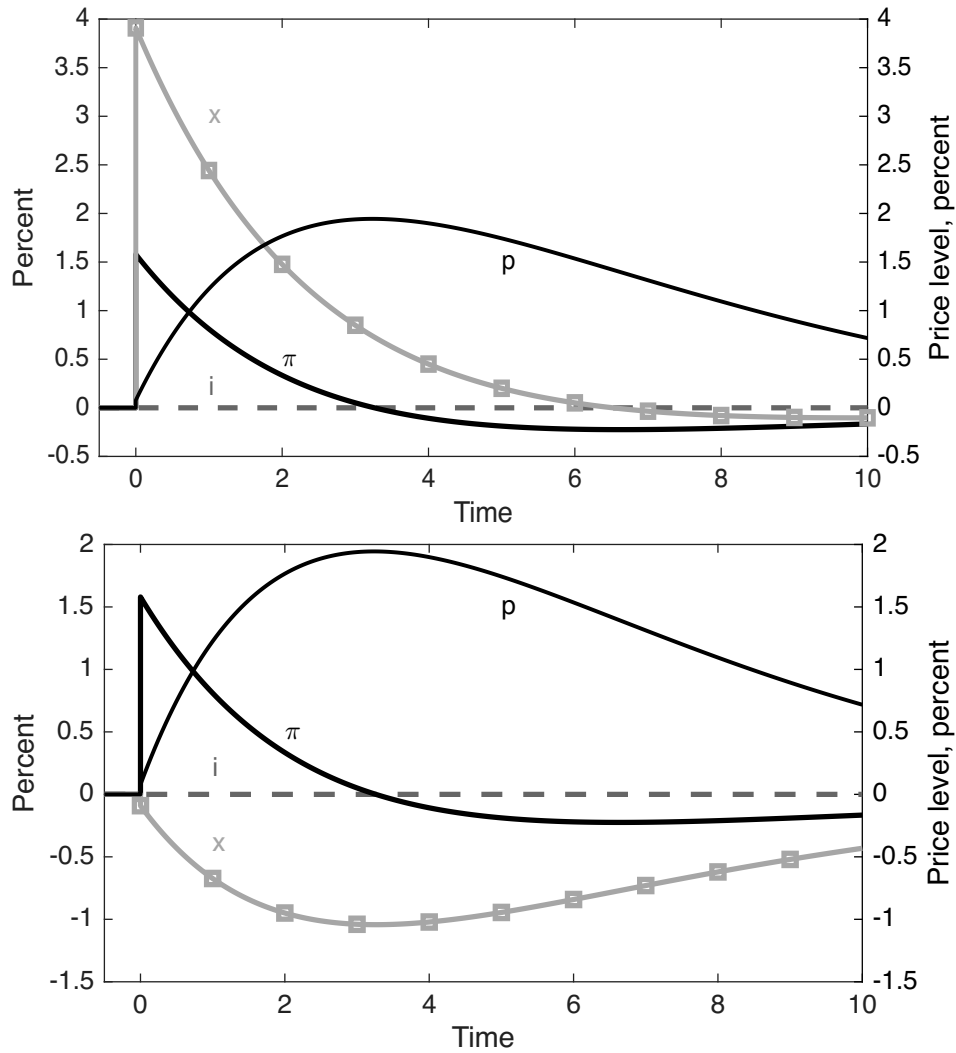


Figure 3.3: Response to a demand, real interest rate, or IS curve shock (upper) and to a supply, or Phillips curve shock (lower). The interest rate is i , inflation is π , the price level is p .

rate or in the consumer's impatience or discount factor, a $u_{d,t}$ in the notation of Box 3.3. This shock raises output and inflation.

The inflation and output surge look a lot like the result of the fiscal shock of Figure 3.1. Shock accounting, which focuses on the near-term responses, would have trouble telling them apart. There is a big difference: early inflation is matched by a later small and persistent deflation, so that the price level returns to where it started. Only a change in fiscal or monetary policy can permanently change the price level.

(Monetary policy can also raise the long-run price level. In the flexible-price model, higher interest rates raise higher future inflation, with no subsequent deflation to bring back the price level. The monetary policy path of 3.2 also permanently raises the price level. Higher interest rates raise the amount of nominal debt.)

The “supply” shock is a shock to the Phillips curve, an increase in inflation given future inflation and output. I graph a negative supply shock, which is also inflationary. The path of inflation is, here, exactly the same as it is for the demand shock. Output, however, declines. Negative supply shocks are stagflationary, and output moving the opposite way from inflation is the key measure of a supply shock. Again, with no change to monetary or fiscal policy, the price level returns to its previous level.

As the shock-accounting exercises find, it’s reasonable that the pandemic and lockdown policy response produced a deflationary demand shock, the opposite of the top panel, together with and an inflationary (negative) supply shock, as in the bottom panel. That combination produces a large fall in output, with little change in inflation or the price level. I called it a snowstorm shock above: the stores are closed, and nobody wants to go out anyway.

The government responded to the prospect of a huge output fall by offering a massive fiscal stimulus. If we now add a large fiscal shock, as graphed in 3.1, the government can offset some of the large fall in output, at the cost of inducing inflation, and a permanent price-level increase. The *inflation* response is roughly the same as in Figure 3.1. Thus, Figure 3.1 did tell the central story for inflation. So the fiscal expansion really is the central feature of the inflation we observed. Without it, the price level would have returned to its original value.

One can digest many shock accounting and counterfactual exercises as variations on this scheme. Kaplan and Miyahara (2026) account for the small initial deflation with a demand shock initially larger than supply shock, and inflation comes from a later larger supply shock and fiscal shock. Whether the fiscal or monetary policy movements needed to account for the data are “shocks” or “rules” clearly matters a lot for shock accounting but not for the result.

The distinguishing feature of monetary and fiscal policy is the long-term price-level rise, which the supply and demand shocks cannot produce on their own. However, conventional shock accounting focuses on the fit of model equations in the period of the shock, for example the size of the relative movements in output and inflation that distinguishes supply from demand shocks. The long-term price level rise only shows up in changing the baseline from which other shocks are computed when the price level has written. Thus shock accounting largely leaves out the most important piece of evidence.

Figure 3.3 shows that inflation can move despite no change in fiscal or monetary

policy. What happened to the nominal anchor and fiscal theory of the price level? With sticky prices, the real interest rate or discount rate part of the present value formula changes. Higher discount rates, or higher interest costs on the debt, lower the present value of surpluses and raise the price level. Looking for example at the response to the demand shock in the top panel of Figure 3.3, the period of negative real interest rates (inflation above nominal rate) is initially balanced by the later period of positive real interest rates, so there is no change to the present value of surpluses and no change to the price level. Later, after some of the period of negative real interest rates has passed, higher real interest rates dominate the present value, accounting for the higher price level. But that discount-rate change is transitory, so the price level eventually goes back to where it started.

In the model, the price level *is* always tightly controlled by the nominal anchor and not by real and relative-price shocks. But the nominal anchor is the discounted value of surpluses, not surpluses themselves. Other shocks, by inducing changes in the real rate of interest, induce changes in the nominal anchor even with unchanged surpluses and interest rates. As often in finance, discount factor variation rather than cashflow variation is the dominant force of short-run present value variation.

One can also view the model more skeptically. In such an interpretation, the undiscounted nominal anchor is a weak long-run attractor. The discount rate soaks up other shocks so that the present value relation still holds. In this view, one does not take seriously the model's predictions for the real interest rate. A similar skeptical view of discount-rate variation as an explanation of price changes occurs in finance.

Interpreted either way, we see a good reason why fiscal theory has not been immediately noticeable to practical people.

I do not take the calculation further, offering a competing shock-attribution and counterfactual analysis. This model is far too simple for that purpose. Indeed, now that you have seen some of the sausage, you may share my skepticism of calculations that take any model as a literal descriptions of reality and lean heavily on the exact size and timing of events. The challenge is not so much to make a calculation in a more complex or "true" model as it is to make a calculation that relies on predictions that are robust across a range of models, including models that we don't have yet. Here, I stray on the side of excess simplicity in the quest for robustness and transparency, and also what's appropriate for this book.

The big issue here is not which calculation is right or wrong. All models make assumptions, and all tie data to mechanisms through models. The point is that one must understand how model-based calculations work, what restrictions they put on the data, and weigh the evidence. One cannot take summary conclusions as proof by black box.

Chapter 4

Theories of Inflation

There are many theories of inflation. The most important ones, that plausibly can be or are used to think about our economy are

- Popular theories. Supply and relative-demand shocks; monopoly, greed, price-gouging, hoarding, and so forth.
- Monetarism. The price level is determined by money supply.
- Old-Keynesian economics. This is the standard view expressed in central bank words and the policy community.
- New-Keynesian models. This is the standard model in academia since 1990 and in the equations of central bank models.
- The fiscal theory of the price level. The price level is determined by the quantity of debt including money relative to expected repayment.

I claim that the fiscal theory, married as I have done to a rational-expectations economic mechanism, is the only known, complete, economic theory of inflation under interest rate targets that is consistent with current institutions. All those qualifiers matter. I will show the historical progression towards a theory of inflation under interest rate targets, how fiscal theory solves outstanding puzzles, and how it, at last, completes such a theory. I also claim that recent history provides as clean a set of experiments as we ever get in macroeconomics to distinguish these theories of inflation. You can guess which one comes out on top.

This analysis is also a bit of a poster for analyzing episodes and economic history guided by simple models alongside or in advance of formal model evaluation and testing. The latter has not really gotten anywhere on these issues and has led a generation of economists to ignore elephants in the room.

4.1 Popular Theories and the Nominal Anchor

In every inflation, at least since Emperor Diocletian in the early 300s, politicians and popular opinion have quickly blamed “greed,” “monopoly,” “price gouging,” “hoarders,” “speculators,” “middlemen,” and so forth. Round up the usual suspects, usually followed by price controls, rationing, subsidies, harsh punishments, and other interventions. The Roosevelt administration, facing deflation, encouraged monopolization and price floors in the same spirit. In 2021 our politicians quickly echoed these sentiments. Central bankers and the policy community blamed “shocks,” in particular “supply-chain shocks” and “relative-demand shocks.” In the pandemic it was hard to get parts and lots of people wanted Pelotons rather than restaurant dinners. So, the price of Pelotons went up.

All of these are stories about *relative* prices, the price of one thing vs. another. If indeed, the great chicken conspirators colluded to raise chicken prices in 2021, they did so to raise chicken prices *relative* to beef prices and wages. Supply-chain and relative-demand shocks raised Peloton prices *relative* to wages and restaurant dinners. These stories do not explain why the price of *everything* and eventually wages went up. Inflation is the latter phenomenon. Inflation is the common component of prices. Inflation is, fundamentally, a decline in the value of money.

Inflation is often buried in relative price changes. The price level is the overall level of a rough ocean. But sea-level rise is not the sum of waves. In the end, only monetary or fiscal policy determine the overall level of prices. Why did Peloton prices go up, rather than wages and restaurant prices go down? Because the government gave us the extra money to pay higher prices on everything.

Governments and central banks often respond to relative-price shocks with demand stimulus. They feel, with some reason, that some prices rising and other prices and especially wages falling would be more economically disruptive than all prices and wages rising, but some more than others. They *choose* inflation as the least-bad outcome.

Such accommodation is the standard story for the oil-price shocks of the 1970s. Oil prices by themselves did not cause inflation. But governments met the oil-price shock with demand stimulus that caused inflation, while perhaps lessening the economic disruption. Europe in 2022 met energy price rises with deficit-financed subsidies to enable people to pay the higher prices. That’s how you turn a relative-price shock into overall inflation. This classic story of the 1970s seems to have been forgotten or lost when contemporary authors blame inflation on supply shocks alone.

“Supply” and “relative demand” shocks have become dog-ate-my-homework, it-wasn’t-our-fault excuses for inflation. While politically convenient, that excuse is an astonishing admission of powerlessness. It implies that the next time some nebulous “shock” comes along, our governments and central banks will be equally unable to

do anything about it.

No. “Shocks” might be a *reason* for inflation, but they are not an *excuse* for inflation. Inflation is a *choice*. If central banks and governments are not proud of the choice to inflate in 2020-2021, they should prepare to make better *choices* next time around. Many countries, including my hosts Switzerland, did so 2020-2021.

These errors persist, even in sophisticated circles, for a reason. The nominal anchor is not usually visible in day-to-day affairs. If oil prices or supply-shocked goods prices rise, and fiscal or monetary policy do nothing, measured inflation rises for a while. Product-market slack or reduced employment reflect the lower demand in other industries for quite some time, rather than instantly lower prices and wages. The relative-price shock may pass before the nominal anchor takes hold. Above, I showed how discount-rate movements dominate the nominal anchor in response to supply or demand shocks, which look just like prices disconnected from the anchor without careful analysis. That was a linear model. Adding a nonlinearity, downward stickiness, further obscures the nominal anchor for everyday observation.

A small economy with a fixed exchange rate to the dollar is a useful case to keep in mind. The nominal anchor is the dollar. Local inflation still does not mirror dollar inflation one for one. Relative price shocks cause local prices and wages to rise and fall. In the end, we know that the price level cannot wander too far from that of the US. But it can wander quite a ways for quite a while. Similarly, inflation varies across countries of the euro and states of the US, though they share the same nominal anchor and their price levels cannot permanently diverge.

Beware, though, that prices are not mechanically sticky. The chain to the nominal anchor can tighten and prices react quickly. Even if the original 2020 fiscal shock caused the 2021 inflation rather than revised repayment expectations, that is only a six month to a year lag.

4.2 Monetarism

Monetarism remains a popular underlying theory of inflation, in part for its simple elegance. Monetarism states that the price level is determined by the interaction of money supply and demand. Money demand is proportional to nominal income, the product of the price level times real income. Thus, increasing the money supply must lead to an increase in nominal income, so that people demand the supplied money. Real income rises in the short run, and the price level rises in the long run.

In monetarism’s clearest statement, money is intrinsically worthless. However, by law or social convention we all use the same intrinsically worthless tokens to mediate transactions. That “liquidity” or demand gives money value. The value is proportional to the nominal income people must buy with money.

Monetarism is a beautiful theory. But monetarism requires a clean distinction between “money” and “bonds.” When the interest rate is zero or if money pays the same interest rate as bonds, then money and bonds are perfect substitutes. Assets we hold anyway for savings purposes can be used for transactions. We then live a perpetual “liquidity trap” (or “liquidity heaven,” also “optimal quantity of money”). An exchange of money for overnight debt is irrelevant. Today’s ample interest-paying reserves mean we live in that world.

Most of all, monetarism only holds if the government *controls the money supply*. If the government supplies money “elastically,” as the 1913 Federal Reserve Act commands, then the relation linking money to nominal income describes how the government provides money in response to nominal income, not the other way around. And nominal income, including the price level, can be anything it wants to be. Monetarists such as Friedman (1968) preached against interest rate targets and passive money policies for just this reason. Target the money supply instead, they said.

But our central banks target interest rates, and do not control any monetary aggregate. Before 2007, the Fed set the overnight interest rate by offering a small amount of reserves that did not pay interest. One might think of as controlling money supply, but only on a daily basis. The Fed shifted the money supply each day to hit the interest rate target. Now the Fed targets interest rates by simply setting the rate it pays on abundant interest-paying reserves. Other central banks, including New Zealand and the ECB, have had simple interest-rate targets enforced by borrowing and lending corridors since the 1990s. Moreover, monetarism teaches that inside money such as checking accounts also satisfy money demand and therefore the government must control their quantity. Today there are no reserve requirements and inside money is created freely.

In sum, monetarism’s basic assumptions are violated by our current institutional framework—interest rate targets, ample interest-paying reserves, no control of inside money, and no control of the overall money supply. The correlation of monetary aggregates with nominal income reflects how demand for money, freely supplied, responds to inflation and output, not the other way around.

One may also still complain about theory. Monetarists really never solved the problem of multiple equilibria with interest-elastic money demand, and they keep changing their mind about which monetary aggregate to use.

Box 4.1: Monetarist Theory

Under monetarism, with an interest rate target the price level is indeterminate. With $MV(i) = PY$, if the central bank pegs the interest rate, that can determine V , but nothing pins down joint movements of M and P .

Even targeting the money supply is not enough to determine the price level with interest-elastic demand. Briefly, suppose $M_t = P_t Y_t V^{-\alpha t}$. With $i_t = p_{t+1} - p_t$, constant money supply and constant output, and lowercase letters denoting logs of uppercase letters,

$$m + \alpha v(p_{t+1} - p_t) = p_t + y.$$

All we can say about the price level p_t is that it follows a difference equation

$$p_{t+1} = \frac{1 + \alpha v}{\alpha v} p_t + \frac{1}{\alpha v} (m + v - y).$$

The difference equation is explosive, so there is only one bounded solution $p_t = m - y$. But no economics restricts explosive inflation, so any solution is valid. Fiscal theory can select one initial price level.

See Cochrane (2023) Chapter 19.2 and in more detail Cochrane (2011a,b,c).

But let us not quibble about theory. Let us defer to its advocates' view that the theory is logically complete. Let us invite the same attitude about fiscal theory theoretical quibbles. What about the facts? How can we tell fiscal theory and monetarism apart?

Fiscal theory and monetarism entirely agree on a central proposition: If you print up \$3 trillion and send people checks, inflation will follow. Friedman famously suggested that the government drop money from helicopters to cause inflation. To a fiscal theorist, money is a form of government debt. Dropping money from helicopters is a good signal that taxes will not rise to soak up the money.

Monetarism and fiscal theory disagree fundamentally on a different proposition: Suppose the government gives people \$3 trillion of new money, but simultaneously *takes back* \$3 trillion of treasury debt. This is an open market operation, not a helicopter drop. To a monetarist, this operation has *exactly* the same effect as a helicopter drop. The quantity of money has increased. That's all that matters. Money is different from bonds. To a fiscal theorist, this operation has no first-order effect whatsoever. The total quantity of government debt has not changed, nor have the surpluses that repay the debt. An open-market operation is an open-change operation. Give people two \$5 bills and one \$10 bill for each \$20. Will that get them to spend? No. The Fed is just a gigantic money-market fund, owning treasury debt and offering interest-paying shares that trade for \$1 per share. How inflationary are money market funds? To first order, do we really care if we hold Treasuries directly, through private money-market funds, or through the Fed's money-market fund? If in 2020-2021 the Treasury had sent people shares in a money market fund that holds treasury debt rather than bank reserves funded by the Fed's treasury

purchases, would that really have caused no inflation?

Fiscal theory focuses on a “wealth effect” of government debt and money: Inflation comes from having too much of both at what seems like an artificially high value. Monetarism focuses on a “portfolio effect:” One special kind of debt, reserves and cash, drives the price level. The other, Treasury debt, does not.

Most of the historical episodes adduced to support monetarist theories of inflation involve printing money to cover intractable deficits. These are just the sort of episodes where monetarism and fiscal theory agree. Inflationary episodes do not come from mistaken money supply control in healthy economies with sound public finances.

Fiscal theory and monetarism may disagree a bit on the magnitude of a helicopter-drop’s effect. If government debt is much larger than the money stock, a given helicopter drop is a larger proportionate rise in the money stock than it is a rise in government debt, so monetarism predicts a quantitatively larger response.

We can imagine a near-ideal experiment to tell fiscal theory and monetarism apart: First, create \$3 trillion of reserves and *exchange* them for government bonds. See what happens to inflation. Then create \$3 trillion of reserves and hand them out, essentially dropping money from helicopters, with no announcement of taxes or future spending restraint to soak up that money. See what happens to inflation. The theories make clear predictions: Monetarism says the two exercises will produce exactly the same inflation. Fiscal theory says only the second will produce inflation.

Our governments just ran this experiment. In three rounds of quantitative easing the Fed brought reserves from under \$50 billion in 2007 to \$2,800 billion in 2014. The corresponding assets, mostly treasury and mortgage-backed securities, rose from \$880 billion in 2007 to \$4,500 billion at the end of 2014. Quantitative easing had no discernible effect on inflation. Then, in 2020-2021 the Fed increased reserves from \$1,727 billion (February 2020) to \$4180 billion (Dec 2021) and leveling off at \$3281 billion (Aug 2025). Assets rose from \$4,171 billion to a peak of \$8,965 billion in 2022. But this time the Fed financed deficits, allowing the Treasury to send people checks of all this new money without having to convince investors to hold trillions of new treasury debt. This time, we saw substantial inflation.

It would be hard to ask for a clearer test between monetarism and fiscal theory. The immense size puts quibbles to rest. Quantitative easing raised reserves by a factor of 50, i.e. by 5,000%. Quantitative easing should have been an atom bomb, a hyperinflation. Instead we are left arguing whether quantitative easing might have lowered long-term bond yields by 10 basis points or so and for how long.

Yes, in simple fiscal theory the Fed’s monetization of debt was likewise not centrally important to 2021-2022 inflation. The overall quantity of debt and repayment expectations are central, not whether the extra debt is held in the form of interest-

paying reserves backed by treasuries or directly. So our criticism of the Fed for monetizing those deficits should be limited. When central banks buy debt in return for non-interest-bearing cash, that is more plausibly inflationary. But we should think of that really as financial repression: holding down interest rates, forcing banks to hold low-interest rate debt at inflated prices, or buying directly from the treasury at inflated prices.

There are second-order effects in both cases. Short-term treasuries and reserves aren't exact substitutes for all investors. The Fed also lowered the maturity structure of debt by buying long-term treasuries. The Fed bought government-guaranteed mortgage backed securities, channeling investment to housing. Monetarists raise the flag of M2, which did not rise as much in the quantitative easing era as it did in the Covid era. But the Fed does not control M2. If M2 is unhinged from open-market operations, open market operations and the Fed remain irrelevant for inflation. But it is hard to argue that these second order effects overturn the size and clarity of the experiment.

One might imagine an updated monetarist view in which treasury debt is also money. Much finance literature, such as Krishnamurthy and Vissing-Jorgensen (2012), finds a liquidity value to treasury debt. Then quantitative easing is still irrelevant, as it exchanges one kind of money for another. But then the fiscal expansion of the Covid and post-Covid era counts as an increase in the money supply which is inflationary.

Now, the fiscal theory easily accommodates a liquidity value of government debt, including zero-interest cash. These demands generate interest-rate discounts and value premiums for some kinds government debt, when those forms of debt are scarce. But expected repayment still anchors the overall price level. Backed money works the same way: backing plus liquidity value. An expanded monetarist view would put scarce supply and liquidity demand at the center of the price level, while assuming a passive fiscal policy so repayment is never a concern. The question is which force is dominant.

In quantitative easing, the Fed bought long-term debt and mortgage-backed securities, so such a view would have to extend "money" to those securities. This view would overturn a century of monetarist analysis in which open market operations were thought to be inflationary. There is also nothing like the correlation of M2 with nominal income on which to base such a theory. Federal debt held by the public as a percent of gross domestic product has been as low as 22% in 1975 and over 90% following WWII and today. Fiscal theory measures debt relative to expected repayment, which allows wide fluctuation in the debt-to-GDP ratio without inflation.

4.3 Old-Keynesian Policy View

We need a theory of inflation based on interest-rate targets. There are three contenders today: the old-Keynesian/IS-LM/policy view, the new-Keynesian view, and fiscal theory married to the new-Keynesian view.

The three theories share two classic ingredients: Higher interest rates correspond to lower output and employment—the IS curve. Lower output and employment correspond to lower inflation—the Phillips curve. Both IS and Phillips curves are centered on expected inflation: Nominal rates above expected inflation correspond to lower output, and inflation above expected inflation corresponds to higher output. The theories differ on how expectations are formed.

To contrast the theories, I use a common simple framework. (This discussion summarizes Cochrane, 2024a.) The traditional IS-LM, old-Keynesian view, reflected in most policy analysis to this day, thinks of expectations as slow-moving and adapting to experience of inflation. For a simple representation, let expected inflation simply be last period’s inflation. (Actual models of this sort usually specified a longer distributed lag.) Then, we can write the IS and Phillips curves

$$x_t = -\sigma(i_t - \pi_{t-1}) \quad (4.1)$$

$$\pi_t = \pi_{t-1} + \kappa x_t \quad (4.2)$$

where x is output, π is inflation, and i is the nominal interest rate.

I’m most interested in how interest rates affect inflation. So, eliminate output x_t , and we get a relationship between interest rates and inflation,

$$\pi_t = (1 + \sigma\kappa)\pi_{t-1} - \sigma\kappa i_t. \quad (4.3)$$

This simple model lets us quickly exhibit standard basic doctrines.

- *Inflation is unstable under an interest rate peg.*

The coefficient $(1 + \sigma\kappa)$ in (4.3) is greater than one. Any inflation that starts then grows geometrically, following $(1 + \sigma\kappa)^t$. More inflation means a lower real interest rate, which boosts output and creates even more inflation. Friedman (1968) describes a similar spiral. A deflation spiral is the same thing in reverse. Low inflation means a high real interest rate which lowers output and lowers inflation even more. This is a story frequently told of the early 1930s. It mirrors some of the “debt-deflation” thinking of the time. It was a clear worry of the Fed and policy community in 2008 and during the zero-bound era. That fear motivated fiscal stimulus and quantitative easing. The model predicts that interest rates below inflation should have led to an upward inflation spiral in 2021. Writing

$$\pi_t = \pi_{t-1} - \sigma\kappa(i_t - \pi_{t-1}),$$

inflation increases when interest rates are below inflation and vice versa.

I emphasize a peg, for its clarity and its importance as a doctrinal question in monetary policy. Inflation is unstable more generally for any fixed or stochastic path of interest rates.

This little model also captures the conventional doctrine of the effect of monetary policy.

- *Higher interest rates lower inflation, going forward.*

The coefficient $-\sigma\kappa$ on the interest rate is negative in (4.3). If the central bank raises the nominal interest rate, expectations do not adjust immediately. The higher real interest rate lowers output. Expectations in the Phillips curve also do not adjust immediately, so lower output lowers inflation. Raising the nominal interest rate sets off a downward spiral, which keeps going until the central bank gets the interest rate back under the inflation rate.

Figure 4.1 illustrates instability under a peg (left) and how interest rates lower inflation (right).

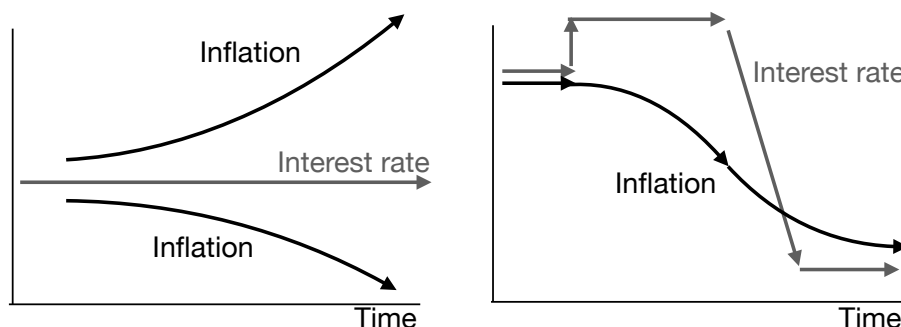


Figure 4.1: Dynamics of the old-Keynesian, adaptive-expectations model.

In addition,

- *To lower inflation, higher interest rates must cause a recession.*

With the backward-looking Phillips curve (4.2) output (or employment) x must fall in order to reduce inflation.

Since interest rate pegs are unstable, said Friedman (1968), target the money supply. But our central banks set interest rates. We need a theory of inflation under interest rate targets.

John Taylor, in particular Taylor (1993) and Taylor (1999), rode to the rescue.

Suppose that the central bank systematically reacts to inflation by raising interest rates more than one for one with inflation. If inflation gets going, the nominal interest rate will automatically rise by more than inflation, which bring inflation back down again. In the little model, use

$$i_t = \phi\pi_t + u_t. \quad (4.4)$$

Then (4.3) becomes

$$\pi_t = \frac{1 + \sigma\kappa}{1 + \sigma\kappa\phi}\pi_{t-1} - \frac{\sigma\kappa}{1 + \sigma\kappa\phi}u_t. \quad (4.5)$$

With $\phi > 1$ —the “Taylor principle” that interest rates react more than one for one to inflation—the coefficient on inflation is now less than one. Inflation is now stable.

- *By following a Taylor rule, central banks stabilize an economy which is naturally unstable.*

The economy is like a trained seal, balancing a ball on its nose. The ball is naturally unstable. If the seal pegs his nose, the ball slides off to one side or another. But by artfully moving his nose more than one-for-one with movements of the ball, the seal can stabilize the ball. If the central bank wishes to lower inflation, the bank deliberately moves its nose in the opposite direction, gets the ball rolling, and then follows inflation down. Thus, this model produces inflation that declines going forward. This is a classic tale told of the 1980s.

This has been a remarkably durable view of monetary policy. The view of the economy was set down in the mid-1970s, building on Hicks’ IS-LM apparatus from the 1940s. The Taylor rule was discovered informally by central banks in the early 1980s and embraced by academics by the early 1990s. It remains the cornerstone of central bank and policy orthodoxy today with prominent adherents such as Blinder (2024). If you ask central banks what they do, they offer this explanation. Expectations are treated a little more flexibly today, which I discuss later, but this does not change the central doctrines set out above.

This standard doctrine does not include an economic “nominal anchor” such as the money supply or debt. Inflation and the price level are given by past inflation and price level plus whatever aggregate demand and central bank policy push inflation around. The price level does not jump unpredictably. It has to be pushed up or down.

People who think in this framework do not necessarily err by attributing inflation to relative-price forces. Without a nominal anchor, the price level is in some sense the sum of individual price and wage decisions. Indeed, the old-Keynesian tradition from which this view springs thinks of inflation entirely as a sum of relative-price decisions: wage bargaining by firms and workers, pricing policies of firms, “cost push” and “demand pull” inflation, and so forth, all unconstrained by some overall

forces dragging the price level to some anchored value. Monetary and fiscal policy can push or resist around the edges, but they are just one more force.

4.4 New-Keynesian, Rational-Expectations Model

In the simple IS-Phillips curve framework of (4.1)-(4.2), the new-Keynesian model uses rational expectations. The expectations of the model — its predictions for the future — are the same as the expectations in the model. I denote both expectations by $E_t\pi_{t+1}$. Then the model is

$$x_t = -\sigma(i_t - E_t\pi_{t+1}) \quad (4.6)$$

$$\pi_t = E_t\pi_{t+1} + \kappa x_t. \quad (4.7)$$

(Woodford, 2001, Galí, 2015 King, 2000 present and summarize the new-Keynesian model.) It turns out that the dynamic part of the modern IS curve (an extra E_tx_{t+1} on the right-hand side of (4.6)) does not matter qualitatively for these points. Omitting that term saves gobs of algebra. Again eliminating output, in place of (4.3) inflation now follows

$$E_t\pi_{t+1} = \frac{1}{1 + \sigma\kappa}\pi_t + \frac{\sigma\kappa}{1 + \sigma\kappa}i_t. \quad (4.8)$$

The small change in timing flips the fundamental doctrines.

- *Inflation is stable under an interest rate peg.*

The coefficient in front of π_t on the right-hand side of (4.8) is less than one. Even if the central bank pegs the interest rate, inflation will eventually go away on its own. The economy is like a pendulum, with a natural tendency to return to where it started. Again, stability is a more general property. Inflation will converge to any path of interest rates.

- *Higher interest rates, on their own, raise expected inflation going forward.*

The term in front of the interest rate, negative in (4.3), is now positive in (4.8). We have seen this behavior in the flexible price model, and in the full new-Keynesian model. Here, it contrasts with the opposite result for the adaptive-expectations model.

- *Inflation is neutral in the long run.*

A one percentage point higher interest rate eventually means one percentage point higher inflation and no change in output. To see neutrality, note that for $i_t = i$ is constant, (4.8) reduces to

$$(E_t\pi_{t+1} - i) = \frac{1}{1 + \sigma\kappa}(\pi_t - i). \quad (4.9)$$

Therefore $\lim_{T \rightarrow \infty} E_t \pi_{t+T} = i$.

Stability and neutrality are important basic properties. The nominal interest rate behaves much like money growth in monetarism, now with sticky prices too. Higher interest rates lead initially to more output and then to higher inflation. Stability and neutrality inescapably imply that higher interest rates eventually mean higher inflation. We will keep working towards the opposite sign in the short run, but we aren't there yet.

The model has a solid optimizing and general-equilibrium economic foundation (which I have not shown you), so deserves the “economic” qualifier of my search. It builds on a clear flexible-price version.

However, though an interest rate peg is *stable*,

- *Inflation is indeterminate under an interest rate peg.*

The model ties down expected inflation $E_t \pi_{t+1}$ but not unexpected inflation $\pi_{t+1} - E_t \pi_{t+1}$ and thus overall inflation. There are “multiple equilibria” corresponding to the multiple possibilities for unexpected inflation. “Indeterminate” means that the model is not enough to fully determine inflation.

We saw this problem already in the flexible-price model. Interest rate equals expected inflation $i_t = E_t \pi_{t+1}$ left unexpected inflation indeterminate. Sticky prices have not changed the situation. Paralleling Friedman (1968), Sargent and Wallace (1975) pointed out this indeterminacy, with the conclusion that central banks should target the money supply. But central banks target interest rates.

Stability and determinacy, spirals and sunspots, are distinct concepts and frequently confused. An unstable determinate system veers off (spirals), but there is only one forecast path. A stable indeterminate system is volatile (sunspots) but does not show a tendency to fly away. (There is no standard language either. Many authors use “stability” to describe the opposite of “volatility,” which I call “quiet,” and thus use “instability” for what I refer to as “indeterminacy.”)

In this model, the Taylor rule can cure indeterminacy (McCallum, 1981).

- *By following a Taylor rule, the central bank destabilizes the economy, leaving only one non-explosive equilibrium.*

If we add $i_t = \phi \pi_t + u_t$ to (4.8) we get

$$E_t \pi_{t+1} = \frac{1 + \sigma \kappa \phi}{1 + \sigma \kappa} \pi_t + \frac{\sigma \kappa}{1 + \sigma \kappa} u_t \quad (4.10)$$

in place of (4.3). If interest rates react more than one for one with inflation, $\phi > 1$, the coefficient on inflation is now *greater* than one. The central bank takes an economy that is *stable* on its own and makes it unstable, exactly the opposite of the

Taylor rule's effect with adaptive expectations. Then, there is exactly one initial value of inflation for which inflation does not explode. By destabilizing the economy, the central bank threatens the private sector with hyperinflation or hyperdeflation should unexpected inflation come out contrary to the central bank's wishes. We also pass a rule against explosive outcomes. The private sector jumps to satisfy the bank's desire.

The central bank now has an *equilibrium-selection* policy on top of its interest-rate policy. It can choose any one of the multiple equilibria consistent with its interest rate policy.

New-Keynesian modelers produce lower inflation along with a higher interest rate by adding a contemporaneous and unrelated equilibrium-selection jump. In the flexible-price model, $i_t = E_t \pi_{t+1}$ means higher interest rates raise inflation going forward. But the central bank can pair that move with a lower $\pi_t - E_{t-1} \pi_t$, using its equilibrium-selection policy to force that negative jump. The sticky price model works the same way.

The left panel of Figure 4.2 illustrates stability and indeterminacy under a peg and how the central bank induces instability by following a Taylor rule to select an equilibrium. The right panel illustrates how higher interest rates raise inflation unless accompanied by an equilibrium-selection shock.

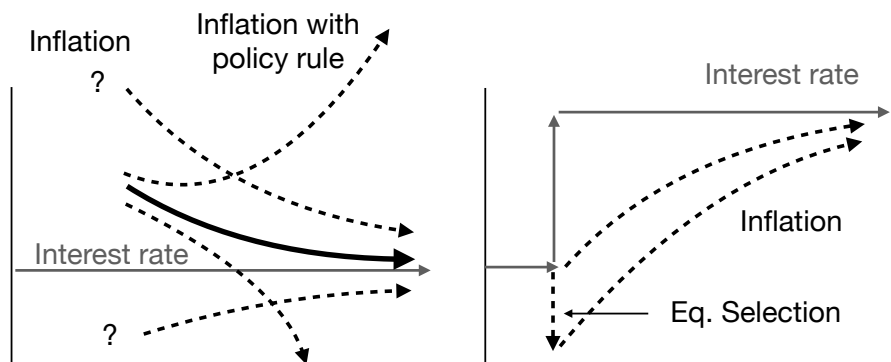


Figure 4.2: Dynamics of the new-Keynesian, rational-expectations model.

Box 4.2: Equilibrium Selection

The role of equilibrium selection is easiest to see in the flexible-price model and rewriting of the Taylor following King (2000). Combine

$$i_t = E_t \pi_{t+1}$$

with

$$i_t = i_t^* + \phi(\pi_t - \pi_t^*).$$

Here, the central bank has a stochastic inflation target π_t^* . That implies a nominal interest rate target $i_t^* = E_t \pi_{t+1}^*$. The conventional Taylor rule $i_t = \phi \pi_t + u_t$ is equivalent with $u_t = i_t^* - \phi \pi_t^*$. Eliminating, i_t , the equilibrium is

$$E_t(\pi_{t+1} - \pi_{t+1}^*) = \phi(\pi_t - \pi_t^*).$$

For any $\pi_t \neq \pi_t^*$, expected inflation explodes. Ruling out explosions, we have a “unique locally bounded equilibrium” $\pi_t = \pi_t^*$. The example also shows that ϕ is not visible in data. In data, we always see $\pi_t = \pi_t^*$. Regressions of interest rates on inflation do not measure ϕ (Cochrane, 2011a). Higher interest rates can appear to lower inflation if they are paired with an equilibrium-selection jump, a lower π^* .

4.5 Fiscal Theory of Monetary Policy

Fiscal theory, when married to the new-Keynesian economic model, appends the government debt valuation equation to that model. Now we have the same dynamics (4.8),

$$E_t \pi_{t+1} = \frac{1}{1 + \sigma \kappa} \pi_t + \frac{\sigma \kappa}{1 + \sigma \kappa} i_t$$

along with the unexpected version of the linearized valuation equation,

$$(E_{t+1} - E_t) \pi_{t+1} = -(E_{t+1} - E_t) \left[\sum_{j=0}^{\infty} \rho^j \tilde{s}_{t+1+j} - \sum_{j=1}^{\infty} \rho^j (i_{t+j} - \pi_{t+1+j}) \right], \quad (4.11)$$

where ρ is a constant of linearization slightly less than one. Unexpected inflation equals the unexpected sum of future primary deficits relative to the value of debt, plus the unexpected sum of future real interest costs on the debt. Higher interest costs are symmetric to lower surpluses. This combination gives a natural generalization of the flexible-price model we arrived at in Chapter 3, in particular (3.4)-(3.5). The latter is the limit as $\kappa \rightarrow \infty$.

Since we have an equation tying unexpected inflation to something, fiscal theory resolves the indeterminacy of the sticky-price new-Keynesian model, just as it did the indeterminacy of the flexible price model, without imagining central-bank-induced explosions or passing a rule against hyperinflations.

This fiscal theory of monetary policy radically rewrites the first doctrine of monetary economics.

- *Inflation is stable, determinate, and long-run neutral under an interest-rate peg.*

From unstable (Friedman, 1968) to stable and indeterminate (Sargent and Wallace, 1975) to stable and rendered determinate by induced instability (McCallum, 1981), now inflation is stable, determinate and, I might as well add, long-run neutral. It's been a long road.

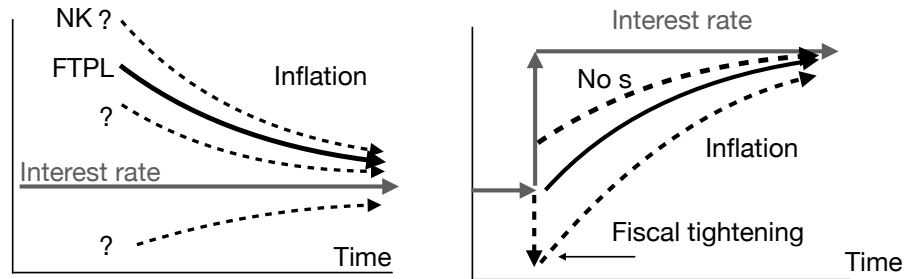


Figure 4.3: Dynamics of the Fiscal Theory + new-Keynesian model.

Figure 4.3 illustrates stability and determinacy. The lines are the same as those of the new-Keynesian model in Figure 4.2, but we pick the equilibrium in a different way, with different policy implications. The left-hand panel shows how only one of the multiple equilibria is consistent with fiscal balance, in lieu of central-bank-induced equilibrium selection. (Just which one is not significant here. I graph an equilibrium which starts with some inflation, which results from a fiscal shock.) Again, the peg is an interesting conceptual experiment and a doctrinal question, but inflation is stable around a stochastic interest rate as well. The central bank can also follow a rule reacting to all sorts of variables.

My celebration of a simple, complete, economic theory of inflation under interest rate targets may have fallen flat at the end of the last chapter, because it all seemed so simple and obvious. Perhaps this historical background will show how important the end of the road is by the long difficulties along the way.

Higher interest rates, all on their own, still raise inflation going forward. Indeed, sticky prices add an inflationary force of higher interest rates. Since higher nominal rates raise real rates, they now also raise interest costs on the debt. The “no s” line in the right-hand side of Figure 4.3 illustrates that inflation rises on the impact of higher interest rates, with short-term debt.

If we want to produce a solution in which inflation declines coincident with an interest rate rise, in this simple model as well as with the full new-Keynesian model, we must arrange a downward jump equivalent to the new-Keynesian equilibrium-

selection jump coincident with higher interest rates. I graph that in the right-hand panel of Figure 4.3. With short-term debt, that jump requires a fiscal contraction. Long-term debt can produce the same decline without a fiscal contraction, as shown in Figure 3.2.

4.6 The Zero Bound Experiment

How can we tell these theories apart? I contrast the theoretical underpinnings later, but let's focus on facts now. While central banks are moving interest rates around, it is hard to tell theories apart. The theories differ dramatically on what would happen if central banks pegged interest rates for a long time, in an environment without a lot of fiscal news.

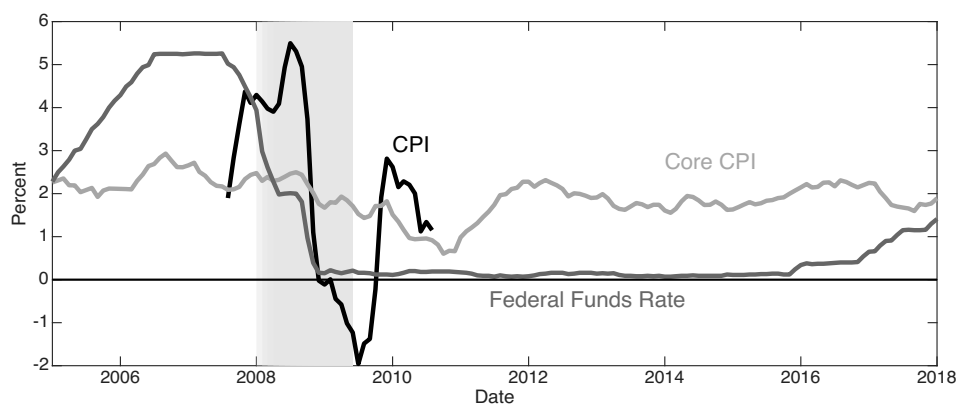


Figure 4.4: Interest rate and inflation in the US zero bound era.

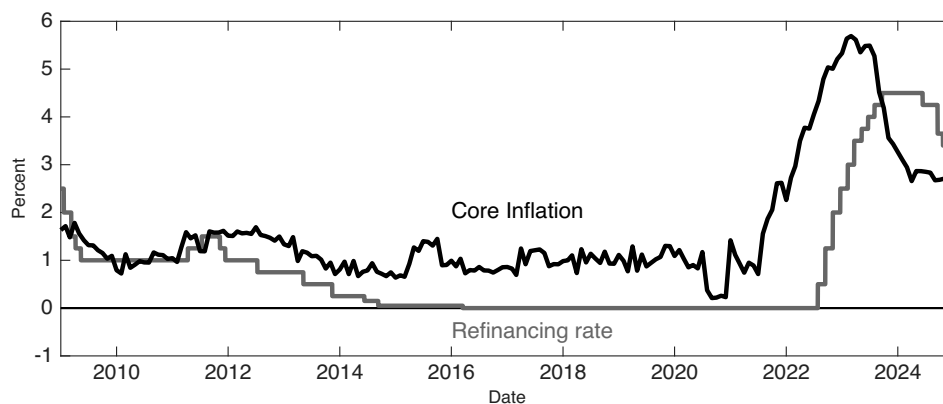


Figure 4.5: Interest rate and inflation in the eurozone during the zero bound era.

That is, of course, what happened in the zero-bound era. Figure 4.4 plots this episode for the US. I focus on core inflation, without food and energy, which gives a

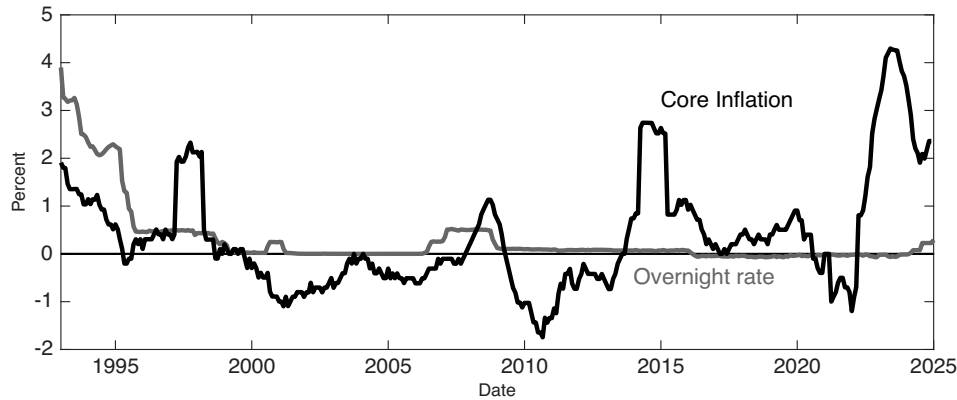


Figure 4.6: Interest rate and inflation in the Japanese zero bound era.

better picture of the long-term trend that is the issue here. (I show the CPI as well as the core CPI only around the financial crisis so as not to clutter up the graph.) Starting in the financial crisis, there was an initial bout of deflation as measured by the full CPI. The Fed quickly lowered interest rates effectively to zero, where they remained until 2016. But no deflation spiral broke out. Inflation as measured by the core CPI declined more slowly towards zero, but then stopped without a spiral. Inflation recovered, and battled a bit around close to the Fed’s target. Inflation was no more volatile with interest rates stuck at zero than it was when the Fed was able to actively manage rates.

Figure 4.5 plots the same event for the eurozone. The European Central Bank’s refinancing rate reached zero in 2015 and stayed there until mid 2022, nearly a decade of stuck interest rates. ECB deposit rates were lower, actually below zero for much of the period. Inflation went nowhere until the fiscal shock in 2021.

Figure 4.6 shows that interest rates in Japan hit effectively zero in the mid-1990s and basically stayed there for 30 years. In Japan, slight deflation led to positive real interest rates. (The inflation jumps in 1997 and 2014 result from consumption tax increases, leading to measured price-level jumps.) As in the US and Europe, inflation broke out with the fiscal expansion of the post-covid era, not an unraveling of a peg.

To review, the models make clear predictions. The adaptive expectations model predicts that a deflation spiral will break out. Deflation starts. That raises the real interest rate, which creates more deflation. Most central banks, international institutions, and policy analysts worried about that spiral, with memories of the disastrous deflation of 1930-33 in mind. *It never happened.* The new-Keynesian model predicts that multiple-equilibrium sunspot volatility will break out. *It never happened.* The fiscal theory model predicts that inflation will be stable—no spirals—determinate—no multiple equilibria and sunspots—and can be quiet—little volatility. I write “can

be,” because quiet requires no important fiscal or discount rate news.

These are not ephemeral predictions, depending on parameter values or auxiliary assumptions. These are basic stability and determinacy properties of models, and central doctrines of their schools of thought, each clearly expressed in real time. The policy and new-Keynesian views are falsified.

One can quibble of course. Nothing is ever *that* clear in economics, and theorists are good at adding epicycles and adapting models to explain uncomfortable facts. (Me too.)

Perhaps the economy was vulnerable to sunspot multiple equilibria but there just were none. Perhaps, but then why was the 1970s so full of sunspots? The prediction that multiple equilibrium volatility will break out when it can do so is central to new-Keynesian thinking. Clarida, Galí, and Gertler (2000), one of the most famous empirical applications of new-Keynesian theory, ran regressions that they interpreted as a Taylor rule coefficient below one in the 1970s and above one in the 1980s. True to their model, they interpreted the 1970s as an outbreak of multiple-equilibrium sunspot volatility, quashed by destabilizing equilibrium-selection policy in the 1980s. They did not interpret the finding in the conventional way, that the Fed underreacted to inflation in the 1970s, allowing spirals to form, and that the Fed finally learned to stabilize inflation in the 1980s. (Clarida, Galí, and Gertler use the word “stable” to mean “less volatile,” not as I have.) Many authors including the classic Benhabib, Schmitt-Grohé, and Uribe (2001, 2002) warned that if interest rates hit zero, multiple-equilibrium volatility must break out again. It’s awfully hard to walk all that back and explain decades of quiet with interest rates stuck at zero and unresponsive to inflation, when one also claims that a coefficient of interest rates on inflation just below one in the 1970s led to that decade’s inflation misery, and in the face of many clear warnings that the zero bound would lead to a repetition.

The zero bound is not a permanent peg. Once interest rates hit the lower bound and inflation did not prove volatile, a sophisticated explanation emerged, for example Werning (2012), Eggertsson (2008). Threats to explode inflation in the distant future can, in the new-Keynesian model, uniquely select the equilibrium today, even if today’s interest rates are stuck. In this view, the zero bound is the result of a persistent demand disturbance—a low discount rate or natural rate, a desire to save rather than consume. Eventually, that demand disturbance will pass, and the interest rate can again climb above zero and begin again to respond to inflation. Each equilibrium today is linked to a different value of inflation at that future date. Then, future threats to select the future equilibrium also select the equilibrium today.

In this story, for example, Japanese inflation in 1994 did not rise to 3% because people knew that if it were to do so, inflation (stable) would then slowly decline to 2.1% in 2022 when Japan finally exits the zero bound. Then, the Japanese central

bank would hyperinflate, because inflation is above 2%. People, knowing that, reject the 3% inflation in 1994.

Related, these new-Keynesian modelers found that forward guidance promises about future interest rates and promises of future fiscal stimulus are very powerful at the zero bound. They are indeed so powerful that the predictions are often regarded as puzzles to be solved, not as reliable guides to policy. Since inflation is stable going forward, it is unstable going backward. If we select equilibria based on promises about the future, then promises further in the future have more effect today! The Japanese central bank could have raised inflation to 3% in 1994 by just changing the after-the-bound-ends inflation target to select that 2.1% inflation rather than 2% inflation. Fiscal theory, by choosing equilibria based on inflation today, resolves this puzzle, and promises further in the future have smaller effects today. (See Cochrane, 2017.)

More generally, apparently passive monetary policy—interest rates that react less than one-for-one with inflation—can actually be active, selecting equilibria, if people expect a shift to interest rates that react more than one-for-one with sufficient probability. The same goes for fiscal policy. (Davig and Leeper, 2007.)

Perhaps. But perhaps not. If you found off-equilibrium hyperinflationary threats a dubious equilibrium-selection story, expectations of a shift to future hyperinflationary threats are even more dubious. We have never lacked for speeches from central bankers promising to get serious about inflation in the future.

Perhaps central banks offered just enough hyperinflationary quantitative easing, and governments offered just enough old-fashioned Keynesian fiscal stimulus, to offset the looming deflation spiral and leave unprecedentedly quiet inflation at the zero bound. Perhaps. Or perhaps, by Occam’s razor, inflation is stable, determinate, and quiet at the zero bound, and quantitative easing is close to neutral.

Of course, fiscal policy was not in great shape in the 2010s either. Why in the fiscal view wasn’t inflation higher or more volatile? There wasn’t much fiscal *news* in the steady drip drip drip of primary deficits. Governments benefited from extremely low or even negative interest rates on government debt as you can see in Figures 4.4 and 4.5. One way or another, bondholders seem to have had faith that sooner or later the US would cure its chronic deficit problem before inflating away substantial debt.

Yes, one hungers for an independent measure of expected surpluses and their discount rate to “test” the theory. But as one hungers for independent measure of expected discounted dividends to test the present value theory of stock prices, that is between hard and a fool’s errand. We shall have to make do with plausible vs. implausible, not possible vs. impossible.

Not all interest rate pegs are quiet. I qualified with “can be” for good reason.

In particular, Friedman (1968) pointed to postwar interest rate pegs that fell apart, including in the US. Turkey more recently tried to lower inflation by lowering interest rates and failed spectacularly. There are many episodes in which low interest rates resulted in higher inflation. But most if not all those pegs were undertaken as part of financial repression, to lower interest costs on the debt, or to fund large uncontrolled deficits. In the fiscal analysis, an interest rate peg is only stable and quiet if there is no drumbeat of bad fiscal news. The reason for the peg is usually the opposite circumstance. The zero bound era is unique that the effective peg was instituted for reasons other than to finance deficits.

2021-2022 pose a similar challenge. The policy view says that inflation should have kept spiraling up in 2021-2022 until the Fed got nominal interest rates above inflation. It then says that reducing inflation would have required a painful recession. Many policy commentators in 2022 said that the Fed should just give up and raise the inflation target, since getting rid of inflation would cause huge losses. It was not true. Their forefathers had argued the same in 1980. (More in section 5.1.) New-Keynesians were strangely quiet, other than alluding to “shocks” in the Phillips curve to “explain” inflation. Where are the off-equilibrium threats that should bring inflation instantly to whatever the central bank wants? Isn’t 9% inflation against a 2% target just the sort of event in which we should have seen the Fed pull the trigger of its hyperinflationary threats? As above, fiscal theory sees a huge one-time unfunded fiscal expansion behind the inflation and its evaporation. Such a thing simply cannot happen in the new-Keynesian worldview: Surpluses always adjust to the Fed-chosen price level.

4.6.1 Lessons of the Zero-Bound Era

Beyond this test of theories, the long quiet zero bound teaches a generally applicable and revolutionary lesson:

- Inflation can be stable and quiet with ample reserves that pay market interest rates. Inflation can be stable and quiet under a long-lasting interest rate peg.

This is tremendously good news. We can live the Friedman (1969) optimum quantity of money. Friedman argued that the interest rate should be zero, with slight deflation offering a positive real return, so that money and bonds pay the same interest rate. Then we have all the liquidity we can want at no cost. Assets that we hold for saving purposes provide monetary services for free. People and businesses waste no time minimizing the amount of cash they hold. Interest-paying money and full interest on ample reserves offer the same benefits more generally. Ample reserves also mean that banks are narrower, backing more of their deposits with reserves, and thus less prone to runs.

That a peg can be stable and quiet is also revolutionary news. Central banks may be able to produce even quieter inflation by manipulating interest rates in

response to shocks. But they do not *have to* do so.

Before the zero-bound era, one genuinely could not know what would happen. Much monetary theory predicted disaster with a peg or with interest-paying reserves. For example, why did Friedman not argue for the Friedman-optimal quantity of money, a zero interest-rate peg and huge reserves? Most likely, because he thought that configuration would not be control inflation, and would lead to an unstable spiral instead. Monetarist price-level control requires artificial scarcity of money. Sargent and Wallace (1985) argue from a basically monetarist point of view that interest on reserves “makes the demand for total reserves indeterminate...” I agree, and that underlies my view that QE has no first order effects. But, without fiscal theory, they predict either a “continuum of equilibria, ...” or “... no equilibrium” depending on how the interest on reserves is financed.

Central banks suffer a lot of criticism from people like me. They do not get the credit they should for the important and courageous innovation of paying interest on ample reserves and controlling interest rates by setting lending and borrowing rates alone. Well done!

4.7 1933 and the Missing Spiral

Why did the initial deflation of 2008 and 2020 not turn in to a spiral? Why was there so much larger deflation in 1933, and how did it end?

Figure 4.7 shows the price level in the Great Depression, taken from Jacobson, Leeper, and Preston (2024) who provide an insightful analysis. In the early years of the Great Depression, consumer prices fell nearly 30%. Wholesale prices fell nearly 40%. A “spiral” seems like a plausible story. Then, in March 1933, the US abandoned the gold standard. Deflation stopped instantly. Output followed a similar path, with GNP declining 30% and turning around at the same moment.

Fiscal theory gives a natural explanation. A gold standard is at heart a *fiscal* commitment. The government will, if asked, always raise surpluses to obtain the necessary gold, or it will credibly raise future surpluses so it can borrow the necessary gold. Thus, the gold standard enforces that the right-hand side of the government debt valuation equation shall always be sufficient to repay debt at the gold value. The gold standard proved a durable commitment against fiscal inflation.

The gold standard has an Achilles heel however. Gold does not always have a steady value relative to goods and services, which is what we care about in the end. It pegs the dollar to gold, but what happens if both the dollar and gold gain value relative to goods and services? What happens in deflation? Now the government is committed to raise taxes or cut spending, to repay debt with suddenly more valuable dollars and gold. A lower price level on the left-hand side of the government

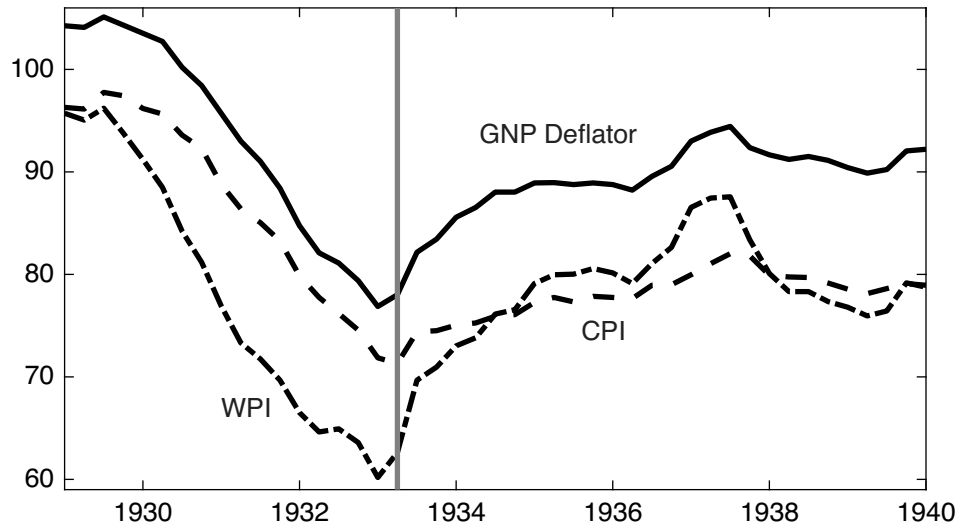


Figure 4.7: Price level in the early Great Depression. All series use 1926 base year. Vertical line marks when the US abandoned the gold standard. CPI is the consumer price index; WPI is the wholesale price index; IP is industrial production. Source: Jacobson, Leeper, and Preston (2024).

debt valuation equation forces higher surpluses on the right hand side. The fiscal commitments of the gold standard are “active” for dollars vs. gold, but “passive” for deflation, dollars and gold vs. goods and services. The situation is analogous to a foreign exchange peg.

The last thing the government wanted to do in 1933 was to raise taxes or cut spending to pay a windfall to bondholders and validate an unexpected and undesired deflation. In the larger scheme, the price level was returning to its pre-1914 parity, so a different government might have welcomed this return to parity. That was not the situation in 1933.

The US defaulted. It abrogated public and private gold clauses and banned private gold holdings. Creditors sued. The Supreme Court ruled that default is constitutional (Edwards, 2018). The right-hand side of the government valuation equation would no longer keep rising. Deflation stopped on a dime.

Jacobson, Leeper, and Preston (2024) describe how the Roosevelt Administration went further, separating the budget into an unbacked emergency budget and a backed regular budget. This clever innovation allowed for a credibly unbacked fiscal expansion—lower surpluses on the right hand side—but only so long as the depression lasted. The two budgets therefore preserved the government’s reputation for repaying debt in normal times. That reputation would soon be needed in WWII, for governments can only raise revenue by borrowing if people expect repayment.

This event provided, I think, a key lesson for 2008. Suppose the price level had started to go down uncontrollably. That decline in price level would have required the government to raise taxes and cut spending, to repay bondholders in more valuable money, or equivalently out of lower nominal tax revenues. That event would have been an unexpected, unmerited windfall to “the rich,” “Wall Street,” and foreign central banks. And the debt was much larger.

Would anyone expect such austerity? Of course not! In a deflation and recession, with 1933 and a half-century of Keynesian stimulus economics in the rear view mirror, people expected exactly what they got: A massive fiscal stimulus, questionable backing, and “helicopter money,” not austerity. The small deflation of 2020 was followed by an even larger fiscal response. The government will default—pause interest payments, force rollovers, tax debt as well as explicit principal write-downs—before it raises taxes and cuts spending in a massive crisis. People, knowing that, know that holding on to government debt will not provide an enormous great deflation-induced return. The spiral or a multiple-equilibrium deflation cannot break out with a fiscal floor.

4.8 Theories

Well, so much for the real world, how does it work in theory? That is an important question. Practical views that do not hold together in theory often do not long hold together in practice either. Practical doctors once thought that bleeding patients was a good idea.

Remember, we are looking for the most simple, baseline, foundational, economic theory of monetary policy under interest rate targets, to take over from monetarism; on to which we add frictions and embellishments. That is a different task than, say, building and estimating a medium or large-scale forecasting and simulation model for a central bank.

4.8.1 The Policy View

My adaptive expectations model captures the essence of the views of central banks, policy makers, and most economists. To them it provides a satisfactory summary and narrative for experience. We should not discount that experience. It has a harder time with currency crashes and hyperinflations outside most advanced-country experience, but practical policy types seem willing to have different theories for such events.

Still, it would be unfortunate if this were our baseline theory, as it relies crucially on non-rational expectations. It requires that people save, invest, consume, buy and sell securities, and set prices expecting the future to mechanically extrapolate the past.

Now, an unproductive debate has raged for decades whether people are really “rational” in their expectations as well as other decisions and what that means in the complex real world. Fortunately, that’s not the issue. “Rational expectations” here just means that the expectations *of* the model are the same as the expectations *in* the model. “Rational expectations” is an internal consistency condition of a model, more than an assumption about the real world. Rational expectations are just another facet of the optimizing behavior that we like to put in basic underlying economic models. That discipline reduces somewhat the impression that one can get any result one wishes by ad-hoc behavioral assumptions.

Economics consists of describing optimizing behavior in radically simplified models of the complex real world, and then going out to see to what extent that behavior mimics behavior we see in the real world. I tend to use the word “specify” rather than “assume” when describing a model, to clarify that I’m talking about the model, not directly about the real world. For example, many models of animal behavior specify optimizing rational decisions. They describe animal behavior well, though the animals do not answer surveys “rationally.” My dog exquisitely maximizes the production of treats, though she can’t do general relativity. Bees act as if they had solved a hard dynamic programming program as they search for pollen from flower to flower. For that reason, economic theories are really quantitative parables, not candidates for a literal description of reality. Good parables are simple parables with few extra ingredients. Testing parables requires a grain of salt. The parable of the sower is not about agricultural yields.

Model-consistent expectations, like optimizing behavior, raise the hope that the model’s predictions are robust to policy changes. For this reason, and despite its enduring popularity in policy circles, academic journals since the late 1970s have published essentially no classic IS-LM style articles, and insist to the point of repetitious tedium on detailed micro-foundations, even for articles that posit learning, limited information processing, or other sources of apparently irrational expectations.

Sure, people do not exactly optimize, and surely their expectations are not perfect either. (Though, do not confuse rational expectations with clairvoyant expectations. Rational expectations does not require people to know an unknowable future. Fed staff economists are not that great at forecasting inflation either.) For this reason, less-than-rational expectations, are, like failures to optimize and long lists of frictions, interesting ingredients for elaborating an underlying simple model to match episodes or to match dynamics *on top* of a simple optimizing model that gives us the basic sign and operation of monetary policy. They are potentially useful icing on the economic cake.

But if we stop with model-inconsistent expectations at the heart of the most basic story about monetary policy, as a minimal, crucial, *necessary* ingredient, we

deny that there is *any* simple, optimizing, economic, supply-and-demand model at the basis of inflation and the operation of monetary policy. Irrational expectations are not the icing, they are the cake. The basic sign and stability of monetary policy rest on people systematically making mistakes.

Perhaps that is true. But it is surely worth looking a little harder for a simple underlying fully economic model before proclaiming such a sorry failure of our discipline. The Lucas rules of micro-founded, policy-invariant economic theory have stood for a half-century, at least as the starting point, for good reason. It is worth making really sure they must fail before we abandon them. More practically, if that is true (and it may be so), then the proposition that higher interest rates lower inflation is highly contingent and may easily disappear in other times, circumstances, public perceptions, and institutional arrangements.

In sum, I announced the challenge to produce, among other desiderata, an *economic* theory of inflation. This isn't it.

4.8.2 The New-Keynesian Model

By the 1990s, the rational-expectations new-Keynesian view took over academic analysis and the equations of central bank models. This program sought to reconstruct the Keynesian program under Lucas rules: Models should be based on preferences and technology, with optimizing behavior and clear definition of equilibrium. Models should not be a collection of ad-hoc behavioral rules such as the IS-LM consumption function. Only such models can hope to predict the effects of policy changes, because people change behavior in response to policy changes. Ad-hoc models may still forecast better, however, so tests based on forecast power are not useful. The intellectual accomplishment is summarized in classic monographs of Woodford (2001) and Galí (2015) and the review in King (2000).

The new-Keynesian model is elegant. It builds on a straightforward flexible-price vision and maintains the long-run stability and neutrality of that vision. But, in order to give the central bank full control over inflation, the model relies on a crucial ingredient: The central bank intentionally destabilizes an economy which is already stable on its own—inflation would go away eventually if the central bank did nothing. The central bank does so in order to fight the scourge of multiple equilibria.

It looks like raising interest rates in response to inflation, $\phi > 1$ in $i_t = \phi\pi_t + u_t$, is the central assumption. That assumption seems a sensible description of what central banks do. But if so, your intuition is too conditioned by the old-Keynesian model and central bank explanations. In those, higher interest rates lower inflation, and the central bank raises rates to stabilize an unstable economy. In the new-Keynesian model, higher interest rates *raise* inflation going forward.

That “Fisherian” property is the only reason that raising interest rates in response to inflation destabilizes inflation and selects equilibria.

We can see this point easily in the flexible-price model. With $i_t = E_t\pi_{t+1}$ and $i_t = \phi\pi_t$, dynamics are

$$E_t\pi_{t+1} = \phi\pi_t$$

so $\phi > 1$ destabilizes inflation, leaving $\pi_t = 0$ as the unique solution. (Box 4.2 has a slightly more general example.) This de-stabilization is key to the model, not the response of interest rates to inflation. In more complex models, coefficients of interest rates on inflation less than one can achieve the same de-stabilization.

But *central banks do not do anything of the sort*. Tell a central banker that their great problem is multiple equilibria and that their bank deliberately de-stabilizes the economy in order to threaten people with hyperinflation or deflation so people will jump to the equilibrium that the banker wishes to select. Tell the banker that they fight inflation by a downward equilibrium-selection threat, backed up by a fiscal contraction that is essentially unrelated to raising interest rates. Opine that they could have just announced a lower inflation target and inflation would have fallen with no change in interest rate. Tell them that their error in 2021 was not threatening hyperinflation forcefully enough, so that inflation could jump right down to the central bank’s desired value. You will be met with a blank stare—though apparently you can present models with those equations at central banks so long as you do not say what the equations mean out loud.

Well, let’s just measure the response of interest rates or future inflation to inflation and we can test these views, you may say, quickly hauling out your vector autoregression toolkit. Alas, the coefficient ϕ , or the more general coefficients governing stability and determinacy, are not measurable in the data. Regressions of inflation on interest rates do not measure the quantity of interest. Box 4.2 presents a simple example. You cannot measure off-equilibrium threats from data drawn from an equilibrium.

But, despite our (including my) love of formal econometrics, that’s not the only data we have, especially about how central bankers might act in unusual circumstances. Central banker speeches, articles, interviews, books, the corpus of explanation on central bank websites, the voluminous popular analysis by media and academic commentators, are also data. They breathe not a whisper about multiple equilibria, intentional destabilization, or equilibrium selection. They are robustly old-Keynesian, describing the central bank as always bringing inflation back after any shock.

My first desideratum is “economic,” and the new-Keynesian model achieved that. My second desideratum is “consistent with current institutions.” I criticized monetarism for that inconsistency, as central banks do not control money supplies.

The new-Keynesian equilibrium-selection mechanism is even more drastically at odds with current institutions.

The threat to hyperinflate or deflate faces other criticisms as well. What is wrong with hyperinflationary solutions? Ask a German, an Argentinian, or a Zimbabwean. One needs to add a new rule against such equilibria to the standard definition of equilibrium. There are also multiple equilibria that end up at the zero bound which do not involve explosions. One must pass a rule against equilibria that are *locally* unstable, but globally stable, equilibria that are “non-locally-bounded.” To uniquely determine inflation at a 2% target, for example, one must rule out paths that start at, say, 1.99% inflation and 2.99% nominal interest rate and smoothly go down to 1% deflation and a 0% nominal interest rate. What is wrong with that? Japan’s approach to the zero bound seems a case in point. A long theoretical controversy has ensued over the proper interpretation of these simple equations.

Why did new-Keynesian models go down this path? As usual, because the path was natural at the outset and the brambles not clear. New-Keynesians set off, as the title implies, to find a foundation for “Keynesian,” IS-LM economics that would pass the Lucas rules of economic modeling. After long hard work on exquisite micro-foundations, the change looks minor: Just put a $t + 1$ where previously there was a $t - 1$ in the expectations terms of IS and Phillips curves. To complete the model, let’s just add a Taylor rule, which was already a very good empirical description of central bank behavior. Compute responses. Throw out troublesome explosions, and focus on the obvious non-explosive equilibrium. Look, higher interest rates lower inflation. Sure, inflation jumps downward followed by a rise, but surely one can add epicycles to draw that out, as later researchers did.

With the benefit of hindsight, one can see old-Keynesian interpretation of new-Keynesian results, aggregate-demand language for equilibrium-selection symbols. On- vs. off-equilibrium behavior, assumptions about what can and cannot explode, how to balance government budgets, all seem and usually are technical annoyances rightly shoved off to footnotes. It took decades to understand their import. Just the technical capacity to separate the on and off-equilibrium parts of an interest rate rule took until King (2000).

Still, we now have the benefit of hindsight. Despite the good intentions and natural paths taken by the developers of the theory, in the end we must recognize that the new-Keynesian model is not the long-dreamt-of micro-foundation for IS-LM that preserve the latter’s basic intuition. It is a radically different theory. When you set out to hunt for horses and you return with a zebra, there is a strong tendency to celebrate bagging a horse. Now we know it’s a zebra.

In the midst of the new-Keynesian development, Woodford (1995) wrote one of the foundational articles on fiscal theory of the price level, building on Leeper (1991) and Sims (1994). So why did Woodford (2003) abandon that approach, wipe

out the government debt valuation equation, and resolve the indeterminacy of the new-Keynesian model with off-equilibrium threats? I do not know his thinking of course, but we can point to some features that make the choice understandable. The equilibrium-selection approach gives the central bank full control over inflation, whereas the fiscal theory completion of the new-Keynesian model recognizes fiscal shocks that the central bank cannot fully offset. I think new-Keynesians wanted a theory in which central banks fully control inflation. New-Keynesian economics is really new-monetarist in many parts, including its emphasis on the primacy of monetary over fiscal policy for business cycle stabilization and stimulus. Moreover, technically, a simple Taylor rule with a coefficient greater than one, an AR(1) residual, and a natural rule against non-locally-bounded equilibria, produces a complete answer. The extent of economic restriction in those natural technical simplifications was not clear at the time.

It is also understandable that in the benign fiscal environment of the 1990s, fiscal constraints on monetary policy did not seem that important. They seemed worthy of being put off to technical footnotes. Monetarism also seems to give central banks full control over the price level, but with a similar footnote about fiscal policy. Monetarists also paid less attention to that footnote in fiscally benign eras, rolling it out only when necessary. Equilibrium-selection rules and restrictions on limiting behavior are also the kind of thing that practical economists have little patience for, and usually for good reasons. Me too. They turn out to have mattered enormously here. It is natural for this understanding to have taken some time. It is less natural to refuse to reconsider now that these issues are understood.

4.8.3 Fiscal Theory of Monetary Policy

Adding fiscal theory to the new-Keynesian vision of sticky prices, we have at last a complete (no indeterminacies), economic model, that is consistent with current institutions. Having run through all the others, it is the *only* model we have at the moment that satisfies these criteria.

One could argue that there is nothing to test. Fortunately, our governments just handed us about as good a test as we could ask for so we do not have to have that argument.

4.9 Observational Equivalence

In marrying fiscal theory to new-Keynesian models, I have not so much added an equation as restored one. The government debt valuation equation is a part of new-Keynesian models as well. New-Keynesians assume that the government debt valuation equation (for example, (4.11)) describes how fiscal surpluses adjust “passively” to whatever inflation the central bank’s equilibrium-selection policy has picked, in

the Leeper (1991) terminology. That fiscal underpinning is usually relegated to a footnote, because the government debt valuation equation then just determines fiscal surpluses and has no other effect on the model.

This footnote has profound implications however. The new-Keynesian disinflationary policy shown in the left half of Figure 4.2 is in fact a joint monetary-fiscal policy. The policy requires an increase in fiscal surpluses. Whether one calls it an equilibrium-selection policy backed up by fiscal action, or the direct effect of a fiscal shock coincident with higher interest rates, the result is the same. And the disinflation, as above, comes entirely from the equilibrium-selection/fiscal part. Higher interest rates, on their own, raise inflation.

The fiscal footnote might not be so easy, either. There is nothing passive about “passive” policy. Congress and parliaments must act to raise taxes or cut spending. Suppose that the Fed Chair comes to Congress and says, “We want to raise interest rates two percentage points to fight inflation. You need to raise fiscal surpluses by 2% of GDP—\$600 billion per year—to pay higher interest costs on the debt.” Congress might refuse. (Congress might laugh!) Then the Fed must select another equilibrium in which inflation is higher, or abandon the project of raising nominal interest rates. At a minimum, new-Keynesian equilibrium selection operates under constraints of just how much surplus the Congress can or will provide.

With the fiscal footnote, all of the equilibrium conditions—the equations describing variables that we can observe—of the standard new-Keynesian model and this fiscal theory alternative are the same. That observation establishes a hard-to-swallow but important observational equivalence theorem: Any equilibrium—any observed path of interest rates, output, and fiscal surpluses here—that is consistent with fiscal theory plus new-Keynesian model is also consistent with Taylor-rule equilibrium selection in the new-Keynesian model, and vice versa. We cannot tell by looking at time-series data if the central bank selected an equilibrium by threatening hyperinflation or deflation and fiscal policy adapted to that price level, or if the stream of expected fiscal surpluses and discount rates determined unexpected inflation directly. We cannot measure off-equilibrium behavior with data taken from an equilibrium.

This theorem has important ramifications. One good piece of news: Econometricians cannot prove fiscal theory wrong, in favor of the corresponding new-Keynesian model! The theorem also tells us that creating fiscal-theory versions of new-Keynesian models is technically easy.

The theorem implies that any econometric test for active vs. passive fiscal and monetary regimes, or for switches between regimes, must add identifying assumptions to measure off-equilibrium behavior from observed equilibrium behavior. Then, such tests are *entirely* tests of the identifying assumptions.

That's not fatal per se. Empirical researchers often make reasonable identifying assumptions in related areas of economics. But so far, identification restrictions in this context have been so "incredible" (Sims, 1980) as to be useless. Sure, if you assume that fiscal-theory governments cannot ever promise future surpluses to repay current deficits, you can create a rejectable model, and one that is swiftly rejected. With that assumption, governments raise no revenue when they borrow. They instantly cause so much inflation that borrowing reduces the value of debt. In reality, governments usually raise revenue when they borrow, and the value of debt rises. No wonder the specification is frequently rejected.

Stated in words, it seems ridiculous to assume that governments cannot pledge repayment. Yet that is what happens if you assume that surpluses follow an AR(1) ($s_t = \eta_s s_{t-1} + \varepsilon_t$) or similar process. Stated in equations, it seems like a harmless simplification. Specifically, it is common to specify a Taylor rule

$$i_t = \phi \pi_t + u_{i,t} \quad (4.12)$$

and a surplus process

$$s_t = \alpha v_t + u_{s,t} \quad (4.13)$$

where v_t is the real value of debt and $u_{s,t}$ and $u_{i,t}$ are disturbances. (This is simplified compared to actual specifications, but gets at the central point.) Researchers estimate the parameters ϕ and α . If $\phi > 1$, they estimate an "active" monetary policy, equilibrium-selection by Taylor rule, and vice versa. If $\alpha > 0$, they estimate a "passive" fiscal policy, that surpluses rise to pay off any value of debt, and vice versa. Researchers sometimes specify stochastic changes in regime, that α and ϕ change over time.

Once you see the observational equivalence theorem, you know identification assumptions are lurking in here. They are. The estimate of ϕ tells us the correlation of interest rates and inflation in equilibrium, not what the central bank would do to trim other equilibria, as analyzed in footnote 4.2. One has assumed that the two responses are the same. But there is no reason to do that and plenty of reason not to do so, as the economic function of the in- and off-equilibrium responses is entirely different. The estimate of α likewise tells us how surpluses respond to *all* sources of variation in the debt. What matters for active vs. passive fiscal policy is only whether the government will respond to an unexpected and undesired deflation by raising taxes and cutting spending. As in 1933 and 2008, above, likely not. But α also measures whether the government commits to paying off debts accumulated from past deficits. It is entirely possible and wise for governments to commit to paying off debts accumulated from past deficits, while committing not to respond to unwanted deflations. It is also entirely possible for researchers to write a surplus process that responds differently to debts accumulated from past deficits than to changes in the value of debt that come from price level surprises, mirroring footnote 4.2 (Cochrane, 2023 spells out the equations). Or, even with $\alpha = 0$, one can write

and estimate a surplus process more complex than the AR(1), such as the sum of two AR(1), in which today's deficits are matched by direct promises of repayment. Allowed to do so, the estimate will quickly comply any time that deficits raise rather than lower the value of debt.

What is the point of making such obviously counterfactual identification assumptions and then "rejecting" fiscal theory, given how easy it is to write assumptions under which fiscal theory governments promise to repay debts? None, with what we know now. But it's easy to see how this happened. The setup (4.12)-(4.13) is how Leeper (1991) introduced the ideas of active and passive policy. The point of his foundational paper was to show that the active fiscal/passive money regime was *possible*. His appropriately simple examples came two decades before anyone understood the difference between on- and off-equilibrium in Taylor rules, let alone fiscal theory, and a decade before anyone imagined the observational equivalence issue. The technical possibility of writing a surplus rule that distinguishes between repayment of debt incurred from deficits and validating unexpected deflations did not exist, as far as I know, until Cochrane (2021), so it is hard to blame people for not separating the two.

That historical explanation is, again, not a reason to continue the practice. Why does this practice continue? I think one reason is that researchers often choose empirical specifications for technical convenience rather than thinking deeply about whether the world behaves this way. Given a desire to implement the valuation equation empirically, well, let's write a surplus process, discount it, and see what comes out. What's a good surplus process? Well, let's use an AR(1). If you phrase the assumption "for simplicity, we assume that surpluses follow an AR(1)," that seems innocuous. If you phrase the assumption "to overcome observational equivalence, we assume that fiscal-theory governments can never pledge to repay deficits by increasing later surpluses" that seems a ridiculous thumb on the scale. We should be more careful to understand when apparently harmless technical simplifications (like an AR(1)) hide crucial identifying assumptions with strong economic implications.

Observational equivalence is not a pathology, an admission that fiscal theory (or new-Keynesian theory, since the theorem goes both ways) is devoid of empirical content and an angels-on-heads-of-pins exercise. Rather, it is the common situation in economics, which we surmount here just as we do elsewhere.

Fiscal theory is an application of standard asset pricing, price equals present value of cashflows, to government finance. By the theorem that absent arbitrage there exists a discount factor such that price is the present value of cashflows, behavioral and rational finance are observationally equivalent. Does that mean that price equals present value of cashflows is useless and untestable, or that rational or behavioral finance are empty, or indistinguishable? No. Empirical asset pricing has been highly productive in the 50 years since the joint-hypothesis (Fama, 1970)

and discount-factor-existence theorems (Harrison and Kreps, 1979) emerged. The behavioral vs. rational debate centers on which of the admittedly *possible* interpretations of facts are *plausible*. We too can think about what is plausible. Asset pricing also features explicit models, i.e. identifying assumptions, tying discount factors to observables. But we understand that the entire content of the test is those extra identifying assumptions, not the whole class “behavioral” vs. “rational” finance. Asset pricing gave up trying to “test” the present value relation per se decades ago. Investors also have more information we do. Efforts today to forecast surpluses, discount them back, predict the value of government debt, and proclaim a puzzle repeat a long and ultimately fruitless debate.

Formal testing of the sort contemplated for active money vs. active fiscal regimes has never been central in the rise and fall of economic theories, even when not formally observationally equivalent. Keynes vs. the classics, monetarism vs. Keynesianism, real business cycles vs. both, new-Keynesianism vs. real business cycles, and so forth were never decided by a p-value published in *Econometrica*. Does $MV=PY$ mean $PY = MV$ (money supply causes nominal income), or does it mean $M = PY/V$ (nominal income drives money demand, which the Fed accommodates)? Or maybe $V=PY/M$ (velocity wanders around endogenously)? Economists since at least Tobin (1970) have been arguing about the direction of causality. (No, Granger causality and VARs did not settle the argument.)

Theories rise and fall on whether they are plausible and useful. Which theory gives a compelling account of experience and a Occam’s-razor-simple guide to policy and institutional design, both understanding past choices and recommending new ones? That’s why I have focused on these issues, rather than formal tests. Friedman and Schwartz (1963) did no formal testing. They established a view of causality by detailed historical and institutional analysis. They showed how useful a monetary perspective was. If fiscal theory is only as successful as monetarism, that is a great step forward from where we are today. Formal testing should follow that sort of effort, not attempt to substitute for it. (Formal testing culminating in Vector Autoregressions followed by 20, and lasted another 40 years. It has been useful, but still not decisive.)

In the end, however, observational equivalence means one can come to a common view, and need not take a stand. A die-hard fan of the new-Keynesian equilibrium-selection story can read this fiscal theory and empirical analysis as simply a plea to take seriously the separation between interest-rate and equilibrium-selection policy of new-Keynesian models, rather than wrap them together in arbitrary assumptions such as an AR(1) Taylor-rule disturbance; to examine the needed fiscal adjustments theoretically, empirically, and in policy simulations; to take seriously fiscal constraints on central bank equilibrium-selection policy; and to reiterate in policy analysis that disinflation cannot happen without the prescribed fiscal policy underpinnings.

Having been led to think about fiscal foundations, one also is led to think about much different questions to ask of a new-Keynesian model. The simulations I have presented above can all be interpreted as simulations from new-Keynesian models with Taylor-rule equilibrium selection. But they alert us that one can produce a given interest rate path with many different Taylor-rule residuals, each of which implies a different inflation path and fiscal adjustment. Peering in to the fiscal adjustment prods one to ask for different residuals that require no change in fiscal surpluses—my response to a monetary policy shock—or to ask for Taylor-rule residuals that change fiscal surpluses but do not change interest rates—my fiscal shock.

4.10 Sluggish Expectations and the Policy View

Today’s policy world has a more nuanced view than the 1970s adaptive expectations I described above. A distillation of the current policy view might be called “sluggish expectations.”

This view acknowledges that expectations are important, but does not tie them rigidly to past experience (adaptive) or to the model’s predictions of the future (rational). In this philosophy, expectations vary through time and in response to various forces, many external to central bank actions. Expectations eventually respond to experience of inflation, though not in a predictable way. Faith that the central bank will eventually do something can “anchor” expectations through a period of inflation. But that faith and “anchoring” can evaporate, at which point a spiral breaks out. Expectations can also move in response to news about the future such as fiscal matters and other shocks, thus accommodating some of the many historical episodes adduced by forward-looking rational expectations. But this happens rarely, and usually only in large tumultuous episodes.

Central banks also measure expectations in surveys and bond markets. They treat these measures as somewhat exogenous disturbances that they should react to, as well as measures of people’s faith in central banks’ future actions that central banks should try to control by actions and statements.

Most of all, expectations do not *react* quickly to interest rates, even when the model predicts that actual inflation will react to interest rates. The expectations of the model are still different from the expectations in the model. Economists armed with the model could make a lot of money. That sluggish property preserves most of the traditional doctrines I captured above with adaptive expectations, but with nuance.

To describe this view, I write out the little model we have been using all along, denoting expectations π_t^e ,

$$x_t = -\sigma(i_t - \pi_t^e) + u_{x,t} \quad (4.14)$$

$$\pi_t = \pi_t^e + \kappa x_t + u_{\pi,t}. \quad (4.15)$$

Eliminating output x_t , inflation is related to interest rates by

$$\pi_t = (1 + \sigma\kappa)\pi_t^e - \sigma\kappa i_t + (u_{\pi,t} + \kappa u_{x,t}). \quad (4.16)$$

(4.14) gives output directly. I add “demand” disturbances $u_{x,t}$ and “supply” disturbances $u_{\pi,t}$, which move inflation and output around and to which the central bank responds. The same equation holds at time $t+1$, and you can verify that the expectations in the model are not the expectations of the model.

Higher inflation expectations raise inflation and output right away. Raise π_t^e in (4.16) and (4.14). So worrying about survey and market expectations is important. But, to our central doctrines, there is no spiral under an interest rate peg so long as expectations do not move, so long as they stay “anchored.” Inflation and deflation starts to spiral when current inflation or deflation starts to feed in to expected inflation. Then an initially slow inflation or deflation can suddenly pick up speed.

That’s why central banks “look through” inflation surges, so long as they believe expectations remain “anchored.” A spurt of inflation coming from shocks to the disturbances ($u_{x,t}$ and $u_{\pi,t}$) goes away on its own in this model. That inflation may lead to a permanently higher price level, but central banks, having interpreted their mandate as a forward-looking inflation target with bygones bygone, do not care about that.

In 2021, for example, the Fed saw inflation surge. But as its forecasts, survey forecasts, and bond market expectations projected a return to 2% inflation, the Fed saw no urgency to move. The Fed only moved when it saw measures of inflation expectations start to creep up. It then interpreted the swift decline of inflation not as a real interest-rate effect—since real interest rates were still sharply negative, and no recession followed—but as a sign that expectations had been re-anchored by the mere threat of action. Similarly, in discussing how to adapt to tariffs, a “temporary” inflation shock and a one-time price level increase, Waller (2025) argued that the Fed should again “look through” the shock and not respond.

This view also lacks an economic nominal anchor. The closest it comes is to view anchored expectations as the anchor for actual inflation, with no anchor for the price level. And at best that anchor comes from faith that the Fed would if necessary repeat 1980 in the event that inflation got out of control. Yet the Fed is curiously silent about such energetic measures. Are we at anchor or just floating in a calm sea?

Central banks can always raise interest rates, but they cannot lower rates much below zero. Thus, central banks have greater fear of downward de-anchoring and deflation spirals. Central banks were much more worried about the small deflation in 2008 in the zero bound era than they were about an upward inflation spiral in 2021.

(They may also view the costs of deflation as larger than those of inflation.) Likewise, many analysts could attribute the swift inflation decline in 2022 while interest rates stayed well below inflation as a case of re-anchoring expectations, showing what the Fed might do in the future, while worrying earlier that deflationary expectations could become de-anchored and the Fed powerless.

In sum, the contemporary policy view still predicts that inflation and deflation spirals can break out. The absence of a spiral in the zero bound era remains a puzzle. “Expectations did not move” is a little easier epicycle to explain the lack of a spiral, but that ignores the constant contrary worry at the time.

So long as expectations are sluggish, higher nominal interest rates lower inflation. See the coefficient $-\sigma\kappa$ in (4.16). Writing (4.16)

$$\pi_t = \pi_t^e - \sigma\kappa(i_t - \pi_t^e),$$

you can see that if expectations rose one-for-one with the nominal interest rate, inflation would rise and in (4.14) output would not move. That non-reactive quality, rather than the rigid adaptive scheme, is crucial to the Fed’s ability to lower inflation with higher interest rates.

However, higher interest rates only move inflation immediately in this little model. As long as inflation π_t does not feed in to expectations π_{t+1}^e , today’s interest rate only affects today’s inflation. There are, so far, no “long and variable lags.” In the adaptive expectations model a small initial inflation gets an expectational snowball going to create more future inflation.

I think the current policy view squares that circle in three ways. First, one can sprinkle lags into these equations to produce some dynamics. For example, people reason that higher interest rates take time to lower demand, via some unspecified friction. Second, lowering future inflation with sluggish expectations requires persistently high interest rates. High interest rates today lower today’s inflation, then high interest rates in the future lower future inflation. This may be a reason that central banks tighten and loosen in long waves. Third and most of all, the time and contingency it takes for inflation to feed in to expectations explains why the lags are both long and variable. My one-period adaptive expectations produce too fast and too reliable a mechanism. After a period of persistently high interest rates, resulting in a period of persistently low inflation, inflation breaks through people’s attention span. Only then, which may be a year or more later, do people wake up, change expectations, and monetary policy really has its effect.

In this view, expectations are also amenable to suasion by central banker speeches, policy frameworks, and “forward guidance.” If central bankers can talk down expectations, that improves the inflation-output tradeoff of the Phillips curve. The central bank can then lower nominal rates and enjoy lower inflation with no output

cost. At the zero bound, central banks try to talk up expectations, such as by announcing a higher target or forward guidance. Indeed, since the Phillips curve in the 2010s seemed flat, with $\kappa \approx 0$, much of the central bank view focuses on expectations alone as the determinant of inflation, $\pi_t = \pi_t^e$. Most of the art of central banking amounts now to expectations management. (Or at least it did through the end of the Powell era. Kevin Warsh has written about scaling back such efforts.) Alas, speaking loudly without a stick has often failed in the past to contain or boost inflation. Eventually if inflation does not do what central bankers want, they need something more than additional speeches.

Chapter 5

More Episodes

The fiscal theory of the price level has collected a long list of historical parables. I pass on a few of the most important ones. This sort of story-telling is not proof. But it is possibility and maybe even plausibility, contrary to standard historical narratives. That’s a good place to start.

5.1 The 1980s

The rise of inflation in the 1970s and its decline in the 1980s is the primary parable for the power of monetary policy to cause inflation and later to cure it. The 1980s disinflation, being a large data point, dominates empirical work such as VAR estimates of how interest rates affect inflation (Ramey, 2016).

Figure 5.1 reminds us of the episode. Inflation came in four great waves. Each time, the Fed raised interest rates with inflation, indeed more promptly than in 2022. In the first three waves, inflation declined, with a recession, but came back more strongly. Starting in 1980 the Fed under Chair Paul Volcker raised rates more energetically, touching 20 percent. Despite two bruising recessions and with the support of the Reagan administration, the Fed kept real rates high for a decade. Inflation dropped sharply in 1982. The Phillips curve shifted in to less inflation and less unemployment. The adaptive-expectations Keynesian establishment had argued for acceptance of higher inflation, warning it would take a decade of stagnation to bring inflation back. That inflation fell so quickly was a central victory for rational expectations. The Fed tightened again in the “inflation scare” of 1987. Inflation then melted away. The “great moderation” had begun. In many analysts’ eyes, the Fed’s hard-won commitment to do what it takes should inflation get out of hand kept inflation low for three subsequent decades by “anchoring expectations.” It allowed the Fed to disinflate painlessly in 2022, by just reestablishing that credibility.

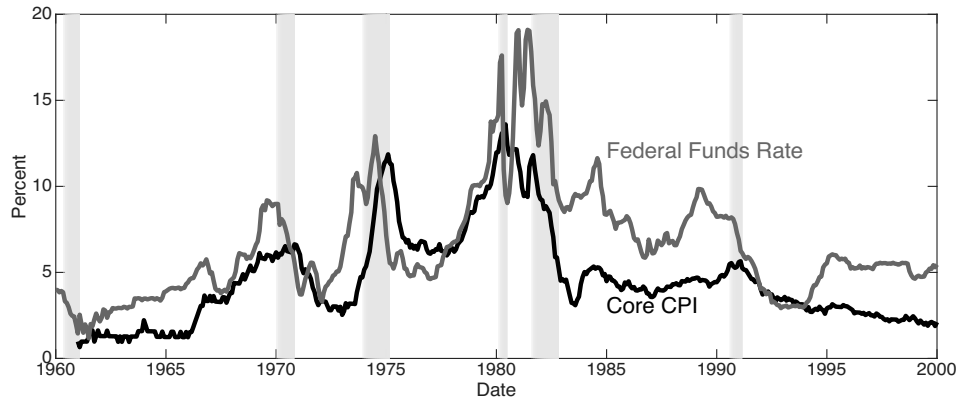


Figure 5.1: Federal Funds Rate and core CPI 1960-2000.

This episode has fiscal as well as monetary roots. (Refer back to the history of primary surpluses in Figure 2.4.) Fiscal roots are already the standard story for the late 1960s inflation surge. President Johnson wished to fund the Vietnam war and the Great Society without tax increases. President Nixon followed suit with larger deficits. The deficits of the time seem small now, but the financial and monetary system was more fragile at the time. Small international capital markets, fixed exchange rates, and the remaining gold standard between central banks could not survive protracted trade and budget deficits. The Bretton Woods exchange rate regime, that fixed the dollar price of gold between central banks, cannot withstand any prolonged inflation. Its fixed exchange rates cannot withstand prolonged inflation differentials. The deficits of the 1975 recession were the largest seen since WWII. The decade-long economic slowdown made expectations of future surpluses more doubtful.

Debt was smaller, which paradoxically can make inflation more vulnerable to fiscal shocks. (Sims, 2024.) With less nominal debt on the left-hand side of the valuation equation, the same change in surplus has a larger effect on the price level. One's intuition that more debt makes governments more vulnerable to inflation comes from the correct intuition that with greater debt-service pressures, it is harder for governments to meet today's deficits with subsequent surpluses, and thus to avoid changes the present value of surpluses in the first place. But for a given change in surpluses, less debt means more inflation. The deficits of the early 1970s were large as a fraction of debt outstanding.

Monetary policy did not act alone during in the great disinflation. A large Social Security reform in 1982 put its finances on a stable footing for 30 years. Yes, it is possible to reform entitlements. As one thinks of present values of decades of future surpluses, that reform is especially salient. There were huge tax reforms in 1982 and 1986. They sharply lowered top marginal tax rates from 70% to 28% together with a

broader base. Deregulation also contributed to higher economic growth which helps primary surpluses. Primary surpluses surged in the late 1980s and 1990s, as Figure 2.4 reminds us. Economists wrote papers about what to do when all federal debt is repaid.

Figure 5.1 shows high real interest rates and a high interest cost on the debt. Taxpayers paid for that. Long-term bond yields were 15% in 1980. Those bonds were repaid when inflation went down below 5%, a windfall to bondholders. Taxpayers paid for that too. Primary surpluses *did* pay for the 1980s disinflation. One can only argue whether people understood it at the time. As above, expectations are about confidence in the institutions of government and its long-run fiscal sustainability, not about spreadsheet projections. That feeling of confidence was in the air.

Successful disinflations are (almost) always and everywhere the result of joint fiscal, monetary, and microeconomic reform, not monetary policy alone and especially not monetary policy with fiscal dysfunction and microeconomic stagnation. This was true of the US in the 1980s as well.

Many other monetary tightenings did not include fiscal reform, and did not lead to durable disinflation, including many in Latin America (next). Sims (2011) reads the waves of inflation in the 1970s this way: higher interest rates without fiscal reform lower inflation now by raising it later. Sims called this “stepping on a rake.” I call it “unpleasant interest rate arithmetic.” The waves stopped in the 1980s because the US solved the long-run fiscal problem.

The deficits of the early Reagan era led Sargent and Wallace (1981) in their classic “unpleasant monetarist arithmetic” to worry that a similar fate would befall the US in the 1980s if the government did not swiftly tighten fiscal policy. If the government runs unsustainable deficits, in their analysis, the central bank must print money and inflate sooner or later, with that timing its only choice. But while brilliantly right in theory, and a crucial precursor to the fiscal theory of the price level, Sargent and Wallace turned out to be wrong in the prediction. With the benefit of hindsight, we can see that the “Reagan deficits” were not particularly large *primary* deficits, especially given the deep recession. (See again Figure 2.4.) Total deficits surged on larger real interest payments on the stock of debt. Temporary recession spending and interest costs might also be expected to be repaid and to decline, as usual. Some of the deficit resulted from the unexpected inflation decline, which did not push people into higher tax brackets as quickly as Congress anticipated (Gramm and Solon, 2026). A congressional mistake was likely to be temporary. Sargent and Wallace also wrote before the Social Security, tax, and regulatory reforms got going. In a sense, the US did respond to their plea, but more in present value terms than by swift austerity.

The debate over disinflation in 1980 echoed some of the above theoretical discussions. The Keynesian policy consensus felt that disinflation would be too costly.

Thinking in terms of a Phillips curve with slowly adaptive expectations, it would take years of high unemployment to drive inflation down. Better to just get used to it, they said. The same arguments reappeared in 2022. Rational expectations economists argued that swift and painless disinflation was possible, if one could bring down expectations. However, central banker speeches then as now were unlikely to work. Changing expectations needs a change in regime. In the event, expectations did collapse, the Phillips curve shifted in (less unemployment and inflation), and inflation came down rapidly in the fall of 1982, a victory for rational expectations in the intellectual history of macroeconomics.

Even conventional IS-LM cannot avoid fiscal backing. One can marry fiscal theory to IS-LM and adaptive expectations too. Fiscal policy has to tighten to pay interest costs on the debt and rather than add deficits to the fiscal fire. Even in IS-LM/adaptive expectations models, if fiscal policy does not pay interest costs on the debt, now or in the future, higher interest rates cannot lower inflation (Cochrane, 2024a). The 1980s have to be understood as a joint monetary, fiscal, and microeconomic stabilization.

Standard new-Keynesian models do not offer an easy explanation of the 1980s either. The standard new-Keynesian model with AR(1) Taylor rule disturbances only lowers inflation for transitory interest rate movements. Persistent interest rate rises raise inflation. Thus, the classic new-Keynesian model must envision the 1980s as a repeated set of transitory interest-rate surprises, not a steadily higher interest rate that drives down inflation. And the “passive” fiscal tightening to pay interest costs and bondholders must still happen and be expected to happen, or inflation cannot fall at all.

5.2 Latin America

Latin American history is full of useful experience and cautionary tales for fiscal-monetary interactions. What happened there can happen here. Kehoe and Nicolini (2021) provide an excellent summary history.

Many Latin American attempted stabilizations tightened monetary policy, but did not follow with the needed fiscal and microeconomic reforms, and failed. In the US, the “Brazil scenario” of a return to inflation was feared in the early 1980s and may account for some of the otherwise puzzlingly high long-bond yields.

Loyo (1999) documents a fascinating episode in Brazil in the late 1970s and early 1980s. In his analysis, the central bank responded to inflation by raising interest rates. But fiscal policy did not tighten. Higher interest costs on the debt then added fiscal fuel to the inflation fire. Interest rates and inflation spiraled upward. A government that wishes to control inflation with high interest rates needs to tighten current or expected future fiscal policy to pay the interest costs on the debt.

This is an important and underappreciated mechanism, important for current policy debates.

If that is true, so is the converse. Lower interest rates lower interest costs on the debt, which is a *disinflationary* force. Governments who wish central banks to hold down interest costs are not entirely wrong. But do not apply that controversial result too quickly. If the government reacts to the interest-cost bounty by spending more, that undoes the disinflationary force. Lowering interest rates via financial repression, to lower interest costs on out-of-control deficits or unsustainable debts, does not work. “Holding constant fiscal policy” is an important qualification. The government must also lower rates persistently, and wait out forces such as the long-term debt mechanism that may raise inflation in the short run.

Ayres et al. (2021) and Carvalho (2025) analyze the fiscal and monetary roots of many other Brazilian episodes. In the late 1980s, Brazil tried several times to cure inflation with monetary policy and price controls, the latter designed to stop “inertia” and wage-price spirals. None worked.

The 1994 Real plan included a more independent central bank, an exchange-rate peg, and a clever transition via a parallel “real” unit of account. But centrally the plan included a broad fiscal and microeconomic reform. Tax revenues rose permanently from 25% to about 32% of GDP, which itself grew more strongly. Seigniorage revenues fell from 3% to less than 0.5% of GDP, indicating much less monetary financing to go along with the much larger tax financing. Inflation ended, at least for a while.

Argentina is the poster country for monetary-fiscal interactions. (See Buera and Nicolini, 2021.) I’ll mention just two episodes. From 1991 to 2002 Argentina operated a currency board. In this arrangement, the central bank pegged the peso to the dollar, with 100% reserves. This looks like an ironclad arrangement to avoid fiscal inflation. The arrangement seems to separate the central bank balance sheet from the government’s fiscal affairs. Pesos can all be redeemed for dollars, at parity, if need be. The present value of surpluses backs the rest of the debt. That debt may default, but it may not inflate. A currency board is a fiscal commitment like the gold standard. Independent central banks with separate balance sheets can be useful devices, even in fiscal theory.

Still, the currency board fell apart. Argentina’s fiscal problems returned, in particular spending by state governments. The government abrogated the currency board, devalued the peso, and seized the assets. The supposedly separate government and central bank balance sheets were consolidated in the end.

That is not to say a currency board is a bad idea. It worked for 10 years. That it is not an unbreakable commitment does not mean it is no commitment at all. Full dollarization would be a stronger commitment, as it is more difficult to reverse.

Inflation returned with a vengeance, reaching 211% in 2023. Javier Milei's election in November 2023 proved a watershed. He immediately embarked on a sharp program of spending cuts. Deficits, 8% of GDP in 2020 and 5% of GDP in 2023, became a 0.8% of GDP surplus in 2024. If anyone complains that fiscal reforms are politically impossible, ask what is the chance that Argentina elects a Libertarian president, who names his dogs Milton (Friedman), Murray (Rothbard), Robert, and Lucas, and who balances the budget in one year by cutting spending? Inflation fell like a stone, with *lower* interest rates and no monetary stringency. Inflation remains 2% per month, but that is the government's devaluation target.

5.3 War Finance

Inflation is one of the great miseries of war, and one that clearly shows inflation's fiscal roots. In wars, governments spend like crazy. They borrow and print money in addition to raising taxes. They have the central bank buy newly-issued debt, hold down interest costs on the debt, and force people and institutions to hold debt. When inflation breaks out, they resort to price controls and rationing. These policies shift some of the costs of war from current and future taxpayers to money holders and bond holders. That shift can be economically efficient if not done too frequently. Lucas and Stokey (1983) describe the optimality of such "state-contingent default." An inflation has broken out with every US war (Hall and Sargent, 2021a) and in many other countries. (Hall and Sargent (2021b) compare the Covid response to war finance. Marzian and Trebesch (2025) study a comprehensive dataset of war finance episodes.)

The amount and timing of inflation varies. Sometimes inflation happens during the war, and sometimes after the war. Sometimes postwar deflation follows wartime inflation. (See figure 27.10 in Hall and Sargent, 2021a.) Inflation or deflation seems to follow the decisions whether and how debt will be *repaid* (my interpretation). Though Alexander Hamilton famously arranged for the United States to assume and repay interest-paying debt from the revolutionary war, the US allowed non-interest paying debt, the continental dollar, to inflate away (Hall and Sargent, 2014). The greenback dollar inflated by 100% during the Civil War. After a long debate, the US returned it to parity in 1879, resulting in a long deflation. The UK was famous for a regime in which currency convertibility to gold was suspended during a war, but then reimposed some time after the war. That regime gave people more confidence to hold bonds and currency, improving the government's borrowing capacity, and it reduced inflation during the war (Bordo and Kydland, 1995). Still, in each case the decision to return to parity was a decision, with debate on both sides. That uncertainty accounts for inflation during the war, which would have been much lower if people knew with certainty that the government would return swiftly to convertibility at the original parity after the war. A return to convertibility is also a

bet on winning the war. The UK decision to return to parity after WWI and repay debt, with consequent deflation, is famous for Keynes' argument against it. France devalued and Germany hyperinflated. This long historical precedent buttresses my view that inflation surged in 2021 not so much from the war-like spending (together with war-like waste) but because the new spending in 2021 amounted to a decision not to repay the new debt.

Hall (2004) and McCandless (1996) show how the value of currencies responds to battlefield gains and losses in WWI and the Civil War respectively. These observations illuminate the fiscal backing underlying the value of money. On the morning of a battlefield loss, money supply or demand do not change. Interest rates do not change. The chance of the government having the fiscal resources to repay its debts and to back its currency changes.

5.4 1951

The US inflation of 1950-51 during the Korean War, leading to the Fed-Treasury Accord that re-established Federal Reserve independence, is another famous parable. (I draw here on Hetzel and Leach, 2001. The interpretation is my own; at more length in Cochrane, 2026a.)

Starting in WWII, the Fed bought as many long-term bonds as needed to keep yields below 2.5%. In the popular narrative, inflation under that interest-rate peg spiraled out of control, following the Friedman's 1968 classic description: Inflation starts, often attributed to Korean war stimulus; the Fed prints money (non-interest-bearing bank reserves) to buy bonds and hold down rates; that raises the money supply, which causes more inflation; and so forth. The Fed then wins its independence, allowing rates to rise. The Fed tightens money supply, which cures inflation.

Figure 5.2 presents the episode. The standard narrative is suspect in many ways. First, the Korean war was financed with taxes, not deficits. Though today we generally advocate tax smoothing and debt financing, that choice was a widespread consensus, to avoid the inflation that broke out when WWII price controls were lifted. Though the deficit had reached 27% of GDP in 1943, it evaporated once WWII was over. The government ran a surplus of 4.3% of GDP in 1948, only 1% of GDP deficit in the recession year of 1950, and 1.8% of GDP surplus in 1951. Remembering that the US was paying 2.5% interest on about 80% of GDP debt, primary surpluses were about 2% of GDP larger.

The 2.5% peg was implemented during WWII in order to help the government to finance the huge deficits of that war. By 1950, though, the fiscal pressure on the Fed was *not* to monetize new debt, nor to hold down budgetary interest costs on the debt. The debt was mostly long-term, including 40-year bonds, so higher interest rates would not result in larger interest costs for many years. The prime fiscal issue

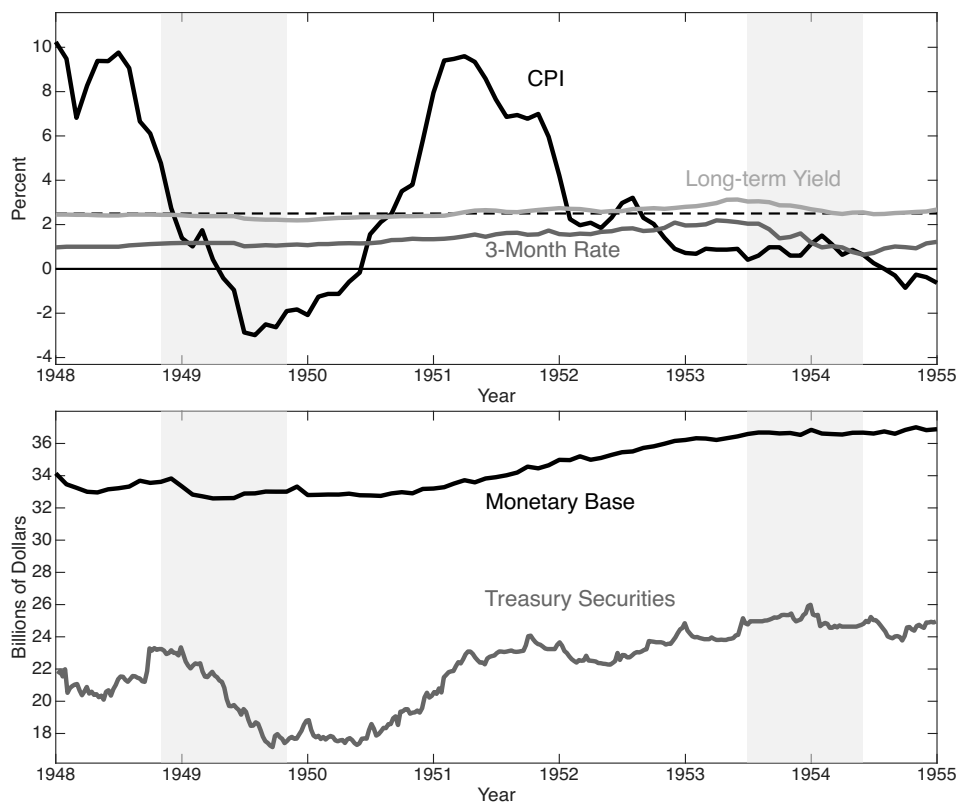


Figure 5.2: The Accord. Top: Inflation and interest rates. Dashed line indicates 2.5% Bottom: Monetary base and Fed holdings of US Treasury securities.

was to keep bond prices high, both as a reward for those who had bought the bonds during the war and out of fear that any decline in prices would cause large holders such as insurance companies to sell.

So what sparked inflation? Contemporary opinion was clear: prospective *future* deficits, along with prospective future price controls. By the end of 1950, the Korean war was going badly for the US and its allies. There was a good chance it would explode into WWII. People rightly anticipated that a major conflict would be financed like WWII, with huge deficits, financial repression, and price and wage controls, with inflation to follow the moment price controls are lifted—and at that, if the US won the war.

Hetzel and Leach, 2001 write

On November 25 and 26 [1950], the Chinese army, 300 thousand strong, crossed the Yalu River. Suddenly, the United States faced the possibility of a war with China and, if the Soviet Union came to the aid

of its ally, of World War III. . . Anticipating the reimposition of wartime controls and shortages, consumers rushed out to buy consumer durables. On world markets, commodity prices soared. For the three-month period ending February 1951, CPI inflation was at an annualized rate of 21 percent.

. . . The prospect of a prolonged war created the likelihood of government deficits and the issuance of new government debt. Additional debt would force down the price of debt unless the Fed monetized it. . .

Milton Friedman himself, in Senate testimony jointly authored with several other University of Chicago economists (Friedman et al., 1950), writes

Actually, the production of armament is as yet a mere trickle. The recent price rises cannot, therefore, be attributed to expenditures on these. Neither can they be attributed to other expenditures of the Federal Government. During the second 6 months of 1950, the Federal Government took in substantially more than it paid out. The federal budget was, therefore, if anything a deflationary rather than in inflationary force during this period. True, as armament expenditures rise, this situation will change unless new taxes are levied to meet the increased expenditures. Such additional taxes should be levied. . .

The expectation has been that there would be substantial armament expenditures in the future, that a wide variety of goods would be unavailable and that there would occur future rises in prices. The expectation has given a strong incentive to businesses and individuals to buy now. The repeated threats by Government of wage and price ceilings has further promoted price rises by serving notice on any groups that can exercise control over prices or wages to increase them before it is too late.

Expected future deficits are a central cause of inflation. The fiscal theorist smiles.

Friedman and Hetzel and Leach, of course, thought that that the increase in monetary base was the crucial fuel that let this fiscal spark turn in to inflation. To them, re-establishing the Fed's authority to stop buying bonds and creating new reserves, even if long-term interest rates would then rise, and thus controlling the monetary base (cash and reserves), was the key to stopping inflation.

The bottom panel of Figure 5.2 casts some doubt on this analysis. The Fed did buy a lot of US treasury debt from 1950 to 1951. But the nominal monetary base (reserves + currency) did not show the sort of unusual growth that one would associate with unusual inflation in 1950 and 1951. With 10% inflation, the real monetary base grew even less. The monetary base grew more quickly after the inflation was over from 1952-55.

The top panel of Figure 5.2 shows a greater surprise. One would expect that once the Fed-Treasury Accord was implemented in mid-1951, that long-term rates would have surged, or that short-term rates would have risen and money supply would have stopped growing. Nothing of the sort happened. One can barely see the long-term bond yield slightly breach 2.5%. The short-term interest rate barely budged. Inflation stopped with no monetary stringency, no high interest rates, and no recession. What was all the fuss about, one wonders? This is another immaculate disinflation, coming from a perceived change in regime. At best, one might argue that the *threat* of Fed action was enough, without the Fed having to do much of anything.

What else happened in Spring 1951 that could account for the end of inflation? Most crucially, it became clear that Korea would not turn in to WWII, but rather would settle into a relatively inexpensive stalemate. Expectations of large future deficits, price controls, and rationing evaporated.

The episode thus has an interesting alternative fiscal-theory narrative. Expected future deficits, amplified by expected future price controls, sent inflation zooming. The evaporation of those expected future deficits immaculately ended inflation with basically no movement in interest rates.

That of course is not proof. But the possibility of a dramatically different story than the conventional narrative is intriguing.

5.5 The Ends of Hyperinflations.

Figure 5.3, from Sargent (1982), plots the price level in the famous German hyperinflation that followed WWI. Note the vertical axis. The price level rose by a factor of 10^{12} . Ferguson (1999) also has a useful history of the episode.

That inflation had a clear fiscal source. The German government ran large deficits in part to pay reparations under the treaty of Versailles. It resorted to printing money. In Ferguson's account, reparations payments themselves were not so much the problem, but the government had little incentive to fix its other fiscal problems if any greater revenues or lower spending would just lead to larger reparations. Inflation ended with the Dawes plan that renegotiated reparations, and a fundamental fiscal and monetary reform. The government cut substantial internal deficits, including by firing state, railroad, and postal employees, and it instituted an independent central bank.

Inflation ended immediately. There was no monetary stringency. Indeed, the money supply increased, as people were happy to hold more non-inflating money. Interest rates declined. There was no recession. Sargent writes, "By all available measures, the stabilization of the German mark was accompanied by increases in

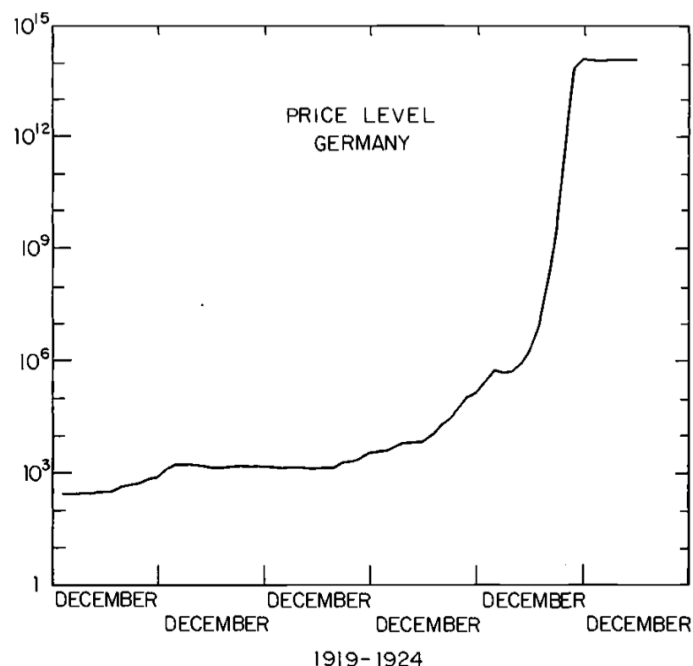


Figure 5.3: Price level in Germany after WWI. Source: Sargent (1982).

output and employment and decreases in unemployment.” Inflation stopped the moment the *long-run* fiscal problem was solved, the minute the fiscal *regime* changed.

Sargent wrote in the context of the debate over disinflation in the US. Many thought that expectations were so sticky and adaptive that the severe recession of 1982 would have to go on for years to bring down inflation. Sargent’s point that a change in regime could shift forward-looking expectations rapidly presciently anticipated that event in late 1982.

Sargent reports that in Austria, following a similar path, the central bank was *forbidden* to buy treasury debt. It instead had to back its currency issues with gold, foreign debt, or other assets. This idea is similar to the Argentinian currency board. That contrasts with the US Federal Reserve, which usually holds *only* government or government-guaranteed securities. The former guards against inflationary finance. The latter guards against credit allocation. Different institutions serve different purposes. Again, central bank balance sheets can offer important fiscal precommitments, when needed.

5.6 Currency Crashes and Exchange Rates

In the great puzzle of why exchange rates vary so much, we often note that currencies appreciate on good economic news, even with no change in monetary policies. Why? Well, higher economic growth means greater fiscal surpluses.

The East Asian currency crises of the late 1990s were a puzzle to international economics. These countries did not have large external debts, no large trade or budget deficits, and no monetary easing. But, as Burnside, Eichenbaum, and Rebelo (2001) show, the crises featured bad news about *prospective* deficits. The governments were widely expected to bail out banks. Banks had taken on a lot of short-term foreign-currency debt, so were vulnerable to an exchange-rate depreciation. Such depreciation led to a run on banks which then became a run on the government. The government had unfunded *contingent* liabilities. The lesson that contingent liabilities can undermine fiscal and monetary affairs is important for the United States going forward, given the huge size of implicit and explicit bailout, credit, and mortgage guarantees.

I have highlighted the pitfalls of trying to relate deficits to inflation, and trying to discount official deficit projections to predict inflation and currency devaluation. Sometimes it does work, however. Deficits *can* follow AR(1) rather than s-shaped processes, and deficit projections *can* have useful information. Jiang (2021) finds that rises IMF deficit forecasts line up with exchange rate depreciations across a sample of developed countries.

5.7 Inflation Targets

In the 1990s a number of countries starting with New Zealand, Canada, and Israel adopted an inflation-targeting framework. They experienced rapid inflation declines without monetary stringency or economic contraction. Many other countries followed though less thoroughly.

The centerpiece of inflation targeting is an independent central bank, given a single mandate to control inflation, often with a numerical target and formal accountability. That sounds like a purely monetary arrangement. One would expect, and many did, that the new central banks were simply empowered to repeat the 1980s; to reduce inflation via prolonged high interest rates and deep recessions. But that did not happen. Inflation fell without high interest rates, and output grew. The conventional interpretation is that the power to repeat the 1980s quickly gave the banks credibility so hard-won by the US Federal Reserve, so expectations dropped and became “anchored,” without the banks having to prove that anchor in a storm.

However, the inflation-targeting reforms coincided with fiscal and microeconomic reforms. Governments cut budget deficits sustainably. Microeconomic reforms al-

lowed economic growth, which adds to tax revenue. Adopting an inflation target is not an exogenous event. It is the product of a government that has too much inflation, too little growth, budget deficits, and has the political will and ability to reform on many fronts.

More deeply, a government that sets up an independent central bank with an inflation target implicitly commits to repaying its debts at the target value of inflation, no more and no less. This is the kind of fiscal commitment behind a gold standard, currency board, a foreign-exchange peg or a debt brake. It commits that the right-hand side of the government debt valuation equation will be consistent with the left-hand side, at the inflation target. A more formal fiscal commitment might work even better.

Advanced-country economists often dismiss the evidence of wars, hyperinflations, inflation-targeting reforms, Latin American affairs, and currency crashes. “Sure, fiscal theory works for those extreme events, but not for normal times in our countries.” Yet, why not? Large data points are often the most informative about basic mechanisms. Yes, other effects such as liquidity premiums, credit frictions, sticky prices and wages, and so forth may have a greater chance to stand out when fiscal affairs are more quiet. And they also have a greater chance to obscure underlying mechanisms. Yes, the economy may be nonlinear and respond differently to large shocks. Prices are notoriously less sticky in large inflations. But all that does not argue for a fundamentally different theory of large and small events.

5.8 Japan

What about Japan? The question usually comes up the minute one says “fiscal theory.” (More on this issue in Cochrane (2023) and Cochrane (2024b).)

Japan notoriously has a huge debt to GDP ratio, between 150% and 250% depending how you count it. Yet, until recently, Japan had next to no inflation. From 1993 to 2021 Japan’s price *level* barely budged, changing not at all until 2016 and only 5% higher in 2021 than in 1993. Take that, fiscal theory.

Debt sustainability does not distinguish fiscal from other theories. All complete economic models include the government debt valuation equation. If that equation truly fails, it is equally a puzzle to all theories that inflation or a debt crisis has not already broken out. And if Japan is the exception, that does not make painless 250% debt to GDP the rule. Every other country that has had a debt crisis or inflation has done so with less than 250% of GDP debt!

There are many reasons (excuses?) why Japan has been able to sustain this large debt so far. Japan saves about one third of GDP, double the US. Japan’s debt is much longer term than the US, insulating it from rollover crises and interest rate

swings. Japanese debt is mostly (85% or more) held domestically by people, banks, insurance and pension companies, and other institutions. Japan has an estate tax, which kicks in at ¥10,000,000, about \$65,000. Some of that debt is coming right back in taxes. A lot of US debt is held by foreign central banks and fast-trading financial institutions that use US debt as collateral. Japan has large international assets, built up from years of trade surpluses. The US has been running trade deficits and borrowing abroad (Salmon, 2025). Japan funded much of its pension liability by a carry trade—borrowing short at low rates in Yen, investing in US stocks, benefiting from that rise and the Yen’s depreciation (Chien, Cole, and Lustig, 2025). If that bet does not go sour, the present value of the Japanese government’s pension liabilities is a lot smaller than it looks. Japan tried fiscal stimulus for many years, but was criticized because it also raised consumption taxes any time debt seemed slightly precarious. A habit and reputation for fiscal probity and debt repayment is hard to reverse, and especially to reverse a little bit. Japan also benefited from extraordinarily low interest costs. Any debt is sustainable at near-zero real interest cost. The same debt is not sustainable at 3% interest. “Just wait,” I also answered for many years. We may not have to wait much longer, as long-term rates in Japan have been rising ominously as I write in early 2026. Interest costs are consuming more and more of the budget. The decline of the Yen and the beginning of inflation may be the first sign.

Japanese monetary policy featured zero interest rates, zero price level growth, extremely quiet inflation, and ample reserves for 30 years. What is there to complain about? Japan had for 30 years the most perfect monetary policy *outcomes* the world has ever seen.

What of the supposed 30 years of stagnation supposedly brought on by the deflationary pressure of the zero bound? Monetary non-neutrality doesn’t last 30 years. The US grew well in the 19th century with slow deflation. Japan does not show signs of perpetual lack of demand. Japan’s unemployment rate has been below that of the US for all but about three of the last thirty years. A 30-year growth problem is a growth problem, microeconomic not macroeconomic. And one can point to many microeconomic distortions. Japan is 29th on the World Bank’s Ease of Doing Business Index,¹ just below the Russia. Japan’s banks have been criticized as carrying too much non-performing debt. Its financial system is not particularly innovative. It is not clear all that stimulus was wisely spent.

Even then, though Japan’s GDP growth has slowed, Japan’s GDP *per working age person* has grown faster than in the United States (Shirakawa, 2023; Fernández-Villaverde, Ventura, and Yao, 2024). Perhaps Milton Friedman (1968) should have extended his list of things that monetary policy cannot do: Monetary policy cannot create or retard long-run growth. And monetary policy cannot create babies! Still,

¹<https://archive.doingbusiness.org/en/rankings>

total GDP is what matters for debt repayment.

5.9 The Euro

The Euro is the grandest inflation-targeting regime and one with explicit fiscal foundations. Here I quickly summarize Cochrane, Garicano, and Masuch (2025) among other sources.

A currency union without fiscal union suffers an even greater temptation to debt monetization than a single country like the US. Each country can be tempted to borrow, spend, cry “crisis,” and plead for the central bank to hold down its interest costs and bail it and its creditors out with newly-printed money.

The architects of the euro understood this danger and presciently erected institutions to control it. The ECB is founded as an independent central bank. It is more independent than the US Fed, both in the terms of its leaders’ appointments and the relative weakness of the EU institutions that oversee it. The ECB has a single mandate, “price stability.” That meant “and nothing else,” specifically not employment, not varying conditions across member states, and not even financial and banking stability. The ECB would not buy sovereign debts. Instead, it would create reserves by lending to banks against collateral. Countries would avoid getting in to trouble in the first place by following debt and deficit limits. A “no-bail out” rule prohibited country-to-country fiscal bailouts.

There were a few lacunae at the start. A currency union without fiscal and political union requires that, in the end, countries must be able to default and stay in the euro just as companies do. Yet there was no procedure for sovereign default or restructuring. There was no IMF-like institution to manage sovereigns on the edge of default, where low interest rates are sustainable but high interest rates are not, providing temporary assistance conditional on the sort of hard steps that bring a country back from the edge. Most of all, bank regulators never acknowledged that sovereign debt is risky. Sovereign debt is treated as a risk-free asset for banks. This treatment, together with expanding ECB intervention, encourages banks to hold sovereign debt. Sovereigns like having banks as ready buyers of their debts. The concentration of sovereign debt in bank assets means that any sovereign default or restructuring threatens to bring down the banks. That threat of financial chaos further invites ECB intervention to prop up government bonds.

These lacunae are understandable. All institutions start with simple founding principles and then adapt in response to experience. And in the late 1990s, who could have imagined that advanced-country sovereign default and financial crises could even be possible? Nobody wants to write too harsh a pre-nuptial agreement on the wedding night, spelling out all sorts of unlikely but unpleasant events.

The European Monetary Union worked remarkably well, with low inflation. But early on, cracks started to show. France and Germany violated the debt and deficit rules, with no consequence. Starting in the financial crisis, the ECB took on a financial stability role and started buying assets. Then came the sovereign debt crisis, with Mario Draghi's memorable "whatever it takes," committing to sovereign bond purchases (but with important limits). These purchases continued in one after another program, each with looser and looser limits. The combination of the Target2 mechanism and the fact that national central banks hold ECB purchases of their own countries' debts and share profits only with their own countries, implies large cross-country fiscal transfers (Chien, Jiang, and Leombroni, 2025). High-debt and high-yield countries are able, in essence, to finance large fractions of their debts at the ECB overnight rate, which ultimately is subsidized by taxpayers across the union. Now the ECB has a large portfolio of sovereign bonds and is widely expected to intervene to stop sovereign spreads from widening, with sovereign default unthinkable. Sovereigns see little incentive to tighten, and investors see little reason to worry.

We outline a set of reforms. The ECB needs to stop perpetually propping up sovereign debts. It must be able to do so. To that end, the European Stability Mechanism needs to be improved to offer help with conditionality, but with default a possibility should that fail. Banks should not have concentrated sovereign exposure.

5.10 The Future

From a fiscal-theory point of view, the future of the US, Europe, UK, Japan, and other countries looks perilous.

Figure 5.4 plots the Congressional Budget Office long-term projections for debt to GDP and deficits. The steady 2% of GDP primary deficits lead to a slow explosion of the debt to GDP ratio.

These are projections, not conditional expectations. They are optimistic in several ways. The CBO is required to project tax rises and spending cuts in current law that are not likely to happen. The real interest rate on long-term debt may not remain as low as the projected 1.8%. Population growth is coming in dramatically less than earlier projections. Economic growth may disappoint. Most of all, though, these projections assume that nothing bad will happen again. Note how debt rose in the financial crisis and pandemic, reduced only slightly by inflation in the latter case. Surely something bad will happen at some point in the next 30 years. The US will want to meet future crises with more borrowed or printed money.

These projections are also pessimistic, as forecasts. This scenario will not happen. The CBO itself labels the scenario "unsustainable." Debt to GDP cannot grow forever. The only question is how it will not happen. The good news is that fixing

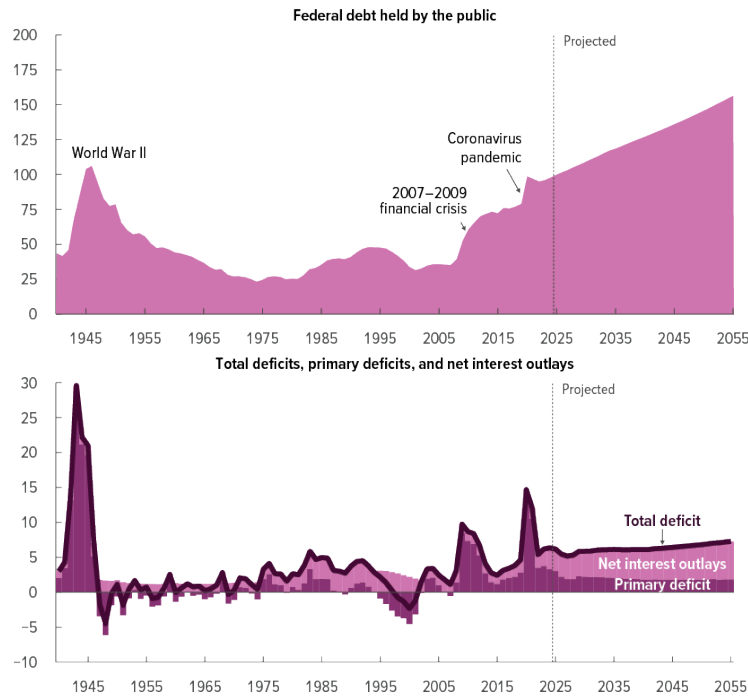


Figure 5.4: Congressional Budget Office debt and deficit history and projections. Source: Congressional Budget Office (2025).

a 2% of GDP fiscal gap in a prosperous growing country at peace is not that hard as an economic matter. The reforms of the 1980s can be repeated. A humorist can do it in an afternoon (O’Rourke, 1991, p. 99 ff). And maybe AI will bring a river of growth and all our debt problems will vanish.

Absent such luck, we need decades of reliable small primary surpluses, not just to pay off the old debt but to cure the larger problem of unlimited scheduled borrowing. The good news in that statement is that we do not need short-run “austerity,” especially rises in already-high marginal tax rates. That will be counterproductive. That is also the bad news. We need long-run reforms, more revenue at lower marginal rates not one-time wealth grabs, and surpluses past the usual 10 year budget windows. The long-run Laffer curve peaks lower than the short-run curve, because all the behavioral responses and disincentives kick in over time. In particular, capital levies that look attractive in the short run are disasters in the long run. High and progressive labor taxes induce less human capital investment even if they do not induce fewer hours of work.

Why don’t we already have galloping inflation with these fiscal projections? Markets know they cannot happen. Arguably, bond markets understand the United

States is a great country, with no external fiscal pressure. Surely the United States is not going to drive itself to large inflation or a debt crisis for no good reason other than internal bickering. On the other hand, it is dangerous to take that faith too much for granted. As straightforward as a fiscal reform is as a matter of economics, it does seem to be beyond capacity of the current US political system.

Inflation or default will not cure the US or other advanced-country fiscal problems. The fiscal problem is prospective deficits; poor prospects for repayment, not so much current debt. If we wipe out all current debt, we still must finance endless primary deficits. And the day after a \$36 trillion default or Weimar hyperinflation, who is going to lend a trillion or so new dollars to the US each year?

The conventional framing posits that we follow the CBO path of deficit, debt and its economic projections for growth and interest rates, but nothing else happens. Some day the bond vigilantes wake up, and refuse to roll over the debt. We experience a crisis which the Fed fights by monetization and inflation.

Two other danger scenarios are, I think, more salient. First, debt hangs over monetary policy. Suppose inflation surges and the Fed wishes to raise interest rates. The Fed will face the usual headwinds: The president, Congress, and electorate will be in little mood for high interest rates, or to tolerate high borrowing costs and unemployment. The usual blame-game of “price-gougers,” “monopolists,” “greed,” and “shocks” will emanate from Washington, offering excuses for inaction. Higher interest rates will put all the too-big-to fail financial institutions at risk again, “financial dominance” for the Fed’s monetary policy and more gasoline on the fiscal fire should bailouts materialize. On top of this, every one percent real interest rate rise is, at 100% debt to GDP ratio, a one percent of GDP rise in interest costs. Debt to GDP was only 25% in the last great disinflation of 1980.

Second, what happens in the next crisis? There could be a geopolitical shock—China blockades Taiwan for example, or a major war in the middle east—a new pandemic, or another financial crisis. Once again, the US government will want to spend \$5 trillion or more on bailouts, stimulus, insurance for the unfortunate, and perhaps a big military investment. But there will still be no plan for debt repayment. Will bond markets, a 15% or so inflation-induced loss fresh in mind, really provide \$5 trillion in additional savings and sit on the bonds for a generation? If not, inflation will surge even more quickly. And the US may find itself finally *unable* to extinguish every crisis with a river of money. Debt is not the problem. Lack of fiscal space to reliably promise additional primary surpluses is the central problem.

These concerns intersect. Imagine a crisis like 2020, with Treasury rates rising and pressure on the Fed to again monetize \$3 trillion of debt and to lower rates, but this time with inflation already beginning to surge. Will the Fed really raise short-term interest rates, allow long-term rates to spike, refuse to buy treasury debt

in what will surely be called “fragmented,” “illiquid,” or “dysfunctional” markets, and add interest costs on the debt to the governments’ problems, all in the name of fighting inflation? This is what an independent bank with an inflation mandate is supposed to do. Do we even *want* the Fed to stand firm, with Congress and Administration screaming for action? Imagine the ECB in a similar situation, with sovereign defaults looming. Will it really allow sovereign defaults in order to fight inflation?

I suspect that these fiscal-monetary tensions, involving interest costs on the debt and crisis monetization, rather than Phillips curve stimulus, will be a central conflict between administration, Congress, and Federal Reserve in the future. Already, President Trump cites interest costs on the debt as a reason for demanding lower interest rates from the Fed. The precedent will be Truman 1951, not Nixon 1972. With debt to GDP not seen since the second world war, this should not be a surprise. But this is a conflict that few in government, Fed or academia are thinking about. Our central banks’ mandates and the terms of their independence do not adequately consider this conflict.

Inflation is always a choice. If we wish less inflation in the future, we must prepare to make different choices. First, fix the long-run fiscal problem, to produce steady surpluses that can reliably pay down debts accumulated in emergencies. Pair any deficit financing with much clearer commitments that the government can and will repay. A debt brake, a functional budget process, and rules linking surpluses the price level would strengthen those commitments. Second, spend more wisely in emergencies. Foreswear fiscal stimulus—deliberate spending just in an attempt to goose demand rather than on anything of particular value. Fix finance to eliminate bailouts. Third, empower the central bank to fight fiscal inflation, rather than to quickly monetize government debt. Allow long-term interest rates to signal the markets’ limits. Raise short-term rates promptly.

On the other hand, real interest rates could decline back to zero or lower, allowing debt to be sustainable much longer. AI, or (in my dreams) a free-market revolution might spur unimagined growth, so that debt is automatically paid off. It’s hard to forecast, especially the future.

Chapter 6

Interest Rates and Inflation

A nagging problem remains: How do central banks, by raising interest rates, lower inflation? Can they do so, how, for how long, and with what constraints? There is a chasm on this question between the policy community's beliefs, as captured by the adaptive or sluggish expectations models, and the operation of the forward-looking, rational expectations new-Keynesian and new-Keynesian plus fiscal theory models.

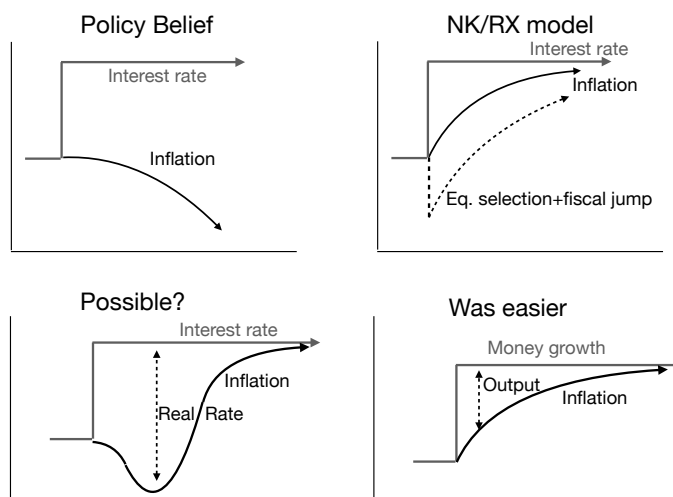


Figure 6.1: Policy view vs. contemporary models of how interest rates affect inflation.

Figure 6.1 illustrates the issue. The top two panels remind us of where we left off in section 4.5. In the policy view, illustrated in the top left panel, higher interest rates set off a downward deflation spiral, until the central bank lowers interest rates once again. (Figure 4.1 shows that reaction. I graph here the response to

a permanent interest rate rise, to better illustrate the long-run properties of the theories. The usual transitory interest rate rises give the same short-run responses.)

The top-right panel illustrates the new-Keynesian model with and without fiscal theory. Higher interest rates alone *raise* inflation. The only way to lower inflation is if a downward jump accompanies higher interest rates. That jump does all the work. In the new-Keynesian model nothing links the equilibrium-selection jump to higher interest rates. The central bank can just as easily cause inflation to jump down with no change in rates. Even the standard Taylor rule encodes separate interest-rate and equilibrium-selection policies; different Taylor-rule residuals can produce the same interest-rate path but different inflation paths. (See Cochrane, 2026d.) To a fiscal theorist, the downward jump is a coincident fiscal tightening with short-term debt, or (at last) tied to the interest rate rise via the long-term debt mechanism.

The first puzzle, then, is how do higher interest rates lower inflation at all? A coincident equilibrium-selection or fiscal jump means that higher interest rates are not just irrelevant, but actually counterproductive. The long-term debt fiscal model at last offers a connection between higher interest rates and lower inflation, and gives banks a reason for raising interest rates at all.

But even in this model, as laid out in Figure 3.2, inflation jumps down and then rises. The conventional doctrine holds that higher interest rates lower inflation going forward, with “long and variable lags.” Is there a model that captures these beliefs? Stability and neutrality mean that higher interest rates must raise inflation in the long run. But it is still possible that higher interest rates lower inflation going forward in the short run, as illustrated in the bottom left-hand panel.

Constructing such a theory is not easy. We need higher nominal interest rates to raise real interest rates more than one for one, as shown. With flexible prices, higher nominal interest rates just raise inflation with no change in real interest rate. With sticky prices, higher nominal interest rates are split between higher real rates and higher inflation in the short run as shown in the top right panel. This real interest rate rise is enough for higher nominal interest rates to reduce *output*, which is where many analyses stop, viewing that the more important issue. But it is not enough to reduce *inflation*.

The challenge was easier for monetarism, illustrated in the bottom right panel. With flexible prices, higher money growth also instantly raises inflation with no output effect. With sticky prices, higher money growth is split between output and inflation in the short run, raising inflation in the long run. But monetarists never wanted higher money growth to temporarily lower inflation, as we want higher nominal interest rates to temporarily lower inflation. (One might argue for a period of inflation outpacing money growth to restore the ratio of money to nominal GDP, less some interest elasticity. I omit such an additional rise for simplicity.)

The contrast between policy doctrine and the equations of contemporary economic models is deep-seated. In the halls of academia, of course higher real interest rates raise expected future consumption growth. A higher real interest rate induces you to consume less today, save, and consume more tomorrow. That is exactly how the standard new-Keynesian model behaves—and the real business cycle model and the first equation of asset pricing. In the policy world, of course higher interest *lower* consumption and output going forward, and only a fool would think otherwise. Likewise, the standard forward-looking Phillips curve says that lower output reduces inflation today relative to next year's inflation. That means inflation will grow over time. In the policy world, even at banks and among analysts who use the forward-looking Philips curve as their central causal story for inflation, nobody would say out loud that lower output makes inflation next year higher than inflation now. (Ball (1994) pointed this out 30 years ago.) Only an instantaneous jump in consumption or inflation can appear to reverse the signs.

Box 6.1: The Sign Puzzle

“A higher real interest rate induces you to consume less today, save, and consume more tomorrow” is the standard intertemporal first order condition

$$R_t^f = \beta E_t(c_{t+1}/c_t)^{-\gamma}$$

or

$$x_t = E_t x_{t+1} - \sigma(i_t - E_t \pi_{t+1}).$$

“Lower output means inflation will grow over time” is the standard forward-looking Phillips curve

$$\pi_t = \beta E_t \pi_{t+1} + \kappa x_t$$

so

$$\beta E_t \pi_{t+1} - \pi_t = -\kappa x_t,$$

and $\beta \approx 1$.

The same problems lie at the base of international economics. In the standard policy view, a higher domestic interest rate i than foreign rate i^* slowly raises the value of the currency, as shown in the right-hand panel of Figure 6.2. In the simplest model, consisting of a single tradeable good, flexible prices, and rational expectations, the exchange rate declines. Higher domestic than foreign interest rates mean higher domestic than foreign inflation. As the domestic currency loses value relative to the foreign currency, the exchange rate falls (purchasing power parity), as shown in the solid e line of the left-hand panel. But the exchange rate can jump too. If one assumes that the nominal exchange rate must return to its initial value (the “bounded” solution), the exchange rate must jump up, as shown by the dashed line, so it may then decline back to that value. The price level jumps down so that

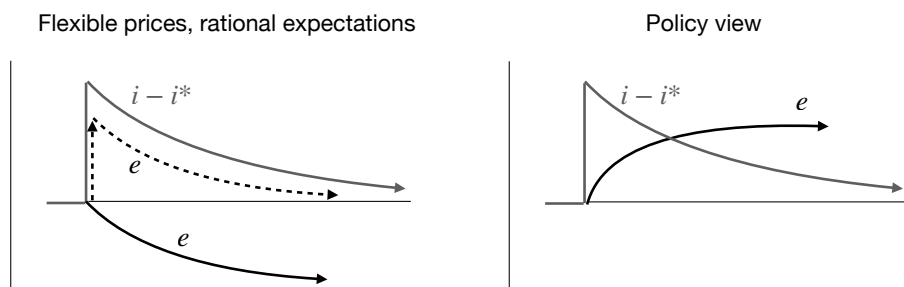


Figure 6.2: Flexible-price rational-expectation model vs. policy view of interest and exchange rates. $i - i^*$ is the difference between domestic and foreign interest rates. e is the exchange rate. The dashed line is an alternative exchange rate path that jumps up so it can revert to zero. In the rational-expectations view, the interest differential equals the inflation differential, which equals the change in the exchange rate, $i - i^* = \pi - \pi^* = -\Delta e$.

it may increase and then return to its original level. But there is no reason why the nominal exchange rate and nominal price level should return to their original levels. And that upward jump implies a fiscal tightening with short-term debt.

The long-term debt mechanism again produces an exchange-rate rise followed by devaluation, but not back to the original level. That is, however, unexplored territory and not the standard model. And the exchange rate jumps, rather than increase slowly going forward.

So, what minimal, sensible, economic ingredients must we add to produce something like the bottom left graph, in which inflation declines going forward before inevitably rising? The adjectives are important. Complex models such as Christiano, Eichenbaum, and Trabandt (2016) are able to produce something like that graph. However, they require a smorgasbord of ingredients to do it. What of that smorgasbord is *necessary*, the foundational ingredient that gives central banks power, without which higher interest rates raise inflation? Christiano, Eichenbaum, and Trabandt also include a fiscal tightening to pay interest costs. And as above, it would be a shame to have to place adaptive expectations in the list of minimal, necessary ingredients. This quest is fundamentally about the rest of the model, and wage or price stickiness in particular, not about fiscal theory.

Of course, it is possible that the policy consensus is wrong; that the world really does behave as the top right panel of Figure 6.1, that higher interest rates by themselves raise inflation at all horizons. The formal empirical evidence is surprisingly weak (Ramey, 2016, Enzinger et al., 2026). But I think before arrogantly proclaiming our equations to be right and practical experience wrong, we should try hard to

see if we can produce something like the standard beliefs, at least about the short-run facts if not the mechanism. To show that *there is no* theory that produces something like standard beliefs, or that any such theory must have unpalatable ingredients, you have to sort through a lot of theories.

6.1 A Step Forward

The best I have been able to do in this quest combines two ingredients: Long-term debt and a slightly generalized version of the Lucas (1973) Phillips curve (Cochrane, 2026c).

That Phillips curve incorporates Lucas' idea that output is high when the aggregate price level rises relative to what firms expect. Firms see their own price but not the relevant aggregate price level. When firms see an unexpected rise in their price, they think that in part it represents an increase in the relative price of their product, so they produce more. If the price rise was pure inflation, that output boost goes away when firms learn that fact. I add the idea that a fraction α_j of firms learn the aggregate price level in j periods rather than all at the same time. Then aggregate output is proportional to the price level, minus an average of its expectation in the past,

$$\kappa x_t = p_t - \int_{j=0}^{\infty} \alpha_j E_{t-j} p_t dj$$

in place of Lucas'

$$\kappa x_t = p_t - E_{t-1} p_t.$$

This is also a simplified version of the Mankiw and Reis (2002) “sticky information” Phillips curve.

The resulting model is at least as simple as the standard new-Keynesian model. It allows easy analytic solutions and a simple intuition. If all goes well, it could substitute for the usual Calvo Phillips curve.

Figure 6.3 presents a calculation of the inflation response to an interest-rate path. I use exponential weights $\alpha_j = ae^{-aj}$. The result is closer to the policy view in the short run, but maintains long-run stability and neutrality, as we hoped for in the bottom left panel of Figure 6.1.

Recall that adaptive expectations, with the Phillips curve anchored on past inflation and which captures the policy view, has unstable inflation. Rational expectations, with the Phillips curve anchored on future inflation, has stable inflation. The Lucas Phillips curve lies in between: the Phillips curve is anchored on past expectations of today's inflation. I was motivated to reexamine the Lucas Phillips curve to see if something in between would give some of both worlds.

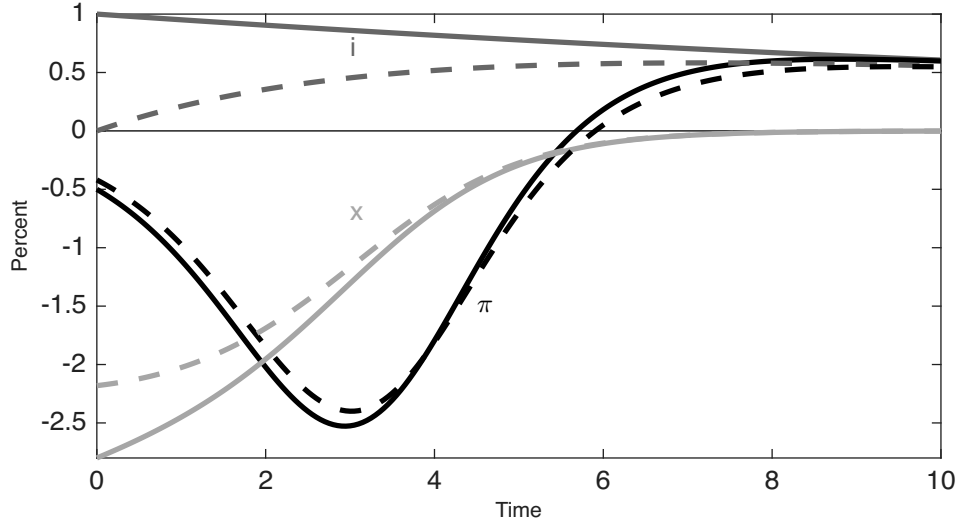


Figure 6.3: Response of inflation and output to the indicated interest rate path with no change in surpluses, long-term debt, and generalized Lucas Phillips curve. Parameters $\sigma = 0.2$, $\kappa = 0.2$, $a = 1$, and $\omega = 0.026$. Solid lines: $i_t = e^{-0.05t}$. Dashed lines: $i_t = e^{-0.05t} - e^{-0.3t}$.

It does. The dynamics are unstable in the short run, where practitioners have experience, but become stable as time passes. The inflation response with a geometric interest rate path obeys a differential equation

$$\frac{d\pi}{dt} = \gamma(t)\pi_t + \delta(t)i_t \quad (6.1)$$

in which the coefficients $\gamma(t)$ and $\delta(t)$ vary as time passes and more firms update their information about aggregates. We have $\gamma(t) > 0$ for small t and thus unstable dynamics as in the policy view. But then $\gamma(t) < 0$ for larger t , so inflation becomes stable as in the rational expectations view.

The short-term dynamics are not quite the same as the policy / adaptive model, however, and the underlying mechanism is still closer to that of the standard new-Keynesian plus fiscal model. By contrast, the mechanism in the standard doctrine wants higher real interest rates to push inflation down, something like

$$\frac{d\pi}{dt} = -\gamma(t)(i_t - \pi_t)$$

with $\gamma(t) > 0$ for small t . The generalized Lucas Phillips curve model (6.1) does not produce $\delta(t) = -\gamma(t)$.

Higher nominal interest rates, on their own, still drag inflation up. Disinflation still needs an initial downward inflation jump to get going. In Figure 6.3 I use the

same long-term debt mechanism as in Figure 3.2 to produce a downward inflation jump from higher nominal interest rates. The generalized Lucas model amplifies a smaller initial jump. Model dynamics contribute a lot to disinflation. That's progress. Perhaps empirical analysts could miss the initial jump, especially since price data are averaged over time and then smoothed by seasonal adjustment. Also, it is less surprising that economic theory has not noticed the mechanisms that produce the initial jump. And our models can be calibrated to produce smaller initial jumps for the same disinflation.

The underlying mechanism for the initial jump that gets disinflation going is the same long-term-debt unpleasant-interest-rate arithmetic mechanism of Figure 6.3. It may look like the standard doctrine in the short run married to long-run neutrality, but it is not. In particular, short-term rates are essentially irrelevant to disinflation. Promising higher future short-term rates to devalue long-term bond prices remains the central mechanism. Figure 6.3 shows that behavior with a different interest rate path, in dashed lines. Here expected interest rates in the future rise, with little rise in current short-term rates. This interest rate path produces about the same path of inflation.

But my quest only included mirroring the *result* of the standard doctrine, not the *mechanism* of the standard doctrine. Indeed, this whole quest is an effort to avoid ISLM. So the more radically different the mechanism, the better.

Moreover, the mechanism of this graph addresses some otherwise puzzling features of monetary policy. First, the tiny slice of interest rate movement that researchers can claim to be exogenous produces a short-lived movement in interest rates and a barely detectable change in inflation. When central banks tighten, they do not follow such a transitory path. An initial tightening is predictably followed by many more interest-rate increases, and central bankers take pains to let markets know what's coming, much like the dashed line in Figure 6.3. And central bankers think such moves have powerful effects on inflation. These moves are not exogenous, so empirical work ignores them—central bankers embark on a tightening cycle in response to economic news, not randomly. In this model, a central bank that *wants* disinflation *should* focus on credibly signaling higher future interest rates, exactly as they do.

Second, since the discovery of the “Fisherian” property of new-Keynesian models, that higher interest rates raise inflation (without a dubious equilibrium-selection shock), the contrary proposition has attracted a lot of attention: lower interest rates lower inflation. Why not just get the best of both worlds? Some countries, like Turkey, alluded to this proposition in a failed attempt to lower inflation by lowering interest rates. Above, I pointed out that the “no change in surpluses” condition applies in both directions: you can't lower interest rates to spend more after lowering interest costs on the debt. But Figure 6.3 adds a more powerful caveat

to Fisherian policy in either direction: The central bank may have to wait out a long period in which inflation goes the opposite way from what it desires.

The long-term-debt mechanism and the generalized Lucas Phillips curve are the best I have found so far to modify the flexible-price fiscal theory of monetary policy to produce realistic dynamics. I regard this as a potential first step, and important more than anything else as an example of where we need to go if we want to make theory look more like common experience. There may be other mechanisms. Indeed, as I speculate in the next section, I hope there are other mechanisms. Empirical work to see if that experience is correct, and if these novel mechanisms are correct are also important.

Box 6.2: Calculations

To make the calculation of Figure 6.3, I proceed as follows. With geometric weights and after an unanticipated time-0 shock, ($E_t(p_\tau) = 0$ for $t < 0$ and $E_t(p_\tau) = p_\tau$ for $t > 0$) the Phillips curve is

$$\kappa x_t = p_t - \int_{j=0}^t a e^{-aj} p_t dj = e^{-at} p_t. \quad (6.2)$$

I use the standard intertemporal IS curve,

$$\frac{dx_t}{dt} = \sigma(i_t - \pi_t), \quad (6.3)$$

Differentiating (6.2)

$$\kappa \frac{dx}{dt} = -a e^{-at} p_t + e^{-at} \frac{dp}{dt}.$$

Eliminating dx/dt , and with $\pi_t = dp/dt$, we have a differential equation for the price level

$$(e^{-at} + \sigma\kappa) \frac{dp}{dt} - a e^{-at} p_t = \sigma\kappa i_t \quad (6.4)$$

with solution

$$p_t = \frac{1 + \sigma\kappa}{e^{-at} + \sigma\kappa} p_0 + \frac{\sigma\kappa}{e^{-at} + \sigma\kappa} \int_{j=0}^t i_j dj. \quad (6.5)$$

Note from (6.4)

$$(1 + \sigma\kappa) \pi_0 - a p_0 = \sigma\kappa i_0.$$

Thus, we can index the multiple equilibria by p_0 or π_0 . I show in Cochrane (2026c) that the solution with $\pi_0 = -0.5\%$ has no change in fiscal surpluses, with a geometric maturity structure of debt in which the face value of debt at maturity j follows $B_t e^{-\omega j}$ and $\omega = 0.026$, and the indicated interest rate process.

Chapter 7

Past And Future Monetary Economics

In sum, adding fiscal theory to contemporary macroeconomics, we finally have a complete, simple, economic theory of the price level under interest rate targets, that is consistent with current institutions—fiat money, interest rate targets, ample reserves, no money supply control, and central banks do not destabilize the economy in order to select equilibria. It is, I have argued, the only currently available theory that fills these desiderata.

In this theory, inflation is determinate—the theory completely describes inflation, without multiple equilibria and sunspots. Inflation is stable and neutral in the long run. The theory builds on an easy flexible-price foundation, which captures these long-run properties. In the flexible-price case, nominal interest rates determine expected inflation while shocks to the present value of primary surpluses drive unexpected inflation. Adding sticky prices via the standard new-Keynesian forward-looking IS and Phillips curves, we obtain more reasonable short-run dynamics. Adding the generalized Lucas Phillips curve, we obtain even more reasonable (to my eyes) dynamics. Adding long-run debt, higher nominal interest rates without fiscal contraction can lower inflation temporarily. We get a somewhat conventional picture of the effects of monetary policy, but via a different mechanism, and one that suggests some novel constraints. Monetary policy acts through long-term interest rates, so invites persistent tightening and loosening cycles. Higher rates alone, without fiscal backing, eventually translate to higher inflation.

The theory offers a simple explanation of many episodes, in particular the appearance and then end of 2021-2022 inflation. It survives the recent experiments that bedevil monetarist, Keynesian, and new-Keynesian models: the contrast of quantitative easing with the recent episode, and the long quiet zero bound. It solves

new-Keynesian forward-guidance puzzles.

7.1 Doctrines, Institutions, and Questions

The theory overturns many classic doctrines. That helps, since even casual observation casts doubt on many of those doctrines.

- Money supply control is not necessary in order to control inflation. Passive money supply or a real-bills policy do not threaten inflation. A flat supply of reserves at a fixed interest rate does not threaten inflation. Inside money (checking and savings accounts) does not cause inflation, unless it has an implicit or explicit bailout guarantee.
- Paying market interest rates on ample reserves and allowing people to hold money that pays full market interest do not threaten inflation. A “liquidity trap” at zero interest rates does not threaten inflation. We can live the Friedman optimal quantity of money.
- Interest rate pegs or “passive” interest-rate rules do not threaten inflation spirals or multiple-equilibrium volatility—so long as they are accompanied by solvent fiscal policy, not as part of deficit-financing financial repression. While a peg is possible, however, more responsive interest rates may still be desirable.
- Higher interest rates with no fiscal change will eventually raise inflation and vice versa, though inflation may go the other way at first.

Most importantly, perhaps,

- Central banks do not fully control inflation. Interest rate targets have an important influence on the path of inflation, and completely control expected inflation in the long run. But deficits not financed by expected discounted future surpluses must eventually inflate away the value of outstanding bonds, absent default. (In the formal model, interest rates choose a family of inflation paths, and fiscal policy chooses which one occurs.) Monetary and fiscal policy must be coordinated for inflation control.

Surpluses are not exogenous. The theory extends easily, allowing surpluses that respond to output, employment, inflation, and other forces.

Central bank pressure is one such force. Central bank independence and a separate balance sheet help the government to precommit to repay rather than inflate away debt, and thereby help the government to borrow in the first place.

Many institutional and legal aspects of central banks are set up to resist inflationary deficit financing. The Federal Reserve may not, for example, buy securities directly from the Treasury. The Fed is supposed to buy at market rates, thereby

forcing the Treasury to confront the interest rates that repayment-suspicious investors demand. Other central banks have been forbidden to buy sovereign debt at all, or they have been required to hold gold or foreign reserves, thereby limiting currency issue and debt monetization. A strict inflation mandate is legal mandate to refuse monetization. These provisions all prod sovereigns to produce surpluses to back sovereign debts.

An independent central banks with a monopoly on money creation can, in the end, resist fiscal inflation by refusing to monetize debt and by allowing interest rates to spike. Government debt promises to pay money. If the Treasury cannot come up with the dollars to repay maturing debt by current taxation, spending, or debt sales, it must ask the central bank for money. If the central bank refuses, then the Treasury must raise tax revenue, cut spending, credibly promise future surpluses so it can again sell debt, or explicitly default (restructure) rather than inflate.

But do we, and the government, really want central banks “independently” to have such dramatic influence over taxes, spending, and crisis management? Do we (and Congress) want central banks to stop inflation in all circumstances? Surely we would not want to have lost WWII on the altar of inflation. And surely we would not want an independent central bank to make that decision.

My preference would be for a strong anti-inflation mandate, that empowers the central bank to make such difficult decisions, but that Congress can suspend in time of emergency, as it passed the TARP legislation in 2008. Then Congress takes responsibility for the decision to let bond and money holders rather than taxpayers or beneficiaries of spending pay for the crisis.

Most discussion of central bank independence posits that monetary and fiscal policy must be separate, that independent central banks should not stray in to fiscal policy, which must be the province of politically accountable officials. But that vision cannot apply to the role of a central bank in resisting fiscal inflation. (For more on independence, see Cochrane (2026b)).

This is, in my view, a hypothetical danger at the moment. Currently, I suspect that central banks will go along quickly with fiscal demands for inflationary policies. They will hold down sovereign interest rates and buy government debt as needed, as they did in 2020. In the current agenda, clarifying that independent central banks should fight fiscal inflation seems more pressing.

In this vein, the equilibrium-selection and passive fiscal policy of new-Keynesian models gives central banks enormous power over fiscal policy. The models were not designed to think seriously about these issues, of course. But that implicit power is worth considering if one starts to take their fiscal underpinnings seriously or use them to think about monetary-fiscal coordination and central bank independence.

The central bank’s separate balance sheet, backing money with specific assets,

can also be a useful device for controlling inflation. We saw examples in currency boards and post WWI inflations. A separate pot of real assets backs the currency. People know that the currency can all be redeemed. That slice, and no more, of the present value of government surpluses and assets is visible. The government then commits to repay deficits with following surpluses in the rest of the budget. Gold and foreign exchange reserves have served this role. A balance sheet of nominal assets such as government or corporate debt do not work in this role, since a rise in the price level devalues assets and liabilities at the same rate. A central bank that issues money backed by indexed debt is an interesting way to extend the concept of real reserves, yet to insulate the economy from inflation due to real exchange rate or gold price fluctuations. Yes, in the end there is a single consolidated budget. Governments can abrogate currency boards, grab foreign exchange reserves, or default on the central bank's indexed-debt holdings. But it is costly to do so. Every economics department splits an ultimately unified balance sheet into hundreds of separate budgets for the same reasons.

Understanding and improving institutions by which central banks can resist fiscal inflation is an obvious task. It is also pressing, given the debt that overhangs many countries.

Fiscal institutions that commit the government to repay debt without inflation can also help to provide a steady nominal anchor. Governments once tied debt issues to specific tax streams. Rules like the Swiss debt brake are an obvious possibility. Rules that tie surpluses to inflation or the price level might be even better. Debt and deficit limits such as those the eurozone tries to live by can be useful. Even returning to a functional budget process in the US, where spending each year has to live under an agreed total budget cap would be useful. I argued above that inflation-targeting countries have an implicit commitment that the government will repay its debt at the official inflation target. Making that commitment explicit would help.

These are questions, of course. Many important and fascinating issues lie ahead. Some more questions:

- What is the optimal monetary policy rule? I indicated that in a fiscal theory version of the new-Keynesian model, a Taylor rule with coefficient slightly less than one makes inflation a random walk, which minimizes output volatility in the presence of fiscal shocks. That result is the tip of a largely unexplored iceberg. How should monetary policy respond to other shocks?
- More generally, inflation is a finite ill. Inflation is also always a choice, balancing distorting taxation, economically necessary or politically expedient spending, and a government's reputation for future borrowing. Good rules need good procedures for making exceptions. Optimal fiscal and monetary policy now need to be considered together, including other shocks, distorting taxes, and costs of inflation

- What is the optimal monetary policy instrument? Can we do better than manipulation of the short-term nominal interest rate, which requires central bankers to divine the elusive r^* , the time-varying “natural” rate of interest?
- In particular, is there an arrangement that mimics the good properties of the gold or commodity standard without their price-level volatility and invitation to deflation? Is there a more mechanical rule that can work in practice, obviating the need for so much discretion along with its inevitable failures? Targeting the spread of indexed versus non-indexed debt, to target expected inflation while letting the level of interest rates vary according to market forces, is attractive. Targeting the spread implements an expected-CPI standard. Does it work? Do we really believe inflation is stable, so targeting the spread would target inflation and not result in runaway bond purchases? How many perverse short-run forces lie in the way?
- Corporate finance applies to government debt. Indexed and foreign debt is like debt; repay or default. Nominal debt is like equity, which can devalue with a lower price. But not every firm can issue equity. Which governments should, or must, issue indexed debt, foreign debt, long vs. short maturity debt, GDP-linked or otherwise explicitly state-contingent debt?

7.2 Economic Directions

In the quest for realistic and interesting dynamics, I added the simplest textbook new-Keynesian model to the fiscal theory. I focused on a dynamic response to a fiscal shock that looks like 2021-2022 inflation and on a response to interest rates that mimics somewhat conventional beliefs about monetary policy. To these ends, I added long-term debt and a generalized Lucas Phillips curve. These additions are evidently more tenuous than the underlying fiscal-theory idea. I barely scratched the surface of how the economy reacts to “supply” and “demand” shocks, and what policy might do about. Alternative and additional elaborations beckon, along with quantitative empirical evaluation.

Integrating a fiscal perspective with more elaborate current macroeconomic models is technically trivial. You have seen that my integration of fiscal theory with the textbook new-Keynesian model is technically trivial. Stating the models in observationally equivalent form, separating the equilibrium (and observable) vs. off-equilibrium (and unobservable) parts of policy helps to adapt any current model to fiscal theory. Observational equivalence is also a useful guiding principle for application and empirical work. It implies that formal time-series tests for regimes and regime switches are a waste of time, absent immense progress in reasonable identifying assumptions.

Even if one retains the standard new-Keynesian equilibrium-selection story, look-

ing at its fiscal underpinnings opens up a new set of interesting questions. What if the central bank raises interest rates, but Congress cannot or refuses the “passive” fiscal response? You see in what I have done how dramatically that approach changes one’s interpretation of the simplest models. Decades of more complex and realistic models lie unexamined.

To generate more appealing dynamics, I played with the Phillips curve. That is a well-recognized weak spot. In the cloud of points, some see a curve that is sometimes flat and sometimes vertical, sometimes shifts in and sometimes shifts out. Others see just a cloud of points. Yet the Phillips curve has become the central causal mechanism for inflation in central bankers’ eyes. Inflation comes from expected inflation, influenceable by speeches, and by output or employment, multiplied by a time-varying coefficient, and by large “shocks,” which account for most of the inflation volatility that we see. Really?

Surely the nature of price and wage stickiness is something on which we can do better. And we have. Prices and wages *are* sticky, except when they are not sticky at all, such as in currency reforms (cutting zeros off the currency and all prices), the introduction of the euro, in large inflations, or when I delay buying an airline ticket for an hour. Alas, I have not found in the massive theoretical and empirical effort on this question a simple and useable aggregate relationship between inflation and other variables. Perhaps you will.

The intertemporal IS curve relating output growth to the real interest rate is as mistrusted as the new-Keynesian Phillips curve, and suffers as badly in empirical evaluation. Maybe the crucial fix lies there. Including “demand” channels that seem obvious in data and verbal analysis are a potential first step. Investment, housing, capacity utilization, and unemployment are all signature features of business cycles that I have not included. Financial frictions beckon. Currently popular heterogenous-agent models modify the IS curve. Among other effects, they essentially add government debt to the IS curve. Less real debt lowers the real interest rate. In this and other ways, these models already recognize the crucial importance of monetary-fiscal interactions. For example, Kaplan, Moll, and Violante (2018) write “in HANK models, the fiscal reaction to the monetary expansion is a key determinant of the overall size of the macroeconomic response.” Alves et al. (2020) write “...assumptions about the fiscal reaction to a monetary policy shock have a stronger effect on the aggregate consumption response than any of the other three elements.”

However, we may not need a full theory of *recessions* to have an adequate theory of *inflation*. Quantities only matter if we are using a Phillips curve to think about the price level. And as always beware the difference between adding epicycles, matching dynamics, and constructing the the minimal basic parable.

For understanding how interest rates and fiscal policy affect inflation, perhaps

the combination of IS and Phillips curve to generate output and price level effects together is already an unnecessary detour. Perhaps simplifying the goal to merely understanding price stickiness without output effects will help.

Historically, the question was the opposite, understanding business cycles not understanding inflation dynamics. Lucas (1972), for example, felt that he had a perfectly good theory of inflation in $MV=PY$. He needed only a theory of why money and inflation affect output in the short run. Monetary economics from Friedman and Schwartz (1963) to today's calibrated new-Keynesian models focuses on the output and employment effects of monetary policy (and its mistakes), and much less on inflation. Maybe separating the two questions will help to understand the latter. Surely we can envisage an economy in which output is constant, but higher interest rates do not raise inflation the next day. Dispersed information, the fact that we do not place Walrasian demands for all goods at all times, might well make prices sticky even without a IS and Phillips curve. Eventually, of course, we want a theory with output and employment effects, part of a theory of recessions. But perhaps the quest for an underlying simplest model of inflation dynamics might start without it. Likewise, perhaps inflation is not at the heart of unemployment; perhaps business cycles are really not about variation in the nominal anchor, and their study would benefit from separating the two forces.

I have avoided the natural temptation to merge fiscal theory with the adaptive expectations economic model that underlies the standard policy doctrine. But perhaps central bank's ability to lower inflation may rely on, and be limited to, situations of poor expectation formation. Merging fiscal theory with traditional adaptive expectations is easy, and revealing. One must then beware that the models will fall apart in the events like ends of hyperinflations, fiscal blowouts, and regime changes in which people react in a more forward-looking manner.

A recent academic literature investigates sophisticated models of expectation formation that mimic some adaptive and sluggish expectations results. García-Schmidt and Woodford (2019), Angeletos and Lian (2016), Angeletos and Huo (2021), and Gabaix (2020) are notable recent examples. Broadly speaking they describe models in which higher-order beliefs (my beliefs of your beliefs of my beliefs etc.), bounded rationality, learning, information-processing constraints, and so forth produce something like the policy view. Like adaptive expectations, while interesting ingredients for dynamics, these are troublesome as minimum *necessary* ingredients. Must an honest central banker, wary of explaining to Congress that the Fed conquers multiple equilibria by off-equilibrium inflationary threats, instead explain that higher interest rates lower rather than raise inflation because higher-order beliefs do not converge? But perhaps this investigation will lead to something simple and robust enough to become the benchmark.

More generally, we should beware repeating the new-Keynesian investigation,

which added complications on top of a foundation that turned out to be radically misunderstood. First, let us find the minimal, necessary, simplest, economically explainable modification of the flexible price model.

The same fiscal foundations can apply to exchange rate determination. Since exchange rates provide a measure of the value of currency that moves more quickly than prices, they should be particularly informative.

A big empirical project also lies before us. The long-term debt mechanism, the crucial ingredient so far in producing lower inflation in response to higher interest rates without fiscal help, has not been evaluated. I have only held off because I cannot find a convincing way to orthogonalize monetary and fiscal shocks. Historical analysis also beckons, more serious than the story-telling in which I have indulged here.

7.3 Takeaways

This ought to be an exciting time to *do* monetary economics. If I am right, we are on the cusp of a once-in-a-generation change, a paradigm shift. While the hard business of extending new-Keynesian models with Taylor-rule equilibrium selection has consumed most attention, the foundations of those models have crumbled. Few believe the new-Keynesian equilibrium-selection stories. That's not an accusation. Simplified models always have unrealistic technical conveniences. People rightly adopt unrealistic assumptions that are technically convenient, but have no important effect on the results. Now, however, we see that the equilibrium-selection story is central to the results. Few trust the standard IS-Phillips curve ingredients either. A chasm remains between policy doctrine and economic theory. Fiscal/monetary interactions are staring us in the face in the form of interest costs on the debt and a widely feared sovereign-debt crisis.

The basic question of how interest rates affect inflation is up for grabs. The basic question where inflation comes from is up for grabs. I propose the beginnings of an answer, but it is pretty radically different from standard stories.

What should a poor central banker take from all this? First, think in simple, robust, and transparent terms, with clear principles and historical experience in hand. Complex models hide unrealistic assumptions, that sometimes drive results.

Second, be humble. The fact that such basics of monetary policy are up for grabs contrasts sharply with the illusion of detailed technocratic competence propounded by central banks. For example, Figure 7.1 presents a summary of the “main” channels of monetary policy transmission that the European Central Bank claims to understand and manage. Kidding one's self that any central bank understands and controls these arrows and boxes is likely to lead to bad decisions. While pretend-

central concern for centuries before they faded in postwar Keynesian and monetarist macroeconomics. That conservatism and eclecticism may mean bleeding the patient a little. Try to make it only a little, and recognize when it is not working.

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