

Inflation

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Preface

This book is the result of the Ninth Karl Brunner Distinguished Lecture, given in October 2025. I am very grateful to the Swiss National Bank for the honor of being invited and their kind hospitality.

The lecture and this little book allow me to distill a line of thought going back decades. It is now spread over two books and more papers than even I can count without looking, and more than anyone can possibly be expected to read. Those efforts also, and rightly, lay out the mathematical structure of theories of inflation in some detail and generality. They delve into what-abouts, what-ifs, theoretical controversies, and other objections that a theory must surmount. They are aimed mostly at the audience of professional and practicing economic researchers, focusing on how one should *do* the economics of inflation.

During the three years since the publication of *Fiscal Theory of the Price Level*, I gave many talks trying to digest its message and apply it to current and historical events. I developed a better understanding of the recent bout of inflation and several important other episodes. 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 uniform consensus among central bankers of how interest rates affect inflation? The Brunner Lecture and this book gave me an ideal opportunity distill all these ideas.

This book, like the talk, also is a chance to distill the ideas for a nontechnical audience. There are some equations. Academic economists find it hard to understand words without them. But every idea is also described in words, and the nontechnical reader can skip the equations entirely with no loss. I put most of the more technical development in footnotes, which the nontechnical reader should ignore.

I focus on analyzing historical episodes. 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 inflat? And so forth. Academic economics is usually devoted to formal testing. 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 understand a theory, and make for a far better lecture than slides full of equations. Here I am influenced by the many works of Tom Sargent. For example, the Sargent (1982) story about the end of the German hyperinflation, discussed below, was perhaps the most influential single observation in the entire rational expectations debate. I do not rise to the level of historical scholarship exemplified by Sargent and his coauthors, but I hope these suggestive stories can inspire others with the appropriate comparative advantage to do so.

I travel to learn more than to evangelize, and this trip was no different. I learned a lot about Switzerland on this trip, 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. I don't know of another country who has ever fought, and lost, a battle against currency *appreciation*.

Of course, the Fiscal Theory of the Price Level is the underlying view of inflation that organizes my thoughts. It seems to me, modestly, to have arrived at lucky moment. Our central banks do not set money supplies, while large debts and deficits weigh over monetary affairs. The 2021-2022 episode looks exactly like the first Fiscal Theory exercise, and reminiscent of centuries of money-financed fiscal blowouts that led to inflation. The central policy issue going forward is likely to be whether central banks will continue to buy large amounts of government debt and hold down interest rates and interest costs on the debt. This policy issue, not inflation vs. employment, is likely to dominate in a way not seen since the early postwar period.

Yet, fiscal theory has not gained the traction that I had 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. Or, perhaps, I will end up being the prototypical American tourist, who, when the locals don't understand him, just yells louder.

I have tried to make this book self-contained, for people who are not familiar with the ideas. It is a summary and distillation, so there is some repetition of points made elsewhere. I hope fiscal theory fans will find the novel parts and the distillation and simplification useful nonetheless.

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 it be better controlled?

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

In fact, we live in a moment of great uncertainty in monetary economics. That policy doctrine is completely at odds with contemporary economic theory. The great inflation of 2020-2021 revealed that central banks have much less control and understanding of inflation than one might have thought. The consensus New-Keynesian theory, which has been with us at least 35 years, falls apart when you actually look hard at the equations. But the 1970s policy doctrine barely qualifies as an economic theory.

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. At last, as I will show you, we have the foundations of such a theory. I’ll show that to you, how it applies to our recent past, and what it says of our policy situation.

The job is not complete, especially on the issue of how central banks, by raising interest rates, can lower inflation. The best theory we have remains quite different from the standard view. Rather than come down from the nirvana of beautiful equations to proclaim practical people wrong, I think it is worth first trying as hard as we can to see if theory can at make some sense of their experience. I’ll show you how that quest is going.

Like any moment of “paradigm shift” or radical change, this is an exciting moment to study monetary economics. There is more to do than add epicycles. Basic questions are up for grabs, and you can address them with careful thought about simple economic models.

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 history in the United States. There was a steep recession in the Covid-19 pandemic. As usual in a recession, inflation slightly 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.

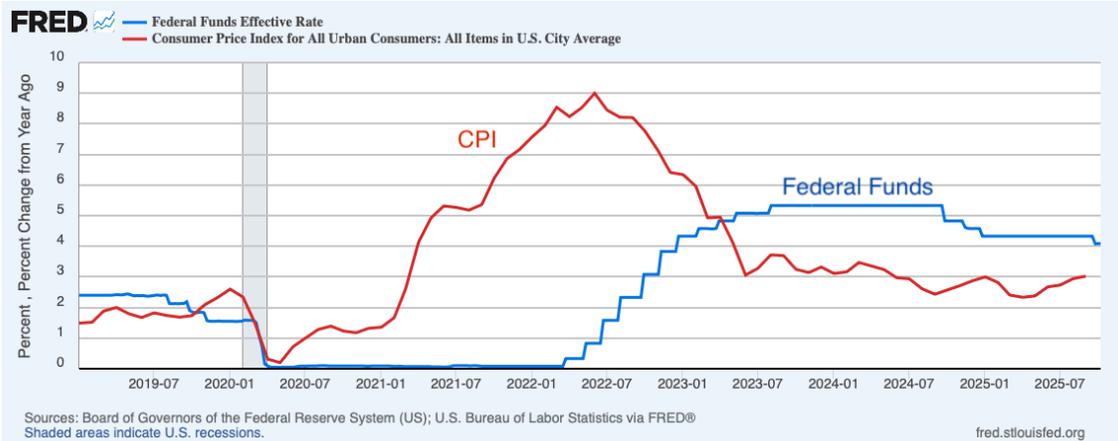


Figure 2.1: CPI inflation and federal Funds rate.

This episode begs 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 the 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 nominal interest rate is below the level of inflation, and then only a period of high real interest rates, inducing a deep recession like the early 1980s, will bring inflation back. Yet inflation peaked and started to decline, just as the Fed was getting going with higher 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?

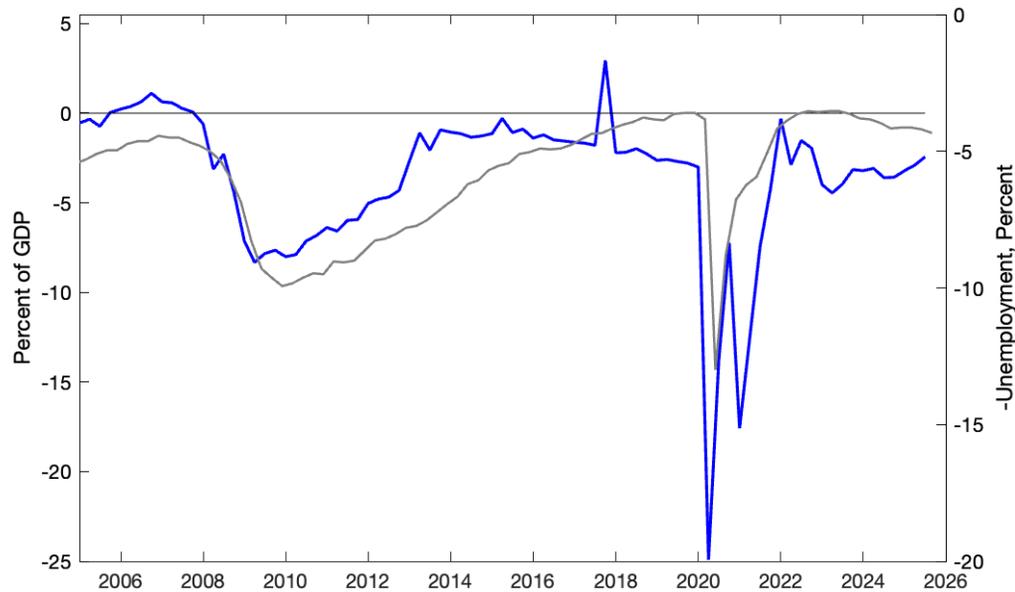


Figure 2.2: Primary surplus as a percentage of GDP and negative of the unemployment rate.

Figure 2.2 documents the elephant in this room: The massive fiscal stimulus of the Covid year 2020 and, continued in the year 2021 after Covid and its economic impact was largely over, as seen in the unemployment rate. During the Covid year, the primary deficit hit 25% of GDP. In a second surge of spending in Q1 2021, the primary deficit hit 18% of GDP. 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 much of it was overdone and wasted, but that's not the point. This is what our government did, and the wisdom of the spending is broadly irrelevant for its inflationary effect.

The US was not alone. Many countries embarked on immense fiscal stimulus, and many 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 (2025), especially their Figure 1, shows a strong correlation across countries between cumulative 2020-2023 inflation and government spending.

2.2 The Fiscal Theory of the Price Level

We cannot simply point to deficits to explain inflation. Debt and deficits often are clearly behind many large inflations. But debt and deficits often do not provoke inflation, and there is very little correlation between debt or deficits and inflation in most time periods. In particular, the stimulus of the 2008 recession, shown in Figure 2.2, 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,

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

in the simple case of one-period nominal government debt B_{t-1} , a fixed real interest rate r and $\beta = 1/(1+r)$. The price level is P_t , and primary surpluses (tax revenue less spending, not including interest payments on the debt) is s_t . I write here the simplest version, for expositional clarity. *The Fiscal Theory of the Price Level* includes just about every generalization you can think of.

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. 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 and in doing so drive down their value. If people do not think the government will fully repay its debt, then people will try to get rid of government debt, and try to buy goods and services or real assets instead, driving up the price level. I call this relation the “government debt valuation equation” as a result. 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 say that fiscal theory describes money as backed by taxes. Inflation is always too much money chasing too few goods. The government can soak extra money by levying taxes in excess of spending. The government can also soak up money by bond sales. But people only buy bonds if they think those bonds are backed by future taxes in excess of spending. Thus, the government soaks up today’s money, and money printed to pay off today’s bonds, by current and future taxes in excess of spending.

Third, fiscal theory can be seen in the context of the great historical theories of money. Backing is the first great theory: Money was a claim to gold, and gained value by the value of the gold. Clamshells is the second great theory: Money is inherently useless, but limited in supply and used for transactions. Money gains value by that useful liquidity. That theory applies to Bitcoin today. Government debt is a third great theory. Fiscal theory notices that money is just instant-maturity government debt. So, we value money as a component of government debt, by its present value. If we quoted prices in Apple shares, we would similarly start to analyze the value of money with the present value of Apple dividends.

Now, this fiscal theory limits the kinds of stories we can tell. 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 steady state average over time. 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 crises such as wars or recessions, or they may wish to make valuable public investments like freeways. The government borrows, and pays back over decades, spreading out the tax burden or spending retrenchment. Such well-managed government debt is a good and great thing, as it 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 a short period of very high tax rates.

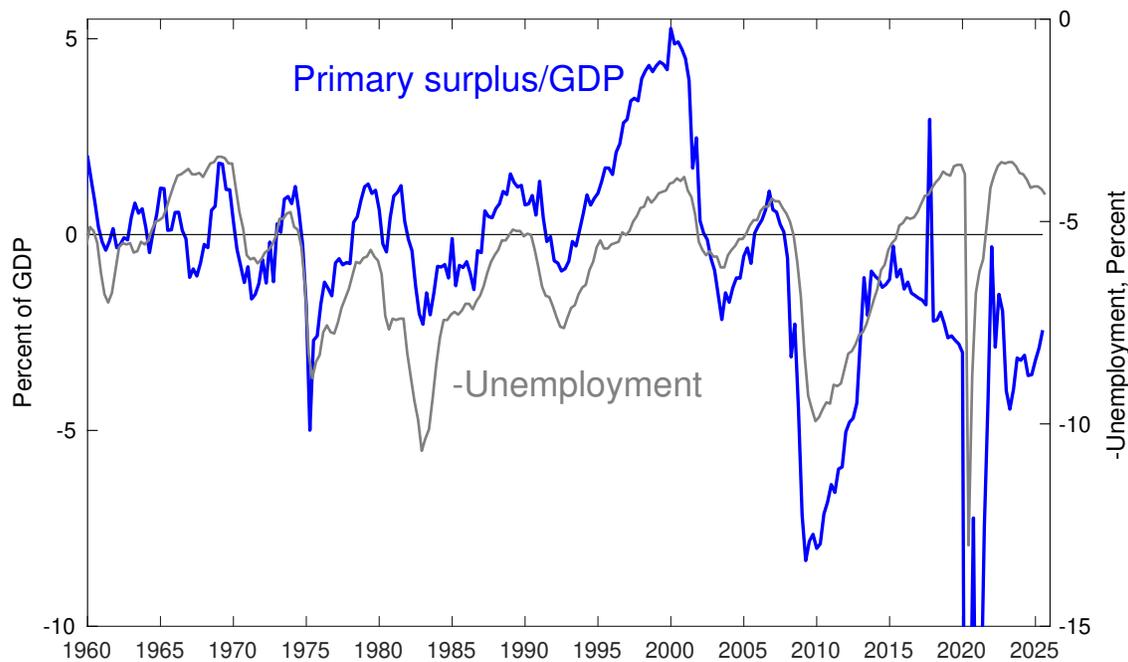


Figure 2.4: Primary surplus as a percentage of GDP and negative of the unemployment rate.

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 every have is deficits.” But the US has, until recently, regularly run primary surpluses. Positive primary surpluses mean debt grows at less than the interest rate, and therefore the present value holds.

You can see the pattern of reasonably good fiscal policy. Primary surpluses fall in recessions, and then rise to repay debt in the subsequent expansion. Tax revenue equals tax rate times income, so income variations drive tax revenue at constant rates. Recessions also include automatic stabilizers such as unemployment insurance as well as predictable stimulus spending. As you can see, practically all 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. The habitual surpluses have turned to small primary deficits in expansions since 2000, which is a worrisome turn discussed below.

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. Mechanically, the resources that would have gone to repayment go to spending instead.

This is not a scenario we should expect to see frequently. A government that does this routinely will find it unable to borrow in the first place. This scenario clearly does not describe the bulk of advanced-country history. In this case, a deficit is accompanied by a *decline* in the real value of debt. The initial deficit promises more future deficits, so the present value of deficits declines. A bout of inflation wipes out even more debt than the initial deficit. In reality, higher deficits are accompanied by a *rise* in the real value of debt and usually do not occasion large inflation. 2021 was the exception, as much debt was inflated away, and the debt-to-GDP ratio fell despite huge deficits. That’s the point. In this case, inflation is very volatile. 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 the conventional Phillips curve. 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.

The first case emphasizes that large debt and deficits are perfectly possible with no inflation at all, even in the fiscal theory of the price level, and indeed this is what we should expect to see most of the time of a responsible fiscal-theory government. Fiscal theory does *not* imply that debt and deficits are necessarily inflationary. We expect fiscal inflation to be a rare pathology, not a regular occurrence.

Switzerland is notable for its constitutional “debt brake,” helping to guarantee that debt is repaid rather than inflated away. That’s a key ingredient to successful control of inflation. As a result, Switzerland is practically the only country on earth whose major macroeconomic problem is keeping its currency from becoming too valuable.

This is all perfectly standard public finance 101, except that people tend to forget it once someone says the words “fiscal theory of the price level.” They assume that fiscal theory only describes the second case. They describe fiscal theory in general as applying only to pathological “fiscal dominance,” with the normal pattern labeled “monetary dominance” rather than well-managed fiscal theory. Many empirical researchers inadvertently specify that a fiscal theory government

must follow a fiscal policy as outlined in the second case, and *may not* follow a 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. But it has massive consequences, and causes spurious statistical rejections of the resulting fiscal theory model. (See Cochrane, 2023 Ch. 4, 24.) Researchers: don’t do it.

An important related conceptual misunderstanding has led people astray. We are used to valuation equations that apply to individual securities. An individual government bond is not directly a claim to a share of the surplus, and always has positive and relatively risk-free cashflows. Government debt is a portfolio of such bonds, yet we describe it as the present value of a surplus that can be negative, and is risky and pro-cyclical. How can the portfolio of bonds with positive and stable payoffs be a claim to a sometimes negative and volatile payoffs?

Yet the valuation equation as stated is correct. It 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 in the first year issue 10 more shares, and 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 $\{\$-90, \$20, \$20, \dots\}$, as if the initial stockholders had kicked in the \$100 investment themselves which they might have done. The \$100 “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 emerge. The firm will be worth \$200 at the end of the first period, so if one calculates return as $(-\$90 + \$200)/\$100$, it is still 10%, riskless.

This is how the government debt valuation equation emerges. The negative surpluses in the early periods of the first case are funded by new issues of debt, which are paid off by the extra surpluses that follow. They 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 actual government bondholders, you can be led astray. In particular, the negative cashflow of the first period is matched by higher value of debt to produce a constant return. If you miss that higher value, the claim to the subsequent higher cashflows, you will wrongly think government debt is very risky and procyclical. This error has occurred frequently.

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, when people dump debt today fearing that people next year will fear repayment and not be willing to roll over today’s debt. Since inflation often does seem 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 may be fragile.

Not pictured, the present value thinking reveals another important mechanism. The discount rate for government debt matters as much as the 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 with a lower β or higher r in (2.2).

This effect is important quantitatively. At the moment, the US has a 100% debt-to-GDP ratio. Each one percentage point higher real interest rate then increases interest costs on the debt by one percentage point, and is equivalent to a one percentage point decline in primary surplus. 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).

2.3 A More Nuanced History of Recent Inflation

So, a fiscal story for the 2021-2022 inflation, and why other deficits did not cause 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, where they did in other episodes.

That people did not expect a substantial portion of 2020-2021 deficits to be repaid, unlike the usual pattern, is plausible. In 2008, the U.S. administration had the decency to promise that current deficits would be followed by debt repayment. Yes, cynics chuckled as this promise is frequently made. But at least they tried, and return to small surpluses had been the historical norm. By contrast, the 2021-2022 fiscal expansion was devoid of any discussion of eventual repayment let alone institutional mechanisms to guarantee repayment. Congress suspended PAYGO rules that require taxes or spending offsets for new spending. Recall also the economic zeitgeist and policy consensus of the era: “fiscal stimulus” to offset “secular stagnation” and “hysteresis.” Borrow, print, hand out cash, and we will all be prosperous again. The “savings glut,” “safe-asset shortage” and “exorbitant privilege” would provide an endless appetite for US government debt at low interest rates. Blanchard (2019) gave an influential American Economic Association Presidential address opining fiscal expansion need not concern itself with repayment. Since interest costs on the debt would remain below the economy's growth rate, debt to GDP would melt away. Further to the left, but remarkably influential, “Modern Monetary Theorists” such as Kelton (2020) advocated the view that governments never have to repay debt, and that borrowing or printing money is free for the government. Reflecting this consensus, Treasury Secretary Janet Yellen 2021, arguing for more fiscal expansion, 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, with huge fiscal intervention such as the NextGenEU program, large ECB purchases of new debt, and little attention to repayment.

The 2008 expansion also was followed by a decade of sharply lower and sometimes negative real interest rates on government debt. Again, low interest costs act just like higher surpluses to raise the value of government debt and hold down inflation. That good fortune is unlikely to happen again. However, it's not clear that people saw higher real rates in 2020-2021, as long term rates stayed low until the Fed started raising short-term rates in 2022, so this may count more as a difficulty in lowering inflation than an account of why inflation broke out.

Why didn't inflation jump with the first 2020 interventions, during Covid? After all, this initial \$5 trillion of money borrowed and quickly spent, yet inflation did not start until Feb 2021 and did not peak until 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 didn't get around to spending it until the pandemic eased in early 2021. Maybe. But another possibility is intriguing and in any case illustrates fiscal theory principles.

Early 2021 is when, normally, the US would have passed from emergency deficit to normal recovery of government finances; canceling “emergency” spending programs. The early Biden administration did the opposite. It kept most of the “emergency” pandemic spending programs, and indeed sought to make many permanent such as health insurance subsidies. Then it doubled down with an expanded debt-financed spending program. The “American Rescue Plan” was proposed in January and passed in March 2021. The hilariously-named August 2022 “Inflation Reduction Act” added hundreds of billions of additional spending initiatives. The Biden administration added more spending, for example with several hundred billions of student debt cancellation and mortgage relief. The administration unapologetically aimed to equal or outdo the Roosevelt administration’s expansion of government spending programs. You can see this second surge of deficit in Figure 2.2.

So, here is a second story for inflation only starting 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 would reasonably expect 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 was a signal that the US would not return to normal. This is when we learned the new debt would not be repaid, and thus when inflation broke out.

Going along with this story, inflation *ended* in mid 2022 as it became clear that the Democrats would lose the Senate in the 2022 mid-term elections. This meant that the mooted \$6 trillion “green new deal” would not pass. Maybe the US would return to regular levels of fiscal dysfunction after all. Even if the additional Covid and 2021 debt would not be paid back, the big unfunded fiscal stimulus was over.

In the end, cumulative US inflation from Feb 2020 (259.3) to Feb 2025 (319.8) was 23%. If we count expected inflation at 2% per year, then 13% of that 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 $\$23.9/\$17.2 = 39\%$ unexpected fiscal expansion. 30% fiscal expansion with 13% unexpected inflation indicates people expected about two thirds of the new debt to be repaid, and one third not. This seems like a reasonable number, so the magnitude of the inflation and the magnitude of the fiscal shock are in the right ballpark.

This fiscal theory analysis is different from standard ISLM analysis. ISLM also says that large budget deficits cause inflation, but via a static multiplier effect when aggregate demand exceeds aggregate supply, and even if people expect debt to be repaid. ISLM relies on the idea that people do not rationally anticipate their own taxes that must retire debt. Fiscal theory is content with completely rational expectations. 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. 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 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 also have an excellent detailed analysis of the fiscal underpinnings 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 budgets. 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—just as their decision to hold stocks or spend is based on a general view of the company and economy rather than spreadsheets. Congressional Budget Office deficit projections are not conditional expectations. They point to unsustainable debts. They won't happen. The question is how. The question is whether and when the government will eventually respond to the drumbeat of warnings, by fixing the underlying long run fiscal problems. Strong norms, traditions, and institutions including budget processes and a debt brake can help. A strong norm that repaying debt is sacrosanct helps. When people lose that faith, they spend rather than save government debt, and the price level rises. That's the mechanism which we capture by these equations. The save vs spend decision may also be influenced by a long list of frictions. Fiscal theory starts with the underlying supply and demand before adding these, rather than look only in the frictions, but adding the frictions is important for quantitative analysis.

The 2020-2022 stimulus was likely more powerful than previous ones because the government sent people checks directly, and sent checks to people likely to quickly spend them, rather than buy or build things. However, that fact is not necessarily of first order importance. If government debt and interest-paying reserves were seen by investors as a good investment, then when the first high marginal propensity households spent their money, the investors would have purchased and held the greater debt. The consumption vs. saving decision of the initial recipient does not matter; the consumption vs. saving decision of the whole economy matters. Sending money not bonds, and sending it to constrained households may well have had second-order importance, and I think including these sorts of frictions in fiscal theory models is an excellent idea. But it is not as necessarily powerful as it first may seem.

You are likely hungry for better “proof:” Examine some regression, analyst or CBO deficit forecasts, discount them back, and obtain that way or some other way an independent measure of the present value of surpluses. Contrast that to the value of debt, and “test” the theory. It's 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 get within an order of magnitude. After a tumultuous few decades, asset pricers learned to face two deep theorems 1) Agents have more information than we do. Any empirical application of a model must be robust to that possibility. What if they 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 very interesting to see which terms of the identity account, mechanically account for prices.

Rather than painfully re-learn the lessons of empirical asset pricing, we can simply copy and paste. However, 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 it 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. Don't 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 models) that seem to produce such tests.

Chapter 3

Monetary Policy

A present value 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 write down the simplest possible full economic theory that incorporates the fiscal theory idea, and lets us think about how central banks affect the economy by setting nominal interest rates. We can then add complications and frictions as necessary. With flexible prices, the real rate is fixed independently of the nominal interest rate and inflation. Then we have

$$\text{nominal interest rate} = (\text{constant}) \text{ real interest rate} + \text{expected inflation.} \quad (3.1)$$

For example, a 5% nominal interest rate corresponds to a 2% real interest rate and 3% expected inflation. So, the central bank, by setting an interest rate target, determines *expected* inflation.

The government debt valuation equation (2.1) or (2.2) then determines unexpected inflation and the price level. To keep it simple, suppose the government only issues short term debt. Then nominal debt—the face value coming due, the numerator on the left hand side—is fixed, as the number of shares of a stock outstanding is fixed. So a surprise to the present value of surpluses must result in unexpected inflation,¹

$$\text{unexpected inflation} = -\text{news about present value of surpluses} / \text{initial debt} \quad (3.6)$$

¹In equations,

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

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

with $\beta \equiv 1/(1+r)$. To derive (3.3), move (2.2) one period forward, multiply and divide by P_t , and take the innovation. It's 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. If you want to be more explicit and formal, you can set these equations up a representative agent general equilibrium economy with a constant endowment. See *Fiscal Theory*.

A coin flip is heads or tails with 50/50 probability. The expected value of a heads vs. tails coin flip is $1/2$. That's what the central bank determines. Which of heads or tails turns out to be true is the unexpected part of the coin flip. That's what fiscal policy determines.

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 no money supply control. The central bank sets the interest rate. The Congress sets taxes and spending. With those two levers, we can 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. As I will stress later, up until the moment of putting these two ingredients together, we did not have such a theory.

Central banks matter! You might have thought that "fiscal theory" left no room for central banks, but that's not the case. It's 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 lots of experience suggests that interest rate targets do matter, and we want a theory that can hope to inform monetary policy.²

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. You can see that coordination at work here.

So, in a few steps we have an elegant and complete theory. But it is unrealistic. If the central bank raises interest rates, and there is no change to fiscal policy, then inflation *rises* one period later. Higher interest rates *raise* inflation?

Yes. When you think about it, this makes perfect sense of the model we have written down, and of the long run when prices have come unstuck in the world. A country with permanent 10% inflation must have 12% interest rates. Figure 5.1 below shows that over the decade from 1970 to 1990, the level of interest rates did follow the level of inflation over the long run. With flexible prices, you see the long run right away. This model is the interest-rate/fiscal theory analogue to monetarism with flexible prices. In that theory, higher money growth means higher inflation instantly, and the money supply is the nominal anchor for the level of prices. In our model, higher interest rates mean higher inflation right away, and debt vs. the present value of surpluses is the nominal anchor for the level of prices.

So, if the model's prediction doesn't fit your intuition or the world, it means that we need additional ingredients, and in particular that prices are not completely flexible. I add sticky prices next. No surprise, sticky prices will leave long run neutrality intact. Higher interest rates still eventually mean higher inflation. But it can go the other way in the short run and there will be short-run output effects.

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. It's hard to remember now, but Milton Friedman's (1968) insistence that higher money growth means only higher inflation in the long run met similar incredulous resistance.

²Implicitly, the interest rate target at time t determines next period nominal debt, B_{t+1} , which is why it affects the expected future price level P_{t+1} and expected future inflation.

If there is a fiscal shock, a decline in present value of surplus as I argue happened in 2020-2021, then this model predicts a one-time price level increase, a one-time inflation. In the continuous-time version of the model, the price level jumps overnight. That too is unrealistic. And it too suggests that we need to add sticky prices. Both considerations also turn out to be helped by recognizing that the government issues long-term debt, where I have specified only one-period debt so far.

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 I find it useful to see what each can do alone.

3.1 Sticky Prices and Long Term Debt

To add sticky prices, I add fiscal theory to the most standard macroeconomic model possible, the two-equation new-Keynesian model as popularized in the standard monographs Woodford (2003) and Galí (2015). This model generalizes (3.2) to an IS (intertemporal substitution) curve, which says that higher real interest rates – nominal interest rate less expected inflation – lower consumption and output relative to future consumption and output, and a Phillips curve, which says higher output and higher expected inflation raise inflation.³

Since both IS and Phillips curves involve expected future inflation, this model too only determines expected inflation given interest rates. Thus, as above, I use the government debt valuation equation to pick unexpected inflation.⁴

Figure 3.1 presents the response of this model 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.

Now, the fiscal shock produces a surge in inflation. Instantaneous inflation jumps up on the

³In discrete time, that 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.

⁴The model in Figure 3.1 is the continuous time version of the new-Keynesian model,

$$\begin{aligned}E_t dx_t &= \sigma(i_t - \pi_t)dt \\ d\pi_t &= (\rho\pi_t - \kappa x_t)dt \\ dv_t &= (rv_t + i_t - \pi_t - \tilde{s}_t)dt \\ i_t &= \theta p_t + u_t \\ du_t &= -\eta_i u_t dt + d\varepsilon_{i,t} \\ d\tilde{s}_t &= -\eta_s \tilde{s}_t dt + d\varepsilon_{s,t}.\end{aligned}\tag{3.7}$$

Here 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 (2025a). These equations show how easy it is to add fiscal theory to a new-Keynesian model. Remove the “active” Taylor rule, with $\theta < 1$, and add the v equations instead

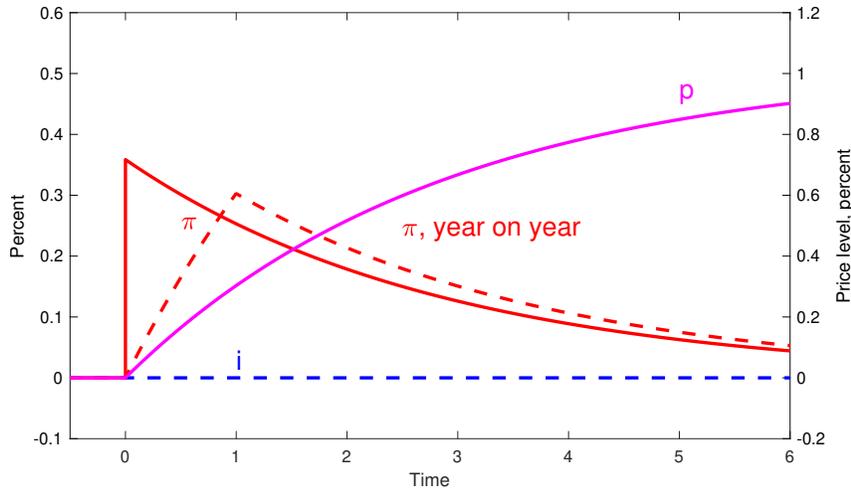


Figure 3.1: Response to a fiscal shock with no change to interest rates

day of the shock, and then declines. I also plot inflation measured year over year, which gives rise to some of the hump-shape we see. Also, this is a plot of a one-time news event. Surely the extent of the fiscal shock and how much of it would be paid back developed over time.

The price level rises slowly rather than jump up. Bondholders lose, but not by an overnight jump in the price level. Instead the long period of inflation above the nominal interest rate gives them a low real return on their debt, which eats away its value.

Inflation surges, seemingly from nowhere, if you stare at the central bank while ignoring fiscal policy, as interest rates do nothing. Inflation peaks on its own, rather than spiral away, 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. Indeed output (not shown) is higher through the whole episode than it would have been without the fiscal stimulus, which was the point of the whole policy to begin with. The price level is permanently higher, though inflation goes away, a fact that voters seem to have noticed over 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.

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 latter caveat. Most analyses of this question, in both new and old Keynesian settings, unwittingly include a fiscal contraction—the opposite of Figure 3.1—along with higher interest rates. Taxes must rise to pay higher interest costs on the debt and any disinflationary windfall to bondholders. In well-written papers there is a footnote to that effect somewhere. Once seen, though, and with a view of the world in which fiscal tightening lowers inflation, that seems a mislading 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. This difference accounts for much of the harder time I have in getting inflation to go down with higher interest rates. In the real world, central banks may indeed operate

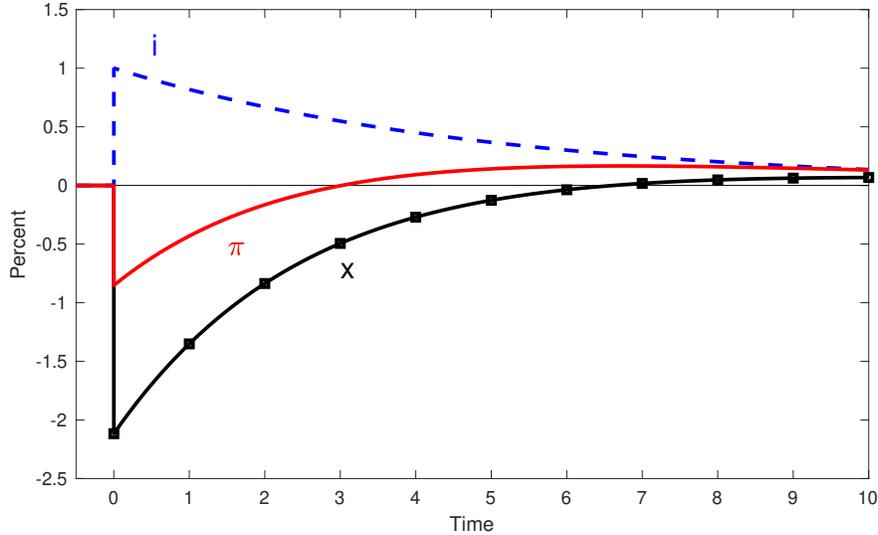


Figure 3.2: Response to a transitory monetary policy shock with long term debt and no change to fiscal surpluses

by inducing fiscal tightening. But we should understand separately what they can do alone, and what they can do by secondary fiscal channels, so this seems like the right conceptual exercise to ask of monetary policy.

If I just add sticky prices, higher interest rates still *raise* inflation throughout. Sticky prices just slow down that process. Thus Figure 3.2 adds a second ingredient, long-term debt. With these two ingredients, higher interest rates do temporarily lower inflation and output, as shown in Figure 3.2. 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 small and hardly visible or measurable difference, this looks a lot like the standard response to a monetary policy shock.⁵

The *mechanism* is utterly nonstandard, however. With no control over fiscal policy, the central bank can really only move inflation around over time, getting a little less today by accepting more in the future. I call the mechanism “unpleasant interest rate arithmetic,” in honor of Sargent and Wallace (1981). Chris Sims (2011) calls it “stepping on a rake,” as lower inflation now comes back to bite later. With long-term debt, the basic valuation formula becomes

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

By raising interest rates persistently, the central bank creates inflation in the far future. That lowers the nominal market value of long-term bonds. Since the present value of surpluses has not

⁵In the model of the last section, replace equation (3.7) 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 the previous case of instantaneous debt. I use $\omega = 0.03$ and $\eta_i = 0.25$. I plot the response to a $d\varepsilon_{i,0}$ shock with $d\varepsilon_{u,0} = 0$.

changed, the price level must decline.⁶

A central banker armed with the option to create this sort of response, faced with a fiscal shock such as the one graphed in Figure 3.1, desiring low inflation and not offsetting some other shock, *should* promptly raise rates. Doing so, we get the sum of the two responses, a small and roughly permanent rise in inflation. Some inflation is unavoidable – the government is not paying for its fiscal expansion so it must come out of the pockets of bondholders. But the forward-looking Philips curve means output responds, roughly to the *change* in inflation. Thus a random walk inflation leads to small output losses, and is better than short sharp inflation.

Indeed, by following a Taylor rule, responding automatically to inflation by raising interest rates (though with a coefficient slightly less than one in this model), the central bank can *automatically* create that response, and smooth out the inflation coming from fiscal shocks. In vastly different models – old-Keynesian, new-Keynesian, and now fiscal theory– the Taylor rule produces pretty good outcomes. The Taylor rule is often the right answer, though the questions keep changing. That’s usually an insult, but today it is praise.

So, despite quite different foundations and mechanisms, we still have a conventional result. If central banks did not want to go along with massive fiscal stimulus and a large swift inflation, they should have raised interest rates much more quickly.

In the event, (Figure 2.1) when central banks did get around to raising rates, inflation came down more quickly than the fiscal shock graph 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 are as I write.

3.2 Final Thoughts on the Recent Inflation

In sum, this simple but complete model offers an interesting match to the puzzling features of the 2020-2025 episode. Inflation surges with no unusual interest rate movement, but a large fiscal expansion featuring little talk of repayment. Once the fiscal expansion is over and primary surpluses return to usual levels of dysfunction, inflation peaks rather than spiral away, event though central banks sit on their hands and do nothing. When central banks start raising rates, inflation comes down quickly, though with no recession (the fiscal stimulus offset by the monetary restraint). But the quick decline of inflation is paid for by extended stubborn small inflation.

The large inflation, and central bank inaction, was not necessarily a mistake. There was a big shock, which I left out of the modeling so far. There was genuine fear of economic collapse at least during Covid. The decisions that led to inflation, either then or in early 2021 in my reading, can be justified as implementing a Lucas-Stokey state contingent default. It is optimal to have existing

⁶With a constant real rate in the flexible price model,

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

where $Q_t^{(j)} = \beta^j E_t(P_t/P_{t+j})$ is the price of j period debt and $B_{t-1}^{(t+j)}$ is the quantity outstanding. Raising the interest rate persistently raises long-term inflation, so raises 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.

bondholders shoulder some of the burden of large rare shocks. One would not want to have lost WWII on the altar of no inflation, if tax and borrowing capacity were not enough.

One may argue with the amounts. I think the Covid spending was overdone, and the inflation excessive. I think the Fed and Biden administration agree, since they did not explain, “yes, we inflated deliberately. We saved the economy from Covid with a river of money and made bondholders pay. Thank us at the polls.” Instead they offered excuses about “shocks,” “greed,” “price-gouging” and so on. But my analysis of what happened is also consistent with the argument that it was optimal.

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. First, spend more wisely. There is no question that the spending was overdone, more than the minimum needed to meet the crisis. The attitude that debt does not matter contributed to this vast gusher of money. Now we know debt matters. Second, borrow with greater clarity about repayment. That is crucial to get people to hold the new debt rather than try to spend it. Third, empower, indeed mandate, the central bank to fight inflation and to fight the time-tested fiscal roots of inflation, rather than to quickly monetize government debt. Allow long-term interest rates to signal the markets’ limits. Raise short-term rates promptly. If the crisis is so severe as to merit inflation, the Congress should explicitly suspend the rules, as it did for TARP bailouts in 2008.

The 2020-2022 inflation episode was wonderfully instructive in many additional ways. The economic zeitgeist and policy consensus described above, of eternal insufficient demand for goods and services but endless demand for government debt, prescribed a massive fiscal expansion. Well, our policy makers did just what was asked, and got slapped in the face with a cumulative 23% inflation. All of that belongs now in the dustbin of history. We are a supply-constrained economy. If you want growth you need efficiency, not stimulus.

Chapter 4

Distinguishing 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

- Politician’s and 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 macro. This is the standard view expressed in central bank words and the policy community.
- New-Keynesian DSGE. This is the standard model in academia since 1990, and 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 the new-Keynesian 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 also claim that recent history provides as clean a set of experiments as we ever get in macroeconomics to distinguish these known 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 as well as the usual formal model evaluation. The latter hasn’t really gotten anywhere, and has led a generation of economists to ignore these elephants in the room.

4.1 Popular theories

In every inflation, at least since that of Emperor Diocletian in the early 300s, politicians and popular opinion has quickly blamed “greed,” “monopoly,” “price gouging,” “hoarders,” “speculators,” and so forth. Round up the usual suspects, usually followed by price controls, rationing, and other interventions. The Roosevelt administration, facing deflation, quickly encouraged monopolization and price floors in the same spirit. Our politicians were no less quick to echo the sentiments.

Central bankers and the policy community quickly 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 Peletons rather than restaurant dinners. So, the price of Peletons went up.

The trouble with all these is that they are stories about *relative* prices; the price of one thing vs. another. They do not explain why the price of *everything* goes up. Inflation is the latter phenomenon, the common component of all prices and wages. It is, fundamentally, a decline in the value of money, not the rise in prices itself.

If indeed, the great chicken conspiracy colluded to raise chicken prices they did so to raise chicken prices *relative* to beef prices and the wages they pay. Supply and relative demand shocks raise Peleton prices *relative* to wages and restaurant dinners. That does not explain why all prices and eventually wages go up.

Inflation is often buried in relative price changes. Relative prices are the waves. Inflation is the overall level of the ocean. Higher or lower waves in one or another place disturb boats, but do not tell us the overall level of the ocean. The level of the ocean is the “nominal anchor” that determines the average level of all prices and wages. In the end, only monetary or fiscal policy determine the overall level of prices.

That is not to say supply or relative demand shocks did not happen or were not important. The pandemic included large examples of both. But they alone did not determine inflation. Why did Peleton 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 wages and other prices 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 by itself did not cause inflation. But it caused the government to meet the relative price shock with demand stimulus that caused inflation, while perhaps lessening the economic disruption. This classic story seems to have been forgotten or lost in modern attempts to attribute inflation to supply shocks.

If you look hard at good economic analyses of the sources of shocks in recent inflation, you will always find that the shocks led to fiscal or monetary accommodation. There is usually a footnote about passive fiscal policy or money supply accommodation. But the footnote is easily overlooked, and authors report only that “supply shocks caused” some percent of the observed inflation, without that qualification.

Lay readers of such analyses may not be fully aware what “shock” means. You may have in mind that deep in the bowels of the Federal Reserve a group of PhD economists is watching the detailed operation of the economy and proclaiming “aha, the supply chain for Peleton components is running in to trouble. We measure a supply shock.” No. A “shock” is a measure of ignorance. For example, one measure of supply shock comes from looking at the Phillips curve equation,¹

inflation = expected future inflation + constant x output or employment + shock.

The “shock” is simply the number that fits the equation, the movement in inflation today not explained by a measure of expectations or output. Then we say the “supply” or “marginal cost”

1

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

shock “caused” inflation. But that simply means a movement in inflation that we don’t understand caused inflation.

In a sense, of course, supply shocks did “cause” the inflation, and fiscal (or monetarist) theory can agree entirely. Supply shocks caused the event that caused the Fed and Congress to inflate. One might go further and say a lab leak shock “caused” inflation. A lab leak caused (for the sake of argument) covid; covid caused lockdowns and supply disruption; supply disruption caused governments to flood the economy with demand; the latter caused inflation. Supply shocks are the carrot that led the horse of monetary and fiscal policy to pull the cart of inflation. But this notion of “cause” does little to help us understand cause and effect, or what policies might produce less inflation next time around. The horse pulls the cart, not the carrot. If the horse refused to move, the cart would not move. To say that supply or other relative-price shocks “caused” the inflation leaves out that crucial detail.

Many economic analyses simply have no nominal anchor, no equivalent of the money supply or the government valuation equation that restrains the overall price level within the everyday tumult of relative prices. The early Keynesian tradition, for example, often viewed inflation as the product of price setting, union wage bargaining, and “wage price spirals,” untethered. Inflation, or the price level, is last year’s inflation or price level, pushed up or down by this year’s aggregate demand or this year’s pricing and wage-setting decisions. This is just bad economics, or at least incomplete economics, or an assertion that economics does not have the power to determine the level of prices. ISLM analysis at best anchors inflation by whatever inflation was last year. Even old and new-Keynesian analyses that anchor the inflation rate do not anchor the price level, which is just whatever it was before plus inflation. Milton Friedman’s restoration of a nominal anchor to economic thinking is still often overlooked.

Sadly, “supply” and “relative demand” shocks are intoned regularly by central banks to absolve themselves of blame for 2010 inflation. They have become the-dog-ate-my-homework, it-wasn’t-our-fault excuses. While politically convenient, that is an astonishing admission of powerlessness. It implies that the next time some nebulous “shock” comes along, central banks will be equally powerless.

No. “Shocks” might be a *reason* for inflation, but they are not an *excuse* for inflation. Inflation is an *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.

4.2 Monetarism

Monetarism remains powerful as a baseline view 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 increase nominal income; real income in the short run and the price level in the long run.

In its clearest statement, money is intrinsically worthless. However, by social convention we all use the same intrinsically worthless tokens to mediate transactions. That “liquidity” demand gives money value, proportional to the nominal income it must buy, even with no backing such as gold or taxes.

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” in Friedman’s own words) in which changes in the money supply are irrelevant. Today’s ample interest-paying reserves mean we live in that worlds.

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. Monetarists such as Friedman (1968) preached against interest rate targets, which would unhinge the price level for just this reason. Target money instead, they said.

But our Federal reserve targets interest rates, not any monetary aggregate. Before 2007, the Fed set the overnight interest rate by rationing a small amount of reserves that did not pay interest, which one might have been able to think of as controlling money supply at least on a daily basis. But now the Fed targets interest rates by simply changing the rate it pays on abundant interest-paying reserves. Moreover, monetarism teaches that inside money such as checking accounts also satisfy money demand, and the government must control their quantity. But today there are no reserve requirements and inside money is created freely.

In sum, though a beautiful theory, 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. It may well apply to other institutional frameworks. For example, I might start with monetarism to describe early economies based on gold coins. But monetarism simply does not apply to our economies today.

(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.)

Let us not quibble about theory. Let us defer to its advocates’ view that it is logically complete, and 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 called this a “helicopter drop:” If you drop money from helicopters, inflation will follow. To a fiscal theorist, money is a form of government debt, and dropping it from helicopters is a good signal that taxes will not rise to soak up the money. Most of the historical episodes adduced to support monetarism involve printing money to cover intractable deficits, just the sort of episode where monetarism and fiscal theory agree. (At least they agree on the sign of the 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.)

Monetarism and fiscal theory disagree 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 effect whatsoever, to first order. The total quantity of government debt has not changed, nor have the surpluses that repay the debt. An open-market or QE operation, especially in our world of abundant interest-paying reserves, is an open-change operation. Give people 2 \$5 and a \$10 for each \$20. Will that get them to spend? The Fed is just a gigantic federal 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, drives the price level. The other, treasury debt, does not.

Most monetarist episodes of serious inflation result from printing money to finance deficits, not from mistaken control of the money supply in a healthy economy with sound public finances.

So we can imagine a near-ideal experiment to tell them apart: First, create \$3 trillion of reserves and *exchange* them for government bonds. See what happens to inflation. Then, when things have settled down, create \$3 trillion of reserves and hand them out, essentially dropping money from helicopters. See what happens to inflation. Theories make a clear prediction: 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 asset purchases the Fed brought reserves from about \$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. In 2020-2021 the Fed increased reserves from \$1,727 billion (Feb 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 prediction, and a clearer or larger test of the central proposition of monetarism that open market operations have the same effect as helicopter drops.

The immense size puts quibbles to rest. QE raised reserves by a factor of 50, 5,000%. QE should have been an atom bomb, a hyperinflation. Instead we are left arguing whether QE might have lowered long-term bond yields by 10 basis points or so. The stark predictions put quibbles to rest. One theory starts by saying that the two experiments should have the same effect. The other starts by saying one should have no effect at all.

Yes, in fiscal theory the Fed's monetization was not really important to 2021-2022 inflation. So our criticism of the Fed for monetizing the debt should be limited.

Yes, there are second order effects in both cases. Bank deposits are a little different from money market funds. The Fed also lowered the maturity structure of debt, and in QE bought government-guaranteed mortgage backed securities. Monetarists raise the flag of M2, which did not rise as much in the QE era as it did in the Covid era. But the Fed does not control M2, so an

M2 based theory leaves the price level uncontrolled. That view still says open market operations are irrelevant for inflation. But the size and clarity of the experiment surely overwhelms these epicycles.

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/ISLM/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 lower output and employment—the IS curve. Then, and lower output and employment reduce 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 them, I use a common simple framework. (This discussion summarizes Cochrane, 2024a.) The traditional ISLM, 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

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

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

$$(4.3)$$

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,

$$\pi_t = (1 + \sigma\kappa)\pi_{t-1} - \sigma\kappa i_t. \quad (4.4)$$

This simple model lets us quickly exhibit standard basic doctrines.

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

The coefficient $(1 + \sigma\kappa)$ in (4.4) is greater than one. Any inflation that starts grows at the rate $(1 + \sigma\kappa)^t$. More inflation means a lower real interest rate, which boosts output, and creates even more inflation. Friedman (1968) described a similar spiral. The same thing can happen in reverse, a deflation spiral. 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, and 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 QE, understood as helicopter drops of money. 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.

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

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

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. This is the central, core belief in central banks of how higher interest rates affect inflation, with long and variable lags. The coefficient $-\sigma\kappa$ on the interest rate is negative in (4.4). Raising the nominal interest rate sets off a downward spiral, which keeps going until the central bank reverses course and 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).

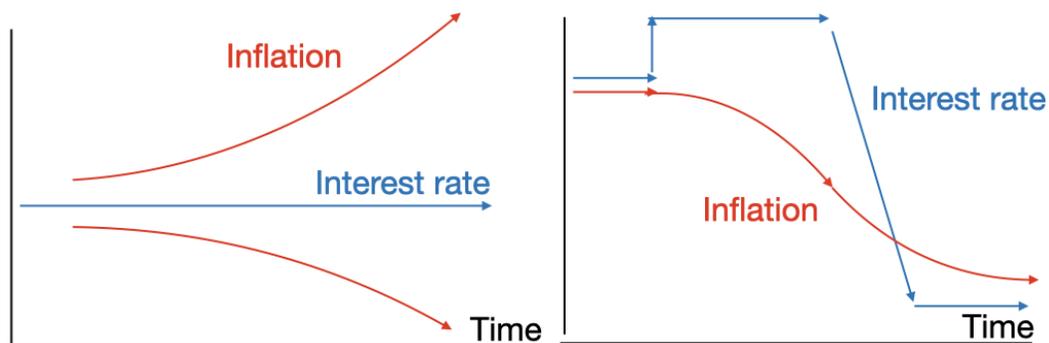


Figure 4.1: Dynamics of the old-Keynesian, adaptive-expectations model.

In addition,

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

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, and inflation most of the time does not spiral up and down.

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 will now raise the real rate, lowering output and bringing inflation back down again. In the little model, use

$$i_t = \phi\pi_t + u_t. \quad (4.5)$$

Then (4.4) becomes

$$\pi_t = \frac{1 + \sigma\kappa}{1 + \sigma\kappa\phi}\pi_{t-1} - \frac{\sigma\kappa}{1 + \sigma\kappa\phi}u_t. \quad (4.6)$$

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 the Taylor rule, central banks *stabilize* an economy which is naturally *unstable*.

If you ask central banks what they do, they offer this explanation. The economy is like a 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, it deliberately moves its nose in the opposite direction, gets the ball rolling, and then follows inflation down. This is captured in (4.5) and (4.6) by a persistent rise in the disturbance u_t . Thus, it produces inflation that declines going forward, with long and, adding the vagaries of economic modeling variable, lags. This is a classic tale told of the 1980s. Figure 6.5 below includes a simulation.

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' ISLM 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. Prominent economists such as Blinder (2024) view all the intertemporal and equilibrium economics that has happened since 1970 as a grand mistake. Much current research, discussed below, works hard to bring back the outlines of this theory with more respectable economic foundations, as the micro-foundations for Keynesianism literature has been trying rather fruitlessly to do since the 1940s. 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 model does not include a “nominal anchor.” Inflation and the price level are given by past inflation and price level plus wherever aggregate demand pushes inflation around intersected with the stickiness of various prices and wages. There is nothing like the money supply or the fiscal theory constraining the overall price level. Introducing such a nominal anchor was one of Milton Friedman's central intellectual accomplishments. For this reason, central bankers and policy analysts' stories that inflation is pushed around by relative price shocks, which I made a bit of fun of above, is not quite as illogical as it seems. If there is no economics behind the overall price level, they are right. It would be unfortunate for us to give up too quickly on any economics behind the overall price level, however.

4.4 New-Keynesian, Rational Expectations

In the simple IS-Phillips curve framework of (4.1)-(4.2), the new-Keynesian model uses rational (or, better, model-consistent) expectations,

$$x_t = -\sigma(i_t - E_t\pi_{t+1}) \quad (4.7)$$

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

(Woodford, 2001 and Galí, 2015 are classic monographs.) It turns out that the dynamic part of the modern IS curve (an extra $E_t x_{t+1}$ on the right hand side of (4.7)) does not matter qualitatively for these points, and omitting it saves gobs of algebra. Again eliminating output, in place of (4.4) inflation now follows

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

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 (4.9) is less than one, so even if the central bank does nothing with interest rates, inflation will eventually go away on its own.

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

The term in front of the interest rate, negative in (4.4), is now positive in (4.9). The economy is like a pendulum, with a natural tendency to return to where it started.

- *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 for $i_t = i$ is constant, (4.9) reduces to

$$(E_t\pi_{t+1} - i) = \frac{1}{1 + \sigma\kappa}(\pi_t - i). \quad (4.10)$$

When I examined the flexible price model above, we got to the point that $i_t = E_t\pi_{t+1}$, interest rate equals expected inflation, so higher interest rates raise inflation going forward with no output effect. We realized that this instant stability and neutrality was perfectly natural for a flexible price model. We hoped that adding sticky prices would turn it around in the short run. That hope is dashed. Sticky prices alone slow down the adjustment, but not the sign. We need more ingredients if we want inflation to go down in the short run.

We have so far, however, a lovely theory. The nominal interest rate behaves much like money growth in monetarism. Like monetarism, in which higher money growth leads first to more output and then higher inflation, higher interest rates lead initially to more output and then higher inflation, maintaining stability and long-run neutrality. 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 they don’t.

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

In this model, the Taylor rule cures indeterminacy, a fact first discovered by McCallum (1981). If we add $i_t = \phi\pi_t$ to (4.9) we get

$$E_t\pi_{t+1} = \frac{1 + \sigma\kappa\phi}{1 + \sigma\kappa}\pi_t + \frac{\sigma\kappa}{1 + \sigma\kappa}u_t \quad (4.11)$$

in place of (4.4). 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*, reversing its operation in the adaptive expectations model. We also pass a rule against explosive outcomes. Then, there is exactly one initial value of inflation for which inflation does not explode. By destabilizing the economy for all but one unexpected inflation, the central bank threatens the private sector with hyperinflation or hyperdeflation should unexpected inflation come out contrary to the central bank’s wishes.

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.²

Thus, the new-Keynesian model produces lower inflation along with a higher interest rate by pairing higher interest rates with a contemporaneous, and unrelated, equilibrium-selection jump. In the flex price model, $i_t = E_t \pi_{t+1}$ means higher interest rates raise inflation going forward, but if the central bank has an equilibrium-selection policy, it can pair that move with a $\pi_t - E_{t-1} \pi_t$ that declines. That’s what’s going on in the sticky price model.

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

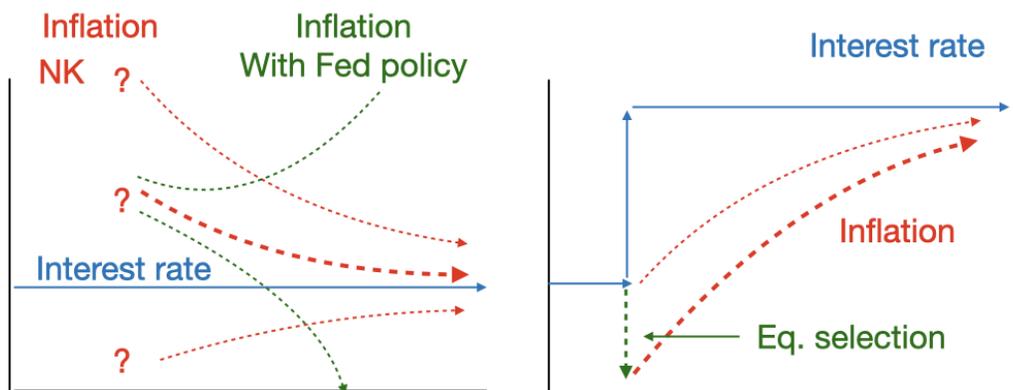


Figure 4.2: Dynamics of the new-Keynesian, rational-expectations model.

²This proposition is easiest to see in the flexible price model, and with a rewriting of the Taylor rule due to 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 is equivalent with $u_t = i_t^* - \phi \pi_t^*$. 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.” Cochrane (2025c) treats conventional Taylor rules in the full new-Keynesian model. 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). This is part of the observational equivalence theorem between active and passive policies.

4.5 Fiscal Theory of Monetary Policy

Fiscal theory, when married to the new-Keynesian economic model, just appends the government debt valuation equation that model. This naturally extends the flexible-price view of (3.2)-(3.3) to the new-Keynesian vision of sticky prices. Interest rates still tie down expected inflation, and fiscal policy picks unexpected inflation. Any unfunded deficits, plus any rise in interest cost of the debt, must be paid for by inflating away outstanding government bonds.

Now we have the same dynamics (4.9), along with the unexpected version of the linearized valuation equation,

$$E_t \pi_{t+1} = \frac{1}{1 + \sigma \kappa} \pi_t + \frac{\sigma \kappa}{1 + \sigma \kappa} i_t \tag{4.12}$$

$$(E_{t+1} - E_t) \pi_{t+1} = -(E_{t+1} - E_t) \sum_{j=0}^{\infty} \rho^j [\tilde{s}_{t+j} - \rho(i_{t+j} - \pi_{t+j+1})]. \tag{4.13}$$

ρ is a constant very slightly less than one. This is 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 the real rate of interest can vary, we now have a discount rate/interest cost on the debt term in the last equation.

Since we have an equation tying unexpected inflation to something, you see that fiscal theory resolves the indeterminacy of the sticky price new-Keynesian model, just as it did the indeterminacy of the flexible price model. The range of solutions of the new-Keynesian IS and Phillips curve remains. Now, however, we recognize that only one of those solutions is consistent with fiscal balance.

Thus 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) to stable and indeterminate (Sargent and Wallace) to stable and rendered determinate by induced instability (McCallum), now inflation is stable, determinate and, I might as well add, long-run neutral.

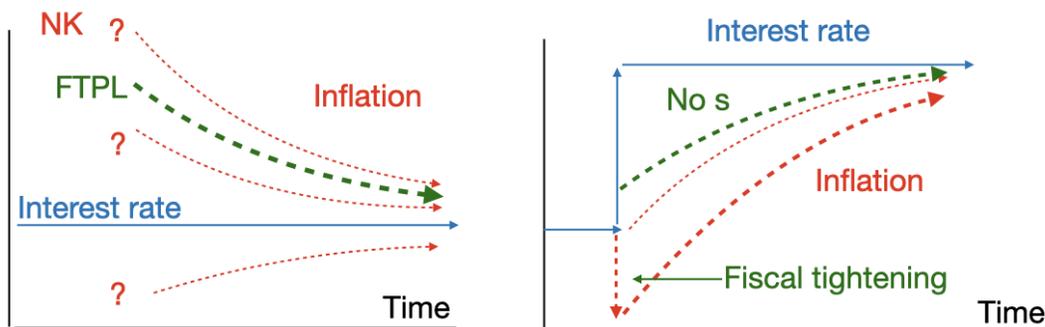


Figure 4.3: Dynamics of the Fiscal Theory + new-Keynesian model.

Figure 4.3 illustrates stability and indeterminacy under this fiscal theory of monetary policy. The lines look a lot like those of the new-Keynesian model. They are the same, as it is the same

economic model, but picking a different equilibrium, and thus with different policy implications. The left hand panel shows how, in lieu of central-bank-induced equilibrium selection, now only one of the multiple equilibria is consistent with fiscal balance. (Just which one is not significant here. I graph an equilibrium which starts with some inflation, which results from a negative fiscal shock.)

The Taylor rule is not necessary in this model to restore stability or determinacy. However, a Taylor rule with a coefficient near one remains very good policy. As above, it reduces output volatility by turning inflation into a near random walk, and thereby minimizing output volatility. “The Taylor rule is always the answer, the questions keep changing” might be a joke or an insult, but as Taylor long advocated, this robustness is a strong point in its favor. In this simple model the coefficient on inflation should be less than one, but one can generalize the model so that measured coefficients are greater than one (Cochrane, 2011b).

Higher interest rates, all on their own with no change in fiscal policy, still raise inflation going forward. Indeed, higher real interest rates raise interest costs on the debt, which other things constant adds to inflation. The right hand side of Figure 4.3 illustrates, that the solution with no change in fiscal surpluses and short-term debt now involves an initial rise of inflation. Sticky prices add this inflationary force to the effect higher interest rates, not the opposite we might have hoped for.

If we want to produce a solution in which inflation declines coincident with an interest rate rise, in this simple model, we must do so by supposing that a fiscal contraction — higher surpluses — happens at the same time as the central bank raises interest rates. I graph that in the right-hand panel of Figure 4.3. And, clearly, the fiscal contraction is doing all the work of lowering interest rates. That’s shown in the right hand panel of Figure 4.3. (This statement assumes short-term debt. Long-term debt can produce the same decline without a fiscal contraction, as shown in Figure 3.2. I return to that issue below.)

I have not so much added an equation as restored it. The government debt valuation and its implication (4.13) is a part of new-Keynesian models as well, as it is part of every well-specified model. All of the equations of the new-Keynesian and this fiscal model are in fact the same. However, new-Keynesians assume that the fiscal equation (4.13) describes how fiscal surpluses “passively” adjust to whatever inflation the central bank’s equilibrium-selection policy has picked, in the Leeper (1991) terminology. That fiscal policy is usually relegated to a footnote, because now (4.13) determines fiscal surpluses and has no other effect on the model.

Once one grasps this footnote, however, it has profound implications. The new-Keynesian disinflationary policy shown in the left half of Figure 4.2 is in fact a joint monetary-fiscal policy. Whether one calls it equilibrium-selection policy backed up by fiscal action, or fiscal policy directly, 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 in a new-Keynesian model might not be so easy. There is nothing automatic about “passive” policy. Fiscal authorities must act to raise taxes or cut spending, to pay the interest costs on the debt and bondholder windfall implied by the central bank’s equilibrium-selection policy. If the Fed Chair comes to Congress and says “we want to raise interest rates 2%. You need to raise fiscal surpluses by 2% of GDP to pay higher interest costs on the debt,” and Congress laughs, the central bank has to select another equilibrium.

Since the equations are the same, a die-hard new-Keynesian can read this whole line of theory as simply a plea to take seriously the needed fiscal foundations of equilibrium-selection policy; to

examine the needed fiscal adjustments theoretically, empirically, and in policy simulations; and to reiterate in policy analysis that without the prescribed fiscal policy disinflation cannot happen.

Since the equations are the same, we also establish a hard-to-swallow but important observational equivalence theorem. Any equilibrium, any observed path of interest rates, output, and fiscal surpluses consistent with one model, is also consistent with the other. We cannot tell one theory from the other by any time-series test. Formal time-series tests for one vs. the other regime, or for switches between regimes, are not fruitful. They test only the artificial identifying assumptions one adds to overcome observational equivalence.

We shall have to think, instead; to examine the plausibility of the different regimes; to use information such as provided by central bank's descriptions of what they do, and what they would do in alternative circumstances, and to examine the powerful lessons of historical episodes.

4.6 The Zero Bound Experiment

How could we tell these theories apart? I'll contrast the theoretical underpinnings later, but let's focus on facts. While central banks are moving interest rates around, it's hard to tell. 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. Let's ask central banks to peg interest rates for a several years to a decade or more in such an environment.

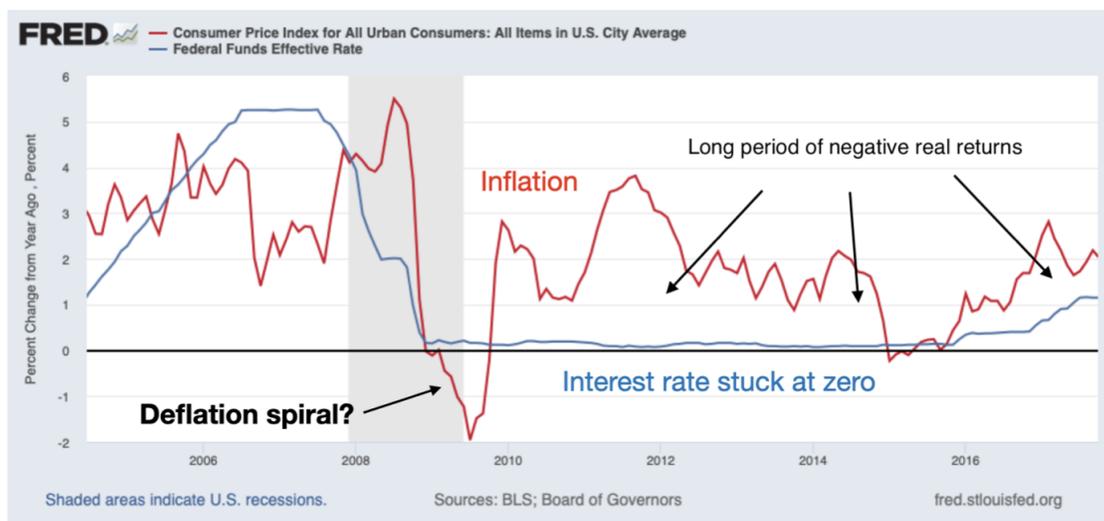


Figure 4.4: Interest rate and inflation in the US zero bound era

That is, of course, exactly what happened in the zero bound era. Figure 4.4 plots this episode for the US. Starting in the financial crisis, there was an initial bout of deflation. The Fed quickly lowered interest rates effectively to zero, where they remained until 2016. A small deflation broke out. But then inflation recovered and then batted a bit around slightly below 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 Europe and Japan. Europe sat at the zero bound for 14 years, and Japan for 27, with steady, low, and quiet inflation the whole time.

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 rate, which

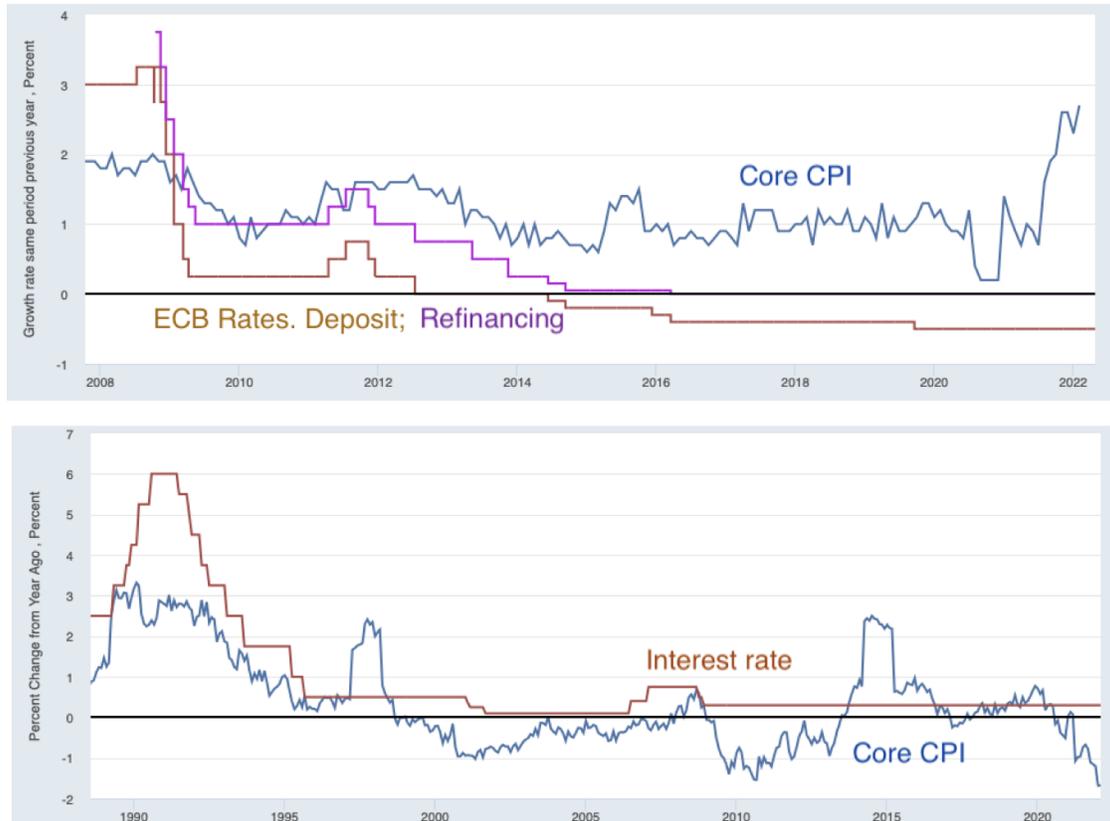


Figure 4.5: Interest rate and inflation in the European and Japanese zero bound era

pushes deflation down more. 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. This prediction is central to new-Keynesian thinking as well as a clear prediction of the model. 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 active, destabilizing, equilibrium-selection policy in the 1980s. They did not interpret the finding in the conventional way, that the Fed under-reacted to inflation in the 1970s, allowing spirals to form, and that the Fed finally learned to stabilize inflation in the 1980s. (Note, 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, correctly given the model, that if interest rates hit zero multiple equilibrium volatility must break out again, and proposed fiscal stimulus policies to avoid ever hitting the zero bound. *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. The policy and new-Keynesian views are falsified.

Beyond this theoretical dispute, the long quiet zero bound taught monetary theory 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, 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 spend no time minimizing the amount of cash they hold. The same point holds of interest-paying money more generally, and interest on ample reserves.

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 don't *have to* do so.

Before the zero bound era, one genuinely could not know what would happen, and 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 able to control inflation. He thought that price level control required 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...” which is true, and underlies my view that QE has no first order effects. They predict either a “continuum of equilibria, ...” or “... no equilibrium” depending on how the interest on reserves is financed. Along with indeterminacy, don't do it. Neither Friedman nor Sargent and Wallace, nor any of the other hundreds of economists thinking about interest rate pegs and interest on reserves could know what would happen, before we ran the experiment. Now we do.

Both issues are erupting in the Spring 2025 US policy debate, as I write. Some people want the Fed to lower rates sharply, and keep them at a low level in a less “data-dependent” way. Interestingly, the same people want to shrink the balance sheet a lot, worried about the stimulative effect of all the extra “liquidity.” Others take the opposite view of both propositions. The experience of the long quiet zero bound ought to powerfully inform that debate.

Central banks, who often come in for a lot of criticism from people like me, do not get the credit they should for the important innovation of paying interest on ample reserves and controlling interest rates by the lending and borrowing rates. Well done!

One can quibble of course. Nothing is ever *that* clear in economics, and theorists are good at adding epicycles. Perhaps, new-Keynesians theorize, people know that once the zero bound passes, central banks will go back to selecting equilibria based on inflationary or deflationary threats, and each equilibrium today is linked to one in the future. Then those future threats which select the future equilibrium, select the equilibrium today. Inflation in, say, 1994 in Japan does not rise to, say, 3%, because people know inflation would then slowly decline to 2.01% in 2025 when Japan finally exits the zero bound, and then the Japanese central bank will hyperinflate because inflation is above 2%. And, in an almost magical power, central banks could have raised inflation to 3% in 1994 by just changing the after-the-bound-ends inflation target to select that 2.01% inflation.

Perhaps. The theory works. You have to judge for yourself whether a stochastic shift to future inflationary threats makes people jump to a specific equilibrium today.

Perhaps the economy was vulnerable to sunspot multiple equilibria but there just were none. Perhaps, but then why was the 1970s so full of them?

Perhaps central banks, with incomparable skill, offered just enough hyperinflationary quantitative easing, along with just enough old-style fiscal stimulus, to offset the looming deflation spiral. Perhaps. Or perhaps, by Occam's razor, inflation is stable, determinate and quiet at the zero bound, and QE 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? But there wasn't much fiscal *news* in the steady drip drip drip of primary deficits. And governments benefited from extremely low or even negative interest rates on government debt as you can see in Figures 4.4 and 4.5. In the $r < g$ view such as Blanchard (2019), the present value of public debt is infinitely positive, so the puzzle is why there wasn't fiscal *deflation* in the 2010s. 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, as they have done despite decades of warnings from academics. 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.

For that reason, 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, either large leftover WWII debts, or to fund large uncontrolled deficits in other countries and during war. 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 says that inflation should have kept spiraling up in 2021-2022 until the Fed got nominal interest rates above inflation, and then 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. 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? If 10% inflation against a 2% target really a realization of the state-contingent plan, rather than 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.

4.7 1933 and the Missing Spiral

Why did the initial deflation of 2008 not turn in to a spiral? And why was there so much larger deflation in 1933?

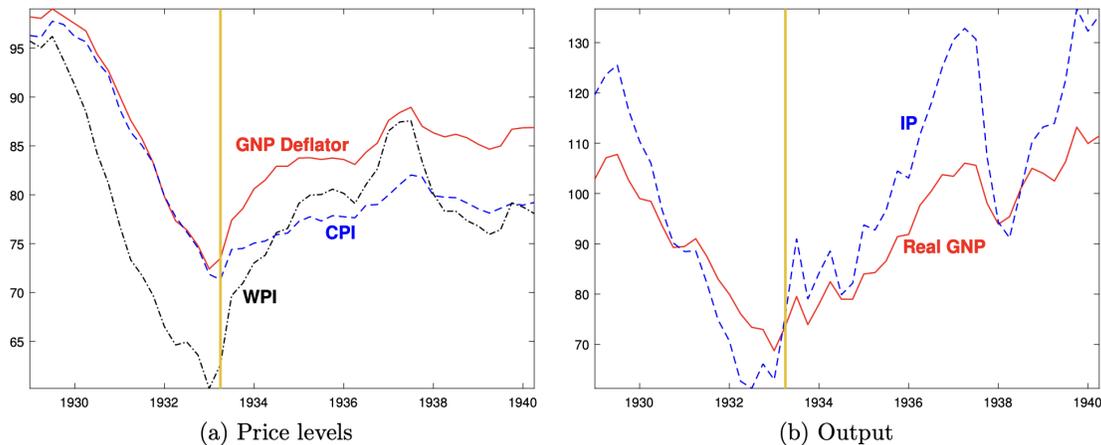


Figure 4.6: Price level and output in the early Great Depression. All series use 1926 base year. Vertical lines mark when the U.S. abandoned the gold standard. Source: Jacobson, Leeper, and Preston (2024)

Figure 4.6 shows the 1933 case, taken from Jacobson, Leeper, and Preston (2024) who provide an insightful analysis. In these early years of the Great Depression, consumer prices fell nearly 30%. Wholesale prices fell nearly 40%. Output fell a bit more than 30%. A “spiral” seems like a plausible story. Then, in March 1934, the US abandoned the gold standard. The deflation stopped instantly.

The fiscal theory gives a natural explanation. A gold standard is at heart a *fiscal* commitment. The government will, if asked, always raise taxes to obtain the necessary gold, or credibly raise future taxes 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. 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 debt valuation equation forces higher surpluses on the right hand side.

But 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 deflation. (In the larger scheme, the price level was returning to its pre-1914 value, so a different government might have welcomed this return to parity. That was not the situation in 1933.)

So, the US defaulted. It abrogated public and private gold clauses, and banned private gold holdings. Creditors sued, but the Supreme Court sided with the government that default was legal (Edwards, 2018). The right hand side of the government valuation equation would no longer keep rising. And 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 allowed for a credibly unbacked fiscal expansion – lower surpluses on the right hand side – but only

so long as the depression lasted, and therefore preserving the government's reputation for repaying debt in normal times. That reputation would soon be needed in WWII.

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. It 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 provoked an even larger fiscal response. The government will default before it raises taxes and cuts spending in a massive crisis. People, knowing that, know that holding on to government debt will not provide a 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's an old University of Chicago joke.) That is an important question. Practical views that do not hold together in theory often don't long hold together in practice either.

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, which we should not discount. 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.

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 just means that the expectations *of* the model are the same as the expectations of the people *in* the model. "Rational expectations" is not a statement about the world, it is an internal consistency condition of a model. 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. Many models of animal behavior assume optimizing rational decisions, and describe animal behavior very well, though the animals don't answer surveys very well. Model-consistent expectations, like optimizing behavior, moves us a bit more to offering explanations rather than mere descriptions of events, and raise the hope that the model's predictions

generalize and are robust to different policy regimes. 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.

Sure, people don't exactly optimize, and surely their expectations are not perfect either. (Though, don't confuse rational expectations with clairvoyant expectations. 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, 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, supply and demand model of monetary policy like monetarism 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. 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's worth making really sure 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, shocks, 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

Starting in the 1990s, the rational-expectations new-Keynesian view took over academic analysis and in the equations of central bank models. This program sought to reconstruct the Keynesian program under the Lucas rules of economic theory: Models should be based on preferences and technology, with optimizing behavior and explicit equilibrium rules, rather than ad-hoc behavioral rules. 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 are not useful. The intellectual accomplishment is summarized in classic monographs of Woodford (2001) and Galí (2015).

The new-Keynesian model is an elegant theory. It builds on a straightforward flexible price vision, and maintains the long-run stability and neutrality of that vision. But it relies on a crucial ingredient: The central bank takes an economy which is already stable on its own—inflation would go away eventually if the central bank did nothing—and intentionally destabilizes it. 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, and that assumption seems a sensible description of what central banks do. But your intuition is too conditioned by the old-Keynesian model. In the new-Keynesian model, higher interest rates *raise* inflation going forward. The real import of the Taylor rule in a new-Keynesian model is thus that the central bank does what it takes so that *inflation* rises explosively in response to current inflation. We can see this 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. (Footnote 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 on inflation less than one achieve the same de-stabilization.

The theoretical problem, then, is that *central banks don't do anything of the sort*. Tell a central banker that their great problem is multiple equilibria, and 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 them that the central bank fights disinflation by a downward equilibrium-selection threat, backed up by a fiscal contraction, that is essentially unrelated to raising interest rates. 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 don't say what the equations mean out loud.

Well, let's just measure the response to inflation and we can test the two 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.³ You can't measure off-equilibrium threats from data drawn from an equilibrium.

But, despite our (including my) love for formal econometrics, that's not the only data we have, especially about how central bankers might act in unusual circumstances. Central banker speeches, articles, writing, the corpus of explanation on central bank websites, is also data. It breathes not a whisper about multiple equilibria, intentional destabilization, or equilibrium selection. It is 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,

³A simple example, taken from Cochrane (2011a):

$$\begin{aligned} i_t &= E_t\pi_{t+1} \\ i_t &= \phi\pi_t + u_t \\ u_t &= \rho u_{t-1} + \varepsilon_t. \end{aligned} \tag{4.14}$$

Equilibrium is

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

and the only non-explosive solution is

$$\begin{aligned} \pi_t &= -E_t \sum_{j=0}^{\infty} \phi^{-(j+1)} u_{t+j} = -\frac{1}{\phi - \rho} u_t \\ i_t &= -\frac{\rho}{\phi - \rho} u_t. \end{aligned}$$

Thus, in equilibrium,

$$i_t = \rho\pi_t$$

with no error term. A regression measures ρ , not the off-equilibrium threat ϕ . The error term in (4.14) is perfectly correlated with the right hand variable. See also the example in Footnote 2.

as central banks don't 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's wrong with hyperinflationary solutions? Ask a Latin American, or a Zimbabwean. One needs a new rule against such equilibria. There are also generically deflationary solutions that end up at the zero bound that don't involve explosions. One must then pass a rule against *locally* unstable equilibria, to rule out paths that start at, say, 2% inflation and 3% nominal interest rate, and smoothly go down to 1% deflation and a 0% nominal interest rate. What's wrong with that? A long theoretical controversy has ensued over the proper interpretation of these simple equations.

Why did new-Keynesian models go down this path? Woodford (1995) wrote one of the foundational articles on fiscal theory of the price level, after all. So why did Woodford (2003) abandon that approach, wipe out the government debt valuation equation with the "passive" assumption that surpluses adjust to the price level, and resolve the indeterminacy of the new-Keynesian model with off-equilibrium threats? I don't 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 about which the central bank can do little. At best it can choose inflation now vs. later, but it cannot avoid inflation entirely without forcing the government to change fiscal surpluses or to default. I think new-Keynesians wanted a theory in which central banks fully control inflation, and not just in the long run. But our world does not offer them such complete control.

It is also understandable that in the benign fiscal environment of the 1990s, fiscal constraints on monetary policy didn't seem that important, and 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. They paid less attention to that footnote in fiscally more benign eras. Equilibrium selection is also the kind of thing that practical economists have little patience for, and usually for good reasons. No longer.

New-Keynesians set off, as the title implies, to find a foundation for "Keynesian," ISLM economics that would pass the Lucas rules. The change looks minor, just put a $t + 1$ where previously there was a $t - 1$. The resulting model, though a technical achievement is, as I hope you have seen, a completely different animal. It is not the long-dreamt of micro-foundations for ISLM. But when you go hunting for zebras, and you come back with a horse, there is a strong tendency to celebrate bagging a zebra. With an ISLM prior it is hard to read just what the equations are saying. But now we know.

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 don't have to have that argument.

4.9 Non-Reactive Expectations and the Contemporary 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 “non-reactive expectations.”

This view acknowledges how important expectations are, 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.

Most of all, expectations do not *react* quickly to interest rates, even when the model predicts that actual inflation will react to interest rates. That “non-reactive” property preserves most of the traditional doctrines I captured above with adaptive expectations, but with nuance.

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

$$x_t = -\sigma(i_t - \pi_t^e) + u_t \quad (4.15)$$

$$\pi_t = \pi_t^e + \kappa x_t + v_t. \quad (4.16)$$

Eliminating x_t , inflation is related to interest rates by

$$\pi_t = (1 + \sigma\kappa)\pi_t^e - \sigma\kappa i_t + (v_t + \kappa u_t). \quad (4.17)$$

(4.15) gives output directly. I add “demand” shocks u_t and “supply” shocks v_t , which move inflation and output around and to which the central bank must respond. Central banks also measure expectations in surveys and bond markets and treat them as somewhat exogenous disturbances that they should react to, as well as measures of people’s faith in central banks’ future actions.

Higher inflation expectations raise inflation right away, and lower output. See (4.17) and (4.15). So worrying about survey and market expectations is important. But, to our central doctrines, under an interest rate peg, there is no spiral so long as expectations do not move, or in central bank parlance 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 spiral.

That’s why central banks “look through” inflation surges, so long as they believe expectations remain “anchored.” A spurt of inflation coming from shocks (u_t and v_t) to this model will go away on its own. It may lead to a permanently higher price level, but central banks, having interpreted their mandate as a forward-looking inflation target with by-gones by-gone, don’t 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 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.

Like the adaptive expectations view, this view also mostly lacks a nominal anchor. The closest it comes is to view anchored expectations as the anchor for actual inflation, though there is no anchor for the price level. Is it an anchor or a calm sea? At best the 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 that.

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. Likewise, many analysts could attribute the swift inflation decline in 2022 as a case of re-anchoring expectations, showing what the Fed might do in the future, while worrying that deflationary expectations could become de-anchored.

In sum, the contemporary policy view still predicts that inflation and deflation spirals can break out, and the absence of a spiral in the zero bound era remains a puzzle. “Expectations didn’t 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 non-reactive, higher nominal interest rates lower inflation. See the coefficient $-\sigma\kappa$ in (4.17). Writing (4.17)

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

you can see that if expectations rose one-for-one with the nominal interest rate, inflation would rise, and in (4.16) 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. In the adaptive expectations model a small initial effect gets an expectational snowball going to create that lag. I think people square 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 non-reactive expectations requires persistently high interest rates. 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. Instead, one must wait through a persistent period of high interest rates, inflation must get going to break through the attention span, and 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, as that raises output and brings inflation up to target. 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. Alas, speaking loudly without a stick has often failed to contain or boost inflation. Eventually if inflation does not do what central bankers want, they need something more than additional speeches,

I characterize here what I read in the verbal explanations given by central bankers and mainstream policy analysts. To turn this in to an economic model, we need to formalize how expectations form, in place of the explicit adaptive-expectations schemes of the 1970s. The many contrasting, nonlinear, and contingent forces alluded to above make that a challenge.

A somewhat related recent academic literature has given up on the quest to find a simple rational model in which higher interest rates produce lower inflation going forward, and investigates sophisticated and complex models of expectation formation that to some extent parallel and formalize this thinking. 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 this policy view. The papers are complex, since they try to abide by the rules of optimizing or other rule-based decisions rather than add ad-hoc expectation or decision rules, staying under the Lucas umbrella and hopefully producing models that could apply with some policy invariance. That complexity means, however, that they don't yet satisfy the quest for a *simple* and explainable economic theory of monetary policy. Do we really *need* higher order beliefs, bounded rationality, learning, information-processing constraints, and so forth as the minimal necessary ingredient to deliver a model of inflation, the price level, and the basic signs of monetary policy? Must an honest central banker, wary of going to Congress to explain how 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? Theories get simpler over time, however, so perhaps one will emerge.

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. Like all episodes, this sort of breezy history is not proof. But it is possibility, and maybe even plausibility, and that’s a good place to start. *The Fiscal Theory of the Price Level* includes more detail on these, additional literature, and additional episodes.

5.1 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 dominates empirical work such as VAR estimates (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. Each time inflation declined, with a recession, but came back more strongly. Starting in 1980 the Fed under Chair Paul Volcker raised rates much 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 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 things get out of hand kept inflation low for three subsequent decades by “anchoring expectations,” and allowed the painless disinflation after the 2021 surge.

But this episode has fiscal as well as monetary roots. (Refer back to the history of primary surpluses in Figure 2.4 for the remaining discussion.) Fiscal roots are the standard story for the surge of inflation in the late 1960s. President Johnson wished to fund the Vietnam war and the Great Society without tax increases, and President Nixon followed suit with larger deficits. The deficits of the time seem small now, but the financial and monetary system was much more fragile then. Small international capital markets, fixed exchange rates, and the remaining gold standard between central banks could not survive protracted trade and budget deficits and any prolonged inflation. 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 makes inflation more vulnerable to fiscal shocks. (Sims, 2024 made this point for the 1970s.) The same change in surplus on the right hand side

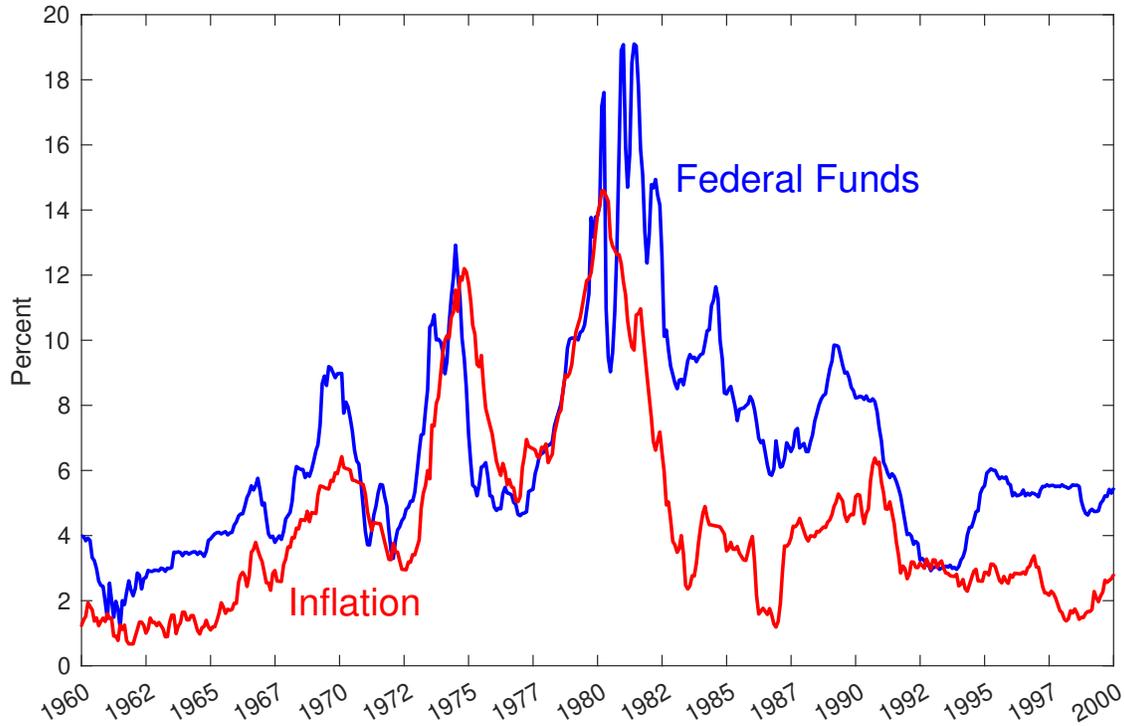


Figure 5.1: Federal Funds Rate and CPI.

of the valuation equation has a larger effect on the price level on the left hand side if there is less nominal debt. One's intuition that more debt makes governments more vulnerable to inflation comes from intuition that with greater debt service pressures, it is harder for governments to meet today's deficits with subsequent surpluses, and not to change 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 as a fraction of debt outstanding were large.

Even in the conventional story, oil shocks themselves did not cause inflation. Like the supply shocks of 2020-2021 they induced fiscal as well as monetary policy to choose inflation.

Monetary policy was not alone in accounting for 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 and reduced capital taxation, and quickly led to greater revenues. A deregulation effort also contributed to higher economic growth which helps primary surpluses. Primary surpluses surged in the 1980s and 1990s, as Figure 2.4 reminds us. Economists were writing 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, and 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. That's an identity; 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 spreadsheets. That feeling of confidence was in the air, though worries about deficits flew among economists.

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 previous monetary tightenings did not include fiscal reform, and did not lead to durable disinflation, including many in Latin America (below). Sims (2011) reads the waves of inflation before 1980 this way: with long-term debt, higher interest rates and no change in fiscal policy lower inflation now by raising it later. Sims called this “stepping on a rake,” and I have referred to it as “unpleasant interest rate arithmetic.” Sims views the 1970s as an instance of that pattern, only reversed because the 1980s did, it turns out, solve 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, the central bank must print money and inflate sooner or later, with that timing its only choice. But while brilliantly right in theory, the most important 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. They were largely due to much larger real interest payments on the stock of debt. Sargent and Wallace wrote before the Social Security, tax, and regulatory reforms got going, so in a sense the US did respond to their plea, but more in present value terms than quick 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 very rapidly in the fall of 1982.

More importantly, even conventional ISLM cannot avoid fiscal backing. (One can marry fiscal theory to ISLM and adaptive expectations too.) Fiscal policy has to tighten to pay interest costs on the debt, and not add more deficits to the fiscal fire. Even in ISLM/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. The 1980s have to be understood as a joint monetary, fiscal, and microeconomic stabilization.

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 produces a decline in inflation along with high interest rates for transitory interest rate movements. Persistent interest rate movements raise inflation. Thus, this classic 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 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 reforms and failed. The “Brazil scenario” of a return to inflation, a fifth wave even larger than the first four, was discussed in the early 1980s and may account for some of the otherwise puzzling 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.

This is an important and underappreciated mechanism, important for current policy debates. Conversely, 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. Spending the interest-cost bounty undoes the disinflationary force, however. Still, a government that needs breathing space may not be wrong to ask central banks to lower interest rates. And 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.

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 inflation targeting regime, and a clever transition via a parallel “real” unit of account. But centrally it 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. Inflation ended.

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 a fantastic arrangement. The arrangement seems to separate the central bank balance sheet from the government’s fiscal affairs: The peso is fully backed by the reserves. The present value of surpluses backs the rest of the debt, which may default but may not inflate. It is a fiscal commitment like the gold standard. Independent central banks can be very 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 an 0.8% of GDP surplus in 2024. If anyone complains that 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 target.

5.3 The Ends of Hyperinflations.

Figure 5.2, 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 an excellent and somewhat contrarian history of the episode.)

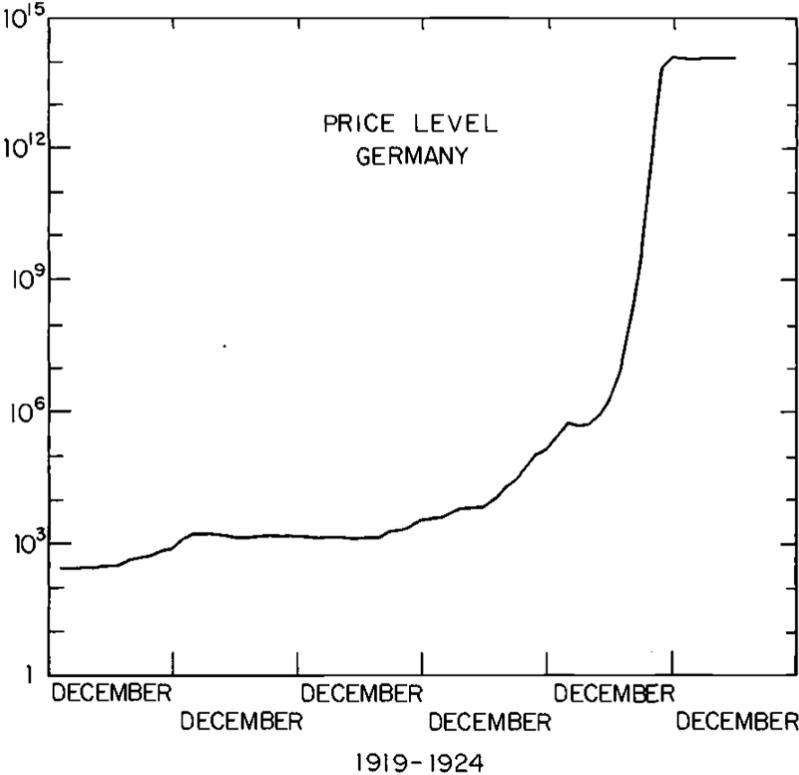


Figure 5.2: Price level in Germany after WWI. Source: Sargent (1982)

That inflation had a clear fiscal source. The government ran large deficits, and resorted to printing money. The end came with the Dawes plan, that renegotiated reparations due under the treaty of Versailles, and a fundamental fundamental fiscal and monetary reform. In Ferguson’s account, reparations themselves were not huge, but the government had little incentive to fix its fiscal problems if any revenues would just lead to larger reparations. The government also 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 are happy to hold more non-inflating money. There was no period of high interest rates. Interest rates declined. The government was actually able to borrow more during the transition, since the probability of repayment was larger. There was no recession. The economy grew rapidly and unemployment fell. Inflation stopped the moment the *long-run* fiscal problem was solved, the minute the fiscal *regime* changed.

Sargent reports that in Austria, following a similar path, the central bank was *forbidden* to buy treasury debt and 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.

5.4 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, borrow, and print money in addition to raising taxes. They have the central bank buy much of the newly issued debt, hold down interest costs on the debt, and force people and institutions to hold debt. When inflation breaks out they often resort to price controls and rationing. All of this shifts some of the costs of war from current and future taxpayers to money holders and bondholders. 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 (see the excellent Hall and Sargent, 2021a), and in many other countries. Hall and Sargent (2021b) compare the Covid response to war finance.

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 inflated by 100% during the Civil War, but 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, giving people more confidence to hold bonds and currency and reducing 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 be much lower if people knew with certainty that convertibility at the original parity would follow the war, followed by deflation during the eventual return to parity. A return to convertibility is also a bet on winning the war. The 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, nor do interest rates change. The chance of the government having the

fiscal resources to repay its debts and to back its currency changes.

5.5 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 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. A run on banks then becomes 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.

Though usually *current* deficits do not indicate larger present values of deficits, because subsequent surpluses will repay them, Jiang (2021) finds that deficits do line up with exchange rate depreciations in a sample of developed countries.

5.6 Inflation Targets

In the 1990s a number of countries starting with New Zealand, Canada, and Israel, adopted an inflation-targeting framework. They experienced rapid declines in inflation 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 didn't 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 having to prove that anchor in a storm.

However, the inflation targeting reforms involved fiscal and microeconomic reforms as well. Budget deficits were cut, sustainably. Microeconomic reforms allowed 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, or foreign exchange rate peg. It commits that the right hand side of the government debt valuation equation will be consistent with the 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? The large data points are often the most informative. Yes, other effects such as liquidity premiums, credit frictions, and other aspects of monetary economics may have a greater chance to stand out when fiscal affairs are more quiet. But that speaks to the sort of icing we put on the cake, not the cake itself.

5.7 Japan

What about Japan? The question usually comes up the minute one says “fiscal theory.” I summarize here some thoughts in *Fiscal Theory of the Price Level* 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.

Of course, debt sustainability is not a fiscal theory issue per se. All complete economic models include the government debt valuation equation, and if that equation truly fails, it is equally a puzzle to all theories that inflation or a debt crisis has not already broken out. If not inflation, bond yields should anticipate default.

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, etc. 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 it 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 was trying fiscal stimulus for many years, but was criticized because it also raised consumption taxes when debt might hiccup. Most of all, Japan has benefited from extraordinarily low interest costs. Any debt is sustainable at zero to one percent real interest. The same debt is not sustainable at 3% interest. “Just wait,” I 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’s 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. There is no sign 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 microeconomic distortions. Japan is 29th on the World Bank's Ease of Doing Business Index¹, just below the Russian Federation. Japan's banks have been criticized as carrying too much non-performing debt. Its financial system is not particularly innovative. It's 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, total GDP is what matters for debt repayment.

5.8 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 erected a prescient set of 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 means "and nothing else," specifically not employment, not varying conditions across member states, and initially not even financial and banking stability. The ECB would not buy sovereign debts, and instead 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 fiscal bailouts. Again, you see a set of institutions designed to add credibility that the present value of surpluses on the right hand side of the valuation equation matched the value of debts on the left, without inflation.

There were a few lacunae at the start. A currency union without fiscal and political union requires that, in the end, it must be possible that countries 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 have never brought themselves to acknowledge 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 that, but it means that any sovereign default brings down the banks with it, inviting ECB intervention.

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

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

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 started buying assets. Then came the sovereign debt crisis, with Mario Draghi's immemorable "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 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.

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

5.9 The Future

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

Figure 5.3 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 by law to project tax rises and spending cuts of 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, and 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, and the US will want to meet it with another river of borrowed or printed money.

These projections are also pessimistic. 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 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 all our debt problems 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

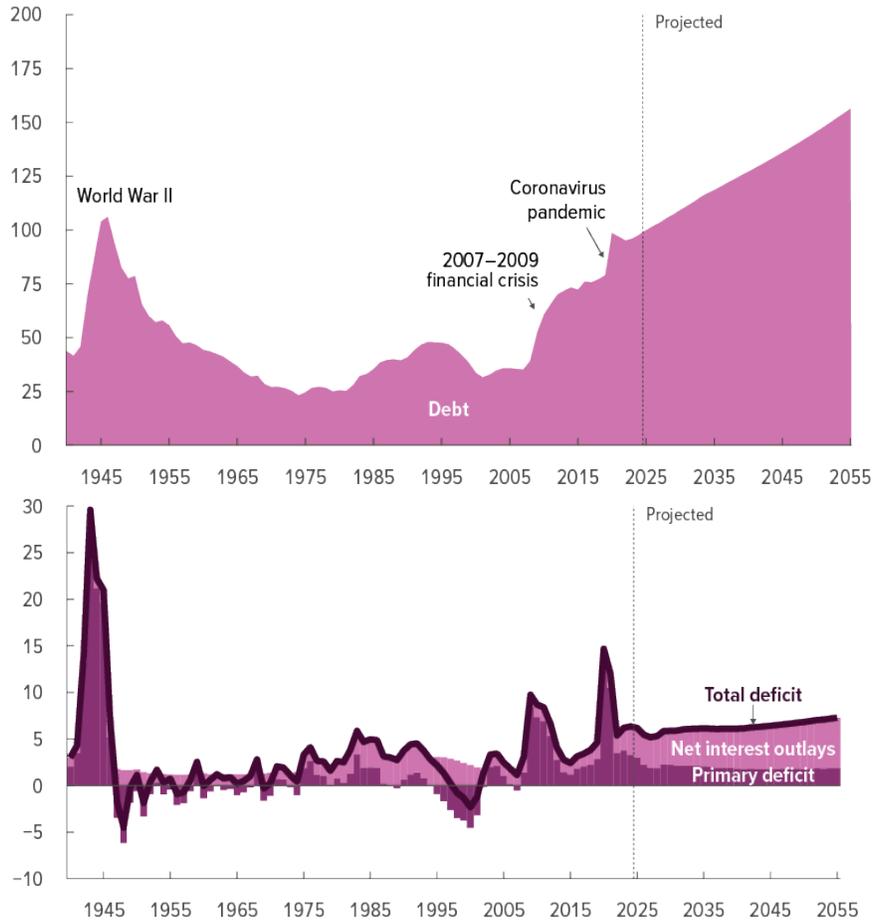


Figure 5.3: Congressional Budget Office projections. Source: Congressional Budget Office (2025)

not short run fixes; more revenue at lower marginal rates not one-time wealth grabs. The long-run Laffer curve peaks much lower than the short-run curve, because over decades, all the behavioral responses and disincentives kick in. In particular one-time 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? Again, they are projections, not conditional expectations, and markets know they can't 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. Eventually, the reform must come, and the sooner it comes the easier it is. And 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 and repayment, not debt. If we wipe out all current debt, we still must finance endless primary deficits. And the day after a \$36 billion 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, and some day the bond vigilantes wake up leading to a roll-over crisis, high interest rates which the Fed fights by monetization, and inflation. Two other scenarios are, I think, more salient.

First, debt hangs over monetary policy. Suppose inflation surges and the Fed wishes to raise interest rates. It 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” and “monopolists” and “greed” 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. And 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. In all current theories of inflation, central banks cannot durably lower inflation by higher interest rates unless fiscal policy tightens to pay those interest costs. Will Congress pony up several percents of GDP higher surpluses to pay higher interest costs to the ever unpopular “Wall Street?”

Already, President Trump cites interest costs on the debt as one of his main reasons for demanding lower interest rates from the Fed. The conflict between administration and Fed is no longer just Phillips curve stimulus, it is interest costs on a large debt. We are back to 1945-1951, when the Fed was required to hold down interest costs. 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 or the Fed are thinking about and prepared to tackle.

Second, what happens in the next crisis? There could be a geopolitical shock —China invades Taiwan for example—a new pandemic, or another financial crisis. Once again, the US will want to spend \$5 trillion or more on a round of bailouts, stimulus, insurance for the unfortunate, and perhaps this time a big military investment. 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. The lack of fiscal space to borrow more in an emergency may hit us before placid debt dynamics to so.

Again, debt is not the problem. The problem is the lack of fiscal space to reliably promise additional primary surpluses.

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?

The conflict between fiscal and monetary policy will be the issue for our central banks in the near future. A central bank can stop a fiscal inflation, by refusing to monetize debt and by allowing interest rates to spike. Doing so, it forces the government either to change fiscal policy, providing the surpluses needed to back debt, or to default (restructure) explicitly rather than via inflation. But do we really want central banks to stop inflation in all circumstances? Do we want central banks “independently” to have such dramatic influence over taxes, spending, and crisis

management? Surely we would not want to lose WWII on the altar of no inflation, or to allow an “independent” Fed to make that decision. Neither our mandates nor terms of independence consider this conflict. They need to so so, fast. (For more, see Cochrane (2026)).

(The “passive fiscal policy” footnote to new-Keynesian. models gives central banks a huge amount of power over fiscal policy, far beyond the separation of fiscal and monetary policy presumed in the theory of central bank independence. This has not been noticed, but perhaps bringing fiscal policy back out of new-Keynesian footnotes will help.)

In sum, there are two answers to our current pickle. First, fix the long-run fiscal problem so that the government can borrow without inflation. Second, face up to what happened in 2021-2022. Inflation is always a choice. We can, in the next crisis, spend more wisely. Covid did not require WWII levels of spending. Foreswear stimulus. Fix finance to eliminate bailouts. Allow asset prices to fall. And decide that we want central banks to fight such inflation, and give them a stronger mandate to do so.

Chapter 6

Interest Rates and Inflation

We now have, at last, a simple, complete, economic theory of inflation under interest rate targets. It survives the elephant-in-the-room tests of dramatic recent and wide historical experience. But a nagging problem remains: How do central banks, by raising interest rates, lower inflation? We already saw a sharp divergence on that question. Here I dig deeper.

There is a chasm between the beliefs of the policy community, as outlined in the adaptive or non-reactive expectations view above, and the operation of the forward-looking, rational expectations view of the new-Keynesian and new-Keynesian plus fiscal theory view.

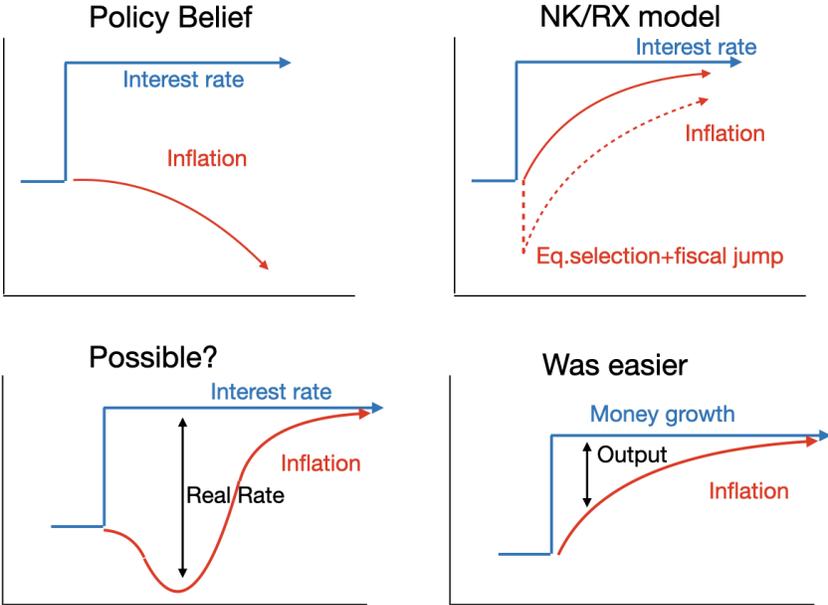


Figure 6.1: Policy view vs. contemporary models of how interest rates affect inflation

Figure 6.1 illustrates. In the standard 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.) In the new-Keynesian model, illustrated in the top right panel, higher interest rates alone *raise* inflation. The only way to have the appearance of lower

inflation is for a downward equilibrium-selection jump to accompany higher interest rates. But equilibrium selection is independent of interest rates, so there is no reason to bother with the inflationary higher interest rates if the central bank can induce equilibrium-selection jumps. (I graph the response to permanent interest rate rises, to better illustrate the long-run properties of the economic theories. That is not essential; the usual transitory interest rate rises give the same short-run responses.)

The fiscal theory notices that the downward equilibrium-selection jump must be accompanied by a fiscal tightening to pay the higher interest costs on the debt and a windfall to bondholders. Hence, at least label it properly as an equilibrium-selection + fiscal jump. But from a fiscal theory point of view (with short-term debt) this is the combination of two policies, higher interest rates that raise inflation, and a fiscal tightening—higher present value of surpluses—that lowers inflation. Interest rates without that fiscal tightening just raise inflation.

That higher interest rates raise inflation is deeply embedded in rational expectations models. In the flexible price model, the nominal interest rate equals a real rate unaffected by monetary policy plus expected inflation, $i_t = r + E_t\pi_{t+1}$. Sticky prices smooth but do not change that sign. More generally, the rational expectations model is *stable* and *neutral* in the long run, highly desirable properties. But stability and neutrality imply that permanently higher nominal interest rates must eventually raise inflation, just as permanently higher money growth eventually raises inflation in a monetarist view.

It is still possible that higher interest rates lower inflation in the short run before rising in the long run, as illustrated in the bottom left hand panel. That practical policy makers don't know about long-run neutrality makes a lot of sense, since at least until the zero bound era we never saw a long run in which interest rates did not move around, and without fiscal shocks.

It won't be easy. We need higher nominal interest rates to raise real interest rates more than one for one, as shown. It's hard to get a model to do that. 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 real rates and 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 most monetary economists stop. But it is not enough to reduce *inflation*.

The rational expectations model mirrors monetarism in many ways, as the contrast between the top right and bottom right panels illustrates. 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 here the comparison ends. We never wanted higher money growth to temporarily lower inflation, as we want higher nominal interest rates to temporarily lower inflation.

It's hard enough to get a rational-expectations interest-rate model to lower inflation at all. It's harder still to get one that will lower inflation going forward, as the policy view prescribes, rather than to rise after at best an initial jump down.

The contrast between policy doctrine and the equations of the last three decades of economic models is palpable once you think about it, and revealing that so few people thinks about it. 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's just the standard intertemporal first order condition ($R_t^f = \beta E_t(c_{t+1}/c_t)^{-\gamma}$ or $x_t = E_t x_{t+1} - \sigma(i_t - E_t \pi_{t+1})$). That's exactly how the standard new-Keynesian model behaves—and

the real business cycle model and the first equation of asset pricing. There is only the possibility of an instant downward jump the minute the higher rate is announced. In the halls of central banks, of course, if you say that higher interest rates will raise, not lower, consumption and output growth going ahead relative to today, they will laugh at you. In the standard forward-looking Phillips curve, of course lower output raises inflation growth, with only the possibility of an instant downward inflation jump. The standard Calvo Phillips curve says lower output lowers inflation today relative to next year's inflation. That means inflation will grow over time ($\pi_t = \beta E_t \pi_{t+1} + \kappa x_t$). Ball (1994) pointed this out 30 years ago. In the halls of central banks, and the minds of most policy analysts, even banks and analysts who use the forward-looking Philips curve as their central causal story for inflation, if you say that lower output makes inflation next year higher than inflation now, they will laugh at you. These signs are deeply baked in, so will be hard to change.

I also ask for a theory in which interest rates *alone* can lower inflation, without an independent or induced fiscal tightening. Most successful historical disinflations likely do include such a tightening, at least in present value terms, as we saw in the 1980-1990 episode. Now, monetary policy does have many positive and negative fiscal effects. A policy evaluation should include those effects. But central banks cannot directly control taxes and spending. If central banks only lower inflation because they induce fiscal tightening, while higher interest rates are per-se inflationary, that is radically important news. So it is important for theory and institutional design, even if not for practice, to see what it takes for higher interest rates to lower inflation without fiscal help. I also abstract so far with a very simple interpretation of “no fiscal help,” no change in surpluses. No change in tax rates or spending policies might make more sense, but I leave the most interesting definition of “constant fiscal policy” for later once we have all agreed this is the important question.

So, what minimal sensible economic ingredients must we add to produce something like the bottom left graph? The adjectives are important. “Medium scale” models such as Christiano, Eichenbaum, and Trabandt (2016) are able to produce something like the bottom left graph. However, they require a smorgasbord of ingredients to do it, and they also include a fiscal tightening to pay interest costs. What of that smorgasbord is *necessary*, the foundational ingredient that gives central banks power, without which central banks lose power, the one without which higher interest rates raise inflation, and hence (if one is honest) explained to undergraduates, on central bank websites, and in testimony to politicians? That is our quest. This is not fundamentally a fiscal theory question. It is a question about the rest of the model.

Of course, it is possible that the policy consensus is wrong; that the world really does behave as the top right panel, that higher interest rates by themselves raise inflation; that we have only seen lower inflation because of a correlated fiscal shock. But I think before arrogantly proclaiming our equations to be right and practical experience wrong, we should try very hard to see if we can produce something like the standard beliefs, at least about the facts if not the mechanism. To show that *there is no* theory that produces something like standard beliefs, you have to sort through a lot of theories.

The same problem lies at the base of international economics. What is the minimal model in which higher interest rates – not lower money supplies – raise the value of a currency?

In the standard policy view, a higher domestic i than foreign i^* interest rate raises the value of the currency, as shown in the right panel. In the simplest model—a single tradeable good, flexible prices—the rational expectations model gives the opposite sign. Higher nominal interest rates mean higher expected inflation. The exchange rate obeys purchasing power parity, so a higher domestic price level means an expected exchange rate depreciation, as shown. Now, once again,

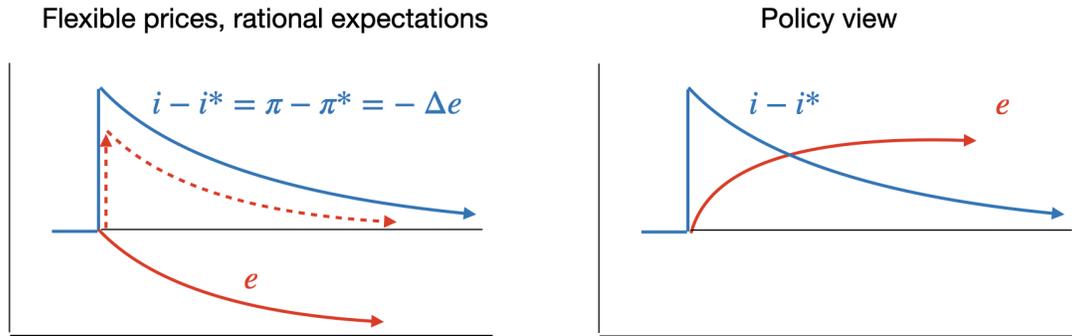


Figure 6.2: Policy view vs. flexible price rational expectation model of interest and exchange rates

the exchange rate can jump just like inflation. The unexpected exchange rate can rise even if the expected exchange rate falls. And that is the usual story: expected depreciation in the future means the exchange rate must jump up now. But that story assumes that the nominal exchange rate must return to its original level after the shock has passed. But there is no particular reason why the *nominal* exchange rate should return to its original level. Japanese prices still have two zeros more than American prices, and the exchange rate two more zeros from 1.00. And that upward jump implies a fiscal tightening. (The model here is just $i_t = E_t \pi_{t+1}$ home and abroad, and $e = p_t^* - p_t$.) Since adding sticky prices slows down but does not reverse inflation, the same result holds with sticky prices.

6.0.1 The Standard new-Keynesian Model Doesn't Work

My assertion that standard theories do not work to this goal needs some elaboration. Surely, academic economists will say, the standard three-equation new-Keynesian model, in place for three decades, is our workhorse basic explanation of how higher interest rates lower inflation?

Figure 6.3 presents the standard exercise, based on an intertemporal IS curve, the forward-

looking Calvo Phillips curve, and a Taylor rule with an AR(1) transitory disturbance.¹ (The calculations of this section come from Cochrane, 2025c.) There you see it: higher interest rates, lower inflation, no?

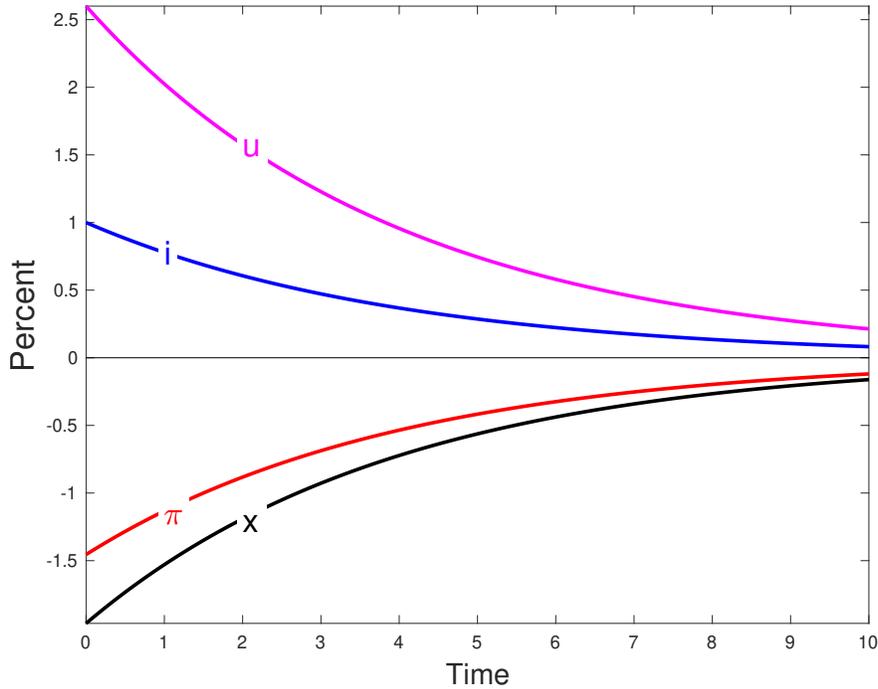


Figure 6.3: Response of the standard three-equation new-Keynesian model to an AR(1) Taylor-rule policy disturbance u_t . Parameters $\eta_i = 0.25$, $\phi = 1.1$, $r = 2\%$, $\sigma = 0.2$, $\kappa = 0.2$, $u_0 = 2.6\%$.

On inspection, though, this model does not answer the question. First, note the interest rate is above inflation through the episode. Interest costs on the debt rose. Who paid those? Taxpayers did. The “passive” fiscal policy behind this exercise must raise taxes or cut spending. It is at least

¹The model is

$$\frac{dx_t}{dt} = \sigma (i_t - \pi_t) \tag{6.1}$$

$$\frac{d\pi_t}{dt} = r\pi_t - \kappa x_t. \tag{6.2}$$

together with a Taylor rule with an AR(1) disturbance,

$$\begin{aligned} i_t &= \phi\pi_t + u_t \\ u_t &= u_0 e^{-\eta_i t}. \end{aligned}$$

Eliminating x_t results in a second order differential equation linking inflation π_t to the interest rate i_t . The bounded solutions to that differential equation are

$$\pi_t = \frac{1}{\frac{1}{\lambda_1} + \frac{1}{\lambda_2}} \left[C e^{-\lambda_1 t} + \int_{s=0}^t e^{-\lambda_1(t-s)} i_s ds + \int_{s=t}^{\infty} e^{-\lambda_2(s-t)} i_s ds \right] \tag{6.3}$$

where C is an initial condition, the “equilibrium-selection” choice and

$$\lambda_{1,2} = \frac{\mp r + \sqrt{r^2 + 4\sigma\kappa}}{2} > 0.$$

Each C corresponds to a different π_0 , so we can also parameterize equilibrium selection by that choice.

a joint monetary-fiscal policy shock. We hoped for a model in which monetary policy alone lowers inflation.

Second, note as above that inflation and output each *rise* going forward after an initial jump, where the policy view wants no immediate movement and then a decline. Only the initial jump gives the desired sign. As above, that sign is deep in the basic economics of the model. We can't wave our hands about long and variable lags to make it go away.

Most importantly, however, this model combines a higher interest rate with a separate equilibrium-selection/fiscal shock to produce the initial downward jump, and only the latter has anything to do with lower inflation. Inflation is a two-sided moving average of the interest rate with positive weights, plus an exponentially decaying transient, indexed by wherever inflation starts. Policy has to specify initial inflation as well as the interest rate path. In the end, this model just smooths over the dynamics of the flexible price model in which inflation is just the previous period's interest rate, with initial (unexpected) inflation the "equilibrium selection" choice.

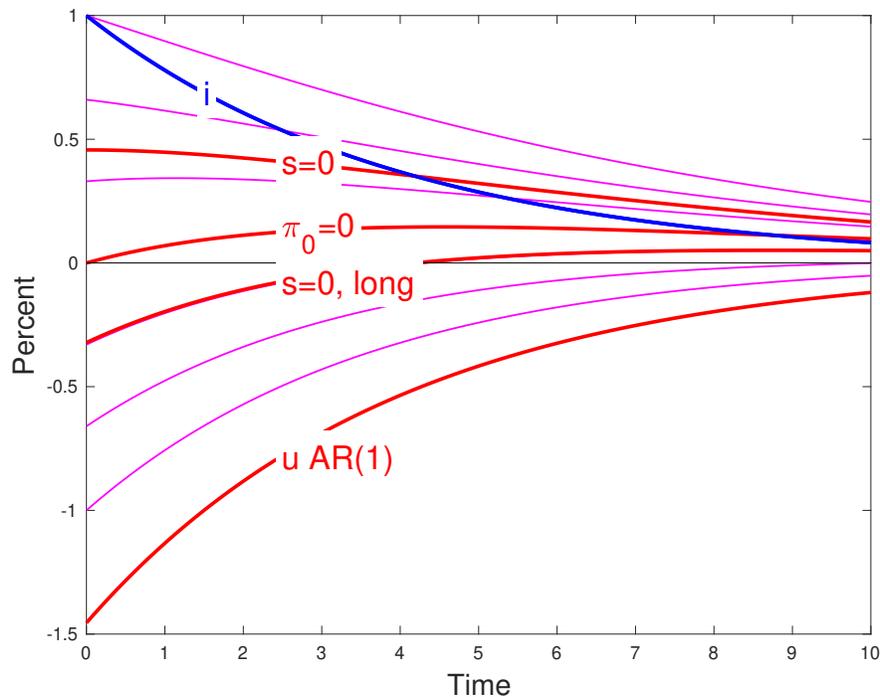


Figure 6.4: Response of inflation in the standard new-Keynesian model to an AR(1) interest rate i , illustrating multiple equilibrium possibilities. The “u AR(1)” equilibrium is generated by a Taylor rule with an AR(1) disturbance. This is the same as in Figure 6.3. The $\pi_0 = 0$ equilibrium is identified by zero inflation at time zero. The “ $s = 0$ ” equilibrium requires no change in primary surpluses with short-term debt. The “ $s = 0, \text{ long}$ ” equilibrium requires no change in primary surpluses with perpetual debt. “ i ” gives the interest rate path, common to all inflation paths. Parameters $\eta_i = 0.25$, $\phi = 1.1$, $r = 2\%$, $\sigma = 0.2$, $\kappa = 0.2$.

Figure 6.4 illustrates. This figure has the same interest rate path as Figure 6.3. But now I illustrate the family of equilibria, corresponding to different values of the initial inflation choice. The “u AR(1)” path is the same as the standard exercise in figure 6.3. But there are many others. And, even though they have the same interest rate path, they have different inflation paths, with many having positive inflation. Lower inflation depends on equilibrium selection. I highlight a

few of the other equilibria. The two “s=0” equilibria have no change in fiscal policy, one with short-term debt and one with long-term debt. The “s=0” equilibrium verifies that with short-term debt and no change in fiscal policy, higher interest rates raise inflation. I discuss the long-term debt case below.

What about the Taylor rule? Writing $i_t = \phi\pi_t + u_t$ with $\phi > 1$ and picking a path for the disturbance u_t , we arrive at a unique interest rate and inflation path, as I did in figure 6.3. That approach seems to tie together the interest rate path $\{i_t\}$ and equilibrium selection, the initial inflation π_0 . It turns out however that there are many disturbances $\{u_t\}$ that generate the same interest rate path, but different initial inflation π_0 . By choosing among that set, the central bank can separately control the interest rate path and select the equilibrium.² It was only the restriction that the disturbance follows a specific path (an AR(1)) that gave the appearance that the Taylor rule ties together the interest rate path and initial inflation.

Indeed, the central bank can reduce inflation with a pure equilibrium-selection/fiscal shock, without moving interest rates at all. We can call this an open-mouth operation. Just give a speech about what the Taylor rule disturbance is, while leaving interest rates alone. Inflation jumps down.³ If only disinflation were so easy.

The open mouth operation also requires a fiscal contraction to pay interest costs on the debt. For a fiscal theorist, of course, this is just a pure fiscal shock with no change in interest rate, the prime example of what fiscal policy can do with no change in monetary policy.

6.0.2 Even the Policy Model Doesn’t Work

Surely, many economists and practitioners will say, we should just give up on model-consistent expectations. Then the standard old-Keynesian model is our workhorse explanation of how higher interest rates lower inflation.

But not even the old-Keynesian model satisfies our quest. When the central bank raises interest rates, fiscal policy still has to tighten to pay the interest costs on the debt. If fiscal policy does not or cannot tighten, then higher interest rates cannot lower inflation. Higher interest rates on their own do not lower inflation. I’ve said that before, but offer greater detail here.

Figure 6.5 presents a simulation, from Cochrane (2024a). The model is a continuous-time version of the simplified adaptive expectations model. I use a static IS curve, which says that higher real interest rates lower output. And I use the adaptive expectations Phillips curve, which says that higher output corresponds to growing inflation.⁴

²Choose an $\{i_t\}$ and any C or π_0 . Construct $\{\pi_t\}$ by (6.3). Construct (reverse-engineer) $\{u_t\}$ by $u_t = i_t - \phi\pi_t$. This disturbance produces the desired interest rate path and the desired equilibrium choice. The choice of process $\{u_t\}$ among the set that produce the same $\{i_t\}$ is the same as choosing C or π_0 .

³Just set $i_t = 0$ and choose $C < 0$. Inflation follows $\pi_t = \pi_0 e^{-\lambda_1 t}$. The central bank can induce this with a Taylor rule disturbance $u_t = u_0 e^{-\lambda_1 t}$.

⁴The model is

$$x_t = -\sigma(i_t - \pi_t) \tag{6.4}$$

$$\frac{d\pi_t}{dt} = \kappa x_t \tag{6.5}$$

$$i_t = \phi\pi_t + u_t. \tag{6.6}$$

The positive sign on the right hand side of the Phillips curve captures the adaptive expectations idea. High output raises inflation relative to past inflation, not future inflation. The sign is negative in the rational expectations model.

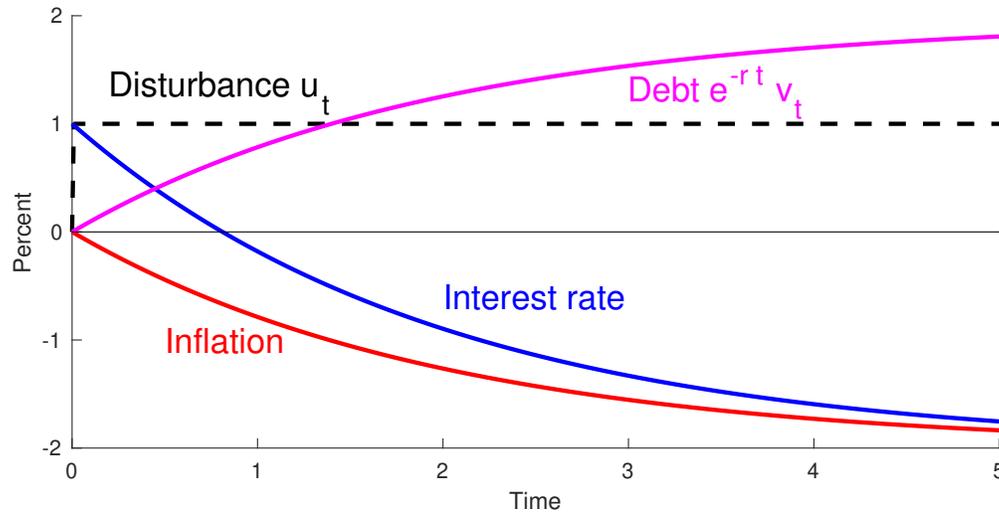


Figure 6.5: Response to a 1% permanent monetary policy shock in the adaptive expectations model with a Taylor rule. Parameters $\sigma\kappa = 1$, $\phi = 1.5$, $\rho = 0.01$.

Figure 6.5 looks like a standard story for the 1980s. Compare it to Figure 5.1. The Fed persistently tightens monetary policy. Inflation doesn't jump, but starts going down. Via the Taylor rule, interest rates follow inflation down keeping gentle pressure but avoiding a deflationary spiral. (The standard story might be better captured by a rise in Taylor rule sensitivity ϕ rather than a permanent disturbance u , but with constants in the equation that has the same effect.)

But the real interest rate is positive throughout. Interest costs on the debt are positive throughout. Fiscal policy must tighten, in a present value sense, to pay those interest costs. This is a joint monetary-fiscal disinflation, as I argued the 1980s were in fact. To illustrate that fact, I plot the discounted value of the debt in this scenario, if fiscal policy does not tighten. Debt itself (without the e^{-rt}) grows explosively, violating the condition that the discounted value of the debt must approach zero. Without fiscal tightening, this outcome cannot happen.

In this traditional model, higher interest rates cannot lower durably inflation on their own, without fiscal tightening. The intuition is simple. Higher real interest rates push inflation down. But higher real interest rates raise interest costs on the debt, and without surpluses, the government must borrow more to pay those interest costs. Debt starts to explode, as in the above simulation. To stop the debt explosion, the government must now lower real interest rates to lower interest

Eliminating x_t , with a constant (after time 0) $u_t = u$ to show the permanent shock, inflation follows

$$\frac{d\pi_t}{dt} = -\sigma\kappa(\phi - 1)\pi_t - \sigma\kappa u.$$

with solution

$$\pi_t = -\frac{1}{\phi - 1} \left[1 - e^{-\sigma\kappa(\phi-1)t} \right] u.$$

I also plot the value of debt if surpluses do not change along with the interest rate change. Then debt follows

$$\frac{dv_t}{dt} = rv_t + i_t - \pi_t$$

so

$$e^{-rt}v_t = \frac{e^{-[r+\sigma\kappa(\phi-1)]t} - 1}{r + \sigma\kappa(\phi - 1)}.$$

costs on the debt. But that raises inflation again. If the average real rate is zero, so that average interest costs are zero, real rates cannot push inflation anywhere in the long run. Cochrane (2024a) includes a proof.⁵

6.1 A Step Forward

The best I have been able to do in our quest for a simple, transparent, economic model in which higher interest rates lower inflation going forward without a fiscal tightening combines two ingredients: Long term debt and a slightly generalized version of the Lucas (1973) Phillips curve. (For details see Cochrane (2025b)).

That Phillips curve incorporates Lucas' idea that output is high when the aggregate price level rises relative to what firms expect. Firms see inflation, and think it is an increase in the relative price of their product, so they produce more. That output boost goes away when firms learn that the price they are seeing is just inflation. I add the idea that that a fraction α_j of firms learn the aggregate price level with a "period" j long. 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 in the baseline model. As motivation, the adaptive expectations model uses past inflation as its reference point; the new-Keynesian model uses expected future inflation. The Lucas Phillips curve uses today's expected inflation. Perhaps that can lead to some of the features of both worlds? It does.

Figure 6.6 presents a calculation,⁶ using exponential weights $\alpha_j = ae^{-aj}$. The result is closer to the policy view with long run stability, as we hoped for in Ffigure 6.1. Inflation declines going

⁵The argument is easy to see in the special case of zero steady state interest rate $r = 0$. Eliminating x_t from (6.4)-(6.5) and with $i_t - \pi_t = r_t$, we have

$$\frac{d\pi_t}{dt} = -\sigma\kappa r_t$$

and with $r = 0$

$$\frac{dv_t}{dt} = r_t$$

Then, $\pi_t = \sigma\kappa v_t$, and $\lim_{T \rightarrow \infty} V_T = 0$ means $\lim_{T \rightarrow \infty} \pi_T = 0$.

⁶To make the calculation of figure 6.6, 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

$$\kappa x_t = p_t - \int_{j=0}^t ae^{-aj} p_t dj = e^{-at} p_t. \quad (6.7)$$

I use the standard intertemporal IS curve,

$$\frac{dx_t}{dt} = \sigma(i_t - \pi_t), \quad (6.8)$$

Differentiating (6.7)

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

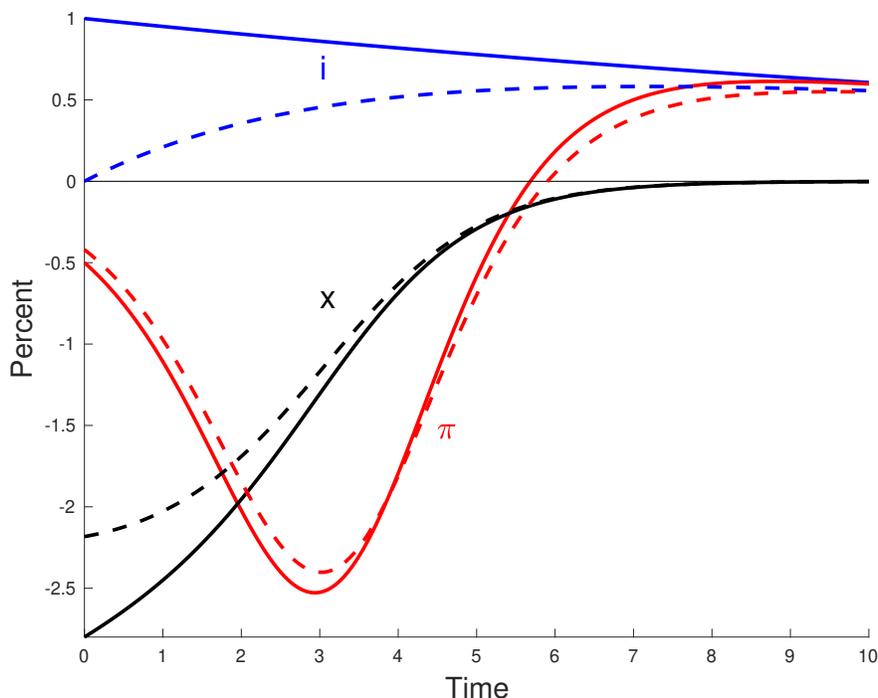


Figure 6.6: Response of inflation and output to the indicated interest rate path with no change in surpluses, long-term debt, and generalized Lucas Phillips curve. Parameters $\sigma = 0.2$, $\kappa = 0.2$, $a = 1$, and $\omega = 0.026$. Solid lines: $i_t = e^{-0.05t}$. Dashed lines: $i_t = e^{-0.05t} - e^{-0.3t}$.

forward initially. But then inflation turns around and the model is stable and neutral in the long run as it should be.

The model fills in the stability/instability intuition with which I characterized the policy view and the rational expectations view. The dynamics are unstable in the short run, but turn around and become stable as time passes. In equations, the solutions obey a differential equation

$$\frac{d\pi}{dt} = \gamma(t)\pi_t + \delta(t)i_t \tag{6.11}$$

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 like the policy view. But then $\gamma(t) < 0$ for larger t , so inflation becomes stable again like the rational expectations view.

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

$$(e^{-at} + \sigma\kappa) \frac{dp}{dt} - ae^{-at}p_t = \sigma\kappa i_t \tag{6.9}$$

with solution

$$p_t = \frac{1 + \sigma\kappa}{e^{-at} + \sigma\kappa} p_0 + \frac{\sigma\kappa}{e^{-at} + \sigma\kappa} \int_{j=0}^t i_j dj. \tag{6.10}$$

Note from (6.9)

$$(1 + \sigma\kappa) \pi_0 - ap_0 = \sigma\kappa i_0$$

Thus, we can index the multiple equilibria by p_0 or π_0 . I show in Cochrane (2025b) 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 $\omega^{-\omega j}$ and $\omega = 0.026$, and the indicated interest rate process.

The short-term dynamics are not quite the same as the policy / adaptive model however, and the underlying mechanism is much closer to that of the standard new-Keynesian model. Disinflation still needs an initial downward inflation jump to get going. Higher nominal interest rates, on their own, still just drag inflation up. 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 (6.11) does not produce $\delta(t) = -\gamma(t)$.

But this model amplifies a smaller jump. That's progress. Quantitatively, the initial jump can be much smaller, and model dynamics do contribute a lot to disinflation. Perhaps practical analysts could miss the initial jump, especially since inflation data are averaged and smoothed over time.

As in the new-Keynesian model, there are multiple equilibria. I plot here rather arbitrarily the equilibrium starting from a -0.5% initial inflation. This simulation involves a long period of higher real interest rates, and interest costs on the debt, as well as a small downward jump in the price level (not shown), that require fiscal surpluses in the presence of short-term debt. So with short-term debt, this simulation requires a fiscal contraction coincident with the higher interest rates, and higher interest rates per se raise inflation.

Adding long-term debt, however, with a sufficiently persistent nominal interest rate rise, this equilibrium is the one that requires no change in fiscal policy. The effect of the Lucas Phillips curve is then to add hump-shaped dynamics to the long-term debt simulations of the new-Keynesian models. That counts as a big step forward. We saw those outcomes in the “s=0, long” equilibrium of figure 6.4 and the simulation of Figure 3.2. (These two figures are two different views of the same model.) The generalized Lucas Phillips curve gives more realistic dynamics to the same basic model. (Adding long-term debt does not change model dynamics. It just changes which equilibrium requires no change to fiscal surpluses, allowing equilibria with less initial inflation.)

This simulation also squares an important circle. So far, interest rate policy and equilibrium selection/fiscal shocks have been conceptually distinct. Only equilibrium selection/fiscal shocks did anything to lower inflation. Interest rates on their own raised inflation. There really was no reason for central banks to raise interest rates. Now there is one. The long-term debt mechanism ties higher interest rates to the negative initial jump. The central bank, with no fiscal help, can lower inflation at least in the short run, and to do so it raises interest rates! Conversely, lowering interest rates, which would otherwise lower inflation, would temporarily raise inflation and so dissuade the central bank from that otherwise (in these models) attractive option. And now, it raises inflation going forward not just instantly.

This model still lies far from the standard intuition, especially on the underlying causal mechanism. As explained above, lower inflation comes because persistently higher nominal rates raise long-term inflation, which devalues long-term bonds. With no change in surpluses, short-term bonds must become more valuable, which requires short-term disinflation. It would take courage for a central banker to say that in public. Moreover, the disinflation only happens on announcement of higher long-term rates, not when rates themselves rise. Indeed, short-term rates are essentially irrelevant to disinflation. Figure 6.6 shows that behavior with a different interest rate path, in dashed lines. Here expected rates in the future rise, with little rise in current rates. It produces about the same path of inflation.

In sum, we produce a model that starts to have some of the same effects as the standard doctrine envisages, but by totally different mechanisms. And in other circumstances, like a perfectly expected rate rise, or if the government issues only short-term debt, it produces quite different results.

Chapter 7

Past And Future Monetary Economics

Adding fiscal theory to contemporary macroeconomics, we finally have a complete, simple, economic theory of inflation under interest rate targets, that is consistent with current institutions—flat money, interest rate targets, ample reserves, no money supply control, and central banks do not destabilize the economy in order to to select equilibria.

Like monetarism, inflation is determinate, and stable and neutral in the long run. The theory builds on an easy flexible-price foundation, which captures its long-run properties: Higher nominal interest rates raise expected inflation. Shocks to the present value of primary surpluses drive unexpected inflation. Adding sticky prices via the standard new-Keynesian forward-looking Phillips curve we obtain more reasonable dynamics. Adding the generalized Lucas Phillips curve, we obtain even more reasonable (to my eyes) dynamics.

The theory offers a simple explanation many episodes. It survives the recent enormous experiments that bedevil monetarist, Keynesian, and new-Keynesian models: The appearance and then end of 2021-2022 inflation, the contrast of Quantitative Easing with that episode, and the long quiet zero bound. It solves many other new-Keynesian puzzles, including nearly magical properties of forward guidance.¹

The theory overturns many classic doctrines, which 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, offering to lend against collateral or take reserves in any quantity, does not threaten inflation. Inside money (checking and savings accounts) does not cause inflation, unless it has an implicit or explicit bailout guarantee.
- Interest rate pegs, or rates that do not respond quickly to inflation do not threaten inflation spirals or multiple-equilibrium volatility. (So long as they are accompanied by solvent fiscal policy, not a part of deficit-financing financial repression. More active interest rate movement may still be desirable.)
- A higher peg with no fiscal change will eventually raise inflation, and vice versa.

¹I did not review the forward guidance puzzle. Promises about policies further in the future have larger effects today. Adding fiscal theory resolves the puzzle. See Cochrane (2017) and the summary in Cochrane (2023).

- 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.

Most importantly, perhaps

- Central banks do not fully control inflation. Monetary and fiscal policy must be coordinated for inflation control.

Interest rate targets control expected inflation in the long run, and central banks can move inflation around in the short run via “unpleasant interest rate arithmetic.” Other credit and financial frictions may allow some additional control. But deficits not financed by expected future surpluses must eventually come by inflating away the value of outstanding bonds (absent default).

That said, *central banks matter*, beyond setting interest rates. One of the main reasons independent central banks are established is to resist fiscal inflation, to force the general government to repay debt without inflation, and by that precommitment to help the government to borrow in the first place.

Surpluses are not exogenous, and they respond to many forces, in fiscal theory as in life. I have not delved into where surpluses come in the interest of brevity, not as a theoretical imperative. Central bank pressure is one such force.

Many institutional and legal aspects of central banks are set up to resist inflationary deficit financing. (One can regard these also as “off-equilibrium threats,” but they are visibly written into law.) The Federal Reserve may not, for example, buy securities directly from the Treasury. It 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 required to hold gold reserves limiting currency issue and thereby monetization. A strict inflation mandate is legal mandate to refuse monetization. The euro included stronger limitations against debt monetization, explicitly designed to force sovereigns to produce the surpluses to back their debt and ruling out inflation.

In extremis, if the Treasury is unable to roll over debt—if it cannot come up with the dollars that repaying short-term debt requires—a central bank that refuses to buy debt can force the Treasury to fiscal reform—changing surpluses—or to explicit default in place of inflation.

Thus the central bank *can* force fiscal surpluses, though by nothing so simple as the hyperinflation threats and lump-sum passive taxes envisioned by new-Keynesian models or by simple “game of chicken” analyses. (Which, to be fair, are not designed for these purposes.) Understanding and improving the institutions is an obvious task, and one on which we should not delay given the debt overhanging many countries. Are our central banks really given mandates, tools and independence enough that they will force sharp fiscal adjustments or default rather than inflate in the next crisis? Do we want them to do that? When should they ask permission from more politically accountable executives and legislatures? Nobody is really facing these questions.

From a point of view of the ingredients of contemporary economic theory, adding fiscal theory to current models is not dramatic. We replace the explosive off-equilibrium threats and “passive” fiscal policy of new-Keynesian models with “active” fiscal policy. The models are observationally equivalent: any path of observed inflation, output, interest rates, and fiscal surpluses is consistent with either reading.

Observational equivalence is a fact that we simply must face. It implies that formal tests

are never going to distinguish the two views. Instead, we are forced to think about which set of underlying assumptions are more reasonable, and which make more sense of policy-maker's choices. That central banks never breathe a word about destabilizing threats and multiple equilibria is evidence.

But, having looked at fiscal underpinnings, the set of *reasonable* questions and answers changes. For example, once we see that the standard new-Keynesian equilibrium-selection choice involves a large fiscal tightening contemporaneous with higher interest rates, maybe we want to consider a different equilibrium choice of the same model. That different question leads to a sharply different prediction—that higher interest rates raise, rather than lower inflation for example. So if I have not persuaded you to adopt the fiscal theory point of view, at least I hope you will now look in to the “passive” fiscal policies underlying new-Keynesian models, and consider whether they actually can happen. Indeed, this new-found fiscal attention gives a nearly ideal paper-writing recipe for PhD students and central bank staff: it is trivially easy to take any new-Keynesian model, investigate its fiscal underpinnings, and ask what happens under alternative fiscal policies. You see how dramatically that approach changes one's interpretation of the simplest models. 30 years of more complex and realistic models lie unexamined.

The greatest challenge ahead, unearthed by this investigation, remains the hard question: How do central banks lower inflation, going forward, by raising nominal interest rates? Do they? Under what conditions? Can they do it without coordinated fiscal tightening?

The forward-looking economic models are robustly Fisherian: higher nominal interest rates want to raise inflation, especially in the long run, just as higher money growth wants to raise inflation in the long run. This is not so much a fiscal theory insight as it is a deep and poorly recognized property of the rational-expectations new-Keynesian approach itself, because it builds on forward-looking behavior. But even the long-run proposition is poorly recognized and very hard for practitioners to swallow, whose intuition is formed by a sequence of short runs and long experience with ISLM models and reiteration of the standard policy doctrine.

As I emphasized, there is a poorly-recognized chasm between the actual operation of new-Keynesian models and the old-Keynesian intuition that pervades policy analysis and, all too often, interpretations of new-Keynesian results, on this question. The policy consensus thinks that high real interest rates drive inflation down going forward. New-Keynesian models only achieve something that looks similar by engineering an equilibrium-selection/fiscal shock coincident with higher interest rates.

Reconciling these views, either by theory that more closely resembles the standard view, or by empirical work that reinforces the theoretical view, remains the challenge ahead. The historical and practical experience that central banks, by raising interest rates, can make their currencies more valuable is pretty strong. Even under the gold standard, central banks routinely raised interest rates to attract gold inflows and defend their currencies. It might be like the experience that bleeding cured patients. But I would rather explore a bit more before proclaiming that this storied experience is wrong, or a reflection of some deeper contrary fact.

I reviewed one useful potential step in that reconciliation: by replacing the standard Calvo Phillips curve with a generalized version of Lucas, Mankiw, and Reis' Phillips curve, I obtain a model that looks more like standard intuition in the short run, and gives central banks a reason to raise interest rates in order to lower inflation. But its operation is still dramatically different from the old-Keynesian intuition.

I view this only as a first, tentative, step. What is the *minimal, simplest* economic model that explains how central banks lower inflation going forward by raising nominal interest rates? Let us at least proclaim this a vitally important and unsettled question.

I played with a different Phillips curve, and that is clearly a weak spot. The Phillips curve is a widely recognized empirical and theoretical mess. In the cloud of points, some see a curve that is sometimes flat and sometimes vertical. Others like me see just a cloud of points. Yet it has become the central causal mechanism for inflation in central bankers' eyes. Inflation comes from expected inflation, influenceable by speeches, output or employment, multiplied by a time-varying coefficient, and 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. I don't attempt to summarize the massive theoretical and empirical effort on this question. Prices are very sticky, except when they are not sticky at all, such as the introduction of the euro, in large inflations, or when I delay buying an airline ticket for a day. A lesson seems clear though: unless you can boil it down to a simple aggregate relationship between inflation and other variables, nobody will use it. We need a simple and useable basic model.

The Phillips curve has long been the central ingredient in understanding how monetary policy and inflation translate to output and employment. Lucas, for example, clearly thought he had a perfectly good theory of inflation in $MV=PY$, needing only a theory of why money affected output in the short run. We aren't at the starting block, however, with a widely accepted theory of inflation. Thus, perhaps we will make progress by studying price and wage stickiness on their own, without tying it so closely to output effects. Surely, we can envisage an economy in which monetary affairs did not move output and employment, but in which higher interest rates did not raise inflation the next day. The whole structure of IS curve to create output effects, then output to create inflation in a Phillips curve, may be at fault. The intertemporal IS curve is as artificial as the new-Keyensian Phillips curve. Maybe the crucial ingredient lies there.

In this search, however, let us not repeat what happened in the new-Keynesian investigation, of quickly adding complication after complication on top of a foundation that turned out to be poorly understood. As above, it is easy to modify the rest of the DSGE architecture to add fiscal roots, and a paper-writing recipe one can practically hand to an AI bot. And it is undoubtedly easy to quickly add complications that will once again make impulse-response functions look like those of the policy view by adding enough frictions—rules against moving prices immediately, adjustment costs, credit frictions, heterogeneous agents, information and information processing frictions, bounded rationality, higher order expectations, and more. Don't lose focus on the challenge to find the *minimal, necessary, simplest, economically explainable* modification to the flexible price model, the one crucial element by which higher interest rates lower inflation. Only then add epicycles.

The same fiscal foundations in place of equilibrium-selection threats can upend exchange rate determination and international macroeconomics. Since exchange rates provide a measure of the value of currency that moves more quickly than prices, they should be particularly informative.

Empirically, 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 can't find a convincing way to orthogonalize monetary and fiscal shocks.) Revealing historical analysis beckons, more serious than the story-telling in which I have indulged here.

At the same time, I pass along some things to avoid, in order to spare new researchers the

bitter experience of so many hard-learned lessons.

Do not try to “test the fiscal theory.” The observational equivalence theorem proves that is impossible. The identifying restrictions that have been used in the past are, under examination, completely unsuitable. Sure, if you assume surpluses must follow an AR(1), and governments cannot ever promise future surpluses to repay current debts, you can create a rejectable model, and one that is swiftly rejected. But what’s the point of that, given all the efforts that governments make to credibly promise to repay debts? Likewise, efforts to estimate fiscal-dominant vs. money-dominant regimes are doomed, or Markov switches between the two. More generally, Keynes vs the classics, monetarism vs. Keynesianism, real business cycles vs. both, new-Keynesianism vs. real business cycles, rational vs. behavioral finance were never decided by a p-value published in *Econometrica*. Theories rise and fall on whether they are *useful*, whether they give a compelling account of experience and whether they give an Occam’s razor simple guide to policy and institutional design. Those are more productive efforts.

Fiscal theory is just asset pricing applied to government debt. Asset pricing is enormously productive, and copy-paste empirical asset pricing on to government debt is also an attractive paper-writing recipe. But asset pricing gave up trying to “test” the present value relation decades ago, after decades of contentious debate. Investors have more information we do, and there always exists a discount factor. Efforts today to forecast surpluses, discount them back, predict the value of government debt, and proclaim a puzzle that the result is not equal to the observed value are just as pointless.

Once we understand how important the fiscal foundations of inflation are, many other questions lie before us. A partial list:

- Is there a better central bank structure? Should central banks hold indexed debt, thereby backing reserves with something real? How strong should the constraints on monetization be?
- How should a currency union be better structured to avoid the race to the bottom of sovereign debt monetization? (Cochrane, Garicano, and Masuch, 2025 offer an extended reform program, but only to start the important debate.)
- Corporate finance applies to government debt. Which governments should issue indexed debt, foreign debt, long vs. short maturity debt? What precommitments can governments offer to better ensure repayment—or not, as in the case of GDP linked debt?
- What’s 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. That’s the tip of an iceberg. Holding fiscal shocks constant changes the optimal monetary policy of new-Keynesian models. Making fiscal policy a choice with distorting taxes changes optimal policy again.
- What’s 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? Is there something that mimics the good properties of the gold standard without its price level volatility and invitation to deflation? Targeting the spread of indexed vs non indexed debt, to target expected inflation without while letting interest rates vary according to market forces, is attractive in a simple model. It implements a sort of CPI standard. Does it work?

- What are better *fiscal* institutions for price stability? The more governments can commit to repaying debt, the more the threat of fiscal inflation recedes. Rules like the Swiss debt brake are an obvious possibility. The sorts of institutions that the euro aspires to separate fiscal and monetary policy are also useful for individual countries.
- Yet inflation is a finite ill. Inflation is 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.

Cochrane (2023) offers some exploratory thoughts on many of these issues, but really only to spark discussion.

All in all, this ought to be an exciting time to *do* monetary economics. A paradigm shift is at hand. The fundamental theory of money changes once a generation. I think we are on the cusp of such a change. Few actually believe the new-Keynesian equilibrium-selection stories. The basic question of how interest rates affect the economy is up for grabs. Fiscal/monetary interactions are staring us in the face and will only grow until the happy day comes of a massive fiscal reform sweeping the advanced economies. And if that day does not come, facing the crisis will require us to have thought hard about the connection between fiscal and monetary policy. While the hard and computationally intensive business of extending new-Keynesian models to heterogeneous agents grabs headlines, the foundations of those models has crumbled. Fiscal theory, though the only coherent theory we have of inflation under current institutions, is woefully underdeveloped.

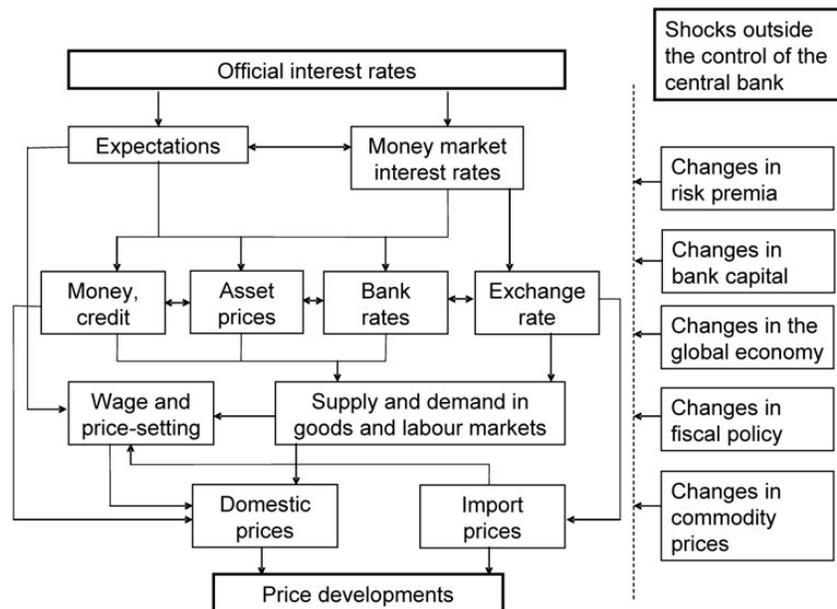


Figure 7.1: “[A] schematic illustration of the main transmission channels of monetary policy decisions.” Source: European Central Bank <https://www.ecb.europa.eu/mopo/intro/transmission/html/index.en.html>.

What should a poor central banker do, if we accept my diagnosis that the most basic questions are up for grabs? I offer two suggestions. First, think in simple terms, with clear principles and historical experience in hand. Complex models are likely to be wrong. The fact that such basics of monetary policy are up for grabs contrasts sharply with the illusion of detailed technocratic com-

petence promulgated by central banks. For example, Figure 7.1 presents a summary of the “main” channels of monetary policy transmission that the European Central Bank thinks it understands and controls. The impression of a well-understood central story requiring only this kind of detailed epicycle addition pervades the academic literature as well. Meanwhile you and I are puzzling just how higher interest rates lower inflation at all. A little humility and simplicity would do us all good.

Second, however, the objectives of people making policy in real time are quite different from those of academics. We want to be right, eventually, and we are rewarded for being innovative. If we are wrong, it is only a small and personal loss. A policy maker needs to make decent and imperfect choices, but most of all avoid disaster. Policy thus should be much more suspicious of the latest hot academic theory, including my own, and move gently, when widespread experience and consensus forms. Put a Bayesian, or perhaps robust-control weight on all theories, and make sure policy is not disastrous under any. If I were in the shoes of a central banker, even I would put a lot of weight on the policy doctrine, though recognizing its poor economic fundamentals. That may mean bleeding the patient a little. Try to make it only a little and quickly recognize when it isn't working.

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