Monetary-Fiscal Policy Interactions for Central Bankers*

Eric M. Leeper†

This essay consists of five parts. It starts with a description of conventional views about monetary-fiscal policy interactions from monetarist, old and new Keynesian, and central bank models. It aims to place readers on the common ground on which "inflation is always and everywhere a monetary phenomenon," taken to mean inflation can in principle always be controlled by monetary policy. I call this the "money-only perspective." This set of beliefs evolved into the creation of "independent" central banks operating under remits determined by elected officials. I argue that the modifier "independent" requires its own modifier—"operationally"—lest deep misunderstandings about inflation determination arise.

Part two describes a theoretical framework in which to understand the economics that underlies monetary-fiscal policy interactions. Theory tells us that inflation is "always and everywhere a monetary *and* fiscal phenomenon" even in inflation-targeting regimes. This represents the "joint monetary-fiscal policy perspective," which is a general equilibrium extension of the partial equilibrium money-only view. With that understanding in hand the essay turns to how the interactions have played out in various countries. Examples highlight mistakes that can arise from adopting a money-only perspective.

Part three turns to my remit, which reads

> What degree of fiscal-monetary policy coordination is desirable for the RBA's inflation targeting framework to function well and best support the RBA's objectives? In particular, is there only a strong case for coordination at times when monetary policy is constrained by the effective lower bound on the policy rate? Or is there also a case for more coordination in "normal" times and if so what might that look like?

As part two's theory tries to make clear, monetary and fiscal policy are *always* coordinated in the sense of being consistent with existence of unique economic outcomes. I take my remit to be more nuanced, calling for more precise notions of what "coordination" means. I suggest three distinct notions of coordination and discuss their desirability.

The essay moves to a brief discussion of how central banks might bring fiscal policy explicitly into their models. While this is tangential to the RBA's review, I hope it provides some ideas that the bank's modelers will find useful for integrating fiscal behavior systematically into their monetary policy projections, giving the bank's policy makers a broader view of inflation dynamics in Australia and elsewhere. I end with remarks about communication.

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†University of Virginia, eleeper@virginia.edu

I Background: Money-Only Perspective

I begin with a description of the conventional wisdom among macroeconomists—in academia, the private-sector, and policy institutions—about how inflation is determined. This is the intellectual setting in which most central bankers reside, with which alternative perspectives can be contrasted.

I.1 Review of Monetary and Central Bank Perspectives

The new Keynesian framework and its variants dominate both formal and informal analyses at central banks around the world. Many Ph.D. programs teach the framework as *the* way to understand macroeconomic policy impacts.[1] Central bank econometric models embed critical new Keynesian features.

New Keynesian economics is a formalization and relabeling of monetarism as Milton Friedman articulated it. Formalization manifests as providing some micro foundations for consumer and firm behavior in an equilibrium environment, modeling dynamics, and completely specifying the stochastic structure and expectations formation. I regard this as relabeling because in its basic form the new Keynesian model is isomorphic to canonical monetarist models, with the short-term nominal interest rate replacing the money stock as the monetary policy instrument.[2] Most new Keynesian setups adopt Woodford's (1998) "cashless limit" to yield a model with no monetary aggregates.[3]

Similarities between monetarism and new Keynesianism abound, including:

1. **Monetary policy is omnipotent.** Monetary policy can always achieve any inflation rate it desires regardless of the disturbances hitting the economy. Of course, policy may *choose* to trade off missing the inflation target in favor of stabilizing real activity, but this is a choice, not a limitation, of policy.

2. **Monetary policy acquires its real economic impacts entirely from nominal price and wage rigidities.** Although this might be the source of the "Keynesian" adjective, sluggish price adjust was a central feature underlying Friedman's (1961) famous "long and variable lags" adage.

3. **Absence of a range of assets and relative rates of return on those assets.** Tobin (1961, 1969) believed that conventional monetary policy actions like open-market operations perturbed private-sector portfolios and affected the real economy by altering

[1] Only this approach is taught in some leading graduate textbooks—Galí (2015) and Woodford (2003)—and undergraduate texts—Challe (2019).

[2] At one time Friedman (1970) warned about treating the nominal interest rate as an indicator of the stance of policy because it blurs the distinction between what policy can control—the nominal rate—and what matters for economic behavior—the real rate. Friedman believed that a persistent increase in the growth rate of the money supply would reduce nominal rates in the short run—the liquidity effect—but raise them over longer period—the expected inflation rate. After a brief surge in academic interest in this topic in the 1990s, the profession decided to move on, leaving the matter unresolved.

[3] Some researchers see a cashless model as progress from Patinkin's (1965) "money, interest, and prices" to Woodford's (2003) "interest and prices."

relative rates of return.[4] Through this mechanism monetary policy can have real effects even with perfectly flexible prices. Central to Tobin is imperfect asset substitutability, a view that central bankers invoked during quantitative easing.

Friedman (1956) begins his theory of money demand with a range of assets and rates of return, but through a series of no-arbitrage arguments arrives at his preferred specification in which only a single asset, money, and a single interest rate, the opportunity cost of money, appear. Closely related reasoning runs through much of the new Keynesian literature, for example, Woodford's (2012) irrelevance results for central-bank balance sheet operations. Wallace (1981) is the classic statement of irrelevance.

The textbook new Keynesian model contains *no assets whatsoever*, yet by changing the short-term nominal interest rate monetary policy can have profound impacts on output and inflation. Rarely discussed are the central bank actions that underlie changes in the interest rate. Models treat "the interest rate" as the nominal return on a one-period government bond, which connects only loosely to real-world counterparts like the cash rate, the repo rate or the federal funds rate. Remarkably, these features are regarded as inessential to understanding monetary policy impacts. Model monetary policy actions have no impacts on asset quantities in anyone's balance sheet, including the central bank's, though the actions do affect asset prices.

4. **Trivialization of fiscal policy and fiscal finance.** If fiscal variables make an appearance, they enter in such a way that they can be readily set aside for monetary analyses. Taxes net of transfers are usually lump-sum (non-distorting) and government debt is in zero net supply [Galí (2015), for example]. When debt is in positive supply, a Ricardian irrelevance result lurks and analysts simply assume fiscal behavior is such that taxes and debt have no effects on any variables other than each other.

   Fiscal analyses focus exclusively on "Keynesian hydraulics."[5] "Hydraulics" conjure's A. W. Phillip's MONIAC machine, which literally modeled flows of income and spending as water, reflecting Phillips's interpretation of early IS-LM descriptions of the economy [Phillips (1950)]. Higher government spending raises *real* demand for goods, which raises *real* incomes, *real* consumption and investment through the textbook multiplier mechanism; higher taxes trigger the same pattern in reverse. Treating fiscal policy as an entirely real phenomenon neglects a second effect on the financial side—impacts of nominal government liabilities and their expected backing—and the wealth effects from that financing.[6]

   Tobin and Golub (1998, p. 274) highlight the two distinct fiscal impacts with an example: "Does retirement of government long-term debt through taxation have ex-

[4] Tobin (1965) is the best-known of his arguments: higher money growth reduces the return on money relative to capital, inducing agents to substitute into capital, raising output.

[5] This term comes from Coddington (1976) and is adopted in Jacobson et al. (2019). Woodford (2011) exemplifies a hydraulics-only analysis of the government expenditures multiplier in models in which lump-sum taxes finance purchases and Ricardian equivalence holds, so the timing of taxation is irrelevant. Leeper et al. (2011) supplement hydraulics with wealth effects from government debt to estimate vastly different spending multipliers than hydraulics alone produce.

[6] This neglect is not unique to new Keynesians and monetarists. Even those who label themselves "decidedly Keynesian," like Blinder (2022), discuss fiscal impacts only in real terms.

> pansionary or contractionary consequences? The question refers not to the temporary multiplier-like effects of the surplus that reduces debt—these are of course contractionary—but to the enduring effect, through the capital account, of having smaller debt." Those longer-term effects can be expansionary or contractionary, depending on the assets available to savers. (I return to two points from Tobin and Golub: "temporary effects of the surplus" and "enduring effects of debt.")
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> I first realized the tight connection between monetarism and Ricardian equivalence from Tobin (1980). He argues "...the Ricardian equivalence theorem is fundamental, perhaps indispensable, to monetarism" [p. 53]. The connection appears in new Keynesian models, as Caramp and Silva (2022) and Leeper (2022a) demonstrate. Ricardian equivalence, an often implicit assumption in monetary analyses, eliminates wealth effects from government debt to create the illusion of monetary policy omnipotence. As elaborated below, the assumption is far more than an assumption of convenience on which no outcomes important to policy hinge.

An important difference between new Keynesian and monetarist thought lies in policy implementation. New Keynesian analyses—perhaps driven by the "micro-founding" of the model—frequently examine optimal policy in which the nominal interest rate is an exact function of the state of the economy. Monetarists typically argue against the fine-tuning that optimal policy prescribes in favor of simple and predictable rules for policy.[7] This difference derives from sharply different beliefs in the reliability of the theory, rather than from fundamental beliefs about how monetary policy works.

An immediate implication of the new Keynesians's faith in their theory is the reliance on policy prescriptions based on model objects such as the "natural rate of interest," the "natural level of output," and the slope of the aggregate supply function. The first two are model constructs, not observables; the last—often couched as the Phillips curve—has revealed itself unamenable to stable empirical representation. Nevertheless these objects constitute the cornerstones of modern monetary policy analysis.

The point here is not to disparage either new Keynesian or monetarist frameworks. I raise these similarities and differences to ensure that the reviewers appreciate the mindset of many central bankers and central bank research staffs. It is a mindset that grows from a long tradition in monetary economics of simplifying the economic framework to the point where fiscal policy is less than a sideshow. That is the audience to whom I address this essay.

I.2 "Central Bank Independence" as a Reinforcing Agent

Unfortunately, central bank independence appears to have reinforced the view that monetary policy can always take the actions necessary to contain inflation.

Central bank independence is a double-edged sword.[8] At the same time that independence has provided central banks with the latitude and cover to undertake politically unpopular but socially desirable policies, independence has also created around central banks an aura of omnipotence that leads to elevated and frequently unachievable expectations for

[7] Taylor (1993) is perhaps the most prominent modern proponent of simple rules.

[8] Leeper (2022a) elaborates on this topic.

central banks. Failure of central banks to meet those expectations can be taken to signal incompetence, indecisiveness, or lack of resolve. But frequently failure springs from expecting central banks to achieve the impossible given the circumstances, a fact that central banks need to understand and to explain to the public and policy makers.

Independence has morphed into omnipotence in the public's perception. Central bankers themselves have encouraged this (mis)perception largely by not candidly speaking out when circumstances make their tasks impossible, not merely difficult. Central bankers understand that independence is operational, with policy objectives specified by elected officials. Sophisticated central bankers further understand that monetary policy is never economically independent in the sense that outcomes of their policy choices are unrelated to fiscal decisions by elected officials.

Frequently central bankers talk as if monetary policy can control inflation *regardless of prevailing fiscal policy*.[9] Such statements reinforce in the minds of the financial press and the public that monetary policy can always control inflation, with or without fiscal support. Conventional wisdom from the money-only perspective on inflation buttresses beliefs of monetary omnipotence. Basic economic theory does not support this sanguine view of monetary policy's powers, as the next section explains.

It may be more constructive for central bankers to communicate explicitly about the ways in which monetary and fiscal policy jointly determine economic outcomes. When monetary policy needs fiscal support to control inflation, central bankers may do well to communicate that need. We cannot expect fiscal authorities or elected officials to fill the void left by silent central bankers.

One argument against such communication points to fears of loss or reduction of independence should monetary policy enter the fiscal domain. I believe those fears are overblown: elected officials granted monetary policy "independence" precisely to give themselves cover when economic outcomes turn bad. It is doubtful that thoughtful and clear statements by central bankers about the ways in which fiscal choices could serve the common good would lead officials to revoke independence.

A second argument maintains that if central bankers publicly hedge their claims about what monetary policy can achieve, they will defeat their efforts to anchor inflation expectations. After all, if inflation outcomes depend as much on fiscal as monetary actions, why should we believe a central banker's assurances? In light of fiscal vagaries, I appreciate leaning more heavily on the relative stability of central bank behavior. But this is less an argument for central bankers to continue to speak self-confidently about their control of inflation than it is a call for more scientific research to get to the bottom of inflation determination or for political reforms that yield more stable political environments. Ultimately, though, if fiscal behavior prevents monetary policy from controlling inflation, it's not in anyone's interest for central bankers to publicly state otherwise.

There is no bigger threat to central bank independence and credibility than central bank failure to keep inflation in check. Yet that is the risk when central bankers are not forthright about how monetary and fiscal policies *jointly* determine inflation.

[9]Federal Reserve Governor Waller (2022) recently stated: "we have the tools to fight inflation, and now we must demonstrate the will to use them." Secretary of the Treasury and former Fed Chair Janet Yellen sought to tamp down inflation concerns by reassuring people on "Meet the Press" on May 2, 2021 that "The Federal Reserve has the tools to address inflation, should it arise."

II Background: Joint Monetary-Fiscal Perspectives

Changes in the central bank's instrument—the short-term nominal interest rate—and the impacts of those changes—on the term structure, the price level, and real activity—have direct fiscal consequences. Those consequences require fiscal adjustments that ensure the central bank's desired outcomes are equilibrium outcomes. In the absence of the requisite fiscal adjustments, something else in the economy—perhaps the object the central bank targets—must adjust. This is the nature of the general equilibrium in which monetary and fiscal policies interact.

II.1 Pricing Government Liabilities

Macroeconomists have long recognized that monetary-fiscal interactions can be important for understanding and predicting policy effects [Keynes (1924), Friedman (1948), Hansen (1949), Tobin (1969), Brunner and Meltzer (1972), Sargent and Wallace (1981), Wallace (1981), Aiyagari and Gertler (1985)].[10] Only in the past 30 years have researchers come to realize that policy interactions lie at the heart of determining the price level and inflation [Leeper (1989, 1991), Leeper and Leith (2017), Sims (1988, 1994), Woodford (1995, 2001), Cochrane (2011, 2023)].

The price level is the rate at which units of nominal government liabilities exchange for goods and services. Policy determines the price level by varying the supply of liabilities relative to the real assets that back them. Interest-bearing liabilities include reserves at the central bank and securities issued by the treasury. Backing comes from the expected stream of future primary budget surpluses including seigniorage revenues discounted to the present. While total liabilities and their composition are policy choices, their market prices depend on private-sector and policy actions. Backing is a complex object that depends on *expectations* of the equilibrium outcomes today and in the future. Shocks to the economy can move the price level by altering the relation of liabilities to their real backing.[11]

Holders of government liabilities care about their real returns. Real returns depend on the *goods* government extracts from the private sector. Direct tax and seigniorage revenues transfer real resources from private to government hands and constitute the government's assets. Inflation-targeting central banks severely limit seigniorage revenues, leaving direct taxes—net of expenditures excluding interest payments on liabilities—as the predominant source of real backing for liabilities.

A little notation goes a long way to solidify this perspective on price-level determination. The relationship just described is the bond-pricing equation

$$\frac{B_{t-1}}{P_t} = E_t PV(S_t) \qquad \text{(Pricing Equation)}$$

[10] There is also a large normative literature, some of which studies strategic behavior between policy authorities [Dixit and Lambertini (2003), Hughes Hallett et al. (2011), Chen et al. (2022), for example].

[11] The discussion that follows tends to posit expectations are formed rationally. An important alternative view, particularly for policy makers who operate in real time, is laid out in an insightful paper by Eusepi and Preston (2018). Those authors assume decision makers have imperfect knowledge and must learn about the economic structure. Under those plausible assumptions Ricardian equivalence breaks down generically and the level of government debt can have a powerful influence on monetary policy effectiveness.

B_{t-1} is total nominal liabilities carried from the previous period into the present, P_t is the aggregate price level, and $E_t PV(S_t)$ is today's expectation of the present value of primary surpluses from today into the future.

This bond-pricing equation is an equilibrium relationship among endogenous variables. At time t all variables except B_{t-1} need to be determined. This is just one of many equations that determine the general equilibrium, so only through special thought experiments can we use the expression to draw causal inferences.

Why highlight this particular relationship? First, it is ubiquitous in that some version of it must be satisfied in many dynamic models. Second, money-only perspectives brush the relationship under the rug, assuming it will be satisfied in a manner compatible with the desired interpretations. Third, as we explain in the next section, it is closely related to equilibrium in markets for government liabilities, markets of great interest to central bankers. Finally, bringing this pricing equation out of the shadows sheds new light on how monetary and fiscal policy must interact in equilibrium: evidently, actions by both policy authorities directly impinge on the variables in (Pricing Equation). With this conceptual framework about the price level we turn to a joint monetary-fiscal perspective on inflation.

II.2 Policy Interactions

We can start to understand policy interactions by explicitly considering precisely how the consolidated—combined treasury and central bank—budget identity gets satisfied. Interactions play out through prices: the general price level and the nominal yield curve, which is pinned down at the short end by the monetary policy rate. When government debt is denominated in local currency, its real value depends on the price level. A central bank that targets inflation aims to affect that same price level. Changes in the policy rate, in turn, affect bond prices, the market value of debt, and interest payments on outstanding debt. In a general equilibrium, monetary actions have fiscal consequences, and fiscal actions have monetary consequences, as both Tobin (1980) and Wallace (1981) emphasize.

Conventional views—monetarist or textbook Keynesian (new and old)—emerge from maintained assumptions about fiscal behavior that force interactions to be unidirectional, running solely from monetary to fiscal policy.[12] Those assumptions include a central bank that adjusts the policy rate aggressively to inflation and a fiscal authority that adjusts taxes to the real value of debt. By making taxes rise with *real* debt, fiscal policy ensures that a lower price level, which raises real debt, induces fiscal contraction, a critical feature of conventional views of policy interactions. Maintained and untested assumptions about fiscal behavior—namely, that monetary contraction (expansion) generates fiscal contraction (expansion)—creates a Panglossian world for monetary policy omnipotence.

Both theory and practice call for less circumscribed views of policy behavior. When monetary policy is at or near the effective lower bound, as the federal funds rate was for seven years beginning in November 2008, the policy rate is constant in the face of inflation fluctuations. Conventional theory tells us a constant interest rate leaves the price level undetermined and susceptible to self-fulfilling expectations [Sargent and Wallace (1975)].

[12] These assumptions create a monetary-fiscal regime that goes by a number of names—monetary dominance, active monetary/passive fiscal, Taylor principle/Ricardian fiscal. See Leeper (1991) for discussion of the policy taxonomy and Henderson and McKibbin (1993) for an early "Taylor principle" discovery.

Experience provides no support for this proposition [Cochrane (2018a)]. On the fiscal front, there are ample examples from advanced economies in which rising (falling) price levels do not induce fiscal contraction (expansion) [Leeper (2018)]. Conventional theory does not permit analyses of instances in which policy behavior does not comport to maintained assumptions.

Broader understanding comes from relaxing the narrow conventional assumptions. It turns out that the Taylor principle is not necessary to uniquely determine the price level and passive adjustment of taxes to real debt is not necessary to stabilize debt [Leeper (1991), Bai and Leeper (2017)]. In the alternative policy mix monetary policy allows shocks to affect the price level and revalue outstanding debt; fiscal policy is free to pursue objectives other than debt stabilization.[13] For example, during the Covid period, central banks held the policy rate fixed at the effective lower bound while fiscal authorities expanded spending on emergency Covid-relief programs [see Cochrane (2022) and Leeper (2022b)]. Because taxes do not respond strongly to debt in the alternative mix, higher nominal debt raises real wealth at the prevailing price level, giving fiscal policy an additional channel through which to affect aggregate demand. By not sharply raising rates in the face of higher inflation, monetary policy prevents interest payments on debt from producing an explosive path for government debt.

To make the exposition concrete, I will focus on three thought experiments, two fiscal and one monetary: (1) a debt-financed expansion in government purchases; (2) a debt-financed expansion in government transfers; (3) a monetary policy contraction. In each case, I show how alternative assumptions about interactions between monetary and fiscal authorities affect the economic outturns of the experiments. To keep the exposition as simple as possible, I assume all taxes and transfers are non-distorting and the economy is populated by a representative household.[14]

These experiments will make explicit a ubiquitous equilibrium condition that most policy analyses leave implicit: prices and policies must adjust to equate the supply of government bonds to the demand for those bonds. Like with any asset, bonds derive their value from their expected payoffs: dividends for equities, transaction services for currency, marginal productivities for capital. When bonds serve only as a saving device to smooth consumption, the demand for nominal bonds depends on the aggregate price level, the price of bonds, and bonds' expected discounted "cash flows." Future primary budget surpluses back government bonds and are the relevant measure of cash flows. A little notation helps:

$$B_t^d = \frac{1}{Q_t} P_t E_t PV(S_{t+1}) = B_t^s \qquad \text{(Bond Market Equilibrium)}$$

where B^d is the demand for and B^s is the supply of nominal bonds, Q is their price, P is the price level, and $E_t PV(S_{t+1})$ is the expectation at t of the present value of primary surpluses from $t+1$ into the future.[15] To simplify notation, we include in "bonds" both securities and

[13] The policy mix is labeled fiscal dominance, passive monetary/active fiscal.

[14] These assumptions need to be relaxed in any quantitative analysis of policy. As footnote 11 mentions, relaxing rational expectations may also be important for short-run analysis or during periods of unusual economic circumstances like the Covid panemic. Relaxation greatly complicates the thought experiments, but does not alter the underlying logic in this essay.

[15] Cochrane (2023) refers to the (Pricing Equation) variant of the bond demand as the "bond valuation equation." In cashless representative agent models imposing bond market equilibrium is equivalent to impos-

interest-earning reserves. Bond market equilibrium equates demand to supply, the latter determined by the government's financing needs as dictated by its budget identity.

Bond demand rises with the price level and falls with bond prices. The present value of surpluses combines fiscal choices—revenues less expenditures excluding debt service—with intertemporal prices—real discount rates. Bond demand can rise because expected backing rises (higher primary surpluses) or because the current value of future goods rises (lower real discount rates). Debt dynamics play out over many years, prolonging policy impacts long after hydraulic effects have expired. Monetary policy actions potentially affect each component of bond demand to create subtle and complex interactions with fiscal behavior.

II.3 Fiscal Experiments

We consider in turn increases in government purchases of goods and services and increases in government transfer payments to households. Because higher purchases directly raise real demand for current goods and real interest rates, the two experiments differ somewhat.

II.3.1 Debt-Financed Expansion in Government Purchases

Higher government purchases of goods and services that are financed by new issuances of nominal government bonds always trigger two effects. The first, familiar from principles of macroeconomics, operates through the real fiscal multiplier channel. Higher real demand induces higher employment, production, and real incomes. Real total expenditures rise, driving up the real interest rate. When output rises above potential, inflation increases via the Phillips curve. Notice that the entire logical chain—including the final step to a higher price level—is *real*. I call this chain of events *Keynesian hydraulics*.

Treating hydraulics as the entirety of fiscal effects amounts to a partial equilibrium analysis. General equilibrium also examines the impacts of the new bond sales. At initial prices higher government debt raises households' wealth, triggering still higher demand for goods and services to supplement the expansionary Keynesian hydraulics. A sufficient condition for hydraulics to be the whole story is that the debt expansion creates the expectation that non-distorting taxes will rise in present value to exactly cancel the positive wealth effects. In new Keynesian models Ricardian equivalence delivers exact cancellation.

Although I've never met a policy maker who believes Ricardian equivalence applies to the actual economy, it is so entrenched in formal models, including central bank econometric models, that the notion deserves comment. Even retaining the artifice of non-distorting taxes, exact cancellation of wealth effects stretches credulity. Fiscal expansion raises real interest rates, the price level, and nominal debt, but reduces bond prices. Higher real rates reduce the present value of a given stream of primary surpluses. Higher nominal debt raises government indebtedness, but the price responses reduce the market value of debt. Ricardian equivalence assumes that fiscal behavior, and beliefs about that behavior, are finely calibrated to make the increase in the present value of surpluses exactly match the increase in the market value of debt.[16] Any mismatch in future surplus changes either amplifies or dampens the

ing either the agent's budget constraint or the government's budget identity. Sophisticated old Keynesian analyses followed Christ (1968) to impose the equivalent of (Bond Market Equilibrium) [Blinder and Solow (1973, 1974), Tobin and Buiter (1976), Sargent (1979)].

[16]Ricardian equivalence also relies on rational expectations, further stretching the credulity of exact offset

expansionary (hydraulic) effects of higher government purchases.

The distinction between Keynesian hydraulics and wealth effects lies at the heart of the belief that monetary policy can always offset inflationary consequences of fiscal expansion. The belief stems from assuming away wealth effects from government debt, believing Keynesian hydraulics are the totality of fiscal impacts. New Keynesian treatments of government spending closely parallel simple textbook expositions of the IS curve [Branson (1989, chapter 5)]. Consider a closed economy with autonomous investment, $\bar{I}$, lump-sum taxes, T, and exogenous government purchases, G. Consumption depends on disposable income, $Y - T$, and the real interest rate, $r = i - \pi$, where i is the nominal interest rate set by monetary policy and π is the inflation rate. Equilibrium in the goods market requires

$$C(Y - T, i - \pi) + \bar{I} + G = Y = F(N, \bar{K}) \qquad \text{(Goods Market)}$$

N is employment and $\bar{K}$ is the fixed capital stock. All variables are real.[17] The left side is aggregate demand and the right is aggregate supply. Notice that asset accumulation—particularly bonds and money—has no effect on aggregate demand through the IS relation or the consumption Euler equation in new Keynesian models.

A fiscal expansion raises G. Monetary policy can straightforwardly offset the aggregate demand stimulus by raising the nominal interest rate relative to inflation to increase the real interest rate and real consumption demand. This offsets the *real* hydraulics stimulus from higher government purchases.

But the analysis isn't complete. When higher government spending is financed by selling new nominal government bonds, what ensures the private sector will absorb the new bonds? Higher bond demand arises from a higher price level, lower bond price, or higher expected primary surpluses. For monetary policy to effectively counter the inflationary impacts of fiscal expansion, the increase in bond demand *must arise from higher future budget surpluses—a fiscal choice*. That is, monetary contraction must be followed by fiscal contraction to eliminate the wealth effects from government debt.

If future taxes do not eliminate wealth effects, how does tighter monetary policy affect debt dynamics? Higher interest rates raise interest payments on new debt. When taxes don't rise sufficiently to finance debt service, nominal debt grows, further fueling wealth and inflation. This is one of several examples of the limitations of monetary policy to combat inflation created by government debt growth and its attending wealth effects on aggregate demand.

This thought experiment underscores recurring themes from perceiving monetary and fiscal policy jointly:

1. Monetary policy's ability to offset higher aggregate demand depends on the source of the stimulus. When the stimulus perturbs bond market equilibrium, offset relies equally on monetary and fiscal reactions.

of wealth effects.

[17] Treating monetary policy as directly controlling the nominal interest rate allows us to dispense with the LM relationship, so this condition equates aggregate demand to aggregate supply. In dynamic versions disposable income is the sum of permanent and transitory income.

2. The view that monetary policy can always control inflation embeds particular assumptions about fiscal behavior. When those assumptions do not apply, monetary policy cannot successfully target inflation.

II.3.2 Debt-Financed Expansion in Government Transfers Understanding debt-financed transfer payments is easy in a Ricardian-equivalent setting: they have no effects on aggregate demand and inflation. Forward-looking households regard transfers as loans from the government that will be repaid with interest through higher future taxes. Anticipating those tax liabilities, households save the transfers and accumulate earnings on that new saving sufficient to meet the tax obligations.[18] With no change in real aggregate demand—higher private saving exactly matches lower government saving—inflation is unchanged even with no monetary policy response.

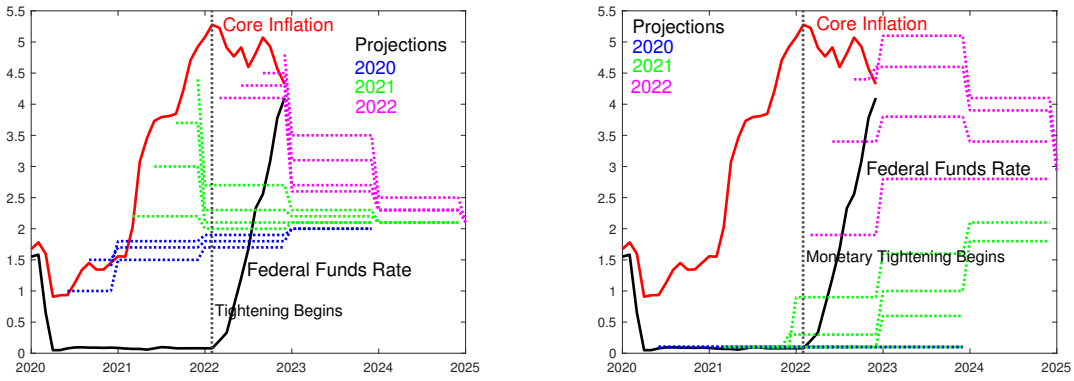
Suppose, as I believe happened during Covid in many countries, that the government tells households the transfers are *gifts* instead of loans. For example, in a statement representative of government communications during Covid, White House Press Secretary Jen Psaki said, "It's important to note that we believe this should be provided on an emergency basis, not something where it would require offsets" [The White House (2022)]. "Gift" communicates the transfers do not have IOUs attached. Rational households perceive the transfers as an increase in permanent income, so they seek to shift up their desired path of consumption, raising aggregate demand now and in the future. A fraction of transfers is spent immediately and the remainder is set aside for future consumption. This is the Keynesian hydraulics channel, which leads many observers to align the timing of aggregate demand stimulus with the timing of transfers spending. Once the bulk of that spending has occurred, observers treat the fiscally-induced demand stimulus as over.

As with government purchases, higher transfers also entail issuing new nominal bonds whose expected backing determines whether new bonds raise household wealth. The dynamics triggered by bonds and the impacts of monetary contraction to combat higher demand on those dynamics are identical to those that arise from government purchases.

Whether individuals perceive government transfer payments as loans or gifts that are financed with new debt sales determines the wealth, aggregate demand, and inflation impacts of those transfers.

II.3.3 Evidence From March 2020 to March 2021, the U.S. Congress allocated $5 trillion in various forms of relief for the Covid pandemic, amounting to 22 percent of 2020 GDP. While some of the spending was on goods and services, the majority was transfers to individuals and businesses. Initially financed with new bond sales, ultimately about $2 trillion worth of bonds were purchased with freshly created bank reserves by the Federal Reserve. This changed the composition of but not the total amount of the increase in government indebtedness. Until 2020Q1 core inflation was below the Fed's 2 percent target. Then it rose to average 4 percent over the last three quarters of 2021. Personal consumption expenditures inflation reached 9 percent in the summer of 2022.

[18]The analysis is more nuanced when some segment of the population lives hand-to-mouth because that segment converts transfers into consumption—now or in the future—rather than into saving earmarked for taxes. In this setting something close to Ricardian irrelevance of debt vs. tax financing still holds, depending on what fraction of the population bears future tax obligations.



(a) Inflation (b) Funds Rate

Figure 1: Core inflation, policy interest rate, and median Federal Reserve projections of inflation [panel (a)] and federal funds rate [panel (b)] in dotted lines from 2020Q2 to 2022Q4 in the United States. Source: U.S. Bureau of Economic Analysis and Board of Governors of the Federal Reserve https://www.federalreserve.gov/monetarypolicy/fomccalendars.htm.

Throughout the period, the Federal Reserve consistently regarded the inflation as fleeting. Chairman Jerome Powell explained

> ...spending on durable goods has boomed since the start of the recovery and is now running about 20 percent above the pre-pandemic level. With demand outstripping pandemic-afflicted supply, rising durables prices are a principal factor lifting inflation well above our 2 percent objective [Powell (2021)].

Demand stimulus plays a role in the Fed's interpretation of inflation, but supply-side factors proved to be more persistent than the Fed initially thought. It isn't clear if the Fed attributes demand to Covid-related spending, but it is clear both the initial inflation and its persistence took the Fed by surprise.

Figure 1 records the core inflation rate and the federal funds rate from 2020 to the end of 2022. Dotted lines plot Federal Open Market Committee member's median projections of core inflation [panel (a)] and the federal funds rate [panel (b)] over three years, which come out each quarter. Patterns emerge. When inflation was below target in 2020, FOMC members believed it would quickly return to target. That belief persisted through 2021 even as inflation rose well above target. By 2022 members projected inflation would remain above target throughout 2023, but be back at 2 percent by the end of 2024.

Panel (b) reveals that members were ratcheting up their expected paths for the policy rate over the period. This reflects a belief in Keynesian hydraulics from fiscal expansion: if inflation proves to be more stubborn than expected, monetary policy simply needs to be tighter. Missing from the Fed's analysis is the Tobin and Golub (1998, p. 274) point: "temporary effects of the surplus" and "enduring effect of debt."

Fed projections of policy impacts on inflation do not include any statements about fiscal behavior. As interest rates rise, interest payments on outstanding debt—including bank reserves—also rise. Since the Fed began tightening in 2022, interest payments as a percentage

of expenditures have risen from 8 percent in 2021 to 13 percent through 2022. With debt about 100 percent of the economy, interest rate hikes like those in panel (b) eventually increase debt service by $1 trillion annually. If Congress declines to raise taxes or cut spending to cover these additional expenditures, nominal debt growth will have to increase, potentially undermining the Fed's hopeful inflation projections.[19]

Wealth effects from government debt generate effects on inflation that persist beyond hydraulic impacts. A numerical example illustrates the point. Since March 2020 nominal government debt has increased 30 percent and the price level has risen 12.5 percent.[20] If the present value of surpluses is unchanged, ultimately the price level must rise 30 percent, suggesting prices have quite a ways to go. Much of the adjustment has already occurred in bond prices: the market value of debt has risen only 12 percent, so there has been a significant decline in the price of the government's bond portfolio. Lower bond prices may reflect the expectation that the price level will continue to rise.

Holding the present value of surpluses fixed is a strong assumption. Fed contractions in 2022 raised real discount rates and may slow the economy to reduce surpluses. Taken together these outcome mean that with no Congressional actions to raise taxes or cut spending, the price level will need to rise more than 30 percent. If the Fed reacts to continuing inflation by raising rates more than figure 1 suggests, economic activity will slow further and stagflation becomes a real possibility. Sims (2011) refers to this phenomenon as "stepping on a rake:" initially higher interest rates reduce inflation but eventually inflation rises above its initial levels [also see Cochrane (2018b)].

This reasoning argues that in their fight against fiscal inflation, central banks would do well to condition their projections of monetary policy impacts on alternative assumptions about future fiscal behavior. At present this exercise is done in only the most cursory manner, focusing exclusively on fiscal deficit paths—hydraulics—and neglecting debt dynamics. Rarely do central bank models impose a government budget identity or bond-market clearing condition.

II.4 Monetary Experiment

We turn to the case in which the central bank seeks to reduce (raise) inflation from its current level by raising (lowering) the policy interest rate.

II.4.1 Monetary Policy Contraction Today's primary concern in many countries is excessively high inflation, which central banks are trying to reduce by contracting monetary policy. Although part of the policy response involves shrinking the central banks' balance sheets, for present purposes we focus exclusively on the monetary-fiscal interactions triggered by raising the short-term nominal policy rate. To understand the general equilibrium effects of monetary contraction, we trace through the impacts on both the (Goods Market) condition and bond market equilibrium, (Bond Market Equilibrium).

A transitory increase in nominal and real interest rates reduces consumption demand. By conventional reasoning real aggregate demand and inflation fall. Setting aside any underlying

[19] This assumes, of course, that Congress raises the debt ceiling.

[20] Debt is measured as the par value of privately held debt and the price level is measured as the consumer price index as of December 2022.

change in net government nominal liabilities, a lower price level and somewhat lower bond prices raise the real market value of government bonds.[21] For these price changes to be a new equilibrium, real backing of debt must rise—the present value of primary surpluses must increase. Because monetary policy raises real discount rates, surpluses do the heavy lifting.

Typical new Keynesian expositions of monetary tightening eliminate the need for fiscal backing by considering the special and empirically irrelevant case in which government debt is in zero net supply [Galí (2015)]. More generally, those expositions *assume* passive fiscal behavior which raises lump-sum taxes when real debt is above some target level.[22] Fiscal backing ensures that when tighter monetary policy reduces inflation and raises real debt, tighter fiscal policy follows. The fiscal response to debt *per se* is not the critical aspect. It is the fiscal response to the price level or inflation that matters: disinflation leads to fiscal tightening. More colloquially, passive fiscal behavior enforces that "monetary and fiscal policies pull in the same direction" as regards the desired effects on the price level. This is a form of policy coordination that usually arises in normal times.

Most fiscal rules countries have adopted do *not* deliver passive fiscal behavior. Rules understandably emphasize fiscal sustainability and countercyclical policy [Portes and Wren-Lewis (2015)]. But these emphases may not provide the fiscal backing to permit monetary policy to successfully target inflation [Bai and Leeper (2017)]. The bulk of government debt that advanced economies and an increasing number of emerging market economies issue is nominal, denominated in units of local currency. Its value depends on the price level, the object inflation targeters aim to control. Passive fiscal policy maps a lower nominal price into higher real private-sector tax liabilities to ensure disinflation is associated with reduced real aggregate demand.

Debt stabilization and fiscal backing for monetary policy are distinct concepts, as an example explains. Suppose the real interest rate is constant. One policy that stabilizes debt is a constant primary surplus-GDP ratio. This makes the debt-GDP ratio constant, to deliver stable debt. Unfortunately, that policy also delivers a unique equilibrium price level consistent with bond-market equilibrium. There is no reason to believe that price level is also consistent with the central bank's inflation target. Inconsistency arises because the constant primary surplus conflicts with providing fiscal backing for monetary policy by contracting in response to monetary contraction.[23]

Two messages emerge from this thought experiment

1. Fiscal backing for monetary policy requires fiscal behavior in which a lower price level leads to fiscal contraction.

[21] To keep the experiment simple, we posit the open-market sale that raises the interest rate swaps reserves for securities that pay identical interest rates so there is no change in net government indebtedness. A one-period rate hike will have small effects on longer rates by the expectations theory of the term structure.

[22] When the tax response is positive but less than the real interest rate on debt, the debt-GDP ratio grows without bound, a feasible outcome only when taxes do not distort. Most distorting taxes deliver a Laffer curve for revenues, imposing a bound on debt-GDP. In those cases, feasible tax rules must react to debt by more than the real rate.

[23] Start with the government budget identity, $\frac{B_t}{P_t} + s_t = \frac{(1+i_{t-1})B_{t-1}}{P_t}$. Set $s_t = \bar{s}$, take expectations, and use the Fisher relation $1/\beta = E_{t-1}\left(\frac{1+i_{t-1}}{1+\pi_t}\right)$ to yield $\beta^{-1}b_{t-1} = E_{t-1}b_t + \bar{s}$, where $b_t \equiv B_t/P_t$. There is an equilibrium in which $b_t = b_{t-1} = \bar{b} = \frac{\beta}{1-\beta}\bar{s}$. Use this in the budget identity to yield $\frac{(1+i_{t-1})B_{t-1}}{P_t} = \frac{1}{1-\beta}\bar{s}$. At time t, this delivers a unique equilibrium price level, $P_t^* > 0$ when $B_{t-1} > 0$.

2. Fiscal rules that focus on sustainability to effectively eliminate the link from a lower price level to lower real aggregate demand are generally inconsistent with an inflation-targeting monetary policy.

II.4.2 Evidence Countries have not always provided appropriate fiscal backing.[24] This section offers two examples—one dramatic and one subtle—in which it appears fiscal policy did not provide the backing needed for monetary policy to achieve its inflation target.

Brazil. In recent years, Brazil followed a fiscal policy that was unresponsive to debt, while its central bank sought to target inflation. The 1988 constitution indexed government benefits to inflation, which placed 90 percent of expenditures out of legislative control. At the same time, tax increases were politically infeasible, leading to growing primary deficits with no propsect of reversal.

When inflation began to rise, the central bank aggressively raised interest rates, just as the Taylor principle instructs. Debt service rose, driving up aggregate demand and inflation. In December 2015, the primary deficit was 1.88 percent of GDP, but the gross deficit—primary plus interest payments—was 10.34 percent of output. Figure 2 plots Banco Central do Brasil's policy rate, the Selic, along with the consumer price inflation rate from 2009 through 2019 in the left panel. Despite a doubling of the policy rate between January 2013 and the end of 2015, the inflation rate rose by nearly 5 percentage points: monetary policy does not appear to be controlling inflation. In fact, inflation began to retreat in 2016 only after the central bank had stabilized the Selic at 14.25 percent for a year. The Selic then followed the inflation rate down.

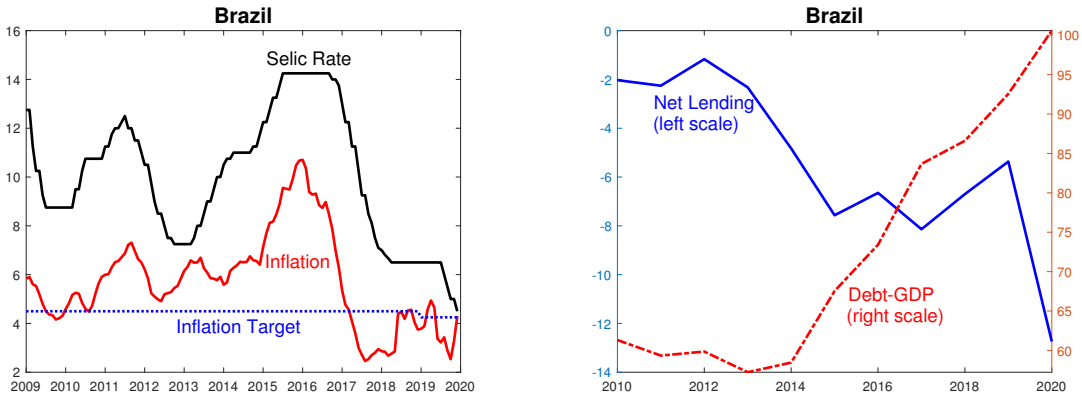
The right panel of the figure shows that fiscal policy was strongly expansionary starting in 2013. Over the remainder of the decade the gross deficit increased six fold and the debt-GDP ratio doubled. In this fiscal setting nominal interest rate increases are hyper-Fisherian: higher rates raise expected inflation with little impact on real rates. Higher expected inflation feeds back to raise current inflation.

Europe. The Brazilian case is an extreme implication of monetary policy ineffectiveness when fiscal policy fails to provide appropriate backing. Europe before Covid is a more nuanced situation. Figure 3 plots data analogous to figure 2 for the euro area, Switzerland, and Sweden. Coming out of the financial and the sovereign debt crises countries in the European Union agreed to a "fiscal compact" in 2012 that calls for signatories to adopt fiscal rules that deliver general government budgets that are balanced or in surplus [European Central Bank (2012)]. Country-specific medium-term fiscal objectives must be consistent with the balanced budget rule, subject to deviations in "exceptional circumstances."[25]

The Swedish Fiscal Policy Framework, Swedish Government (2011), is among the most explicit statements of fiscal interactions with monetary policy. It states: "In the event of very large demand or supply shocks, fiscal policy may need to support monetary policy actively [p. 8]." But this is quite different from providing fiscal backing for the central bank's routine pursuit of its inflation targeting. As Leeper (2018) documents, during the period when the Riksbank aggressively sought to raise inflation with negative policy rates and balance sheet expansion, the Swedish fiscal council remained laser-focused on fiscal

[24] Leeper (2017, 2018) provide additional examples.

[25] Kamps et al. (2017) and Kamps et al. (2017) provide historical background and thoughtful discussion of EU rules.



(a) Monetary Policy (b) Fiscal Policy

Figure 2: Left panel plots policy interest rate (Selic), consumer price inflation, and inflation target in Brazil; right panel plots net lending (left axis) and debt-GDP (right axis) in Brazil. Sources: Central Bank of Brazil and World Bank.

tightening [Swedish Fiscal Policy Council (2015, 2016)]. For six years, despite aggressive monetary easing, Swedish inflation was below target.

Switzerland was an early adopter of a debt break in 2006, which placed severe limitations on structural deficits. Even in the aftermath of the financial crisis Switzerland ran gross and primary surpluses to steadily reduce its debt-GDP. From 2015 to 2019 yields on Swiss government bonds averaged −0.64 percent on 5-year maturities and −0.19 percent on 10-year maturities. Switzerland also experienced the largest and most persistent shortfalls in inflation relative to target.

The German experience is especially pronounced [figure 4]. After it adopted a debt break in 2009, fiscal policy swung from running sizable deficits during the financial crisis to large primary surpluses in a couple of years. Interest payments dropped quickly to below 1 percent of GDP. Along with this long-term nominal German government bond yields turned negative at both 5- and 10-year maturities. Negative nominal yields in the face of ever-tighter fiscal policy is *prima facie* evidence of excessively contractionary fiscal stance.[26] It certainly is not providing the support needed to raise inflation.

Fiscal rules have been developed primarily to solve political problems. These are legitimate concerns. But in addressing political economy issues, the rules may inadvertently create economic problems by preventing fiscal authorities from appropriately backing monetary policy. Policy conflicts emerge from an enduring partial equilibrium belief that monetary and fiscal policy can operate independently of each other, pursuing objectives that in general equilibrium may be mutually exclusive.

III Variations on Policy Coordination

There are many levels on which monetary and fiscal policy may coordinate. Here I consider three levels: explicitly, implicitly, and unintentionally. Economic theory tells us that in the

[26] I would argue it is also evidence of suboptimal fiscal policy: investors were willing to pay for the opportunity to lend to the government, yet policy makers declined the free lunch.

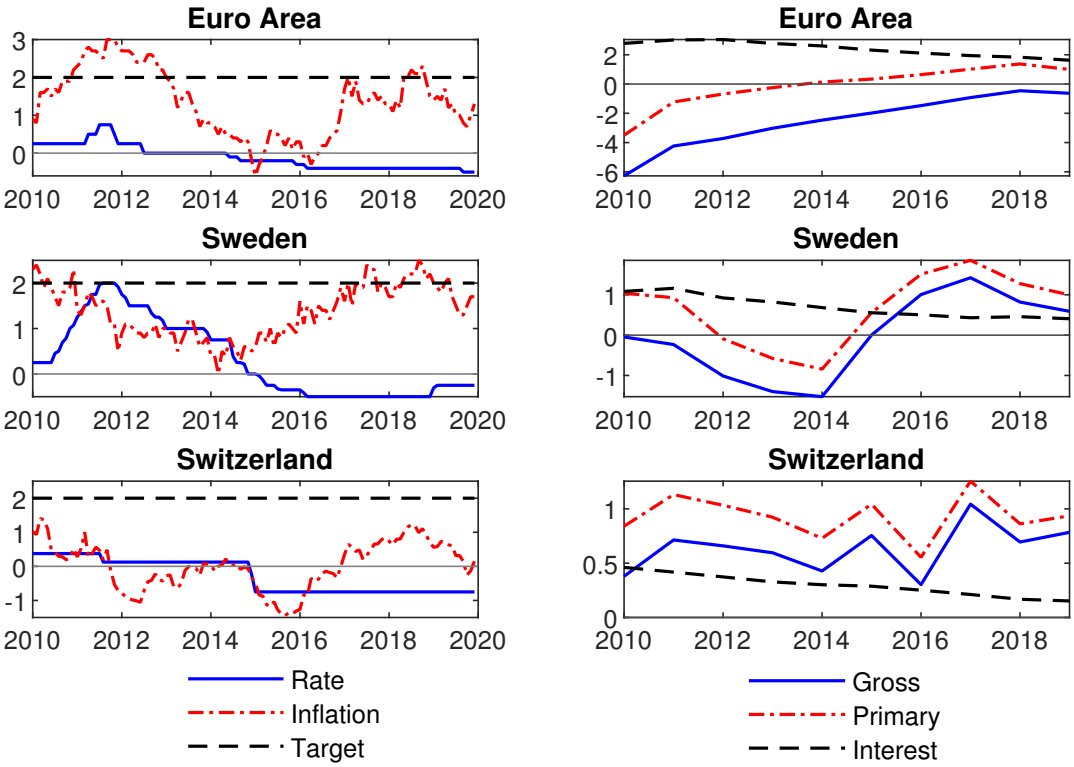


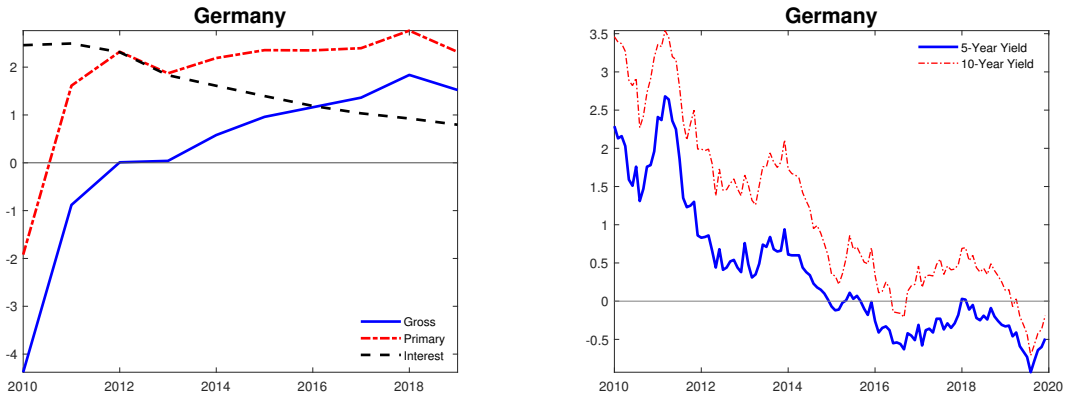
Figure 3: Left panels plot the monetary policy rate, inflation, and the inflation target; right panels plot primary surpluses, gross surpluses (including interest payments on debt), and interest payments as percentages of GDP. Sources: ECB, IMF, Sveriges Riksbank, Swiss National Bank.

long run monetary and fiscal policies *must be coordinated* in the sense that they are consistent with equilibrium.

III.1 Explicit Coordination

Economic benefits come from explicit policy coordination that is clearly communicated to the public. First, it reassures decision makers that monetary and fiscal policies are on the same page, which both signals the seriousness of the current economic circumstances and reduces uncertainty about what policies will address the situation. Second, it minimizes the likelihood of policy clashes that might otherwise ensue. Finally, it enhances the effectiveness of the policy response by appropriately anchoring monetary and fiscal expectations.

Explicit coordination is essential whenever central bank actions have the potential to substantially increase the government's liabilities. During the global financial crisis central banks and governments coordinated openly and publicly. When the Fed bought large quantities of mortgage backed securities it sought to shift risk from the private sector to the Fed's balance sheet. Risk grew from the fact that assets once thought to be both valuable and safe suddenly had both unknown value and unknown risk characteristics. In such circumstances fiscal authorities must communicate that they approve of the central bank actions and stand



(a) Fiscal Policy (b) Government Bond Yields

Figure 4: Left panel plots primary surpluses, gross surpluses (including interest payments on debt), and interest payments as percentages of GDP in Germany; right panel plots 5- and 10-yield government bond yields in Germany. Sources: IMF and Deutsche Bundesbank.

ready with taxpayer dollars to back the bank should it incur losses on its holdings.

Ultimately, lender of last resort functions are fiscal acts because they entail transfers of resources from taxpayers. Although many central banks are tasked with making lender of last resort policy decisions, they have no authority to raise the necessary resources; only the fiscal authority can do so [Leeper and Nason (2014)]. This is an odd assignment of tasks that in the absence of explicit coordination can leave the central bank holding a bag full of losses.

In the United States, Treasury Secretary Paulson, Fed Chair Bernanke, and New York President Geithner famously stood shoulder-to-shoulder, both figuratively and literally in policy. As figure 5 portrays, they may not have been happy to do it, but they did it.

Figure 5: Secretary of Treasury Henry M. Paulson, Federal Reserve Chairman Ben Bernanke, and Federal Reserve Bank of New York President Timothy Geithner (left to right) in 2008.

Those American architects of the 2008 coordination described their actions a decade later: "Acting in its traditional role as lender of last resort, the Federal Reserve provided

massive quantities of short-term loans to financial institutions facing runs, while cutting interest rates nearly to zero. The Treasury Department stopped a run on money market funds by providing a backstop for investors. The Treasury also managed the takeover of the mortgage giants Fannie Mae and Freddie Mac, and worked with the Fed to try to prevent the collapse of large, systemically important financial firms. The Federal Deposit Insurance Corporation guaranteed bank debt and protected depositors [Bernanke et al. (2018)]."

Bernanke (2022) emphasizes a critical limit to the ability of fiscal policy to coordinate with monetary policy. In the fall of 2008, when a number of financial firms were on the brink of failure, Bernanke determined that the economy required "a major fiscal commitment by the U.S. government to recapitalize the financial system Bernanke (2022, p. 129)" but it was politically infeasible until Congress grew convinced no alternative was available. This delay in fiscal support exacerbated the crisis.[27] Avoiding delays in the legislative process calls for contingency planning for policy coordination in the case of emergencies; although the need is apparent, how one engineers such planning is not obvious.

This coordination focuses on financial stability concerns, rather than on stabilizing aggregate demand. When monetary policy is at the effective lower bound, there may be reason for coordination about aggregate demand stimulus. During Covid the need for coordination was apparent: shutdowns and layoffs left many citizens in immediate need of relief of the kind that no amount of monetary stimulus can address. Explicit policy coordination would have been beneficial. Unfortunately, important Federal Reserve actions were taken without fiscal authority buy-in.

Between March 2020 and March 2022 the Fed used bank reserves and reverse repurchase agreements to purchase about $4.6 trillion in long-term securities, Treasury bonds and mortgage backed securities. Rationale for the purchases varied: initially to stabilize financial markets and later to provide monetary stimulus. These and earlier purchases have created severe maturity mismatch between long assets and short liabilities that subject the Fed's balance sheet to substantial interest rate risk in the face of rising mortgage and other interest rates. Those rates have now risen. One estimate suggests these purchases will cost American taxpayers $760 billion over a 10-year period [Levin et al. (2022), Levin and Nelson (2023)]. To cover these loses the Fed will suspend remittances to the Treasury for five years and reduce remittances in subsequent years, in lieu of the $100 billion in remittances those authors estimate the Fed would have paid in the absence of the asset purchases.

These direct fiscal consequences of monetary actions can make the Federal Reserve vulnerable to political pressures. By "taking duration out of private hands" Fed actions have converted what would have been private losses into public losses. This is a politically fraught act that may haunt Fed officials in coming years.

Policy responses to the financial crisis and the pandemic starkly illustrate the benefits to a central bank of explicit coordination with fiscal authorities. In both cases the central bank expanded and made more risky its balance sheet. During the financial crisis the Fed, to the extent possible, sought government agreement with its plans. During Covid, as Levin and Nelson (2023) document, Fed balance sheet operations and their potential fiscal implications were not communicated to fiscal authorities. Time will tell if the political fallout is different

[27] On the other hand, Bernanke points out that the Fed was able to secure timely Congressional approval to begin paying interest on excess bank reserves earlier than planned.

from the two central bank approaches.

III.2 Implicit Coordination

Implicit coordination is far more common than explicit coordination. As section II explains, economic theory tells us feasible economic outcomes require that monetary and fiscal policies be consistent or "coordinated." Sargent (1986a) is a series of examples, historical and contemporary, of implicit policy coordination. I elaborate on one example that reflects both section II's joint monetary-fiscal perspective and the type of coordination that occurs routinely.

The Reagan administration began with inconsistent plans for monetary and fiscal policy [Sargent (1986b)]. At the same time that it supported Chairman Paul Volcker's goal of wringing inflation out of the economy through tight "active" monetary policy, it announced tax cuts and defense spending increases that implied paths of "active" primary fiscal deficits. The two policies cannot coexist indefinitely because neither policy would stabilize debt. Sargent credits Neil Wallace with describing the conflict between policies as a game of chicken. Which policy would flinch to avoid an economic crash? As Sargent put it, "...Reaganomics was not credible because it was not feasible."

Implicit coordination arises when one policy submits and alters its original plans. As it happened, fiscal policy flinched. After Reagan's signature Economic Recovery Tax Act of 1981 there followed a series of 11 tax bills whose cumulative effect four years after enactment was to increase revenues by $279.1 billion, swamping the $176.7 billion reduction from the 1981 legislation. Although monetary policy did ultimately prevail, it was not without political drama and substantial uncertainty. A fiscal policy that explicitly tied the 1981 cuts to subsequent increases would have reduced uncertainty and avoided the costly game of chicken.

The United States has recently become the poster child for fiscal gamesmanship. Policy has lurched from fiscal cliffs to government shutdowns to threats of default on Treasury securities. At this writing the U.S. government cannot issue new government bonds because federal debt has reached its statutory limit. One party is holding the "full faith and credit" of the U.S. government hostage until the other party submits to as-yet unspecified spending cuts. Because this is happening at the same time that the Federal Reserve is raising interest rates to tamp down inflation, the absence of explicit policy coordination is glaringly apparent. As in the Reagan-Volcker stand off, citizens, global financial markets, and international policy makers await the implicit coordination that emerges. Even if one feels confident the political squabble will not result in outright default, the precise nature of the resolution matters for expectations and economic choices. By leaving coordination implicit, policy makers force economic decision makers to speculate about the resolution.

These examples make clear that implicit coordination is generally less desirable than explicit coordination. Both examples illustrate instances in which the fiscal backing needed to support monetary disinflation efforts was not assured. In the current case, if fiscal authorities cannot swiftly resolve their differences, it becomes more uncertain that primary surpluses will rise in the face of increasing debt service. Outright default on treasurys could trigger a run that would be both inflationary and recessionary, with no available monetary solution. Raising the debt ceiling without also raising surpluses undercuts the Fed's disinflation by a different channel.

There is a straightforward solution: adoption of enforceable fiscal rules that both stabilize

debt and provide fiscal backing for monetary policy. Such rules would shift policy interactions away from implicit coordination and obviate the need for explicit coordination by automating the coordination. Because those rule also reduce the sovereignty of elected officials, there is natural resistance to them.

III.3 Unintentional Coordination

Last year the United Kingdom generously provided a clean example of unintentional coordination. When U.K. Chancellor of the Exchequer Kwasi Kwarteng revealed on September 23, 2022 new Prime Minister Liz Truss's plans to raise fiscal spending and cut taxes, the news that primary budget surpluses would be lower than previously anticipated crashed financial markets. Sterling depreciated 4.7 percent against the dollar and yields on long-term gilts rose 100 basis points in the days that followed. Sales of gilts were amplified by pension funds whose urgent liquidity needs drove them to sell gilts for other reasons. Five days later the Bank of England simultaneously announced that "to restore orderly market conditions" it would buy long-dated government "on whatever scale necessary" *and* that its interventions would end on October 14 [Bank of England (2022)]. Not until the chancellor was replaced and Truss ultimately resigned on October 20 did markets return to pre-announcement levels.

The fiscal fiasco placed the Bank of England in an untenable position in several ways. First, the Bank postponed its planned monetary tightening to buy treasurys, usually construed as monetary ease. Financial instability prompted by the fiscal announcement shifted the Bank's immediate priority away from disinflation toward restoring smoothly functioning markets. Second, the Bank made the logically inconsistent statement that it would do whatever it takes, but conclude the doing at a fixed date. One interpretation is that this was the Bank of England's game of chicken against the Truss government: get your act together because we will not bail you out indefinitely. It surely is no coincidence that Kwarteng was replaced on the same date as the Bank's deadline.

One lesson is clear from the Truss fiasco: unintentional monetary coordination was a bandage to staunch the bleeding from a fiscal wound that only fiscal treatment could heal.

A second example comes from the European Central Bank's unveiling of a new monetary policy tool on July 21, 2022 "to counter unwarranted, disorderly market dynamics." The tool permits the ECB to buy sovereign bonds issued by a member nation whose bond yields are "not warranted by country-specific fundamentals [European Central Bank (2022a)]." Financial reporters immediately interpreted the policy as designed to reduce Italian bond yields, which were elevated during the summer's Italian political uncertainty, a significant departure from the ECB's standing policy to buy sovereign bonds of member states in fixed proportions [European Central Bank (2022b)].

Once again, fiscal actions—this time by a sovereign nation—forced the central bank's hand. Although the ECB's argument for intervention hinges on claims that "non-fundamental" yield spreads distort and retard the transmission mechanism of monetary policy, it is difficult to get past the fact that large-scale ECB purchases of Italian government bonds would buy Italy fiscal space. Purchases would also likely skew incentives for Italian fiscal policy makers away from the behavior the ECB would deem desirable.

I cannot claim to know exactly what considerations lie behind the ECB's unusual new tool. Nor can I predict how it will be implemented. It is clear, though, that Italian govern-

ment debt is an *Italian fiscal problem*. Short of setting itself up as the lender of last resort for member nations with sovereign debt troubles, it is hard to see what the ECB can do to alleviate the troubles. This unintentional coordination strikes me as dangerous.[28]

These are examples in which arguably bad fiscal choices were foisted upon a central bank concerned with non-fiscal issues like financial stability and monetary transmission. Unintentional coordination arose when the central bank perceived fiscal conditions as a direct threat to its remit. In societies whose fiscal policies are driven by elected officials with short planning horizons, situations like these may be unavoidable. The main cautionary note for central bankers responding in real time to fiscal disturbances is: beware the incentives your actions may create.

IV How Can Central Banks Take Fiscal Policy More Seriously?

Taking fiscal policy seriously entails a combination of gathering and analyzing fresh data series and bringing fiscal behavior firmly into central bank models and discussions.[29] Central bankers *can* talk about fiscal policy in ways that help to achieve monetary policy objectives without threatening the sovereignty of fiscal authorities. In what follows I lay out the ideal, but there is high value added to monetary policy from taking even the first steps toward the ideal.

IV.1 Data

Central banks commonly bring fiscal deficits—primary and gross (whose different is interest payments)—into analyses, treating deficits as a source of aggregate demand stimulus. This is pure Keynesian hydraulics. Some central banks analyses also consider various kinds of tax rates and components of fiscal expenditures, primarily as a means for enriching the narrative about economic developments.

Typically missing are fiscal measures that gauge the dynamics impacts of fiscal policy. These would include the time series that figure prominently in section II's discussion:

1. Market and par values of government liabilities, including bonds and bank reserves.
2. Maturity structure and denominations of government liabilities.
3. Liquid government assets like foreign reserves.
4. Real discount rates relevant to valuing the expected stream of primary surpluses.
5. Expectations of government tax and spending plans.

Market values of every bond issuance are available in the United States, as are monthly holding period returns on the government bond portfolio and maturity structure [Federal Reserve Bank of Dallas (2023), Sargent et al. (2023)]. As far as I know, no comparable data are available for Australia or most other countries, the United Kingdom excepted [Ellison

[28] Perhaps ECB executive board members hope to pull off a coup like Draghi's (2012) famous "whatever it takes" pledge, a promise that was never tested.

[29] Leeper (2017) discusses the difficulties inherent in fiscal modeling.

and Scott (2020)]. Methodologies for computing these series from underlying data are well developed, so it would not be a difficult task to compile and make available the data. No professional consensus exists on the "right" real discount rate measure.

Central banks, other institutions, and researchers conduct countless surveys of expectations of inflation, interest rates, and economic activity. Remarkably few surveys track fiscal expectations. Carefully worded questions and good survey techniques may generate data that shed light of where people believe fiscal policy is headed, data that could provide interpretations of equilibrium conditions like (Pricing Equation).

IV.2 Modeling

At a minimum any model—fully specified DSGE or reduced form—must include some version of a government budget identity. Although weak, particularly in its intertemporal form, this is the only constraint that ensures consistency between monetary and fiscal policies. Rees et al. (2015) specifies an identity, but then discards any potential for it to matter by assuming government bonds are in zero net supply, so the government's budget gets balanced period by period using lump-sum taxes. In this sense, the RBA's MCM model is equivalent to simple textbook new Keynesian models in its handling of fiscal policy. If the model's predictions for tax revenues were included in assessments of model fit, the data would choke on those predictions.

A different perspective on the government budget identity may be helpful. Equilibrium in a complete closed-economy representative agent model requires that the three following conditions hold: the household budget constraint, the aggregate resource constraint (or national accounting identity), and the government budget identity. The MCM description includes each of these. In practice, though, the resource constraint binds outcomes while the other two impose no restrictions. This modeling approach prevents the study of monetary-fiscal interactions in any but the most trivial way—lump-sum taxes adjust to make everything add up.

Another requirement for monetary-fiscal analysis is inclusion of fiscal rules that describe *how* the government budget identity gets satisfied. Leeper et al. (2017) do this for a set of tax rates and government purchases in a manner fully compatible with the MCM's Bayesian methods. This at least allows for counterfactual experiments that turn on or off various fiscal adjustments. In DSGE models the adjustment matters a great deal for model predictions, as Leeper et al. (2010) and Leeper et al. (2017) show in estimated models.

Modeling a government budget identity that gets satisfied non-trivially forces the modeler to think through likely fiscal behavior. That process can be informed by government policy statements to tie model outcomes more closely to actual fiscal behavior. Non-trivial fiscal modeling leads to a sniff test for model predictions: is the model's implied fiscal responses to shocks plausible? If not, we want to know.

I couched the discussion in terms of the MCM, but the arguments apply equally to reduced-form models like MARTIN [Ballantyne et al. (2019)]. It too carries implications for fiscal behavior that ensures things add up. A prime motivation for MARTIN is to "draw together the vast array of single-equation forecasting models that RBA staff maintain" to deliver an economy-wide perspective [Ballantyne et al. (2019, p. 1)]. Surely fiscal policy is an essential input to that perspective.

IV.3 Projections

Most central bankers believe fiscal policy plays a critical role in determining macroeconomic outcomes and the impacts of monetary actions. Monetary projections from central bank models belie this belief. A typical central bank projections posits paths for a host of "exogenous" driving forces—oil and commodity prices; foreign output, inflation, and interest rates; import prices; productivity, among others—along with a hypothetical path for the policy interest rate. Starting from some initial state of the economy, conditional on those paths projections report path for variables of interest to policy makers—inflation, consumption, investment, employment, GDP, etc. But posited paths for fiscal variables—government consumption and investment, tax rates, transfer payments—are equally important inputs. Given the initial stock of government debt, the projection would report the path of debt derived from the government's budget identity. If the model includes fiscal rules instead, then only the "exogenous" components of fiscal policy require posited paths.

Monetary policy impacts could condition on alternative fiscal assumptions—paths or rules. Do tax rates rise with the higher debt service that monetary contraction induces? If so, which rates and how do predictions vary with the fiscal assumptions? What happens to the monetary policy impacts if tax rates do not rise? By tracking government debt dynamics and possible sources of fiscal financing the central bank makes explicit how the economic impacts of its actions hinge of fiscal behavior.

Making central bank projections of monetary policy impacts explicitly conditional on fiscal behavior provides a channel for monetary-fiscal coordination. Importantly, this channel entails no central bank jawboning or criticism of fiscal policy. This offers a scientific way for central banks to communicate with the government and the public about the deep interdependencies between monetary and fiscal policies for macroeconomic outcomes.

IV.4 An Alternative Approach to Projections

A very different technique for producing monetary policy projections to the one that section IV.3 describes builds on Cochrane's (2023) work. The alternative approach springs from a theoretical result. The two policy regimes—monetary dominance (active money/passive fiscal) and fiscal dominance (passive money/active fiscal) that section II.2 describes—can produce identical macroeconomic equilibria. That is, any economic outcomes that a monetary dominant regime produces can be replicated by a fiscal dominant regime. This "observational equivalence" frees modelers from the burden of positing alternative policy rules when conducting counterfactual projections.

Modelers can exploit the theoretical result that under a passive money/active fiscal policy mix, with plausible sequences of the central bank's interest rate and the fiscal authority's primary surplus, $\{i_t, s_t\}$, there always exists a unique equilibrium. This means the economic projections can easily be conditioned on alternative sequences of policy variables to understand how different policy scenarios affect the outlook. Although it is *feasible* to condition on a wide range of $\{i_t, s_t\}$ paths, it is important to check how much posited paths deviate from past policy behavior.

V Communication

There are many ways that communication between monetary and fiscal authorities can be enhanced. The key is to communicate in constructive, scientifically grounded terms. It is possible that having the Secretary to the Treasury sit as an *ex officio* member of the Reserve Board will generate productive communication. But because how well that arrangement works depends heavily on the personalities of both the Secretary and other Board members, this approach is unlikely to *institutionalize* improved communication and coordination.

I lean toward communicating through alternative scenario projections. Central bank model descriptions and estimates can be public information. So, too, can be the details of the projections that provide inputs to policy decisions. Transparency enforces the scientific nature of the projections and encourages thoughtful discourse. The scientific method imposes discipline on the projections and the discourse equally. If wrapped around the projections is discussion of how particular scenarios come closer to achieving policy objectives, they present a coherent framework that serves as a basis for informed debate.

Models are imperfect. Sometimes very imperfect. They can also be useful. With sufficient resources models can be ever-improving. The alternative t formal modeling is casual ruminations about policy impacts, which run the risk of devolving into debates uninformed by economic theory and consistent statistical analysis.

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