Discussion of "Sovereign Default and Monetary Policy Tradeoffs"*

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1. Introduction

Any good student of general equilibrium knows that macroeconomic outcomes are jointly determined by both monetary and fiscal policies. The study of this interaction in the past has focused on the conditions under which the two policies can be separated, as in the literature on the classical dichotomy and central bank independence, or on the conditions under which they become almost indistinguishable, as in the literature on hyperinflations and the fiscal theory of the price level. But recent monetary and fiscal policies in response to the Great Recession have raised two new issues. First, from the side of fiscal policy, the accumulation of deficits for many years has led to the highest U.S. public debt over GDP since the peak of World War II and, at the same time, one of the shortest outstanding maturities held in private hands. Second, the many unconventional monetary policies pursued by the Federal Reserve have blurred the line between what is monetary and what is fiscal.[1]

The paper by Bi, Leeper, and Leith (henceforth, BLL) explores one particular aspect of this interaction. They focus on the fact that when the debt is high, the probability of sovereign default becomes relevant, and they purport to study whether this changes the effect on inflation and output of a standard increase in the policy interest rate. Their conclusion is that if the monetary policy rule takes into account the probability of default, or not, then either inflation may rise significantly above target or output may fall sharply.

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[1]For a picture of the current state of the U.S. debt, see Hilscher, Raviv, and Reis (2014) and for a discussion of the fiscal implications of unconventional monetary policies, see Reis (2016a).

In this discussion, I will make four points. First, I will restate the authors' basic point but claim that it is best seen backwards. Second, I will raise the possibility of multiple equilibriums. Third, I will extend their idea to apply instead to mismeasurement of natural rates, to term premium, and to financial segmentation. Fourth, I will discuss other relevant monetary policy tradeoffs created by sovereign default.

2. Their Idea, Backwards

Consider a central bank that perfectly chooses the interest rate (i_t) that remunerates deposits by banks at the central bank. Every central bank in an advanced economy does this today. This interest on reserves, as it is called in the United States, follows the classic feedback rule:

$$i_t = \rho_t + \mathbb{E}_t(\pi^*_{t+1}) + \phi(\pi_t - \pi^*_t),$$

where π_t is inflation. The central bank's inflation target, π^*_t, is stochastic and may change from period to period—for instance, because of the implementation of an optimal elastic price standard target rule. The expectations operator $\mathbb{E}_t(.)$ is a rational expectation, as I assume that both the policymaker and the public have full and common information. Of interest in this paper is the intercept of the rule ρ_t, which I will take as exogenous: more on it to follow.

The relevant equilibrium in the economy, which results from market clearing and optimal behavior, can be summarized for the sake of inflation determination by a linearized Fisher condition:

$$i_t = r_t + \mathbb{E}_t(\pi_{t+1}).$$

Because reserves are risk free, i_t is a nominal risk-free rate. Therefore, the r_t in this equation is the real risk-free rate in the economy.

A very strong assumption I will make is that this real rate is independent of any inflation outcome or of the interest rate policy. This classical dichotomy assumption implies that r_t is exogenous to the model, so the two equations above are enough to solve for the endogenous values of i_t and π_t. Combining the equations, iterating forward, and solving for the locally bounded fundamental equilibrium for the price level gives the solution:

$$\pi_t = \pi_t^* + \sum_{j=0}^{\infty} \phi^{-(j+1)} \mathbb{E}_t(r_{t+j} - \rho_{t+j}).$$

If the real interest rate is always equal to the policy intercept, then inflation is always on target.

Imagine, however, that the policymaker chooses ρ_t in its policy rule to be the *rate on inflation-indexed government bonds.* If these bonds are safe, then $r_{t+j} = \rho_{t+j}$ and inflation is on target. But, if the government bonds may default, now $r_{t+j} - \rho_{t+j}$ is *negative.* The negative of this difference is equal to the risk premium on the government bonds. In turn, in this linearized world, the risk premium is proportional to the default probability of the government. When default is more likely, monetary policy sets its policy rate too high, and so inflation is too low.

In a nutshell, this is the main insight of this paper. However, if you read the paper, you will see that BLL state that higher expected default *raises* inflation. Above I explained that instead it *lowers* inflation. Which one is it?

The reason for the difference is that BLL assume that the central bank sets a risky interest rate. Implicitly, the default risk in their paper is the default risk on reserves, since this is the interest rate that the Federal Reserve actually sets. Then, in their paper, they write the feedback rule with an intercept that is the risk-free rate. This mismatch, as above, is what leads to the deviations of inflation from target, but the effect is turned on its head relative to my description.

For two reasons, I think it is more natural to take on my description. The authors' characterization implicitly assumes that reserves are risky. But, the defining feature of reserves is that they are nominally risk free: they are the unit of account in our bank-based economy.[2] Second, the authors must continuously refer to the central bank as targeting the interest rate. It is true that before 2010, the

[2] In fact, this fundamental characteristic of reserves allows for different, more effective, ways to control inflation than the feedback rule above; see Hall and Reis (2016).

Federal Reserve targeted an interbank interest rate, the federal funds rate (also a rate that is very close to safe). But since then, monetary policy as practiced in the United States and most advanced economies has changed because central banks saturated the market for their reserves by increasing the size of their balance sheets. Since then, the monetary policy tool has effectively been the interest on reserves, and that is a rate that the central bank *sets*, not the one that it *targets*.[3]

3. Multiple Equilibriums?

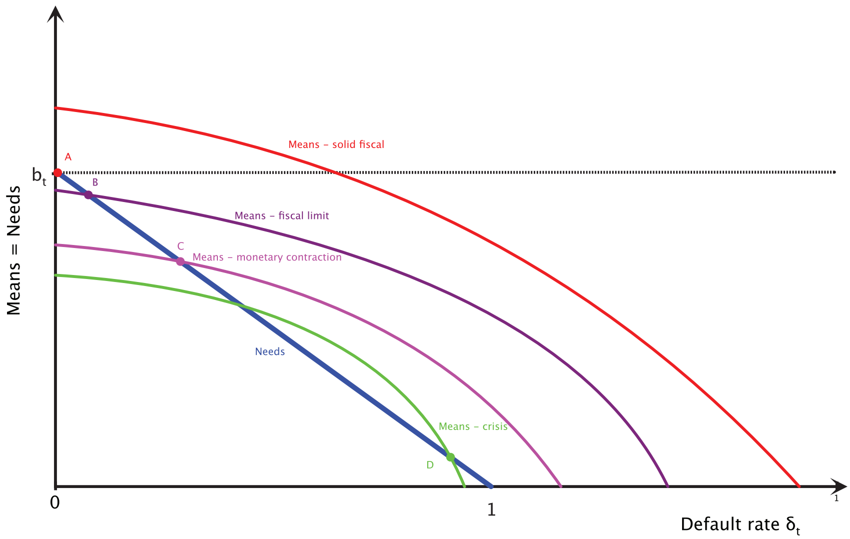
BLL show that, in their quantitative model, expected default, the risk-free rate, and the inflation rate co-move. If an economy is near its fiscal limit, then any shock to monetary policy doesn't just affect inflation and output as usual, but it also affects debt dynamics. In particular, if the shock is contractionary, the ensuing recession reduces tax revenues and so makes default more likely. Given the monetary policy mistake described in the previous section, this may feed into further contractionary monetary policy, which further lowers inflation below target. Even if the central bank sets the interest rate following the appropriate safe rate, the presence of default can magnify the size of the recession and lead to persistently higher debt.

In their numerical simulations, BLL always use this economic channel as an amplification mechanism around a unique equilibrium. Yet, this channel can also potentially lead to multiple equilibriums. A simple way to see this is to use a reduced-form model of the interaction between sovereign default and fiscal policy.[4] Imagine that the fiscal authority has an amount b_t due to repay at period t. Yet, the repayment rate is only $1 - \delta_t$, so a positive δ_t captures partial default. The government budget constraint, or valuation equation, requires that repayment is matched by the expected present value of fiscal surpluses Φ. Many models will predict that these surpluses are a declining function of the stance of monetary policy and of the extent of default, so $\Phi(\rho_t, \delta_t)$. Tighter monetary policy can cause a recession, which lowers tax revenues and raises government transfers

[3]For more on the consequences of satiation of the market for reserves on monetary policy and the control of inflation, see Reis (2016b).

[4]This model is laid out in Reis (2013b).

Figure 1. Sovereign Default and Multiple Equilibriums



through the operation of the automatic stabilizers. A higher extent or likelihood of default implies that banks that hold government bonds will suffer a loss. Thus, the likelihood or size of a bank bailout rises, worsening the fiscal situation.

Figure 1 plots both sides of the equation $(1 - \delta_t)b_t = \Phi(\rho_t, \delta_t)$, which has fiscal needs on the left-hand side and fiscal means on the right-hand side, against δ on the horizontal axis. It shows four cases for different fiscal positions of the government. If the fiscal situation is solid—mathematically, if $\Phi(\rho_t, 0) > b_t$ and $\Phi(\rho_t, 1) > 0$ for the range of possible ρ_t—then the government always pays its debt in full, no matter the stance of monetary policy, so the equilibrium is at point A. However, if the economy is near the fiscal limit—mathematically, if $\Phi(\rho_t, 0) < b_t$ for the prevailing ρ_t—then default will happen, as the equilibrium is at point B instead. Starting from this situation, contractionary monetary policy shifts the means curve downwards and worsens default. The authors' point is that this may lead to a further contraction in monetary policy, amplifying the shock. This is captured by point C in the figure. But, it may also lead to another situation if now $\Phi(\rho_t, 1) < 0$, as a second equilibrium emerges corresponding to point D. In it, the expectation of default leads to the expectation of large deficits from bailing out banks, which confirms the expectation that the default will be large.

4. Other Sources of Policy Mismatch

Section 2 should have made clear that *any* gap between the safe real rate, r_t, and the intercept that monetary policy uses to set the rate of interest on its reserves, ρ_t, will lead to a deviation of inflation from target. Sovereign default is one of these, but there are others.

One of them comes from the common use of Taylor rules that have inflation responding to a constant intercept plus a term that depends on a measure of the output gap. This matches the policy rule in section 2 where ρ_t is now a linear function of the output gap. In this case, any errors in measuring the output gap, or any economic shock or model feature that make the safe real rate not co-move perfectly with the output gap, will lead to the policy mismatches that induce deviations of inflation from target. Because these deviations in turn cause recessions and booms through nominal rigidities, this changes the output gap, and a similar channel takes place as in section 2.

A related version of this argument arises if the central bank replaces the output gap with instead the efficient, or Wicksellian, real interest rate. This rule both fits the U.S. pre-crisis data better than a Taylor rule and leads under many circumstances to better outcomes in New Keynesian models.[5] Now, $r_t - \rho_t$ has an easy interpretation as a "real interest rate gap," or the difference between the actual safe rate and its efficient level.

A second source of mismatch is the term premium. Reserves at the central bank are overnight deposits. But the safe real rate that one can plausibly measure in the data is probably at its shortest a three-month rate. Therefore, even if the central bank uses a safe rate to measure ρ_t, there will be a maturity disconnect between the fact that this is a three-month measure and the relevant r_t is an overnight rate. The mismatch now maps into a term premium leading to fluctuations in inflation.[6]

[5] See Cúrdia et al. (2015).

[6] Eliminating this term premium could be done if the central bank issued three-month reserves and made their interest rate the policy tool. In a different context, Hall and Reis (2016) provide a separate argument for this reccomendation.

A third, and harder, mismatch arises in a currency union where different regions have different sovereign interest rates. The theory above is clear: the central bank should set the intercept in its policy rule by measuring the safe rate. In practice, this is much harder, especially as the output gap and real interest rates will differ across regions. A concrete example comes to mind. On the one hand, theory would suggest that the ECB should guide its interest rate by the sovereign interest rate in Germany, for which default risk is negligible. But even though the safe real interest rate for Italy is harder to measure, it is no less relevant for euro-area inflation, and given the asynchronization of business cycles, I would conjecture it sometimes moves in a different direction from the German rate. As long as the capital markets in the euro area are not fully integrated, the relevant real interest rate r_t is going to be some combination of safe rates in different regions, which are hard to measure and harder to aggregate, leading to frequent policy mismatches.

5. Other Tradeoffs between Sovereign Default and Monetary Policy

BLL focus on the tradeoff between the normal setting of policy rates by the central bank and sovereign default. There are further interesting interactions with other forms of monetary policy.

Starting with quantitative easing, in a fiscal crisis, reserves at the central bank become particularly *special*. Both government bonds and reserves are government liabilities. Yet, historically, governments are more willing to default on bonds than on reserves. Sovereign defaults, in the form of repayment rates below 1 for government bonds, are common. But central bank defaults, in the form of currency reforms that debase the unit of account, are much rarer. When governments become insolvent, most of the time they prefer to keep the central bank independent and separately solvent.[7]

Quantitative easing (QE) consists of issuing reserves to buy government bonds. This swap of one government liability for another is typically close to neutral. But, during a fiscal crisis, the central bank buys from the private economy a risky asset and gives it a

[7]To understand how a central bank can become insolvent, see Reis (2015) or Reis (2016a).

nominally safe asset. Therefore, QE increases the effective supply of default-free safe assets in the economy.[8] This matters for economic fluctuations and financial stability, which feed back into the likelihood of default.[9]

At the same time, the central bank's ability to do this relies on being fiscally backed by the Treasury, as shown in a theorem of Hall and Reis (2015). Otherwise, when default happens, the central bank will suffer losses on its government bond holdings, which may put its own solvency at risk. If so, the central bank will be pressured to raise its seignorage revenues from issuing bank notes, in order to generate the income that can offset this loss. This requires higher nominal interest rates, and higher expected and actual inflation.[10]

A second interaction arises between macroprudential monetary policy and sovereign default. Banks in Europe hold a large fraction of their portfolio in sovereign bonds, and the demand for government bonds seems to be downward sloping rather than horizontal.[11] This causes what has been called a "diabolic loop," a "doom loop," or a "deadly embrace" between sovereigns and banks.[12]

Imagine that tighter macroprudential policy hurts banks' profitability. If bank net worth is scarce, this leads to a cut in credit, causing a recession, and a deterioration of public finances. Moreover, it increases the probability that the government may end up bailing out the bank, thus lowering future expected fiscal surpluses. Both combine to make sovereign default more likely. But this further lowers the price of government bonds, triggering the loop that amplifies the effect of the initial shock.

A third monetary policy choice has to do with the central bank's goals, and namely the zeal with which it pursues the stability of inflation. A country that goes through a fiscal crisis and cannot pay

[8]Reis (2017) elaborates on this point.

[9]See, for instance, Caballero, Farhi, and Gourinchas (2016) or Benigno and Nistico (2017).

[10]Del Negro and Sims (2015) model this interaction.

[11]For evidence on sovereign holdings by banks, see Altavilla, Pagano, and Simonelli (2017) and for evidence on the downward-sloping demand for Treasuries, see Krishnamurthy and Vissing-Jorgensen (2012).

[12]See Brunnermeier et al. (2016) or Farhi and Tirole (2016), among others.

its debt can either default or try to inflate away the debt.[13] It may well be that the latter is less socially costly. In this case, monetary policy faces a tradeoff: should it stick to its mandate of keeping inflation stable, or should it instead maximize social welfare, which may well involve a sudden burst of unexpected inflation to debase the nominal debt?[14]

Fourth and finally, the Federal Reserve generates fiscal resources in the sense of net income that it earns as part of its activity. In normal times, there is a strict rule that the Federal Reserve remits all of its income to the Treasury, and this happens annually with neither fanfare nor kerfuffle. If the United States finds itself in a fiscal crisis, though, all sources of revenue will be scrutinized. The independence of the Federal Reserve will be at risk insofar as the Treasury may demand it to generate and remit higher revenues. Ultimately though, a central bank can only systematically generate revenues by increasing inflation, printing more bank notes, and collecting the associated seignorage revenue.[15]

6. Conclusion

With public debt at historically high levels across the developed world, and a large amount of central bank liabilities outstanding, the fiscal role of central banks is under the spotlight. Within this broad and important research agenda, BLL's contribution is to show that when there is a chance of sovereign default, then the central bank must be careful about how it measures real interest rates for use in its policy rule.

In these comments, I made four points. First, I argued that the authors' logic implies that higher expected default leads a central

[13]See Reinhart and Rogoff (2009) for the classic historical account of when governments chose one or the other, and Hilscher, Raviv, and Reis (2014) on the ability to the United States today to inflate away its public debt.

[14]See Reis (2013a) for a broad discussion of the goals and design of a central bank.

[15]Sargent and Wallace (1981) is the classic reference on this unpleasant monetarist arithmetic. Reis (2016a) provides a thorough analysis of the components of net income for a modern central bank and of the limited ability of the central bank to generate revenues beyond seignorage from bank notes.

bank that sets a risk-free rate to engage in contractionary monetary policy and obtain lower-than-optimal inflation. Second, I noted that the interaction between the stance of monetary policy and the fiscal position of the government may lead to multiple equilibriums that lead to self-fulfilling sovereign default. Third, I expanded the argument that policy mismatches between the safe real rate and the intercept of the policy rule may have different sources, including mismeasurement of the natural rate of interest, term premium in bond markets, and non-integrated financial markets. Fourth, I pointed to tradeoffs between sovereign default and different monetary policies, namely quantitative easing, macroprudential policy, inflation targeting, and central bank independence.

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