



## Economic Policy Papers

### EXECUTIVE SUMMARY

Most economic models used by central banks prior to the recent financial crisis omitted two fundamental elements: financial markets and liquidity measures. Those models therefore failed to foresee the crisis or understand the policy reaction that followed.

In contrast to more orthodox models, we develop a theory in which credit markets and measures of liquidity are central. Our model emphasizes the role of collateral constraints on credit lines and the role of money in transactions, and it can be used to study the effects of alternative monetary policies during and after a financial crisis.

A key insight from our approach is that a credit crisis characterized by tightened collateral constraints can cause a bout of deflation that exacerbates the constraints and reduces investment, productivity, employment and economic output. Policymakers can curb deflation and soften the recession by issuing more bonds and money, exactly as U.S. fiscal and monetary officials did in 2008.

But our model also reveals an important trade-off in the aftermath of the crisis. Additional liquidity injections necessary to maintain low inflation will partially crowd out private investment and thereby slow economic recovery. The cost of curbing the recession's depth is thus to extend its duration.

# Macroeconomic Policy during a Credit Crunch

*Tightened collateral constraints during financial crises can cause recessions, but liquidity injections that soften such downturns may also lengthen them*

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## Introduction

The Great Recession that followed the failure of Lehman Brothers in 2008 will be long remembered, not only for the massive shock that hit financial markets, but also for the Fed's response: an unprecedented liquidity injection—a dramatic increase in the nation's money supply.

The conceptual orthodoxy that then dominated central bank policy analysis in developed economies had no role for either financial markets or measures of liquidity.

The lack of attention to the role of financial markets seemed reasonable given that a recession of the sort experienced in the United States starting in 2008—which began as a financial crisis sparked by liquidity shortfalls—had not occurred since the Great Depression. Indeed, developed economies had experienced over two decades of growth and stability known as the “Great Moderation.” (See Bernanke 2004.) The economic turmoil experienced during financial crises seemed to afflict only developing economies, not nations with seemingly sophisticated financial markets and regulatory systems.

Measures of liquidity were largely neglected as well. Until the early 1980s, strong empirical relationships had existed among liquidity measures, interest rates and prices. But those links seemed

broken thereafter (during the Great Moderation) and were therefore deemed largely irrelevant to policy analysis. Recent research suggests that this neglect was a mistake, however. Once regulatory changes that occurred during the early 1980s are taken into account, those empirical relationships are seen to have been remarkably stable from the beginning of the 20th century through the present. (See Lucas and Nicolini 2014.)

Because most economic models in use prior to the onset of the financial crisis omitted financial markets and liquidity measures, they gave no warning about impending pressures and constraints. It is fair to say that the crisis took many economists by surprise, as our models failed to address its fundamental elements.

### **A focus on liquidity and credit**

In recent research, Francisco Buera and I develop a new model that can be used to study the effects of alternative monetary policies during and after a financial crisis. (See Buera and Nicolini 2014.) In contrast to more orthodox models, credit markets and measures of liquidity are central to our theory, which emphasizes the role of collateral constraints on credit lines and the role of money in transactions.

A key insight from our approach is that a credit crisis characterized by tightened collateral constraints can cause a bout of deflation that exacerbates the constraints and reduces investment, productivity, employment and economic output. Policymakers can curb deflation and soften the recession by issuing more bonds and money, exactly as U.S. fiscal and monetary officials did in 2008.

But our model also reveals an important trade-off. The immense liquidity injection necessary to prevent deflation will partially crowd out private investment and thereby slow economic recovery. The cost of curbing the recession's depth is to extend its duration.

Our model's simulations closely match the evolution of many features of U.S. economic data since 2008. Therefore, we suggest, it provides an appropriate laboratory to analyze the effects of alternative macroeconomic policies in contexts such as the recent U.S. credit crisis.

In this paper, we explain the model's key features and mechanisms, describe its response to a financial shock and then discuss how alternative policy choices can mitigate a shock's impact. Finally, we compare our theory's policy implications to those of conventional models.

### **The theory**

As mentioned, the key elements of our theory are credit markets that facilitate (or constrict) the flow of funds among entrepreneurs and the relationship between cash and securities insofar as they're used for transactions and saving. We describe each in turn.

### *Credit markets*

Our theory features entrepreneurs who invest in various projects and a financial sector that moves funds among them. Entrepreneurs differ in both personal wealth and investment project quality, and the financial sector channels funds from wealthy entrepreneurs with low-quality projects who seek higher returns to less-wealthy entrepreneurs who have high-quality projects that need financing.

Our model's entrepreneurs must pledge a portion of their own wealth as partial collateral for loans they seek. The higher this collateral constraint, the less capital entrepreneurs with good projects will be able to borrow, lowering overall loan demand and the equilibrium interest rate. Some former lenders may instead invest in their own (low-quality) projects. Thus, the fraction of entrepreneurs who invest in their own projects and the average quality of funded projects both depend on the collateral constraint.

The credit market determines a real interest rate (which is the nominal interest rate adjusted for the expected inflation rate). In normal times, real interest rates are positive, averaging around 2 percent. But if demand for loans falls sufficiently—as it will when collateral constraints tighten—real rates can turn negative.

### *Treasury bills, money and interest rates*

Money and Treasury bills have distinct properties in our model. Money can be used for transactions, while T-bills cannot. Money does not pay interest, while T-bills may. Thus, when the interest rate paid by T-bills is positive, all savings will be held in T-bills (or other such assets), and money will be used only for transactions. However, if the interest rate hits zero, money and T-bills become completely equivalent for savers.

These properties imply that nominal interest rates cannot be negative—there is a zero lower bound. They also mean that the real interest rate (computed as the nominal rate minus expected inflation) cannot be lower than the negative of the expected inflation rate.

### **Reaction to a shock**

Suppose that, following a financial shock, banks tighten lending strategies and increase collateral restrictions. With tighter bank financing, high-quality projects must borrow less, reducing loan demand and the real interest rate. As the rate falls, some former lenders will decide instead to start up their own low-quality projects. This reduces the supply of loans and partially reverses the drop in the real interest rate.

Thus, a worsening of lending conditions reduces borrowing and lending, lowers the real interest rate and increases the number of less-productive projects that get financed. This depresses average productivity. The economy enters a recession.

If policymakers maintain a constant inflation target, the nominal interest rate will move in tandem with the real rate, the difference between the two being the constant inflation target.<sup>1</sup> Real interest rates during normal times are relatively close to zero. A large enough shock will drive them into negative territory, and if the inflation target is small, nominal interest may hit the zero lower bound.

In addition, the shock brings about an initial deflation because, as the real interest rate becomes negative, demand will rise for nominal assets, increasing the price of money in terms of real goods and services. Stated conversely, the general price level must fall: Deflation occurs and will continue until nominal assets have the same future return as real assets.<sup>2</sup>

If private debt contracts are indexed to inflation and wages are flexible, the deflation will have negligible impact on output and productivity. However, if private debt obligations are in nominal terms, borrowers who are active entrepreneurs must borrow even less than before, which worsens the credit constraints. In addition, if wages take time to react, as is typically assumed in the monetary policy literature, the real wage will go up, affecting the creation of jobs till nominal wages fall.

In our simulations, this debt deflation problem can transform a three-year recession with a maximum 5 percent drop in economic output into a four-year recession with as much as an 8 percent drop. On the other hand, wage rigidity can transform a three-year recession with a 5 percent slump into a three-year recession with a 12 percent maximum drop.<sup>3</sup> The two effects combined thus transform a recession into a depression.

Our theory thus rationalizes the interpretation of Milton Friedman and Anna Schwartz in their pathbreaking book, *The Monetary History of the United States*, that the failure to prevent deflation in the 1930s transformed what would have been a major recession into the most dramatic event in U.S. economic history.<sup>4</sup>

## **The role of policy**

An immediate increase in the total supply of nominal government bonds and money can blunt this deflation. Indeed, the Fed pursued exactly this policy, with considerable success.

The increase in nominal government bonds and money is important because deflation occurs when demand increases for a given supply of nominal assets. But if the supply of nominal assets is increased sufficiently, deflation can be avoided, or at least restrained.

What about policies beyond the immediate response? Suppose the shock that worsens credit conditions and tightens collateral constraints lasts for several quarters and then recedes slowly.

During this transition, the central bank's target for inflation is a key policy choice. The larger the inflation target, the lower the bound on the real interest rate. To hit a 2 percent inflation target, policymakers must prevent the real interest rate from falling too low. Which policy can accomplish that?

According to our theory, an expansion of total government liabilities (money plus bonds) can do it, similar to the expansion that followed the fiscal stimulus that started in 2009.

An expansion in the supply of money plus government bonds works through the credit market to lessen the drop in real interest rates caused by credit tightening. Recall that the credit crunch reduces the demand for loans, pushing the real interest rate down. If, at the same time, the government increases its demand for loans, it counteracts the drop in the real interest rate.

Thus, to maintain a low inflation target, policies must prevent the real interest rate from dropping too much. Under such policies, the economy remains at the zero bound, but the government absorbs some of the excess supply of loans created by the tightening of collateral constraints.

This policy has other effects. First, by absorbing some of the excess loans, it keeps capital allocated to the best projects and reduces the drop in average productivity, so the recession is less pronounced. But there is a second, less benign effect. Increasing government liabilities instead of financing real projects crowds out private investment and hampers post-shock capital accumulation. Thus, the recovery following the recession will be slower.

Overall, the results are mixed. The depth of the recession can be reduced, but the pace of the recovery will be slower and the economy will remain at the zero lower bound for a longer period.

### **Our model versus the dominant view**

Central banks typically use two main policy instruments when short-term policy rates are at the zero bound, as has recently been the case in the United States and Europe.

The first instrument is forward guidance, which we interpret as maintaining the short-term interest rate at zero beyond the period recommended by normal interest rate rules (such as the Taylor rule). In standard models, applying forward guidance is unambiguously optimal. In contrast, our model implies that such a policy involves an important cost: It can make the recovery very slow.

The second instrument is quantitative easing. This policy involves retiring long-term government bonds in exchange for short-term ones. In our theory, what matters is the *quantity* of government debt, not its maturity composition. Thus, according to our theory, quantitative easing does not have a significant impact. Mainstream models are ambiguous in this regard.

Finally, the mainstream framework used in central banks ignores the effect of liquid assets, so it's unable to assess the liquidity injections of the Fed and other central banks in September 2008. In contrast, our theory implies that, to the extent that most debt obligations are in nominal terms and wages take time to adjust, those policies may have been key to avoiding a major world depression.

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## Endnotes

<sup>1</sup> We assume here and elsewhere in the analysis that the central bank succeeds in implementing the inflation target, so that expected inflation is equal to the target.

<sup>2</sup> In the last months of 2008 for the consumer price index and till the third quarter of 2009 for the producer price index, the United States experienced just such a deflation.

<sup>3</sup> For parameter values of wage rigidity taken from conventional models used at central banks.

<sup>4</sup> At the Conference to Honor Milton Friedman, then Governor Ben S. Bernanke made the following remarks: Let me end my talk by abusing slightly my status as an official representative of the Federal Reserve. I would like to say to Milton and Anna: Regarding the Great Depression. You're right, we did it. We're very sorry. But thanks to you, we won't do it again." (See Bernanke 2002.)

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