Remarks on Unconventional Monetary Policy*

Lawrence Christiano
Northwestern University

To be useful in discussions about the rationale and effectiveness of unconventional monetary policy, models of monetary economies need to be modified. Progress on this is well under way and I review one approach here.

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1. Introduction

Figure 1 displays the facts that motivate this discussion. Interest rate spreads increased somewhat at the start of the 2007 recession and then widened substantially after August 2008. The Federal Reserve initiated a program of unconventional monetary policy in the fall of 2007, by purchasing privately issued assets and by permitting banks to use privately issued assets as collateral at the discount window. The Federal Reserve's program of unconventional monetary policy accelerated considerably in March 2009. At roughly the same time, interest rate spreads—initially the commercial paper spreads and then corporate spreads—returned to normal. Moreover, asset prices and economic activity began to bounce back from their plunge since late 2007 (see figures 1B and C). These observations raise the following questions:

- What are the economic mechanisms whereby unconventional monetary policy has its impact on interest rate spreads and economic activity?
- What are the market failures that unconventional monetary policy is designed to correct?

There is a wide range of actions that a central bank can take as part of an unconventional monetary policy. For example, it can make

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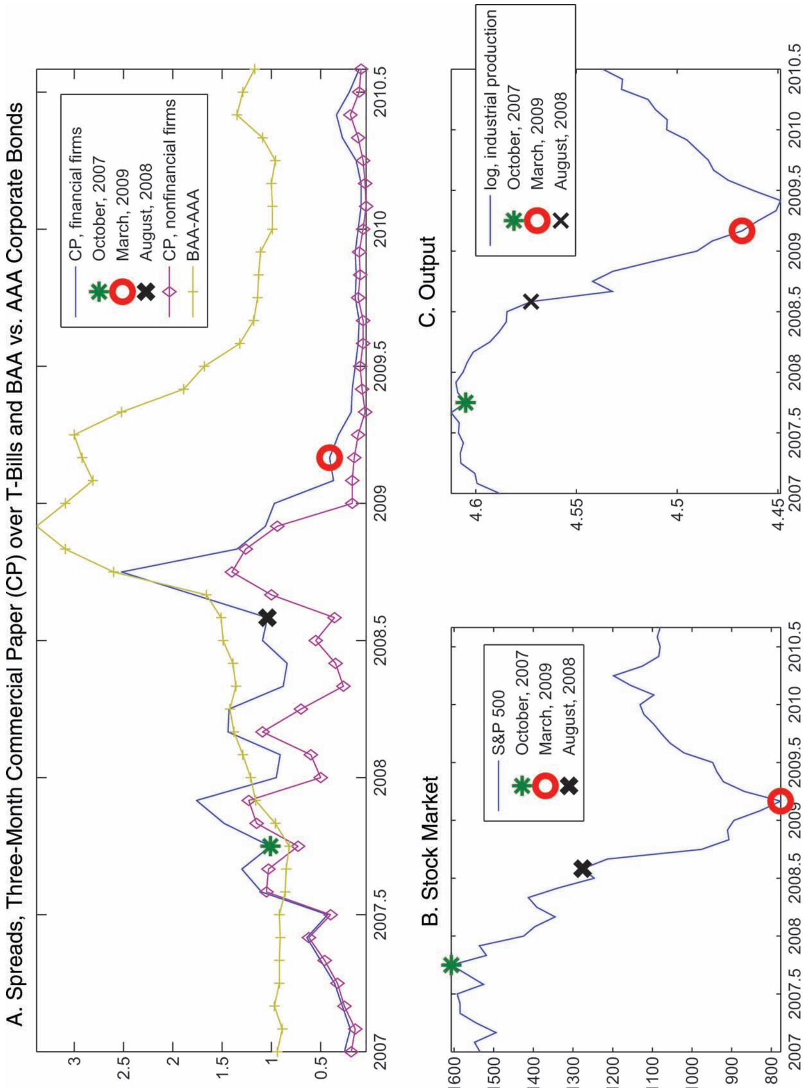
Figure 1. Interest Rate Spreads, Stock Market, and Output



loans to banks, inject equity into banks, or purchase various kinds of asset-backed securities. Answers to the above questions determine which of these actions is desired and at what scale.

To address the above questions requires structural models of the economy that capture the linkages between interest rate spreads and the real economy. Several classic papers laid the groundwork for this long ago. This is why it is that even though little time has elapsed since the start of the recent turmoil, there is now a large number of models in place that can be used to study unconventional monetary policy.[1]

Broadly, there are three approaches to financial frictions. They can be organized around the question, "why are there interest rate spreads?" One answer has to do with liquidity: an asset that is hard to sell quickly in case the holder suddenly needs cash must pay a high return if it is to be held. If everyone comes to think that everyone else is unwilling to part with cash in exchange for financial assets, then there will be a general reluctance to purchase private assets and the liquidity premium on these assets will be high. These considerations were undoubtedly an important factor behind the rise in spreads in 2008, and it may justify the Federal Reserve's purchase of private assets at the time.[2] Another factor underlying interest rate spreads is the possibility of non-payment on risky loans. The approach taken in the work of Bernanke, Gertler, and Gilchrist (1999) and Carlstrom and Fuerst (1997) stresses observed costs associated with default.[3] However, recent work suggests that the very sharp increases in spreads in 2008 were too big to be accounted for by observed bankruptcies.[4] In part, this may be due to increased liquidity spreads. However, the moral hazard approach to interest rate spreads suggests another possibility—that spreads reflected a

[1]See, for example, Christiano, Motto, and Rostagno (2010), Cúrdia and Woodford (2009), Dib (2010), Gertler and Kiyotaki (2010), Hirakata, Sudo, and Ueda (2009a, 2009b, 2010), Meh and Moran (2010), Ueda (2009), and Zeng (2010).

[2]See, e.g., Moore (2009).

[3]The Bernanke, Gertler, Gilchrist (1999) approach has been used to study the financial factors driving recent business cycles as well as in the U.S. Great Depression (see Christiano, Motto, and Rostagno 2003, 2010). The approach has been extended to the analysis of risks in the banking system by Dib (2010), Hirakata, Sudo, and Ueda (2009a, 2009b, 2010), Ueda (2009), and Zeng (2010).

[4]See Gilchrist, Yankov, and Zakrajšek (2009).

fear of out-of-equilibrium default.[5] In my discussion I present a simple two-period example of this possibility, based on the paper by Gertler and Kiyotaki (2010).[6]

2. Model Analysis

The basic idea in the model is that the people who operate the intermediation industry come into contact with large sums of money, presenting them with opportunities to "steal." Stealing need not only mean that bankers literally abscond with money. There are other ways that the same thing can be accomplished. For example, bankers might not make a large effort to manage funds properly (i.e., they "steal" leisure) or they might make investments which do not earn a high return for depositors but do generate benefits for the bankers themselves. Under these circumstances, depositors are understandably reluctant to make deposits in banks. They do so anyway if they believe that bankers have committed their own funds to the industry in a way that if bankers misbehave, the bankers' own funds are put at risk.[7] The idea is that with their own "skin in the game," bankers have an incentive to behave properly. The funds committed by bankers correspond to their net worth. One could imagine that in normal times the net worth of the banking system is sufficient, so that depositors have little concern about mismanagement. However, if the net worth of banks suddenly undergoes a substantial drop (as in 2008), then there may not be enough net worth in the banking system for depositors to feel comfortable about committing their funds. In this case, the banking system functions at a lower rate and fewer projects are funded. To avoid passing up good projects, unconventional monetary policy—a policy in which the central bank takes over part of the intermediation industry—may be desirable and increase welfare.

We now turn to the formal two-period model. There are many identical households, each with a unit measure of members. Some

[5] Recent work on this includes Gertler and Karadi (2009), Gertler and Kiyotaki (2010), and Meh and Moran (2010).

[6] The example is based on ongoing work with Tao Zha. Other examples are reviewed in Christiano and Ikeda (2010).

[7] For an example of this idea, see Holmstrom and Tirole (1997).

Table 1. Problem of the Household

	Period 1	**Period 2**
Budget Constraint	$c + d \leq y$	$C \leq R^d d + \pi$
Problem: $\max_{c,C,d}[u(c) + \beta u(C)]$		

Table 2. Solution to Household Problem

$\frac{u'(c)}{\beta u'(C)} = R^d$	$c + \frac{C}{R^d} = y + \frac{\pi}{R^d}$
$u(c) = \frac{c^{1-\gamma}}{1-\gamma}$	$c = \frac{y+\frac{\pi}{R^d}}{1+\frac{(\beta R^d)^{\frac{1}{\gamma}}}{R^d}}.$

members are "bankers" and others are "workers." There is perfect insurance inside households, so that all household members consume the same amount, c, in period 1 and C in period 2. In period 1, workers are endowed with y goods and the representative household makes a deposit, d, in a bank subject to its period 1 budget constraint (see table 1).

Bankers in period 1 are endowed with N goods. They take deposits and purchase securities, s, from firms. Firms issue securities in order to finance the capital they use to produce consumption goods in period 2. Intermediation is crucial in this economy. Without it, production cannot occur, and period 2 production is the only source of the period 2 consumption goods. In period 2, households receive earnings, $R^d d$, on their bank deposits and profits, π, from bankers. The household chooses c, C, and d to maximize utility subject to the periods 1 and 2 budget constraints (see table 1).

Assuming a constant elasticity period utility function, the solution to the household problem is given in table 2.

We assume that $0 < \gamma < 1$, so that c is decreasing in R^d and d is increasing in R^d. The single intertemporal budget constraint in the model is derived by substituting out for d in the two-period budget constraints and imposing that maximizing households will choose a consumption bundle on the boundary of their budget constraint. According to the intertemporal budget constraint, the present discounted value of consumption must equal the present discounted

Table 3. Problem of the Bank in the Efficient Benchmark Model

Period 1	Period 2
Take Deposits, d	Pay dR^d to Households
Buy Securities, $s = N + d$	Receive sR^k from Firms
Problem: $\pi = \max_d[sR^k - R^d d]$	

value of income. As an aside, the expression highlights the fact that there must be frictions if the purchase of private assets by the government is to have an effect. For example, suppose the government raises lump-sum taxes, T, and uses the proceeds to purchase T securities from firms. Suppose that the government rebates the proceeds of this asset purchase in the second period to households in lump-sum form and that the government earns R^d on the private assets. Then, the household's intertemporal budget constraint is

$$c + \frac{C}{R^d} = y - T + \frac{\pi + R^d T}{R^d}.$$

Note that T cancels in this expression, so that it has no impact on the household's intertemporal consumption opportunities. As a result, the household's decisions about c and C are unaffected by T. Unless the government's purchase of private assets corrects some sort of private market failure, it will induce an equal reduction in private purchases and thus have no effect.

In practice, government intervention has costs that are not included in our model analysis. For example, it is generally understood that if the Federal Reserve purchases too many private assets, at some point it poses a risk to its independence. Central bank independence is crucial if it is to succeed in its mission of price stability. Thus, a policy that has no effect in the model could be very damaging if applied in practice.

We now turn to the banks in our model. We first consider the benchmark case in which there are no financial frictions (see table 3). We suppose that the gross rate of return on privately issued securities is technologically fixed at R^k. Bankers combine their own net worth, N, with the deposits received, d, to purchase securities, s,

Table 4. Definition of Equilibrium

Interior Equilibrium: R^d, c, C, d, π
Such that:
(i) The bank, household, and firm problems are solved.
(ii) Markets for goods and deposits clear.
(iii) $c, C, d > 0$.

from firms. Firms use the proceeds from selling these securities to purchase an equal quantity of goods which they turn into capital. The quantity of goods produced by firms in period 2 is sR^k. Goods-producing firms make no profits, so sR^k is the revenue they pass back to the banks. Banks pay dR^d on household deposits in period 2.

An equilibrium for the efficient benchmark version of the model is defined in table 4. A property of equilibrium is that $R^d = R^k$. To see this, suppose it were not so. If $R^d > R^k$, the bank would set $d = 0$ and if $R^d < R^k$, the bank would set $d = \infty$, neither of which is consistent with the interior equilibria that we study. Thus, in the efficient benchmark the interest rate faced by households coincides with the actual rate of return on capital. It is therefore not surprising that the first best allocations are achieved in this version of the model. That is, the allocations in the efficient benchmark equilibrium coincide with the allocations that solve the following planning problem:[8]

$$\max_{c,C,k} u(c) + \beta u(C)$$

$$\text{subject to} \quad c + k \leq y + N, \; C \leq kR^k.$$

In this economy there is no interest rate spread. This makes sense, since there are no costs associated with intermediation and there is no default.

Now consider the case of financial frictions. The bank has two options. It can choose not to "default," in which case it simply does what it does in the benchmark version of the model. In this case, the bank earns profits

[8] We assume the environment is such that $c < y$.

$$\pi = R^k(N + d) - R^d d.$$

Alternatively, the bank can choose to default. In this case it takes a fraction, θ, of its assets and reneges on its commitment to repay depositors. A defaulting bank receives $\theta R^k(N+d)$ and its depositors receive the rest, $(1-\theta)R^k(N+d)$. The bank chooses the no-default option if, and only if,

$$(N + d)R^k - R^d d \geq \theta(N + d)R^k. \tag{1}$$

Default will never be observed in equilibrium because households would not place deposits with a bank that has an incentive to default.

When the bank's incentive constraint, (1), is non-binding, then $R^k = R^d$ and the no-default condition reduces to

$$NR^k \geq \theta(N + d)R^k.$$

In an economy in which N is large, the above constraint is likely to be satisfied. However, if N is very small (consider, for example, the case $N = 0$), then the condition would fail. In this case, the equilibrium would not be characterized by $R^k = R^d$. Instead, $R^d < R^k$, so that d would be low. Both the high spread, $R^k - R^d$, and the low value of deposits, d, would help ensure that (1) is satisfied.

A sequentially repeated version of this model economy provides a very rough characterization of events before and after 2007. Suppose that N was large in the early period, so that the economy was operating at its efficient level and no part of actual spreads was due to the type of default considerations addressed here. Then, in late 2007 the net worth of banks suddenly began to fall. Spreads opened up, reflecting fears of default. The level of intermediation dropped and economic activity slowed down. The government responded by using tax dollars to make loans directly to firms. This caused spreads to narrow and the economy to begin to expand again.

3. Conclusion

Central bank intervention in private asset markets is potentially very costly. In the case of the United States, such interventions have the potential to put the central bank's independence at risk. This kind of risk should only be taken if the gains are correspondingly large.

Assessing the gains requires models. Such models allow one to decide if intervention is warranted and, if so, what sort of intervention. Fortunately, there is a range of models under development, each focusing on a different set of factors driving interest rate spreads. As an illustration, I briefly sketched a very simple model in these remarks. This model has been incorporated into a full-blown dynamic stochastic equilibrium model usable for policy analysis by Gertler and Kiyotaki (2010).

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