The Provision of Central Bank Liquidity under Asymmetric Information

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Central banks provide liquidity in various contexts to promote the stability and efficient functioning of the financial system. While the exact institutional aspects of liquidity provision vary among central banks, some basic features seem to be generic. First, the provision of central bank liquidity in normal periods is restricted to a small subset of possible agents who are encouraged to compete for liquidity with each other instead of automatically receiving liquidity from the central bank. Second, in extraordinary cases, the central bank has the option of providing liquidity to a much broader range of agents, and this liquidity can be provided independent of financial market conditions.

This article summarizes Chapman and Martin (2007), in which we develop a stylized economic model that captures these features. In the model, the central bank has two instruments with which to inject liquidity into a payments system: an instrument whose use depends on prevailing market conditions (the market-sensitive instrument), and an instrument whose use does not depend on market conditions (the market-insensitive instrument). These two instruments have different effects on the behaviour of agents in the economy.

We find that when the central bank is modelled as having less-precise information than other agents about what actions agents take to insure themselves against credit risk, the optimal policy for the central bank has the features noted above.

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The Model

The key features of the model borrow heavily from the seminal work of Freeman (1996, 1999). The model abstracts from many important features of real-world financial and payments systems but contains the four criteria, stated by Zhou (2000), necessary to effectively model a payments system: First, it captures the underlying transactions that lead to a need for some non-cash payments. Second, the debt instruments used in trade for goods are different from saving/investment debt. Third, there is a potential shortage of liquidity, for at least some agents, when payment debt is settled. Fourth, there exists credit risk that is generated endogenously by the choice of agents.

The model features two types of agents: debtors and creditors, who interact with each other to trade money and short-term debt for goods and later for money to settle the short-term debt. The debtors that trade for goods may default instead of settling their debt. To avoid this default, a creditor can pay the cost of monitoring the debt and thus reduce the probability that the debtor will default (credit risk).

The investment to reduce the probability of default is observable only by other agents in the economy and is not observable by the central bank. This assumption is consistent with two real-world characteristics: First, agents in the financial system can take actions to limit their exposure to credit risk. Second, since the central bank is usually not an active participant in the financial system, its information about these actions is less precise than that of other financial system agents. Thus, at the margin, participants in the banking sector have better information about their counterparties than the central bank.

When these loans are settled, there is a coordination problem in the timing of settlement.

That is, there is a chance that the creditor who is waiting for a debt to clear may have an unexpected need for the funds before the debt is settled. When this happens, the creditor can borrow funds (liquidity) from other creditors, using their unsettled claims as collateral. From the point of view of the other creditors, the unsettled debt may be unsettled either because of a coordination problem in the settlement of debt or because of default.

The market for liquidity

In the model, the interest rate at which creditors are able to borrow is efficient in that it accurately reflects the credit risk inherent in the claims they hold. The total supply of liquidity comes from debts that are already settled. But when the coordination problem is severe, the supply of funds available is small relative to the demand for funds, and there will be a liquidity shortage. In this case, the interest rate that equates the supply of liquidity to the demand for liquidity will primarily reflect a liquidity premium and will not accurately reflect credit risk. Previous work (Freeman 1996, 1999; Martin 2004) has shown that such a liquidity shortage is suboptimal and requires the central bank to intervene with a temporary injection of liquidity.

Central bank liquidity provision

If the model contained no credit risk, it would be optimal for the central bank to intervene directly to eliminate the liquidity shortage. Indeed, since the coordination problem in settling debt does not arise because of a choice made by agents, the central bank's intervention would not affect incentives to monitor. The problem is attributable to a missing market that would coordinate the settlement of funds at an exact time within a day. The central bank's intervention, in this case, can be viewed as an attempt to correct the inefficiency arising from the missing market.

When there is credit risk and agents can take on too much of this risk, the optimal action for the central bank is not as straightforward. Agents in the economy form rational expectations about the effect that the central bank's policy will have, and they will behave accordingly. If the central bank's policy on providing liquidity is too liberal, it will increase the credit risk in the financial system, since it will reduce the incentive for private agents to monitor credit risk. This distortion of incentives is caused by two factors: First, the central bank in the model will misprice liquidity because of its less-precise information. Second, if the central bank intervenes and provides liquidity by extending uncollateralized loans, it would distort the allocation of credit risk in the financial system by taking credit risk on its own books at an incorrect price.

The market-sensitive instrument

If the central bank provides liquidity to all creditors in a way that is not conditional on any market variables, then creditors will have no incentive to put any effort in avoiding credit risk, since the price that they are charged for liquidity from the central bank is not affected by the amount of monitoring they do. Since they gain no benefit from monitoring, agents will not monitor their exposure to credit risk. And the central bank will again take on credit risk from agents when it provides liquidity. It follows that an optimal policy must be conditional on the underlying market price for liquidity.

For liquidity provision to give the correct incentives to all creditors, liquidity must be provided to a subset of the creditors. This subset (i.e., central bank counterparties)[1] has more-precise information than the central bank about the amount of monitoring of credit risk. They use this information when supplying liquidity to the rest of the payments system, thereby charging the correct price. Agents in the economy who are not central bank counterparties then know that the price they have to pay for liquidity will depend on the amount of credit-risk monitoring that they undertake. They will therefore choose the amount of monitoring that equates the cost of monitoring to the expected cost of obtaining liquidity.

The optimal policy should be set up to encourage competition between the central bank counterparties. Without this competition, these counterparties would use their privileged position to earn economic rents. In addition, liquidity should

1. In the working paper, these are referred to as primary dealers. The term "central bank counterparty" is used here to avoid confusion, since the term "primary dealer" is used in Canada to denote distributors of government securities whose participation in primary and secondary markets for Government of Canada bonds is above a certain threshold.

be provided to the central bank's counterparties on a collateralized basis, so that all credit risk resides with the agents in the economy and not with the central bank.

A role for the market-insensitive instrument

To be effective, the optimal policy described by the model (a market-sensitive policy) has two requirements. First, it needs a well-functioning market for liquidity. Second, it requires that the central bank know exactly how much liquidity to supply to its counterparties. The lack of either of these requirements implies a role for a market-insensitive policy to supplement the market-sensitive policy.

In certain situations, however, the market for liquidity may be disrupted. In these cases, the first requirement is missing. When this happens, liquidity must be provided using a market-insensitive policy, since the market among the central bank's counterparties is not functioning properly.

If the second requirement is missing, then the central bank in the model does not know the amount of liquidity demanded by the market, and it must forecast the amount of liquidity to inject. Large errors in the central bank's forecast will cause distortions in the pricing of credit risk. A market-insensitive policy that is set so that it is inactive in normal market conditions will help limit such distortions; it will provide an upper bound on the effect that errors in the forecast of liquidity can have.

Liquidity Provision by the Bank of Canada

In general, the provision of liquidity by the Bank of Canada to the financial system is centred on its monetary policy framework.[2]

Liquidity provision by the Bank shares some of the key features implied by the model, although it is significantly more complex. First, in normal circumstances, the model suggests that the central bank should use a market-sensitive policy, which is intended for a small subset of all market participants. In the case of the Bank of Canada, open market buyback operations (special purchase and resale agreements and sale and repurchase agreements) and the Large Value Transfer System (LVTS) cash setting are essentially market-sensitive policies. The use of open market buyback operations is based on market conditions (including importantly, observed rates in the overnight market); they are transacted with only a subset of the market; and they are carried out in such a way that virtually no credit risk is assumed by the Bank of Canada. The Bank can adjust the targeted level of settlement balances depending on actual and expected conditions in the overnight market (Arjani and McVanel 2006). Access to these settlement balances is restricted to direct participants in the LVTS.

Second, when it is difficult to accurately forecast the level of liquidity needed, the model suggests that the central bank should provide liquidity through a market-insensitive policy. This policy should be designed in such a way that it encourages participants to transact with each other for their liquidity needs and use the market-insensitive instrument only for unexpected shortfalls. In the case of the Bank of Canada, the Standing Liquidity Facility (SLF) is available to LVTS direct participants experiencing temporary unexpected shortfalls in their end-of-day settlement balances. The rate paid on loans from the SLF encourages direct participants in the LVTS to seek liquidity from each other rather than from the SLF.[3]

Finally, the model suggests that in extraordinary circumstances the central bank should provide liquidity to a larger set of participants through a market-insensitive policy. In cases of extraordinary stress, the Bank provides Emergency Lending Assistance (ELA) to member institutions in the Canadian Payments Association, not only to the direct participants in the LVTS, under the restrictions set out in its policy.[4]

2. Details of the Bank of Canada's framework for implementing monetary policy may be found in Bank of Canada (2007). For a description of how the Bank of Canada has recently used some of these facilities, see Box 3 on p. 12.

3. The rate paid to use the SLF is 25 basis points above the target overnight rate, while the rate that the Bank of Canada pays on balances left with it overnight is 25 basis points less than the target overnight rate.

4. For a fuller description, see Daniel, Engert, and Maclean (2004–05).

Conclusion

Our model suggests that central bank liquidity is best provided through a tiered structure: The central bank provides liquidity to a subset of the market that, in turn, provides liquidity to others. This is fundamentally because the provision of liquidity by the central bank can distort the price of credit risk in the market to which the liquidity is provided. The model implies that a central bank that has relatively less information than market participants should effectively delegate the monitoring of credit risk to a subset of the market.

The Bank of Canada's policy for liquidity provision shares many of the policy features that are optimal in this model. In particular, it has the aspects of limited access and market sensitivity in normal circumstances and wider access in extraordinary circumstances.

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