Understanding the cost difference between intraday and overnight liquidity[1]

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In most countries, the cost of reserves intraday is very close to zero. Many central banks, including the European Central Bank (ECB), the Bank of England, or the Swiss National Bank allow collateralized intraday borrowing at no cost. In the U.S., banks are allowed to incur uncollateralized daylight overdrafts for which they incur a small fee[2]. In contrast, most countries rely on a positive marginal cost of overnight reserves for the implementation of their monetary policies. In the Euro Area, the cost is at least as large as the difference between the policy rate and the rate the ECB pays on reserves deposited by banks, which is 100 basis points. In the U.S., the cost corresponds to the Fed funds target, since the Fed does not pay interest on reserves.

A considerable literature in payment economics has been devoted to understanding this difference. Early work focused on understanding the reason for the low cost of intraday reserves. It stressed the incentives for banks to delay payments when intraday reserves are costly. A low cost of liquidity can help prevent potential gridlocks resulting from the incentive to delay. Another stream of research has emphasized the risk sharing benefits of low cost intraday reserves. Intraday liquidity needs are very volatile and a high cost of reserves would penalize unlucky banks with high liquidity needs on a given day. Both arguments focus mainly on understanding the low cost of intraday reserves.

Recent papers suggest that the difference between the cost of intraday and overnight reserves could be an application of the Friedman rule, intraday, in an environment where the Friedman rule is not optimal overnight. Friedman's (1969) argument can be stated as follows: central bank reserves can be created at almost no cost. If such reserves are valuable, they should be supplied until the marginal cost to society from supplying them equals the marginal benefit to society, which can be associated with the benefits to banks in this case. Hence, the cost of reserves to bank should be almost zero.

This argument could apply to overnight as well as intraday reserves. However, it is common central bank practice to have a positive cost for overnight reserves. Some recent work has attempted to understand why this may be the optimal policy, but this remains an open question. Whether overnight reserves should be costly at the margin is particularly important now that the Federal Reserve has received authority to pay interest on reserves, starting in 2011.

The role of overnight and intraday reserves

Deposits held by commercial banks at central banks, which we call bank reserves, play an important role in the monetary system. This role is different intraday and overnight. To understand these different roles, it is useful to have some institutional details in mind.

Banks use reserves held on a central bank account to make payments to each other as well as to auxiliary systems such as securities settlement systems, retail payment systems, or special-purpose foreign exchange settlement systems. The large amount of reserves needed for these payments to take place generates a demand for intraday reserves.

In many countries, banks also hold reserves at the central bank overnight. Some central banks, such as the European Central Bank (ECB) or the Federal Reserve, impose reserve requirements. Others, such as the Bank of England, allow banks to choose voluntary contractual reserves[3]. In addition, banks may hold reserves for precautionary purposes. Whatever the reason, this generates a demand for reserves overnight. These two types of demand for reserves are related since reserves held overnight can be used to make payments intraday. Hence, a bank could reduce its need for intraday reserves by increasing the amount of overnight reserves it holds. Note, however, that intraday reserves cannot fulfill a bank's contractual or required reserves requirements. This limits the ability of banks to reduce their holding of overnight reserves by increasing intraday reserves.

Suppose a bank's demand for reserves is perfectly predictable. If obtaining additional reserves during the day is more expensive than holding reserves overnight, then banks would choose to hold all their reserves overnight and would not get additional daylight reserves. In contrast, if the cost of daylight reserves is lower than the cost of overnight reserves, then banks would only hold as much overnight reserves as they are required to and get daylight reserves to meet their demand. If the demand for reserves is not perfectly predictable, the demand for intraday and overnight reserves may change more smoothly with the relative prices of the two kinds of

1 The views expressed herein are those of the authors and not necessarily those of the Federal Reserve Bank of New York or the Federal Reserve System.

2 The fee is explained and determined by the Board of Governors Payment System Risk Policy. See http://www.federalreserve.gov/paymentsystems/psr/default.htm for an explanation. Also see http://www.federalreserve.gov/newsevents/press/other/20080228a.htm for a proposal to change the Federal Reserve's method of supplying daylight reserves. Under this proposal, banks would be able to obtain daylight reserves either on a collateralized basis at no cost or on an uncollateralized basis for an increased fee.

3 The Federal Reserve allows banks to hold voluntary reserves, called contractual clearing balances, in addition to their required reserves.

reserves. Banks may need to hold precautionary levels of either kind of reserves to protect themselves against large shocks.

In practice, however, the two demands are largely independent because the cost of intraday reserves is so low. Banks hold as little overnight reserves as they can to satisfy their contractual or required reserve requirements and obtain intraday reserves to meet any additional needs. Because of this independence, the provision of intraday liquidity by the central bank is associated with payments policy, since it affects the ease with which banks can make payments to one another or to auxiliary systems. The provision of overnight liquidity is associated with monetary policy, since central banks often set monetary policy by targeting the overnight interest rate.

The cost difference between intraday and overnight reserves

Considerable research in payment economics has been devoted to understanding the difference in cost between intraday and overnight reserves. In this section, we describe three types of arguments suggesting that intraday liquidity should have a cost of zero, or very close to zero.

The first argument is based on the idea that lowering the cost of reserves during the day reduces banks' incentives to strategically delay sending payments, therefore improving the liquidity of the payment system. Suppose, as is the case in practice, that the cost of overnight reserves is positive and that there is no intraday market for reserves. In most payment systems, banks face no pecuniary cost of delay. Hence, banks will try to minimize the risk that they have to borrow intraday if it is costly to do so. Assuming that the behavior of other banks does not change, a bank can reduce its need to borrow reserves by delaying sending payments, since payments from other banks increase the reserves of the delaying bank. While this behavior is individually rational, it does not reduce the borrowing needs of the banking system as a whole. Hence, all participants have the same incentives to delay payments thereby potentially creating gridlock [Angelini (1998, 2000), Bech and Garratt (2003), Kahn and Roberds (1999), Mills and Nesmith (2008)].

The second argument rests on the idea that central banks can provide insurance against the risk of incurring large intraday overdrafts. Since the timing of payments received and sent by banks is very volatile, two banks with identical reserve positions at the opening and the closing of the market may have very different needs for reserves throughout the day. For example, one institution may make a lot of payments early in the morning before it receives offsetting receipts. Another institution may receive many payments before it needs to make any. Hence, these otherwise identical banks face potentially very different costs, if intraday reserves are costly. The central bank can insure banks against that risk because it has the ability to temporarily expand the supply of reserves at practically no cost. Banks with high liquidity needs will not bear a heavy cost if the price of intraday credit is very low [Green (1997), Kahn and Roberds (2001), Martin (2004), Zhou (2000)]. It should be noted that providing intraday liquidity at a low price is only possible because an intraday loan cannot be rolled over into an overnight loan. Otherwise, the low price of intraday liquidity could conflict with other monetary policy goals as banks would prefer to roll over inexpensive intraday loans rather than pay the higher cost of overnight reserves.

The third argument is that a low cost intraday liquidity can also be viewed as an application of the Friedman rule. Friedman (1969) argued that the return on money should be equal to the return on short-term, riskless assets so that there is no opportunity cost of holding money. The returns are equalized if the nominal interest rate on short-term riskless assets is equal to zero, since this is the return on money. Alternatively, the opportunity cost of reserves will be close to zero if it is possible to borrow the reserves at little or no cost. In that case, banks will not expend costly resources in sequencing their payments to avoid the costs of borrowing reserves during the day, hence improving efficiency. It can be shown that the cost of intraday liquidity should be zero even in an environment in which it is optimal for the cost of overnight liquidity to be strictly positive [Millard et al. (2006), Bhattacharya et al. (2007)].

In practice, central banks do not provide intraday liquidity at zero cost, but at a very low cost. The cost may come from collateralization requirements or from a small fee for borrowing reserves intraday. These deviations from the Friedman rule-like prescription can be justified by the fact that theoretical models do not take into account some features of the environment in which central banks operate, such as credit risk and cost recovery [Mills (2006)]. The key message from this section is that there is broad agreement between central bank practice and the prescription of economic theory on the fact that the cost of intraday reserves should be very low.

What should the cost of overnight reserves be?

There is much more disparity among central banks concerning the cost of overnight reserves and the economic literature has not reached a consensus on what the cost of overnight reserves ought to be. Among central banks, the cost of overnight liquidity can vary sharply. For example, the Federal Reserve does not yet have the authority to pay interest on reserves[4]. Hence, the cost of overnight reserves is equal to the Federal funds rate, and changes whenever the Federal Open Market Committee chooses to modify this rate. The ECB pays interest on reserves but at a rate that is 100 basis points lower than its policy rate. Hence, while the cost of overnight reserves does not change with the policy rate in the Euro Area, it is still much larger than the cost of intraday reserves. Finally, since

4 In 2006, the Federal Reserve received explicit authority to pay interest on reserves, starting in October 2011.

October 2006, the Reserve Bank of New Zealand (RBNZ) pays on overnight reserves at its policy rate. Hence, the opportunity cost of such reserves is zero [Nield (2006)].

In the academic literature, the Friedman rule has proved to be a very robust prescription of many models of monetary economies. Because Friedman's prescription is at odds with the practice of many central banks, a recent literature has developed that tries to understand the frictions needed to reconcile theory and practice [Bhattacharya et al. (2005), and the references therein].

Many central banks rely on a positive cost of overnight reserves to obtain a downward sloping demand curve for these reserves. The central bank is then able to implement the interest rate it desires by setting the supply of overnight reserves equal to the demand for reserves at that rate [Keister et al. (forthcoming)]. If demand curve is downward sloping, only one level of supply of reserves intersects the demand curve at exactly the desired rate. This is the way monetary policy is implemented by the Federal Reserve and the ECB, among others.

The experience of the RBNZ shows that a downward sloping demand curve, and thus a positive cost of overnight reserves, is not necessary for the conduct of monetary policy. In New Zealand, the cost of overnight reserves is zero since the RBNZ pays interest on reserves at the policy rate. The demand curve for reserves becomes horizontal at the policy rate and by supplying enough reserves, which allows the RBNZ to achieve its policy objectives. A potential benefit of this kind of implementation framework is that it allows the central bank to have a greater flexibility in choosing the supply of reserves [Keister et al. (forthcoming)].

The cost of reserves faced by economic agents should be related to the opportunity cost of these reserves to society. Bhattacharya et al. (2007) argue that if overnight reserves are substitutable with more productive assets, then these reserves should come at a cost to ensure they are not overused. Intraday reserves, in contrast, are not substitutable with more productive assets since they have a very short horizon and cannot be rolled over. They should thus have a very low cost, since reserves are practically costless to produce.

Conclusion

An important puzzle in the economics of payments is the difference in cost between intraday and overnight reserves. Central banks typically supply intraday reserves at a very low cost. In contrast, the cost of overnight liquidity is much higher. In this article, we argued that central banks' policies concerning the supply of intraday reserves are very similar and are broadly consistent with the academic literature. Hence, there is not much debate about how to supply intraday reserves. We have also argued that central bank policies concerning the supply of overnight reserves differ considerably from one central bank to another. Moreover, the academic literature has not achieved a broad consensus on the optimal cost of overnight reserves.

The question of the optimal cost of overnight reserves is important in light of the fact that the Federal Reserve has received the authority, starting in October 2011, to pay interest on reserves. If the optimal marginal cost of overnight reserves is very small, as suggested by Friedman (1969), then the Federal Reserve should pay interest on overnight reserves at the policy rate, as the RBNZ currently does. However, if the optimal marginal cost of overnight reserves is high, then the Federal Reserve needs to maintain a sufficiently large gap between its policy rate and the rate it pays on reserves.

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