

AN ECONOMIC PERSPECTIVE ON THE ENFORCEMENT OF CREDIT ARRANGEMENTS: THE CASE OF DAYLIGHT OVERDRAFTS IN FEDWIRE

- The Federal Reserve’s extension of daylight overdrafts to banks exposes the central bank to some credit risk during the day.
- The Fed manages this exposure through a combination of tools, including monitoring, an awareness of banks’ reputations, and collateral requirements.
- Under a proposed policy change, the Fed would supply intraday balances to healthy banks through collateralized and uncollateralized overdrafts; banks would be allowed to pledge collateral voluntarily to support intraday overdrafts.
- An analysis of the increased use of collateral resulting from the change points to potential benefits—as well as costs—for the Federal Reserve, banks, and the financial system.

1. INTRODUCTION

Credit arrangements between a borrower and a lender are a prevalent part of the economy. A fundamental concern for any lender is the risk that the borrower fails to fully repay the loan as expected, a type of risk called *credit risk*. Thus, lenders want credit arrangements that are designed to compensate them for—and help them effectively manage—credit risk.

In certain situations, central banks engage in credit arrangements as lenders to banks. For example, the Federal Reserve offers certain banks overnight loans at the discount window. Additionally, it provides liquidity to many banks during the day whenever those banks must overdraw on their Federal Reserve accounts in order to make payments and settle securities. This extension of *daylight overdrafts* by the Fed can be interpreted as very-short-term credit, so the central bank is exposed to credit risk that it must manage.

This article discusses how the Federal Reserve manages its credit risk exposure from daylight overdrafts. We first present a simple economic framework for thinking about the causes of credit risk and the possible tools that lenders have to help them

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manage it. We then apply this framework to the Federal Reserve's Payments System Risk Policy, which uses a variety of tools to manage credit risk. Finally, we discuss a possible increase in the use of collateral as a credit risk management tool, as presented in a recent policy proposal published by the Board of Governors of the Federal Reserve System (hereafter, the Board) that considers changes to its Payments System Risk Policy (Board of Governors of the Federal Reserve System 2008).

2. A FRAMEWORK FOR THINKING ABOUT CONTRACTUAL RELATIONSHIPS

Economists have developed a framework for thinking about contracts in general and credit arrangements in particular. We now summarize and illustrate the main elements of this framework. The emphasis is on first principles, an approach that provides a helpful basis for policy analysis.

2.1 Bad Luck versus Opportunistic Behavior

A borrower may not fully repay a lender for one of two reasons: bad luck or opportunistic behavior. By "luck," we mean all random factors that affect borrowers' and lenders' actions and that are independent of their behavior. For example, weather is a random factor that can influence a farmer's yield of corn independent of the amount of effort the farmer exerts. The effect of luck can typically be priced into a contract.

In contrast, opportunistic behavior—a privately beneficial action that increases costs to the other party in the transaction—typically cannot be priced into a contract. Opportunistic behavior occurs when borrowers may not have sufficient incentive to do all they can to repay their debts. In the example of the farmer, the lender wants the farmer to put forth great effort to yield a large amount of corn and would like to be assured that the farmer will do so. The farmer is opportunistic if he does not work very hard in the field. By not working very hard, he may not yield enough corn to fully repay his debt to the lender.

Why do borrowers have an incentive to engage in opportunistic behavior? At the time a credit arrangement is made, all borrowers promise to repay their debt. Otherwise, lenders would refuse to lend. Once the loan is made, however, borrowers have an incentive to renege on their promise and default. The economic decision of the borrower is *time inconsistent*. In other words, the best decision at a given time (the promise made at the beginning of the credit arrangement to repay the loan) may no longer be optimal later because of the

consequences of the original decision (once the loan is obtained because of the promise to repay, the borrower no longer wants to repay it). Anticipating this outcome, the lender may choose to forgo making the loan in the first place.

2.2 Enforcement

To achieve a good outcome, borrowers would like to be able to *credibly commit* to not renege on their promise. A strong enough commitment can sufficiently address the time-inconsistency problem.¹ Experience shows, however, that this kind of commitment is difficult to make. Institutions, formal or informal, that help economic agents make credible commitments are said to provide *enforcement*. Courts are an example of such institutions, but many other examples exist.

If enforcement were costless to lenders, they could adequately control opportunistic behavior and it would not affect the decision to lend and the determination of the interest rate to charge. Lenders would typically charge an interest rate sufficient for them to cover the risk of bad luck in the credit relationship.

2.3 Information Problems

Enforcement is rarely, if ever, costless. In particular, a lender may have inadequate information about some actions or traits of the borrower. Economists distinguish between two types of information problems: *moral hazard* (or hidden actions) of the borrower and *adverse selection* (or hidden types) of borrowers.² Consider this example of moral hazard. It is well understood that if a bicycle is insured against theft, its owner is less likely to protect it as carefully as if it were not insured. The hidden action here is how carefully the owner protects the bicycle. Since the insurance company is unable to observe this action, it cannot make the insurance contract dependent on it.

An example of the adverse selection problem is found in the health insurance industry. The hidden type here is an

¹ A classical example of solving a time-inconsistency problem with credible commitment is found in the Greek myth of Ulysses and the sirens. Ulysses would like to hear the song of the sirens, but knows that once he does, he will be compelled to change the course of his ship and crash it against the rocks on which the sirens are standing. To enforce his commitment to not change course, Ulysses asks his sailors to bind him to the mast of the ship and to put wax in their ears. The wax will prevent the sailors from hearing the sirens and from hearing Ulysses when he asks his sailors to change course. Such elegant solutions to an enforcement problem are, unfortunately, not always available.

² Moral hazard and adverse selection are terms from the insurance markets, where these problems were first studied.

individual's health. Someone who seeks health insurance knows his or her health better than the insurance company does. Individuals who believe they are likely to need a lot of medical attention, for instance, will want to choose insurance with better coverage.

In the context of a lending relationship, the lender may not be able to observe what the borrower does with the loaned funds. In the farming example, will the farmer buy equipment that will allow for a greater yield of corn, increasing the likelihood that the loan will be repaid? Or will the farmer instead buy a big-screen television, leading to lower effort and making it less likely that the loan will be repaid? Similarly, the lender may not be able to observe the borrower's type. A lender will be more reluctant to lend to a farmer who has previously defaulted on other loans, which would suggest that this borrower is not a good type compared with a farmer who has never defaulted.

Borrower actions or types may be hidden from the lender, in which case they are called *unobservable*. Alternatively, they may be observable to the lender but hidden to parties outside the lending relationship, such as courts of law, in which case they are called *unverifiable*. In the previous example, the farmer's

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use of fertilizer is observable and verifiable if the lender is able to ascertain whether fertilizer was used and if, in addition, a court is able to establish that fact. However, the quality of the fertilizer used may be observable but not verifiable if, for example, the lender can analyze the fertilizer but cannot prove to a court, or any other third party, that the farmer used a particular fertilizer of a certain quality. Finally, whether the farmer used the correct amount of fertilizer may be unobservable and unverifiable because neither the lender nor a third party can determine how much fertilizer was used.

Information that is either unobservable or unverifiable is typically called *private*—as opposed to *public* information,

which is both observable and verifiable. Economists therefore classify contractual situations as either of two types: 1) those in which perfect enforcement is possible because all relevant information is publicly available and 2) those in which there is only imperfect or costly enforcement because at least some relevant information is private.

2.4 Enforcing Contracts through Reputation, Monitoring, and Collateral

The information frictions described above can create credit risk over and above the risk that might come only from bad luck. Because of information frictions, a more sophisticated policy than simply charging an interest rate for a loan might be necessary. As we observed, when credit risk arises only from bad luck, no additional policy is necessary because nothing can be done to affect the probability that the loan will be repaid.

In principle, there are several ways to alleviate enforcement problems, and each method is costly. Because enforcement is not perfect, a trade-off always exists between better enforcement of contract terms and more costly means of ensuring enforcement. Among the ways of enforcing contracts in situations of imperfect information are *reputation*, *monitoring*, and *collateral*. We consider each of them in turn and provide an example of how a loan for a construction project uses all three.

Reputation

In cases of repeated interactions, the terms of a contract can depend on past actions. Borrowers can obtain better terms by establishing a reputation for good behavior. Reputation is achieved by showing a willingness to refrain from short-term opportunism. Reputation can be thought of as a way to make private information about one's type more public. In particular, it signals to a potential lender that a borrower is more interested in long-term outcomes (possibly because he or she wants to avoid punishments that restrict access to future loans) than any short-term gains achieved by defaulting on a loan. Reputation, therefore, can typically alleviate problems associated with adverse selection. In the case of a construction loan, a building contractor who wants to finance a new project may rely on reputation in negotiating terms for a new loan. A solid credit history increases the contractor's chances of securing a new loan and allows him to negotiate favorable terms.

Monitoring

Lenders can prevent opportunism by closely monitoring borrowers' actions, by screening and certifying their quality and that of their project, or, after a default, by verifying the quality and amount of their assets and operations. Monitoring can be thought of as a way to acquire information that would otherwise be private. As a result, monitoring can typically help alleviate the incentive issues associated with both moral hazard and adverse selection. In monitoring construction loans, for example, lenders conduct periodic inspections and require status reports from the contractor or independent third parties as a way to keep track of the project's progress.

Collateral

By posting collateral, the borrower offers a type of guarantee to the lender. Collateral may be something that has value to the lender so that the lender is at least partially compensated in case of default. In that particular case, the collateral plays an insurance role and need not have any value to the borrower. Collateral may also be something that has value to the borrower so that its loss punishes the borrower in case of default. In that case, the collateral plays an incentive role and need not have any value to the lender. In practice, collateral typically plays

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both roles in that it usually has some value to both the borrower and the lender. It is the incentive role that is most important from the perspective of reducing information frictions. Thus, collateral typically helps alleviate the incentive problems associated with moral hazard.

Various assets can be pledged as collateral. For example, loans for such durable goods as houses, cars, and boats are often secured by the goods themselves. In the financial sector, securities and other financial assets can be used as collateral for various types of loans. In our construction loan example, once a project is complete and a building is ready for sale, the contractor can convert the loan into a standard mortgage, which requires that the new building be pledged as collateral.

This conversion can provide the borrower with more favorable terms, such as a lower interest rate.

Depending on the circumstances, some of these ways to alleviate enforcement problems may be more or less costly or efficient. Reputations may be costly or impossible to maintain if there are not enough opportunities to signal one's type—for example, if relationships are short lived or if the economic environment evolves quickly and in unpredictable ways. Monitoring can be difficult or costly because it may require very specific and technical knowledge or because it may be possible to misrepresent the true state of a project. The use of collateral, too, is not without cost; there are costs involved in valuing and managing it. The collateral may have more value to the borrower than the lender, which implies that, in the case of default, the collateral is transferred from one agent that gives it a higher valuation to another agent that assigns it a lower valuation. This reallocation results in a loss to society. There may also be a cost associated with rationing credit if the collateral is insufficient.

Finally, technological advances can also change the relative costs and benefits of the various ways of alleviating enforcement problems. For example, innovations in information technology have improved recordkeeping and the transmission of information. The effect of improvements in information technology has likely reduced the costs of reputation, monitoring, and collateral, making these tools more effective at reducing information problems. The ability to keep better records enables borrowers to signal information about their reputations. It also allows lenders to gather and evaluate information quickly, which reduces the cost of monitoring. Furthermore, better information technology can improve lenders' evaluations of certain assets that can be pledged as collateral, reducing some uncertainty regarding the collateral's value.

3. THE CASE OF DAYLIGHT OVERDRAFTS ON FEDERAL RESERVE ACCOUNTS

We now turn to the specific case of the Federal Reserve's policy regarding daylight overdrafts on accounts that banks have at the Fed.³ Most, but not all, of the value of overdrafts arises from banks' Fedwire activity.⁴ Fedwire is a large-value payments system and a securities settlement system that banks use to send

³ See Board of Governors of the Federal Reserve System (2007).

⁴ Overdrafts can also arise from check clearing and settlement via the Automated Clearing House services provided by the Federal Reserve. The Federal Reserve's overdraft policy applies to the net account balance resulting from activity over all Federal Reserve services to banks. Here, we focus on Fedwire because most of the value of overdrafts is the result of Fedwire activity.

each other funds and government securities on behalf of their customers and their own accounts. Transactions are sent over Fedwire one at a time with finality, which means that the Federal Reserve guarantees that the funds or securities a bank receives will not be revoked.⁵ Because transactions are processed one at a time, banks must have access to enough funds to complete each transaction. This need for available funds generates various frictions that banks face in the settlement of transactions, such as search frictions, timing frictions, and incentive frictions (see box).

The Federal Reserve alleviates the impact of these frictions by providing intraday liquidity,⁶ which allows qualifying banks to overdraw on their Fed accounts in order to make payments via Fedwire. Banks can acquire overdrafts throughout the day to make payments, but must ensure that their accounts are not in a negative position at the end of the day. The Federal Reserve's provision of liquidity through daylight overdrafts can be interpreted as very-short-term credit.

This exposure is something the Federal Reserve must manage to protect itself from moral hazard or adverse selection problems that may arise from the type of information frictions described earlier. For example, because the Fed does not observe all the actions of banks, it may be concerned that some banks could use daylight overdrafts to finance excessively risky bets. Similarly, the Reserve Banks may not have full information regarding a bank's risk of default on daylight overdrafts. The Fed currently manages its exposure to this form of credit risk with a combination of overdraft fees, reputation, monitoring, and collateral. We now turn to some specifics of the policy to make this connection clearer.

The Federal Reserve charges an explicit price for daylight overdrafts, currently a twenty-four-hour rate of 36 basis points less a deductible. This price, though small, is meant to provide an incentive for banks to minimize their use of daylight overdrafts. But even though this fee may help constrain the size of daylight overdrafts, and accordingly the Federal Reserve's credit exposure, it does not address the information frictions of adverse selection and moral hazard. Thus, other aspects of the policy address those issues.

The daylight overdraft fee provides some incentive for banks to constrain the size of their daylight overdrafts. In addition, the Fed uses a *net debit cap*, which is the maximum dollar amount of daylight overdrafts that an institution may incur in its Federal Reserve account. Each bank that has an

⁵ Although transactions cannot be revoked, that does not mean that they cannot be reversed. Reversals, however, are conducted by initiating a second irrevocable transaction.

⁶ Note that some of these frictions are attributable to imperfect information and the absence of commitment. However, we focus here on the incentive problems arising from the provision of intraday liquidity by the Reserve Banks.

Frictions in the Payments System^a

Search Friction

A search friction refers to the efforts that would be necessary for a payer (the party that intends to send a payment to some other party) and potential liquidity providers to make contact with one another and to determine the right amounts of liquidity to transfer to the payer's accounts. If a payer did not have sufficient funds in its account and did not have access to overdrafts provided by the central bank, it would have to borrow the amount of the payment prior to sending it. But from whom should it borrow? The payer would not necessarily know which other party has sufficient funds in its account, and so it must search for such a lender.

Timing Friction

The timing friction refers to the operational difficulty of achieving the precise timing for when funds will be delivered during the day. Even if parties overcome the search friction and agree on a particular amount of funds to be delivered by one participant to another for the purpose of funding some time-critical payments of the borrower, how will the borrower be assured of receiving the funds at the given time? A commercial bank may have operational difficulties or experience delays for other reasons. The borrower would simply have to wait for delivery of the funds, which reduces the benefits of the arrangement.

Incentive Frictions

There are two incentive frictions to confront in adapting to a withdrawal of daylight credit. First, the rewards of providing intraday funding need to appropriately reflect the costs and risks of doing so. This is also true with overnight funding arrangements, but the intraday timing possibly exacerbates these frictions. Lending \$1 billion overnight at a 4 percent interest rate yields approximately \$111,000 in earnings, but lending it for an hour at the same rate would yield only \$4,600. Assuming the processing costs for arranging the delivery and return of funds are fixed and roughly similar for an intraday and an overnight loan, then it may not be profitable for potential lenders to enter the market at low interest rates.

Second, payments system participants have the option to delay sending a payment rather than borrowing, if the cost of borrowing is too high. However, if all participants are inclined to delay, the system may be vulnerable to gridlock.

^a This material is borrowed from McAndrews (2006).

account and that is also eligible for intraday overdrafts has a net debit cap. The policy on net debit caps is based on a set of specific guidelines and some degree of banking supervision. The policy allows for one of six ratings for a bank. For most

banks, net debit caps range from zero to 2.25 times the bank's risk-based capital.⁷

Net debit caps involve a great deal of monitoring. The Federal Reserve reviews supervisory information, evaluates banks' self-assessments (if applicable), and then uses this information to assess the appropriateness of an institution's cap category.⁸ This monitoring alleviates some problems associated with adverse selection.

The Federal Reserve also monitors a bank's use of its daylight overdrafts against the cap, providing an opportunity for banks to establish reputations with their regional Federal Reserve Bank. In most instances, banks that exceed their cap limit are required to explain the reason to the Fed and then be counseled to prevent it from happening again. The Fed reserves

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the right to reduce net debit caps unilaterally, impose collateralization or clearing-balance requirements, reject or delay certain payments, or, in extreme circumstances, prohibit the bank from using Fedwire. Thus, maintaining a reputation of staying under the cap can help banks avoid such actions and can alleviate certain moral hazard concerns.

Although most daylight overdrafts are uncollateralized, the Federal Reserve uses collateral in two situations. First, it requires collateral from problem institutions to cover any incidental overdrafts. Second, banks wishing to increase their net debit caps can pledge collateral to do so subject to the Federal Reserve's approval. The amount and type of collateral pledged are determined through an agreement between the bank and the Federal Reserve.⁹ Collateral plays an insurance role for the Fed in the event of a loss due to an overdraft. It also plays an incentive role for the bank to control its overdrafts and avoid risky behavior that could lead to its closure and forfeiture of the assets it pledged as collateral. Thus, the collateral here also overcomes certain moral hazard concerns.

⁷ For foreign banking organizations, a net debit cap is a function of no more than 35 percent of their worldwide capital (referred to as their U.S. capital equivalency).

⁸ Each bank that uses a relatively large amount of overdrafts must perform a self-assessment of its own creditworthiness, intraday funds management and control, customer credit policies and controls, and operating controls and contingency procedures.

⁹ The type and value of collateral pledged are consistent with the Federal Reserve's discount window policy.

The Federal Reserve's policy regarding daylight overdrafts uses a combination of fees, monitoring, reputation, and collateral. Changes in payments and securities settlement systems, and their effect on the need for intraday liquidity, have led to periodic reviews of this policy to determine whether changes to it can improve the safety and efficiency of the payments system. Recently, in order to ease intraday liquidity constraints and reduce operational risk, the Board proposed changes to its Payments System Risk policy to supply intraday balances to healthy banks predominantly through explicitly collateralized daylight overdrafts.¹⁰ Under the proposal, the Board would allow banks to voluntarily pledge collateral to support intraday overdrafts. Collateralized intraday overdrafts would be charged a zero fee, while the fee for uncollateralized overdrafts would increase from 36 to 50 basis points.¹¹ We now describe how increasing the use of collateral could bring benefits as well as costs to the Federal Reserve, to banks, and to the financial system as a whole.

3.1 The Benefits of Increasing Collateral Use

Greater use of collateral has the potential to benefit the Federal Reserve, banks, and the financial system in several ways.

The *Federal Reserve* could benefit because collateral provides it with some insurance in the event a bank cannot repay its overdraft. It may also benefit if greater use of collateral increases the incentives for banks to repay their overdrafts over and above the incentives already in place because of monitoring, reputation, and the existing use of collateral.

Banks could benefit if greater use of collateral relaxed some credit constraints. As we observed in the construction loan example, providing collateral can often allow a borrower to obtain better terms on a loan. For similar reasons, the Board's policy proposal includes a zero fee on collateralized daylight overdrafts. In such a case, banks' overdraft costs could decrease when they pledge collateral.

The *financial system* may benefit if the increased use of collateralized intraday overdrafts at the zero fee speeds up the flow of payments across financial markets. The lower cost of collateralized intraday overdrafts may lead to more payments being made earlier in the day, as banks would have less need to delay payments until they have sufficient incoming funds. By encouraging more banks to have collateral pledged at the Fed, increased use of collateral could make it easier for the Federal

¹⁰ See Board of Governors of the Federal Reserve System (2008).

¹¹ There are other proposed changes as well. See Table 1 in Board of Governors of the Federal Reserve System (2008) for a summary of all the proposed changes.

Reserve to inject liquidity both intraday and overnight in times of financial stress. This is true in particular because collateral is required for overnight loans. In addition, increased use of collateral may prepare banks for financial stress by increasing their ability to borrow at the discount window. All of these spillover benefits may accrue to the financial system through greater use of collateral.

3.2 The Potential Costs of Greater Collateral Use

There are also possible costs to increasing the use of collateral.

The *Federal Reserve* could face higher costs associated with monitoring collateral, such as making sure it is available and valuing it properly. The Federal Reserve already pays such costs because it accepts collateral for overnight loans, but these costs could rise if the amount of collateral increases. Moreover, if there is a greater reliance on collateral for intraday overdrafts, banks may ask to manage their collateral more actively at the Federal Reserve, requiring the Fed to invest in enhancements to its collateral management systems.

Banks would have to pay costs associated with acquiring, managing, and tracking their collateral. Additionally, they may face an opportunity cost associated with using collateral to secure overdrafts because that collateral may no longer be used for other purposes. Banks may also reallocate their portfolio of assets to acquire enough collateral for daylight overdraft purposes. Whether this would constrain banks much depends on the type of collateral that the Federal Reserve and other banks are willing to accept.¹²

The *financial system* as well may be negatively affected by the greater use of collateral. Collateralized overdrafts make the Federal Reserve a higher claimant on assets of a failed bank, which reduces the attachable assets to residual claimants in the event of a bank liquidation, adversely affecting the unsecured creditors of that bank. This is an issue mainly if the policy is not explained well in advance so that some long-term contracts cannot be renegotiated. Another potential cost would occur if too much of the banking system's assets are tied to collateralized daylight overdrafts. In extreme situations, this

¹² For discount window purposes, the Federal Reserve accepts a large range of assets of varying liquidity and credit risk, by which they are categorized. The collateral value of each asset is a discounted value of an asset's determined price. This applied discount is based on an asset's class. If the discounts accurately reflect a liquidity and risk premium, banks can have some flexibility in pledging collateral at the Federal Reserve and can minimize opportunity costs associated with collateral. The proposed policy would follow discount window practices to determine which assets are acceptable, those assets' categories, and the discount applied to the assets' determined price.

could lead to credit rationing in the economy should a shortage of collateral occur. Thus, the increased use of collateral could have negative spillover effects on the economy. Again, whether such a cost is likely to be large is an empirical question and depends on the range of collateral that would be acceptable to the Federal Reserve and other banks.

As with any policy proposal, a careful analysis of the overall benefits and costs of a change in the daylight overdraft policy is essential. It should be noted that the costs of a greater use of collateral are higher for banks if collateral were required for all overdrafts. But if banks are given the choice between uncollateralized lending and posting collateral (with a zero fee on collateralized daylight overdrafts), then their costs should be lower because collateral would be pledged by those banks for which it is the less costly option.

4. CONCLUSION

How to best enable the extension of liquidity by a central bank is an important policy question. As the examples presented here suggest, it may be desirable to use a combination of reputation, monitoring, and collateral. However, the relative role of each method of enforcing credit arrangements should depend on the details of the contractual relationship considered.

In the future, we can expect the risk faced by central banks to change over time, but we can also expect central banks to have access to more effective enforcement technologies. As banks find themselves in situations requiring them to take quick actions, credit risk can emerge unpredictably and without warning. However, the quality of the tools used by central banks to mitigate these risks has increased as well. For example, technological progress has the potential to make monitoring less costly and more effective in the future. Moreover, new technologies could reduce risk in a number of ways:

- The development of liquidity-saving methods for safely transferring balances could reduce the demand for daylight overdrafts.
- The development of improved markets during the day could potentially lead to a decreased demand for intraday overdrafts, as they are replaced by better methods of intraday distribution of liquidity. In other words, the frictions that require the provision of daylight overdrafts today may be reduced by enhanced technology.
- Technological progress will influence the need to rely heavily on reputation, monitoring, or collateral as some of these methods may become relatively more effective than others.

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