A Mechanism for Thawing the Credit Markets

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Abstract

This paper describes a mechanism designed to induce commercial banks to increase their willingness to extend loans in an economic environment characterized by increased uncertainty and diminished expectations. This mechanism is a new tool for the conduct of monetary policy to combat recessions.

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1 The Problem Defined

During periods of economic slowdown entrepreneurs and companies face higher risks and lower returns on their investment projects than during periods of normal economic activity. Consequently, banks face higher risk of default on their loans and, as a result are more inclined to take self-protective measures, including building up their reserves at the expense of lending, thus contributing to choking off economic activity. To extend credit in deteriorating economic environment, banks must charge higher interest rates to compensate for the extra risk they bear. At the same time, facing diminished expected returns, prospective borrowers, cannot afford to pay higher interest rates. The result is that fewer projects get the necessary financing, while the banks hoard loanable funds. Moreover, because liquidity, by itself, does not turn a bad lending prospect into a good one, providing banks with additional liquidity (e.g., by allowing them to borrow from the central bank or injecting liquidity to the economy through open market operations) may be slow and ineffective means of increasing the supply of credit.

The mechanism proposed here is designed help remedy the problem by inducing banks to extend extra loans that would otherwise, because of the recession, not be feasible. Underlying this proposal is the presumption that government intervention is justified on the ground that stimulating economic activity is a public interest not fully internalized by the individual banks. Under the proposed scheme, the government bridges the gap between the interest rates that would make banks ready to lend and those potential borrowers can afford to pay by offering an interest subsidy. In exchange the banks are required to let the government agency assume the lion share of the subsidized loans. The beauty of the mechanism is that *it induces banks to apply for interest subsidies only for loans they would not have otherwise made and that the government has an interest in seeing made, and to refrain from asking the government to subsidize loans they would have made without a subsidy.* The proposed mechanism leaves the assessment of investment projects and the management loans in the hands of the banks, where the expertise to carry on these tasks, presumably, resides. Because, under the proposed scheme, the banks are required to use their on funds to finance part of the subsidized loans, their incentive to spend the necessary resource to assess the merits of the requested loans remains, by and large, intact. Thus the proposed mechanism minimizes the potential moral hazard problem. The

proposed mechanism constitute new tool for the conduct of monetary policy to counteract economic slowdown.

The next section outlines the relevant features of the economic model. Section 3 describes the mechanism. Section 4 contains an evaluation of the mechanism. Concluding remarks appear in section 5.

2 The Economy

A business project, i, matched with a bank j is a triplet $\left(x_i, \mu_i, \sigma_i^j\right)$, where x_i is the dollar amount of the loan needed for the project; μ_i denotes the expected return per dollar invested *as perceived by the entrepreneur seeking the loan*; and σ_i^j denotes the incremental risk borne by the bank if it were to extend the loan, *as perceived by the bank.* Assume that the bank portfolio is efficient, then the incremental risk depends on the risk characteristics of the project itself, as measured by the standard deviation of its return, and its correlations with the returns of the existing assets in bank j's portfolio. It is measured by the change in the standard deviation of bank j's portfolio return as a consequence of extending this additional loan.[1]

Henceforth, assume that the behavior of the banks and the firms is as depicted by the mean-variance analysis. Denote by $J = \{1, ..., m\}$ the set of banks, and by $I = \{1, ..., n\}$ the set of projects under consideration. Let r_f be the rate of return on risk-free assets and, for each $j \in J$, let $\hat{r}^j$ be a scalar defined by

$$u^j\left(\hat{r}^j, \sigma_i^j\right) = u^j\left(r_f, 0\right),$$

where u^j denotes bank j's utility function. Then $\hat{r}^j\left(\sigma_i^j, r_f\right)$ depicts the minimal acceptable interest, per dollar invested, required by bank j to finance a loan that increases the riskiness of the bank's portfolio by σ_i^j, when the the alternative risk-free rate is r_f. If the bank displays risk aversion (that is, $u_2^j < 0$, where u_2^j denotes the partial derivative of u^j with respect to its second argument) then $\hat{r}^j\left(\cdot, r_f\right)$ is monotonic increasing function. If the bank's portfolio is efficient then the function $\hat{r}^j\left(\cdot, r_f\right)$ is in fact linear.[2] Let $\hat{R}_j\left(r_f\right)$

[1] For detailed discussion of this concept see Fama and Miller (1972). The role of portfolio efficiency is discussed below.

[2] See Fama and Miller (1972). If the bank's portfolio is not efficient and the cross derivative, u_{12}^j, is negative, then $\hat{r}^j\left(\cdot, r_f\right)$ is a convex function.

denote the epigraph of the function $\hat{r}^j(\cdot, r_f)$.

For each project, the terms of the loan are determined by a process of negotiation. Loans are feasible (that is, are acceptable to both parties) if the interest rate on the loan, r_i, satisfies $r_i \in \left(\hat{r}^j\left(\sigma_i^j, r_f\right), \mu_i\right)$.

An investment project is *acceptable* by bank j if $\{i \in I \mid \left(r_i, \sigma_i^j\right) \in \hat{R}_j(r_f)\}$. A bank is characterized by a pair $(C_j(r_f), Y_j(r_f))$, consisting of a set $C_j(r_f)$ of acceptable projects and the amount, $Y_j(r_f)$, of loanable funds at its disposal.[3] The banks characteristics are private information.

Each bank by itself can finance a set of projects that is acceptable to it and meets the loanable funds constraint. For bank j these projects satisfy the constraint

$$\sum_{i \in C_j(r_f)} x_i \leq Y_j(r_f). \tag{1}$$

Let $\{C_j(r_f) \mid Y_j(r_f)\}$ be the set of acceptable projects that are fundable (that is, satisfy the constraint (1)). Let

$$C_j^*(r_f) \in \arg \max_{\{C_j(r_f) | Y_j(r_f)\}} u^j\left(\bar{r}\left(C_j(r_f)\right), \sigma^j\left(C_j(r_f)\right)\right),$$

where $\bar{r}\left(C_j(r_f)\right)$ denotes the mean portfolio return and $\sigma^j\left(C_j(r_f)\right)$ its standard deviation. With interbank loans, the economy wide financial equilibrium is a risk-free rate that clears the loanable fund market, namely, a risk-free rate such that

$$\sum_{j \in J} \sum_{i \in C_j^*(r_f)} x_i = \sum_{j \in J} Y_j(r_f). \tag{2}$$

The increased uncertainty associated with economic slowdown means that many investment projects entail lower expected returns, higher risk, or both. Consequently, investment projects that would have been acceptable before the onset of a recession are outside the acceptable sets of the banks. Even if the risk-free interest is at its lower bound, say $r_f = 0$, there are not enough acceptable projects, and banks tend to hoard the additional funds.[4] The financial sector is caught in a liquidity trap that is difficult to get out of.

[3] It is assumed here that $r_f > r'_f$ implies $C_j(r_f) \subset C_j\left(r'_f\right)$ and $Y_j(r_f) \geq Y_j\left(r'_f\right)$.

[4] Formally, $\sum_{j \in J} \sum_{i \in C_j^*(r_f)} x_i < \sum_{j \in J} Y_j(0)$.

Under these circumstances, pumping additional liquidity into the banking system will not, by itself, make them more ready to lend, because the problem is lack of acceptable projects, not lack of liquidity.

3 The Mechanism Described

Consider the following mechanism. The government offers the banks the opportunity to apply for a subsidy in the form of s percent additional interest on every loan they make, to be paid by the government. If a bank chooses to apply for a subsidy, the government will finance a share, $(1-\alpha)$, of the loan, leaving the bank to provide a share α of the requested funds.[5]

Consider next a project, i, requiring a loan in the amount x_i that is acceptable to bank j, and let the negotiated interest on the loan be $r_i \in \left(\hat{r}^j\left(\sigma_i^j, r_f\right), \mu_i\right)$.[6] Will the bank apply for a subsidy? Without the subsidy the bank's expected return on the loan is $r_i x_i$, exceeding $\hat{r}^j\left(\sigma_i^j, r_f\right) x_i$, the lowest acceptable return for the risk involved. The net bank profit is $\left(r_i - \hat{r}^j\left(\sigma_i^j, r_f\right)\right) x_i > 0$.[7] If the bank applies for a loan subsidy the bank expected profit is $\alpha\left(r_i + s - \hat{r}^j\left(\sigma_i^j, r_f\right)\right) x_i$. If the bank applies for a loan subsidy for this project, its expected profit is $\alpha\left(r_i + s - \hat{r}^j\left(\sigma_i^j, r_f\right)\right) x_i$.[8] For sufficiently small α,

$$\left(r_i - \hat{r}^j\left(\sigma_i^j, r_f\right)\right) x_i > \alpha\left(r_i + s - \hat{r}^j\left(\sigma_i^j, r_f\right)\right) x_i \tag{3}$$

Hence in the limit, as α tends to zero, no request will be made for subsidizing loans that the bank finds profitable without the subsidy.

[5]Formally, the proposed mechanism is a pair $(\alpha, s) \in (0,1)^2$, where α denotes the share of the capital the bank puts up and s is the extra interest on the loan paid to the bank by the government.

[6]If the loan is shared by several banks in a consolidation, the x_i is the part assumed by bank j.

[7]Note that $\hat{r}_j\left(\sigma_i^j, r_f\right) x_i$ is bank j's "implicit cost" of financing the project i.

[8]For simplicity, with no essential loss of generality, this formula disregards partial recovery of the loan. To avoid misunderstanding of the way the mechanism works it is worth emphasizing that, as the expected profit function indicates, if the borrower defaults on a loan, the bank is out of the subsidy on this loan. In other words, from the viewpoint of the bank the subsidy, like the interest on the loan, is contingent on the recovery of the loan.

Consider next a project, i,requiring a loan in the amount x_i that is unacceptable to bank j under any interest that is acceptable to the would be borrower (that is, $\mu_i \leq \hat{r}^j\left(\sigma_i^j, r_f\right)$). Without the loan subsidy the bank will refrain from financing the project, earning zero profit. Under the proposed mechanism if $\mu_i + s > \hat{r}^j\left(\sigma_i^j, r_f\right)$, then for any negotiated interest rate on the subsidized loan, $r_i \in (\hat{r}^j\left(\sigma_i^j, r_f\right) - s, \mu_i]$, and $\alpha > 0$, the bank's expected profit is $\alpha\left(r_i + s - \hat{r}^j\left(\sigma_i^j, r_f\right)\right) x_i > 0$. Thus all projects such that $r_i + s > \hat{r}^j\left(\sigma_i^j, r_f\right)$ are acceptable under the mechanism.

In conclusion, as α tends to zero, the banks will never seek subsidies for loans that they would have made absent the subsidy scheme, and will seek subsidies for some loans that they would otherwise have found unacceptable. The larger the subsidy, the larger is the set of loans that will be financed under this scheme.

4 The Mechanism Evaluated

The evaluation of the mechanism begins with the analysis of its implications for the government. Suppose that the government is risk neutral, and let i be an investment project for which a bank seeks a subsidy for a loan in the amount x_i. By granting the request the government must provide capital to the amount $(1-\alpha) x_i$. The expected return on this investment is

$$\left((1-\alpha) r_i - \alpha s\right) x_i = \left[r_i - \alpha\left(r_i + s\right)\right] x_i. \tag{4}$$

Denote by $\rho > 0$ the marginal rate of return on the public investments. Then imposing the constraint

$$\left[r_i - \alpha\left(r_i + s\right)\right] \geq (1-\alpha)\rho \tag{5}$$

on the choice of (α, s) will ensure that the net return on public funds under this mechanism is, on average, profitable.[9]

Denote by $C_j\left(\alpha, s; r_f\right)$ the set of bank j's acceptable loans under the mechanism. Let

$$C\left(\alpha, s; r_f\right) = \sum_{j \in J}\left(C_j\left(\alpha, s; r_f\right) - C_j^*\left(r_f\right)\right), \tag{6}$$

[9]In the limit there constrait requires at $r_i \geq \rho$.

then the total expected return of the program is

$$\mathcal{R}(\alpha, s) = \sum_{i \in C_j(\alpha, s; r_f)} [r_i - \alpha(r_i + s)] x_i. \tag{7}$$

Let σ_{ik} denote the covariance of the returns on the projects $i, k \in I$. Then the risk borne by the government is

$$\mathcal{S}(\alpha, s) = \left[\sum_{i \in C_j(\alpha, s; r_f)} \sum_{k \in C_j(\alpha, s; r_f)} \sigma_{ik} x_i x_k \right]^{1/2}. \tag{8}$$

Because the government acts as if it were risk neutral, this plan disregards the underlying risk. However, the assumption that government is risk neutral is not necessary for the validity of the proposed mechanism. To justify the mechanism, all that is required is that the government be willing to bear the risk of (and collect the return on) some loans that private banks are reluctant to extend. This can be rationalized by supposing that the interests of the government and those of the private banks diverge. In particular, the objectives of the government include promoting of economic activity, which is not a main interest of individual banks. Put differently, the social benefits of the program exceed those captured by the banks, and justify the risk assumed by the government. Note, however, that because the risk and returns are endogenous, to the extent that the program is successful, it will reduce the level of risk in the economy and increase the level of returns, thereby reducing the costs of the subsidy program.

In addition to its simplicity, this mechanism incorporates several important features. First, it induces the banks to truthfully reveal which loans they would make in the absence of a subsidy an which loans they would make only if induced to do so by the subsidy. In this way, it ensures that taxpayer dollars are spent only where they make a difference. Second, it keeps the business of assessing projects and managing loans where it belongs – in the hands of bankers, not government bureaucrats. Third, because banks put their own money at risk, the scheme bypasses a potential moral hazard problem, namely, that the banks will not be diligent in the loan assessment. In other words, it is assumed that the optimal level of effort required for due diligence in assessing the merit of loans is attained when the amount at risk is much below the requested amount of the loan, this level is attainable

even if the banks carry only a part of the loan.[10] Forth, it cost taxpayer money only when loans are actually made. Finally, the scheme is flexible, as it allows policy makers to adjust the level of the interest subsidy in response to development in the credit markets.

5 Concluding Remarks

The assumption that banks will truthfully identify the marginal loans they are willing to make only if subsidized to do so is based on the limit argument that the full and truthful revelation is obtained when α tends to zero. In practice, banks' share of the loans they make must be fixed at some positive level. This means that some marginal loans the banks would have made without the subsidy will be subsidized.

A variation on the mechanism entails a subsidy proportional to the interest rate on the loan. This variation would encourage lending to projects that add greater risk to (and generate higher returns on) the bank's portfolio.

Finally, the scheme is immune to manipulations by banks that lend to one another (or to other borrowers) and apply for the subsidy to divide among themselves. Because they must pay a large share of the interest on such loans to the government, such an attempt at manipulation is a losing proposition. The scheme is not immune to different kind of manipulation, namely, refinancing existing loans with he intent of palming off on the government bad debts that are already on the banks' books. To prevent the abuse of the mechanism in this way, implementation of the scheme must exclude refinancing, directly or indirectly through third parties, of existing loans. Enforcing this restriction would require instituting monitoring and appropriate penalties for violations.

References

[1] Fama, Eugene F., and Merton H. Miller. 1972. *The Theory of Finance.* Hinsdale, IL: Dryden Press.

[10] Support of this assumption is provided by the fact that, under consolidation, banks that initiate loans end up carrying only part of the initiated loans. This seems to satisfy the participating banks, who are aware of potential pitfalls due to moral hazard problems.