BANKING RISK MANAGEMENT

Şimon Adrian

Universitatea „Petru Maior" Tîrgu-Mureş, Facultatea de Ştiinţe Economice, Juridice şi Administrative, Str. N. Iorga nr. 1, adr_simon@yahoo.com, telefon 0745/235211

Abstract: General banks, investment banks, and mutual funds have to control and select the risks inherent in the management of deposits, loans portfolios of securities, and off-balance-sheet contracts.

Since the risks that a bank has to manage are diverse, several classifications have been proposed, some of which are standard. Thus, economists have put forward the fundamental distinction between microeconomic or idiosyncratic risks, which can be diversified away through the law of large numbers, and macroeconomic or systematic risks, which cannot. Unlike insurance companies, which essentially deal with microeconomic risks, banks generally have to deal with both types of risks.

The credit activity of banks is affected by default risks, which occur when a borrower is not able to repay a debt (principal or interest).

Liquidity risks occur when a bank must make unexpected cash payments. This type of risk essentially comes from the specificity of the demand deposit contract: unlike the creditors of other kinds of firms, depositors are allowed to demand their money at any time. Consequently, the deposit activity is affected by the risk of an unexpected massive withdrawal by depositors.

Default risks

Defining and measuring credit risk is equivalent to determining how the market evaluates the probability of default by a particular borrower, taking into count all the possibilities of diversification and hedging provided by financial markets. In part, the level of risk depends on the institutional arrangements to which the banks are subject, either through the interbank money market or through specialized institutions created for this purpose.

Clearly the riskiness of a loan will be affected by the existence of:

- collateral
- compensating balances
- endorsement

But other characteristics of the credit market will also be relevant: Do banks share information on their creditors? How is the bankruptcy process settled? Notice that in the process of international competition, as well as in a process of market integration like the one undergone by Europe, differences between these institutions or regulations across countries are fundamental not only because they may represent a barrier to entry, but also because they may tend to concentrate some banking activities in the countries that provide the more efficient institutions and regulations.

Evaluating the cost of default risks

To understand how default risk affects the competitive pricing of loans, this discussion will begin with a simple approach that will justify me use of the risk spread (the difference between the interest rate on a risky loan and the risk less rate for the same maturity) as a measure of the credit risk of an asset.

Indeed, this discussion will show how the risk spread is determined by the boor- Rower's probability of default. It will then proceed to examine a more complete approach based on option pricing (Merton 1974).

A simple interpretation of risk spread

Assuming that default risk is diversifiable and that the bank under consideration can indeed diversify this risk away through a large population of borrowers, the only thing that matters is the probability of default. Credit scoring methods, the analogue of actuarial techniques used by insurers, allow banks to estimate a priori this probability of default based on the observable characteristics of the loan applicant.

From a financial viewpoint, the value of such a loan (subject to a diversifiable credit risk) is nothing but the expected present value of the borrower's repayments. Leaving aside interest rate risk for the moment, assume that the refinancing rate r is constant, and take e^{-r} as the one-period discount factor. Consider now a risky loan, characterized by a series of promised repayments $(C_i, C_z,..., C_n)$ at future dates $(t_1, t_2,..., t_n)$. Assume for simplicity that if the firm defaults, the bank receives nothing. The expected cost of default risk for this loan can be measured by the difference between:

$$P_0 = \sum C_k e^{-rt_k} \qquad (1)$$

the value of the loan if there were no default risk, and

$$P = \sum C_k p_k e^{-rt_k} \qquad (2)$$

the value of the risky loan, where p_k denotes the probability that the k-th repayment will not be defaulted, assuming that there are no partial repayments.

In practice, however, the most commonly used instrument for evaluating the cost of default risk is the difference (spread) between the yield to maturity R of the risky loan and the refinancing rate r. R is defined implicitly by the equation

$$P = \sum C_k e^{-Rt_k} \qquad (3)$$

and this determines the value of the spread $s = R - r$.

Bierman and Hass (1975) and Yawitz (1977) have proved the following simple result:

If the firms' default follows a Poisson process of intensity λ, the spread s is independent of the characteristics of the loan. It is equal to the intensity of the Poisson process:

$$s = \lambda \qquad (4)$$

Proof ` In a Poisson process of intensity λ, the probability of survival at date

t_k ` is by definition

$$P_k = e^{-\lambda t_k}$$

Combining 2, 3, and 5 yields

$$\sum C_k e^{-Rt_k} = \sum C_k e^{-\lambda t_k} e^{-rt_k}$$

This equation in R has a unique solution, independent of $C_1,..., C_n$:

$$R = r + \lambda$$

Therefore:

$$S = R - r = \lambda$$

Consequently, if one considers corporate debt of a certain type, the spread can be considered as the instantaneous probability of failure λ. that the market assesses implicitly to the particular class of borrowers under consideration.

For instance, a spread of fifty basis points indicates a failure probability of

$1 - e^{-\lambda} = 0.5$ percent per year.

The option approach to pricing default risk

The simple approach just explained relies on three assumptions that are not very satisfactory: (1) the instantaneous probability of failure is constant and exogenous, (2) credit risk is completely diversifiable, and (3) in case of failure, the residual value of the firm is zero. Consider now what happens when these assumptions are relaxed.

When credit risk is not completely diversifiable, a risk premium must be introduced, and the analysis becomes more involved. However, financial markets provide insurance possibilities for banks. Therefore the risk premium quoted by banks must be in line with the ones prevailing in the securities market. This remark will allow development of a model for pricing risky debts following Merton (1974).

Liquidity risk and asset liability-management

The ALM group in a traditional bank is also responsible for the management of liquidity risk. As defined earlier, it is the risk that a bank is unable to meet its liabilities when they fall due. Liquidity risk is normally associated with the liabilities side of the balance sheet when depositors unexpectedly withdraw their

financial claims. Assuming the liquidity preferences of a bank's customers are roughly constant, the problem usually arises if there is a run on the bank as depositors try to withdraw their cash. A bank liquidity crisis is normally triggered either by a loss of confidence in the bank or because of poor management practices, or the bank is a victim of a loss of confidence in the financial system, caused, possibly, by the failure of another bank. Contagion and systemic risk are discussed in detail in the next chapter. However, if the bank experiences an unusually high deposit withdrawal rate, and lacks the cash or is unable to borrow the money quickly, it is faced with liquidating its longer-term investments, possibly in a market where other banks and investment houses are also selling, pushing down prices.

A bank can also experience liquidity problems on the asset side of the balance sheet, caused by large numbers of unexpected loan defaults. Banks have also been caught out granting credit lines which they do not expect to be drawn down, but which are subsequently used by the borrowers. If an economy goes into recession relatively quickly, these banks may see firms drawing down their credit lines all at once, which will put pressure on their liquidity. There is also liquidity risk linked to off-balance sheet transactions and to a slow-down or collapse in the payments system.

If a bank does experience liquidity problems, the central bank is usually willing to lend to them at some penal rate, which is costly for the bank. Also, the central bank will have to be reasonably certain that the problem is one of illiquidity and not insolvency. Banks will borrow funds on the interbank markets or from other sources before they approach the central bank, but again, this is costly for the bank, and undermines its profitability.

The objective of liquidity risk management should be to avoid a situation where the net liquid assets are negative. Gap analysis can be used to manage this type of risk. The gap is defined in terms of net liquid assets: the difference between net liquid assets and volatile liabilities. Liquidity gap analysis is similar to the maturity ladder for interest rate risk, but items from the balance sheet are placed on a ladder according to the expected time the cash flow (which may be an outflow or an inflow) is generated. Net mismatched positions are accumulated through time to produce a cumulative net mismatch position. The ban can monitor the amount of cash which will become available over time, without having to liquidate assets early, at penal rates.

The Bank of International Settlements (2000) has outlined a maturity ladder approach, which consists of monitoring all cash inflows and outflows, and computing the net funds required.

The ALM group in a bank is not normally responsible for risk management in other areas, though how risk management is organized does vary from bank to bank. In some banks, the ALM group has been replaced by a division with overall responsibility for risk management, but credit risk continues to be managed separately. Increasingly, 21st century banks have a division with overall responsibility for coordinating risk management.

The management of interest rate risk has moved beyond the traditional gap and duration analysis because banks have increased their off-balance sheet business and the use of derivatives.

At the individual level, liquidity management is not fundamentally different for banks than for other firms. It can even be seen as a particular case of the general problem of managing inventories of any sort.

Liquidity is an important service offered by a bank and one of the services that distinguishes banks from other financial firms. Customers place their deposits with a bank, confident they can withdraw the deposit when they wish, even if it is a term deposit and they want to withdraw their funds before the term is up. If there are rum ours about the bank's ability pay out on demand, and most depositors race to the banks to withdraw deposits, it will soon become illiquid. In the absence of a liquidity injection by the central bank or a lifeboat rescue, it could become insolvent since it can do nothing to reduce overhead costs during such a short period.

Maturity matching (getting rid of all maturity gaps) will guarantee sufficient liquidity and eliminate liquidity risk because all deposits are invested in assets of identical maturities: then every deposit is repaid from the cash inflow of maturing assets, assuming these also risk-free. But such a policy will never be adopted because the bank, as an intermediary, engages in asset transformation to make profits. In macroeconomic terms, provided there is no change in the liquidity preferences of the economy as a whole, then the withdrawal of a deposit by one customer will eventually end up as a deposit in another account somewhere in the hacking system. If banks kept to a strict maturity match, then competition would see to it that the bank which invested in assets rather than keeping idle deposits could offer a higher returns (and therefore, greater profitability compared to banks that simply hold idle deposits.

At the microeconomic level, the maturity profile of a bank's liabilities understates actual liquidity because term deposits rend to be rolled over, and only a small percentage of a bank's deposits will be withdrawn on a given day. This is another for argument for incurring some liquidity risk. Given that the objective of a bank is to maximize profit/shareholder value-added, all banks will have some acceptable degree of maturity mismatch.

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