

## **PART I**

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# **THE ELEMENTS OF BANK FINANCIAL SUPERVISION**

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# 1

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## INTRODUCTION TO BANKS AND BANKING

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In order to understand bank regulation, it is first necessary to understand what a bank is. Everyone knows that a bank is an institution which takes deposits from the public and lends the monies thus raised, but even the simplest bank is more complex than this. Bank balance sheets include a range of types of exposures to a range of types of counterparties, and even where these exposures are as simple as fixed rate, fixed term single repayment loans, the interaction of those loans with other parts of the balance sheet may itself give rise to risks. **1.01**

This highlights the point that there are two ways of looking at banks. An economist, for example, may see a bank primarily as a monetary phenomenon—a conduit for passing and creating credit. On this analysis a bank is simply a mechanism by which money is borrowed from the future and lent in the present.<sup>1</sup> This approach, however, is useful for those trying to describe and quantify the financial system, but not for those trying to control it. Viewed from the perspective of a bank board or a bank regulator, a bank is a mechanism for taking risks. Banks take risks for the same reasons that all commercial entities take risks—to obtain rewards. The nature of these risks and these rewards deserves a word of explanation. **1.02**

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<sup>1</sup> A process rather grandly referred to as 'intertemporal resource allocation'.

## **A. Banks Considered as Risk Takers**

- 1.03** A bank takes in money from one group of people (depositors) and lends it to another (borrowers). It is (almost) certain that it will have to repay depositors; it is not certain that it will be repaid by borrowers. This means that there must be a gross profit margin made from loans advanced which can be set against borrower defaults. The business of lending is the same as any other business, in that increased profit comes at the expense of increased risk. Thus a bank may lend either at very high rates to very risky borrowers and hope that the default rate is sufficiently low to leave it in profit, or at very low rates to creditworthy borrowers and hope that the profit margin is sufficient to cover any loss which does occur. The key point here is that the riskiness of the strategy is not the same as the riskiness of the borrowers. A strategy of making large loans to high quality borrowers may be a very high risk strategy, since the margin on such loans may be very low, and even one default may destroy the entire institution. Conversely, a portfolio containing a very large number of small loans to relatively uncreditworthy borrowers at very high rates may be a relatively low-risk strategy, since the gross margin on the portfolio may be sufficient to cover likely losses many times over. This explains why institutions which are constrained in their lending to particular types of assets viewed as 'safe' (for example UK Building Societies and US Thrifts) have not in general proved particularly more stable than other deposit taking businesses.
- 1.04** Most banks, of course, diversify their lending across a number of different strategies, and seek to minimize their risk exposures by diversifying across a number of different types of business. However, the basic risk versus reward model is common to all areas of business, as it is to all businesses. Thus both managers and regulators of banks have a task which in principle is relatively straightforward. First, they must understand exactly which risks the bank is in fact exposed to (this is not as simple as it sounds). Second, they must—to the extent possible—quantify those risks. Third, they must assess the returns which may be obtained through the taking of those risks, in order to satisfy themselves that the risks are justified. Fourth, they must assess the degree to which the risks to which they are exposed are correlated to each other, in order to establish the total risk which is faced by the institution as a whole. In doing this they will be guided by the well-known principle that the generation of commercial returns necessitates the taking of risks, but the taking of risks by no means necessarily results in the generation of any returns.

## **B. A Prototypical Bank**

- 1.05** In order to understand how this process may work in practice, we begin with a representative example of a bank. This particular example is not intended to resemble

any bank living or dead, but was constructed in November 2001 by the Joint Forum<sup>2</sup> as a comparator for a cross-industry exercise.<sup>3</sup>

Assets		Liabilities	
Asset class	%	Liability class	%
Cash and cash equivalents	0.8	Inter-bank borrowing (deposits) (1)	10.1
Inter-bank lending (1)	12.4	Customer deposits (5)	60.4
Securities (2)	8.5	Debt securities (6)	10.9
Loans and advances to customers		Other liabilities	4.6
Gross loan amounts	69.0		
Loan loss reserves	(0.8)		
Loans net of reserves (3)	68.2		
Prepayments and accrued income (4)	1.9	Accruals and deferred income (4)	2.8
Tangible and intangible fixed assets	3.4	Loss reserves (provisions) for liabilities and charges (7)	1.2
Other assets (5)	4.8	Subordinated debt (8)	4.5
		Total shareholder equity	5.5
<b>Total Assets</b>	<b>100</b>	<b>Total Liabilities</b>	<b>100</b>

Notes to stylized balance sheet

(1) Inter-bank lending and borrowing generally occur through deposits and/or money market instruments. These are short-term securities issued or bought by the bank. In effect, when held to maturity, they are the equivalent of a traditional inter-bank time deposit.

(2) Securities: this corresponds to securities bought and held by the bank either for trading purposes (market-making or proprietary trading) or for investment purposes (buy-and-hold). Fixed income securities are held to maturity at cost value. Securities held by banks are in most cases essentially made up of fixed income instruments.

(3) Loans and advances to customers are comprised of all types of credits extended to customers, including overdrafts. This item also presents loan loss reserves as a negative (contra) asset item, consistent with its presentation in a number of countries.

(4) Prepayments and accrued/deferred income is related to all balance sheet items that are accounting for at cost and whose income is accrued. This is the case in particular for loans and advances to customers and customer deposits but can also be the case for a large proportion of inter-bank borrowing and lending.

(5) Customer deposits are the aggregated total of all outstanding deposits and cash balances of all customers' accounts.

(6) Debt securities include all securities issued by the bank, regardless of maturity. In addition to bonds and medium-term notes, this might also include deposit certificates although, in some jurisdictions, such certificates are aggregates either with inter-bank borrowing or with customer deposits, depending on the nature of the investor.

(7) Loss reserves for liabilities and charges: this can encompass, in some jurisdictions, loss reserves and/or provisions calculated on a statistical basis for specific events such as staff pensions. It also includes provisions for deferred tax. The proportion of such reserves for a bank is dependent on the taxation regime of its jurisdiction of incorporation.<sup>4</sup>

(8) Subordinated debt is made up of dated and undated subordinated securities qualifying for regulatory capital purposes (tier 2 capital).

<sup>2</sup> *The Joint Forum—Risk Management Practices and Regulatory Capital—Cross Sector Comparison* published by the Basel Committee on Banking Supervision November 2001. Much of what follows in this section is based on the description set out in that document.

<sup>3</sup> The paper also contains a typical securities firm, a typical life insurer, and a typical life and non-life insurance company.

<sup>4</sup> In jurisdictions which permit provisions to be deducted from taxable profits, loan loss reserves are generally higher.

### **Business summary**

- 1.06** Banks primarily engage in granting loans and extending credits, although market activities have become more important. Assets are mainly funded by deposits collected from customers and from other banks (inter-bank deposits). Hence, these two classes represent the bulk of respectively, assets and liabilities in the stylized balance sheet of a bank. Proportions can, however, be as low as 40 per cent of assets for loans and 40 per cent of liabilities for customer deposits, depending on the bank's reliance on market operations and inter-bank funding.
- 1.07** The reliance on inter-bank funding and proportion of inter-bank lending varies widely between banks. This proportion increases if the bank is active in the derivative markets, since these are generally inter-bank transactions. More importantly, banks which raise money in the repo markets are likely to have a significantly higher proportion of inter-bank funding.
- 1.08** Customers range from retail customers to commercial and industrial entities to other financial institutions and governments. In some banks a substantial part of a bank's assets can be made up of securities held for trading or investment purposes, although this is clearly not the case in the example previously referenced. Likewise, part of a bank's liabilities can take the form of bonds or other securities.
- 1.09** Off balance, traditional transactions are the undrawn credit facilities granted, and guarantees and collateral given or received. The bulk of off-balance sheet items, however, are likely to be derivatives contracts. The aggregated nominal amounts outstanding for derivatives contracts are often a multiple of the balance sheet total. The issue of netting of derivative exposures varies—in the US, for example, derivatives contracts are more easily netted than in Europe—but this figure does not generally give any particularly useful information as to the level of market risk to which the bank is actually exposed.
- 1.10** The interest margin on the traditional banking activity still constitutes the bulk of many banks' income, but diversification strategies have increased reliance on fees and commissions earned on all kinds of financial services provided by the banking sector (asset management, payment and settlement services, custody, proprietary trading, investment banking).

### **Risk analysis**

- 1.11** Having seen what a bank looks like, we now turn to the risks which it faces.
- 1.12** Credit risk arising out of lending business is the dominant risk for banks. In the stylized example previously given, loans make up approximately two-thirds of the assets, and this is a relatively representative figure. For most banks, loans will make up between 25 per cent and 75 per cent of total assets, although there are some exceptions.

No bank expects its lending to be entirely risk-free, and in general all banks will provide against at least some of their loans. The circumstances in which provisions may be taken on the balance sheet of a bank are explained at para 4.68. In the previous example, loan loss reserves are shown on the stylized balance sheet as a contra-asset item, reflecting their treatment in a number of jurisdictions. Such reserves can range from less than one per cent of loans outstanding to much larger amounts in some cases. **1.13**

A major source of credit risk for banks does not appear on the balance sheet of the bank at all. This is the agreed but undrawn lines of credit and other forms of lending commitments which the bank will have entered into. There are many ways in which a bank can give customers a promise to lend money at a future time, ranging from the grant of committed borrowing facilities through to guarantees and standby letters of credit. None of these appear as accounting items (although they are sometimes disclosed in the notes to the accounts). They are, however, a real source of credit risk, since in general a bank which has entered into a commitment to lend will not be able to refuse to make the advance when called upon to do so. For many banks, total undrawn loan commitments are half again as large as their total assets, although naturally there is a wide range of variation across banks. **1.14**

Interbank activities, securities holdings, and other traded assets tend to make up the bulk of a bank's assets not devoted to customer loans. These assets may be held either as part of the bank's own treasury operations, or may be employed in proprietary securities trading business. Depending on the size and scale of these activities, banks are exposed to market risks and other risks associated with holding traded securities. **1.15**

Similarly, banks have in many cases become significant users of derivative instruments. The notional value of derivatives entered into is now very large for most banks. However, there are two aspects of this which require more detailed thought. One is that in general the relevant figure for the bank is not the notional value of the derivatives which it has entered into, but the 'mark to market' figure, being (loosely) the amount of money which the bank would have to either pay or receive in order to be released from the contract. This figure will be shown in the accounts as a receivable (or an amount payable), and is likely to be a very small fraction of the total nominal value of the derivatives concerned. Thus banks frequently have very large nominal exposures to assets through the derivatives markets, but show a relatively small exposure in their accounts. **1.16**

Finally, the bank will be exposed to risks such as foreign exchange risk and interest rate risk which may arise across its entire portfolio. In general, foreign exchange risk arises wherever a bank enters into any transaction where the amounts receivable are calculated by reference to a currency other than the currency in which the bank accounts, and interest rate risk arises in any circumstance where the bank's **1.17**

obligations to pay interest on an asset are not precisely matched by an equivalent interest stream. Interest rate risk generally arises as a result of reinvestment risk.

- 1.18** On the liability side, customer deposits remain the largest source of bank funding for almost all banks (although there have been some notable exceptions in the recent past—Northern Rock springs to mind). Interbank liabilities and other forms of short-term wholesale funding are also important, particularly for banks active in trading activities. Importantly, the structure of bank's liabilities relative to its assets can give rise to both funding liquidity risks and to interest rate risk if the underlying maturity of a bank's assets and liabilities do not match.
- 1.19** Capital issued by the bank tends to be between 5 and 15 per cent of assets depending on the bank and on how capital is defined. For example, for the bank shown on the stylized balance sheet, equity capital is equal to 5.5 per cent of assets, while subordinated debt eligible for regulatory capital makes up another 4.5 per cent. In general, the total ratio of bank capital to total assets is unlikely to exceed 5 per cent—or, put another way, at least 95 per cent of a bank's assets will be funded out of borrowings.

### **Credit risk**

- 1.20** Credit risk is the risk that a counterparty will fail to perform fully its financial obligations. It includes the risk of default on a loan or bond obligation, as well as the risk of a guarantor or derivative counterparty failing to meet its obligations. This risk is present to some extent in all businesses—including non-financial businesses. The management of credit risk is the most highly developed area of any bank's activities. In general, modern banks will employ credit personnel who will establish abstract criteria for the taking on of any credit exposure. These criteria will include borrower qualifications and credit limits, the incorporation of appropriate risk premiums in pricing, and the establishment of loan loss reserves. The credit unit will operate independently of the business areas charged with originating business for the bank.
- 1.21** When a new business proposal is brought in, the process by which it will be evaluated is generally very formal. For large credits a specialized unit will analyse the risks inherent in the relevant product and geographical sectors as well as the particular borrower itself. The process by which credits are approved is a source of some concern to bank management. The issue is generally that for any substantial credit, the individual or individuals within the bank who originated the proposal are likely to feel some degree of 'fatherhood' for it, and even if the bank's remuneration structure does not specifically incentivize them.
- 1.22** In general credit exposure is managed through a process of imposing exposure limits, to individual borrower, to counterparties and groups of connected counterparties, to particular economic sectors, geographic regions and specific products.



Such limits are generally based at least in part on an internal credit grading scale. Banks price credits in such a way as to cover all of the embedded costs and compensate them for the risks incurred—however, the approach used to price credit is by no means always the same as the approach used to assess the exposure of the bank. Finally, in general banks assess the profitability of particular business areas by charging them the cost of their use of capital—ie by adjusting their apparent profitability to reflect the amount of risk and risk capital which they absorb. Thus a business which generates high margin loans to high-risk borrowers can be compared with a business which generates lower margin loans to higher quality borrowers (see para 1.40).

Most banks have now developed systematic internal models for the quantification of credit risk, which operate as internal rating systems. These models assess portfolios of credit risks as well as individual credits, and provide estimates for default probabilities, exposures at default and potential losses given default. This modelling activity is used to estimate the amount of economic capital needed to support banks' activities that involve credit risk. The economic capital for credit risk is determined so that the estimated probability of unexpected credit loss exhausting economic capital is less than some target confidence level. In practice, this target confidence level is often chosen to be consistent with the bank's desired credit rating. **1.23**

Banks may also seek to reduce their risk exposures by using risk mitigants—collateral, guarantees, and credit derivatives. These techniques can be used not only to reduce absolute levels of risk, but also to restructure portfolios of risk in order to obtain diversification benefits. The increase in the use of portfolio models within banks appears to have driven the rapid development of credit derivatives. Credit risk mitigation techniques used by banks for their market operations, especially in their trading books, are similar to those used by securities firms in that they rely heavily on collateral. **1.24**

In the trading book, banks expose themselves to credit risk through many of their activities such as making margin loans to customers, entering into derivatives contracts, borrowing or lending securities, executing repurchase/reverse repurchase agreements, and occasionally extending accommodation loans in connection with pending transactions. In general credit risk arising out of trading activities is managed by the taking of highly liquid securities as collateral. These arrangements are generally subject to daily re-margining. In addition, banks seek to minimize the levels of such obligations by entering into master netting and collateral arrangements with counterparties where there are multiple exposures across different business lines. **1.25**

### **Market and asset liquidity risks**

Market risk refers to the potential for losses arising from changes in the value or price of an asset, and asset liquidity risk refers to the risk that there will be no **1.26**

liquid market for the asset when it is to be sold. It is important to understand that although these are separate risks, they are both encountered as regards securities holdings. To take a simple example, imagine that a bank has one million shares in a particular company with a market price of £1. The bank is exposed to the risk of the market price falling. However, if the normal market size is only a few thousand shares per day, the fact is that if the bank decided the following morning that it wanted to sell the entire holding it would likely receive considerably less than the ordinary market price for each share.

- 1.27** Market risk can be subdivided into specific and general risk. Specific risk is the risk that the value of a particular security will change for reasons connected to that specific security—for example, the issuer of a bond suffers a rating downgrade. Specific risks generally affect no other security. General risks, however, affect all of the securities of a particular type—for example, if interest rates change, all of the bonds in a particular portfolio of debt securities will move in value simultaneously. General risk may arise from fluctuations in interest rates, currency exchange rates, or commodity prices.
- 1.28** Most securities firms and banks, together with insurance companies running significant trading positions, use statistical models to calculate how the prices and values of assets are potentially impacted by the various market risk factors. These models generate a ‘value at risk’ (‘VaR’) estimate of the largest potential loss the firm could incur, given its current portfolio of financial instruments. More precisely, the VaR number is an estimate of maximum potential loss to be expected over a given period a certain percentage of the time.
- 1.29** For example, a firm may use a VaR model with a 10-day holding period and a 99-percentile criterion to calculate that its \$100 million portfolio of financial instruments has a potential loss of \$150,000. In other words, the VaR model has forecasted that with this portfolio the firm may lose more than \$150,000 during a 10-day period only once every 100 10-day periods. Most VaR models depend on statistical analyses of past price movements that determine returns on the assets. The VaR approach evaluates how prices and price volatility behaved in the past to determine the range of price movements or risks that might occur in the future. VaR models are commonly back-tested to evaluate the accuracy of the assumptions by comparing predictions with actual trading results. In practice, while VaR models provide a convenient methodology for quantifying market risks and are helpful in monitoring and limiting market risk, there are limitations to their ability to predict the size of potential losses.
- 1.30** Firms use stress tests and scenario analyses to supplement and to help validate VaR models. Stress tests measure the potential impact of various large market movements on the value of a firm’s portfolio. These tests can identify market risk

exposures that appear to be small in the current environment but may grow disproportionately under certain circumstances.

Scenario analysis focuses on the potential impact of particular market events on the value of the portfolio. Frequently, large and disruptive events from the past (eg major stock and bond market crashes) are used as potential scenarios. The main way to mitigate market risk, once assumed, is by taking positions in securities and derivatives whose price behaviour is negatively correlated to the issue or instrument whose risk is to be mitigated. **1.31**

Asset liquidity is increasingly taken into account in marking instruments and in interpreting VaR results based on short holding horizons. Banks take account of the difficulty in liquidating some assets at or near market value by discounting such market values, for instance when the securities are thinly traded or when the firm holds a large position in a specific security. **1.32**

### Funding liquidity risk

Funding liquidity risk is the risk that a bank cannot obtain the necessary funds to meet its obligations as they fall due. In general, banks cannot know what the calls on their liquidity will be, since the vast majority of their liabilities (for example retail deposits) could in theory all be withdrawn tomorrow. They are therefore obliged to rely on forecasts of customer behaviour in modelling the likely outflow of liquidity, and must ensure that they maintain sufficient liquidity to meet that outflow. Contingency plans and stress testing are particularly important in this regard. In general, liquidity risks are dealt with through a combination of maintaining a pool of highly liquid assets which can be called upon within the relevant timescales, and diversification of funding sources in order to ensure that if one source fails there are others available. **1.33**

Banks are particularly vulnerable to funding liquidity risk because they finance many illiquid long-term assets, mainly loans, with shorter-term liabilities, largely customer and inter-bank funding deposits, that are vulnerable to a 'run' in the event of a drop in confidence. **1.34**

### Interest rate risk

Interest rate risk is the exposure of a bank's financial condition to adverse movements to interest rates. Commercial banks, which tend to have large portfolios of long-term fixed rate loans funded by shorter-term floating rate deposits, are particularly exposed to this risk. Mitigation is accomplished to some degree by interest rate swaps, repackaging, and asset securitization, and banks seek to manage this exposure on a whole-bank basis using asset-liability management techniques. Callable debt and derivative products can also be helpful in managing **1.35**

the contingent nature of interest rate risks linked to mortgages with prepayment options.

### **Operational risk**

- 1.36** Operational risk can be defined in a variety of ways. For example, the Basel Committee has defined operational risk as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events (see Chapter 17). This definition generally excludes such risks as the strategic risk associated with business decisions. However, it does include some elements of reputational risk as well as legal and compliance-related risks. Most firms address legal and reputational risks by seeking to have well-developed compliance programmes and by focusing on the need for adequate legal documentation of transactions.
- 1.37** Other types of operational risks arise when a firm is exposed to loss because of employee error, the failure of an automated system, or the failure of a communications network. As banks have increased their reliance on technology and automated systems, the management of these operations-related risks has taken on higher priority. The increasing prevalence of outsourcing of technology-related services is another contributing factor to the emphasis on such risks.

### **Risk consolidation**

- 1.38** Many banks are increasingly seeking to take a consolidated, enterprise-wide view of risk management. Their motivation comes from competitive forces to increase risk-adjusted returns on equity, in part by making more efficient use and allocation of capital, as well as from other current trends, such as globalization, expansion across sector lines, and increasing involvement with products that entail multiple types of risk. Further, financial firms are increasingly managing their risks in structurally complex ways. For example, many firms use inter-affiliate transactions to transfer risks from different legal entities into a common vehicle where the risk can be managed and hedged on a more aggregate basis.
- 1.39** The need to consolidate or aggregate measures of risk can arise at several different levels within an organization. Within a business line, individual risk types (eg market risk or credit risk) may be aggregated across the various activities and positions. Consolidation at this level typically makes use of the relevant risk measurement methodology for the particular risk under consideration. This allows offsetting exposures to identical risk factors to be fully netted out and allows for diversification benefits across similar risk factors to be considered. Some firms take this approach a step further and attempt to perform firm-wide aggregation of particular risk types. For example, it is common for firms employing VaR techniques for market risk measurement to attempt to aggregate all market risks related to trading positions throughout the firm into a single aggregate VaR calculation for the entire firm. This produces a consolidated measure of market risk for the entire firm.

### Economic capital

Banks conventionally use 'economic capital' as the internal currency for risk across risk types and across business units. Firms using economic capital models calculate the amount of economic capital needed to support a given risk at a given level of confidence. Many firms set the confidence level for the measurement of risk so that it matches the default probability associated with a particular external credit rating. In this way, firms are calculating the amount of economic capital required to obtain a given rating for a firm taking on the underlying amount of risk on a stand-alone basis. As well as being performed at the business level, economic capital calculations are often performed at the business line level for a given risk type, and may be performed on a business line by business line basis. **1.40**

In this regard economic capital—or, more precisely, the allocation of economic capital—becomes the primary management tool for bank management. Individual business lines within the bank may be given a certain amount of economic capital, and told to manage their overall business within that 'budget'. Business lines which generate what they believe to be unusually profitable business opportunities which require capital above their allocation may be allowed to 'bid' for capital internally against other business lines. The aim of this mechanism is to improve the overall risk/return ratio within the bank by ensuring that capital is used for the most profitable business. **1.41**

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