

CHAPTER 1**A Primer on Bank Business
and Balance Sheet Risk**

This chapter is intended for newcomers to the market, junior bankers and finance students. Everyone else should read it as an essential refresher course. The purpose of this primer is to introduce all the essential basics of banking necessary to gain a strategic overview of what banks do and to manage what risk exposures they face. We begin with the concept of banking, and follow with a description of bank cash flows, calculation of return, the risks faced in banking, and organisation and strategy.

A summary of the bank product line is given in the Appendix at the end of the chapter.

AN INTRODUCTION TO BANKING

Banking has a long and honourable history. Banking operations encompass a wide range of activities, all of which contribute to the asset and liability profile of a bank. Table 1.1 shows selected banking activities, and the type of risk exposure they represent. The terms used in the table, such as “market risk”, are explained elsewhere in this book. In Chapter 2 we discuss elementary aspects of financial analysis, using key financial ratios, that are used to examine the profitability and asset quality of a bank. We also discuss bank regulation and the concept of bank capital.

Before considering the concept of asset and liability management (ALM), all readers should be familiar with the way a bank’s earnings and performance are reported in its financial statements. A bank’s income statement will break down the earnings by type, as we have defined in Table 1.1. So we need to be familiar with interest income, trading income and so on. The other side of an income statement is the costs, such as operating expenses and bad loan provisions.

TABLE 1.1 Selected banking activities and services.

Service or function	Revenue generated	Risk
Lending		
– Retail	Interest income, fees	Credit, Market
– Commercial	Interest income, fees	Credit, Market
– Mortgage	Interest income, fees	Credit, Market
– Syndicated	Trading, interest income, fees	Credit, Market
Credit cards	Interest income, fees	Credit, Operational
Project finance	Interest income, fees	Credit
Trade finance	Interest income, fees	Credit, Operational
Cash management		
– Processing	Fees	Operational
– Payments	Fees	Credit, Operational
Custodian	Fees	Credit, Operational
Private banking	Commission income, interest income, fees	Operational
Asset management	Fees, performance payments	Credit, Market, Operational
Capital markets		
– Investment banking	Fees	Credit, Market
– Corporate finance	Fees	Credit, Market
– Equities	Trading income, fees	Credit, Market
– Bonds	Trading income, interest income, fees	Credit, Market
– Foreign exchange	Trading income, fees	Credit, Market
– Derivatives	Trading income, fees	Credit, Market

That the universe of banks encompasses many different forms is evident from the way they earn their money. Traditional banking institutions, perhaps typified by a regional bank in the United States (US) or a building society in the United Kingdom (UK), will generate a much greater share of their revenues through net interest income than trading income, and vice versa for a bank such as Goldman Sachs or Morgan Stanley. The latter firms will earn a greater share of their revenues through fees and trading income.

During 2007 a regional European bank reported the following earnings breakdown, as shown in Table 1.2.

However, this breakdown varies widely across regions and banks, and in fact would be reversed at an “investment bank” whose core operating activity was market-making and proprietary trading.

Let us now consider the different types of income stream and costs.

TABLE 1.2 European regional bank, earnings structure 2007.

Core operating income	% share
Net interest income	62
Fees and commissions	27
Trading income	11

Source: Bank financial statements.

Interest Income

Interest income, or net interest income (NII), is the main source of revenue for the majority of banks worldwide. As we saw from Table 1.2, it can form upwards of 60% of operating income, and for smaller banks and building societies it reaches 80% or more.

NII is generated from lending activity and interest-bearing assets, the “net” return is this interest income minus the cost of funding the loans. Funding, which is a cost to the bank, is obtained from a variety of sources. For many banks, retail deposits are a key source of funding, as well as one of the cheapest. They are generally short term, though, or available on demand, so are often supplemented with longer term funding. Other sources of funds include senior debt, in the form of bonds, securitised bonds and money market paper.

NII is sensitive to both credit risk and market risk. Market risk, which we will look at later, is essentially interest-rate risk for loans and deposits. Interest-rate risk will be driven by the maturity structure of the loan book, as well as the match (or mismatch) between the maturity of the loans against the maturity of the funding. This is known as the interest-rate gap.

Fees and Commissions

Banks generate fee income as a result of the provision of services to customers. Fee income is very popular with bank senior management because it is less volatile and not susceptible to market risk like trading income or NII. There is also no credit risk because the fees are often paid up front. There are other benefits as well, such as the opportunity to build up a diversified customer base for this additional range of services.

Fee income uses less capital and also carries no market risk, but does carry other risks such as operational risk.

Trading Income

Banks generate trading income through trading activity in financial products such as equities (shares), bonds and derivative instruments. This includes acting as a dealer or market-maker in these products, as well as taking proprietary positions for speculative purposes. Running positions in securities (as opposed to derivatives) in some cases generates interest income; some banks strip this out of the capital gain made when the security is traded to profit, while others include it as part of overall trading income.

Trading income is the most volatile income source for a bank. It also carries relatively high market risk, as well as not inconsiderable credit risk. Many banks, although by no means all, use the value-at-risk (VaR) methodology to measure the risk arising from trading activity, which gives a statistical measure of expected losses to the trading portfolio under certain selected market scenarios.

Costs

Bank operating costs comprise staff costs, as well as other costs such as regulatory costs, premises, information technology and equipment costs. Further, significant elements of cost are provisions for loan losses, which are a charge against the loan revenues of the bank. The provision is based on a subjective measure by management of how much of the loan portfolio can be expected to be repaid by the borrower.

THE CAPITAL MARKETS

“Capital markets” is the term used to describe the market for raising and investing finance. The economies of most countries are based on financial systems that contain investors and borrowers, markets and trading arrangements. A market can be one in the traditional sense such as an exchange where financial instruments are bought and sold on a trading floor, or it may refer to one where participants deal with each other over the telephone or via electronic screens. The basic principles are the same in any type of market. There are two primary users of the capital markets: lenders and borrowers. The source of lenders’ funds is, to a large extent, the personal sector made up of household savings and those acting as their investment managers such as life assurance companies and pension funds. The borrowers are made up of the government, local governments and companies (called corporates). There is a basic conflict in the financial objectives of borrowers and lenders, in that those who are investing funds

wish to remain *liquid*, which means they have easy access to their investments. They also wish to maximise the return on their investment. A borrower, on the other hand, will wish to generate maximum net profit on its activities, which will require continuous investment in plant, equipment, human resources and so on. Such investment will therefore need to be as long term as possible. Government borrowing, as well, is often related to long-term projects such as the construction of schools, hospitals and roads. So while investors wish to have ready access to their cash and invest short, borrowers desire funding to be as long as possible. The economist John Hicks¹ referred to this conflict as the “constitutional weakness” of financial markets, especially when there is no conduit through which to reconcile the needs of lenders and borrowers. To facilitate the efficient operation of financial markets and the price mechanism, intermediaries exist to bring together the needs of lenders and borrowers. A bank is the best example of this. Banks accept deposits from investors, which make up the *liability* side of their balance sheet, and lend funds to borrowers, which form the *assets* on their balance sheet. If a bank builds up a sufficiently large asset and liability base, it will be able to meet the needs of both investors and borrowers, as it can maintain liquidity to meet investors’ requirements, as well as create long-term assets to meet the needs of borrowers. The bank is exposed to two primary risks in carrying out its operations, one that a large number of investors decide to withdraw their funds at the same time (a “run” on the bank), or that large numbers of borrowers go bankrupt and default on their loans. In acting as a financial intermediary, the bank reduces the risks it is exposed to by spreading and pooling risk across a wide asset and liability base.

Corporate borrowers wishing to finance investment can raise capital in various ways. The main methods are:

- continued reinvestment of the profits generated by a company’s current operations;
- selling shares in the company, known as equity capital, equity securities or *equity*, which confirm on buyers a share in ownership of the company. The shareholders as owners have the right to vote at general meetings of the company, as well as the right to share in the company’s profits by receiving dividends;
- borrowing money from a bank, via a bank loan. This can be a short-term loan such as an overdraft, or a longer term loan over two, three, five years or even longer. Bank loans can be at either a fixed or more usually, variable rate of interest;

1 Hicks, J. (1939), *Value and Capital*, Oxford University Press, Oxford.

- borrowing money by issuing debt securities, in the form of *bills*, *commercial paper* (CP) and *bonds* that subsequently trade in the debt capital market.

The first method may not generate sufficient funds, especially if a company is seeking to expand by growth or acquisition of other companies. In any case a proportion of annual after-tax profits will need to be paid out as dividends to shareholders. Selling further shares is not always popular among existing shareholders as it dilutes the extent of their ownership; there are also a host of other factors to consider, including if there is any appetite in the market for that company's shares. A bank loan is often inflexible, and the interest rate charged by the bank may be comparatively high for all but the highest quality companies. However, it is often the first source of corporate finance. Hence the importance of banks.

BANKING BUSINESS AND CAPITAL

We introduced the different aspects of banking business at the beginning of this chapter. For the largest banks these aspects are widely varying in nature. For our purposes we may group them together in the form shown in Figure 1.1. Put simply, “retail” or “commercial” banking covers the more traditional lending and trust activities, while “investment” banking covers trading activity and fee-based income such as stock exchange listing and mergers and acquisitions (M&A). The one common objective of all banking activity is return on capital. Depending on the degree of risk it represents, a particular activity will be required to achieve a specified return on the capital it uses. The issue of banking capital is vital to an appreciation of the banking business; entire new business lines (such as securitisation) have been originated in response to a need to generate more efficient use of capital.

We can see the scope of banking business from Figure 1.1. There is a vast literature on all these activities, so we do not need to cover them here. However, it is important to have good knowledge of the main products.

ALM is concerned with, among other things, the efficient management of banking capital. It therefore concerns itself with all banking operations, even if the day-to-day contact between the ALM desk (or Treasury desk) with other parts of the bank is remote. The ALM desk will be responsible for the treasury and money markets activities of the entire bank. So if we wish, we could draw a box with ALM in it around the whole of Figure 1.1. This is not to say that the ALM function does all these activities; rather,

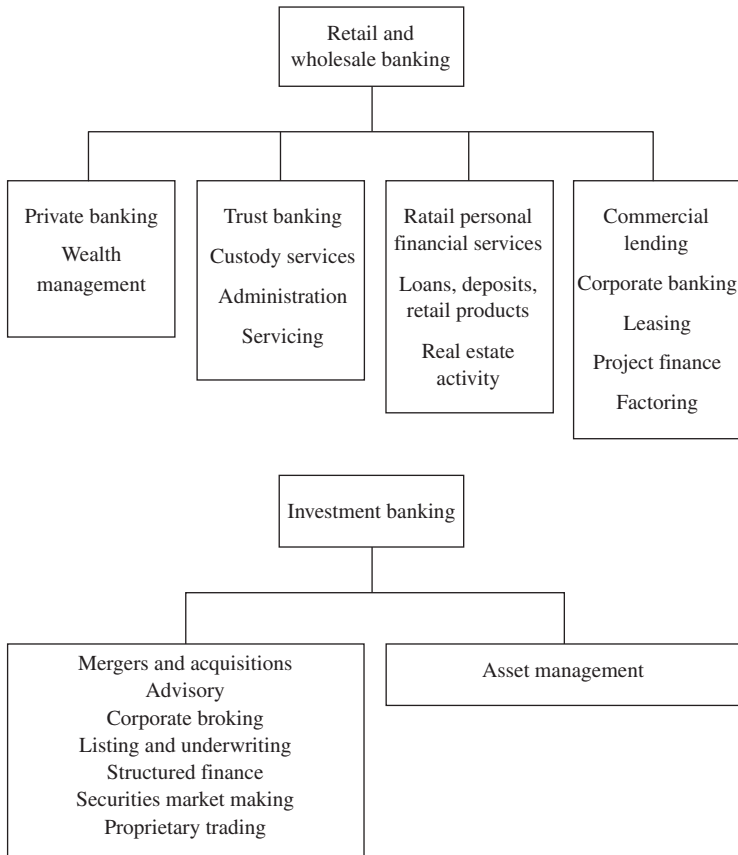


FIGURE 1.1 Scope of banking activities.

it is just to make clear that all the various activities represent assets and liabilities for the bank, and one central function should be responsible for the management of this side of these activities. In other words, the ALM function is responsible for the overall management of the balance sheet.

For capital management purposes a bank's business is organised into a "banking book" and a "trading book". We consider them next; first though, a word on bank capital.

Capital

Bank capital is the equity of the bank. It is important as it is the cushion that absorbs any unreserved losses that the bank incurs. By acting as this

cushion, it enables the bank to continue operating *as a going concern* and thus avoid insolvency or bankruptcy during periods of market correction or economic downturn. When the bank suffers a loss or writes off a loss-making or otherwise economically untenable activity, the capital is used to absorb the loss. This can be done by eating into reserves, freezing dividend payments or (in more extreme scenarios) writing down equity capital. In the capital structure, the rights of capital creditors, including equity holders, are subordinated to senior creditors and deposit holders. A capital base that is not sufficient to absorb losses and still maintain the viability of the bank as a going concern is inadequate and not fit for purpose.

Banks occupy a vital and pivotal position in any economy, as suppliers of credit and financial liquidity, so bank capital is important. As such, banks are heavily regulated by central monetary authorities, and their capital is subject to regulatory rules governed by the Bank for International Settlements (BIS), based in Basel, Switzerland. For this reason its regulatory capital rules are often called the Basel rules. Under the original Basel rules (“Basel I”) a banking institution was required to hold a minimum capital level of 8% against the assets on its book.² Total capital is comprised of:

- equity capital;
- reserves;
- retained earnings;
- preference share capital;
- hybrid capital instruments
- subordinated debt.

Capital is split into Tier 1 capital and Tier 2 capital. The first three items above comprise Tier 1 capital while the remaining items are Tier 2 capital.

The quality of the capital in a bank reflects its mix of Tier 1 and 2 capital. Tier 1 or “core capital” is the highest quality capital, as it is not obliged to be repaid, and moreover there is no impact on the bank’s reputation if it is not repaid. Tier 2 is considered lower quality as it is not “loss absorbing”; it is repayable and also of shorter term than equity capital. Assessing the financial strength and quality of a particular banking institution often requires calculating key capital ratios for the bank and comparing these to market averages and other benchmarks.

² There is more to this than just this simple statement, and we consider the subject in chapters 2 and 17.

TABLE 1.3 Bank analysis ratios for capital strength.

Ratio	Calculation	Notes
Core capital ratio	Tier 1 capital/ Risk-weighted assets	A key ratio monitored in particular by rating agencies as a measure of high-quality non-repayable capital, available to absorb losses incurred by the bank
Tier 1 capital ratio	Eligible Tier 1 capital/ Risk-weighted assets	Another important ratio monitored by investors and rating agencies. Represents the amount of high-quality, non-repayable capital available to the bank
Total capital ratio	Total capital/ Risk-weighted assets	Represents total capital available to the bank
Off-balance sheet risk to total capital	Off-balance sheet and contingent risk/Total capital	Measure of adequacy of capital against off-balance sheet risk including derivatives exposure and committed, undrawn credit lines

Source: Higson (1995).

Analysts use a number of ratios to assess bank capital strength. Some of the more common ones are shown in Table 1.3.

Banking and Trading Books

Banks and financial institutions make a distinction between their activities for capital management, including regulatory capital, purposes. Activities are split into the “banking book” and the “trading book”. Put simply, the banking book holds the more traditional banking activities such as commercial banking; for example, loans and deposits. This would cover lending to individuals as well as corporates and other banks, and so will interact with investment banking business.³ The trading book records wholesale market transactions, such as market making and proprietary trading in bonds and derivatives. Again, speaking simply, the primary difference between the two books is that the over-riding principle of the

³ For a start, there will be a commonality of clients. A corporate client will borrow from a bank, and may also retain the bank’s underwriting or structured finance departments to arrange a share issue or securitisation for it, as well as arrange interest-rate risk hedging via the bank’s derivatives desk.

banking book is one of “buy and hold”; that is, a long-term acquisition. Assets may be held on the book for up to 30 years or longer. The trading book is just that, it employs a trading philosophy so that assets may be held for very short terms, less than one day in some cases, and usually no longer than six months. The regulatory capital and accounting treatment of each book differs. The primary difference here is that the trading book employs the “mark-to-market” approach to record profit and loss (P&L), which is the daily “marking” of an asset to its fair market value. An increase or decrease in the mark on the previous day’s mark is recorded as an unrealised profit or loss on the book: on disposal of the asset, the realised profit or loss is the change in the mark at disposal compared to its mark at purchase.

The Banking Book

Traditional banking activity such as deposits and loans is recorded in the banking book. Accounting treatment for the banking book follows the accrual concept, which accrues interest cash flows as they occur. There is no mark-to-market. The banking book holds assets for which both corporate and retail counterparties as well as banking counterparties are represented. So it is the type of business activity that dictates whether it is placed in the banking book, not the type of counterparty or which department of the bank is conducting it. Assets and liabilities in the banking book generate interest-rate and credit risk exposure for the bank. They also create liquidity and term mismatch (“gap”) risks. Liquidity refers to the ease with which an asset can be transformed into cash, as well as to the ease with which funds can be raised in the market. So we see that “liquidity risk” actually refers to two related but separate issues.

All these risks form part of ALM. Interest-rate risk management is a critical part of Treasury policy and ALM, while credit risk management will be set and dictated by the credit policy of the bank. Gap risk creates an excess or shortage of cash, which must be managed. This is the cash management part of ALM. There is also a mismatch risk associated with fixed-rate and floating-rate interest liabilities. The central role of the financial markets is to enable cash management and interest-rate management to be undertaken efficiently. ALM of the banking book will centre on interest-rate risk management and hedging, and liquidity management. Note how there is no “market risk” for the banking book in principle, because there is no marking-to-market and all interest-rate risk should be hedged. However, the interest rate exposure of the book (floating-versus fixed-rate interest risks) creates an exposure that is subject to market movements in interest rates, and so in reality the banking book is indeed exposed to market risk that requires hedging.

The Trading Book

Wholesale market activity, including market making and proprietary trading, is recorded in the trading book. Assets on the trading book can be expected to have a high turnover, although not necessarily so, and are usually subject to a “churn” rule, which means they must be sold after a period of 180 days on the book. Assets are marked-to-market daily. The counterparties to this trading activity can include other banks and financial institutions such as hedge funds, corporates and central banks. Trading book activity generates the same risk exposure as that on the banking book, including market risk, credit risk and liquidity risk. It also creates a need for cash management. Much trading book activity involves derivative instruments, as opposed to “cash” products. Derivatives include futures, swaps and options. These can be equity, interest-rate, credit, commodity, foreign exchange (FX), weather and other derivatives. Derivatives are known as “off-balance sheet” instruments because they are recorded off the (cash) balance sheet.

Off-balance sheet transactions refer to “contingent liabilities”, which are so-called because they refer to a future exposure contracted now. These are not only derivatives contracts such as interest-rate swaps or writing an option, but include guarantees such as a credit line to a third-party customer or a group subsidiary company. These represent a liability for the bank that may be required to be honoured at some future date. In most cases they do not generate cash inflow or outflow at inception, unlike a cash transaction, but represent future exposure. If a credit line is drawn on, it represents a cash outflow and that transaction is then recorded on the balance sheet. However, it is risk-managed as if a current exposure.

FINANCIAL STATEMENTS AND RATIOS

A key information tool for bank analysis is the financial statement, which is comprised of the balance sheet and the P&L account. Assets on the balance sheet should equal the assets on a bank’s ALM report, while receipt of revenue (such as interest and fees income) and payout of costs during a specified period is recorded in the P&L report or income statement.

The Balance Sheet

The balance sheet is a statement of a company’s assets and liabilities as determined by accounting rules. It is a snapshot of a particular point in time, and so by the time it is produced it is already out of date. However, it is an important information statement. A number of management

TABLE 1.4 Components of a bank balance sheet.

Assets	Liabilities
Cash	Short-term liabilities
Loans	Deposits
Financial instruments (long)	Financial instruments (short)
Fixed assets	Long-dated debt
Off-balance sheet (receivables)	Equity
	Off-balance sheet (liabilities)

information ratios are used when analysing the balance sheet and these are shown at Table 1.6.

For a bank there are usually four parts to a balance sheet, as it is split to show separately:

- lending and deposits, or traditional bank business;
- trading assets;
- treasury and inter-bank assets;
- off-balance sheet assets;
- long-term assets, including fixed assets, shares in subsidiary companies, together with equity and Tier 2 capital.

This is illustrated in Table 1.4. The balance sheet of a retail or commercial bank will differ from that of an investment bank in the relative importance of their various business lines.

Profit & Loss Report

The income statement for a bank is the P&L report. It records all the income, and losses, during a specified period of time. A bank income statement will show revenues that can be accounted for as either NII fees and commissions, and trading income. The precise mix of these sources will reflect the type of banking institution and the business lines it operates in. Revenue is offset by operating (non-interest) expenses, loan loss provisions, trading losses and tax expense.

A more “traditional” commercial bank will have a much higher dependence on interest revenues than an investment bank that engages in large-scale wholesale capital market business. Table 1.5 shows the components of a UK retail bank’s income statement.

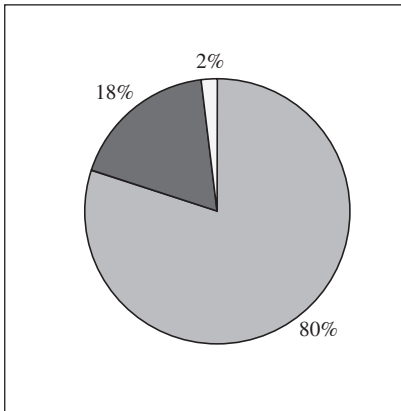
The composition of earnings varies widely among different institutions. Figure 1.2 shows the breakdown for a UK building society and the UK branch of a US investment bank in 2007, as reported in their financial accounts for that year.

TABLE 1.5 Components of a bank income statement, typical structure for a retail bank.

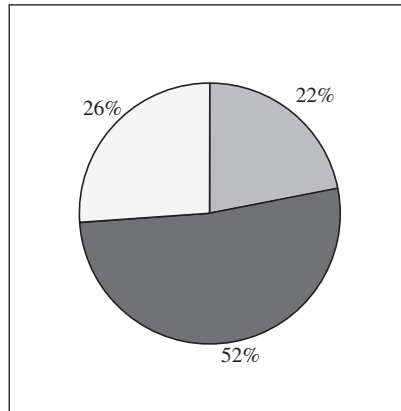
	%	Expressed as percentage of
Core operating income	100	
Net interest income	64	/core operating income
Commissions and fee income	31	/core operating income
Trading income	8	/core operating income
+ Net other operating income	8	/core operating income
– Operating expenses	61	/revenues
Personnel	38	/revenues
Other, depreciation		
– Loan loss provisions	23	/pre-provision net income
= Net operating income		
+ Other non-operating income		
= Profit before tax		
– Tax		
= Net income		
– Minority interest		
= Attributable income		

UK building society, core earnings split 2007

Net interest income	80%
Fee income	18%
Trading profit	2%

**UK branch, US investment bank, core earnings split 2007**

Net interest income	22%
Fee income	52%
Trading profit	26%

**FIGURE 1.2** Composition of earnings.

Source: Bank financial statements.

Net Interest Income

The traditional source of revenue for retail banks, NII, remains as such today (see Figure 1.2). NII is driven by lending and interest-earning asset volumes, and the net yield available on these assets after taking into account the cost of funding. While the main focus is on the loan book, the ALM desk will also concentrate on the bank's investment portfolio. The latter will include coupon receipts from money market and bond market assets, and dividends received from any equity holdings.

The cost of funding is the key variable in generating overall NII. For a retail bank the cheapest source of funds is deposits, especially non-interest-bearing deposits such as cheque accounts.⁴ Even in an era of high-street competition, the interest payable on short-term liabilities such as instant access deposits is far below the wholesale market interest rate. This is a funding advantage for retail banks when compared to investment banks, which generally do not have a retail deposit base. Other funding sources include capital markets (senior debt), wholesale markets (the inter-bank money market), securitised markets and covered bonds. The overall composition of funding affects significantly net interest margin, and if constrained, can reduce the activities of the bank.

The risk profile of the asset classes that generate yields for the bank should lead to a range of net interest margins being reported across the sector, such that a bank with a strong unsecured lending franchise should seek significantly higher yields than one investing in secured mortgage loans; this reflects the different risk profiles of the assets. The proportion of NIBLs will also have a significant impact on the net interest margin of the institution. While a high net interest margin is desirable, it should also be an adequate return for the risk incurred in holding the assets.

Bank NII is sensitive to both credit risk and market risk. Interest income is sensitive to changes in interest rates and the maturity profile of the balance sheet. Banks that have assets that mature earlier than their funding liabilities will gain from an environment of rising interest rates. The opposite applies where the asset book has a maturity profile that is longer dated than the liability book. Note that in a declining or low interest-rate environment, banks may suffer from negative NII irrespective of their asset-liability maturity profile, as it becomes more and more difficult to pass on interest rate cuts to depositors.

While investment banks are less sensitive to changes in rates, as their overall NII expectations are low due to their lower reliance on NII itself, their trading book will also be sensitive to changes in interest rates.

⁴ These are referred to as *NIBLs* (non-interest bearing liabilities).

Fee and Commission Income

Fee revenue is generated from the sale and provision of financial services to customers. The level of fees and commissions will be communicated in advance to customers. Fee income, separate from trading income and known as non-interest income, is desirable for banks because it represents a stable source of revenue that is not exposed to market risk. It is also attractive because it provides an opportunity for the bank to cross-sell new products and services to existing customers, and the provision of these services does not expose the bank to additional credit or market risk. Fee income represents diversification in a bank's revenue base.

Note that although fee-based business may not expose the bank to market risk directly, it does bring with it other risks, and these can include indirect exposure to market risk.⁵ In addition, an ability to provide fee-based financial services may require significant investment in infrastructure and human resources.

Trading Income

Trading income arises from the capital gain earned from buying and selling financial instruments. These instruments include both cash and derivative (off-balance sheet) instruments, and can arise from undertaking market-making business, which in theory is undertaken to meet client demands, and from proprietary business for the bank's own trading book. Note that interest income earned while holding assets on the trading book should really be considered as NII and not trading income, but sometimes this is not stripped out from the overall trading book P&L. There is no uniformity of approach among banks in this regard.

Trading income is the most volatile form of bank revenue. Even a record of consistent profit in trading over a long period is no guarantee of future losses arising out of market corrections or simply making the wrong bet on financial markets.

Operating Expenses

Banking operating costs typically contain the human resources costs (remuneration and other personnel-related expenses), together with other operating costs such as premises and infrastructure costs, depreciation

⁵ For example, a strategy pursued by banks in the 1990s was to merge with or acquire insurance companies, so-called *bancassurance* groups. Although much insurance business is fee-based, the acquisition of insurance portfolios brought with it added market risk to the banking group.

TABLE 1.6 Common bank cost–income ratios.

Ratio	Calculation	Notes
Pre-tax ROE	Pre-tax income/Average shareholders' equity	Measures the pre-tax return on equity. A measure above 20% is viewed as above average and strong
ROE	Attributable net income/Average shareholders' equity	Measures return on equity. A measure above 10% is considered strong
ROA	Net income/Average assets	Measures return on assets. A measure above 1% is considered strong
Cost–income ratio	Non-interest costs/Total net revenues	Non-interest costs minus non-cash items such as goodwill or depreciation of intangible assets. The cost to produce one unit of net interest and non-interest income. The lower the ratio, the more efficient the bank
Net interest margin	Net interest income/Average earning assets	The difference between tax-equivalent yield on earning assets and the rate paid on funds to support those assets, divided by average earning assets
Loan loss provision	Loan-loss provision/Pre-provision, pre-tax income	The proportion of pre-tax income that is being absorbed by loan losses. This is the credit cost of conducting the business
Non-interest income	Non-interest income/Net revenues	Non-interest income includes service charges on deposits, trust fees, advisory fees, servicing fees, net trading profits from trading books, and commissions and fees from off-balance sheet items. Generally, the higher the ratio, the greater the bank's sensitivity to changes in interest rates

charges and goodwill.⁶ Cost is generally measured as a proportion of revenue. A number of cost–income ratios are used by analysts, some of which are given in Table 1.6.

The return on equity (RoE) measure is probably the most commonly encountered, and is usually integrated into bank strategy, with a target RoE level stated explicitly in management objectives. Note that there is a difference

⁶ These are accounting terms common to all corporate entities, and are not solely used to describe bank operating costs.

between the accounting RoE and the market return on equity; the latter is calculated as a price return, rather like a standard P&L calculation, which is taken as the difference between market prices between two dates. The RoE target needs to reflect the relative risk of different business activity.

The return on assets (RoA) is another common measure of performance, and for a number of reasons a better measure to employ. This is calculated as follows:

$$\frac{\text{Current income (Interest income + Fees)}}{\text{Asset value}}$$

Both financial statement P&L reports and measures such as RoE and RoA are bland calculations of absolute values. They do not make any adjustment for relative risk exposure so cannot stand too much comparison with the equivalent figures of another institution. This is because the risk exposure, not to mention the specific type of business activity, will differ from one bank to another. However, there are general approximate values that serve as benchmarks for certain sectors, such as the 15% RoE level for investment banks.

Provisions

Banks expect a percentage of loan assets, and other assets, to suffer loss or become unrecoverable completely. Provisions are set aside out of reserves to cover for these losses each year, and are a charge against the loan revenues of the bank. The size of the provision taken is a function of what write-offs may be required against the loan portfolio in the current portfolio in the current period and in the future, and the size and adequacy of loan loss reserves currently available. In some jurisdictions there are regulatory requirements that dictate the minimum size of the provision. Provisions fund the bank's loan loss reserve, and the reserve will grow in size when the bank provides more for expected credit losses than the actual amount that is written off. If the bank believes subsequently that the size of the reserve built up is in excess of what is currently required, it may write back a percentage of it.

THE MONEY MARKETS

The money markets are part of the global financial system. The various markets that make up this system are all, in one form or another, channels through which fund flows between the users and the suppliers of capital move. This flow of funds takes place in different markets, depending on the characteristics of the funds themselves and the needs of the market

participants. The money market is where transactions in short-term funds take place. This is the borrowing and lending of funds that have a repayment date of within 12 months of the loan start date. However, the money market is not just made up of loans or cash products. There is a wide range of instruments used in the market, both cash and derivative, and it is these products and the uses to which they are put that are a significant focus of this book.

So, the money market is the centre in which market participants – which can be governments, banks, other corporate institutions, fund managers or individuals – meet to transform a short-term shortage (or surplus) of funds into a surplus (or shortage). As such, the money market enables market participants to manage their liquidity positions.

The suppliers of funds in financial systems worldwide are generally commercial banks, as well as savings institutions such as money market mutual funds. Other institutions such as local authorities and corporations are also long of cash at certain times. The borrowers of funds include the government, banks (again), local authorities and corporations (also, again).

In terms of trading volumes the money markets are the largest and most active market in the world. As money market securities are securities with maturities of up to 12 months, they are short-term debt obligations. Money market debt is an important part of the global financial markets, and facilitates the smooth running of the banking industry, as well as providing working capital for industrial and commercial corporate institutions. Money market instruments allow issuers to raise funds for short-term periods at relatively low interest rates. These issuers include sovereign governments, who issue Treasury bills (T-bills), corporates issuing CP, and banks issuing bills and certificates of deposit. The T-bill market in any country is that country's lowest risk instrument, and consequently carries the lowest yield of any debt instrument. Indeed, the first market that develops in any country is frequently the T-bill market.

Although the money market has traditionally been defined as the market for instruments maturing in one year or less, frequently the money market desks of banks trade instruments with maturities of up to two or three years, both cash and off-balance sheet.⁷ In addition to the cash instruments that go to make up the market, the money markets also consist

⁷ The author has personal experience in market making on a desk that combined cash and derivative instruments of up to two years' maturity, as well as government bonds of up to three years' maturity. In his capacity on other bank Treasury desks the longest maturity of trades in cash and derivatives varied between 18 and 36 months, including products such as loans and deposits and overnight-index swaps of up to 18 months' maturity, medium-term notes (MTNs) of up to 24 months' maturity and liquidity portfolios of up to five years maturity.

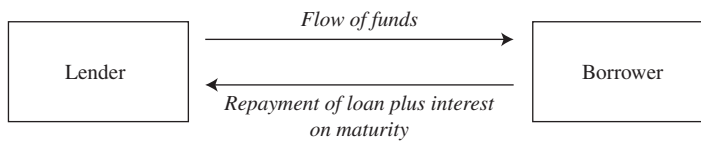


FIGURE 1.3 Direct financing.

of a wide range of over-the-counter (OTC) off-balance sheet derivative instruments. These instruments are used mainly to establish future borrowing and lending rates, and to hedge or change existing interest-rate exposure. This activity is carried out by both banks, central banks and corporates. The main derivatives are short-term interest rate futures, forward rate agreements, and short-dated interest rate swaps. Other derivatives such as total return swaps are also used.

Financial Transactions

All financial systems exist to facilitate one basic transaction: the moving of funds from cash-rich entities to cash-poor ones. This transaction involves the exchange of money for financial assets, or an interest in a financial asset. This exchange can be undertaken directly between participants, via an intermediary or indirectly.

Direct Finance

This involves two parties, one of which lends funds directly to the other for an agreed term and rate of interest. This transaction is shown in Figure 1.3. The funds can be lent in exchange for security (known as *collateral*) or on an unsecured basis. Direct financing is the simplest method for undertaking a financial transaction. Its drawbacks are that parties must know about each other and each other's requirements; they must also possess sufficient information on their counterparties such that they are satisfied in entering into the transaction. For this reason, direct financing, while very common among larger institutions or where the central government is involved, often gives way to financing via intermediaries.

Financing via an Intermediary

In terms of volume, the majority of money market transactions are carried out in semi-direct form, via intermediaries. We include banks among our list of intermediaries. These can be distinguished as follows:

- **Brokers:** a broker simply acts to bring lenders and borrowers together, and charges a commission for doing so. However, the involvement of

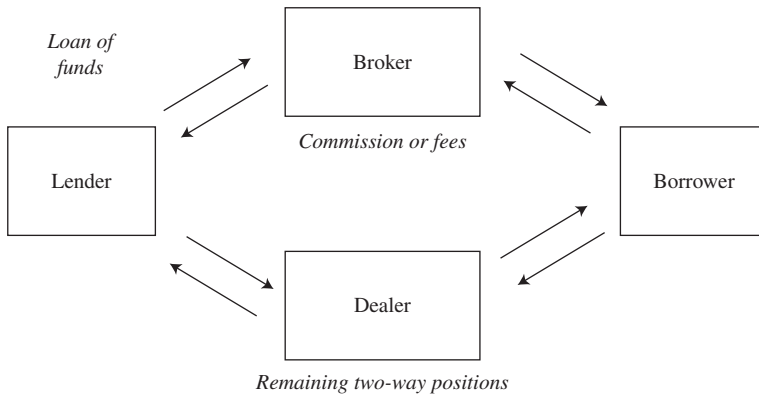


FIGURE 1.4 Intermediary financing.

a broker introduces greater transparency and information into the market.

- Market-makers: known as *dealers* in the US market, who also serve as intermediaries between borrowers and lenders, but take the cash position onto their own books and charge a two-way price in this cash to all other market participants. As such, dealers run a risk exposure position in the cash they own directly, as their profit depends on the value of the cash, which fluctuates in line with market dynamics and supply and demand.

Of course, the same institution can act in both capacities, according to who its counterparties are or what market it is trading in. This transaction is illustrated in Figure 1.4.

Indirect Financing

The existence of an active secondary market in money market securities reflects the extent of indirect financing. This covers a number of areas, such as banks issuing their own securities to fund their loans to corporates and individuals, and the trading of these securities after the initial finance has been raised. Financial intermediaries that are part of this market include commercial banks, insurance companies, credit institutions such as automobile manufacturer credit arms, finance companies, savings and loan associations (known as building societies in the UK), pension funds, mutual funds and so on. Their role in the market is to act essentially as both borrowers and lenders themselves in a way that serves the market's ultimate borrowers and lenders. Table 1.7 lists the types of firms involved in indirect financing.

TABLE 1.7 Financial institutions and intermediaries active in the money markets.

Deposit-taking institutions	Contractual institutions	Wholesale market counterparties
Commercial banks	Life insurance companies	Investment banks
Retail banks	Life assurance companies	Securities houses
Non-banking institutions:	Pension fund managers	(“Broker-Dealers”)
– Savings & Loan	Mutual Funds	Brokers
(“Building Societies”)	(“Unit Trusts”)	
– Credit Unions	Investment trust companies	
Mutual funds (“Unit Trusts”)		
– Money market funds		
Finance companies		
Government-lending institutions		

Characteristics of the Money Market

The money market, worldwide, acts as a channel through which market participants exchange financial assets for cash, or raise cash on a secured and unsecured basis. Its key defining point is that it serves short-term needs. These are the short-term financing needs of participants who are short of cash, and the short-term investment needs of participants who are long cash. Figure 1.5 shows a stylised structure of the money market as it would exist in most countries.

Interest rates set in the money market act as benchmarks and guidelines for all other rates used. The importance of the money markets to this activity is often over-looked.

The size of the market means that it, in most countries and certainly in all developed economies, carries considerable breadth and depth. It is possible to transact very large volumes of business and for this not to impact the money market in an observable way. Money market dealing is “OTC”, meaning it is not conducted on an exchange but over the telephone or computer terminal.

Interest rates in the money market – the rates at which participants borrow and lend funds – are set by the market and reflect a number of factors, from macroeconomic issues and global supply and demand, to more market-specific issues such as liquidity and transparency. There are a large number of interest rates, for different products and different counterparties. The cornerstone of the market’s various rates is the T-bill rate. T-bills are issued by the government to raise short-term cash (the typical maturity is

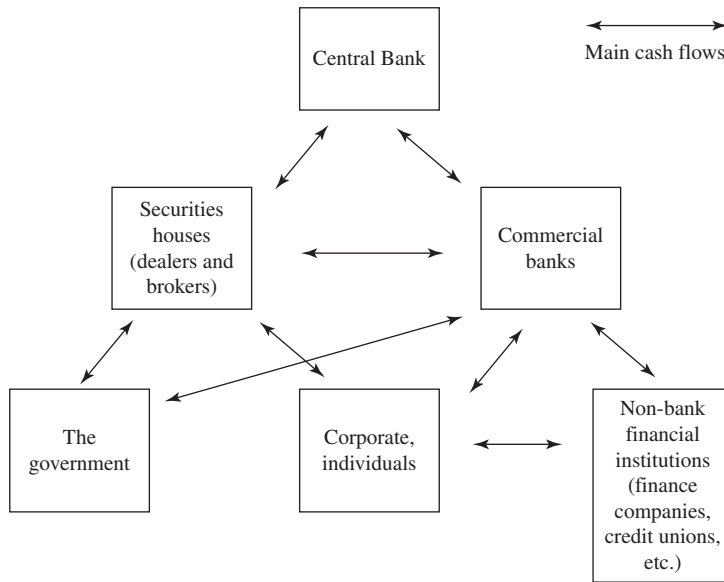


FIGURE 1.5 The structure of the money market.

90 days). Because the bills are backed by the government, they carry the lowest default risk in that market. Hence the rates payable on these bills are the lowest in that market. All other rates in the market (and the bond market) will be at a positive spread over the T-bill rate.

Readers interested in detailed coverage of the various instruments that go to make up the money markets may wish to consult the author's book *Bank Asset and Liability Management*. That book includes a primer on financial markets arithmetic. This is required background for an understanding of interest rate mechanics.

Money Market Conventions

Many money market instruments trade under similar market conventions. For example, for most currencies the basis used to calculate interest on a loan assumes a 360-day year, although sterling is an important exception to this. Again, while it is the norm for many currencies to float freely, their exchange rates to other currencies set by market supply and demand, some other important currencies are pegged to the US dollar and move with that currency. A small number of currencies are not convertible and cannot be traded.

Table 1.8 shows the characteristics of a sample of world currencies. It serves to highlight the individual detail differences that exist in the market. Terms such as "day-count" and "value date" are explained in the author's book noted above.

TABLE 1.8 Selected global currency conventions.

Country	Currency	FX rate	Day-count	Spot FX value date
Argentina	Peso	Free-floating	ACT/360	T+2
Australia	Dollar	Free-floating	ACT/365	T+2
Brazil	Real	Free-floating	ACT/360	T+3
Canada	Dollar	Free-floating	ACT/365	T+1
			(domestic)	
			ACT/360 (int'l)	T+2
China	Renminbi	Pegged to USD	ACT/360	N/A
Czech Republic	Koruna	Free-floating	ACT/360	T+2
Denmark	Krone	Free-floating	ACT/360	T+2
Egypt	Pound	Free-floating	ACT/360	T+2
Euro Area ¹	Euro	Free-floating	ACT/360	T+2
Hong Kong	Dollar	Pegged to USD, HKD 7.70 per USD 1	ACT/365	T+2
Hungary	Forint	Managed floating	ACT/360	T+2
Japan	Yen	Free-floating	ACT/360	T+2
Latvia	Lats	Pegged to Special Drawing Right (SDR) ²	ACT/360	T+2
Lithuania	Litas	Pegged to euro, LTL 3.4528 to EUR 1	ACT/360	T+2
Malaysia	Ringgit	Pegged to US dollar	ACT/365	T+2
New Zealand	Dollar	Free-floating	ACT/365	T+2
Norway	Krone	Free-floating	ACT/360	T+2
Poland	Zloty	Free-floating	ACT/365	T+2
Singapore	Dollar	Managed floating	ACT/365	T+2
South Africa	Rand	Free-floating	ACT/365	T+2
South Korea	Won	Free-floating	ACT/365	T+2
Switzerland	Franc	Free-floating	ACT/360	T+2
Taiwan	Dollar	Free-floating	ACT/365	T+2
Thailand	Baht	Free-floating	ACT/365	T+2
United Kingdom	Pound	Free-floating	ACT/365	T+2
United States	Dollar	Free-floating	ACT/360	T+2

¹Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia and Spain.

²The “currency” of the International Monetary Fund.

Sources: Bloomberg L.P. and Reuters.

Practitioners with access to Bloomberg can look up individual currency details by selecting:

[Ticker] [Currency yellow key] DES <Go>.

We show this page for Australian dollar, Brazilian real and Egyptian pound in Figures 1.6, 1.7 and 1.8 respectively.

AUD ↓ .7495 +.0056 TTOL .7493/.7497 TTOL Curncy DES
 At 9:35 Op .7448 Hi .7498 Lo .7441 Prev .7439 Value 4/21/04

Description Page 1/1

AUD-USD AUSTRALIAN DOLLAR SPOT 1 Dollar = 100 Cents	
The Australian dollar is the official currency of the Commonwealth of Australia. The conventional market quotation is the number of US dollars per Australian dollar. It is an independent, free-floating currency.	
1) Economic Statistics	AUSTRALIA
9) GDP 190200 12/31/03	Region: Pacific Rim
10) Unemploymnt Rate 5.6 03/31/04	Capital: Canberra
11) CPI 142.80 12/31/03	Population 19.55 12/31/02
12) Total Foreign De 360688 09/30/03	Area: 2966155
13) Exports (MLN) 11539.00 02/29/04	4)MAPS Map
14) Imports (MLN) 13355.00 02/29/04	5)CDR Calendar
2) News, Research & Market Information	Quick Statistics
15) Current News	6)GPD 52Wk High 0.80 02/18/04
16) Bond Market News	52Wk Low 0.61 04/21/03
17) Equity Market News	History Since 12/13/83
18) Economic News	Day count ACT/365
19) Economist Intelligence Unit	Value Date 04/21/04
20) Economic Releases	
3) Related Instruments	7)PCS Composite(NY)
Australia 61 2 2777 8609 Brazil 5511 3046 4500 Europe 44 20 7320 7500 Germany 49 69 920410	8)VOTE
Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000	Copyright 2004 Bloomberg L.P.
	6926-902-0 19-Apr-04 9:35:26

FIGURE 1.6 Bloomberg page DES for Australian dollar.
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BRL 2.9130Y as of close 4/16 Curncy DES

Description Page 1/3

USD-BRL BRAZILIAN REAL SPOT 1 Real = 100 Centavos	
The Brazilian real is the official currency of the Federative Republic of Brazil. The conventional market quotation is the number of reals per US dollar. It is an independent free-floating currency.	
1) Economic Statistics	BRAZIL
9) GDP% Qtr/Qtr 1.50 12/31/03	Region: South America
10) Unemploymnt Rate 7.08 11/30/02	Capital: Brasilia
11) CPI .12 03/31/04	Population 179.91 12/31/02
12) Government Debt 926680.65 02/29/04	Area: 3286500
13) Total revenue 13053.0 11/30/99	4)MAPS Map
14) Total Expenditur 12742.0 11/30/99	5)CDR Calendar
2) News, Research & Market Information	Quick Statistics
15) Current News	6)GPD 52Wk High 3.11 08/04/03
16) Equity Market News	52Wk Low 2.77 01/13/04
17) Economist Intelligence Unit	History Since 1/15/92
18) Economic Statistics	Day count ACT/360
19) IMF Data	Value Date 04/22/04
20) Related Instruments	
3) Related Instruments	7)PCS Composite(NY)
Australia 61 2 2777 8609 Brazil 5511 3046 4500 Europe 44 20 7320 7500 Germany 49 69 920410	8)VOTE
Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000	Copyright 2004 Bloomberg L.P.
	6926-902-0 19-Apr-04 9:35:26

FIGURE 1.7 Bloomberg page DES for Brazilian real.
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EGP 6.1850 - .0250 SAXD 6.1700/6.2000 SAXD Curncy DES	
At 09:30 Op 6.2150 Hi 6.2150 Lo 6.1450 Prev 6.2100 Value 4/21/04	
Description	
Page 1/2	
USD-EGP	EGYPTIAN POUND SPOT 1 Pound = 100 Piastres
The Egyptian pound is the official currency of the Arab Republic of Egypt. The conventional market quotation is the number of Egyptian pounds per US dollar. On 1/29/03 the Egyptian Pound was allowed to float freely.	
1) Economic Statistics	
9) CPI - Monthly Pe .69 03/31/03	EGYPT Region: Northern Africa Capital: Cairo Population 73.31 12/31/02 Area: 386662 4)MAPS Map 5)CDR Calendar
2) News, Research & Market Information	
10) Current News 11) Economist Intelligence Unit 12) IMF Data 13) Related Instruments	Quick Statistics 6)GPD 52wk High 6.23 04/13/04 52wk Low 5.91 05/06/03 History Since 6/ 9/93 Day count ACT/360 Value Date 04/21/04
3) Related Instruments	
7)PCS Composite(NY) 8)YOTE	
Australia 61 2 5277 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 920410 Hong Kong 852 2577 6000 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2004 Bloomberg L.P. 0926-802-3 18-Apr-04 9:36:47	

FIGURE 1.8 Bloomberg page DES for Egyptian pound.

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LIBOR

The term Libor or “LIBOR” is the acronym for London Inter-bank Offered Rate and is the interest rate at which one London bank expects to pay for funds from another London bank of acceptable credit quality. The rate is fixed by the British Bankers’ Association (BBA) at 11 a.m. every business day morning (in practice, the fix is usually about 20 minutes later) by taking the average of the rates supplied by member banks. The term “Libid” is the bank’s “bid” rate; that is, the rate at which it pays for funds in the London market. The quote spread for a selected maturity is therefore the difference between Libor and Libid. The convention in London is to quote the two rates as Libor–Libid, thus matching the yield convention for other instruments. In some other markets the quote convention is reversed. Euribor is the interbank rate offered for euros as reported by the European Central Bank, fixed in Brussels.

Figure 1.9 shows the Libor fixing page from the BBA on Bloomberg, for the Libor rate fix on 31 August 2004.

(continued)

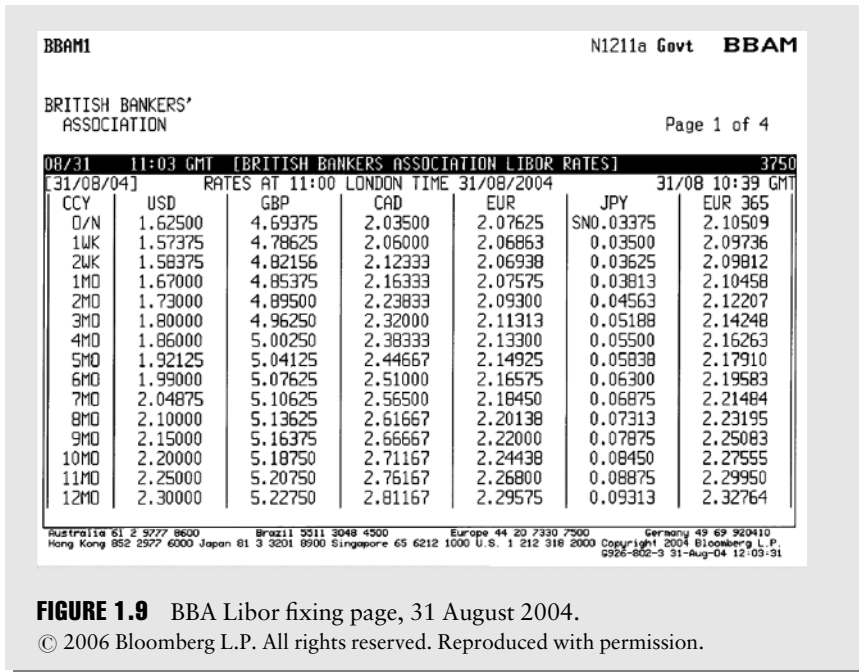


FIGURE 1.9 BBA Libor fixing page, 31 August 2004.

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EURIBOR

The official euro fixing is known as Euribor, which is set in Brussels at 1100 hours local time each euro business day. This should not be confused with the euro Libor fixing. The fixing operates in the same way as Libor, with a panel of Euribor banks contributing their rates each morning. The average rate of all contributions is taken as the fix.

Figure 1.10 shows the main menu page for euro fixing on Bloomberg, which is EBF. The rates fix page is shown in Figure 1.12, which is the fix for 11 June 2004. The fix is for spot value, and this is confirmed on the page, where we see that the value date is 15 June 2004, two business days later. The same menu page can be used to access both Euribor and the EONIA fix, which is the euro overnight interest rate.⁸ This is shown at Figure 1.12, again for 11 June 2004. This shows the same fixings seen in Figure 1.11, as well as the previous days' fixing and the EONIA rate fixing at the bottom of the screen.

⁸ EONIA is the rate used with regard to an overnight-index swap (OIS), which we discuss in Chapter 8.

EBF N217 n M-Mkt EBF



email: pricecontrib@bloomberg.net

€ONIA - EUREPO - EURIBOR

1) OFFICIAL EURIBOR FIXING	8) OFFICIAL EUREPO FIXING
2) OFFICIAL €ONIA FIXING	9) EUREPO PANEL BANK DATA
3) OFFICIAL EURIBOR FIXING (ACT/365)	10) EURIBOR OFFICIAL WEB PAGE
4) EURIBOR & €ONIA HISTORICAL DATA	11) EUREPO OFFICIAL WEB PAGE
5) EURIBOR PANEL BANK DATA	12) FBE OFFICIAL WEB PAGE
6) EURIBOR DEFINITIONS	
7) €ONIA DEFINITIONS	

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 920410
 Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2004 Bloomberg L.P.
0206-802-2 11-Jun-04 11:14:34

FIGURE 1.10 Euribor menu page EBF on Bloomberg.

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1 N121 a M-Mkt EBF

Screen Printed

EUROPEAN BANKING FEDERATION Page 1 of 1

06/11 12:48 GMT [EURIBOR FBE/ACI] 248

EURIBOR RATES ACT/360 AT 11H00 BRUSSELS TIME 11/06/2004 11/06 09:12 GMT

	ACT/ 360	
1WK	2.054	[FIXED]
2WK	2.058	VALUE DATE 15/06/04
3WK	2.070	[EURIBOR NOTE ON PAGE 47893]
1MD	2.078	
2MD	2.093	
3MD	2.112	
4MD	2.148	
5MD	2.177	
6MD	2.199	[WARNING] EITHER EURIBOR FBE,
7MD	2.240	NOR EURIBOR ACI, NOR THE EURIBO
8MD	2.280	PANEL BANKS, NOR THE EURIBOR
9MD	2.312	STEERING COMMITTEE, NOR MONEYLI
10MD	2.345	TELERATE LTD CAN BE HELD LIABLE
11MD	2.390	FOR ANY IRREGULARITY OR
12MD	2.426	INACCURACY OF THE EURIBOR RATE.
		(FOR DETAILS SEE PAGE 47896)

[HISTORY] THIS CAN BE DOWNLOADED FROM THE WEBSITE WWW.EURIBOR.ORG

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 920410
 Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2004 Bloomberg L.P.
0206-802-2 11-Jun-04 13:45:35

FIGURE 1.11 Euribor rates fix page, 11 June 2004.

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4
Screen Printed
11:47 EURIBOR & EONIA FIXINGS
N2N299 M-Mkt EBF
PAGE 1 / 1

EURIBOR ACT/360	RATE	PREVIOUS RATE	TIME	EURIBOR ACT/365	RATE	PREVIOUS RATE	TIME
1) 1 WK	2.054	2.054	10:12	17) 1 WK	2.083	2.083	10:12
2) 2 WK	2.058	2.058	10:12	18) 2 WK	2.087	2.087	10:12
3) 3 WK	2.070	2.069	10:12	19) 3 WK	2.099	2.098	10:12
4) 1 MTH	2.078	2.077	10:12	20) 1 MTH	2.107	2.106	10:12
5) 2 MTH	2.093	2.093	10:12	21) 2 MTH	2.122	2.122	10:12
6) 3 MTH	2.112	2.109	10:12	22) 3 MTH	2.141	2.138	10:12
7) 4 MTH	2.148	2.132	10:12	23) 4 MTH	2.178	2.162	10:12
8) 5 MTH	2.177	2.155	10:12	24) 5 MTH	2.207	2.185	10:12
9) 6 MTH	2.199	2.178	10:12	25) 6 MTH	2.230	2.208	10:12
10) 7 MTH	2.240	2.211	10:12	26) 7 MTH	2.271	2.242	10:12
11) 8 MTH	2.280	2.247	10:12	27) 8 MTH	2.312	2.278	10:12
12) 9 MTH	2.312	2.281	10:12	28) 9 MTH	2.344	2.313	10:12
13) 10 MTH	2.345	2.313	10:12	29) 10 MTH	2.378	2.345	10:12
14) 11 MTH	2.390	2.349	10:12	30) 11 MTH	2.423	2.382	10:12
15) 12 MTH	2.426	2.386	10:12	31) 12 MTH	2.460	2.419	10:12
EONIA	TODAY'S RATE	PREVIOUS RATE	TIME	in millions of EURO			
16) EONIA	2.030	2.030	6/10	32) EONIA VOLUME	27567		6/10
Eonia updates at 7 PM CET				European money market rates.			
Use ER <GO> to monitor additional							

Australia 61 2 9277 9600 Brazil 5511 2048 4500 Europe 44 20 7230 7500 Germany 49 69 320410
Hong Kong 852 2977 6000 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2004 Bloomberg L.P.
G52E-802-2 11-Jun-04 11:47:02

FIGURE 1.12 Euribor and EONIA rates fix page, 11 June 2004.

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BANK CASH FLOWS AND OTHER BASIC CONCEPTS

The essentials of banking are a familiarity with the principles of banking cash flows and the concept of credit risk. The former creates the ALM risk and liquidity risk, and the latter creates default risk, which impacts bank capital. In later sections we introduce these two basic principles. First we get to the starting point with a look at basic cash flows and how to calculate the required interest rate on a loan.

Bank Cash Flows: The Conventional Bank Business Model

Figure 1.13 is an overview diagram of the cash flow profile of a commercial bank. Notice how these are managed through the Treasury function. This hypothetical bank deals with corporate and retail customers and other banks; it also has a loan facility at the central bank, where it deposits reserve funds.

Treasury is the cornerstone of a bank and indeed a microcosm of the conventional bank business model. In essence, banking is based on the following:

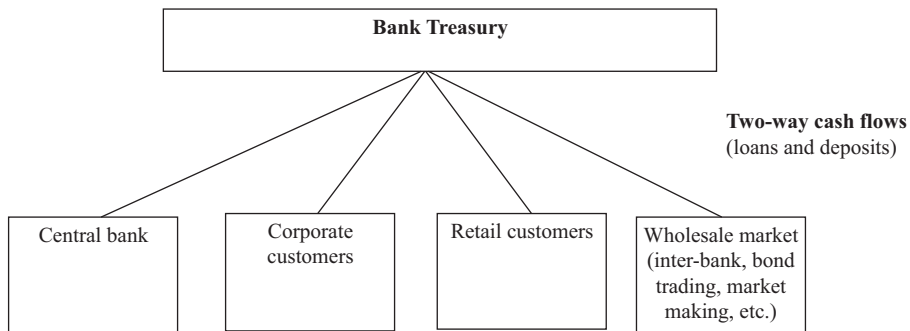


FIGURE 1.13 Two-way cash flows for a commercial bank.

- **Capital and leverage:** the capital of any corporation is defined as the difference between the firm’s assets and its liabilities. For a bank it also includes capital set aside to cover expected loan losses, as well as certain types of long-dated debt. A bank’s capital is the pool of funds that are its own funds: shareholders funds. For this reason it is also called the *capital buffer*. In banking, a small capital base is levered up into an asset pool that can be 10, 20, 30 times greater, or even higher. The equity base of a bank, that is the bank’s own funds, is only a small element of the total balance sheet, perhaps 8% to 12% on average. It therefore forms only a small share of the bank’s total funding, although business best-practice dictates that the capital itself is not actually used to lend to customers (not unless they are risk-free customers! More about this later). The balance of the balance sheet is made up of borrowed cash, which is then lent out to generate revenue. If we take the 10% equity capital base as an example, then a bank will be levered 10 times on this amount – the balance of 90 is borrowed and lent out. Managing the capital base, and ensuring its sufficiency, as well as controlling the level of leverage, are vital to the well-being of the bank.
- **The “Gap”:** this is the difference in maturity between the legal contractual maturity of the assets and the legal contractual maturity of the liability. In simple terms, it is *funding short to lend long*. Consider a financial institution with a simple business model, such as a UK building society. Such a firm will have two main businesses, lending funds in the form of residential mortgages to retail customers (private individuals), and accepting deposits from retail customers. The legal final maturity of a residential mortgage might be 20 or 25 years, whereas deposits can be very short notice indeed, and unlikely to exceed two or three years in behavioural maturity. This is the basic business of banking; in formal terms this practice is known as “maturity transformation”. The very act of

banking itself produces the key risk of banking – that of liquidity risk. A bank that advances a mortgage must ensure that it can find the funds to match the loan for the entire life of the transaction; failure to do so will result in the dissolution of the bank. So one can see how understanding the Gap,⁹ and meeting its needs, is the cornerstone of banking risk management.

- The yield curve: the Gap, which arises naturally as a result of banking business, produces an extreme reliance on a positively sloping yield curve to help generate much of the bank's profits. This is because the shorter end of the yield curve, at which tenor the bank borrows money, has a lower interest rate than the longer end, at which tenor it lends money. So an understanding of yield curve risks is important. The author covers the yield curve in great detail in his earlier book, *Bank Asset and Liability Management*, and we reprise some of this material in Chapter 5.
- Liquidity: the business of maturity transformation contains an implicit, and explicit, assumption that one will always be able to rollover funding as it becomes due. Without this assumption, no bank would ever advance a 25-year loan. Therefore the business of banking assumes continuous liquidity. One can see immediately that managing the liquidity risk of the bank is vital, no less than a matter of life or death for the bank.
- Risk management: an understanding of default risk. Advancing a loan to a customer – any customer – carries with it the risk that the customer will default on the loan. An understanding of the credit risk presented by all customers is crucial to the survival of the bank, because excess defaults will erode the bank's capital and finish it as a going concern. Of equal importance to understanding customer default risk is the maintenance of loan origination standards. If these standards, which govern how creditworthy a customer must be before being eligible for a loan, are allowed to deteriorate, the bank will find itself sitting on a larger pool of poor-quality loans than is prudent.

These are the essential principles of banking. The reader is correct in thinking that they do not appear excessively complex. The art of banking is not technically difficult, it simply requires good judgement and common sense. Successful management of a financial institution does not require a PhD in mathematics or physics.¹⁰

Note that Figure 1.13 refers to cash flows that are both on-balance sheet and off-balance sheet. Managing the risks that arise from the latter are as important as those that arise from the former. Off-balance sheet cash

⁹ In continental Europe they do not use the term “Gap”. They appear to prefer the term “mismatch” instead. The terms are synonymous. The author prefers “Gap”.

¹⁰ Or in Econometrics . . .

flows are potentially more complex to model and measure, but this need not necessarily be the case. They do not only arise from derivative trading, but also from plain vanilla business such as letters of credit, guarantees and stand-by agreements. Such instruments create a forward-dated cash flow requirement, which must be incorporated into risk reports.

Measuring Return

Elsewhere in this book we will discuss the importance of a coherent, articulate strategy being in place at any bank, and the need for this strategy to target an explicit RoE or return on capital (RoC). To clarify exactly what we are referring to, we illustrate with a simple example.

Table 1.9 shows a hypothetical bank income statement and balance sheet. Using the values in these simplified statements, we can calculate the following:

Return on equity: $18.4/100$	= 18.4%
Return on capital: $18.4/120$	= 15.3%
Return on assets: $18.4/1200$	= 1.53%
Earnings on assets: $(120 + 65 - 12)/1200$	= 14.4%
Leverage ratio: $1080/100$	= 10.8
Average cost of debt: $90/1080$	= 8.3%
Operating expenses: $60/1200$	= 5%
Operating margin: $14.4\% - 8.3\%$	= 6.1%
Taxation rate: $4.6/23$	= 20%

A glance at the above ratios shows that they are all related. All of the six variables below the RoE/RoC ratio will impact the final RoE number, so

TABLE 1.9 Hypothetical bank income statement and balance sheet.

Income statement EUR m	Balance sheet		
		Assets	Liabilities
Interest income	120	Loans 1200	Deposits 1080
Fees and services	65		Equity 100
			Retained profits 20
Interest expense	(90)		
Expenses	(60)		
Loss provisions	(12)		
Operating profit	23		
Taxation	(4.6)		
Profit after tax	18.4		

it is possible to generate higher return by altering only one of them (the taxation variable is outside the control of the bank of course). We see also that higher leverage produces a higher RoE, so it can become tempting for senior management to gear up ever higher, with more and more debt, in an effort to generate higher shareholder returns. This is of course a risky strategy, because in a market downturn a high level of borrowing causes debt-servicing problems. It is also why we recommend targeting return on assets (RoA) as the preferred measure.

The above would be sufficient analysis if the bank consisted of just one line of business. Most banks have more than one business line, so it is necessary to calculate returns adjusted for the amount of risk exposure each business creates, and the amount of capital it uses. The standard calculation is the risk-adjusted return on capital, or RAROC, which is given by:

$$\text{RAROC} = \text{business line profit} / \text{business line equity allocation}.$$

Using RAROC enables senior management to compare the genuine value-added of each business line. By definition the RAROC achieved by each business should exceed the bank's cost of equity. If it does not, that is an unsustainable business.

Loan Valuation

This section may seem obvious to many readers, as well as very basic, but one would be surprised how often its main tenets are not followed in corporate and commercial bank loan origination desks. So think of this as a refresher course.

The concept of shareholder value-added arises the instant one sets a target RoE at the strategy level. Holding all else equal, the bank shareholder will not continue to hold shares in the bank unless its target return is met. This target therefore drives strategy. All business undertaken by the bank must meet this target, otherwise it is not creating value. Thus the target RoE, together with the other variables introduced in the previous section, drives loan pricing. This is shown in the simple illustration at Example 1.1. Economic value-added, with respect to the capital employed, must be the guiding principle of all bank business.¹¹ In other words, the business must

11 Beware of arguments advanced along the lines of “in the real world, it is not as simple as that”. Thus we observe “loss leader” products, we observe loss-making overseas subsidiaries being maintained because the bank's competitors are based there, we observe loss-making businesses retained for a tax write-off advantage. We observe a myriad of businesses being maintained in existence that, far from creating value, actively destroy it. Ultimately, this is all complete nonsense. Any business line that destroys value must be discontinued. It really is as simple as that.

generate a return that exceeds the target RoE. If it does not, then it is creating zero value, which means the shareholder would not rationally embark upon it.

EXAMPLE 1.1 LOAN PRICING ILLUSTRATION

Asset		Liability	
Loan	100	Deposit	90
		Equity	10

The equity base of the bank is exclusively Tier 1 (equity and retained profits)

Assumptions

Loan maturity =	1 year
The customer deposit pay rate =	5%
The target RoE =	10%
The corporate tax rate =	20%
Loan interest rate =	X%

The main principle is that the business, in this case the loan, must create value that exceeds the RoE target of equity invested.

We set the following relationship, which equates the capital employed with the after-tax discounted cash flow of the business:

$$10 = [(1 - 20\%) * ((X * 100) - (5\% * 90))] + 100 - 90 / 1.10$$

Rearranging for X we obtain an interest rate of 5.75%. The interpretation of this is as follows: by setting an interest rate of 5.75%, the present value of the revenue earned on the loan, after tax, is equal to 10, which is the capital set aside for the loan.

Therefore the loan interest rate must be set above 5.75%. At this rate or below, there is zero value creation.

Note that the break-even loan rate of 5.75% is 75 bps (basis points) above the funding rate of 5%. This is the break-even margin.

Following naturally from this illustration in Example 1.1, we see that a bank should calculate the break-even interest rate charge on business as a function of its funding rate, the break-even margin, as well as its RoE and the corporate tax rate. This is of course a very simple example that ignores all other operating costs, but these additional expenses can be incorporated in the analysis easily enough.

Note that the break-even margin is what is required to create shareholder value. For business lines that do not require any capital, for example AAA-rated government bonds, the margin can be lower. In our simple example, the loan is backed with the full capital base. In reality, the amount of capital required will depend on the “risk weighting” of the asset (loan). But the essential principle remains the same.

Let us now make the illustration more like the real world (see Example 1.2).

EXAMPLE 1.2 LOAN PRICING INCORPORATING DEFAULT RISK

Asset		Liability	
Loan	100	Deposit	90
		Equity	10

The equity base of the bank is exclusively Tier 1 (equity and retained profits)

Assumptions

Loan maturity =	2 years (annual interest)
Customer deposit pay rate =	5% (fixed for two years)
Target RoE =	10%
Corporate tax rate =	20%
Loan default probability (Year 1) =	0%
Loan default probability (Year 2) =	5%
Recovery rate =	40%
Loan interest rate =	X%

The same principle is applied again, whereby the break-even loan rate of X% must be set such that the present value of the expected cash flow of the loan, after tax, equates the value of the equity used to back the loan. Thus we have:

(continued)

$$\begin{aligned}
 10 &= [(X*100) - (90 * 5\%)] * (1 - 0.2) / 1.10 && \leftarrow \text{Year 1 cash flow present value} \\
 & && \text{(zero default probability)} \\
 \text{plus} & && \text{Year 2 cash flow present value} \\
 & && \text{(incorporates default probability)} \\
 95\% * [(1 - 0.2) * X*100 + 100] + 5\% * [40 + (0.2 * 60)] / 1.10^2 & && \\
 \swarrow & & \nearrow & \\
 \text{Allowing for no default (95\% probability)} & & \text{Allowing for default (5\% probability)} & \\
 \text{minus} & & & \\
 90 * 5\% * (1 - 0.2) + 90 / 1.10^2 & & \leftarrow \text{Year 2 funding cost} &
 \end{aligned}$$

Rearranging for X we obtain an interest rate of 11.1%. This is the break-even loan rate that must be applied to the loan.

In this example, we allow for the possibility of default by the borrower in Year 2 of the two-year loan. There are now two parameters to allow for in addition to the equity backing the loan, and these are the default probability of the loan and the amount of recovery in the event of default (called the “recovery rate”, in the manner of the credit derivative market). Should default occur, the bank will recover 40 cents on the dollar. We also allow for a tax recovery on the amount that is lost in the event of default, which is the tax rate of 20% multiplied by the loss amount of 60 cents on the dollar.

We see then that in setting the loan rate at a level that creates value, we need to adjust the expected cash flows for the possibility of customer default, and the amount we expect to recover should there be a default. From this point on, we have introduced an element of subjectivity in the calculation: the recovery rate is an *assumed* value (we have no firm idea what we will recover in the event of a customer going into bankruptcy) and the default probability of any customer can never be known with certainty, although one can infer it from observing the prices of loans and bonds in the market.¹² But one can see how once one enters the real world, pricing loans to create shareholder value and allow for credit risk becomes as much an art as a science.

This example also highlights the issue of setting aside part of each year’s profit to cover for future loan defaults. This is known as loan provisioning; it is the method by which a proportion of bank capital is earmarked as a buffer to enable the bank to withstand losses arising from customer default in the future. In this process, part of the profit generated by the loan at the

12 See pages 815–18 of the author’s book *Bank Asset and Liability Management* (John Wiley & Sons, 2007) for a detailed look from first principles on how to extract default probabilities from bond market prices.

end of Year 1, which is essentially the interest income minus the funding cost and expenses, after tax, is not recorded as profit but is instead set aside as a loan loss provision for the following year. In other words, loan provisions reduce the after-tax profit of the business.

What should the amount of loss provision be? The calculation of this amount again uses the default probability and recovery rate parameters (which may have changed from the time the loan was originated). We illustrate this in Example 1.3.

EXAMPLE 1.3 LOAN LOSS PROVISION

Net loan value:

$$\begin{aligned} & 0.95*[100 + (11.1)*(1 - 0.2)] + 0.05*[40 + (0.2*60)]/1.10 \\ & \text{minus} \\ & [90*0.05*(1 - 0.2) + 90]/1.10 \\ & = \\ & 9.305 \end{aligned}$$

Interest margin after tax:

$$\begin{aligned} & (1 - 0.2)*[(11.1\%*100) - (5\%*90)] \\ & = 5.28 \end{aligned}$$

Attributable profit

$$\begin{aligned} & = 5.28 - 0.695 \\ & = 4.585 \end{aligned}$$

We see that the net loan value is now 9.305. At loan origination the loan value was 10, so the loan has fallen in value by $[10 - 9.305]$ or 0.695.

The fall in the net value of the loan at the end of the year is used to calculate the amount of interest income from it that can be attributed as profit, and what should be set aside as a loan provision. This is given as:

$$\text{Attributable profit} = \text{Post-tax interest margin} - \text{fall in loan value.}$$

This is shown in the second half of Example 1.3. The balance of the interest income not assigned to attributable profit is set aside as a credit provision.

We see then that to arrive at a sensible lending rate for any type of business that it undertakes, a bank must have a good idea of its cost base as well as a good idea of what the expected frequency of bad loans will be in the following 12 months. It also needs to have a target RoE to aim for. The interest rate on a loan is then set as a spread over the bank's funding cost, being calculated as a function of the target RoE, a credit spread to cover anticipated loan losses, and any additional spread to cover its operating expenses.

The above may be obvious, but one would be surprised just how many banks do not observe this very basic principle.

Capital Requirement

In principle, the amount of capital that a bank should hold is that amount which is sufficient to preserve it *as a going concern* in the event of losses. The italics in the previous sentence are deliberate. The capital level must be able to absorb all expected losses, and a certain level of unexpected losses, and leave enough in place to enable the bank to continue operating. This implies the following:

- the bank must have a reasonable estimate of what its expected losses, together with an add-on for unexpected losses, are likely to be; call this amount X;
- the level of capital in place must be at least X more than the minimum level required by the regulatory authority.

The first requirement is self-evident, the second less so. However, if the level of capital in place is the minimum required, and the bank suffers X expected losses, unless the second requirement has been met, the bank will be under-capitalised for regulatory purposes, which will result in a loss of confidence, a bank run and either bankruptcy or taxpayer bailout. It is important to bear this in mind when setting capital levels.

The starting point for capital allocation is the regulatory requirement. This is the simplest approach to take and quite common. The regulatory capital amount required can be compared to the "earnings-at-risk" (EaR) approach for measuring capital. This method involves observing the historical distribution of earnings, and its volatility, to determine the extent of earnings risk. The volatility level of earnings then drives the capital requirement. EaR is measured in different ways, including loan revenue, interest margin, mark-to-market volatility, accounting profit and so on. The volatility (standard deviation) of the distribution of earnings then sets the capital required.

RISK EXPOSURES IN BANKING

We need to be familiar with the risks inherent in the business of banking. The obvious ones are better known, but all risks need to be adequately managed, and the direction for this risk management must come from the top, at board level. In Chapter 18 we provide a detailed look at the ideal bank governance structure, which should allow for an effective risk management framework. Here we summarise the key risk exposures that must be measured and mitigated.

In Choudhry (2006) we define and describe the main bank risk exposures. It is worth summarising that content here.

The Main Bank Risks

Any transaction or undertaking with an element of uncertainty as to its future outcome carries an element of risk: risk can be thought of as uncertainty. To associate particular assets such as equities, bonds or corporate cash flows with types of risk, we need to define “risk” itself. It is useful to define it in terms of a risk *horizon*, the point at which an asset will be realised, or turned into cash. All market participants, including speculators, have a horizon. Essentially then the horizon is the time period within which risk is being considered.

Once we have established a notion of horizon, a working definition of risk is *the uncertainty of the future total cash value of an investment on the investor’s horizon date*. This uncertainty arises from many sources. For participants in the financial markets risk is essentially a measure of the volatility of asset returns, although it has a broader definition as being any type of uncertainty as to future outcomes. The types of risk that a bank is exposed to as part of its operations in the loan and debt capital markets are described below.

Credit Risk

Also called *issuer risk*, this is the primary risk in banking. It is the risk that a customer will default on a loan. It is also the risk, short of default, that the credit quality of the obligor will deteriorate, which affects book value because there is an increased probability of default. Credit risk exists in the banking portfolio and trading portfolio. Banking book assets are not marked-to-market.

Credit risk is described by exposure, or notional value at risk; probability of default; and loss in event of default. The most common measure of credit risk is the formal credit rating. However, all banks will rate their customers

according to their own internal rating methodology, which is part of their credit analysis process. An internal rating scale is essential in a bank because most bank customers (in the case of small and medium-size corporates, or SMEs, virtually all bank customers) will not have a formal public credit rating.

Sovereign risk is a type of credit risk specific to government debt. A country may default on its obligation (or declare a debt “moratorium”) if debt payments relative to domestic product reach unsustainable levels.

Performance is an extension of the notion of credit risk; it relates primarily to OTC derivative instruments. It would apply, for instance, to financial agreements that do not involve an extension of credit; little or no cash is exchanged at the agreement’s inception. Instead the contract calls for counterparties to exchange cash payments on a pre-set future date, according to a schedule based on the values of specific assets or indices.

Related to credit risk is “performance risk”, which is the risk of underperformance by the borrower on a specific transaction. However, it is best to roll this into overall credit risk for the obligor.

A bank will have credit risk at an individual level, to each borrowing customer, as well as at the aggregate portfolio level. Portfolio risk will need to take into account the diversification impact of a group of loans, although in a bear market there is a strong case for arguing that diversity disappears and that correlation of assets is effectively unity. However, portfolio risk will differ according to the number of borrowers and their variation across industries, sectors and geographical regions.

Modelling individual and portfolio default probability is a problematic exercise at the best of times because it relies on assumptions, and unrealistic or inaccurate assumptions will produce flawed results. As such, in stress scenarios it may make more sense to assume a zero recovery and a unity correlation when determining economic capital at risk.

Market Risk

This is risk of loss arising from movements in prices in financial markets. Examples include FX risk, interest-rate risk and basis risk. In banks the key market risk is interest-rate risk, and it is sometimes measured and reported separately to other market risk.

Market risk is essentially mark-to-market risk and does not apply to non-trading assets held in a banking book or accrual books.

Interest-rate risk is the risk of loss of earnings due to movement in interest rates. A significant share of bank earnings arises as a result of interest earnings on assets. Hence this is a significant risk. Even in a banking book, with no mark-to-market revaluation, fixed rate assets will produce lower

profit if the interest rate payable on liabilities funding that asset rises. Interest-rate risk includes reset risk, the risk of rates changing in between re-fixing dates on a floating-rate asset or liability.

Specific market risks will differ according to the type of asset under consideration.

Currency Risk This arises from exposure to movements in FX rates. Currency risk is often sub-divided into *transaction* risk, where currency fluctuations affect the proceeds from day-to-day transactions, and *translation* risk, which affects the value of assets and liabilities on a balance sheet.

Interest-rate Risk This arises from the impact of fluctuating interest rates and will directly affect any entity borrowing or investing funds. The most common exposure is simply to the level of interest rates, but some institutions run positions that are exposed to the changes in the shape of the yield curve.

Equity Risk This affects anyone holding a portfolio of shares, which will rise and fall with the level of individual share prices and the level of the stock market.

Reinvestment Risk This is essentially interest-rate risk: if an asset makes any payments before the investor's horizon, whether it matures or not, the cash flows will have to be reinvested until the horizon date. Since the reinvestment rate is unknown when the asset is purchased, the final cash flow is uncertain.

Prepayment Risk This is specific to mortgage assets. For example, mortgage lenders allow the homeowner to repay outstanding debt before the stated maturity. If interest rates fall prepayment will occur, which forces reinvestment at rates lower than the initial yield.

Model Risk Some of the latest financial instruments are heavily dependent on complex mathematical models for pricing and hedging. If the model is incorrectly specified, is based on questionable assumptions or does not accurately reflect the true behaviour of the market, banks trading these instruments could suffer extensive losses.

Other Market Risk There are residual market risks that fall into this category. Among these are *volatility* risk, which affects option traders, and *basis* risk, which has a wider impact. Basis risk arises whenever one kind of risk exposure is hedged with an instrument that behaves in a similar, but not identical manner. One example would be a company using 3-month interest rate futures to hedge its short-term money market notes. Although

TABLE 1.10 Summary of market risks.

	Market	Reinvestment	Credit	Sovereign	FX	Basis	Performance	Prepayment
Government bond								
– developed country								
– developing country								
Zero-coupon bond								
Corporate bond								
Asset-backed bond								
Bank deposit								
FRA							OTC	
Futures contract								
Forward contract							OTC	
Interest-rate swap							OTC	
Repo								
Equity (listed exchange)								

Eurocurrency rates, to which futures prices respond, are well correlated with money market rates, they do not invariably move in lock step. If rates moved up by 50 bps but futures prices dropped by only 35 bps, the 15 bp gap would be the basis risk in this case.

Table 1.10 assigns sources of risk for a range of fixed interest, FX, interest rate derivative and equity products.

Liquidity Risk

This refers to two different but related issues: for a Treasury or money markets person, it is the risk that a bank has insufficient funding to meet commitments as they arise. That is, the risk that funds cannot be raised in the market as and when required. This is also known as *rollover risk*, for obvious reasons. Funding risk can be affected by events in the market, affecting all but the most creditworthy of banks, or by events specific to the individual bank. So, in August 2007 the UK bank Northern Rock plc found that it was unable to access inter-bank lines as these had been withdrawn from it, and was forced to go to the Bank of England for funding. Once this fact became public, a run on the bank sealed its fate. In September 2008 the collapse of

the US investment bank Lehman Brothers resulted in a general drying up of liquidity in the inter-bank market, so that even large AA-rated banks were forced to pay substantially over Libor to secure term inter-bank money.

The credit rating and general perception of a bank in the market is its best protection against funding risk.

For a securities or derivatives trader, liquidity risk is the risk that the market for assets becomes too thin to enable fair and efficient trading to take place. This is the risk that assets cannot be sold or bought as and when required – in other words, the risk that an asset, once purchased, becomes illiquid and cannot be sold. Of course, many bank assets are illiquid at the start; for example, an SME loan. Therefore, it becomes important to fund such assets with a secure source of funds. It is also imperative, as we shall see later, that a sufficient share of the bank's balance sheet is held in liquid assets that may be easily realised whenever needed.

Operational Risk

This is the risk of loss associated with non-financial matters such as fraud, system failure, accidents and ethics. Operational risk can be mitigated by defining strict procedures for all aspects of a bank's business functions, from front to back office, and ensuring adherence to them. The bank's risk management function should assign a dedicated person or team to managing operational risk and each department of the bank should appoint an operational risk liaison who will work as the primary contact for the head of operational risk.

Country Risk

The primary "other" risk is country risk. A bank that undertakes operations outside its home country will be exposed to this, the risk of a crisis or other market event in a country. The most obvious example of course is war or revolution, but it can also include a sovereign downgrade or balance of payments crisis. General economic deterioration, for example high inflation rates, is another example of country risk.

The Risk Management Function

While there is some variety in the way a bank risk management function is organised, the following may be taken as being business best-practice:

- having an independent department responsible for drawing up and explicitly stating the bank's approach to risk, and defining trading limits and the areas of the market that the firm can have exposure to;

- having the head of the risk function report to an independent senior manager, who is a member of the Executive Board. This person is usually styled as the chief risk officer (CRO);
- monitoring the separation of duties between front, middle and back office, often in conjunction with an internal audit function;
- reporting to senior management, including the firm's overall exposure and adherence of the front office to the firm's overall risk strategy;
- communicating risks and risk strategy to shareholders.

The risk management function is more likely to deliver effective results when there are clear lines of responsibility and accountability. It is also imperative that the department interacts closely with other areas of the front and back office.

In addition to the above the following are often accepted as ingredients of a risk management framework in an institution engaged in investment banking and trading activity:

- proactive management involvement in risk issues;
- daily overview of the risk exposure profile and P&L reports;
- VaR as a common measure of risk exposure, alongside modified duration, but not as a sole measure of risk exposure;
- defined escalation procedures to deal with rising levels of trading loss, as well as internal "stop-loss" limits;
- independent daily monitoring of risk utilisation by a middle-office risk management function;
- independent production of daily P&L, and independent review of front-office closing prices on a daily basis;
- independent validation of market pricing, and pricing and VaR models.

These guidelines, adopted universally in the banking community, should help to develop an influential and effective risk management function for all financial institutions.

The different stakeholders in a bank or financial institution will have slightly different perspectives on risk and its management. If we were to generalise, shareholders will wish for stable earnings, as well as the highest possible return on capital. From the point of view of business managers though, the perspective may be slightly different and possibly shorter term. For them, risk management often takes the following route:

- create as diversified a set of business lines as possible, and within each business line diversify portfolios to maximum extent;
- establish procedures to enable some measure of forecasting of market prices;

- hedge the portfolio to minimise losses when market forecasts suggest that losses are to be expected.

A robust risk measurement function is central to bank strategy and management. It is used to provide an accurate idea of risk exposure for shareholders and senior management, so that banks can stay within risk exposure limits.

DRIVERS OF CREDIT RISK

Notwithstanding that liquidity risk is the primary risk management concern for a bank, it should be fairly evident that an understanding of credit risk is also fundamental. We would argue that a proper understanding of credit is not possible without a deep familiarity with the market that one is operating in. That is, to know one's risk is to know one's market. Banks have attempted to measure the extent of their credit risk, and hence the amount of capital needed to cover this risk, through the use of credit risk models. It is worthwhile considering what parameters drive these models, because that is to understand what drives credit risk. Of course, the experience of 2007–2009 demonstrated that it is not possible to model credit risk accurately for all of the time, or to cover all eventualities. This brings us back to the importance of knowing one's market. An over-reliance on mathematical models of risk exposure can prove literally fatal.

Credit risk itself is the risk of loss in event of borrower default or borrower credit standing deterioration. The management of credit risk seeks to address the issues of (i) the probability of loss and (ii) the amount of loss. Credit risk and credit ratings are discussed further in Chapter 3.

Parameters of Credit Risk Models

Since the 1990s many, if not most, banks have employed a form of credit risk model to determine the extent of their credit risk, and in some cases to calculate their capital requirement. These might be “off-the-shelf” models such as those devised by the KMV corporation, Moodys or RiskMetrics, or an in-house proprietary one. Generally these models, known as “portfolio models”, use two parameters to determine the extent of credit risk: the probability of default and the “loss-given-default (LGD)”, which is also sometimes referred to via the “recovery rate (RR)”, since $(100 - RR)$ is also the LGD. They also involve a third parameter: default correlation. The logic behind default correlation is as follows: one can benefit from portfolio diversification if one has a varied range of borrower names in the portfolio.

TABLE 1.11 The drivers of credit risk.

Credit risk exposure	Cash instruments: notional (face) amount Derivative instruments: current mark-to-market
Credit risk drivers	Default probability Credit rating change Recovery rate
Default correlation	Commonality of risk drivers across portfolio names
Capital at risk	Implied capital at risk from default

Equally, if there is a factor that drives changes in status, such as credit ratings, across more than one reference name in the portfolio, it is well to be aware of it because changes in this factor will produce the same impact on all the names in the portfolio. Common factors that impact in large parts of a portfolio, or an entire portfolio, may include macro-level indicators such as the base interest rate or the level of housing mortgage defaults. However, since default correlation is a statistic that cannot be observed in the market, using it to determine your credit risk exposure becomes a little problematic.

Table 1.11 is an overview of the drivers of credit risk as viewed by bank credit models.

Looking at Table 1.11, we perceive fairly quickly that there is not inconsiderable uncertainty in calculating credit risk. The only parameter we know with certainty is the notional amount of cash at risk in a loan. Default probability is usually taken from credit ratings, or in some cases it is extracted from market prices such as credit default swap (CDS) spreads or corporate bond yields. However, credit ratings become notoriously unreliable the closer we get to a market downturn or recession, as do market-implied default probabilities. Risk managers often use published data on default rates and credit rating transition matrices, but again these suffer from the same drawback as all historical data; namely, in not being necessarily a guide to future default rates. We see then that a model will always, at all times, never be more than a best endeavours estimate of what the risk exposure actually is. Therefore we conclude principally that an over-reliance on models is unwise. At precisely the moment when a bank needs to be as fully aware as possible of its risk exposures, for example as an overheating economy is about to enter recession, this will be the time when the model will be at its most inaccurate. It is important to exercise sound judgement in assessing credit risk, and this is best facilitated by knowing one's market. An unfamiliarity with the markets and customers that one is dealing with is more likely to result in a greater reliance on model output.

Credit Rating

A credit rating from one or more of the three principal ratings agencies – Standard & Poor’s, Moody’s and Fitch, or a bank internal credit rating – is a qualitative and quantitative measure of an obligor’s default probability over the next 12 months. In essence, ratings are a function of both quantitative factors, such as financial ratios, balance sheet strength and so on, and qualitative factors such as competitive pressures and management competence. There are two main types of model: ratings models, which assign a credit rating from which is inferred a default probability; and default models, which model the default probability and map this onto a ratings scale. Details apart, both represent the same methodology. An overview of the process of undertaking credit ratings analysis is given in Chapter 4 of the author’s book *Structured Credit Products* (2nd edition, John Wiley & Sons 2010).

Under the bank regulatory capital regime known as Basel II, credit ratings play a big part in determining the risk weighting of a particular asset, and hence the capital that must be set against it. The experience of 2007–2009 shows that ratings remain an inaccurate measure of credit risk under market crisis conditions. Again, the use of credit ratings does not obviate the need for sound judgement when assessing credit risk. This is particularly true when undertaking the investment decision.

Figures 1.14A to C are a stylised illustration of credit risk. The credit risk distribution of a portfolio looks somewhat like this. What the exhibit is saying is that the extent of risk is highest for the equity capital of the bank

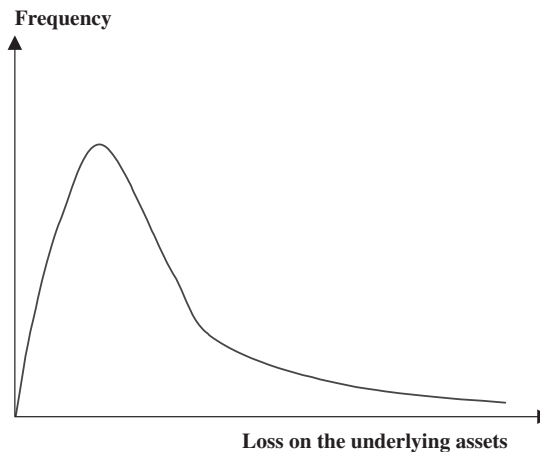


FIGURE 1.14A Credit loss distribution.

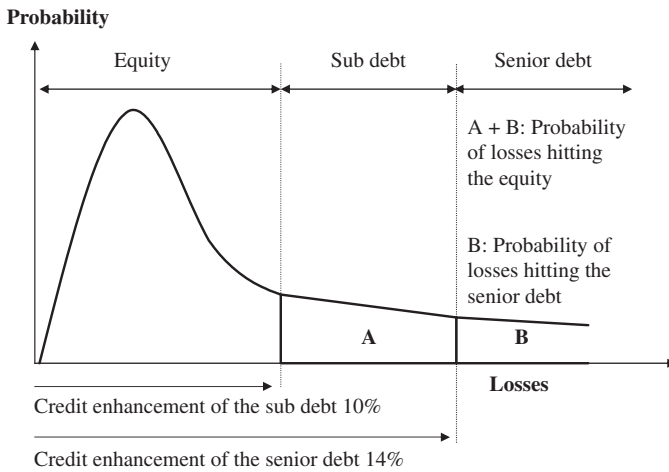
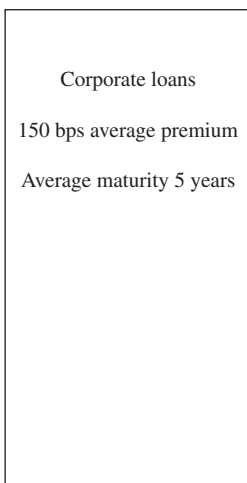


FIGURE 1.14B Expected loss distribution for the different constituents of the bank capital structure.

and lowest for the senior debt (a similar approach is taken when modelling the credit risk of a structured credit instrument such as a collateralised debt obligation). The subordinated debt holders will only suffer loss once a certain part of the portfolio has experienced loss. The credit model

Loan portfolio



Capital structure

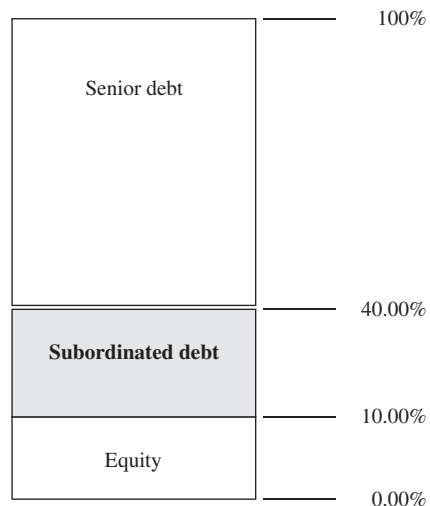


FIGURE 1.14C Capital structure of bank liabilities.

approach attempts to model this credit risk distribution. Of course, the bank is no longer viable as a going concern once the equity capital amount falls below the required regulatory minimum. Therefore the bank needs to have sufficient capital to meet the highest amount of risk exposure in the portfolio. The credit model used by the bank, allied with prudent judgement, is used to calculate this figure.

Correlation

All credit models make an allowance for default correlation. The use of this parameter, as we noted above, introduces still more uncertainty in the credit risk measurement calculation. It is accepted that corporate defaults, as well as ratings migrations, are more frequent in a recessionary market. Therefore when assessing portfolio credit risk, it is understandable to incorporate a positive correlation between the default rate of different names in the portfolio. How positive is positive? If we assign unity correlation to the assets, this means the entire portfolio defaults as soon as the first default occurs. Clearly this is unrealistic. Moreover, the joint-default correlation between two corporate names is an unobservable statistic. So at what level should the correlation parameter be set? This debate can get quite involved, and is outside the scope of this book. Again, the best approach is to apply good judgement: an element of positive correlation is sensible when assessing portfolio risk.

Modern portfolio theory states that there is a diversity benefit in correlation terms when one constructs a mixed portfolio. But this is dangerous for banking credit risk and capital calculations, because of the high positive correlation of assets during economic downturns.¹³ In essence, it is not business best-practice to reduce the capital requirement based solely on portfolio diversity.

MACRO-LEVEL RISK MANAGEMENT AND STRATEGY

The high-level strategy and risk appetite of a bank is set by its Board of Directors.¹⁴ Such a process is a very real, serious one, or at least it should

13 See the author's book *The Future of Finance* (John Wiley & Sons, 2010) for a discussion of this.

14 Just to be clear, the Board of Directors of a bank will comprise the executive directors, who are full-time senior officers of the bank and will typically include the chief executive officer (CEO) and the finance director, plus (say) one to five other senior officers (such as the head of investment banking or the head of

be, because board direction must set the overall approach of the bank. In other words, this direction must be a practical working document because the bank's entire appreciation of its risk-reward profile will come from it. An unclear or ambiguous board direction can come back to haunt the bank's shareholders, and embarrass its directors, if the bank ends up taking large losses on a particular trade or line of business.

We summarise now the correct process by which this overall risk appetite for a bank should be set.

Setting the Formal Risk-Reward Profile

The Board sets the high-level guidelines for the bank's risk appetite and its expected return. Risk appetite is in the form of upper limits on risk exposures. We do not mean that the Board sets trading limits; we mean that the Board defines broad measures such as capital ratio ranges and leverage ratios. If it does not, then it will be held accountable if the bank is seen to have taken on too much risk exposure or allowed its capital base to fall to unacceptable levels. So in this context, when we refer to "limits" we mean the broad upper limit – in other words, the risk tolerance and risk appetite.

The same applies to expected return. The Board should set the target, or benchmark, levels of return on an annual basis. Of course, traditionally higher risk means higher reward, so the return expected should reflect the risk tolerance of the bank.

We described the various bank risk exposures earlier. For a commercial bank the key risk exposure is credit risk. At this level, the Board is not setting credit risk limits for individual borrowers. Rather, it should set

commercial banking), and the non-executive directors (NEDs), who are not employees of the bank but retained as members of the Board (they are paid a fee for this). Often, significant shareholders of the bank may also have representation on the Board. Generally, the NEDs should be individuals with considerable banking and finance experience and/or expertise, but it is not uncommon to find some whose experience and expertise lie in other, very different fields. The chairman of the Board is often, in effect, a NED because he/she will not have a formal line function at the bank. NEDs usually chair the various board sub-committees of the bank, so one would hope that they do indeed possess extensive banking experience, as well as a proven track record of competence and excellence within banking and finance. A strong track record in other fields such as retail (supermarkets, shops and so on) is no indicator of effective judgement and decision-making ability when applied in a bank. We discuss bank corporate governance in Chapter 18.

aggregate or upper limits for countries and sectors. Below this, risk limit setting is delegated to operating business lines. Credit risk setting and monitoring is a discipline that is as old as banking itself, and its basic principles remain unchanged; essentially, credit risk management starts and ends with avoiding concentration – concentration with a single customer, industry, sector or country. The capital base of the bank also acts as a constraint on lending. Other risk limits, for market risk and FX risk for instance, are set at a lower operating level.

The point of setting a high-level risk tolerance guideline is to ensure that the bank's risk exposure does not exceed the appetite of the Board and shareholders. For this reason, limits on capital structure may be set; for instance, these could include:

- leverage limits: a limit on how much a multiple of the bank's capital base it can lever up to;
- funding gap limits: how much of a tenor mismatch between assets and liabilities a bank can run;
- wholesale funding limits: how much of the bank's balance sheet can be funded by wholesale, as opposed to retail deposit, funds.

By definition, staying within the overall risk culture, and adhering to the formal limits that are part of it, acts as a brake on business volume. That is the point. The whole concept of "risk management" is to prevent a bank over-reaching itself in a bull market or expanding economy, and to maintain its business within manageable levels. Hence procedures to constrain unlimited growth are vital.

Banking is a relationship business. The customer relationship must always remain the most important principle in banking. Viewed purely from a business angle, the logical approach might be to continuously enhance the relationship through more and more transactions. This implies a continuous increase in risk exposure as more and more business was put on the balance sheet. This would be an unsustainable strategy, because it would come unstuck at the first sign of an economic downturn. The risk management framework acts as a limit to continuous new business, thus constraining risk exposure to a manageable level. The same principle applies to market risks and capital structure risks.

Of course, it is possible to hedge risk exposures. Interest-rate risk can be neutralised, at least in theory, using derivatives. Credit risk can be removed using credit derivatives, insurance or some form of securitisation. In this way a bank can increase its business volume, but still remain within both the high-level risk culture and the specific risk limits. This is true only if the bank's senior management remains aware of the bank's true risk. In other

words, to what extent in reality, and under all market conditions, is the risk really hedged? Risk hedging does not remove the need for the bank to “know your risk”.

Target Return Rates

It is essential that a bank’s Board sets the target return rates for business lines to meet. The level of return is itself part of the risk culture of a bank. A high target, relative to, for instance, long-run average return rates or the bank’s peer group average, sends a message from management that the bank is willing to take greater risks in order to meet the higher return.

The key objective in return setting is sustainability. A bank must set targets that it believes can be sustained over the business cycle. If they are too high, then they risk being unwound at the next downturn; conversely, if they are too low then shareholders may find it unacceptable. Of course, a key part of the Board’s role is to educate shareholders about the concept of a sustainable return.

There are a number of return measures that can be set. They will usually include RoE or its close relation RoC, and RoA. It is quite common to set different RoE targets for different business lines, reflecting the different risk exposures across each business line. An important ingredient in the target-setting discipline is the cost at which a business line obtains its funds. This is known as the internal funding rate (IFR), internal funds pricing or funds transfer pricing (FTP or just TP). We prefer the first term because the cost at which a Treasury desk lends funds to the other business lines of the bank is not really a “transfer” and it isn’t really a “price” either; however, FTP is the most commonly used expression. FTP is important because it itself is a discipline, and also because it feeds into the return calculation. It is therefore a vital part of risk management policy. It is discussed in Chapter 15.

Another ingredient in return target setting is the risk-adjusted return. This allows for the different risk exposure of a particular business line, and is allied to how much capital it consumes. The amount of capital consumed by a business should be commensurate with the risk exposure it represents and also the return it generates. The Sharpe ratio is commonly used to compare returns levels for different businesses in order to make a fair risk-adjusted comparison.¹⁵

15 There are countless references in the financial literature, as well as on the Internet, to this calculation.

A sustainable return target, together with a robust FTP mechanism and a logical capital allocation methodology, are essential ingredients in the high-level risk management mechanism in a bank.

Dynamic Risk Management

The process of risk management in a bank is a dynamic and not static one. In other words, it is not enough to simply set up the infrastructure and then leave it at that. The Board and senior management need to remain aware of changes in market conditions, and act accordingly. What seemed like a worthwhile transaction a few months ago may not be now, in light of other events, and bank management must be able to react to these. Of course, prevention is better than cure. Ideally, the risk impact of all ongoing business should be captured and assessed as part of the decision-making process; that is, before the decision is made rather than after. Once a transaction is entered into, changing circumstances may dictate that the exposure is no longer worth maintaining, in which case the risk management response should be to re-hedge it or otherwise dispose of the transaction.

The risk management process is therefore dynamic with regard to the existing portfolio of business and all new business. Each new business transaction decision, both at the individual as well as portfolio level, should seek to answer clearly the following questions:

- Does it adhere to existing risk-reward guidelines and bank risk culture?
- What is the impact of the transaction(s) on risk exposure?
- Does it meet specified return-on-capital requirements?

Notice how we placed the revenue question last. This is deliberate. It is not sufficient to consider only the revenue raised and the net profit generated. To do so would result in excessive risk generation, often beyond the acceptable tolerance of the shareholders. Therefore it is imperative that the risk review process stays within an acceptable framework.

Exactly the same process applies to off-balance sheet transactions. Derivative and other OTC transactions, whether undertaken for hedging or speculative purposes, or as part of a customer product offering, must still fall under the high-level risk review process.

Bank Risk Management Structure and Organisation

A 20th century development in banks worldwide has been the introduction of a bank-wide risk management function. This was a response to the

increasing sophistication and internationalisation of banking operations.¹⁶ Risk management is now a centralised operation, whereas previously credit risk would have been managed separately to market risk, liquidity risk, operational risk and so on. These are still individual departments within a bank, but are overseen by a head of risk or chief risk officer (CRO). The CRO will typically report to the chief operating officer (COO) or a non-executive member of the Board.

By definition a firm-wide risk management function will mean a separation between the business lines and the risk supervising lines of a bank. This is an essential organisational requirement. The ALM function of the bank, usually delegated to the Treasury division, is part of this centralised risk management framework. The ALM desk is usually a separate desk within Treasury (in small banks it can be just two persons) and is responsible for the entire bank's interest-rate risk and liquidity management. For banks that have overseas branches, the head office ALM desk is ultimately responsible for the entire bank's ALM risk. Global banking groups, with overseas subsidiaries, will still place overall firm ALM risk management supervision with its Global Treasury, even if the foreign subsidiaries are required to be independent stand-alone entities with their own funding.

Placing interest-rate risk and liquidity management within one centralised function is essential for efficient ALM. Individual bank business lines cannot be allowed to run interest-rate or liquidity risk, otherwise there would be a severe danger of the bank's senior management being unable to effectively control it. Each business line, be it project finance or corporate banking or private banking, generates interest-rate risk, and this is managed at an aggregate portfolio level by the ALM desk. Transferring this risk from the individual businesses to Treasury also means that the business lines do not have to worry about interest-rate and liquidity risk: this is managed for them. The banking portfolio also generates credit risk, which is monitored by the credit risk unit. The hedging of credit risk, either by securitisation or the use of credit derivatives, insurance or guarantees, may be left to the business line (or, in the case of securitisation, to Treasury) or a dedicated unit.

16 Globalisation was an indirect causal factor of the 2007–2009 financial crisis. What began as a downturn in one particular sector of the US housing market ended up as global recession, and banking failure, partly arising as a result of the extensive cross-border and integrated nature of banking operations.

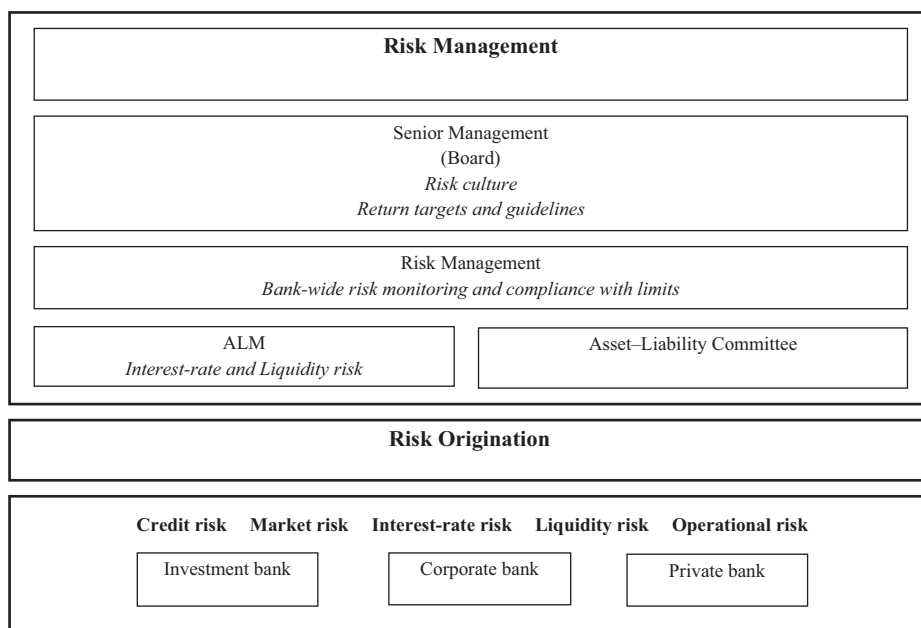


FIGURE 1.15 Centralised bank risk management, overseeing bank business lines.

Centralised Risk Management

Figure 1.15 is a stylised view of the centralised risk management function in a bank. We observe that the business lines originate the various risk exposures, and these are overseen, monitored and managed by the risk function. The senior management – which we can take to be the Board – will set the overall risk culture and this must be dynamic and up-to-date with events.

The centralised risk function will break down into individual departments monitoring specific risks. This is illustrated at Figure 1.16. Note that the Valuation Control function is sometimes situated within the Finance department. It is also sometimes known as “product control”, although this term does not describe what it actually does, which is the independent checking of market prices. All three of the principal department heads will meet regularly on the ALCO. The role, objectives and responsibility of ALCOs are described in detail in Chapter 9.

Asset–Liability Management and the ALM Committee

The art of banking is the art of asset and liability management or ALM. Or rather we should say that the art of banking is maturity transformation.

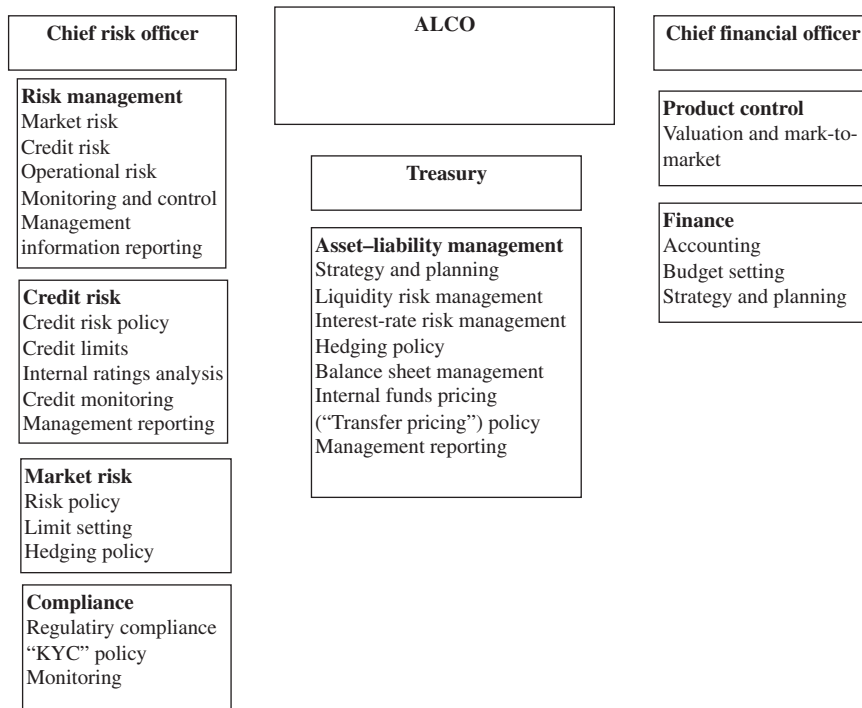


FIGURE 1.16 Centralised bank risk management, breakdown into individual risk departments.

This is the term for the mechanism by which banks “lend long” and “borrow short”. This is an unavoidable fact of life for banks, and the need for ALM arises precisely because assets (loans) are always, on average, longer dated than liabilities (borrowings). It is not really practical to run a bank, except one with a very narrow and specific remit, any other way. Customer assets such as corporate loans and mortgages will always have a longer legal final maturity than liabilities such as customer deposits.

The ALM department, which is organised in different ways in different banks, is the unit responsible for managing the bank’s liquidity, its interest rate and foreign exchange risk, and also its internal funds pricing. The stewardship of ALM is in the hands of the ALM Committee or ALCO. The ALCO sets policy for a number of different areas in the bank, and is the most important committee in the bank, including the bank’s Board. It is possible to have an incompetent Board and still survive a market crisis;

however, it is not possible for a bank to have an incompetent ALCO and survive the same crisis.

The ALCO terms of reference are larger than mere implementation of ALM decisions, important and onerous though that task is. They include overall balance sheet management, as well as the responsibility of ensuring that policies adopted by the individual business lines fall within the boundaries required by the global ALM policy. This latter is an important, “political” task.

ALM itself addresses the following:

- defining the extent of the actual structure of the balance sheet, both assets and liabilities: one sees how this must perforce drill down into more detailed issues such as allowed tenor of assets and liabilities, as well as sources of liabilities;
- hedging policy for all risk exposures, including interest-rate, FX and liquidity risk;
- defining actual risk measures: how risks will be measured, how they will be reported, and what the limits are; monitor (or delegate monitoring) the risk exposures themselves.

We state at the outset that liquidity risk and market risk (including interest-rate risk) are inter-related and inter-dependent issues. They cannot be managed, monitored or controlled separately or independently of each other. This reflects a number of factors, the main one being that an expectation of funding difficulty in the future must be addressed today, with consequent impact on the funding cost and interest rate exposure.

Notwithstanding that larger and more sophisticated banks will have different levels of complexity compared to smaller or more narrowly focused banks, the scope of the ALM function will be identical at all banks. The one key functional difference across banks is whether the ALM, and Treasury, function, operates as a cost centre or a profit centre. We discuss this further in Chapter 9. However, setting up the ALM desk as a profit centre does not obviate the need for it to adhere to all the required levels of ALM control.

The ALCO then is the controlling arm for bank ALM. It is not an administrative function, however, as it also sets policy and guidelines. Note that banks comprised of more than one legal entity, for example across multiple legal jurisdictions, will have a Group ALCO that sets policy for the banking group as a whole. In some banks ALCO is known as the ALMAC (Asset–Liability Management Action Committee) or ALPCO (Asset–Liability Policy Committee). We discuss the ALCO function in detail in chapters 6, 7, 8, 9 and 10.

APPENDIX 1.1 SUMMARY OVERVIEW OF BANK PRODUCT LINE

DEFINITION OF BANKING

A definition of banking is available in a number of textbooks; the author recommends *Modern Banking* by Shelagh Heffernan (Wiley 2005). As a matter of interest the following are just two of many hundreds of definitions on the Internet:

Engaging in the business of keeping money for savings and checking accounts or for exchange or for issuing loans and credit etc.

www.wordnetweb.princeton.edu/perl/webwn

A bank is a financial institution that accepts deposits and channels those deposits into lending activities. Banks primarily provide financial services to customers while enriching investors. Government restrictions on financial activities by banks vary over time and location.

www.en.wikipedia.org/wiki/Banking

We will keep the definition even briefer, and refer readers to Figure A1.1.

PRODUCT LINE

As part of the primer on banking we provide a summary of the main product line offered by banks. Not all banks offer all these products, but these instruments are available in virtually every banking market. More detailed information is available in the following books by the author: *The Money Market Handbook*, *Fixed Income Markets* and *Bank Asset and Liability Management*, all published by John Wiley & Sons (Asia) Pte Ltd.

Interest-bearing and Non-interest-bearing Current Accounts

These are also known as cheque accounts or (in the US) checking accounts, and are the simplest form of short-term deposit or investment instrument.

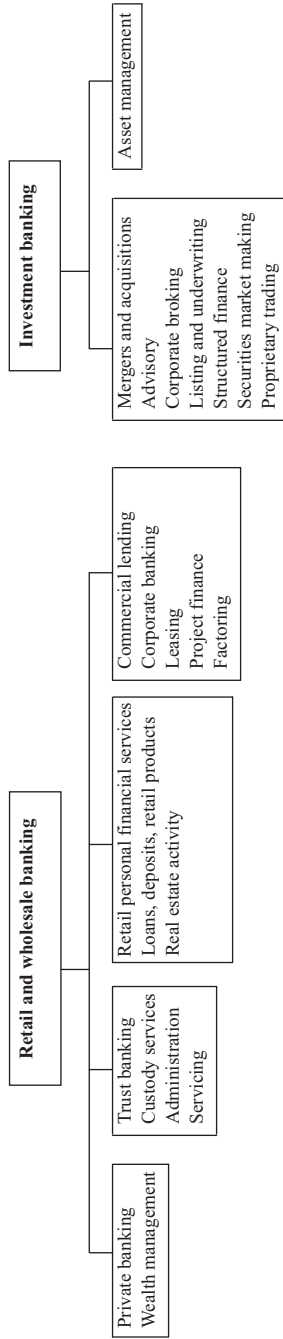


FIGURE A1.1 Banking activities.

Customer funds may be withdrawn instantly on demand, and banks generally pay interest on surplus balances, although not in all cases. Current accounts are a cheap source of funding for banks, as well as a stable one, but because their balances are instant access, the funds are less valuable from a liquidity metrics point of view.

Demand Deposits

These are also referred to as sight deposits, similar to a cheque account, but they are always interest bearing. The funds are available on demand, but cannot be used for cheques or other similar payments.

Time Deposits

Time or term deposits are interest-bearing deposit accounts of fixed maturity. They are usually offered with a range of maturities ranging from one month to five years, with the longer dated deposits attracting higher interest. This reflects the positive yield curve, which reflects the funding value to the bank of longer term liabilities. Most time deposits pay a fixed rate of interest, payable on maturity. Accounts of longer than 1-year maturity often capitalise interest on an annual basis.

Certificates of Deposit

Certificates of deposit (CDs) are receipts from banks for deposits that have been placed with them. They were first introduced in the sterling market in 1958. The deposits themselves carry a fixed rate of interest related to Libor and have a fixed term to maturity, so they cannot be withdrawn before then. However, the certificates themselves can be traded in a secondary market; that is, they are negotiable. CDs therefore are very similar to negotiable money market deposits, although the yields trade below the equivalent tenor deposit rates because of the added benefit of secondary-market liquidity. Most CDs issued are of between one and three months' maturity, although they do trade in maturities of one to five years. Interest is paid on maturity except for CDs lasting longer than one year, where interest is paid annually or occasionally, semi-annually.

Banks, investment banks and building societies issue CDs to raise funds to finance their business activities. A CD will have a stated interest rate and fixed maturity date, and can be issued in any denomination. On issue a CD is sold for face value, so the settlement proceeds of a CD on issue are always equal to its nominal value. The interest is paid, together with the face amount, on maturity. The interest rate is sometimes called the coupon, but

unless the CD is held to maturity this will not equal the yield, which is of course the current rate available in the market and varies over time. The largest group of CD investors are banks, money market funds, corporates and local authority treasurers.

Commercial Paper

Commercial paper (CP) is a short-term money market funding instrument issued by banks and corporates. In most markets, including the US and UK, it is a discount instrument. Companies' short-term capital and working capital requirement is usually sourced directly from banks, in the form of bank loans. An alternative short-term funding instrument is CP, which is available to corporates that have a sufficiently strong credit rating. CP is a short-term unsecured promissory note. The issuer of the note promises to pay its holder a specified amount on a specified maturity date. CP normally has a zero coupon and trades at a *discount* to its face value. The discount represents interest to the investor in the period to maturity. CP is typically issued in bearer form, although some issues are in registered form.

CP issued in the US dollar domestic market differs in detail from Euromarket CP, which is known as EuroCommercial Paper (ECP). We highlight the main differences in Table A1.1

Asset-backed Commercial Paper

Securitisation technology led to the creation of short-term money market instruments backed by the cash flows from other assets, known as asset-backed commercial paper (ABCP). Securitisation is the practice of using the cash flows from a specified asset, such as residential mortgages, car loans or commercial bank loans, as backing for an issue of bonds. The assets

TABLE A1.1 Comparison of USCP and ECP.

	USCP	ECP
Currency	US dollar	Any Euro currency
Maturity	1–270 days	2–365 days
Common maturity	30–60 days	30–90 days
Interest	Zero coupon, issued at discount	Zero-coupon, issued at discount
Quotation	On a discount rate basis	On a yield basis
Settlement	T + 0 or T + 1	T + 2
Registration	Bearer form	Bearer form
Negotiable	Yes	Yes

themselves are transferred from the original owner (the *originator*) to a specially created legal entity known as a *special purpose vehicle* (SPV), so as to make them separate and bankruptcy-remote from the originator. In the meantime, the originator is able to benefit from capital market financing, often charged at a lower rate of interest than that earned by the originator on its assets.

Issuing ABCP enables an originator to benefit from money market financing that it might otherwise not have access to because its credit rating is not sufficiently strong. ABCP trades as conventional CP, except generally at a higher yield due to the perceived lower liquidity compared to straight CP. The administration and legal treatment is more onerous, however, because of the need to establish the CP trust structure and issuing SPV.

An ABCP conduit has the following features:

- it is a bankruptcy-remote legal entity that issues CP to finance a purchase of assets from a seller of assets;
- the interest on the CP issued by the conduit, and its principal on maturity, will be paid out of the receipts on the assets purchased by the conduit.

The assets that can be funded via a conduit programme are many and varied; to date they have included:

- trade receivables and equipment lease receivables;
- credit card receivables;
- auto loans and leases;
- corporate loans, franchise loans and mortgage loans;
- real-estate leases.

Conduits are classified into a “programme type”, which refers to the makeup of the underlying asset portfolio. This can be single-seller or multi-seller, which indicates how many institutions or entities are selling assets to the conduit.

Figure A1.2 illustrates a typical ABCP structure issuing to the USCP and ECP markets.

Foreign Exchange

A *spot* FX trade is an outright purchase or sale of one currency against another currency, with delivery two working days after the trade date. Note that in some currencies, generally in the Middle East, markets are closed on Friday but open on Saturday. A settlement date that falls on a public holiday in the country of one of the two currencies is delayed for

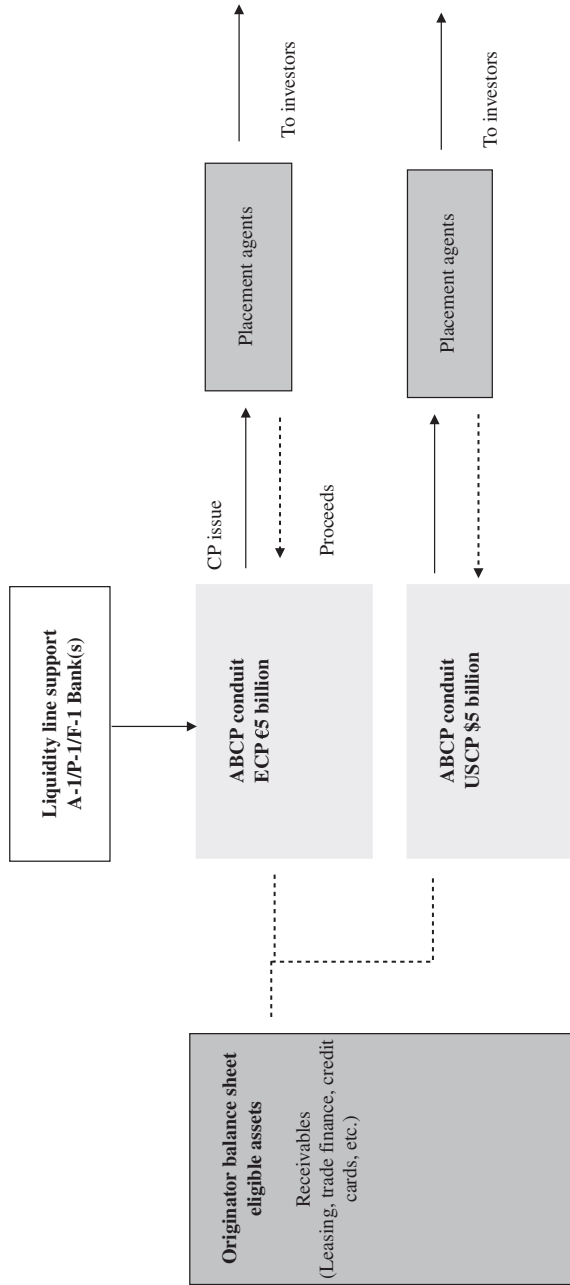


FIGURE A1.2 Single-seller ABCP conduit.

settlement by that day. An FX transaction is possible between any two currencies; however, to reduce the number of quotes that need to be made, the market generally quotes only against the US dollar or occasionally against sterling or euro, so that the exchange rate between two non-dollar currencies is calculated from the rate for each currency against the dollar. The resulting exchange rate is known as the *cross-rate*. Cross-rates themselves are also traded between banks in addition to dollar-based rates. This is usually because the relationship between two rates is closer than that of either against the dollar; for example, the Swiss franc moves more closely in line with the euro than against the dollar, so in practice one observes that the dollar/Swiss franc rate is more a function of the euro/franc rate.

The spot FX quote is a two-way bid–offer price and indicates the rate at which a bank is prepared to buy the base currency against the variable currency; this is the “bid” for the variable currency, so it is the lower rate. The other side of the quote is the rate at which the bank is prepared to sell the base currency against the variable currency. For example, a quote of 1.6245–1.6255 for GBP/USD means that the bank is prepared to buy sterling for \$1.6245, and to sell sterling for \$1.6255. The convention in the FX market is uniform across countries, unlike the money markets. Although the money market convention for bid–offer quotes is for example, $5\frac{1}{2}\%$ – $5\frac{1}{4}\%$, meaning that the “bid” for paper – the rate at which the bank will lend funds, say in the CD market – is the higher rate and always on the left, this convention is reversed in certain countries. In the FX markets the convention is always the same one just described.

The difference between the two sides in a quote is the bank’s dealing spread. Rates are quoted to $1/100^{\text{th}}$ of a cent, known as a *pip*. In the quote above, the spread is 10 pips; however, this amount is a function of the size of the quote number, so that the rate for USD/JPY at, say, 110.10 – 110.20, indicates a spread of 0.10 yen. Generally, only the pips in the two rates are quoted, so that for example the quote above would be simply “45–55”. The “big figure” is not quoted.

EXAMPLE A1.1 EXCHANGE CROSS-RATES

Consider the following two spot rates:

EUR/USD	1.0566–1.0571
AUD/USD	0.7034–0.7039

The EUD/USD dealer buys euros and sells dollars at 1.0566 (the left side), while the AUD/USD dealer sells Australian dollars and buys
(continued)

US dollars at 0.7039 (the right side). To calculate the rate at which the bank buys euros and sells Australian dollars, we need to do

$$1.0566/0.7039 = 1.4997$$

which is the rate at which the bank buys euros and sells Australian dollars. In the same way, the rate at which the bank sells euros and buys Australian dollars is given by:

$$1.0571/0.7034 \text{ or } 1.5028.$$

Therefore the spot EUR/AUD rate is 1.4997 – 1.5028.

The derivation of cross-rates can be depicted in the following way. If we assume two exchange rates XXX/YYY and XXX/ZZZ , the cross-rates are:

$$YYY/ZZZ = XXX/ZZZ \div XXX/YYY$$

$$ZZZ/YYY = XXX/YYY \div XXX/ZZZ$$

Given two exchange rates, YYY/XXX and XXX/ZZZ , the cross-rates are:

$$YYY/ZZZ = YYY/XXX \times XXX/ZZZ$$

$$ZZZ/YYY = 1 \div (YYY/XXX/ZZZ)$$

Figure A1.3 shows the Bloomberg major currency FX monitor, page FXC, as at 10 May 2004.

Government Bonds

The secondary market in government bonds is provided by banks, those that choose to be market-makers or primary dealers. Sovereign debt is essentially a plain vanilla market, with the vast majority of bonds being fixed coupon and fixed maturity. Governments also issue index-linked bonds that offer returns linked to the rate of inflation.

Floating Rate Notes

Floating rate notes (FRNs) are bonds that have variable rates of interest; the coupon rate is linked to a specified index and changes periodically as

FRNs have much longer maturities. Investors can opt to view FRNs as essentially money market instruments or as alternatives to conventional bonds. For this reason one can use two approaches in analysing FRNs. The first approach is known as the *margin method*. This calculates the difference between the return on an FRN and that on an equivalent money market security. There are two variations on this: simple margin and discounted margin.

Repos

A repo agreement is a transaction in which one party sells securities to another, and at the same time, and as part of the same transaction commits to repurchase identical securities on a specified date at a specified price. The seller delivers securities and receives cash from the buyer. The cash is supplied at a predetermined rate – the *repo rate* – that remains constant during the term of the trade. On maturity the original seller receives back collateral of equivalent type and quality, and returns the cash plus repo interest. One party to the repo requires either the cash or the securities and provides *collateral* to the other party, as well as some form of compensation for the temporary use of the desired asset. Although legal title to the securities is transferred, the seller/lender retains both the economic benefits and the market risk of owning them. The purpose of the transaction of course is to provide secured lending of cash.

Repo is a short-term secured cash instrument that should always be labelled as part of the money markets. There is a wide range of uses to which repo might be put. In the equity market, repo is often conducted in a basket of stocks, which might be constituent stocks in an index such as the FTSE100 or CAC40, or user-specified baskets. Market-makers borrow and lend equities with differing terms to maturity, and generally the credit rating of the institution involved in the repo transaction is of more importance than the quality of the collateral. Central banks' use of repo also reflects its importance; it is a key instrument in the implementation of monetary policy in many countries. Essentially then, repo markets have vital links and relationships with global money markets, bond markets, futures markets, swap markets and OTC interest-rate derivatives.

For practical purposes, repo is essentially a secured loan. The term comes from *sale and repurchase agreement*; however, this is not necessarily the best way to look at it. Although in a classic repo transaction the legal title of an asset is transferred from the “seller” to the “buyer” during the term of the repo, this should not detract from the essence of the instrument: a secured loan of cash. The main value of repo lies in the fact that, for the

lender of cash it provides collateral backing to help mitigate counterparty credit risk, and for the borrower of cash it enables the financing of asset positions in the security that is being repo'd out.

Letter of Credit

A letter of credit (LoC) is a standard vanilla product available from a commercial bank. It is an instrument that guarantees that a buyer's payment to a seller will be received at the right time and for the specific amount. The buyer is the customer of the bank. If the buyer is unable to make payment on the due date, the bank will cover the full amount of the purchase. The bank therefore takes on the credit risk of the buyer when it writes a LoC on its behalf. The buyer therefore pays a fee for the LoC that reflects its credit standing.

LoCs are used in domestic and international trade transactions. Cross-border trade transactions involve both parties in issues such as distance, different legal jurisdictions and lack of due diligence available on the counterparties. A LoC is a valuable tool that eases the process for the buying and selling parties. The bank also acts on behalf of the buyer (the purchaser of the LoC) because it would only make payment when it knows that the goods have been shipped. For the seller, a LoC substitutes the credit of the buyer for that of the bank, which is an easier risk exposure for the seller to take on.

There are essentially two types of LoC: commercial and standby. The commercial LoC is the primary payment mechanism for a transaction, while the standby LoC is a secondary payment mechanism.

Commercial Letter of Credit

A commercial LoC is a contract between a bank, known as the issuing bank, on behalf of one of its customers, authorising another bank, known as the advising or confirming bank, to make payment to the beneficiary. The issuing bank makes a commitment to guarantee drawings made under the credit. The beneficiary is normally the provider of goods and/or services. An advising bank, usually a foreign correspondent bank of the issuing bank, will advise the beneficiary but otherwise has no other obligation under the LoC.

A LoC is generally negotiable; this means that the issuing bank is obliged to pay the beneficiary, but also at its request any bank nominated by the beneficiary. To be negotiable, the LoC features an unconditional promise to pay on demand at a specified time.

Standby Letter of Credit

The standby LoC is a contract issued by a bank on behalf of a customer to provide assurances of its ability to perform under the terms of a contract between it and the beneficiary. In other words, the standby LoC is more of a guarantee, as both parties to the transaction do not expect that the LoC will be drawn on. It essentially provides comfort to the beneficiary, as it enhances the credit worthiness of its customer.

Structured Deposits

A structured deposit is a deposit whose payoff or return profile is structured to match a specified customer requirement. The structuring results from the use of an embedded derivative in the product, which links the deposit to changes in interest rates, FX rates or other market levels. There is a wide range of different products available that fall in the class of “structured deposit”. An example is the following: a customer places funds on deposit at a specified interest rate and fixed term. Under the agreement, if the central bank base interest rate remains between 4% and 5%, then the return is enhanced by 100 bps. If the rate moves below 4% or above 5%, then the deposit forfeits all interest for the remaining term of its life. This is an example of a “collared range accrual” deposit.

Liquidity Facilities

Liquidity facility is the generic term for a standing loan agreement, against which a borrower can draw down funds at any time up to the maximum value of the line. The borrower pays a fee, even if the line is not used, called the standing fee, and then pays the agreed rate of interest on any funds that it does draw.

We distinguish between the following:

- Back-up facility: a facility that is not used in the normal course of business. It is generally drawn down if the borrower is experiencing some difficulty in obtaining funding from its usual sources.
- Revolving credit facility (RCF): a commitment from a bank to lend on a revolving basis under pre-specified terms. Under an RCF there is usually a regular drawdown and repayment of funds during the life of the facility.
- Term loan: this is distinct from liquidity lines in that it is a non-revolving facility and will be drawn down at execution. It has a fixed repayment date, although this may be on an amortised basis.

TABLE A1.2 Typical priorities of corporate bonds and loans of investment grade and sub-investment grade borrowers.

	Investment-grade borrower	Sub-investment-grade borrower
Bonds	<ul style="list-style-type: none"> • Senior unsecured 	<ul style="list-style-type: none"> • Senior unsecured (<i>high-yield bonds</i>)
Loans	<ul style="list-style-type: none"> • Senior unsecured 	<ul style="list-style-type: none"> • Senior secured • (<i>leveraged loans/syndicated loans</i>)

Source: Choudhry (2010).

Liquidity facilities require full regulatory capital backing, as the capital treatment is to assume that they are being fully used at all times.

Syndicated Loans¹⁷

To raise debt capital, companies may issue bonds or loans (as well as other debt-like instruments), both of which are associated with a certain seniority or ranking. In a liquidation or winding-up, the borrower's remaining assets are distributed according to a priority waterfall: debt obligations with the highest seniority are repaid first, and only if assets remain thereafter are obligations with lower seniorities repaid. Further, debt instruments may be secured or unsecured: if a certain number of the borrower's assets are ring-fenced¹⁸ to serve as collateral for the lenders under a particular obligation only, this obligation is deemed to be "secured". Together, seniority and collateral determine the *priority* of an obligation. As illustrated in Table A1.2, bonds and loans issued by investment-grade companies, as well as bonds issued by sub-investment grade companies, called "high-yield bonds", are typically senior unsecured. However, loans issued by sub-investment grade companies are typically senior secured. Often, these are called "leveraged loans" or "syndicated secured loans". The market often uses both terms interchangeably.

The definition of "leveraged loan" is not universal, however. Various market participants define a leveraged loan to be a loan with a sub-investment grade rating, while other users view it as one with a certain spread over Libor

17 This section is an extract from Chapter 11 of Choudhry (2010). It was co-written with Timo Schlafer and Marliese Uhrig-Homburg.

18 Ring-fencing is a legal term that refers to the practice of segregating assets, for the benefit of one entity, such that they cannot be touched by other creditors during a bankruptcy or administration proceeding.

(say 100 bps or more) and sometimes a certain debt/earnings before interest, taxes, depreciation and amortisation (EBITDA) ratio of the borrower. S&P, for instance, calls a loan “leveraged” if it is rated sub-investment grade or if it is rated investment grade but pays interest of at least Libor + 125 bps. Bloomberg uses a hurdle rate of Libor + 250 bps. Essentially, the market refers to leveraged loans and high-yield bonds as “high-yield debt”.

Leveraged loans may be arranged either between a borrower and a single lending bank, or, more commonly, between a borrower and a syndicate of lending banks. In the latter case, one (or more) of the lending banks acts as lead arranger. Before any other lending banks are involved, the lead arranger conducts detailed due diligence on the borrower. Also, lead arranger and borrower agree on the basic transaction terms such as size of the loan, interest rate, fees, loan structure, covenants and type of syndication. These terms are documented in a “loan agreement”. Based on the information received in the due diligence process, the lead arranger prepares an information memorandum, also called “bank book”, which is used to market the transaction to other potential lending banks or institutional investors. Together, the lead arranger and the other lenders constitute the primary market. If the transaction is an “underwritten syndication”, the lead arranger guarantees the borrower that the entire amount of the loan will be placed at a predefined price. If the loan is undersubscribed at that price, the lead arranger is forced to absorb the difference. If the transaction is a “best-efforts syndication”, the lead arranger tries to place the loan at the predefined terms but will, if investor demand is insufficient, adjust these terms to achieve full placement.

Leveraged loans typically consist of a revolving credit facility or “revolver” and “term loans”. The term loans are usually tranching into an amortising term loan (term loan A), provided by the syndicate banks, and institutional tranches (term loans B, C and D), provided by institutional investors. In the US market, amortising term loans have become increasingly rare as institutional investors are now the primary buyers of leveraged loans. The term loan D may represent a further subdivision, called “second lien tranche”, which is subordinated to term loans A, B and C, called “first lien tranches”, but ranks senior to all other debt of the borrower. Historically, this structure has resulted in significantly higher recovery rates of first lien tranches compared to second lien tranches.

The term loan A is usually repaid on scheduled repayment dates during its life, whereas term loans B, C and D are mostly subject to bullet repayment; that is, a one-off repayment on the maturity date. Once repaid, term loans cannot be re-borrowed. This is the principal difference to the revolving credit facility, usually provided by syndicate lenders, which allows the borrower to borrow, repay, and re-borrow funds during the life of the

TABLE A1.3 Typical structure of leveraged loans.

		Lien	Lender	Repayment
Revolving credit facility		} First lien	} Banks	Discretionary
Term loans	A			} Institutional investors
	B		} Bullet	
	C			
	D	Second lien		

Source: Choudhry (2010).

loan in accordance with predetermined conditions. In addition to interest on borrowed funds, borrowers are charged a commitment fee on unused funds. Revolvers are often used to fund working capital and capital expenditure requirements that can fluctuate significantly over time. Table A1.3 summarises the above discussion.

Leveraged loans pay floating rate coupons. These are composed of Libor (or another inter-bank rate, depending on the loan's currency) plus a certain spread (that is, risk premium) and are typically payable quarterly. Floating rate coupons provide an effective hedge against interest-rate risk: if interest rates rise, so does the coupon and vice versa. Consequently, floating rate coupons are particularly popular in times of rising interest rates. Often, the spread of leveraged loans is not fully fixed but moves according to a pricing grid predefined in the loan agreement: if the borrower's credit condition improves, for instance indicated by a decline of financial leverage and/or a rating upgrade, the spread decreases and vice versa.

Leveraged loans commonly mature between 7 to 10 years after issuance. The *effective* life of leveraged loans, however, tends to be significantly shorter as the borrower is typically allowed to prepay or "call" the loan at any time at no or limited premium. Prepayment is generally seen as negative by lenders. This is because borrowers tend to prepay when their refinancing costs decrease; for instance, when they are upgraded to investment grade or acquired by an investment grade-rated company or when interest rates decrease. For lenders, this means that they bear all the downside (that is, rising interest rates or a deterioration in the borrower's credit condition) but retain limited upside. Generally, floating-rate coupons mitigate lenders' risk associated with rising interest rates.

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