3 Risk in banking

3.1 Learning outcomes

After studying this text the learner should / should be able to:

- Elucidate the concept of risk.
- Evaluate the various risks with which banks contend.
- Comprehend the import of risk mitigation techniques.

3.2 Introduction

By virtue of borrowing and lending for various periods, at various rates of interest, engaging in many other interest rate-related activities, dealing in foreign exchange, undertaking different investments, dealing in the derivatives markets, etc, banks are exposed to an array of risks like no other institution. The risks faced by banks are usually identified in the statute/s relating to banks in many countries, and are as follows.

- Interest rate risk.
- Market risk.
- Liquidity risk.
- Credit risk.
- Currency risk.
- Counterparty risk.
- Operational risk.

Exposure to these risks makes for the banks being the most regulated and supervised of any financial institution. It will be evident that bank regulators are required to be experienced and astute in the business of banking. It is important that they be aware of innovations and worldwide trends.

In most countries the statute/s relating to banks makes it compulsory that banks have a robust risk management function, and that the board of directors has a risk management committee.

Each of the risks mentioned above is discussed below, but after we introduce a brief discussion on the concept of risk.

3.3 The concept of risk

Most[19] financial intermediaries owe their existence to risk. They offer liabilities that are "convenient" to the holder; one of these conveniences is the taking on risk on behalf of the liability holder. The biggest risk takers are the banks, which someone once described as *risk machines*. This is an apt description, because they are exposed to all the risk-types. But, to go back to basics, what is risk?

The celebrated Prof Harry Markowitz teaches us that risk cannot be divorced from return: the risk of an asset has no meaning except with reference to the portfolio in which the asset is held.[20] Financial intermediaries, like any business, endeavour to maximise profits and shareholder value, and risk is central to this endeavour. Banks make extensive use of leverage (borrowing in the form of deposits and loans) in order to achieve profits. The minimum a bank can earn without risk is the risk-free rate (rfr), i.e. the treasury bill or government bond rate, and higher returns beyond this rate of return are associated with higher risk (called the risk premium), as shown in the Figure 1.

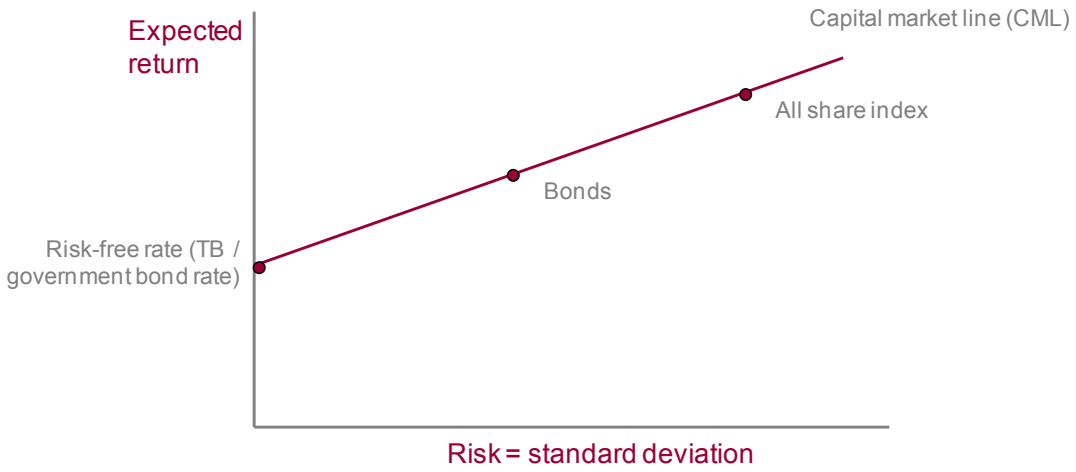

Figure 1: relationship between risk & return

Thus, financial intermediaries demand a higher return as the risk profile increases, and they attempt to maximise return for a given level of risk or minimise risk for a given level of return (the line is called the capital market line – CML).

Risk is usually defined as the uncertainty of future outcomes or the probability of an adverse outcome.[21] It is usually measured as the volatility or standard deviation of returns around the mean return. Profitability is therefore dependent on the management of risk, and it will be obvious that inadequate risk management could threaten the solvency of the financial intermediary. It is important to keep in mind that risk management is core to financial intermediaries, particularly banks, because they "work" with financial liabilities and assets, as opposed to corporate entities, for example, because their core business is usually related to real, not financial, assets. Inadequate risk management by corporate entities can bring about losses, but it is unlikely to endanger their solvency.[22]

It is important to mention at the outset that in modern day financial markets banks are able to hedge virtually every aspect of interest costs and returns. For example, a bank can hedge its margin (with interest rate swaps); it can ensure a return of a bond (with options); it can introduce caps and floors on rates paid and earned, etc. However, what does this mean? The answer is straightforward: the financial intermediary is mitigating risk, and in doing so it is pushing itself down the CML to lower earnings.

What is the conclusion? It is that banks must take on risk in order to be attractive as an investment. The trick is the risk-reward trade-off. It is for this reason that the management rules of banks in respect of risk should be such that the risk-taking process is not constrained to the extent that risk is eliminated. Financial intermediaries cannot be too prudent.

Is there a way to reduce risk without compromising return? The answer is a resounding "yes", and it is embodied in the portfolio theory principle: *diversification and correlation*. The very essence of the Harry Markowitz thesis in respect of portfolio management is that risk is reduced by diversifying the portfolio provided that the assets in the portfolio are not perfectly positively correlated, and that risk is further reduced as correlations move from +1 to -1. Banks are usually well-diversified.

3.4 Interest rate risk

3.4.1 Definition

Interest rate risk is the risk of expected earnings being influenced negatively as a result of changes in the pattern and level of interest rates. As discussed earlier, banks are intermediaries between lenders and borrowers and their liabilities and assets are not matched in terms of tenor (term to maturity) and interest rate type (fixed or floating), because the lenders have different requirements to the borrowers. The *raison d'ĕtre* of banks is to accommodate lenders and borrowers. They are thus exposed to interest rate risk.

There are three elements to interest rate risk:

- The *bank margin*. Banks endeavour to get *highest* rates they can negotiate on assets (MD and NMD), and the *lowest* rates they can negotiate on liabilities (deposits and loans); the difference between these is the bank margin.
- The interest rates are either *floating* (variable) or *fixed*.
- The term to maturity (tenor) of the *fixed rate* assets and liabilities.

Let us examine the meaning of floating / fixed rates and their significance in banking:

- *Floating* means that the rates are repriced frequently, and the accepted definition of floating is call (one day) to three months. Examples:
  - Liabilities:
    - A call deposit at the call deposit rate – the rate can change daily (it does not but it can).
    - A deposit taken for 12 months at KIR[23]+0.3% – the rate is repriced every 91 days at the then prevailing KIR+0.3%.
  - Assets:
    - An overdraft facility at prime rate (PR) – like the call deposit rate, the rate can change daily, but it does not.
    - Mortgage for 20 years at PR-0.5% – immediately above applies.
- *Fixed* means that the rate is fixed for the term. Examples:
  - Liabilities:
    - A 12-month deposit at 8% pa.
  - Assets:
    - A 24-months loan to Mr A at 12% pa.
    - A 30-year government bond at 9.35% pa.

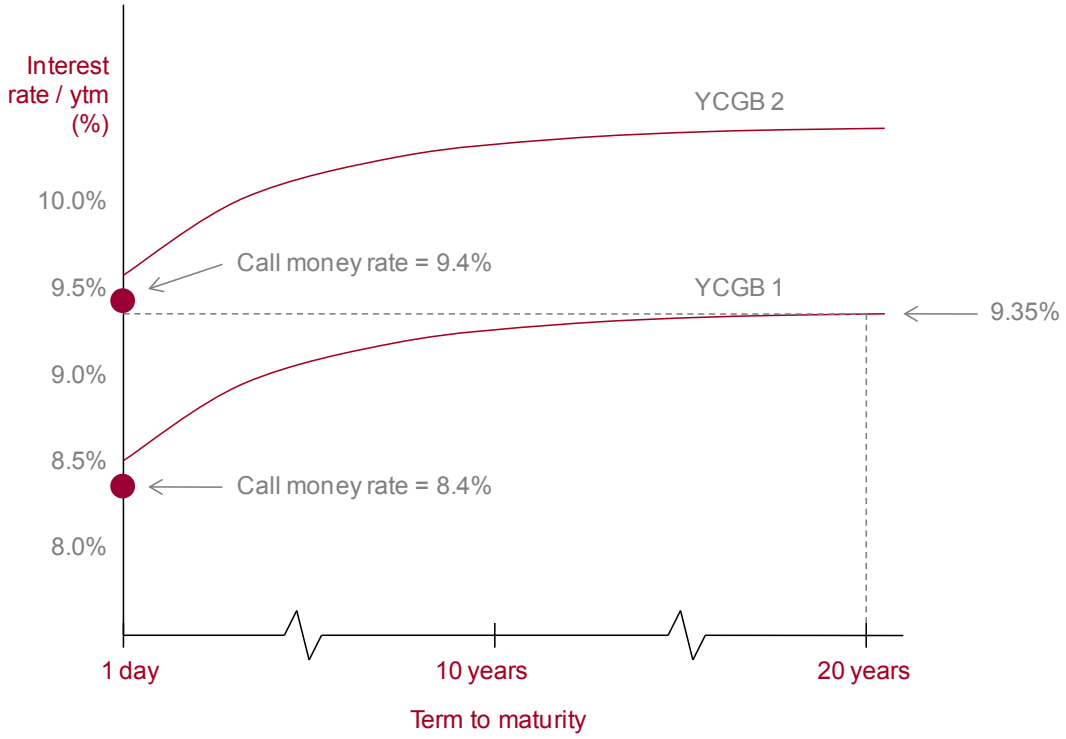

Figure 2: yield curve shift

Allow us to present an example (see Figure 2: YCGB = yield curve[24] for government bonds; YCGB 1 = now and YCGB 2 = one-year later): if a bank buys a 20-year tenor bond now at 9.35% pa, and funds it with call money deposits at a current rate of 8.4% pa, the gross[25] margin is 0.95%, and interest rate risk is high. If after a year, the yield curve has shifted to the YCGB 2 position, the margin has disappeared: the rate on the bond remains at 9.35% for 20 years, and the call money rate rose to 9.4%. (It will be evident that there are also other risks at play here: liquidity risk and market risk.)

Similarly, if a bank provides an overdraft facility at PR now (and it is used) and funds it with a 2-year fixed deposit, it is facing interest rate risk: the margin will be wiped out if interest rates decline sharply in the near future. The funding rate is fixed, while the asset rate is floating.

3.4.2 Ideal and extreme portfolios

Ideally, a bank would like to match liabilities and assets in terms of tenor, and have the rates on both sides being either fixed or floating, or a matched combination (see Figure 3; variable = floating), and thus enjoy a fixed margin without any interest rate risk.

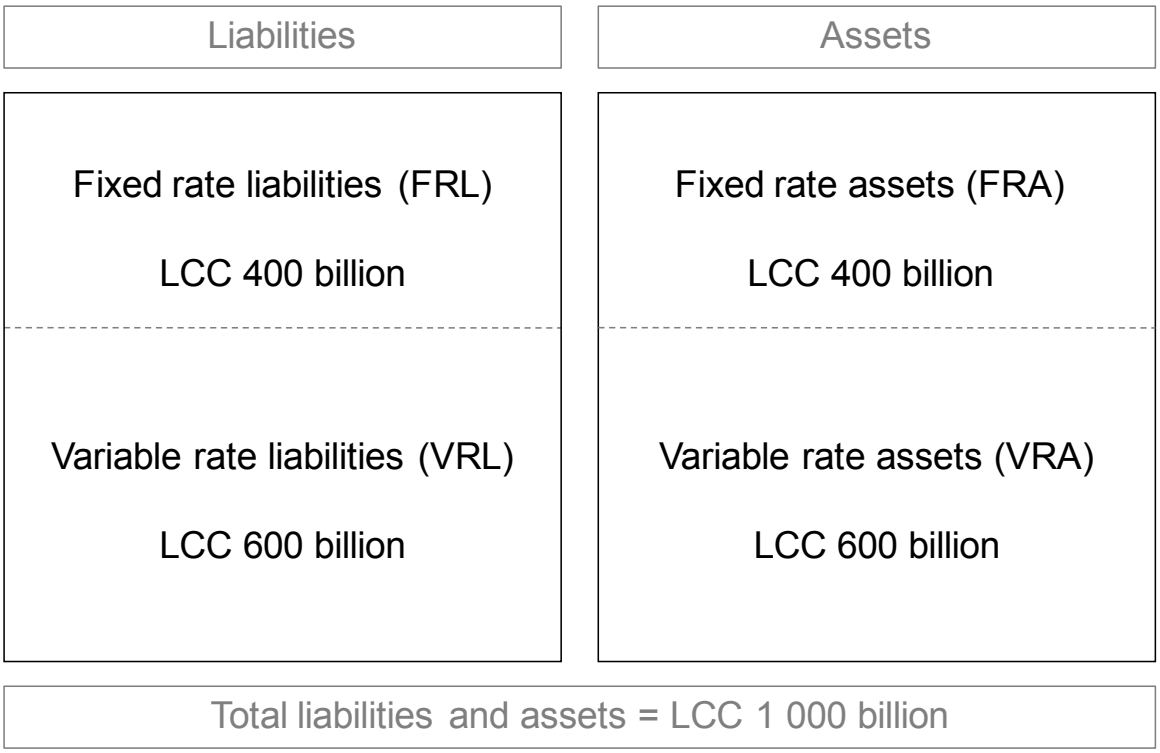

Figure 3: interest rate repricing gap analysis

This seems to be an obvious statement, but in it lurks a problem: *floating* means call to 3 months, and *fixed* means 3 months to 20+ years. Therefore, if a bank funds a 20-year tenor fixed-rate bond with a fixed deposit of 4 months at a fixed rate, it still has interest rate risk. Banks are (usually) acutely aware of this and solve the problem with their risk management techniques outlined below, the most important one being the *time band repricing gap analysis* (which is a more detailed analysis than the one indicated in Figure 3 – see later).

But this is not possible: inevitably some of their liabilities will be of a maturity that is different from the maturity of their assets, and banks are also not able to have the rates on both sides either fixed or floating. Before we discuss this in more detail, we present the extreme cases of interest rate risk.

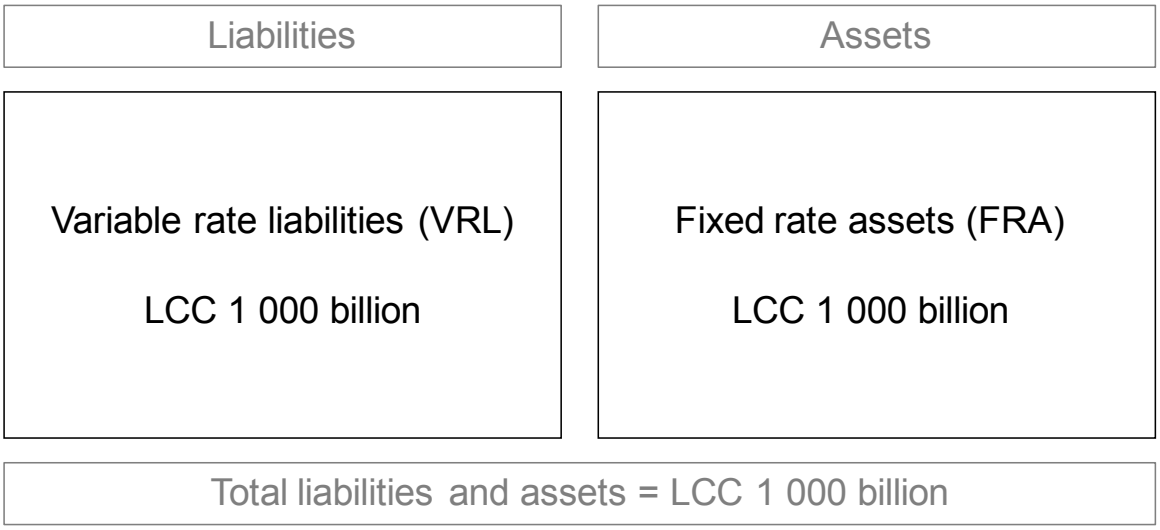

Figure 4: expectation = rates will fall

Figure 4 presents the extreme case of all liabilities = VRL and all assets = FRA. This portfolio construct represents the view that interest rates are about to fall. As interest rates fall, the asset rates do not change (because they are fixed rates), but the liabilities are re-priced frequently.

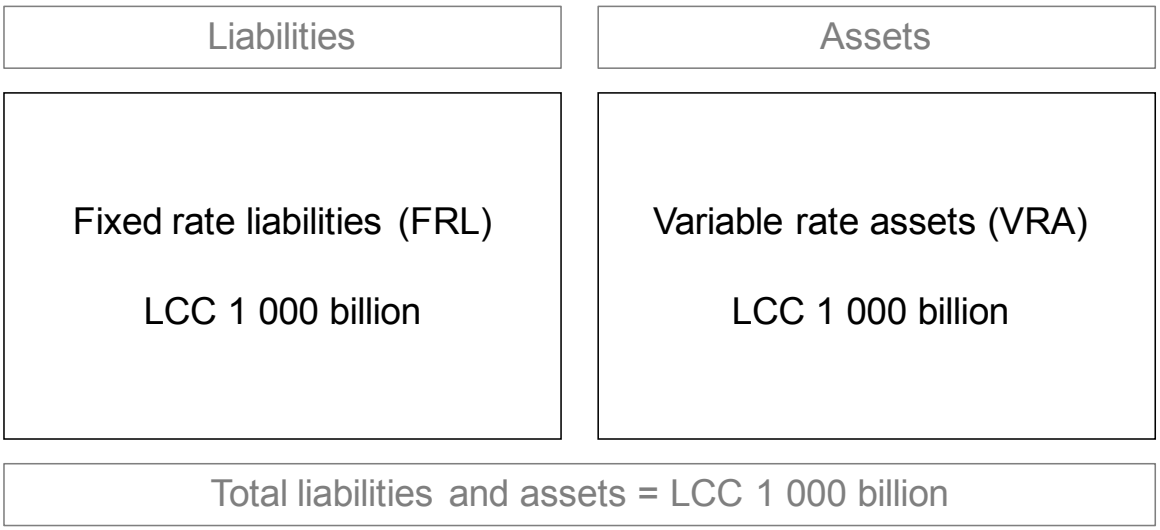

Figure 5: expectation = rates will rise

Figure 5 presents the extreme case of all liabilities = FRL and all assets = VRA. This portfolio construct represents the view that interest rates are about to rise. As interest rates rise, the rates on liabilities do not change, and the rates on assets are re-priced frequently.

If the interest rate expectations in these two examples are correct, the shareholders will be in high spirits (and the bonuses high). However, these portfolio constructs are extremely risky. If interest rates move in the opposite direction to that forecast, the bank/s will be insolvent within a short period, and depositors will lose much of their money.

3.4.3 Reality

As said above, a bank ideally would like to match liabilities and assets in terms of tenor, and have the interest rates on both sides either fixed or floating (or a matched combination), and thus enjoy a fixed margin. The reality is that the liabilities and assets of banks are not matched in terms of maturity and re-pricing frequency (i.e. fixed or floating). Banks have a variety of liabilities and assets in terms of re-pricing frequency.

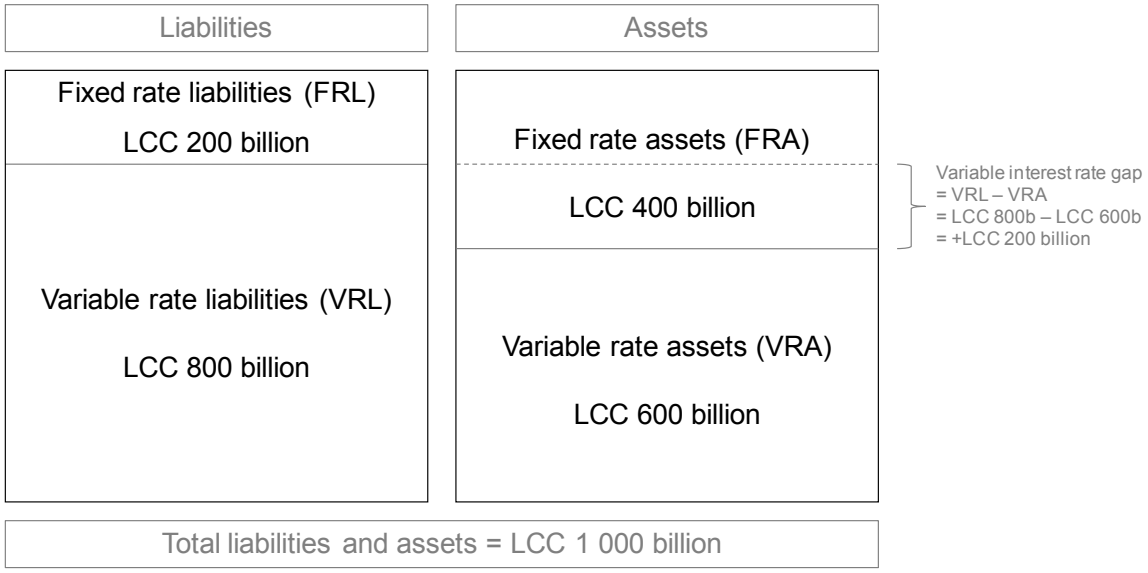

Figure 6: interest rate repricing gap analysis

An example is presented in Figure 6. The interest rate gap (IRG) is:

$$\begin{aligned} \text{IRG} &= \text{VRL} - \text{VRA} \\ &= \text{LCC 800 billion} - \text{LCC 600 billion} \\ &= \text{LCC 200 billion.} \end{aligned}$$

It will be clear that the bank's margin (which can also be called a net interest margin) is at risk. Because VRL > VRA, meaning the bank has more variable rate liabilities (also aptly called *interest-sensitive liabilities*) than variable rate assets (*interest-sensitive assets*), if interest rates in general rise, the bank has to reprice the "gap", i.e. LCC 200 million of liabilities (that does not have a counterpart asset) *at increasing rates*. Obviously, LCC 600 million of the VRL is matched by the LCC 600 million VRA, and the rates on both will move up together. It should also be clear that if rates fall, the bank would achieve financially (the NIM will increase), in that LCC 200 million of unmatched liabilities are repriced at decreasing rates.

In general:

- If banks have excess FRA, they are vulnerable to rising interest rates.
- If banks have excess FRL, they are vulnerable to falling rates.

3.4.4 Management of interest rate risk

3.4.4.1 Introduction

In essence, banks have two options in terms of managing interest rate risk:

- "Physically" change the nature of their liabilities and assets according to their risk appetite, i.e. only do the business that suits the risk profile of the bank.
- Make use of money market and other derivative instruments to change the nature of their liabilities and assets according to their risk appetite.

The first option is not an option because banks are in the business of gathering in clients and retaining their business by doing the business that the clients wish to do. In most countries the banks make use of the second option, i.e. use the derivatives markets to change the profile of their assets and liabilities. The main instruments used are:

- Interest rate swaps.
- Interest rate caps and floors (and collars).
- Forward rate agreements.
- Interest rate forwards.
- Interest rate futures and options on these futures.
- Options on spot market instruments.
- Swaptions (i.e. options on interest rate swaps).
- Repurchase agreements.

The management of interest rate risk cannot take place without the bank being able to measure the risk. There are two main *measures* of interest rate risk:

- Interest rate repricing gap analysis.
- Duration analysis.

3.4.4.2 Interest rate repricing gap analysis

Let us take the example of one bank (the bank and the currency are not disclosed, but it is a true example). This analysis shows that despite the existence of fixed and floating rates, and flexibility of tenor for clients, the bank has managed to keep interest rate risk at a low level. The majority of deposits and assets are in the *call to 3-month* time band, and the mismatch is small. The total mismatch is only 6% of total assets. Note that the bank may have also engineered (with the use of derivatives) a given portfolio to this preferred portfolio, which is in harmony with its interest rate view.

Repricing maturity period	Call – 3 months	4–6 months	7–12 months	Over 12 months	Non-rate sensitive	Total
Total assets	159 275 (= 75%)	5 664	2 476	13 103	32 256	212 774
Total liabilities and shareholders' funds	148 780 (= 70%)	6 563	3 707	7 566	46 158	212 774
Interest rate sensitivity gap	10 495 (= 5%)	(899)	(1 231)	5 537	(13 902)	-
Cumulative interest rate sensitivity gap	10 495	9 596	8 365	13 902 (= 6%)	-	-

Table 1: interest rate repricing gap analysis (LCC millions)

Banks are required to submit to the regulator (usually the central bank) a monthly return setting out information pertaining to interest rate risk. One central bank's[26] return states that its purpose is to determine:

> *"(i) the repricing gap between assets and liabilities before and after the impact of derivative instruments are taken into account; (ii) the expected cumulative impact on net interest income resulting from a two per cent increase in lending rates from existing levels with a correlated change in funding rates, before and after the impact of derivative instruments are taken into account; and (iii) the expected level of selected key interest rates."*

3.4.4.3 Duration analysis

Duration is a measure of the price elasticity of an asset or liability with respect to a change in interest rates. It is the ratio of the present value of the cash flows, weighted by dates, to the market value. Put differently, it is the weighted average maturity of future discounted flows, using the ratio of the present value of each flow to the present value of all flows for the different dates. A space constraint prevents further detailed discussion here.

3.5 Market risk

Market risk (also called *position* risk, *trading* risk and *price* risk) is the risk of a decline in the *market value* of financial securities (shares, debt and derivatives) that is caused by unexpected changes in *market prices and interest rates*, and changes in credit spreads.[27]

This definition requires elaboration:

- Market risk cannot apply to floating rate debt, which makes up the majority of banks' portfolios, because, as interest rates in general change, so do floating rates.
- Market risk can only apply to marketable securities, and these are shares, debt and derivatives.
- In the case of non-marketable assets and liabilities, as rates change there may be *opportunity costs.* For example, if a bank makes a 2-year fixed-rate loan at 10% pa and rates increase after the deal, the bank has missed an *opportunity*. We hastily add that this deal may be matched with a fixed rate liability, and there is no (interest rate) risk here.
- Marketable shares are straightforward: the market prices on the exchange are the market values.
- Fixed-interest debt is a little different: in most countries debt trades at a rate (yield, ytm, discount, etc.). The price of debt = the market value of debt, is derived from the secondary market trading rate. It should be evident that the relationship between rates and prices / market values of debt is inverse.
- Derivatives: The market risk in futures contracts is approximately the same as the underlying asset of the future. With options the extent of risks depends on whether the bank is the writer (= full market risk) or the buyer (= limited risk). These two risk possibilities apply to the other derivatives.
- Credit spread example: if the credit rating on the bonds of a corporate entity deteriorates, the spread above the benchmark rate (= government bond rate) will increase without the benchmark rate changing.
- It was mentioned above that at times banks may also have positions in commodities such as gold. The market value of such commodities = the market price.

Banks over many years have responded to narrowing margins and competition in many traditional areas of banking by increasing their trading activities, as reflected in the larger dealing rooms of banks, and the increased turnover in the various financial markets. This development has led to some banks holding larger positions in financial securities; this has increased exposure to market risk. The collapse or near-collapse of high profile banks in the US, the UK, Europe, Japan and elsewhere, due to losses on positions (particularly in derivatives) is well known.

The response of banks to these collapses and near-collapses of banks has been to sharpen risk management in this regard. This has entailed the introduction of controls and limits on dealers and the development of models to measure market risk exposure. At the same time, the regulators of the world have also sharpened their pencils and improved the regulation and supervision of banks' exposure to market risk.

Most bank regulators require banks to submit elaborate returns in respect of market risk on a monthly basis. One central bank[28] elaborates on the purpose:

> *"The purpose of this return is to measure the extent of market risk (position risk) to which the reporting bank is exposed in respect of both its trading and banking activities."*

Banks generally use the statistical Value at Risk (VaR) approach to market risk. One bank's[29] approach is described as follows:

"Independent market risk management units, accountable to their ALCO, monitor exposures to market risk from trading operations. The units report the exposures and respective excesses monthly to each ALCO concerned and quarterly to the Board Risk Management Committee…

"The group manages market risk through risk limits. The group uses a range of risk measurement methodologies and tools to establish limits, including VaR, stress testing, loss triggers and traditional risk management measures.

"The group uses the VaR approach to derive quantitative measures, specifically for market risk under normal market conditions. While VaR, calculated on a daily basis, provides an indication of possible losses under normal market conditions, the group simulates extreme market movements using stress tests. The stress testing takes into account illiquidity, breakdowns in correlation and event risks which characterise the markets in which the group trades. Loss triggers are designed to contain daily, monthly and year-to-date losses for individual business units by enforcing management intervention at pre-determined loss levels. Several traditional measures specific to individual business units are used and deal with, for example, permissible instruments, concentration of exposures, gap limits and maximum tenor."

3.6 Liquidity risk

3.6.1 Definition

Liquidity risk for a bank is the risk of not being able to meet obligations in terms of funds demanded by clients. This applies to both sides of the balance sheet of banks, i.e. to withdrawals of deposits and to loans drawn down by borrowing clients in terms of loan commitments made by the banks.

Banks are in the financial intermediation business and essentially transmute mostly short-term, i.e. liquid, deposits, into loans and advances and investments, which are for the most part non-liquid and have a longer tenor. No bank can therefore repay all deposits immediately. Banks rely on the law of large numbers, which holds that only a certain proportion of depositors will demand their funds at the same time, and determines its liquid asset holdings (its securities that are quickly reversible into funds) accordingly.

3.6.2 Balance sheet changes resulting from deposit withdrawals and drawdowns on loan facilities

It will be apparent that when deposits are withdrawn, this creates a need for the bank to acquire deposits from other sources, or to undertake the sale of an asset. Similarly, if loan facilities are drawn down in terms of loan commitments provided to clients, this creates an asset, which can only come about if the bank acquires deposits (or loans) or sells assets to the required amount. These scenarios may be depicted as in Balance Sheets 1–4.

Public withdraws deposits (bank funds with other deposits):

BALANCE SHEET 1: BANKS (ZAR MILLIONS)			
Assets		**Equity and liabilities**	
		Deposits from A Deposits from B	-100 +100
Total	**0**	**Total**	**0**

Public withdraws deposits (bank funds by selling securities):

BALANCE SHEET 2: BANKS (ZAR MILLIONS)			
Assets		**Equity and liabilities**	
Securities	-100	Deposits	-100
Total	**-100**	**Total**	**-100**

Public draws down loan facilities (bank funds with new deposits):

BALANCE SHEET 3: BANKS (ZAR MILLIONS)			
Assets		**Equity and liabilities**	
Loans	+100	Deposits	+100
Total	**+100**	**Total**	**+100**

Public draws down loan facilities (bank funds by selling securities):

BALANCE SHEET 4: BANKS (ZAR MILLIONS)			
Assets		**Equity and liabilities**	
Loans Securities	+100 -100		
Total	**0**	**Total**	**0**

3.6.3 Conditions for creation of liquidity

3.6.3.1 Introduction

It will be apparent that the bank, *only under certain conditions*, can bring about the above balance sheet changes, and these are of crucial importance to the bank and to the banking system in general. The conditions are:

- Firstly, the bank must have an impeccable record, which engenders faith in the bank by the public.
- Secondly, it must have sufficient liquid assets in order to reduce assets to raise funds.
- Thirdly, the secondary financial markets must be such that it is easy to dispose of assets (securities), i.e. the markets must be efficient.

3.6.3.2 Impeccable record

The first condition is clear. A bank of good standing in the market will easily be able to raise deposits or loans in the market. It is notable that a deposit lost or a loan facility drawn down will result in the relevant bank losing funds, *but the funds are not lost to the banking system,* i.e. some other bank/s will gain the funds in the form of a deposit. The recipient bank will most likely lend these funds to the deficit bank in the interbank market (see Balance Sheets 5–6). But, this will only take place if the deficit bank is of good standing.

Public withdraws deposits from Bank A (Bank A funds by interbank loan):

BALANCE SHEET 5: BANK A (ZAR MILLIONS)			
Assets		**Equity and liabilities**	
		Public deposits Interbank loan (Bank B)	-100 +100
Total	**0**	**Total**	**0**

Public deposits funds with Bank B (bank makes interbank loan to Bank A):

BALANCE SHEET 6: BANK B (ZAR MILLIONS)			
Assets		**Equity and liabilities**	
Interbank loan (Bank A)	+100	Public deposits	+100
Total	**+100**	**Total**	**+100**

3.6.3.3 Volume of and the type of liquid assets

The second condition refers to the volume of and the type of liquid assets. Banks may have a proportion of their liquid assets in the form of interbank loans. In this case the interbank loans are simply drawn down to fund the public deposit lost. The bank that loses the interbank loan will receive the public deposit lost to the first bank (either directly or through the interbank market – we assume the former). This is depicted In Balance Sheets 7–8).

Public withdraws deposits from Bank A (Bank A funds by withdrawing interbank loan with Bank B):

BALANCE SHEET 7: BANK A (ZAR MILLIONS)			
Assets		**Equity and liabilities**	
Interbank loan	-100	Public deposits	-100
Total	**-100**	**Total**	**-100**

Bank B loses interbank loan (Bank B funds by taking in deposit from public):

BALANCE SHEET 8: BANK B (ZAR MILLIONS)			
Assets		**Equity and liabilities**	
		Interbank loan Public deposits	-100 +100
Total	**0**	**Total**	**0**

However, this is not always the case. Not all banks are willing to lend to all other banks. Also, the private banking *system* may lose funds to the central bank (because of its operations in the market). In this case the bank is obliged to sell securities (assets). The only securities that a bank is able to sell are *liquid asset securities,* such as:

- Treasury bills.
- Commercial paper.
- Negotiable certificates of deposit (NCDs).
- Central bank bills.
- Government bonds.

It will be apparent that the bank must have sufficient of these liquid assets to meet the potential demand for funds. These securities may be disposed of in one or more of three ways:

- Sell securities outright in the secondary market.
- Sell securities under repurchase agreement for the period for which funds will most likely be short.
- Acquire accommodation from the central bank (this only applies if the central bank has made the market short of liquidity).

It is important to point out the difference between *de facto* and *de jure* liquid assets. The *de jure* list is the list of securities that may be used by banks:

- To comply with the statutory liquid asset requirement.
- For accommodation from the central bank (overnight loans against collateral or repos).

The list of *de jure* liquid assets in most countries is:

- Treasury bills.
- Central bank bills.
- Government bonds.

The *de facto* list is the above plus NCDs and commercial paper.

One of the prudential requirements (discussed later) of most countries is a *statutory liquid asset requirement* (LAR). The LAR differs from country to country and is usually in the range 5% – 10% of liabilities to the public. Although this seems low, it must be kept in mind that a number of other *de jure* non-liquid securities have sufficiently active secondary markets, in order for them to be sold at short notice. The markets for NCDs and CP are good examples.

3.6.3.4 Active secondary financial markets

A statutory LAR and voluntary liquid asset holdings will be of no use to a bank in terms of the availability of liquidity, unless there is a market in which they may be sold. It is also important that the markets are of sufficient depth and breadth (efficient) so that a large volume sale will not adversely affect security prices.

3.6.4 Measures of a bank's liquidity exposure

As discussed, a bank's liquidity risk is a function of the potential withdrawal of deposits and the potential utilisation of loan demands under commitments granted, and the need to meet these demands from the sale of securities or the taking in of new deposits / loans. Thus, a bank must at all times be in a position to measure its liquidity situation. There are a number of tools that banks utilise in this regard[30]:

- Net liquidity statement.
- Peer group comparisons.
- Liquidity index.
- Financing gap and the financing requirement.
- Liquidity planning.

The details of these measures will not be discussed here.

Banks are required by regulators submit a return/s on a monthly basis. A central bank[31] expounds on the prupose:

> *"(2) The purpose of the return is to determine: (a) The contractual mismatch between assets and liabilities at the reporting date. (b) The anticipated cash flow requirement from money market sources, as calculated in terms of the ALCO model, for the six months following the reporting month. (c) The extent and anticipated maturity of selected items included in the mismatches reported in terms of…2(a) and 2(b) above."*

3.6.5 Bank liquidity and a "bank run"

A bank run is a banker's nightmare, and it is the ultimate manifestation of liquidity risk. It is not a mythical phenomenon; bank runs have happened in history on many occasions, and not many countries have escaped the experience.

Normally, banks' portfolios are structured to deal with customary withdrawals of deposits and utilisation of loan commitments, and they plan ahead in order to cope with abnormal seasonal disturbances such as the huge demand for bank notes over the holiday seasons (particularly December/January in the southern hemisphere July/August in the northern hemisphere).

Large non-seasonal withdrawals of deposits can occur for a number of reasons:

- A sharp fall in a bank's profits, triggering concerns about the solvency of the bank.
- Loss of faith in the banking system in general.
- Rumours about the solvency of a bank.
- During the Great Depression (1929–1933) a mere queue outside a bank could have started a bank panic, and a run on the bank.

Some commentators add reasons such as marked changes in investor preferences, for example a positive shift in demands for treasury bills, away from bank deposits. We do not see this as a major reason, because the treasury bill will most likely be sourced from the banks themselves. It will be apparent that this amounts simply to bank disintermediation.

At the centre of the bank run are *demand deposits* and *liquid assets*. If the ratio of liquid assets to demand deposits is low, a bank run can be difficult. But the most important condition here is the standing of the bank. As we have said, a bank deposit lost is a bank deposit gained by another bank, and normally it flows back to the deficit bank in the interbank market. This is the norm when banks are of good standing and reputation. If this is not the case, interbank funds are not forthcoming.

This is where the central bank enters the picture.

3.6.6 The central bank and the bank run

As said, in the event of a bank run on a bank with a poor reputation, no other banks will provide the beleaguered bank with interbank loans. The bank will have no option but to approach the central bank for assistance (in its function as the *lender of last resort*).

The central bank will have a dilemma: does it assist the bank with loans in order for the bank to meet the demand for funds or does it allow the bank to fail? Usually, the central bank will base its decision on whether the failure of the bank will lead to a contagion effect, i.e. that the banking system will be in jeopardy (systemic failure, the nightmare of a central banker).

Central banks in most countries have allowed a number of smaller banks to fail, and, in some cases, a larger bank – but only when it does not fear systemic failure. In cases where it does, or when the relevant bank is solvent, but has a short term problem based on an unfounded bad rumour, it will support the bank.

3.6.7 Deposit insurance

Deposit insurance, i.e. insurance in terms of which depositors are protected against the failure of a bank, is an effective method to prevent bank runs. There is no reason for a client to panic and demand his/her funds when a rumour arises about the solvability of a bank.

Deposit insurance is controversial. The prime line of reasoning from the detractors is that deposit insurance is more of a *cause* of bank failures than the *solution*. The logic presented is that deposit insurance may encourage bankers to engage in more risky ventures.

3.7. Credit risk

3.7.1 Definition

Credit risk is also known as *default risk*, and it is the risk-type to which the average bank is principally exposed, as a result of the make-up of its asset portfolio. As seen earlier, banks' loans (NMD and MD) typically comprise the largest proportion of their assets.

Credit risk is the risk that the borrower from a bank will default on the loan and/or the interest payable, i.e. that it will not perform in terms of the conditions under which the loan was granted. This is damaging to the bank, not only because of the actual loss eventually incurred, but also in terms of the time that management and bank counsel expend on attempting to recover the loss or a portion of the loss.

3.7.2 Asymmetric information, adverse selection and moral hazard

Lenders have *asymmetric information*, and this leads to the problem of *adverse selection*, which rears its ugly head before the loan is granted, and to *moral hazard*, which occurs after the loan is granted.

Asymmetric information means that the lender does not have information that is symmetric with that of the borrower, i.e. there is (or could be) a discrepancy between the information provided by the borrowing company (or person) and the actual state of affairs (financial and otherwise) of the company (or person). This means that the lenders are at a major disadvantage in terms of information about the borrower and, coupled with the fact that bad credit risks are more inclined to borrow than are good credit risks, the lenders are more likely to select borrowers with dubious projects (i.e. projects that have an adverse outcome) than borrowers with projects that will succeed.

Moral hazard means that after a loan is granted, there is a high probability that the borrower may engage in activities that do reflect the information gathered by the lender in connection with the borrower and his/her planned projects. There are countless examples where borrowers borrow with good intentions, but when the access to funds becomes a reality, they take on higher risk projects.

As banks are in the business of making loans, they are aware of the hazards, and have (in most cases) become authorities on solving the problems of asymmetrical information and its acolytes, adverse selection and moral hazard. Banks seek to mitigate the high probability of these through the introduction of appropriate credit risk management tools

3.7.3 Management of credit risk[32]

3.7.3.1 Introduction

Methods used by banks to mitigate credit risk include:

- Avoidance.
- Diversification.
- Compensating balances and monitoring of business transactions
- Screening.
- Monitoring.
- Long-term customer relationships.
- Loan commitments.
- Collateral requirement.
- Credit rationing.
- Specialisation in lending.
- Credit derivatives.

3.7.3.2 Avoidance

The obvious approach to alleviating credit risk is *to avoid it*. This can be achieved by only providing loans to, or buying the bonds of, government, the best credit. Because government securities are credit risk-free, the return enjoyed on such investments is of course the lowest available. Because the return on government securities is the risk-free rate (rfr), all other investments should yield rfr + rp (rp = risk premium). Note that while government bonds may be credit risk-free, they do carry market risk. It is also notable that there are some banks that are permitted to only invest in government securities (discussed later).

3.7.3.3 Diversification

Diversification is the first principle of risk management as applied in portfolio theory. Banks typically do not lend a major proportion of their funds to individual borrowers. Rather, they restrict the amount loaned to a percentage of their capital. They are also diversified across economic sectors and countries. In most countries the bank regulator / supervisor stipulates a strict constraint in terms of loan concentration.

Banks also encourage diversification of borrowing by the borrower. The syndicated loan is an example.

3.7.3.4 Compensating balances and monitoring of business transactions

Often, loans are granted with the commitment by the borrower of maintaining a balance with the bank. This increases the likelihood that the loan will be repaid. The commitment may also take the form of a current account with an undertaking that all transactions by the borrower in the business for which the loan was granted are conducted through the current account. This enables the bank to monitor the business of the borrower.

3.7.3.5 Screening

The obvious tool to mitigate credit risk (i.e. to overcome the adverse selection problem) is the careful screening of potential borrowers. This involves information gathering. Much personal information is gathered in from individuals who wish to borrow, and there are grades of information gathering. In the case of a small sum for the purchase of say a washing machine, the information required is far less than that required for the mortgage loan. In the latter case, the information required would include:

- Work history and record.
- Salary and salary history.
- Other bank accounts.
- Other debt.
- Credit card payment history.
- Statement of liabilities and assets.

In addition to such information the lender may require references, which in many cases are followed up on, and some lenders (particularly the banks) put in place local boards of "directors" comprised of persons well known and connected in their relevant areas in order to provide information on the borrowers of the area. The information gathered enables the lender to statistically calculate a score for each borrower. It should be apparent that in many cases the score is borderline in terms of credit risk, and the lender uses a measure of discretion, rather than send the client off to a competitor.

Information gathering in the case of loans to companies is similar except that much emphasis is placed on past financial statements and a business plan for the future, including of course the purpose for which the loan is required.

3.7.3.6 Monitoring

Monitoring is also an information gathering exercise, but after the event of granting of the loan, and this links with the problem of moral hazard. A client may be suitably screened and ultimately selected as a client, but may engage in nefarious activities once the money is in his/her hands. To reduce the risk of this coming about, many lenders include restrictive covenants (provisions) in their loan contracts, and monitor adherence or not to these on a regular basis.

3.7.3.7 Long-term relationship building

Lenders encourage long-term relationship building between loan officers of the institution and their clients. This practice reduces the cost of information gathering because records already exist and monitoring procedures are already in place. The borrower also has an incentive for encouraging a long-term relationship with the lender, and this is because a good credit record not only reduces the risk for the lender but also the borrowing rate for the borrower.

3.7.3.8 Loan commitments

The credit risk mitigating tool *loan commitment* is related to the former. Many lending intermediaries provide borrowers with a commitment of a loan up to a specified amount that can be utilised at any time. This provides the borrower with flexibility in loan utilisation, and encourages a long-term relationship with the lender, which in turn reduces the information gathering cost. The loan interest rate reflects the long-term relationship.

3.7.3.9 Collateral requirement

Collateral means the ceding of assets (usually property, equipment financed, the debtors book, deposit, policy – at appropriate discounted values) as security for the loan. This is a legal commitment to surrender the underlying assets to the lender in the event of default, which the lender is able to sell in order to recover the amount of the loan.

Collateral is the most common method of "insurance" against credit risk, and reduces the problems of adverse selection and moral hazard. A dubious borrower will be reluctant to borrow if collateral is required because s/he has much to lose in the event of default.

3.7.3.10 Credit rationing

Credit rationing takes on two forms: *outright rejection* and *providing less credit that sought*. *Outright rejection* refers to loans where the borrower is willing to pay a higher interest rate to compensate the lender for the risk, but the bank rejects the application because the higher interest rate will contribute toward the failure of the project.

Providing credit less that sought is often a tactic of the lender to thwart moral hazard. A loan that is smaller than sought will tend to ensure that the funds are efficiently allocated, whereas a loan of the desired size may bring about a case of moral hazard.

3.7.3.11 Specialisation in lending

Some lenders practise specialisation in lending; this may refer to geographic area of industry. In the former case the lenders rely on personal relationships to ensure prompt and full repayment of interest and principal: for example, Grameen Bank in Bangladesh, relies on peer pressure in the community for repayment (as a matter of interest in the case of Grameen Bank, the repayment rate is 98%, higher than any other financial intermediary.)

Certain other lenders specialise in making loans to specific industries. For example, a bank may specialise in leasing contracts with the medical fraternity. The line of reasoning here is that information costs are reduced because the lending institution is concerned with gathering information about only one industry (and its related industries). The counter-argument is that a downturn in the particular industry (which is inevitable because it occurs to all industries at some stage) may place the bank at risk. This brings one back to the first tool, diversification, which is a major risk mitigation factor.

3.7.3.12 Credit derivatives

The use of credit derivatives consists of the purchase and sale of credit risk (or credit protection) across sectors and countries. Credit derivatives are bi-lateral financial contracts with payoffs attached to a credit related event such as a default, bankruptcy or credit downgrade. Generally, the largest banks are net buyers of credit protection.

3.7.4 Sovereign credit risk

Sovereign risk, also called *country risk*, straddles credit risk and currency risk (see below); it may be defined as the risk that a foreign government may proclaim the suspension of repayment of loans or investments made in that country.

There are a number of examples of such suspensions. In 1982, for example, the governments of Mexico and Brazil announced a moratorium on the debt of foreign investors, i.e. the domestic debt owned by foreign investors. The debt was frozen and repaid over a long period when the foreign exchange was available. Under sanctions, South Africa declared a debt standstill in 1985, and took more than 10 years to repay the debt.

Other countries that have declared debt moratoriums are a number of African countries, Thailand, South Korea, Malaysia, Indonesia, and Russia. Argentina rescheduled its debt in 2001.

3.7.5 Banking statute returns in respect of credit risk

Because credit risk is so pervasive the banking regulator / supervisor requires a number of monthly returns. The main return required usually stares its purpose as follows[33]:

> *"…to determine…(a) the* classification of all direct and indirect extensions of credit, including, but *not limited to, loans and advances, accounts receivable, property acquired by the bank in satisfaction of debt previously contracted, investments, equity participation and credit substitutes, such as general guarantees of indebtedness and standby letters of credit serving as financial guarantees; (b) the* adequacy of overall provisions *to absorb estimated credit losses; (c) asset* quality; *(d) distribution of assets based on* profitability; *(e) distribution of discounts, loans and advances in accordance with the directives contained in, and based on the* ***sectors*** *identified in, the Standard Industrial Classification of all Economic Activities; (f) distribution of discounts, loans and advances in accordance with selected* geographical *sectors."*
>
> Other returns usually require information on:
>
> - Large exposures in relation to capital.
> - Loans not disposed of within a given period.
> - Funding of specific sectors.

3.8 Currency risk

Currency risk is also called *foreign exchange risk* (forex risk). Certain financial intermediaries' asset portfolios are made up of domestic and foreign securities. In the case of the latter the portfolio will usually include foreign bank deposits and securities such as treasury bills of the US and UK (or other) governments. In addition to their foreign portfolios, banks also play a major role in the spot, forward and derivative foreign exchange markets. Internationally, banks also have liabilities in foreign currencies.

Most large banks are exposed to currency risk, which may be defined as the risk of changes in currency values unfavourably affecting the values of assets and liabilities that are denominated in currencies other than the domestic currency. Because certain financial intermediaries, particularly the banks, are highly leveraged, their exposure to currency risk can be devastating on their profitability and to their capital position.

Currency management is the management of the exposure to levels that are acceptable. Exposure can be managed by various means, and the main instruments that are used are derivative instruments:

- Currency swaps.
- Forwards.

The first step in managing currency exposure is to measure it.[34] The net currency (C) exposure in any given currency, A, is calculated according to:

$$\text{Net exposure}_A = (\text{C assets}_A - \text{C liabilities}_A) + (\text{C bought}_A - \text{C sold}_A).$$

Table 2 will elucidate (home currency = USD):

	GBP	JPY	CHF
Assets (thousands)	10 000	30 000	4 000
Liabilities	15 000	20 000	10 000
C bought	65 000	100 000	50 000
C sold	50 000	125 000	55 000
Net position	+10 000	-15 000	-11 000

Table 2: net currency exposure report

$$\begin{aligned}\text{Net exposure}_{GBP} &= (10\,000 - 15\,000) + (65\,000 - 50\,000)\\ &= (-5\,000) + (15\,000)\\ &= 10\,000\end{aligned}$$

$$\begin{aligned}\text{Net exposure}_{JPY} &= (30\,000 - 20\,000) + (100\,000 - 125\,000)\\ &= (10\,000) + (-25\,000)\\ &= -15\,000\end{aligned}$$

$$\begin{aligned}\text{Net exposure}_{CHF} &= (4\,000 - 10\,000) + (50\,000 - 55\,000)\\ &= (-6\,000) + (-5\,000)\\ &= -11\,000\end{aligned}$$

This means that the US bank is "long" of GBP, and "short" in both JPY and CHF. Thus, if the GBP appreciates (remember home currency = USD), and/or the JPY and the CHF depreciates, the intermediary will make a profit (on this part of the portfolio). However, if they do the opposite, the bank will make a loss (on this part of the portfolio).

With the above currency exposure report the financial intermediary is in the picture and is able to manage the exposure. It may, for example, do currency swaps or forward deals that coincide with the terms of the exposure: sell GBP forward for USD and buy JPY and CHF forward for USD.

While these transactions will cancel out the exposure (approximately depending on terms negotiated, maturities, etc), it should be clear that if the USD generally *appreciates* (i.e. appreciates against the main currencies of the world), the financial intermediary would be hurt by the *depreciating* GBP (remember it is long GBP), but would gain by the extent of the *depreciating* JPY and CHF (remember it is short JPY and CHF). Thus, there is an offsetting effect, meaning that the *net exposure* is not so large. In practice, most banks take on some currency exposure, and manage it according to their views of future currency movements.

Bank regulators[35] require monthly returns in respect of currency exposure. The purpose:

> *"…is to determine…(a) the month-end effective net open foreign-currency position in selected currencies and in all currencies taken together in respect of the reporting bank and its foreign branches and foreign subsidiaries; and (b) the maturity ladder of foreign assets, liabilities and commitments."*

3.9 Counterparty risk

Each party to a deal has a party on the other side of the deal. Thus, each party is the counterparty to the other party, and each party is exposed to the other in that the other party may renege on the deal or be a fraudulent party to the deal (i.e. may not perform in terms of the conditions of the deal). If a party fails to settle a deal the counterparty will do another deal which may not be as favourable (and may result is a loss) as the unsettled deal. This risk is termed counterparty or settlement risk.

There are many different types of deals, each involving a different risk profile. A few examples of hazards with deals follow:

- A seller to a bank may deliver tainted scrip to the bank.
- A buyer from a bank may present a cheque to the broker drawn on an account that is not funded.
- The buyer or seller may decide not to settle because prices may have changed between deal date and settlement date.
- A broker may take an excessive commission or 'turn' (i.e. margin between buying and selling rate or price).

Management of counterparty risk includes:

- As the risk lies with large dealers in the financial markets, banks ensure that transactions are conducted only with known reputable parties and with guaranteed payments.
- Dealing, where applicable, with financial exchanges which are regulated and supervised. The exchanges in turn supervise broker-dealer members.
- Banks have been at the forefront of the formation of a central securities depository (CSD), which brings about scrip dematerialisation / immobilisation. This eliminates the hazard of tainted scrip, and ensures payment against electronic delivery.
- Many countries have a specialised large-transactions payments system (operated by the central bank) that functions on RTGS (real-time gross settlement). This applies to the large deals of the financial markets.

Bank regulators[36] require monthly returns in respect of currency exposure. The purpose is:

> *"…to measure the counterparty risk for all unsettled transactions, including forward rate agreements, interest-rate swaps, derivatives, etc, relating to a bank's banking and trading activities when non-performance by a counterparty could cause a financial loss to the reporting bank."*

3.10 Operational risk

3.10.1 Introduction

Each bank has its unique definition of operational risk. We reviewed a number of them and, founded on some banking experience, present the following elements of operational risk:

- Information technology systems risk.
- Human resources risk.
- Reputation risk.
- Compliance risk.
- Legal and documentation risk.
- External risk.

3.10.2 Information technology systems risk

Banks rely on information systems technology for the smooth functioning of business. The business of the mainstream banks is complex because they operate through a branch system over a large geographic area, have numerous clients and products on both the liability and asset segments of their balance sheets, and have to cope with complex accounting systems and to comply with stringent regulatory issues requiring myriad multifaceted returns.

Given this, *information technology systems risk* may be defined as a breakdown in the information systems' hardware and/or software that renders the retrieval of information unworkable or difficult or delays the retrieval of information, all of which can cause the cessation or delay of business. This definition can be expanded to include the delays caused by the implementation of new hardware or software or, at a lower level, the incorrect encoding of cheques.

The mitigation of *information technology systems risk* involves many elements ranging from organisational structure, delegation of responsibility, etc., to the use of external information technology to back up information and systems, suitably trained managers, the use of reliable vendors, etc.

The most important mitigation element of information technology systems risk is the *disaster recovery system* (DRS). An effectual DRS, which ensures that business can continue outside of the bank's main building, incorporates a back-up site in another part of the, or another, city, where the essential infrastructure is available. The site will provide the same front, middle and back office systems as exist in the main building, and therefore ensure that operations can be conducted.

3.10.3 Human resources risk

Humans manage the business of banking. Human resources risk (HRR) is the risk of insufficiency and/or inadequacy of human capital resources. *Insufficiency* refers to not having sufficient human capital to run the business, and *inadequacy* refers to misdeeds of staff.

The most imperative feature of HRR is the *principal-agent problem*, and it applies at top management level. The mangers (*agents*) of businesses usually own just a fraction of the business. In most cases, the business is owned by the shareholders (*principals*) who are usually not employed by the business. This separation of control and ownership can lead to *moral hazard*, i.e. the agents may not always act in the best interest of the principals.

The management of human resources risk includes:

- Adequate training.
- Ongoing further education / skills improvement.
- Have in place the overlapping of skills to allow for sickness / maternity leave / annual leave / death (i.e. the uninterrupted availability of the key skills).
- Succession identification and training.
- A motivating reward system.
- A policy of disallowing key personnel being exposed to risk to life together (e.g. not flying on the same flight).
- Introduction of checks and balances in key functions.
- Reconciliation and segregation of duties (e.g. capturing, verifying and authorising).
- A code of ethics that covers: business ethics, gifts and favours, confidentiality, etc.
- Auditors (internal and external) should monitor HR issues / processes.

3.10.4 Reputation risk

Reputation risk (or *reputational risk*) (RR) is the risk of negatively affecting the company's / group's image, which could prejudice its ability to retain and generate business. It will be evident that RR is closely related to HRR.

RR is a risk faced by all companies, but is particularly crucial in the case of banks. Continuation of business depends on reputation, and any damage to reputation can exacerbate liquidity risk. Bank runs have been caused by damage to reputation.

Management of RR amounts to:

- Ensuring that HRR management is sound.
- Having a vigorous internal communications policy. RR issues are usually generated internally (and affect the motivation of staff), and spread externally. Internally a robust whistle-blower-confidentiality policy should be in place.
- Having a vigorous external communications policy. If a negative reputational issue is externalised, predetermined communication channels should be in place so that the damage can be minimised. Predetermined communication channels are also used to maximise the outcome on reputation of good information.

3.10.5 Compliance risk

Compliance risk (CR) is the risk of non-compliance with:

- Statutory requirements of the various levels of government
- Regulatory requirements of regulators, in this case the banking regulator.
- Regulatory requirements of other regulators that may be applicable (because the central bank usually regulates banks only).
- Regulatory requirements of the financial exchange/s.
- Other generally accepted codes, such as the corporate governance codes.

Non-compliance may lead to the withdrawal of licenses to do business, and to the incurring of penalties. This has severe RR fallout.

Management of CR amounts to:

- Having in place a comprehensive compliance-reporting framework.
- Ensuring that CR reporting is part of the internal and external audit processes.
- Ensuring that CR reporting is on the agenda of the Audit Committee of the board of directors.

3.10.6 Legal and documentation risk

Legal and documentation risk is the risk of some unanticipated legal or documental hindrance that renders transactions incomplete or non-binding.

The management of legal and documentation risk involves the consulting of expert legal advisers, consulting with the revenue and other authorities when appropriate, and the avoidance of transactions where there remains doubt about the legality of the transaction.

3.10.7 External risk

External risk is the risk that parties other than the bank itself (and its employees) undertake activities, or fail to deliver essential outsourced services, that harm the bank in a financial or other sense, and natural disasters that affect the services or viability of the business. Examples are:

- A fire at the only chequebook printer in the country which puts it out of business for a long period.
- A devastating fire at the company that has backed-up the electronic files of a bank whose systems have failed.
- A power-delivery blackout for three days.
- An earthquake that substantially damages the premises of the head office.
- Bank robberies.

Managing external risk involves identifying the potential external risks, and managing them accordingly. For example, the possibility of an earthquake is managed by having all the required back-up systems in another city. Robberies are managed by implementing appropriate security measures. A possible electrical blackout for three days is managed by installing back-up generators.

In conclusion, it needs to be mentioned that some scholars include *solvency risk* in the list of risks. It is the risk of the bank being declared insolvent, a profound condition where the capital and reserves of the bank are at or near to zero, or negative, and this is an acute outcome of the reckless management of the bank in terms of risk-taking. In our view it is not a separate risk, but the outcome of mismanagement of one or more of the other risks.

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