Accounting for financial instruments in corporate treasuries

by

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Summary

The purpose of this thesis is to demonstrate the need for enhanced accounting methodology for financial instruments which are traded in the global financial markets. The thesis proposes an accounting framework within which the value-at-risk of financial instruments can be disclosed in the financial statements of enterprises.

The thesis considers accounting developments in recent years and analyses the latest proposals suggested by international accounting bodies. It furthermore contemplates the requirements of the Bank for International Settlements in terms of capital adequacy and value-at-risk requirements.

In order to provide a meaningful analysis of the subject matter of financial instruments, the various market risks pertaining to the accounting of financial instruments are discussed and considered in terms of their application to the underlying business of the enterprise.

Extensive analysis is done of valuation techniques and the mathematical concepts of value-at-risk. In this regard the pioneering works of professor Philippe Jorion of the University of California is used to illustrate the application of value-at-risk. The objective of this comprehensive analysis of value-at-risk is to suggest a meaningful method to account for risk exposures in financial instruments and ensure greater transparency in terms of disclosure. In this regard the thesis follows the guidelines proposed by the International Accounting Standards Committee in terms of recognition (definitions), measurement (valuation), presentation (classification) and disclosure (terms, conditions and accounting policies) of financial instruments.

Consideration is also given to global accounting harmonisation and a number of accounting concerns which are presently unresolved. In this regard certain hedge issues as well as the differences between accrual accounting and fair value accounting are considered. Disclosure requirements are analysed in detail, especially in respect of value-at-risk accounting.

Finally, the thesis illustrates the significant growth of products and instruments in the financial markets and the severe financial impact it has in terms of global capital and global financial losses.

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Chapter 1

Introduction

1.1 Importance of the theme

The rationale for this thesis was driven by the need to find a better understanding of the vast and complex environment of financial instruments in order to express a more calculated accounting opinion. This has resulted in a careful study of those variables that influence both financial instruments as well as accounting guidelines. The thesis is an attempt to align the responsibility of fair representation of financial information to the fast moving industry of financial instrument trading and development.

To date much has been written about the dire consequences of inappropriate accounting of financial risks resulting from investments in financial instruments. It is therefore apt to consider briefly some practical instances where ignorance to proper accounting measures and risk management has resulted in significant and often disastrous financial losses to many well-known global enterprises. Not only have such financial disasters caused economic losses to the stakeholders of the enterprises, but has it raised the question whether those authorities charged with the responsibility to control the markets or to report on the financial quality of the activities of those enterprises had been fully aware of the complexities of the risks to which those enterprises were exposed.

Table 1.1 illustrates the extent of the losses incurred by eminent companies since 1995. The list merely portrays the major cases and does not represent an exhaustive record (Jorion 1997:25).

Table 1.1: Enterprise losses resulting from derivatives trading

Corporation	Instrument	Loss (USD millions)
Showa Shell Sekiyu, Japan	Currency forwards	1,580
Kashima Oil, Japan	Currency forwards	1,450
Metallgesellschaft, Germany	Oil futures	1,340
Barings, U.K.	Stock index futures	1,330
Codelco, Chile	Copper futures	200
Procter & Gamble, U.S.A.	Differential swaps	157

It is important to note that losses are not only incurred through speculative trades or where exposures are left unattended, but has in many instances resulted from hedge activities where improper hedges were applied to underlying exposures. This was specifically the case with a subsidiary of the South African chemicals company, Sentrachem, where excess forward exchange cover was taken on export receivables prior to a significant strengthening of the local currency against the US dollar. The company has subsequently been re-rated and was eventually sold to Dow Chemicals of the USA. It is unfair to ascribe the resultant exchange loss to the subsequent transaction, but it is certain that these events significantly influenced the decisions of the company's stakeholders.

From an international perspective it is clear that many differing opinions are held in respect of the accounting treatment of financial instruments. It is therefore increasingly important to move towards a harmonised approach that will create the optimum level of transparency from an accounting perspective without being too complex in the detail. The need therefore arises to ensure that those individuals charged with the financial responsibility of the enterprise be sufficiently informed and well capable of accounting for those instruments or markets to which the enterprise may be financially exposed.

1.2 Purpose of this thesis

The purpose of this thesis is threefold; firstly, to create a greater awareness of the significant impact that financial markets can have on the results of enterprises; secondly, to analyse and define those variables that constitute the financial markets, and finally, to suggest alternatives that will lead to more innovative accounting of the financial instruments to which the enterprise is exposed.

Enterprises are often unaware of the risks to which they are exposed. These risks not only relate to markets and instruments to which the enterprise has direct exposure, such as money market investments or maize prices, but extend beyond the obvious to include those risks to which the enterprise may only remotely be linked. Such indirect risks could often have meaningful cost impacts on the enterprise. It is therefore necessary to consider market risks and how best to account for such risks.

The thesis further endeavours to offer an overview of all financial variables that could influence the accounting of financial instruments. In this regard specific consideration is given to the regulatory environment within which financial markets operate and furthermore an analysis is given of the most common valuation techniques that apply to financial instruments.

Finally, the thesis has as objective to consider existing accounting requirements and to suggest certain alternatives that will result in more meaningful reporting to stakeholders of the financial performance of the enterprise. It is emphasised that these alternatives are proposed at a time when regulatory authorities and accounting bodies are in disagreement as to the most appropriate accounting treatment of financial instruments.

This thesis does not necessarily support any school of thought or any specific line of argument, but considers a best practice alternative in the form of a value-at-risk statement, which enables the enterprise to account for its exposure to financial instruments in a meaningful and transparent manner. The value-at-risk statement significantly enhances the level of accounting for financial instruments and sets a framework, which disciplines the enterprise to consider its economic exposure to financial instruments and the resultant monetary impact of adverse price movements. It is accepted that both the accounting profession as well as the financial markets to which this thesis relates are extremely dynamic environments which will move towards new and differing levels of interaction as these markets evolve.

1.3 Scope and limitations of the thesis

The thesis has as its main focus the impact of financial markets on accounting issues. It is therefore strongly weighted towards the accounting treatment of financial variables and how these would impact the enterprise, and less concerned with risk management and mathematical analysis.

From a risk management perspective, the thesis only reflects those risks that will have an accounting impact on the enterprise with respect to financial instruments. It is therefore not a comprehensive study of risk, nor a guide for management of risk. The latter two issues relate more to pure treasury risk management and less to accounting for treasury activities.

In order to analyse certain accounting variables it is necessary to consider various mathematical concepts. In this regard many concepts are analysed and described in certain of the chapters, but it is not the objective to give a comprehensive analysis of the

mathematical framework from which the prices and values of financial instruments are derived. The mathematical concepts are therefore explained from an application perspective and not from an analytical perspective.

The thesis has as a further objective the analysis of the financial markets for purposes of corporate treasuries. It is more inclined to be generalist than specific, as is the case with the treasury operations of financial institutions. Although the principles apply across the spectrum of operations it is more focused towards the corporate environment. In this regard accounting statements that deal with financial institutions have been excluded from the scope of this thesis, although such statements have been referred to in a number of instances.

Although many of these issues have a number of taxation implications, tax is specifically excluded from this thesis because of the highly specialised nature of the subject and the often-ambiguous nature of interpretations, especially with reference to financial instruments.

In summary, the thesis has been limited to accounting issues pertaining to financial markets and variables that drive these markets, with a strong focus towards corporate enterprises. The thesis analyses the environment, defines the risks, markets and instruments to which enterprises may be exposed and considers the relevant accounting framework within which such enterprises are required to operate. Suggested alternative accounting treatment is limited to financial instruments and selected derivatives.

Given the size and extent of the financial markets it is not possible to give a comprehensive analyse of all financial instruments or permutations thereof. It is therefore more important to analyse principles and to consider examples of financial instruments in order to meet the objectives of the thesis.

1.4 Structure of the contents

The thesis consists of seven chapters, of which the first is the introduction to the subject matter.

The second chapter consists of a brief analysis of present developments in treasury markets, which is followed by a discussion of the regulatory issues that concern financial instruments and financial markets. Although the thesis has a corporate focus, it is necessary to note that financial markets are driven by banks and financial institutions and that these institutions are governed by regulatory bodies such as central banks and international banking authorities such as the International Monetary Fund, the World Bank and the Bank for International Settlements. These institutions make rules which apply to products that banks sell to their customers. Enterprises are therefore indirectly implicated by the regulatory directives of the banking system. The chapter is concluded with an overview of international accounting developments. In chapter six the issue of international accounting issues is discussed more comprehensively.

Chapter three concerns itself with all financial and related risk issues pertaining to the market within which financial instruments are traded. Although many definitions may be ascribed to the various risks, the definitions given in this chapter are those that best describe the various risks for purposes of this thesis. After defining the various risks, each risk is then dealt with from the perspective of its applications in a trading environment to illustrate the practicality of the risk in terms of the market. A brief overview is then given of the risk management issues of each risk category.

In chapter four various mathematical issues are defined and analysed to ensure a better understanding of the financial variables that constitute financial instruments. The chapter is designed to follow a building blocks approach to valuation and begins by defining

simple interest rate calculations after which it increases in complexity to include the valuation of derivatives variables.

One of the two primary components of the thesis, namely accounting treatment of financial instruments, is dealt with in considerable detail in chapter five. The chapter deals with the various statements individually, specifically focusing on some of the contentious issues that are raised in certain statements. These issues are then dealt with by way of practical examples. This chapter concerns itself with the technical issues of the various statements as well as discussion papers and exposure drafts which have not yet been incorporated as formal accounting guidelines. It endeavours to give as broad an analysis as possible of financial instrument accounting within the present global accounting debate. In conclusion the chapter raises the various contentious issues and notes certain points that require further elaboration, of which a number is dealt with in the following chapter.

Chapter six deals with the second primary component of this thesis, namely suggested alternatives in the accounting treatment of financial instruments. The suggested alternative is based on the theory of value-at-risk, which is explained in sufficient detail to arrive at specific accounting conclusions. The theory of value-at-risk is complex and requires extensive financial modelling; it also has a strong mathematical bias, which requires detailed explanations of certain mathematical theorems. This chapter is therefore more focused on the application of value-at-risk theory and principles than the in-depth analysis of the mathematical concepts that support the subject. The chapter then follows with a framework within which financial instruments could be presented to account for value-at-risk. This framework merely suggests an alternative that will enhance the manner in which an enterprise will report its value-at-risk exposure. It is designed to be simple and to elicit a discipline amongst preparers of financial statements

to produce information that will best describe the enterprise's exposure to markets and instruments.

In chapter seven a brief overview is given of the salient points of the thesis, which is followed by concluding remarks and recommendations. The concluding remarks deal with certain contentious issues and provide a platform which could be used for further analysis and deliberation.

1.5 Conclusion

The thesis provides a solution to a contentious issue, namely accounting for financial instruments, by considering methodology - which is the application of value-at-risk techniques - in a manner that is acceptable from an accounting perspective and simultaneously ensures optimal disclosure of sometimes complex financial portfolios.

By moving towards value-at-risk accounting the enterprise empowers itself, not only to be in control of its exposures to financial instruments and their market risks, but to quantify and account for the potential negative value inherent in its portfolio in a manner that will be meaningful to the stakeholders of the enterprise.

The value-at-risk statement is a summary of the enterprise's risk exposure, calculated mathematically, and based on the historic behaviour patterns of various financial markets. It is a one-line financial value, which illustrates the enterprise's potential loss in a specific market by having purchased or sold the underlying financial instruments that constitute the calculated financial value.

The risk of loss due to future movements in the price of financial instruments is an imperfect science, which makes these losses difficult to quantify and hence the instruments that will cause these losses comparatively difficult to account for. This thesis demonstrates an alternative which endeavours to solve these very complex issues in a different yet innovative manner.

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Chapter 2

Developments in treasury operations

2.1 Introduction

The spectacular growth of the derivatives industry over the past decade along with the greater globalisation of financial services through ever improving information technology, has resulted in the implementation of a more professional treasury management approach across the spectrum of enterprises.

Esra Zask of Esra Zask Associates who manages $100 million for institutional and retail clients in the United States, has seen significant growth of US investment outside the United States, calling for greater derivatives-based foreign exchange hedges to manage the inherent capital risks of a rising dollar (Peltz 1993:89).

Not only has global financial risks become of greater concern to US investors; these issues have also surfaced in Asian countries.

Termwattana Suangporn, deputy treasury manager of CP Intertrade Company in Bangkok, holds the opinion that the deregulation of Thailand's financial markets will lead to greater financial complexities (Murphy 1993:63):

> *The financial markets in Thailand are in the process of changing. There are more financial products in the market. People are borrowing more in US dollars and other currencies, and are starting to implement international facilities.*

The market has also developed significantly in terms of derivatives documentation to achieve uniformity. In the early 1980's, swap documentation took the form of long laborious agreements to evidence each trade. Although many provisions of these agreements

remained unchanged from one deal to the next, institutions tended to employ their own definitions and terminology for similar concepts.

In 1984, a group of 18 swap dealers developed a standard agreement and founded the International Swap Dealers Association (ISDA) a year later. ISDA has since expanded to address legal and credit issues as well as various different formats of derivatives documentation. (Nolan 1995:16.)

The responsibilities of ISDA were further expanded to also include legal and credit terminology through the establishment of local currency - single jurisdiction, and multi-currency - cross border, master agreements. These agreements were collectively known as the 1992 ISDA Master Agreements.

2.2 Treasury developments

Given the fact that the banking system offers the medium, through which most financial instruments are traded, it is necessary to consider certain fundamental aspects regarding the banking system. Firstly, the issue of bank supervision needs to be reviewed, since the users of the financial markets are reliant upon the central bank to ensure that capital at risk is measured and controlled. In the second instance, capital at risk in itself should be analysed, and whether South African standards adhere to the Basle Concordat[1]. Finally, it is necessary to review existing regulatory constraints in South Africa, and how it impacts trading in financial instruments.

[1] The Basle Concordat is the central controlling agreement as issued by the Bank for International Settlements (BIS), governing global banking activities. The BIS is situated in Basle, Switzerland. The 1988 Accord refers to the International Convergence of Capital Measurement and Capital Standards, July 1988.

- *Banking supervision*

In a directive issued to all banking institutions in the United Kingdom, the Bank of England defined consolidated supervision as:

> *... a qualitative assessment of the overall strength of a group to which an authorised institution belongs, to evaluate the potential impact of other group companies on the authorised institution.*

The purpose of consolidated supervision is therefore not to supervise all the companies in a group to which a bank belongs, but to supervise the bank in the context of the group.

The increasingly complex financial system is making it imperative that all the business conducted within a banking group is clearly understood by the supervisory authorities. In this regard, it is only necessary to consider the continuous expansion of the derivatives business to realise the need for thorough supervision of the financial system.

In 1992 the Basle Committee on Banking Supervision formulated the following minimum standards for adherence by member countries:

(i) A home-country authority that capably performs consolidated supervision should supervise all international bank groups and international banks.

(ii) The creation of a cross-border banking establishment should receive the prior consent of both host-country supervisory authority and a bank's or banking group's home-country supervisory authority.

(iii) Supervisory authorities should possess the right to gather information from the cross-border banking establishments of the banks or banking groups for which they are the home-country supervisors.

(iv) If a host-country authority determines that any one of the foregoing minimum standards is not met to its satisfaction, that authority could impose such restrictive measures as are necessary to satisfy its prudential concern, consistent with these minimum standards, including the prohibition of the creation of banking establishments.

Supervisory authorities need to conduct their supervision activities in order to prevent or manage certain risks pertaining to the banking system as a whole (Van Greuning 1994:4):

Contagion risk

Contagion risk is the risk that a problem external to the bank itself rubs off onto the bank, leading to negative implications for the bank.

Contagion of banks can take place from outside a banking group, for example, when there is a general lack of confidence in certain types or sizes of banks. The so-called "small-bank syndrome" is a typical example.

Moral risk

Moral risk occurs when a bank or its controlling company, notwithstanding the absence of an actual legal liability, feels obliged or is "forced" to assist an associate or other entity that is in financial distress.

Moral risk can arise in two ways:

- where the bank or its associate has acted as an agent to a transaction that has failed, and the bank is morally obliged to make good financial losses suffered by its clients;

- when a bank or controlling company feels morally obligated to fulfil the obligations of an associate.

Moral hazard occurs when circumstances tempt decision-makers to take excessive risks in the knowledge that, should the investment fail, another party will be morally obliged to make good financial losses of the investors.

Systemic risk

This is the risk inherent in the macro banking system that whole systems may fail or collapse, such as foreign exchange settlements of the whole banking system.

The local authorities follow a holistic approach to financial regulation in order to ensure that banking groups are supervised adequately. An important goal of the holistic approach is to ensure that competitive neutrality is maintained whereby all market participants compete on equal terms, thereby using as the numerator only eligible capital.

In calculating eligible capital, it will be necessary to first calculate the bank's minimum capital requirement for credit risk, and only afterwards its market risk requirement, to establish how much tier one and tier two capital is available to support market risk. Eligible capital will be the sum of the whole of the bank's tier one capital, plus all its tier two capital under the limits

permitted under the 1988 Accord[2]. Tier three capital will be regarded as eligible only if it can be used to support market risks under conditions set out as per the Accord. The quoted capital ratio will therefore represent capital, which is available to meet credit risk and market risk. (BIS 1995b:7).

South Africa responded to these capital guidelines by introducing the Banks Act, 1990, which replaced both the Banks Act, 1965 and the Building Societies Act, 1986. One of the main objectives of this act is to bring South African banking legislation in line with accepted international standards in order to ensure a sound and efficient banking system. Considerable progress has been made in South Africa towards consolidated supervision; to the extent that proposals were made to change banking legislation to enhance the quality of supervision (Van Greuning 1994).

- *Capital adequacy and liquid asset requirements*

The Bank for International Settlements issued the Basle Agreement on risk-based capital, endorsed by Central Bank representatives of the Group of Ten (G10) Industrialised Countries. This agreement is also referred to as the 1988 Accord and gives the following directives (BIS 1988):

The principal form of eligible capital to cover market risks consists of shareholders' equity and retained earnings (tier one capital) and supplementary capital - undisclosed reserves, asset revaluations, hybrid capital instruments and subordinated term debt (tier two capital). Banks may also, on a national level, provided supervisory banks concur, employ tier three capital - short-term subordinated debt.

[2] The 1988 Accord refers to the BIS Accord, Basle Committee on Banking Supervision's, International Convergence of Capital Measurement and Capital Standards, July 1988.

In order to ensure consistency in the calculation of the capital requirements for credit and market risks, an explicit numerical link will be created by multiplying the measure of market risk by 12,5 (i.e. the reciprocal of the 8% minimum ratio) and adding the result to the sum of risk-weighted assets compiled for credit purposes. South Africa is now in full compliance with the minimum capital requirements of the BIS, although these requirements will only be formalised as of 01 October 1998. The Banks Act is applied to individual banks, whereas the BIS is applicable to banks and bank holding companies whose consolidated assets exceed $150 million.

With effect from 1 January 1994, the disclosure requirements relating to financial statements of banks have been expanded in that the Schedule 4 exemptions as referred to in the Companies Act (1961) have been removed. Banks are now required to make full disclosure, both in terms of Generally Accepted Accounting Practice (GAAP) and in terms of the Companies Act.

In addition a revised accounting statement, AC 120 - *Disclosure in the financial statements of banks*, has been issued to support the statutory requirements.

In terms of liquid asset requirements, South African banks must hold an average daily amount of liquid assets, which shall not be less than an amount equal to five percent of the average daily amount of its adjusted total liabilities to the public. The minimum balance of liquid assets may not be less than an amount equal to 75 percent of the average daily amount of liquid assets required to be held by the bank.

The only foreign currency assets that qualify as liquid assets are gold coins and bullion. Liquid assets comprise:

- Reserve Bank notes and coins, gold coins and bullion
- Clearing account balances with the Reserve Bank
- Treasury bills of the Republic of South Africa
- Stocks issued under Section 19 of the Exchequer Act, 1975 with a maturity not exceeding three years
- Securities of the Reserve Bank, with a maturity not exceeding three years
- Short-term bills issued by the Land Bank. (KPMG 1994:41).

- *Regulatory constraints*

The debate surrounding the present system of monetary constraints through which the South African Reserve Bank manages the outward flows of reserves has received much media attention in recent months, and this debate will in all likelihood continue for as long as exchange controls prohibit the free flow of money across South Africa's borders.

The Exchange Control Regulations, Orders and Rules, 1961 (as amended) are issued in terms of the Currency and Exchange Act of 1933. These regulations cover all transactions and commitments in gold and foreign exchange between South African residents and non-residents. Non-residents include local operations of foreign enterprises or legal persona that have a non-resident interest in them.

The regulations empower the South African Reserve Bank, as the duly appointed agent of the Treasury, to make rulings and determine policy regarding the enactment of these rulings. These rulings prescribe to the banks the terms, conditions, limits and procedures to be followed in the course of transacting sales and purchases of foreign currencies with residents and non-residents. Certain rand-denominated transactions are also affected.

The local subsidiary of a foreign holding company have certain restrictions upon it regarding the extent to which it may borrow rand-denominated funds *vis-à-vis* its capital structure.

The regulations are specifically written to minimise the outflow of reserves and include the following broad principles:

- All currency transactions of authorised dealers. Documentary proof of underlying trade flows is required for all purchases and sales of foreign currency.
- Persons other than banks may only deal in foreign currency with authorised dealers (banks appointed by the South African Reserve Bank).
- The responsibility lies with authorised dealers to ensure that customers comply with the relevant rulings.
- Exchange control rulings also cover transactions with non-residents which may not necessarily result in an outflow of foreign exchange.
- Regarding foreign currency proceeds, authorised dealers must ensure that clients internalise such proceeds within 180 days of receipt.
- Any deviations from existing rulings or special requests need to be submitted to the exchange control department through the intermediation of an authorised dealer.

Suffice to say that the Exchange Control Department of the South African Reserve Bank continuously reviews the controls and rulings in an attempt to adhere to government policies that require greater transparency and a monetary environment that is less controlled.

Government officials, as well as senior members of the Reserve Bank, often refer to the potential alleviation of exchange controls, but both the government of the day and the governor of the South African Reserve Bank are well aware of the limitations on the country's foreign reserves and the vulnerability of the exchange rate, which should be protected at all costs in order to maintain currency and inflation stability (SARB 1996:2).

Both bodies have, on numerous occasions, reiterated their willingness to consider gradual abolishment of these controls, provided a stable fiscal and monetary environment could be maintained.

Such gradual abolishment has already manifest itself in certain allowances being made to South African enterprises and financial institutions to exchange South African assets for foreign currency denominated assets and also to hold certain cash amounts in foreign currency.

2.3 Accounting developments

In the preface to his book, Handbook of International Accounting, Professor Frederick Choi (1991:xv) comments as follows:

> *The 1990's promise to be an exciting decade in the world of international commerce and finance. The dramatic developments that are occurring in Eastern Europe on both political and economic fronts, as well as the renewed commitment to integrate Western Europe's factor, product and financial markets, are restructuring the landscape of international business. Together with the continued deregulation of national capital markets, the growing international market for corporate control, enhanced global competition, and a deepening of financial technology, made possible by recent advances in computer and telecommunication technologies, these developments are greatly accelerating cross-border commercial, financial and investment transactions.*
>
> *These fast-breaking developments in the world of international business have significant accounting implications. As business and financial decisions are premised to a large extent on accounting data, an understanding of international accounting issues is crucial to proper interpretation and understanding in international business communications.*

- *An international perspective*

Accounting is shaped by the environment in which it operates. Just as nations have different histories, values and political systems, so too differ the patterns of financial accounting development. The diversity is an extension of the variety of business environments around the world and the fact that accounting is environmentally sensitive.

Various objectives exist for primary accounting information needs. In Latin American countries the primary focus of financial accounting is to ensure that the proper amount of income tax is collected by the national government (Wheeler 1994:2). In other countries financial accounting is designed to assist in the accomplishment of macro-economic policy, and yet in other countries to fulfil the information needs of investors and creditors.

Various accounting models or types exist, of which the Anglo-Saxon model forms the basis for South African accounting. The United Kingdom, the United States and the Netherlands are the trend-setting countries for this cluster. Accounting is oriented toward the decision needs of investors and creditors, and countries that belong to this group have large, developed stock and bond markets. Education levels are high, and users of financial information tend to be sophisticated. A common denominator in these countries is the existence of very large multi-national enterprises.

Other accounting models include the Continental Model, the South American model, the mixed economy model and emerging models. Accounting in communist countries are based on a centrist government approach. Governments own all productive resources and supply all capital needs; high uniformity is required, and the primary users of financial information are government planning agencies. Financial statements are not prepared for outsiders, but for agency administrators. (Saudagarin 1991:5.3.)

There are not as yet a single set of 'generally accepted accounting practices' that are used by financial reporters in all of the major industrialised countries. Consequently, there are large differences between accounting practices in different countries in the same global industry, for example automotive manufacturing. If an investor chooses to hold five different automotive shares in his portfolio, it could be any of Ford, Daimler, Chrysler, Toyota, SAAB, BMW, Hyundai or many others. What is important however, is that the portfolio may consist of shares from companies across the globe with diverse accounting principles. Companies will show substantially different operating results and financial positions, making the investment decision exceedingly difficult.

Much still needs to be done to harmonise global accounting in order to present investors and creditors with homogenous accounting information across markets. A primary benefit of standardising accounting rules or limiting accounting choices to a narrow set of permitted alternatives, is that financial analysis of enterprises would be simplified.

- *Global harmonisation*

The financial market place, once thought to be national, is today in reality a global market. Capital markets are experiencing unprecedented growth of cross-border activity and are less tied to geographical borders. Equity securities of over 500 companies are traded in more than one country, whereas many pension and retirement funds diversify their portfolios by buying securities around the world. Companies looking to raise capital can choose their markets across the globe, in currencies and interest rate regimes that suit their needs.

In 1980, the total value of all stocks traded in the United States was $1,4 trillion, compared with $357 billion in Japan and $1 425 billion in the European Community (EC). By 1989, the value of stocks traded in the United States had more than doubled to $3 trillion whereas Japanese capitalisation had risen to $4,4 trillion and the EC had more than quadrupled to

$2,1 trillion. This clearly illustrates that national markets are changing rapidly as a result of the economic forces that govern the global market place. (Saudagarin 1991:21.)

Although the surge in cross-border securities trading has caused an increase in the number of investors using financial reports of trans-border issuers, accounting standards for financial statements are still determined on a country-by-country basis. Because national accounting standards differ, financial statements prepared for a company in accordance with accounting principles generally accepted in different parts of the world would produce substantially different results. The comparability of financial information contained in these financial statements is limited, thus diminishing the investors' ability to make effective investment decisions. This limitation may impair the ability of companies to raise capital, which may result in their seeking out more efficient markets.

There is empirical evidence which suggests that companies are more likely to list their shares on foreign stock exchanges in countries with lower disclosure levels than those of their domiciles (Biddle 1989:55).

The International Accounting Standards Committee (IASC) has been working to develop international accounting standards since 1973 and is supported by nearly 100 professional accounting bodies in more than 70 countries. Accounting standards for financial instruments have not kept pace with innovations in the instruments and the uses to which they are put. No country has comprehensive accounting standards that address the accounting and reporting of transactions in all types of derivatives and cash market instruments. The lack of comprehensive standards means that different accounting treatments may be permissible for transactions with comparable economic substance.

Progress is being made towards achieving the goal of harmonisation of accounting standards; however, effective enforcement and national sovereignty remain issues that retard this process.

Furthermore, many existing international accounting standards lack completeness and detail. Conceivably the IASC's comparability project may add a great deal to resolving these issues.

2.4 Conclusion

It is clear from the facts given above and also from the concerted efforts of global regulatory harmonisation, which is evidenced in the actions of international monetary authorities such as the Bank for International Settlements and the World Bank that more emphasis will be placed on regulated and transparent environments in which the business of global finance will be conducted. Further confirmation is also found in the continuous attempts of global accounting bodies to find solutions to the ever-present issues surrounding the accounting of global financial activities.

It is certain that as the world moves towards globalisation and monetary unity, accounting regulations will have to align itself to this process. A very imminent example is that of the introduction of European Monetary Union and the effects that it will have on unified banking and accounting. As more and more countries join the unification process, so will cross-border accounting regulations be required to move towards similar practices. The leading edge of this process is the development of the financial markets and their related instruments. With the development of more and more cross-currency financial products, do the markets of the respective countries become more and more seamless. Consider the

example of a South African BA[3] - UK LIBOR (London interbank offered rate) interest rate swap. This effectively links interest rates in London to interest rates in Johannesburg, and market participants in the two countries would therefore want to evaluate the instrument on like terms. Regulatory bodies would therefore move more and more towards a uniform approach on regulation.

Finally, the rapid pace with which the financial markets are increasing in both geographical and volume expansion, will require greater regulatory control and accounting transparency to avoid global financial disasters. Empirical evidence was given in chapter one, and an inability by accounting bodies to remain in touch with the financial markets could lead to financial debacles of even greater magnitude. In this regard meaningful solutions need to be provided to account for these activities, which is evidenced in this thesis.

[3] Bankers Acceptance is a local interest rate instrument, which tends to be used as the benchmark in interest rate swap transactions.

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Chapter 3

Risks pertaining to treasury operations

3.1 Introduction

Financial risks can be defined in many ways and market practitioners have vastly different opinions regarding risks and their definitions. For purposes of this thesis it was attempted to categorise and define risks in such a way that it supports the contents of the ensuing chapters and also explains the most important issues from a treasury risk management perspective.

3.2 Liquidity risk

- *Definition*

  Liquidity risk is the risk of not being able to generate sufficient cash to pay off financial commitments (Falkena 1989:78). It is therefore also the risk of having to liquidate assets to meet liabilities that are called upon, which transaction will often result in an interest or price cost as a result of premature liquidation.

The planning of the maturity structure of cash flows is therefore an essential daily activity in any treasury environment. Not only is it important to meet the daily cash and funding requirements of the operation, but also is it a matter of economic survival to plan the optimal return ratio of the asset and liability structure.

Two aspects of liquidity risk can thus be distinguished as the essential components to avoid liquidity crises. Firstly, the ability of the operation to meet its daily cash flow demands and the resulting regulatory requirements and secondly, the ability of the operation to adjust its

asset and liability structure to effectively follow the changes in interest rate cycles. (Falkena 1989:79.)

It is the latter point that requires further consideration regarding the application of liquidity risk in a trading environment.

- *Applications in a trading environment*

In an environment where interest rates were fixed or even non-existent, without any demands for cash and without pricing structures for money, i.e. a non-market economy such as the communist system, liquidity risk will simply be limited to the risk of either having or not having cash.

However, in a market economy, wealth is measured by an operation's ability to endure varying economic cycles and optimise returns by quickly adjusting to such cycles. Likewise do interest cycles impact returns of operations that have very real exposures to interest rate movements. Banks typically generate a substantial share of income from interest rate activities. Current trends show declining contribution from interest income, due to narrower margins and increased contribution from non-interest income, which include increased levels of trading income generated from derivatives.

Assets and liabilities that are sensitive to interest rate movements can be categorised as follows (Falkena 1989:82):

(i) Assets and liabilities that are maturity-certain, e.g. fixed-term deposits.

(ii) Assets and liabilities that are maturity-uncertain, e.g. call money and overdrafts.

(iii) Assets and liabilities that are maturity-certain, but have a high degree of marketability, e.g. government bonds.

The effectiveness of liquidity management therefore lies in structuring maturities so that potential changes in interest rates will optimise interest returns. The following example illustrates this point:

> *A treasurer has a given amount available to invest for a six-month period after which the funds will be required to expand operations. He is also of the opinion that interest rates will rise in the short term.*
>
> *If his view is correct it will be to his benefit to keep funds on call until after the rate hike and then to fix the deposit until maturity. This will result in him foregoing initial good investment rates, but will ensure optimal returns after the rate hike. If however, his view is wrong it will result in mediocre returns until maturity or until a change in view.*

Although a very simple example, it illustrates the complex problem of asset mix and the management of returns in uncertain interest rate cycles.

- *Risk management: a brief overview*

The ultimate responsibility of any operation's liquidity resides with its directors. The need to remain liquid should therefore be the overriding objective of any operation. Liquidity does not necessarily mean having cash in the bank, but implies having immediate access to funds to maintain its ongoing operations or to protect its capital base.

In a financial institution, liquidity risk management is centred in the institution's "Asset-Liability Management Committee" or more commonly known as the ALCO. It is the responsibility of the ALCO to ensure that the liquidity requirements as reflected by company policy are enforced.

Policy will dictate the minimum prudential liquidity, which will require the operation to hold certain minimum cash assets or have stand-by facilities in the form of overdrafts or short-term loans. Forms of liquidity back-up facilities include cash and rediscountable assets such as government bonds and bills.

In the case of deposit-taking institutions, the Banks Act (1990) furthermore requires that institutions hold certain minimum levels of liquid assets with the South African Reserve Bank (KPMG 1994:41). These requirements may change from time to time as and when the reserve bank changes its prescriptions in terms of broader monetary policy.

3.3 Currency risk

- *Definition*

Currency risk is defined by Gastineau (1992:80) as:

> *The component of return volatility in a cross-border asset class that is due to changes in foreign exchange rates.*

This definition can be expanded to include the greater economic exposure whereby operations without direct cross-border assets or liabilities have exposure to commodities or manufactured components in product lines that are linked to cross-border transactions.

Currency risk can therefore be divided into a number of smaller risks, which include transaction risk, economic risk and translation risk (Falkena 1989:90).

Transaction risk applies to specific currency transactions and includes risks of misquoting, and the erroneous buying or selling of incorrect volumes. Gastineau (1992:97) defines economic risk as exposure to changes in exchange rates, local regulations, product

preferences, etc. that favour the products or services provided by a competitor. Translation risk is the risk that the reporting entity's net asset value of its investment in a foreign entity or in foreign operations will diminish as a result of the adverse effects of negative exchange rate movements when translating investments into the reporting currency.

- *Applications in a trading environment*

If an operation has more receivables than payables in a particular currency, it is said to be 'long' of that currency. If the opposite is true, it is said to be 'short' of that currency.
These long and short positions are the invisible generators that bring global currency activity into motion, which is the very heart of the business of international trade. The US multinational wishing to expand its operations into an emerging market will carefully consider the currency cycle of that economy since its intended expansion simply means going long of the home currency in that market.

This phenomenon is clearly illustrated in the Japanese/USA trade situation whereby the Japanese have a massive trade surplus with the United States as a result of the relative ease of exporting goods and services into the USA market. However, regulatory constraints are still in place in Japan, making it difficult for US multinationals to expand into Japan. The USA therefore resorted to its currency to even the playing field. By keeping its currency weak against the Yen, it makes exports to the US by Japanese multinationals very expensive and uncompetitive. The Japanese countered this in turn to a limited extent by shifting whole factories and infrastructures to economies in other parts of Asia that performed much weaker against the US Dollar. Although this solved the immediate transaction risk, the Yen still performed much better against the currency of the weaker economy and the losses surfaced on translation of the foreign operations into the reporting currency. (Nakamura 1990:45.)

In the very large currency operations of banks and multinational operations, currency risk is usually spread over a basket of currencies and managed by a number of smaller units, breaking down currency risk into its individual components. These components usually include spot risk (cash market transactions), forward risk (the inclusion of interest rate risk), third currency trading (all trading, excluding the local currency) and specialised units such as arbitrage and derivatives operations. Suffice to say that the size of a treasury operation is a function of its appetite for risk. The greater its appetite for risk, the more resources is required to manage the risk positions so generated.

- *Risk management: a brief overview*

Although the reasons for acquiring currency risk may differ from one operation to the next, the management thereof will either be risk containment or profit optimisation. The application of risk management techniques may therefore differ, depending on the different objectives. The most important rule, however is to stick to the rules that apply.

If the rule is to hedge all exposures as and when they arise, then the rule must be applied, irrespective of personal market views regarding anticipated currency movements. If the rule is to have maximum overnight positions of USD 10 million, then adhere to the rule and do not exceed the limit. It can thus be said that good risk management is a function of the quality of the rules that were made and the subsequent application thereof.

Considering the vast range of businesses and potential currency exposures, the rules that will apply may vary from very informal instructions in small operations with singular currency exposures to large and complex currency operations of banks and global enterprises with formal and very comprehensive policy documents.

In active currency risk management (taking on risk to optimise returns) as opposed to passive risk management (minimising risks through the immediate liquidation of open

positions), more emphasis is placed on economic trends and anticipated currency and interest rate movements to optimise returns on such open positions. However, as a result of volatility and uncertainty in the global markets, anticipated movements may not materialise and in fact have disastrous results on currency activities. It is therefore imperative that policies allow for quick and highly flexible action to adjust open positions to ensure that changes in expected currency patterns are incorporated in the underlying activities. (Pit-Watson 1990:135.)

Finally, in a global economy that has resulted in vast and highly competitive trading environments, management must ensure that they are fully aware and also understand the complexities of modern treasury operations. The expansion of derivatives operations and the impact of the applications on treasury returns are significant and should be fully disclosed and quantified in currency risk policies to ensure that all exposures and risks are accounted for.

Management therefore not only has the task of overseeing the proper application of policy, but to explore the possibilities of constant abuse of complex derivatives to undermine stated policies and hence the advent of disaster for the operation at large.

3.4 Interest rate risk

- *Definition*

  Interest rate risk is the risk that investment or funding decisions are taken when subsequent interest rate movements result in a cost, or lost benefit to the investor or borrower (Badger 1995:32). Interest rate risk therefore revolves around the ability of the enterprise to accurately forecast anticipated interest rate movements prior to making investment or funding decisions.

$$\left(V_i\right)^{\frac{d1}{d_2}} \cdot \left[\frac{1}{2} \cdot C \cdot \left[\left(a_n\right)^i + e\right] + 100 \cdot \left(V_i\right)^n\right] \quad = \textit{All-in price}$$

where

d_1	=	number of days from settlement date to next interest date
d_2	=	number of days from last to next interest date or from settlement date to next interest date if settlement date falls on an interest date
i	=	Yield at which stock trades
V_i	=	1/(1 + i/200)
	=	present value of 1 payable in 6 months' time
C	=	coupon percentage
n	=	number of complete six month periods from next interest date to redemption date
a_n^i	=	$(1 - V_i^n)/(i/200)$
	=	present value of an annuity of 1 per six months, payable in arrears.
e	=	1 if the stock is cum-interest and
		0 if the stock is ex-interest

Accrued interest	=	$(d_2 - d_1 / 365) \times C$ (if cum-interest),
	=	$(- d_1 / 365) \times C$ (if ex-interest),
Clean price	=	All-in price - accrued interest.

Faure explains the application of the above formulae by using the following example (Faure 1994:21):

In order to accurately forecast interest rates, it is necessary to have a broad, macro economic perspective of market conditions, which can be broadly divided into two sections, objectives of the authorities and monetary analysis (Ridley 1988:25).

(i) Objectives of the authorities

The authorities will set certain objectives in terms of monetary and fiscal policy, and may include the following:

- A satisfactory rate of economic growth, taking into account the economy's capacity to produce value.
- An exchange rate target.
- Measures to manage inflation.
- Control over the growth of monetary aggregates.

The actions that the authorities take regarding these objectives will largely determine the direction of interest rates. It is therefore important to have the necessary regard for monetary policy in order to understand the reasons for the level of interest rates and its subsequent movement.

Although interest rate forecasts tend to be merely judgemental, the broad parameters of official policy are known and official action by authorities in the markets will either confirm existing policy or indicate changes in policy that may contradict the existing objectives.

(ii) Monetary analysis

To further substantiate interest rate forecasts, it is necessary to analyse certain monetary indicators:

- Real interest rates

The most transparent measure of interest rate discipline, is the relative level of interest rates *vis-à-vis* inflation. The global rule of thumb appears to be 3,0% (Ridley 1988:28). The question however, is which inflation rate should be used as the determinant. Various inflation determinants could be used, such as the current level, a consumer index measure, a producer price measure or even a combination of measures. Likewise, with interest rates various determinants could be considered. Short-term interest rates usually reflect central bank activities to enforce monetary policy, whereas long-term rates have a greater emphasis on fiscal objectives, since government is a primary user of debt in its creation of economic infrastructure.

- Overall level of savings

The overall level of savings in an economy is identified through the current account of the balance of payments (Van den Bogaerde 1987:165). If the outcome of the public, corporate and private sectors taken together is in surplus, the current account will show an equivalent surplus.

- Sectoral balances

Although it is necessary to look at the overall level of savings in the economy, it is important to consider the constraints that exist within these sectors (Ridley 1988:29). A large government deficit in relation to long-term savings will in all likelihood result in high bond yields, whereas a corporate

sector deficit will most probability be funded in the shorter markets. The most complex, however, is the private sector, since it represents an amalgam of flows:

- long-term savings (pension funds and insurance)
- long-term borrowings (mortgage bonds)
- short-term savings (short-term government debt)
- short-term borrowings (bank loans, overdrafts)

An analysis of the private sector outcome will therefore identify the interest pressures on interest rates. A current account deficit has to be matched by capital inflows; long-term flows are represented by equities, and bonds and short-term flows by bills and banking deposits.

Interest rate risk can thus only be defined once the enterprise has established its relative position in the macro economic environment and has modelled economic variables in order to determine further interest rates.

- *Applications in a trading environment*

In considering interest rates and the inherent risks, two variables drive all decisions regarding interest rate risk management.

Firstly, interest rates are not fixed and move in conjunction with the relative changes in market variables. Secondly, any enterprise participating in a free market system has some degree of exposure to interest rate movements. It therefore needs to exercise some degree of management to protect the enterprise against adverse interest rate movements. (Bird 1990:5.)

In the case of Procter & Gamble it became evident that a misunderstanding between the enterprise and its bankers regarding the application of financial instruments, resulted in material losses for the enterprise, which in turn led to extensive litigation.

Procter & Gamble entered into a string of interest rate option transactions, without fully understanding the products. This resulted in the company being unprotected on adverse interest rate movements, which led to excessive interest costs.

Subsequently Procter & Gamble entered into litigation with their bankers on the grounds of misrepresentation.

The question, central to interest rate risk management, is whether interest rate exposure should be fixed or kept floating. In the instance of a borrower that anticipates higher interest rates, it is most likely that the exposure will be fixed to avoid an increased interest cost through higher rates. The risk, however is that rates remain at current levels or even decrease, which would then result in an opportunity cost for the borrower, having fixed interest rates at higher levels.

Fortunately, interest rate risk management decisions need not be that radical and a number of alternatives may be applied to enhance management techniques:

- Borrow in the public or private markets on a floating rate basis and swap the exposure or a portion thereof into a fixed rate.
- Borrow on a floating rate basis and use forward rate agreements (FRA's) to convert floating rate debt to fixed rate debt.
- Hedge interest rate exposure in the interest rate futures market.
- Hedge exposures with interest rate options.

- *Risk management: a brief overview*

In an economic environment where financial instruments and their applications have become increasingly complex and where interest rate volatility has increased to the extent where it subjects enterprises to unacceptable swings in financing costs, the implementation of carefully structured risk management programmes to measure interest rate exposure has become an essential tool in managing the financial well-being of the enterprise. (Edwards 1990:45.)

The following risk management programme (RMP) is merely an example to illustrate some of the important aspects of risk management and is not an exhaustive analysis of interest rate risk programmes.

(i) Defining the scope of the RMP

It is necessary to define the objectives of the programme, i.e. optimising interest income or exceeding or improving certain predefined interest rate benchmarks. The scope of the RMP should furthermore define the interest rate forecast methodology and finally analyse and quantify the exposure that needs to be managed.

(ii) Interest rate forecasts and interest rate objectives

It is necessary that these two variables be synchronised in order to arrive at meaningful interest rate objectives. It is pointless that management set a funding rate target of 7% if prevailing rates are 16%. Management should therefore carefully evaluate the forecasting model in arriving at its objectives.

(iii) Analyse exposure

Exposure analysis includes the following:

- Preparation of cash flow estimates of current and anticipated asset and liability changes, which should cover periods extending well into the future to determine the enterprise's cash flow requirements and risk.
- Incorporating these estimates into a full economic analysis.
- Disaggregation of cash flows to identify specific interest rate exposures.
- A breakdown of the enterprise's exposure across the currency and interest rate spectrum.
- Scaling the portfolio from largest exposure with greatest sensitivity to smallest exposure and least sensitivity.

(iv) Quantification of risk

Various mathematical measures exist to quantify interest rate risk. The important factor however, is to ensure that the full interest rate exposure is calculable and where interest rates are not determinable, a reasonable measurement be applied to calculate those exposures. (Edwards 1990:47.)

Models used to calculate interest rate exposure should consider aspects such as duration, compounding effects, amortisation, accretion as well as the variables inherent in interest rate instruments. This may include reset periods, basis of calculation (semi-annual, quarterly, etc.), day counts and base rates.

(v) Review measurements and results

Since the interest rate environment is dynamic, it is obvious that the programme should be as dynamic and allow for changes to ensure that the best interest rate hedge is applied in the specific cycle. Identify opportunity costs and adjust the programme to minimise potential future opportunity costs.

Table 3.1 (Leach 1988:39) illustrates this calculation:

Table 3.1: Duration of a three-year note with a 6,50% coupon.

Time t	Cash flow Cf It	0% coupon price Pzt	Required market value Cf It * Pzt	Weighted market value Cf It * Pzt * t
0,50	3,25	97,23%	0,0316	0,02
1,00	3,25	93,85%	0,0305	0,03
1,50	3,25	90,46%	0,0294	0,04
2,00	3,25	87,38%	0,0284	0,06
2,50	3,25	83,99%	0,0273	0,07
3,00	103,25	79,37%	0,8195	2,46
			0,9667	2,68

** Based on the zero coupon curve: 5,70%, 6,45%, 6,80%, 6,86%, 7,10% and 7,85%.*

Duration: 2,68/0,9667 = 2,76 Years

Gastineau (1992:150) further defines modified duration as follows:

> *A measurement or the change in the value of an instrument in response to a change in interest rates. The primary basis for comparing the effect of interest rate changes on prices of fixed income instruments.*

$$D_{mod} = [\, 1 / (1 + Y/f) \,] * D_{mac}$$

where

D_{mod} = Modified duration

D_{mac} = Macauly duration

Y = Yield to maturity

f = Frequency of coupon payment

- *Duration*

Duration is the concept of weighting a string of cash flows over the life of a fixed rate instrument to calculate the average life of the underlying instrument, based on the zero coupon curve.

Gastineau (1992:145) defines duration as follows:

> *The present value weighted time to maturity of the cash flows of a fixed payment instrument or of the implicit cash flows of a derivative based on such an instrument.*

Mathematically, duration can be expressed as follows (Leach 1988:39):

$$\frac{\sum_{t=0}^{n} Cf\cdot It\cdot Pzt\cdot t}{\sum_{t=0}^{n} Cf\cdot It\cdot Pzt} = Duration,$$

where

I	=	Financial instrument,
t	=	Time,
n	=	Final cash flow period,
Cf It	=	Cash flow of instrument I, occurring at time t,
Pzt	=	Market determined price of a zero coupon bond, maturing at time *t*. Calculation based on the zero coupon yield curve.

Given the example in table 3.1, modified duration will be calculated as follows:

D_{mod} = [1 / (1 + 0,065/2)] * 2,76

= 2,6731 years.

The purpose of duration is to identify the magnitude of an institution's interest rate exposure. This has been done over many years by portfolio managers by measuring the price movement of a bond for a given change in yields.

3.5 Credit risk

- *Definition*

  Credit risk can be defined as the risk of a debtor failing to meet punctually the financial commitments stemming from a credit agreement (Falkena 1989:18). In a treasury sense, credit risk also includes the risk that the demise of counterparties may result in market risk to the underlying transactions. Credit risk therefore extends well beyond direct lending operations and also incorporates the full spectrum of trading operations.

It is not always easy to quantify credit risk, which may not initially be prevalent in a commercial transaction. A bank is requested to provide bridging finance for a particular deal and will do so in anticipation of the successful underwriting of securities for the borrower at some future point, which will serve to repay the bridging loan. Until the securities have been issued and the loan has been repaid, the bank has taken on an enormous amount of risk (counterparty risk) which cannot be hedged.

Credit risk is a real phenomenon and must be priced into transactions and instruments. Profitability or spread of a transaction therefore needs to incorporate the cost of capital attributable to the transaction as well as the deemed cost of credit risk.

- *Elements of the credit decision*

In order to manage trading activities banks and corporations will make available lines of credit, i.e. the maximum value of transactions that may take place on a given day or over a given period, between the institution and the specific counterparty. Credit risk on counterparties is therefore the risk that the line of credit is either excessive or too small. In the first instance the enterprise is at risk that the counterparty may default, either through over trading or economic demise. The latter contains an element of opportunity cost, since the enterprise may lose the potential of incremental income as a result of credit line constraints. (Banks 1993:58.)

The following aspects need to be considered to arrive at an acceptable credit decision:

(i) Counterparty risk

In properly reviewing the qualities of a counterparty, the following aspects should be considered:

- A formal and rigorous analysis of the counterparty's financial statements.
- A performance review to establish the counterparty's relative strength *vis-a'-vis* its competitors.
- A study of the industry and an outlook of its future performance.
- A discussion with the counterparty's management to clarify specific issues.

A qualitative analysis of counterparty risks will result in the best quantification of the operational exposure that the enterprise is prepared to accept.

(ii) Risk exposure

Risk exposure is defined as the amount of risk a given transaction or product carries with it; it represents the amount a bank could lose if its counterparty defaults (Banks 1993:30).

Risk exposure also covers the full range of financial products or services that a given institution would have entered into with a specific counterparty. Apart from quantifying the aggregate exposure, two facts need to be considered in evaluating the relevant exposure.

Firstly, the quality of the counterparty needs to be measured. This process has developed into a scientific business which spans the globe and which is used as a barometer to measure credit quality. Institutions such as the International Bank Credit Analyst (IBCA), Standard & Poor's and Moody's, have become renowned for their ability to assess enterprises and to determine their credit quality. This has further resulted in the acceptance of rating systems by participants in global financial markets that determine the extent to which such enterprises and institutions could access financial markets.

It is therefore easier to enter into transactions with counterparties that are of an investment grade nature (AAA - BBB), than counterparties that have speculative grade ratings (BB+ and down). The references to credit ratings made in the text of the ensuing table, are those of Moody's, to show the comparison to Standard and Poor's.

Table 3.2 (Goldman: 1994) explains the various rating qualities.

Table 3.2: International ratings for long term credit

AAA	Prime Grade. Debt rated 'Aaa' is regarded as gilt-edged. Capacity to pay interest and repay principal is extremely strong.
AA+	High Grade. Debt rated 'Aa' has a very strong capacity to pay interest and repay principal and differs from the highest rated issues only in small degree.
A+	Upper Medium Grade. Debt rated 'A' has a strong capacity to pay interest and repay principal although it is somewhat more susceptible to the adverse affects of changes in circumstances and economic conditions than debt in higher rate categories.
BBB	Medium Grade. Debt rated 'Baa' is regarded as having an adequate capacity to pay interest and repay principal. Whereas it normally exhibits adequate protection parameters, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity to pay interest and repay principal for debt in this category than in higher rated categories.
BB+	Speculative Grade. Debt rated 'Ba' has less near-term vulnerability to default than other speculative grade debt. However, it faces major ongoing uncertainties or exposure to adverse business, financial or economic conditions which could lead to inadequate capacity to meet timely interest and principal payments.
B+	Distinctly Speculative Grade. Debt rated 'B' has a greater vulnerability to default but presently has the capacity to meet interest payments and principal repayments. Adverse business, financial or economic conditions would likely impair capacity or willingness to pay interest and repay principal.
CCC	Debt rated 'Caa' has a current identifiable vulnerability to default, and is dependent upon favourable business, financial and economic conditions to most timely payment of interest and repayment of principal. In the event of adverse business, financial or economic conditions, it is not likely to have the capacity to pay interest and repay principal.
CC+	Bonds which are rated 'Ca' represent obligations which are speculative in a high degree. Such issues are often in default or have other market shortcomings.
C+	Bonds which are rated 'C' at Moody's and IBCA are the lowest rated class of bonds, and issues so rated can be regarded as having extremely poor prospects of over attaining any real investment standing.
D	Debt rated 'D' at Standard & Poor's is in default, or is expected to default upon maturity or payment date.

Secondly, measures should always be taken to minimise exposure. These can be achieved in a number of different ways, such as delivery versus payment, upfront collateral, options to terminate transactions and regular marking to market of specific transactions.

(iii) Risk-weighted cost of capital

Any risk should have an equal and opposite reward, otherwise it is not beneficial to the enterprise to take on the risk. Although this may seem very obvious it is interesting to note that a 1987 survey by the New England Economic Review (1987:22) of the largest US swap dealers revealed that 20 of the largest dealers did not consistently and methodically include a credit risk premium in quotes.

The following equations are examples of how costs could be incorporated into product pricing (Banks 1993:35):

$$Ts = RWCoC + CS + IHR$$

where

Ts = Total spread

RWCoC = Risk-weighted cost of capital

CS = Credit spread

IHR = Internal hurdle rate

$$RWCoC = k \times CoC,$$

where *k* is the risk-weighted capital attributable to the transaction and is calculated as follows:

$$\text{Capital ratio} = K / [RW * (Rf * N)],$$

where

N = Notional amount of the transaction

RW = Relevant risk-weighting assigned to the transaction

Rf = the risk factor[1] of the specific product

The capital ratio is the agreed capital requirements of the institution in terms of its policy. For banks this is usually 8%[2].

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[1] The risk factor (RF), is a measurement of the historical volatility of an investment. This is used to determine the possible future movement of the instrument, which in turn gives a certain confidence level in terms of cost sensitivity of possible default. It is therefore a means to quantify maximum market risk movements.

[2] Chapter 2, paragraph 2.1., *vide infra*.

The standard cost of capital (CoC) measure is the following:

$$CoC = K_d (1-t_c) * (B / B + S) + K_e (S / B + S)$$

where

K_d = Cost of debt

K_e = Cost of equity

t_c = Tax rate

B = Market value of debt

S = Market value of equity

The credit spread (CS) can be calculated as follows:

$$CS = N \times (Rf \times RS)$$

where

N = Notional amount

Rf = The risk factor of the transaction

RS = The required spread[3] of the given credit

The internal hurdle rate (IHR) represents the specific division's profit target. It can either be a constant or can be applied in similar fashion as credit spreads:

$$IHR = k \times \text{hurdle rate},$$

where *k* represents the capital acquired to support the transaction.

[3] The 'required spread' is the spread that is taken in credit quality. It is obvious that institutions of a better credit quality can borrow money at more favourable rate than institutions or enterprises of a lesser credit standing. The risk of lending to an enterprise with a riskier credit profile will be reflected in the pricing of the debt to that enterprise, i.e. the enterprise will have to pay a higher interest charge on its borrowings.

Two other charges may also be included in the spread calculation; firstly, the other spread required (OSR) which will cover liquidity, legal or hedging costs and secondly, the business overhead expense charge (BOE) which may be added, but is not necessary.

(iv) Maturity considerations

An important aspect of the credit risk process is the length of a transaction. It is obvious that the shorter the transaction, the shorter the time frame of exposure and hence the smaller the chances of default.

It is, however, important to understand the inherent risks in a transaction to qualify the risk of maturity. If a two year loan to a counterparty is compared to a five year fixed/floating interest rate swap to the same counterparty, the first transaction may pose a much greater threat to the lender although of a much shorter maturity than the swap. The swap in turn can be marked to market or even collateralised to reduce its maturity profile.

This necessitates a closer look at duration analysis, *vide supra*, to draw conclusions on the sensitivities of maturity profiles.

- *Risk equivalency*

A careful analysis of trading operations in a treasury environment will reveal that the majority of transactions are of a market risk type *vis-a'-vis* traditional unsecured lending. Furthermore, many of these transactions require dual performance, i.e. interest rate swaps where both parties have to perform in terms of the agreement. It is also true that many of these products carry some kind of security or collateral, i.e. government bonds.

These aspects therefore require some kind of risk adjustment process to measure market risk on the same basis as direct lending. This is necessary since management will allocate

a credit line of certain value to a specific counterparty. Risk equivalence is therefore the process of placing various risks on equal footing and to relate these risks to a single credit line. (Banks 1993:64.)

Risk equivalent exposure is therefore the risk factor of the product or instrument multiplied by the notional amount of the transaction.

If a broker/dealer enters into the sale of government bonds to a counterparty, the risk equivalent exposure can be calculated as follows:

Notional amount of transactions	= R50 000 000
Risk factor of government bonds	= 0,2%
Risk equivalent exposure	= R50 000 000 x 0,2%
	= R100 000

The exposure marked against the credit line of the specific counterparty will therefore be R100 000,00. Two issues influence the 0,2% risk factor; firstly the remaining time till maturity of the bond and secondly, the probability of default by the government on its debt instruments. It is more as a result of the latter that the risk factor is extremely low. In this instance a R50 000 000,00 government bond is equivalent to R100 000,00 worth of direct lending.

The effectiveness of a risk equivalency framework in an enterprise lies in its ability to effectively analyse the potential economic loss of each product in a given market. Risk equivalency therefore needs to incorporate aspects such as market liquidity, settlements and systems qualities as well as volatility of each product.

The risk factor that represents the risk equivalent exposure needs to mirror the volatility of the specific financial instrument, the confidence level with which that volatility is expressed and the maturity profile of that specific instrument. Since this factor forms the corner stone in accounting for risk equivalent exposure it is vital that any operation is confident that the component parts of the risk factor is a true measure of the risks of the underlying market.

3.6 Capital risk

- *Definition*

> *The essence of banking is to raise the return on equity by leveraging the bank's capital. In a broader sense this will apply to any enterprise - to take a risk on equity in order to increase the return. The purpose of bank capital is to cushion depositors and suppliers of debt capital against potential losses as a result of negative leverage. (Falkena 1989:149.)*

First principles of accounting define capital as the difference between the stated value of assets and liabilities. Capital risk is therefore the risk that this difference could be zero or less as a result of adverse market movements.

Considering the nature of treasury operations and its comprehensive exposure to market risk, the issue of market risk capital requirements needs to be analysed in more detail:

- *Market risk capital requirements*

In April 1993 the Basle Committee on Banking Supervision[4] issued for comment a paper entitled "The Supervisory treatment of market risks". This paper set out a framework for

[4] The Basle committee on banking supervision is a committee of banking supervisory authorities, which was established by the central bank governors of the Group of Ten countries in 1975. It consists of senior representatives of bank supervisory authorities and central banks from Belgium, Canada, France, Germany, Italy, Japan, Luxembourg, Netherlands, Sweden, Switzerland, the United Kingdom and the United States of America. (Basle 1995a:13.)

applying capital charges to the market risks incurred by banks, defined as the risk of losses in on- and off-balance sheet positions arising from movements in market prices.

The committee has concluded its reviews and has issued proposals on market risk capital. The proposals endeavour to set a models-based standard to measure market risk by defining a series of qualitative and quantitative standards. (BIS 1995a:8.)

By using internal models, institutions need to consider certain elements of a supervisory framework in its measurement process.

(i) Qualitative standards

The supervisory authorities stressed the importance of soundness and integrity of risk measurement systems and have considered the following qualitative criteria:

(a) Independent risk control units, responsible for the implementation of risk management systems.

(b) The implementation of regular back-testing programmes, i.e. ex-post comparisons of the risk measure generated by the model against actual daily changes in portfolio values.

(c) Senior management should be actively involved in the risk control process, affirm its importance and deploy sufficient resources to manage the process.

(d) The risk measurement model should be closely integrated in the day-to-day risk management process of the business.

(e) The risk measurement system must be used in conjunction with the trading and limits policies of the business, which necessitates a thorough understanding of the risk measurement system by the institution's traders.

(f) Regular programmes of stress testing should be implemented to expose the system's vulnerability to adverse activities.

(g) Regular programmes of compliance should be implemented.

(h) Both internal and external auditors should conduct independent reviews of the system; its integrity and application as well as compliance by its users.

(ii) Specification of market risk factors

The following is an extract of the view of the Basle Committee on Banking Supervision regarding market risk factors (Basle 1995a:12):

> *The risk factors contained in a bank's market risk measurement systems should be sufficiently comprehensive to capture all of the material risks inherent in the portfolio of its on- and off-balance-sheet trading positions. The risk factors should cover interest rates, exchange rates, equity prices, commodity prices, and volatilities related to option positions. Although banks will have some discretion in specifying the risk factors for their internal models, the committee believes that they should be subject to the series of guidelines set out in part B of the supplement.*

These guidelines can be summarised as follows:

(a) Interest rates

- The model should use a yield curve that is derived from a generally accepted approach, such as an estimation of forward rates of zero coupon yields.
- There should be a yield curve for each currency in which the bank has a material exposure.
- The model should be able to express exposure across the maturity of the curve in order to capture variation in volatility.
- The risk measurement system must incorporate separate risk factors to capture spread risk, i.e. the difference between swaps and bonds of the same duration.

(b) Exchange rates

- Risk factors should cover all currencies in which the enterprise has an exposure.
- Since all value-at-risk[5] positions are expressed in the home currency of the enterprise, any net position in foreign currency will introduce foreign exchange risk. Assuming an enterprise buys US dollars against Deutsche marks, but reports in rand. Although it has a long dollar, short mark position and has therefore taken a view that the dollar will strengthen against the mark, it still needs to calculate risk factors for the two underlying rand positions, i.e. Rand/USD and Rand/DEM.

(c) Equity prices

There should be risk factors for every equity market in which the enterprise has an exposure:

- Risk factors should preferably reflect indices to cover market-wide movement.
- Depending on the enterprise's level of equity involvement, factors should focus on sector specific indices or even individual stocks.

(d) Commodity prices

As with other markets, the extent to which risk factors will be defined, depends on the enterprise's involvement in the specific market. Risk factors should be calculated for each commodity in which positions are held.

[5] Value-at-risk can be expressed as an estimate of the likely maximum amount that could be lost on an enterprise's portfolio over a given time horizon at a given confidence level. This is dealt with comprehensively in chapter six.

(iii) Quantitative standards

Although models will vary by enterprise, certain minimum standards must apply to calculate the capital charge. The following are examples from the BIS (1995b:39) of minimum standards that need to be applied:

(a) Value-at-risk should be computed daily.

(b) In calculating value-at-risk, a 99th percentile, one-tailed confidence interval must be used. (This terminology is explained in detail in chapter six and refers to the normal distribution of sample estimates and the relevant confidence levels, *vide supra*.)

(c) A minimum holding period for value-at-risk purposes will be ten trading days.

(d) The choice of historical observation or sample period will be constrained, but will have a minimum length of one year.

(e) Data sets should be updated at least once every three months.

(f) No specific model type is prescribed, provided it captures all material risks.

(g) Banks will have the discretion to recognise empirical correlations within broad risk categories.

(h) Banks' models must accurately capture the unique risks associated with options.

(i) A minimum capital requirement must be met. This is expressed as the higher of, (i) the previous day's value-at-risk number measured according to the above-mentioned parameters and, (ii) an average of the daily value-at-risk measures on each of the preceding sixty business days, multiplied by a multiplication factor. The multiplication factor will be set independently by supervisors, based on their assessment of quality of the risk management system, subject to an absolute minimum of 3.

(j) A separate capital charge should be applied to cover specific risk of traded debt and equity where these risks are not incorporated in the model.

3.7 Country risk

- *Definition*

The evaluation of country risk has in recent years become a complex and specialised business in which global ratings agencies have become the professional advisers to the global providers of capital with respect to the risk of their sovereign investments.

Because this subject is so wide and deep in terms of the aspects that it covers to determine a sovereign risk profile, it is difficult to give an all-encompassing definition. Gastineau (1992:73) defines country risk as follows:

> *Legal, political, settlement, and other risks associated with a cross-border transaction.*

Country risk assessments are therefore an evaluation of all potential risks and inherent weaknesses and strengths, be they structural, financial, political, geographic or economic, in a country in order to determine the investment quality of a sovereign investment. Such a sovereign risk assessment is used by the providers of capital and investors alike, to quantify the value of their investments into such countries.

Country risk ratings are usually driven by a sovereign's desire to borrow money, denominated in foreign currency, which requires an evaluation of the country's ability to service the interest on that debt and to eventually repay the capital amount borrowed. In instances where countries have not been rated by a recognised ratings agency, investors would refer to informal risk assessments, which provide a guideline of the risk quality of a particular sovereign. A recognised ratings agency or institutions such as the World Bank Group or the International Monetary Fund can either provide these assessments. (IBCA 1998a).

- *Political and economic variables*

In recent years the global market has developed into two or three groups of countries, which determine the geographic location of the world's investment. Firstly, investors would ensure that the majority of their investments are invested into top tier industrialised countries of the world. These will include countries such as the United States of America, Canada, Japan, most of Western Europe and the United Kingdom. Although investment returns may not be as high as those in emerging economies, investments in these countries offer a high degree of political and economic stability. Secondly, investors are attracted to emerging economies or developing countries. This group of countries, which include the South American bloc, the ASEAN (Association of South East Asian Nations), the Eastern European bloc and SADC (Southern African Development Community) offer riskier investment opportunities, but obviously greater investment returns. The third group of countries represents those economies that are under-developed and where limited infrastructure exists to accommodate global investment flows. These countries would typically include many African countries and small sovereign islands.

In order for a country to be regarded as a sound economic risk, it should demonstrate an ability to sustain political stability within a well-formulated legal and regulatory framework. This should be combined with a sound judicial and administration system that ensures good corporate governance and optimal financial transparency. (IMF 1998a.)

In developing countries it is necessary to foster focused trade liberalisation policies, which should include the lifting of trade barriers, such as the protection of specific industries through excessively high tariffs and the limitation on the importation of specific goods and services. In terms of financial sector reform, country risk is heightened by an inability of a country to remove monetary controls. In many countries these controls are required because of weak banking and financial systems. Controls usually prevent the free flow of

cross-border financial transactions, which deters many foreign investors and also limits the development of the financial system.

Issues such as public enterprise restructuring, privatisation, as well as civil service reform and capacity management also directly affect country risk. In terms of public enterprise restructuring, governments should be decisive and progressive in terms of commercialisation and privatisation of non-core government enterprises (Treasury Management International 1995:51). Enterprises within a government portfolio should be operated on a fully commercial basis, with market-based pricing and employment decisions, as well as management autonomy and accountability. Governments should also demonstrate a sustained ability to manage the capacity of its civil service. Civil services are usually too large and incapable of flexible change. Wage restraint and rigid compensation systems mostly drive the inertia, which does not allow for attractive and performance-based remuneration. Governments therefore have difficulty in competing with the private sector to attract skilled personnel. The civil service is thus often demoralised and prone to corruption, which in turn fuels the system of poor and ineffective administration. (IMF 1998a.)

Not all sovereigns are islands and countries that are part of a continent should be mindful of their responsibilities towards that geographic region. Regional integration and economic co-operation are drivers that can contribute towards regional economic and political stability, which in turn would positively influence regional and sovereign risk (Euromoney 1993:147). The issue of sovereign risk and the assessment thereof contain a vast number of variables and nuances that determine the risk quality of a country or region.

- *Accessibility of financial markets*

Market access is one of the primary drivers in determining a sovereign's ability to accommodate global investment flows. In this sense the market refers to all markets and not only the financial markets. For example, a country should be able to offer an acceptable level of logistical infrastructure for the importation and exportation of goods. Many other issues need to be considered to determine whether a country can provide market access; however this thesis specifically considers access to the financial markets.

A key issue to foreign participants in a specific economy is the ability of the financial market to provide liquidity. Investors and speculators need to be assured that in times of a crisis investments or speculative asset holdings can be liquidated at a fair market price. The size of the market, i.e. the number of instruments that could be bought and sold across the spectrum of a specific market like the equity or currency market, is often less important than the depth of the market. The depth of the market refers to the ability of the market to withstand large-scale sales or purchases of a specific instrument or group of instruments without an excessive widening of the gap between the bid price and the offer price of the particular instrument.

Two further aspects determine market accessibility and are no less important than the issue of liquidity. Firstly, many markets operate under a given set of exchange controls, which dictate the size and nature of cross-border transactions and often limit or prevent foreign investment. Secondly, investors place a strong emphasis on fiscal and monetary policies and the application thereof. In this regard it is necessary to consider issues such as trade and capital account liberalisation; gross foreign reserves – how is it accumulated and how is it spent; the rate of savings and investments, which incorporates government policies to attract greater investment and to promote savings.

More and more pressure will be placed on developing economies to adhere to global standards of trade, investment and financial policy as the process of globalisation gains momentum. The IMF has initiated a programme to bolster access to developing economies, especially in view of the recent Asian crisis. This programme proposes a new architecture, which will lead to more openness of economies and greater surveillance of banking and financial systems. The IMF has also published a consultation paper, which deals with the issues a Special Data Dissemination Standard (SDDS). The paper proposes the discussion of issues such as gross international reserves, reserve-related liabilities, financial derivatives and other foreign exchange liabilities. (IMF 1998b.)

It is therefore clear that international monetary authorities are insistent on establishing global standards to which all countries should adhere in terms of global investment flows. Countries that fail these standards as a result of political instability, fiscal inertia or excessive monetary controls will find it difficult to further develop its markets because it would not attract investment capital and therefore it would not be able increase its attraction as an investment opportunity.

3.8 Systems and operational risk

Although systems and operational risks are as important as those risks discussed in the preceding paragraphs, it is only briefly mentioned as a close to this chapter to complete the analysis of risk. These two issues are of such substance that it would form the basis for a much wider risk management discussion, which falls outside the immediate scope of this thesis.

- *Systems risk*

Technological advances in recent years have lead to significant increases in transaction volume and complexity. Systems must not only support the smooth functioning of the business, but must also act as an independent check on the activities of traders and originators of transactions.

In summary, systems can be divided into three risk areas, namely processing, accounting and technology (Citicorp 1989:40).

(i) Processing

- Control points must be in place for day to day processing of all phases of the transaction process.
- The system must be able to cope with cyclical volume and staff must be geared for additional work load.
- Training for new products and systems must be done in advance of implementation and in conjunction with originators.
- Duties and accountability must be delineated for operations personnel and procedures must be properly documented. Separation of functions must be provided and sufficient checks and balances must be installed to ensure that procedures are adhered to.

(ii) Accounting

- Proper procedures must be in place to deal with incomplete sub-ledgers and outstanding reconciliations.
- Supervisory personnel should follow up ageing of outstanding reconciliations.
- Excesses and limit contravention should be noted and reported on a daily basis.

(iii) Technology

- Planning for new systems must be rigorous and in line with the institution's global technology strategy. Any purchase of software or hardware should meet given minimum acceptance criteria. Software should be evaluated and tested to ensure that it performs in terms of its specifications and that it is compatible to technology in use in the business.
- User involvement in systems design and testing must be guaranteed. User training should be sufficient to ensure minimum performance levels.
- Testing of new systems must be exhaustive and supplier involvement and after sales service must be incorporated in purchase agreements.

- *Operational risk*

Operational risk is the risk that the variables that constitute the operation may be flawed and consequently house economic loss. Operational risks can be categorised in two broad areas, namely people and the operational framework.

(i) People

The most essential ingredient in the success of any business is the quality of its people. This is even more true in an environment where people are authorised to take on huge risks on behalf of the enterprise - to the extent that a large part of the capital base is at risk to be lost if markets move adversely. (Taguiri 1995:10.)

People in trading positions need to have qualities such as competence, imagination and integrity. The system within which the people operate need to meet certain criteria of which the following are examples:

- Specific appointment processes for all traders.
- On-line management by chief traders.

- Separation of functions between trading units, administrative support and accounting.
- Strong hierarchical risk management functions.
- Independent policy formation.
- A structured regime of risk limits and approval acquirements.

To avoid risks of professional and personal misconduct, management will institute a philosophy and policy regarding the behaviour that is expected of personnel. Aspects that need to be addressed include general commitment of staff, confidentiality of trading information, ethical conduct and a guide to trading room practices and procedures.

(ii) Operational framework

Finally, operational risks need to consider aspects such as legal, tax and regulatory risks that may impede on the day- to-day business.

Legal risks are usually prevalent where new products are developed or where new agreements need to be established to trade with new counterparties. Sufficient legal counsel should be seeked to ensure that risks of economic loss through legal misrepresentations are kept to a minimum.

Tax and regulatory risks should be well understood in the institution's domestic environment, but could pose problems when institutions expand operations into foreign countries.

These risks are usually increased in countries that are relatively unstable and sovereign reports of rating agencies of the relevant countries should be researched to establish future regulatory patterns.

3.9 Conclusion

Many aspects of risk have been discussed in this chapter, of which none are more important than the other. What is important however, is the understanding by enterprise management of those risks that pertain specifically to the respective enterprise. In this regard the importance of the specific risks should be evaluated and prioritised in order to ensure that the enterprise's various exposures to risk are addressed in a way that is meaningful and understandable to the stakeholders of the enterprise.

Some of these risks may have little or no influence on the enterprise's performance whereas others may materially influence the daily operations of the enterprise. With this in mind, management is reponsible towards the stakeholders of the enterprise to give evidence of its efforts to identify and control risks. Risk analysis should therefore be a comprehensive process, which includes both the qualitative and quantitative aspects of risk identification and management.

In many respects this process will ensure that the enterprise operates off a solid base in as far as its general operations are concerned. This will be achieved because of the fact that management would have succeeded in instilling a risk identification mentality across its operations. Although this thesis is not geared towards the pure risk management philosophies of the financial markets, it is necessary to illustrate the pertinent issues of risk management, especially in terms of their influences on accounting.

The purpose of this chapter is to consider a number of market risks, and in particular their influences with respect to accounting issues. This aspect is dealt with in greater detail in ensuing chapters.

Finally, enterprises should be properly structured to *measure* risk; it should be sufficiently resourced to *manage* the identified risks; and it should be equipped in a manner that will effectively *monitor* those risks (Bryant 1997:1.34).

In terms of measurement, management should be aware that both qualitative and quantitative risks should be measured and that this process should include both direct and indirect risk exposures. The more exhaustive this process can be, the more objective the subsequent management process will be.

Once all risks have been measured, both within and around the enterprise, an effective risk management plan should be deployed. This plan should be dynamic and sufficiently flexible to adjust to the cyclical and economical changes that may impact the enterprise. This process will only be as good as the continuous monitoring and reporting process that the enterprise follows to report on its risk performances. It is in respect of this reporting requirement and especially so from an accounting perspective that much global uncertainty exists as to the proper accounting of financial risks.

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Chapter 4

Valuation of financial variables

4.1 Introduction

In order to fairly present the financial performance of any treasury operation, it is necessary to express an opinion on the correctness of the valuation techniques and formulae used in calculating the results of the financial activities of the operation. For purposes of this thesis, the extent of the analysis is limited to those financial variables that form the cornerstones of financial instruments used in treasury operations. In the ensuing paragraphs a number of concepts will be briefly reviewed to provide the base from which calculations will be presented.

One of the distressing factors of financial market operations, is that yields on different instruments are rarely quoted on the same basis. It is therefore difficult to compare returns, which makes the evaluation process that more complicated.

Many reasons exist for this phenomenon, of which the following are mere examples:

- Some instruments are sold on a discount basis, whereas others bear interest.
- Yields on some instruments are quoted on a 360-day year basis and others on a 365-day year.
- Accrued interest is calculated in different ways, i.e. semi-annual based on actual days per annum or quarterl y based on 360 days per annum.

Compound interest calculations assume a series of cash flows before maturity of the investment and adds reinvestment income of the earlier cash flows, assuming that the cash

flows are reinvested. Certain financial instruments, such as money market securities, bills, bankers acceptances and commercial paper are sold on a discount basis. These instruments do not pay interest and are sold on a discount to their face value, while redeeming the face value at maturity. The rate of discount earned on discounted paper always understates the rate of retum earned on a simple interest basis.

For purposes of South African interest rate calculations, it should be noted that the formulae must be changed to accommodate the South African convention of calculation, i.e. actual days over a 365-day year, whereas the United States calculate actual days over a 360-day year.

The term 'mark-to-market' describes the process of valuation to determine the change in economic value of the portfolio, position or transaction due to changes in market factors.

This gives management a clear and objective evaluation of profits and losses arising from the assumption of price risk. The overall philosophy of applying mark-to-market rules is to simulate the orderly liquidation or hedging of price risk in positions. In other words, the prices used for valuing positions must represent an unquestionable best-effort estimate of those price levels at which positions could realistically be liquidated or hedged.

To define market risk, it is necessary to consider the value-at-risk (VAR) in any portfolio. Value-at-risk can be defined as the expected loss from adverse market movements with a specified probability over a particular period of time (Beckström 1994:22).

The choice of confidence interval and time horizon may vary between different instruments or markets, and will be a matter of policy for different institutions. Policy must set parameters for the amalgam of assumptions, which will include confidence levels, time

horizons, volatility and correlation. These issues are dealt with in broad detail in chapter six, *vide supra.*

4.2 Valuing fixed income yields

There is always one discount rate where the present value of a bond's cash flow exactly equals its market value. It is that discount rate which makes the present value equal to its market price, i.e. yield-to-maturity.

- *Definition*

Yield to maturity can best be defined by drawing a comparison between a bond investment and an investment in an equivalent savings account. In the instance of a semi-annually compounded savings account in which the investor makes a deposit equal to the bond's current market value the withdrawal of funds from the savings account in accordance with the bond's coupon schedule, will not influence the capital value of the savings account at redemption. However, three key points need to be reviewed where this analogy breaks down. (Homer 1972:84.)

Firstly, the investor can usually withdraw from a savings account at will whereas in the case of a bond, a specific income stream is purchased. Secondly the savings account does not present continuous availability of the savings rate, unlike the bond which presents a known coupon, but an unknown reinvestment rate. Finally, with a savings account the principal is known and available on notice, whereas with a bond, the investor knows that the bond market offers opportunity and risk with respect to capital values prior to maturity.

While these problems prevent the yield-to-maturity from being a final measure of investment value, it nonetheless serves as a convenience yardstick of relating cash flows to market prices.

- *Accrued interest*

When a bond is purchased for delivery on a coupon date, the coupon will be paid in its entirety to the seller, while the buyer purchases the bond without any fraction of a coupon being due. However, as the delivery date extends beyond the coupon date, the seller is increasingly giving up an accrued fraction of the next coupon payment and becomes entitled to some form of compensation from the buyer. This compensation is referred to as the bond's *accrued interest*. By convention, the accrued interest is computed as the coupon payment multiplied by a fraction of a semi-annual period corresponding to the time held beyond the last coupon date. (Faure 1994:6.)

The accrued interest represents the growth in the interest component of a bond's value as the date of purchase approaches the next coupon payment date. In South Africa a further convention needs to be considered for price calculation purposes. The bond registers of issuers close one month prior to the interest payment date, which results in bonds sold with interest (cum interest) prior to the last day to register (date on which register closes) and bonds sold without interest (ex interest) during the last month until the interest payment date. (Faure 1994:18.)

- *Bond prices*

The standard price formula for bonds with a tenor of six months or longer to redemption is as follows (Faure 1994:20):

$$\left(V_i\right)^{\frac{d1}{d_2}} \cdot \left[\frac{1}{2} \cdot C \cdot \left[\left(a_n\right)^i + e\right] + 100 \cdot \left(V_i\right)^n\right] \quad = \textit{All-in price}$$

where

d_1	=	number of days from settlement date to next interest date
d_2	=	number of days from last to next interest date or from settlement date to next interest date if settlement date falls on an interest date
i	=	Yield at which stock trades
V_i	=	1/(1 + i/200)
	=	present value of 1 payable in 6 months' time
C	=	coupon percentage
n	=	number of complete six month periods from next interest date to redemption date
a_n^i	=	$(1 - V_i^n)/(i/200)$
	=	present value of an annuity of 1 per six months, payable in arrears.
e	=	1 if the stock is cum-interest and
		0 if the stock is ex-interest

Accrued interest	=	$(d_2 - d_1 / 365) \times C$ (if cum-interest),
	=	$(- d_1 / 365) \times C$ (if ex-interest),
Clean price	=	All-in price - accrued interest.

Faure explains the application of the above formulae by using the following example (Faure 1994:21):

Example 4.1: Bond calculation

Coupon (payable half-yearly)	:	12% per annum
Coupon payment dates	:	15 March & 15 September
Redemption date (maturity)	:	15 September 1998
Yield to redemption	:	13,50% per annum
Settlement date	:	20 July 1994
Nominal value	:	R1 000 000,00

The all-in price in respect of cum-interest is calculated as follows:

$$\left(V_i\right)^{\frac{d1}{d_2}} \cdot \left[\frac{1}{2} \cdot C \cdot \left[\left(a_n\right)^i + e\right] + 100 \cdot \left(V_i\right)^n\right] \quad = \textit{All-in price}$$

= $[(0,9368)^{0,3096}]$ [6 ((1 - 0,5930)/0,0675) +1) + 100(0,5930)]

= 0,9800 [6((0,4070/,0675) + 1) + 100(0,5930)]

= 0,9800 [6 (6,0296 + 1) + 59,30)]

= 0,9800 [6(6,0296 + 1) + 59,30]

= 0,9800 [42,1776 + 59,30]

= 0,98 (101.475)

= R99,445

If the bond was purchased on 20 August 1994, the all-in price would be R94,600, the difference being the ex-interest effect.

In this example the accrued interest is calculated as follows:

(184 - 57) / 365 x C

= R4,175

The clean price is therefore the all-in price minus accrued interest:

R99,445 - R4,175

= R95,270

In the case of the ex-interest purchase the clean price is calculated as follows:

R94,600 - (-R0,855)

= R95,455

The *running yield* is a rough measure of the annualised return on a bond investment and is calculated by the ratio of the coupon to the clean price:

0,12 / 0,95455

= 12,57%

Where bonds are purchased beyond the penultimate coupon date only two aspects need to be considered in calculating the all-in price:

- number of days to maturity,
- the last coupon payment.

All-in price = $(1 + c/2) / [1 + (d / 365 \times i)]$

where,

c = annual coupon rate

d = number of days from settlement date to maturity date

i = yield to redemption

- *Total realised compound yield*

Given the uncertainty of the levels of future interest rates, it is necessary to clarify certain issues regarding yields and prices on investments. Any investment compounds interest at the agreed yield, only until the investment or parts thereof are paid back to the investor. In the case of a bond purchase with a fixed coupon and a fixed redemption date, the price is calculated as the discounted cash flow stream of the coupons to maturity, discounted at the market yield. (Homer 1972:120.)

If future reinvestment rates during the life of the bond are less than the purchase yield, then the realised compound yield for the whole life of the bond will be less than the purchase yield; if future rates are higher, then the realised yield will be more than the purchase yield. The realised compound yield supplements yield-to-maturity in two ways - by including interest-on-interest for the full life of the investment at various assumed rates and by including interim price fluctuations (Homer 1972:121). Every bond offering can be related to four interest rates:

(i) The coupon rate,

(ii) The yield-to-maturity,

(iii) The assumed reinvestment rate and

(iv) The realised compound yield, which is derived from the first three rates.

The total realised compound yield is a statement of the total cash flow derived from an investment, i.e. the future value of the investment expressed as an annualised interest rate.

4.3 Valuation of derivatives variables

A comprehensive study of derivatives pricing and the complete analysis of pricing models fall outside the scope of this thesis; however, it is necessary to consider the origins of derivatives pricing in order to draw conclusions on the economic value of derivatives for accounting purposes. The paragraphs that follow will therefore focus on the component parts of derivatives pricing models and their impact on option prices.

- *The binomial model*

The binomial model is based on the expected price of an instrument over a specific period. At the end of this period the price could either be higher, lower or the same than at the start of the period. The binomial model assumes that only two outcomes are possible; the probability of an up or down move is governed by the binomial probability distribution.
The binomial option pricing model is not necessarily meant to be realistic. The number of possible prices at expiration is unlimited in reality. However, the model's importance lies in its usefulness to explain the process by which option prices are determined and not to explain real world option prices.

In order to explain the single-period binomial model, consider an environment with a single stock priced at S, on which call options are available (the same will apply to put options). The call has one period remaining before it expires. At expiry the stock can assume one of two values; it can go up by a factor of u or down by a factor of d.

If it goes up, the stock price will be S_u, which equals S(1 + u), and if it goes down the stock price will be S_d or S(1 + d). Assuming a stock price of 50, an appreciation factor of 10% and a depreciation factor of 8%, the stock prices at the end of the period can be the following:
50 (1 + 0,10) = 55 or 50 (1 + (-0,08)) = 46.

Consider a call option on the stock with an exercise price of E and a current price of C. When the option expires it will be worth either C_u or C_d. Since at expiration the call price is its intrinsic value:

$$C_u = \max [0,S(1 + u) - E] \text{ and}$$

$$C_d = \max [0,S(1 + d) - E].$$

If both stock prices resulted in the option expiring in-the-money, the option would not be very speculative; however, it would still be correctly priced by the model. To illustrate pricing more clearly, variables are chosen so that the option has a chance of expiring out-of-the-money.

Assume that $S(1 + d) < E$, i.e. if the stock price goes down, the option will expire out-of-the-money. Also assume that $S(1 + u) > E$, i.e. if the stock price goes up, the option will be in-the-money.

The risk free interest rate can be defined as the interest earned in a riskless investment over a time period equal to the option's remaining life. (Chance 1989:111.) The risk free rate is identified by the symbol r. The formula for the theoretical option price, C, is developed by constructing a riskless portfolio of stock and options. The riskless portfolio is called a *hedge portfolio* and consists of h shares of stock and a single written call. The model provides the hedge ratio, h. The current portfolio value is defined as V, where

$$V = hS - C$$

At expiration, the portfolio value will be either V_u, if the stock goes up or V_d if the stock goes down (Chance 1989:115):

$$V_u = hS(1 + u) - C_u$$

$$V_d = hS(1 + d) - C_d$$

If the same outcome is achieved, regardless of price movement, the position is riskless. Then $V_u = V_d$ and:

$$hS(1 + u) - C_u = hS(1 + d) - C_d$$

Solving for h:

$$\frac{C_u - C_d}{S\cdot(1 + u) - S\cdot(1 + d)} = h$$

$$= C_u - C_d / S_u - S_d$$

Since the values of S, u and d are known, the values of C_u, C_d and h can be determined. One aspect still needs to be considered: the risk-free return on investment. The portfolio's current value grows at the risk-free rate:

$$(hS - C)(1 + r)$$

The two values of the portfolio at expiration (V_u and V_d) will be equal because it is hedged. Any value could therefore be selected to calculate the formula by setting it equal to the original value of the portfolio (V(1 + r)).

$$V_u = V(1 + r)$$

$$hS(1 + u) - C_u = (hS - C)(1 + r)$$

Substituting the formula for h and solving this equation for C, gives the option pricing formula (Chance 1989:117):

$$C = [\, pC_u + (1 - p)\, C_d \,] / (1 + r)$$

where,

$$p = (r - d) / (u - d)$$

The formula gives the call option's price as a function of the variables C_u, C_d, p and r.

This is illustrated in example 4.2.

Example 4.2: Option price calculation

A stock has a price of 60; after one period it can go up to 69 (a 15% increase), or it can go down to 48 (a 20% decrease). Assume a call option with an exercise price of 50, and assume a risk-free rate of 10%. Therefore:

$S = 60$

$E = 50$

$u = 0{,}15$

$d = -0{,}20$

$r = 0{,}10$

$C_u = \text{Max}\,[0, S(1 + u) - E]$

$= \text{Max}\,(0, 60(1 + 0{,}15) - 50]$

$= 19$

$C_d = \text{Max}\,[0, S(1 + d) - E]$

$= \text{Max}\,(0, 60(1 + (-0{,}20)) - 50]$

$= 0$

The hedge ratio, h, is:

$$h = (C_u - C_d) / (S_u - S_d)$$

$$= (19 - 0) / (69 - 48)$$

$$= 0{,}9048$$

The hedge therefore requires 0,9048 shares of stock for each call.

The value of p is:

$$p = (r - d) / (u - d)$$

$$= [0{,}10 - (-0{,}20)] / [0{,}50 - (-0{,}20)]$$

$$= 0{,}857$$

then

$$1 - p = 1 - 0{,}857$$

$$= 0{,}143,$$

therefore

$$C = [19 (0{,}857) + 0 (0{,}143)] / 1{,}10$$

$$= 14{,}80.$$

Thus, the theoretically correct call price is 14,80.

Given the single-period binomial model, only two outcomes are possible, as is illustrated in figure 4.1. However, by adding a second period, the outcomes are increased as illustrated in figure 4.2. (Chance 1989:120.)

Figure 4.1: Single-period binomial model

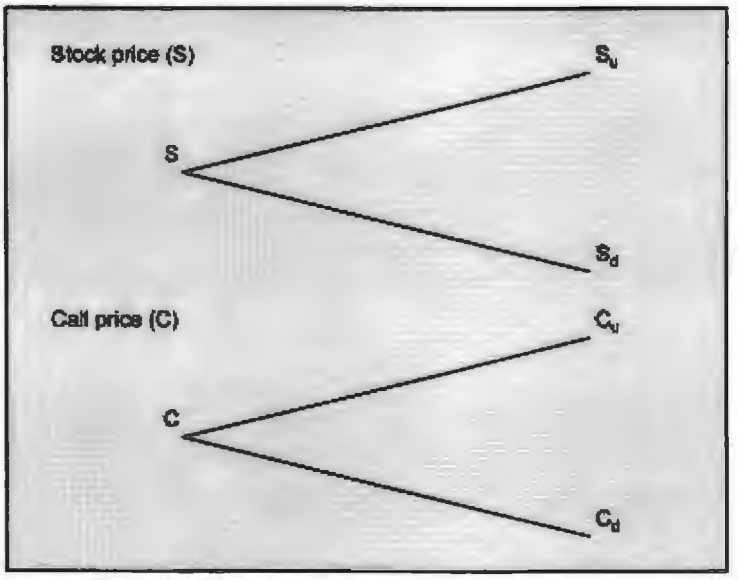
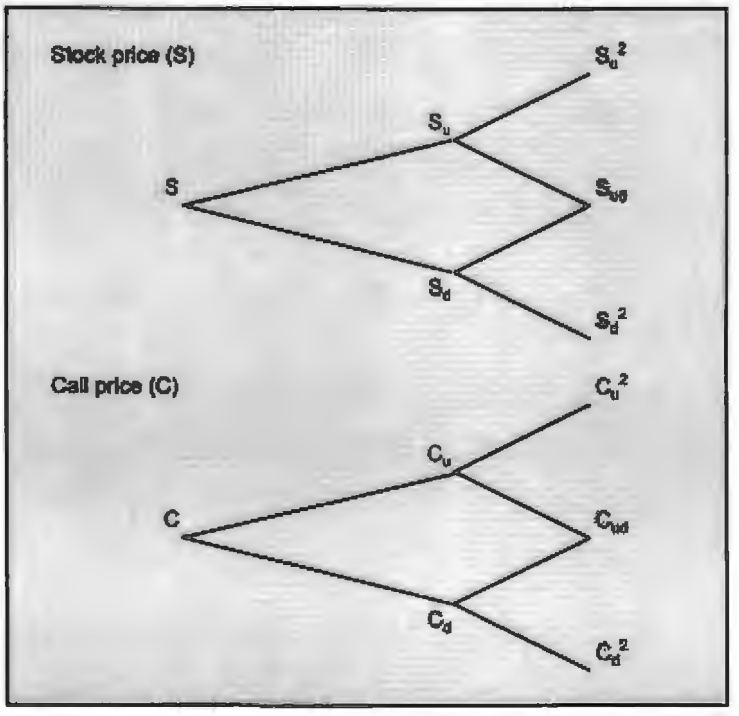


Figure 4.2: Two-period binomial model



The theoretical option price for the two-period model is found in the following formula (Chance 1989:122):

$$C = [p^2C_u^2 + 2p(1 - p)C_{ud} + (1 - p)^2C_d^2] / (1 + r)^2$$

This formula illustrates that the call's value is a weighted average of its three possible values at expiration, two periods later. The denominator $(1 + r)^2$, discounts this figure back two periods to the present.

- *The Black-Scholes model*

In 1973, two professors at the Massachusetts Institute of Technology, Fischer Black and Myron Scholes, published an article in the *Journal of Political Economy* (Chance 1989:124) that presented a formula for pricing an option. The formula, which became known as the Black-Scholes option-pricing model, was one of the most significant developments on the pricing of financial instruments.

Although the Black-Scholes model did not evolve directly from the binomial model, it is a mathematical extension of it. The binomial model can be extended to any number of time periods and is not limited to the two-period illustration in *figure 4.2.* It is not the objective to analyse the mathematical validity of the Black-Scholes model, but to analyse the model's assumptions regarding risk exposures and how to account for it. This is further elaborated upon in chapter six, *vide supra.*

If it is assumed the n-time periods equal infinity and r is the risk-free rate of return over each time period, it is obvious that each time period will be very small and that the possible price outcomes at the end of each period will be infinite. Although the equations for the extended binomial model and the Black-Scholes model are the same, the binomial model had not even been discovered when Black and Scholes began examining some early research on option pricing. They derived their model from a branch of mathematics known as Stochastic Calculus.

The Black-Scholes model assumes the following:

(i) The rate of return on the stock follows a log normal distribution.

(ii) The risk-free rate and variance of the return on the stock are constant throughout the option's life.

(iii) There are no taxes or transaction costs.

(iv) The stock pays no dividends.

(v) The call options are only exercisable on expiry.

As a result, the following formula was derived (Jorion 1997:136):

$$S\cdot\left(e^{-yt}\cdot N(d_1)\right) - K\cdot\left(e^{-rt}\cdot N(d_2)\right) = C$$

where

$$\frac{\ln\cdot\frac{Se^{-yt}}{Ke^{-rt}}}{\sigma\cdot\sqrt{t}} + \frac{\sigma\cdot\sqrt{t}}{2} = d1$$

and

$$d_1 - \sigma\cdot\sqrt{t} = d$$

where

$N(d_1)$, $N(d_2)$ = cumulative normal probabilities,

σ^2 = annualised volatility of the continuously compounded return on the stock,

other variables are all the same as for the binomial model.

- *Determinants of option prices*

The five inputs to the Black-Scholes model are the stock price, exercise price, risk-free rate, time to expiration and volatility. The stock price, the exercise price and the time to expiration are directly observable. The risk-free rate and the volatility need to be investigated further.

The risk-free rate

A simple risk-free rate assumes only annual compounding, whereas a continuously compounded rate assumes that interest compounds continuously. A simple rate can be converted to a continuously compounded rate by taking the natural logarithm of 1 plus the simple interest rate.

If the simple interest rate is 6% and the amount invested is 100; 100 invested at 6% for one year becomes 106. The equivalent continuously compounded rate is ln(1,06) = 0,0583. Therefore 100 invested at 5,83% compounded continuously grows to 106. To convert a continuously compounded rate to a simple rate, the exponential function is used:

$$e^{0,0583} - 1 = 0,06.$$

Table 4.1 presents a range of option prices at different risk-free rates (Chance 1989: 135). This table illustrates that the estimate of the risk-free rate is not particularly critical to pricing the option correctly.

Table 4.1: Black-Scholes prices using different risk-free rates

Risk-free rate	Black-Scholes price ($)
0,01	5 477
0,02	5 550
0,03	5 624
0,04	5 698
0,05	5 773
0,06	5 848
0,07	5 924
0,08	6 001
0,09	6 078
0,10	6 155
0,11	6 234
0,12	6 313
0,13	6 392
0,14	6 472

where:	
S =	164
K =	165
sigma =	0,29
t =	0,0959

Volatility

The volatility used in the model is defined as the standard deviation of the continuously compounded return on the stock. Obtaining a reliable estimate of volatility is difficult, and the model is also very sensitive to volatility estimates. There are two volatility estimates, historical volatility and implied volatility.

The historical volatility estimate is based on the assumption that the volatility that prevailed over the recent past will continue to hold in future. To calculate historical volatility, a sample of returns of stock prices over a given period is converted to continuously compounded returns. The standard deviation is then computed.

Assume a series of J, continuously compounded returns, where each return is identified as r_t^c, and t goes from *1 to J*.

The mean return is calculated as (Chance 1989:33):

$$\sum_{t=1}^{J} \frac{1}{J} \cdot \left(r_t\right)^c = \bar{r}^c$$

where the volatility is

$$\frac{\sum_{t=1}^{J} \left[\left(r_t\right)^c - \bar{r}^c\right]^2}{J-1} = \sigma$$

which equals

$$\frac{\sum_{t=1}^{J} \left[\left(r_t\right)^c\right]^2 - \frac{\left[\sum_{t=1}^{J} \left(r_t\right)^c\right]^2}{J}}{J-1}$$

The sum of the squared deviations is divided around the mean by *(J - 1)*. This is necessary in order for the estimate of the sample volatility to be an unbiased estimate of the population volatility.

Implied volatility is the standard deviation that makes the Black-Scholes price equal to the option's current market price. Since the Black-Scholes equation cannot be solved for the standard deviation, the solution is obtained by plugging in values of *s* until finding the one that makes the Black-Scholes price equal to the market price.

4.4 Futures

In an ever expanding world of global financial trading, and the risks that are brought about, it has become increasingly necessary to deploy accounting systems and controls that can cope with fast changing derivatives complexities. An inability to do just this may have dire consequences for any business, as was clearly illustrated by the demise of Barings, Daiwa and Banka Baltija (Jorion 1997:23). Explaining the risks and the inherent accounting weaknesses that lead to the Barings debacle lies at the heart of the problem that many institutions face, and becomes the overriding purpose of this study.

To form an opinion regarding the apparent lack of accounting control in the Barings case, it is necessary to illustrate the role of futures markets in global trading as well as to understand futures pricing and hedging.

- *The role of futures markets*

The role of financial futures in an open market economy can be divided into two basic economic functions, namely

(i) Price discovery and

(ii) Hedging.

(i) Price discovery

The prices of money generated by the interest rate futures markets reflect the combined views of a large number of buyers and sellers as to the current supply/demand situation and the relationship of prices 12 to 18 months hence (Powers 1991:7).

However, it is not a constant or true prediction of future prices that will hold true at all times; it is rather an expression of opinions concerning today's expectations of future interest rates, commodity prices or the prices of money. As conditions change, opinions change

and subsequently prices of the underlying instruments. This does not make the market less useful, instead, supply and demand volume as prices change are better indicators of future prices than singular predictions.

(ii) Hedging

A major benefit of futures trading is that it can be split from underlying exposures. Financial markets distinguish two types of participants, those who have risk, but do not want it (hedgers) and those who do not have risk, but want it (speculators). Hedging refers to the action of neutralising price risk (Powers 1991:8). The futures market is therefore used to neutralise price risk on the underlying interest rate, commodity or currency exposure by entering into futures contracts that will provide the protection that adverse price movements may bring about on the underlying exposures.

A borrower of funds, concerned that interest rates may rise over the next three months, will sell the number of futures contracts that will equate to the underlying borrowing for the corresponding period over which the rate rise is expected. However, should rates fall, the borrower will, the "loss" incurred on the futures contracts will be offset by the reduced borrowing costs.

- *Futures pricing*

Although financial futures prices will track the price of the underlying instruments, it will not necessarily equal the cash or spot price. Futures prices will either track above or below the cash price, and this resultant differential is referred to as the cost of carry.

The cost of carry is defined as the difference between the cost of financing the purchase of the underlying asset and the benefits of holding the asset until maturity of the futures contract (Carpenter 1991: 60).

In the instance of a futures contract maturing in three months' time and where the underlying asset is a bankers acceptance (BA), the following cost of carry will prevail:

Assume the BA has a market value of R100, short-term interest rates are 12% and BA's are trading at 8%. The cost of financing the purchase of the BA over a three-month period will be R100 x (12% x 3/12) = R3. Whereas the benefits of holding the BA for the same period will only be R100 x (8% x 3/12) = R2. Therefore, the net cost of carry over the three-month period will be R1. Thus, the fair price of the three-month BA-future will be R101.

Cost-of-carry could also be positive, since the slope of the yield curve determines this cost. If the yield curve had been upward sloping, longer-term yields would be higher than short-term rates and hence result in a positive carry. Consequently futures prices would have traded at a discount to the cash market.

The difference between the cash-market price and futures price is generally referred to as basis. On the delivery day of the futures contract, the cash price and futures price should be equal, since the futures contract has now become a cash transaction. In the period leading up to delivery, the basis will narrow since the cost of carry reduces over the shortening time period. This process is known as basis convergence (Carpenter 1991: 62).

The relationship between the futures price and the cash price of an asset is expressed in the following equation (Carpenter 1991: 62):

$$F = S + R - C$$

where,

F = Fair futures price,

S = Cash price,

R = Financing cost,

C = Holding benefits.

Financing costs are a function of the cash price, the short-term rate of interest (r) and the time remaining to delivery (t). The equation will thus read as follows:

$$r = S + S.r.t - S.c.t.$$

$$= S [1 + (r - c)t]$$

- *Stock index futures*

It falls beyond the scope of this thesis to give a comprehensive analysis of the risk management attributes of futures and their pricing peculiarities. The scope is limited to the accounting of such instruments, however, given the intense focus on stock index futures through the Barings scandal, it is necessary to elaborate on this instrument for background purposes.

Futures contracts written on stock market indices are known as stock index futures. The major distinction between stock index futures and most other financial instruments is the concept of cash settlement. When stock index futures expire, they are settled in cash, based on the closing value of the underlying index. This is market convention, since it is very difficult and very costly to collect the shares that constitute the stock index in order to force physical delivery.

Stock index futures can be used in a variety of ways by individual investors and portfolio managers, both for risk management and outright speculation. The speculative potential is enormous because of the leverage afforded by the contracts. The margin required for participating in stock index futures contracts is around 10% to 15% of the contract's value. This is far below the margin requirements on individual securities.

The following example illustrates the return calculations of a futures trade:

Example 4.3: Futures trade

A speculator is of the opinion that a positive run is imminent on the S&P 500. The standard S&P 500 contract size is $500,00 and assume an index level of 300 and a futures price of 304.

Margin posted is calculated as follows:

Futures price:	304
No. of contracts:	5
Value of purchase:	304 x 5 x $500
	= $760 000
Margin required:	$760 000 x 0,15
	= 114 000

Assume a risk in the index from 300 to 315, and a futures price of 317.

Profit is calculated as follows:

Futures price:	317
Sell 5 contracts:	317 x 5 x $500
	= $792 500
Profit from transaction:	$792 500 - $760 000
	= $32 500
Return on investment:	$32 500/$114 000
	= 28,50%

The leverage is illustrated in comparing the return earned above to the return generated by a fund replicating the S&P 500 index. The index moved from 300 to 315, thus yielding a return of 5%.

Hedging with stock index futures

Not only do stock index futures provide speculative leveraging; they also act as a good hedging instrument for portfolio managers. To understand stock index hedging, it is necessary to consider certain aspects of portfolio theory.

Firstly, it is necessary to disaggregate the risks inherent to an equity portfolio into hedgeable and non-hedgeable risks.

The total risk of any security consists of two components; a market risk component (systemic risk) and a non-market risk component (unsystemic risk). The systemic risk of a security is the economic factors that influence the price; examples are inflation, interest rates, the cycle of the specific industry and the economic structure of the specific company. The cumulative effect of these economic factors is summarised in a variable known as the *beta coefficient*. This variable measures the sensitivity of the return on the security, to the return of the market portfolio (Powers 1991: 119). A beta coefficient of 1,5 indicates that a 10% increase in the market portfolio will result in a 15% increase in the relevant security.

The unsystemic risks of securities are those risks inherent to the company; such as the death of key personnel and the possibilities of major lawsuits. The factors giving rise to both types of risks are unpredictable, however, portfolio's can be constructed whereby unsystemic risks are neutralised, leaving the portfolio exposed to hedgeable risks only.

The following example illustrates the calculation of a beta-weighted hedge:

Example 4.4: Beta-weighted hedge

A portfolio manager holds a $100 million equity portfolio. The beta coefficient of the portfolio is 1,35 with respect to the S&P 500 index. The current level of the index is 323,55 and the futures contract is 328,00, expiring in two months.

The beta-weighted hedge is calculated as follows (Powers 1991:200):

No of contracts to short = Beta x Portfolio value / contract value

= (1,35 x 100 000 000)/(500 x 328)

= 823,17

The hedge will therefore be 823 contracts.

Assume a decline in the S&P 500 to 295, with a resultant decline in the cash value of the portfolio to $87,64 million.

The net position is calculated as follows:

Hedge profit and loss = [End portfolio value - Start portfolio value] + [(No. of contracts x $500) x (Sale price - purchase price)]

= (87 640 000 - 100 000 000) + (823 x 500)x (328 - 295)

= $1 219 500

A beta-weighted hedge recognises that the hedged portfolio shows a greater sensitivity to economic factors than the index on which the futures contract is written, hence the provision of more effective protection.

Arbitrage with stock index futures

Arbitrage trading exists to take advantage of profitable opportunities that arise as a result of mispricing of a relevant market or index. One such opportunity arises with spread trading between two different indices. However, successful spread trading requires a thorough

understanding of the long-term price relationship between securities and the reasons why short-term discrepancies may occur. (Powers 1991:202.)

The following correlation table illustrates the arbitrage opportunity of the USA's, Major Markets Index (MMI) to the S&P 500:

Table 4.2: Correlation between MMI & S&P 500

MMI to S&P 500	
1-day	0,909
1-week	0,943
2-week	0,944
4-week	0,955

It appears that the correlation coefficient increases as the time interval increases. This suggests that pricing discrepancies exist over short intervals of time.

Example 4.5: Arbitrage calculation

A spread trader believes that the market is poised for a big upward move, lead by the blue chip shares. He consequently puts a spread in place, going long the MMI futures and short the S&P 500 futures. Since the dollar values of the contracts vary, it is necessary to calculate a spread ratio.

Spread ratio = $ value of S&P500 futures / $ value of MMI futures

= ($500 x 306) / ($250 x 505)

= 1,212

This translates into approximately 5 MMI contracts for every 4 S&P 500 contracts. The spread trader would simultaneously be long 5 MMI contracts and short four S&P 500 contracts.

If the rally did materialise as expected, the following profit would be realised:

Buy 5 MMI contracts @ 505,

Sell 4 S&P 500 contracts @ 306.

After rally:

Sell 5 MMI contracts @ 525,

Buy 4 S&P 500 contracts @ 310.

Profit:

[$250 x (525 - 500)] + [$500 x (306 - 310)]

= $5 000 - $2 000

= $3 000.

In this example the expected rally pushed the MMI up by 20 points, whereas the S&P 500 only responded with a four-point risk. However, the correlation coefficients suggest that the S&P 500 will catch up over time, and hence the importance of timing to unwind the trade.

4.5 Conclusion

The issue of valuation is again discussed in chapter six, when more emphasis is placed on value-at-risk and techniques to determine the accounting exposure of a market risk position. In conclusion to this chapter it is appropriate to review a number of issues.

Financial markets are a mass of inter-linked products and instruments, and these products and instruments should not be viewed or evaluated in isolation. Although this was the case in this chapter, it is admitted that instruments have varying levels of influence on each other and that the relationships that exist between instruments should influence the decision-

making process in the enterprise in terms of market participation and hedge objectives. This is further amplified by the integral relationship of derivatives to the underlying instruments, on which they are based. An understanding of the valuation process should be seen in view of the market as a whole and that the enterprise should value its global exposure to the markets, rather than individual exposures to specific instruments.

As a result of the immense liquidity and opportunity brought about by the development of derivatives instruments, enterprises are much better positioned to manage risk exposures. The judicious use of financial instruments could vastly improve the financial quality of the enterprise, however, it creates an unparalleled risk to malpractice and misuse. This is not only evident in the numerous financial scandals of our time, but is fuelled by the immense leveraging opportunity through derivatives purchases and sales.

The buyer of an option only requires a fraction of the cost of the underlying instrument to benefit from the full value of favourable price movements of that instrument. By the same token the seller of an option receives only a small reward for the risk of being exposed to the massive cost of adverse price movement of the underlying instrument.

Enterprises should therefore ensure that their participation in the financial markets is properly managed, valued and reported on. In this regard financial models should be tested for validity, and that the numbers presented for accounting purposes reflect the actual exposures of the enterprise to the market.

There is a constant need for the enterprise to perform optimally and to ensure that it remains competitive in terms of the market in which it operates. Furthermore the world is increasingly become a single market, which will place more pressure on enterprise to be innovative and dynamic to maintain market share. It is in this regard that enterprises cannot ignore the application of financial instruments to improve their own competitiveness, which

almost forces them to expand their knowledge and use of financial instruments. More demands will therefore be made on the advisors to these enterprises to evaluate and comment on the use of financial instruments by the enterprise.

To this effect accounting bodies and regulatory authorities should be at the leading edge of developing accounting frameworks within which financial instruments should be defined and evaluated.

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Chapter 5

An analysis of present accounting guidelines for financial instruments

5.1 Introduction

The rate of development of financial instruments and related derivatives in the global financial markets has resulted in the development of a void between transactors in the financial markets and those who account for their activities. In this regard recognised accounting bodies are attempting to find accounting solutions for the complex products and financial structures originated in the financial markets.

Considering the size of the global financial markets it is becoming increasingly important that regulators and those bodies that have a responsibility to users of financial information are not only adept with developments in the financial markets, but also become sufficiently proficient in the application of financial instruments so that meaningful opinions can be expressed on financial outcomes.

The following statistics illustrate the magnitude of the markets that support the trading in financial instruments. These are mere examples of specific pockets in the financial markets and do not constitute the universe of the financial markets industry. In the week ending 30 May, 1997, turnover in European debt instruments alone exceeded USD 922 billion (ISMA 1997), that is more than USD 184 billion per day. In 1996 the total turnover of futures contracts of the major futures exchanges exceeded 1 651 million contracts (Financial Mail 1997:404). Given an average contract size of USD 100 000, the monetary value is vast. In South Africa, daily foreign exchange turnover is estimated by the South African Reserve Bank to amount to approximately USD 6,5

billion (SARB 1997:17) with bond transactions in South African bonds exceeding on average USD 4 billion per day (Bond Exchange Journal 1997).

In a singular transaction, the Brooklyn Union Gas Company and Long Island Lighting Company have purchased a US dollar 4,5 billion Libor swaption (a swaption is an option on a swap; it gives the buyer of the swaption the right to fix the rate of interest on a given stream of cash flows for an agreed tenor). It was done in a single day and the derivatives house split it into five parts and auctioned it off at half-hour intervals. The premium cost was US dollar 60 million, for an amortising structure with an average life of twenty two years. (IFR no. 1194, 1997:103.)

These are merely examples of trading statistics, considering that markets such as the US debt market, commodities markets, the Asian markets as well as the expansive currency markets have not been included. The only conclusion to be drawn from these numbers is that sufficient care should be taken in the microcosm of a specific industry or market to understand its variables and to apply reasonable care in evaluating the underlying financial results.

It is therefore imperative that the people responsible for trading activities in a specific market are focused and aligned to the activities of that market to ensure that trading objectives are properly accounted for and that profits and losses are properly monitored.

From an accounting perspective it is necessary to find a coherent framework that is practical and provides validity to financial information as well as ensuring consistency in this complex environment. Where trading activities have very little relevance to historical events and where treasury operations are geared to facilitate both present and future transactions, it is necessary to introduce concepts supplementary to that of historical cost accounting.

- *Trading objectives*

Activities in the market can have two origins; firstly, a proprietary position, based on anticipated market movements and secondly, an action to hedge specific underlying exposures.

I. Proprietary position-taking

In any financial operation a process of budgeting exists to assist management in planning the financial well-being of the business. This is also the case in treasury operations that have as main objective the generation of incremental earnings. The budgets can therefore be regarded as a quantification of the financial goals of the treasury operation. On a broader scale, strategic plans will be made to perhaps enter new markets, eg. agriculture futures, or to expand operations into other financial centres.

Risk/reward calculations need to be made to establish the relationship between the profitability of instruments traded and the underlying risks of open positions. This aspect is closely aligned to the cycle of a specific market. If the capital market is in a rising interest rate cycle, strategies that require the purchase of bonds will not be profitable and it is therefore necessary to draw up a framework of economic forecasts as well as trading guidelines in the design of strategies.

It is primarily the responsibility of a treasury operation to manage the funds and cash requirements of the business. It therefore needs to ensure that it can maintain the liquidity position of the business at all times and that funds are not caught up in proprietary trading positions (Falkena 1989:82).

Although proprietary trading positions generate substantial income, banks have a responsibility to their clients to act as intermediary in the financial markets. Agency and broking business can also generate healthy incremental income, but is more important to the bank as an identifier of funds flows. It is not possible for an enterprise to understand the trend of a specific market unless it is aware of the actions of the market users. If gold producers take a view on the dollar against the rand

and start selling dollars, the rand will strengthen against the dollar and it is therefore vital that an enterprise with dollar exposure be aware of these activities, otherwise it could be adversely affected by market movements.

From a proprietary trading point of view, consideration should be given to leveraged or structured trading. These are trades that will be leveraged through option strategies to generate incremental income if markets move in a certain direction; it will in many cases place a cap on potential losses if markets move adversely.

II. Hedged transactions

Contrary to proprietary trading, the objective of hedging is to minimise losses or contain costs on market exposures. It will therefore be the objective of management to issue guidelines to the treasury regarding, the scope of the enterprise's activities in financial markets; the extent to which these activities need to be hedged; and the required hedge accounting.

The scope of the enterprise's activities

Unlike banks that are willingly participating across markets for financial gain, commerce and industry are exposed to financial markets as a result of their underlying activities. Gold producers are therefore exposed to commodities, exchange and interest rate markets as a result of the fact that their decision-making process is influenced by these variables, which decisions will ultimately determine the levels of profitability of that enterprise. Likewise, companies involved in the supply of telephone systems and cabling will have an exposure to copper, and because future prices for copper can be accessed they need to evaluate their exposure to copper, and whether to hedge those exposures. The management of an enterprise therefore need to carefully consider all aspects of the underlying business and determine the extent to which the business is exposed to the spectrum of commodity, exchange, interest rate and equity prices.

The extent to which these activities need to hedged

Hedging and risk management strategies are as numerous and diverse as the instruments and markets that they are supposed to protect. A requirement of any hedge is that it will substantially reduce exposures to price movement of the instrument that is being hedged and that any adverse price movement in the underlying exposure is inversely reflected in the hedge instrument.

Hedging strategies need to consider the aspect of flexibility. No strategy is foolproof and it is therefore necessary that strategies can be turned around on adverse market movements. The strategy that is most successful is not the one that is the most expensive to implement, but the one that costs the least to adjust. Many institutions and corporations shy away from derivatives and always point to the failures of the market. Barings is a point in case, but management should also consider the benefits of derivatives in successful hedging strategies. The simple rule in applying derivatives in strategies is to evaluate the cost and to understand the rights and obligations that are acquired through a derivatives transaction.

In designing hedging strategies caution must be paid to market cycles and their impact on the business. It is important to design the strategy in such a way that it adheres to the market cycle. An importer of goods that is exposed to dollar appreciation against the rand, will be foolish to cover all commitments if there is a distinct possibility that the market cycle indicates further dollar depreciation against the rand. Such a covered position may have significant opportunity cost implications for the importer and may result in a price disadvantage compared to its competitors.

Hedge accounting

This issue has been raised in a number of opinions amongst market users and accounting bodies, and are dealt with in great detail throughout the ensuing paragraphs. The debate on hedge accounting still continues and is illustrated by the recent article published in the International Finance Review (IFR) (IFR 1189, 1997:128), of which the following paragraphs are extracts:

The FASB's four fundamentals are: derivatives are assets and liabilities and should be reported on the financial statements; fair value is the most relevant measure of financial instruments; only items that are assets and liabilities should be reported as such in financial statements; and special accounting for items designated hedged should be provided only for qualifying transactions.

Revisions include an expanded description of the hedging relationship and the entity's risk management objectives and strategy. The description will include discussion of the entity's risk management objective and strategy and its method for assessing the effectiveness of the hedge.

The revised approach specifies that the carrying amount on an item recognised in a fair value hedge should be equal to the gain or loss on the hedging derivative, adjusted to remove any hedge ineffectiveness. The new approach also requires immediate earnings recognition of the gain or loss accumulated under a cash flow hedge only if the hedge is discontinued because a forecast transaction becomes unlikely.

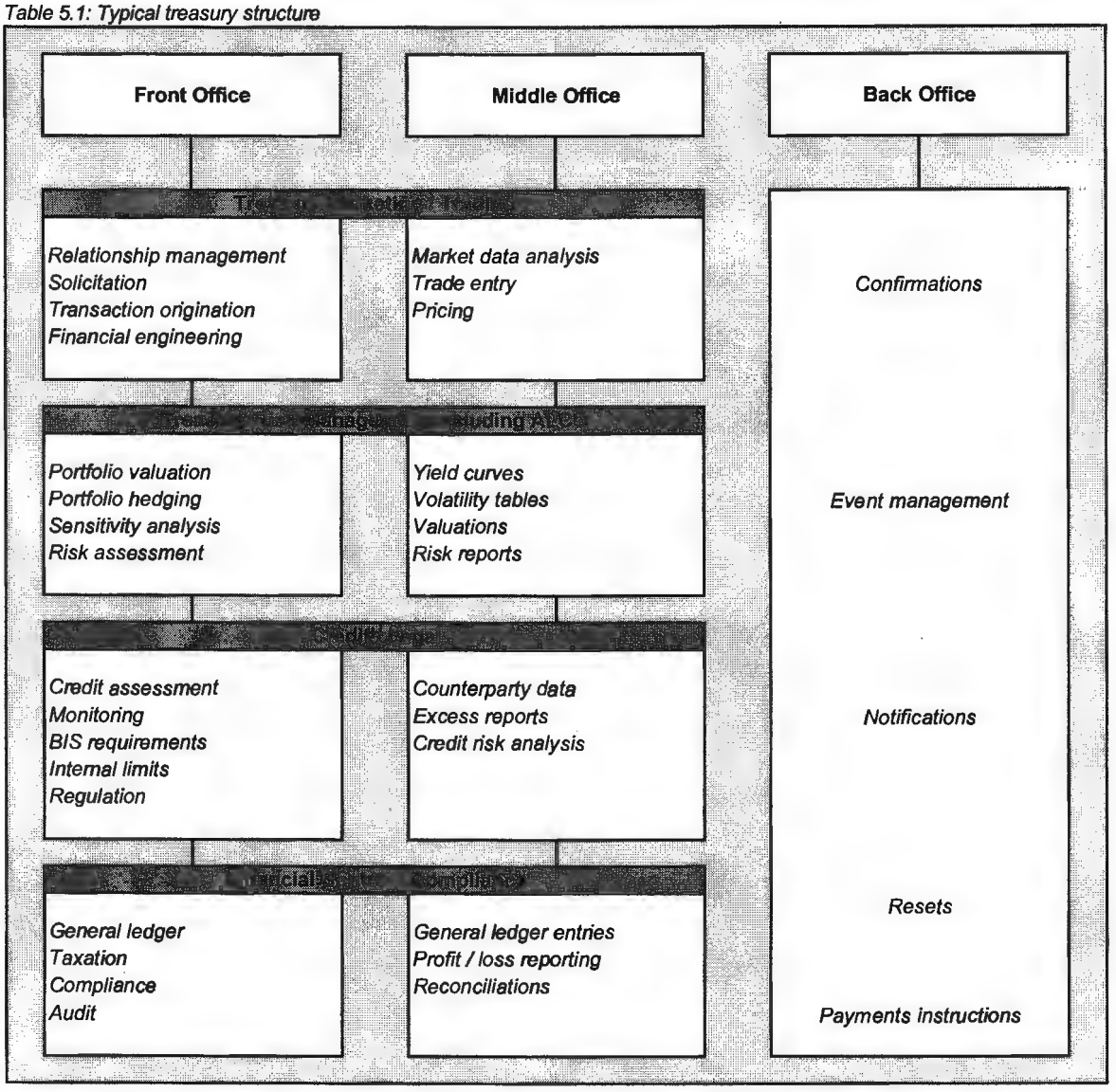
It is therefore necessary to consider the number of accounting options available to account for open positions and the relevant hedges and to arrive at acceptable conclusions within the framework of the present debate.

- *Practical considerations*

Treasuries can be structured in many different ways, but the essence of any structure is to effectively account for a fast moving, dynamic trading environment in which literally billions *(vide infra)* of dollars change hands every day. It is the incorrect or improper accounting of these trades, as was the case with Barings Bank, that can result in financial losses of vast proportions.

The diagram set out in table 5.1 is an example of how a treasury could be structured and endeavours to enforce the concept of divisionalisation, in order to enhance transparency in terms of the accounting of differing financial instruments (Risk 1993:35).

Table 5.1: Typical treasury structure

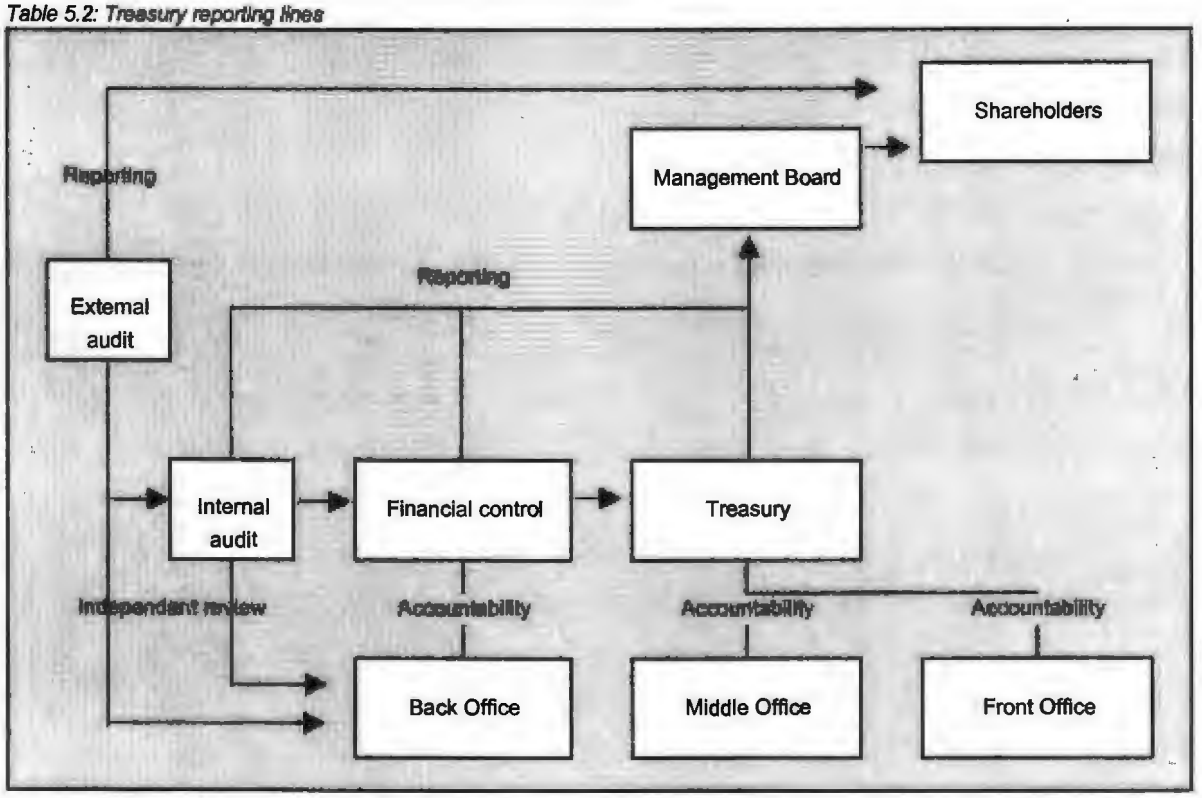


First principles of auditing and internal control confirm the importance of division of duties and the independent accounting of transactions. Although the back office functions should be accountable to treasury regarding the correct and timeous recording of transactions, it should report the results independently to financial control.

It is obvious that the internal control function will operate independently from the financial control function and in close liaison with the external auditors. The internal audit department should report directly to the management board.

A graphic analysis of the reporting and accountability responsibilities may look as follows (Citicorp 1989:10):

Table 5.2: Treasury reporting lines



- *Operational issues*

Certain operational issues need to be considered in order to add to greater transparency of the treasury accounting process. These issues are important, since their applications form the cornerstones of treasury information. First, technology issues need to be analysed as a result of the increasingly important role it plays in financial markets. Second, certain comments are made about pricing and concern the extreme volatility it brings about in terms of the accounting for financial instruments.

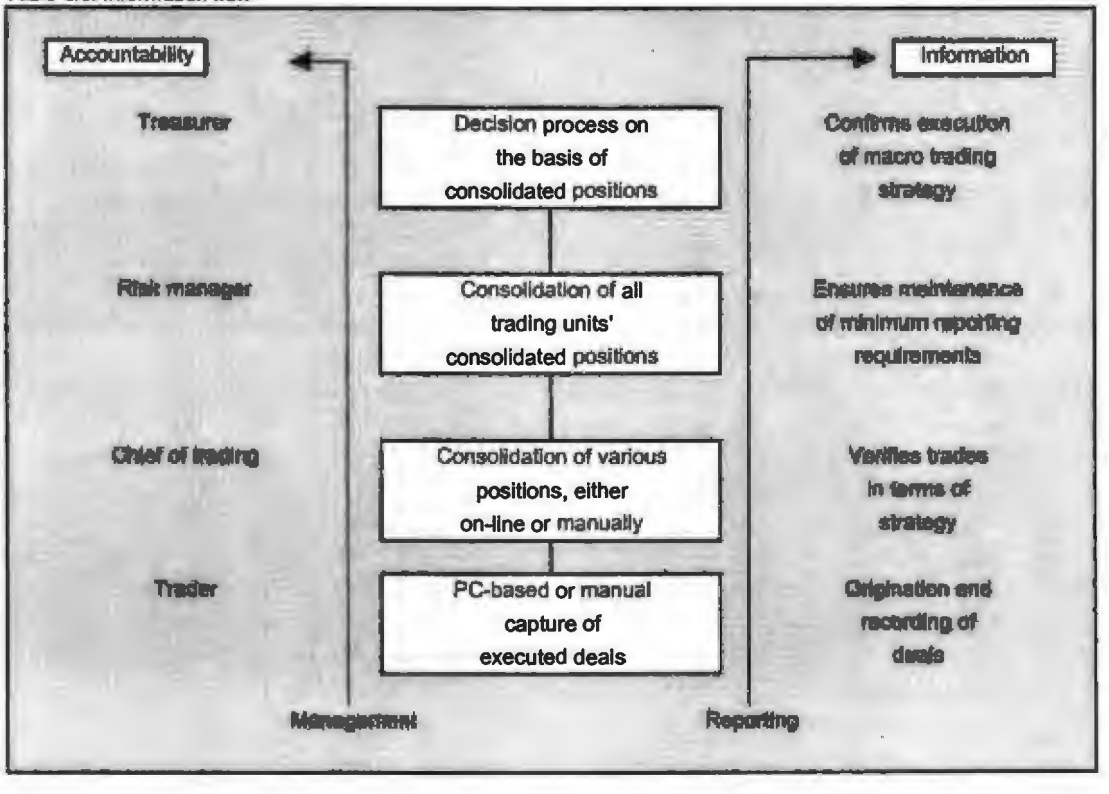
I. Technology requirements

In a perfect world the level of technology in a treasury will enable management to access the operation's balance sheet and observe how price movements in the financial markets impact assets and liabilities on a real-time basis. However, an imperfect world will cause treasury managers to accept a blend of technology and off-line reporting processes to manage the enterprise's money.

It is, however, necessary to have access to certain minimum technology standards, and in the very least have computer-processing power to account for all day-to-day transactions. This will in turn assist the risk manager to report on the risk exposures on a daily basis.

Ideally software programmes analysing assets, liabilities, income and expenditure should be implemented at an operating unit level. This will enable unit heads to verify costs and earnings under their responsibility. The availability of local area networks will provide a mechanism to consolidate the results of the various operating units. The essence of technology applications should be to enhance transparency of activities to management and is explained in table 5.3.

Table 5.3: Information flow

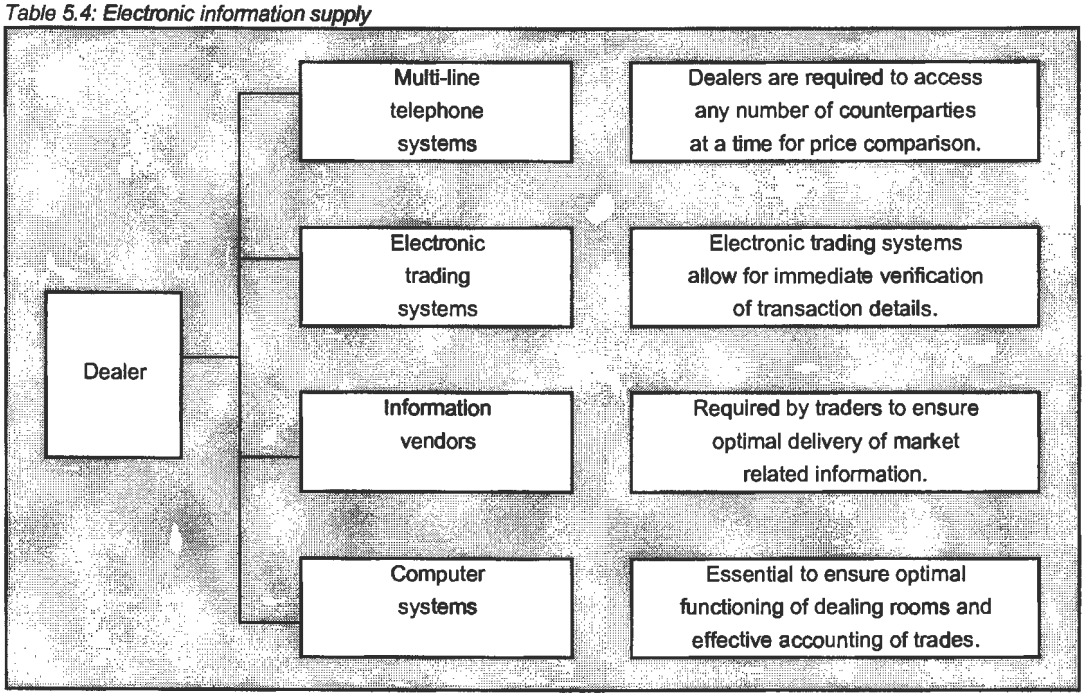


Minimum technology requirements should facilitate the input of daily transactions, updating of accounts and the generation of any number of reports, i.e. profit and loss, excesses and audit trails (Citicorp 1989:22).

Given the importance of pricing and the recording of open positions, it is vital that the technology system supporting the operation meets management's information demands.

Table 5.4 illustrates basic technology requirements (Markets 1997:20).

Table 5.4: Electronic information supply



It is the successful integration and application of these tools that will ensure that informed and carefully calculated decisions are taken in fast-moving financial markets.

In addition to front office dealing requirements, a host of risk management models and software packages are available to manage the underlying risks of trading operations. Systems and software costs are further increased by the demands that derivatives trading place on technology advancement.

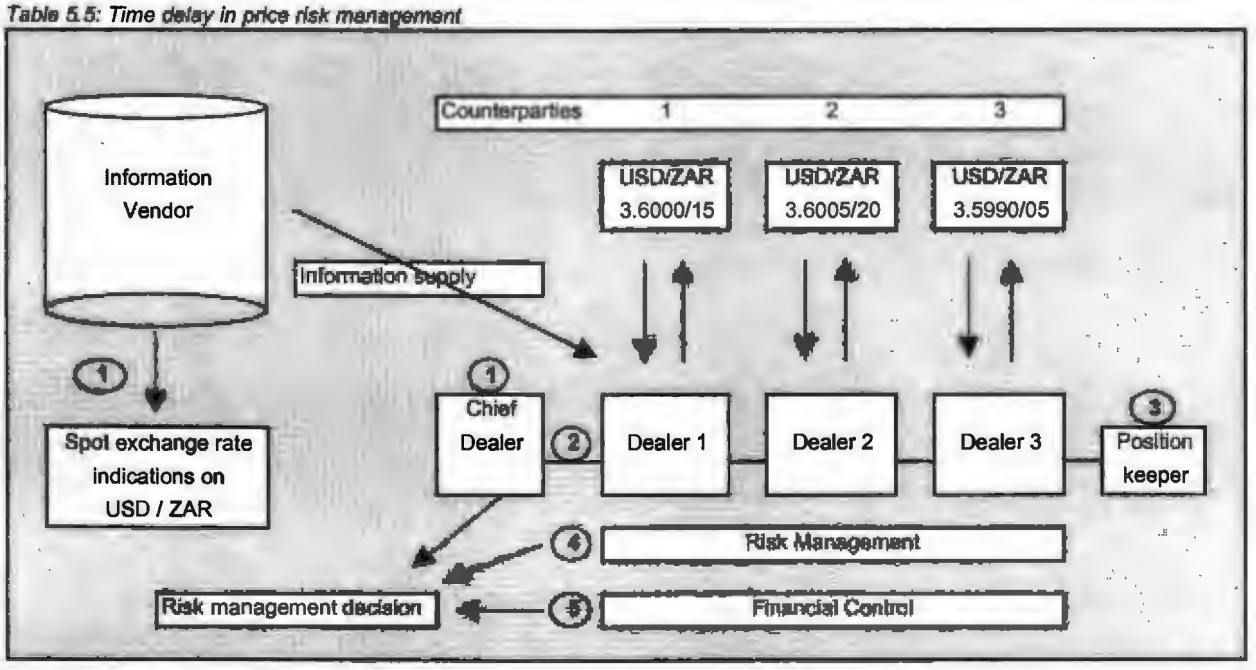
II. Pricing

The single most important fact in any treasury operation is its direct exposure to price movement. If it trades in a market, it is constantly exposed to the prices of the instruments of that market; markets with greater volatility will therefore cause greater changes in risk exposures.

The quicker the operations reflect price changes on positions, the better it will be able to make informed risk management decisions. Conversely, the longer it takes for an operating unit to update trade positions and price movements, the more difficult it is for management to take decisions on trading activities.

Effective real-time recording of trades and price changes demand extensive computing power and software technology. This is obviously very costly, yet the cost of not having real-time management capabilities may prove very expensive over time. The following diagram graphically illustrates the problem of time delay in price risk management.

Table 5.5: Time delay in price risk management



1. Through electronic information supply and based on market experience, the chief spot trader decides to buy $10 000 000,00, "against the rand"[1]. Since it is market convention to trade in $3 000 000,00 parcels at a time, he asks assistant 1 to request a price in $4 000 000,00 from counterparty 1. He instructs assistants 2 and 3 to obtain prices from counterparties 2 and 3.

   Within seconds the bank will be "long"[2] of $10 000 000,00 against the rand at the following prices:

   $4 000 000,00 @ 3,6015

   $3 000 000,00 @ 3,6020

   $3 000 000,00 @ 3,6005

2. The assistants will record their various positions and update the details in the deal capturing system. This can be done in two ways; either through an electronic deal trading system that records all the details as the deal takes place between the enterprise and the counterparty or manually by the dealers, after the deals have been concluded. If an electronic deal capturing system is used, it is only of true value if it can be compatible with the enterprise's own systems. If this is not the case, the deals captured will still have to be recorded manually into the global system.

3. It may happen that deals are not captured immediately, which will result in positions in the treasury that are not accounted for in the enterprise's books of account. It is the responsibility of the position keeper to ensure that every single transaction is tracked so that management is aware of the enterprise's overall risk position.

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[1] The term "against the rand" is market jargon that refers to the counter currency that is bought or sold. "Sell GBP 10 against the Mark" means that a trader wants to sell Pounds Sterling 10 million and buy the quivalent of Deutsche Marks.

[2] The term "long" is market jargon which refers to the acquisition of currency and therefore the creation of an asset. Conversely the term "short" refers to the sale of currency, or the creation of a liability, if there was no underlying currency asset.

4. It is the responsibility of the risk manager to promote and install technology that will enhance the risk management process. If it is assumed that deals are only recorded twice a day, it is obvious that he deals with old information when taking decisions. It is therefore necessary to employ systems or to have programmes written that will accelerate the process of deal capturing from its origination time through reporting to management.

5. Likewise, financial control needs to be aware of adverse market movements and the effects that it may have on the bank's total profitability. However, on-line real-time pricing from a pure accounting perspective may be excessive from an overall management point of view.

Pricing can therefore be categorised as follows:

Front office trading	-	on-line-real-time pricing of open positions
Middle office management	-	on-line-near-time recording of prices, but real-time recording of volumes
Financial control	-	closing prices of instruments, but with management updates of major adverse movements, resulting in excesses

Price movement is the essential ingredient of any treasury operation. It is price movement that causes volatility and subsequently adverse or benign movements in income and expense streams. Price changes and accounting for the effects of price changes on the financial position of an enterprise form the very subject of this thesis. The ability of an enterprise to effectively account for such price changes and proper disclosure of the effects thereof will essentially achieve two very important accounting objectives:

First, decision / information value uses, namely enabling users of financial statements to assess the ability of an enterprise to generate cash and of the timing and certainty of such cash generation. Second, contractual accountability / stewardship uses, namely the accountability of management to

its owners for resources entrusted to them and the effectiveness of management's performance. (IASC 1997:144.)

5.2 The effects of changes in foreign exchange rates - exposure draft 109

The objective of the new exposure draft is to bring the South African statements in line with international standards and has been primarily based on International Accounting Standard, number 21 (IAS 21). It is intended to replace the existing South African accounting statement, AC112, *Accounting for the effects of changes in foreign exchange rates*. The proposed statement ignores hedge transactions as part of the underlying transaction, which is treated separately. Furthermore the proposed statement requires transactions to be raised at the spot rate on the transaction date, whereas AC112 allowed the use of a variety of rates. The proposed new statement requires more comprehensive disclosure than AC112 and gives better guidance on classifying foreign operations.

Furthermore, a discussion paper released by the International Accounting Standards Committee (IASC), entitled *Accounting for financial assets and financial liabilities*, was released in March 1997. The object of this paper was to propose a reasoned framework that will provide the basis for the development of one or more accounting standards. It also acknowledges the fact that present accounting standards are flawed and that problems in current accounting should be addressed to improve the accounting of financial instruments. (IASC 1997:4.)

In the following paragraphs certain concerns are raised regarding particular issues presented in ED109. These are reflected in paragraph 20 of the statement, which deals with investments in foreign entities, as well as paragraph 5 of the Technical Release, which deals with forward exchange contracts. (SAICA 1997:5,15.)

- *Investments in foreign entities*

  Paragraph 20

  Exchange differences arising on a foreign currency liability accounted for as a hedge of an enterprise's net investment in a foreign entity should be classified as equity in the enterprise's financial statements until the disposal of the net investment, at which time they should be recognised as income or as expenses in accordance with paragraph 38.

Paragraph 38 deals with disposal of the foreign entity and the resultant gains or losses at the time of disposal.

Paragraph 20 refers to the existence of foreign currency liabilities, incurred to set off (hedge) the foreign currency investment. The paragraph proposes that exchange differences incurred on such liabilities be accounted for as equity in the financial statements of the enterprise.

The question arises whether gains or losses arising on transactions deemed to be hedges against foreign equity investments should be accounted for as equity or not. Again this paragraph creates the opportunity for management to manipulate accounting treatment in order to achieve specific financial results in any given period. It is possible to raise a foreign loan for working capital purposes, but then account for it as a hedge against a foreign equity investment. This is further illustrated in example 5.1.

Hedging may take place in many different ways and may not always be specifically linked to a foreign entity, although the exchange result will be neutral.

Example 5.1: Offsetting of working capital loan against equity investment.

A South African enterprise invests USD 10 million in a US company for investment purposes. Assume a spot exchange rate of USD 1 = ZAR 4,4. Should the rand appreciate against the dollar the investment will be worth less. If after a year the enterprise wishes to sell its investment and the exchange rate is 4,2, it will realise ZAR 2 million less. If at the same time it obtained a one-year

USD loan of USD 10 million to fund its local operations, it would have effectively nullified the exchange loss incurred in the investment, by having to repay USD 10 million with ZAR 42 million instead of ZAR 44 million. Although the loan acts as a natural hedge against the equity investment it should be considered on its own particular merits as a financing instrument. The two transactions are totally separate from an accounting perspective and the offsetting of the resulting exchange differences may lead to distorted financial interpretation.

The loan should therefore not be equity accounted, although it fulfils the role of natural hedge. The decision to deem a transaction as a hedge could be very vague and include a wide range of transactions, which could lead to misrepresentation.

It is necessary to ensure the greatest level of transparency for the users of financial statements and by offsetting exchange differences in equity would not contribute to greater transparency. By treating the two transactions on their own merit the same economic result is achieved without confusing the user with incorrect financial information. As for management intent, the situation could arise where so-called hedge instruments may change status to suit the profit requirements of the company.

The following examples illustrate the effects of the different methods of accounting treatment and the manipulative implications on taxable income:

Example 5.2: Foreign currency liabilities, not accounted for as a hedge against foreign investments

The following assumptions are made:

The enterprise raises equity capital of ZAR 5 000 and raises a USD loan of 10 000, which is applied to a local investment of ZAR 5 000, yielding a return of 50,00%. It also invested in USD assets an amount of ZAR 10 000, yielding a return of 25,00%.

The USD/ZAR exchange rate at the beginning of the period is 4,00, and at the end of the period, 5,00. The rate of interest on the foreign currency loan is 5,00% and the tax rate is 50%.

The following balance sheet and income statement will result, given a risk management policy that does not consider hedging of foreign equity investments:

Table 5.6: Income Statement - foreign currency liability, not accounted for as a hedge

Income Statement for the period ended 19.1		
		19.1
Investment income		5 625
Expenses		3 125
Interest	625	
Exchange loss	2 500	
Earnings before tax		2 500
Taxation		1 250
Net earnings		1 250

The exchange loss resulting from the currency depreciation on the loan is taken to income, whereas the exchange gain on the equity investment is taken to reserves. This is illustrated in the balance sheet example in table 5.7.

Table 5.7: Balance Sheet - Foreign currency liability, not accounted for as a hedge

Balance Sheet - 19.1		
	19.0	19.1
Capital employed		
Equity	5 000	5 000
Non-distributable reserves		2 500
Retained earnings		1 250
	5 000	8 750
Long term loan	10 000	12 500
Amounts owing		1 875
Interest payable		625
Taxation		1 250
	15 000	23 125
Employment of Capital		
Investments	15 000	17 500
Cash		5 625
	15 000	23 125

In terms of the foreign equity investment, the company raised a non-distributable reserve as a result of the exchange gain on the investment. The question arises whether the exchange loss on the loan should not be offset against the exchange gain on the equity investment. In this instance the company's intent is to treat the loan as a financing tool and not as a hedge against its foreign equity investment.

In terms of paragraph 20, the method of accounting is a management decision, which could obviously be altered from one accounting period to the next. In this regard the repayment of the loan on maturity will have no accounting impact on the equity investment and would exchange rate movements on the equity investment always be reflected in the non-distributable reserves.

Example 5.3: Foreign currency liabilities accounted for as a hedge against foreign investments

In the following example the same variables are applied to account for the foreign currency loan as a hedge against the equity investment. The resultant exchange gains and losses are all presented as equity adjustments.

Table 5.8: Income Statement - foreign currency liability accounted for as a hedge

Income Statement for the period ended 19.1		
		19.1
Investment income		5 625
Expenses		625
Interest	625	
Exchange loss	0	
Earnings before tax		5 000
Taxation		2 500
Net earnings		2 500

The exchange loss on the foreign currency loan is treated as equity in terms of paragraph 20 of the exposure draft. The resultant earnings are therefore increased by the amount of exchange losses.

The balance sheet in table 5.9 reflects these entries.

Table 5.9: Balance Sheet - foreign currency liability accounted for as a hedge

Balance Sheet - 19.1		
	19.0	19.1
Capital employed		
Equity	5 000	5 000
Non-distributable reserves		0
Retained earnings		2 500
	5 000	7 500
Long term loan	10 000	12 500
Amounts owing		3 125
Interest payable		625
Taxation		2 500
	15 000	23 125
Employment of Capital		
Investments	15 000	17 500
Cash		5 625
	15 000	23 125

Where the loan is treated as a hedge, the exchange gain on the equity investment is offset by the exchange loss on the foreign currency loan in the non-distributable reserves. The intention to treat the loan as a hedge is therefore a management decision, which could obviously change from one accounting period to the next. A new hedge decision will have to be taken on maturity of the loan at which time any exchange differences embedded in non-distributable reserves will have to be taken to income.

The alternative treatment of deemed hedges therefore has a material impact on both the accounting and tax results of the enterprise. It is therefore necessary to consider the long-term impact of management decisions rather than the specific requirements of paragraph 20. The more appropriate treatment should be to consider the various risks inherent in the two instruments (the equity investment and the foreign currency loan) and account for those separately.

The equity investment has an inherent price risk and an exchange risk, which should be accounted for separately. Assume the initial investment (USD 2 500 000 x 4,00) has increased to USD 3 000 000 either as a result of an increase in net asset value or as a result in the increase in the share price on a listed investment. The exchange gain or loss recorded as a result of the change in price between the currencies of the two economies is an economic variable which reflect the current business cycle and should therefore be accounted for in the current results of the enterprise.

Likewise with the foreign currency loan, risk elements are recorded. Firstly, the opportunity element inherent in the cost of finance and the currency risk. Theoretically, the opportunity gain or loss resulting from the difference between present interest rates and the interest rate on the foreign currency loan could be taken to non-distributable reserves, if the foreign currency loan is deemed as a hedge against the equity investment. It is argued that the variances between debt and equity are of a long-term nature and should therefore be reflected as such in the financial statements. The same argument will apply to the exchange loss on the foreign currency liability, which will be taken to income.

The following matrix explains the various accounting entries:

Table 5.10: Presentation of deemed hedges

	Non-distributable reserves	Income
Equity investment		
1. Change in net asset value	X	
2. Exchange gain/loss		X
Foreign currency liability		
1. Opportunity gain/loss	X	
2. Exchange gain/loss		X

These entries will apply to transactions where the foreign currency liability is accounted for as a hedge; where the foreign currency liability is not accounted for as a hedge the opportunity gain or loss on the interest rate movement will be disclosed in the notes and not accounted for in non-distributable reserves. Both instruments would then be considered on their own merits and could even then be hedged independently from each other. In this regard the enterprise could consider entering into a forward exchange contract to hedge its currency exposure on the loan, especially if it sees its equity investment as a very long term investment and where it has already discounted any currency movement. The enterprise could now consider taking any exchange gains or losses on the equity investment to the non-distributable reserves account, since it has already been discounted in its long term investment decision and a hedge has been provided for the foreign currency loan. The matrix would then be as follows:

Table 5.11: Accounting for hedged foreign currency liabilities.

	Non-distributable reserves	Income	Notes
Equity investment			
1. Change in net asset value	X		
2. Exchange gain/loss	X		
Foreign currency liability			
1. Opportunity gain/loss			X
2. Exchange gain/loss		X	
Forward exchange contract			X

The impact of forward exchange contracts is dealt with in more detail in the paragraph below.

- *Forward exchange contracts (FEC's)*

In the exposure draft (ED 109) certain issues are addressed in the Technical Release, which is supplementary to the contents of the exposure draft. The paragraph references below, refer to the technical release:

Paragraph 5
Where an entity has entered into a forward exchange contract the difference between the foreign currency monetary item reflected in the books of account at the date the foreign currency monetary item is to be settled and the amount paid on the contract at settlement date would be the foreign exchange gain or loss arising on the forward exchange contract.

Paragraph 6
Where the entity's financial year end occurs before settlement date any gain or loss is calculated by multiplying the foreign currency amount of the forward exchange contract by the difference between the contracted forward rate available at the financial year end date for the remaining maturity period of the forward contract. A corresponding forward exchange contract asset or liability is raised.

The financial results of the two paragraphs are illustrated in tables 5.12 and 5.13.

Table 5.12: Accounting entries illustrating the requirements of paragraph 5

Variables:			
US dollar amount:	1 000 000	Spot exchange rate:	4,5000
Transaction date:	31/03/00	FEC rate:	4,5800
Settlement date:	30/06/00		
Accounting entries:			
Purchase of inventory (1 000 000 x 4,5000)		4 500 000	
Foreign currency liability			4 500 000
Raising liability on inventory purchase.			
On settlement date:			
Foreign currency liability (FEC)		4 580 000	
Bank			4 580 000
Being settlement of foreign currency liability.			
Foreign exchange loss		80 000	
Foreign currency liability			80 000
Being foreign exchange loss on FEC.			

Paragraph 5 explains the accounting treatment where the forward exchange contract maturity does not cross the balance sheet date. In paragraph 6, the treatment of such an outstanding FEC is explained.

Table 5.13: Accounting entry illustrating the requirements of paragraph 6

Variables:			
US dollar amount:	1 000 000	Spot exchange rate:	4,5000
Transaction date:	31/03/00	FEC rate:	4,5800
Balance sheet date	30/06/00	Exchange rate on balance sheet date:	
FEC date	30/09/00		5,0900
		FEC rate to maturity:	5,1700
Accounting entry:			
Forward exchange contract asset		590 000	
Exchange gain (1 000 000 x (5,[illegible] - 4,58)			590 000
Being gain on forward exchange contract.			

Forward exchange contracts are in essence interest rate instruments and not determinants of the future exchange rate or the future price of a foreign currency asset or liability.

The price that is recorded for the acquisition of foreign currency to purchase assets or to pay for liabilities denominated in that currency is determined by any number of economic and financial variables, i.e. inflation rates, balance of payments and trade imbalances. The envisaged forward spot rate is therefore not a function of the interest rate differential, which is reflected in the premium or discount that determines the forward exchange rate reflected in a forward exchange contract.

Incidentally, the purchase of foreign currency in order to pay for foreign currency denominated assets or to settle foreign currency denominated liabilities, in itself results in the acquisition of an asset. Thus by buying inventory denominated in US dollars and by buying the US dollars to pay for the inventory, two separate assets are acquired. The fact that one asset will only materialise on a forward date as a result of the establishment of an FEC does not alter its status as a foreign currency asset.

Example 5.4: Accounting for forward exchange contracts

Assuming the supplier of inventory extended a ninety-day credit term to the customer (the company) for the purchase of USD 100,000 worth of inventory; the prevailing spot exchange rate is 4,45. The following accounting entries will result if the company purchased foreign currency to pay for inventory:

Inventory	445 000	
USD currency asset (USD 100 000)	445 000	
Accounts payable		445 000
Bank		445 000

Purchase of inventory and foreign currency assets to settle foreign currency liability.

By purchasing the US dollars on transaction date, the company has automatically hedged its foreign exchange risk, but now own two assets. Firstly, the inventory and secondly, the foreign currency, hence the dual entry.

If the company had entered into an FEC instead of investing in foreign currency, it would have actually taken a view on the interest rate differential between the SA rand and the US dollar for a given period. By treating FEC's as interest rate transactions and not as foreign exchange transactions, the resultant exchange difference would be interest income or expense and not foreign exchange gains or losses.

Assume a three-month US interest rate of 3,00% and a three-month SA interest rate of 15.00%. The US dollar-denominated asset earns interest at 3,00% for the period up to settlement of the liability, whereas the company incurs a shortfall at a rate of 15,00% which it forfeits on a potential rand investment for the same tenor.

The following cash flows will result on these transactions:

US dollar account:		
Cash asset	100 000	
Interest earned (100 000 x 3,00% x 90 / 360)	750	100 750
SA rand account:		
Rand liability or investment forfeited	445 000	
Interest cost (445 000 x 15,00% x 90 / 365)	16 459	461 459

The exchange rate so derived (461 459 / 100 750), is the implied forward cover rate quoted by banks to companies. In this case the rate happens to be 4,5802, or a forward premium over the spot exchange rate of 0,1302, or 1 302 points. It is therefore clear that the forward cover rate is derived from two interest rate transactions and not necessarily a prediction of the expected spot exchange rate between the US dollar and the SA rand on a given forward date. If the latter had been true, then the forward cover rates could have been used in the manner prescribed by paragraph 5 of the technical release.

Assuming a spot rate of USD 1 = ZAR 5,00 on settlement date three months hence, the following cash flows will be recorded:

US dollar flows:		
Foreign currency invoice	100 000	
USD interest earned	750	
USD bank account		100 750

Being investment in foreign currency asset.

SA rand flows:

Accounts payable	445 000	
USD currency asset		445 000

Settling of foreign currency creditor.

Interest paid	16 459	
Interest earned (750 x 5,00)		3 750
SA bank account		12 709

Being the cost of settling foreign currency liabilities through a foreign currency hedge.

The resultant "forward cover rate" so achieved would be slightly better than the rate achieved on the forward exchange contract. The rate achieved to pay for the USD 100 000 inventory purchase is now 445 000 + 12 709 (the net interest charge), thus 4,57709. The difference in the two rates (4,5802 - 4,57709) is as a result of the more favourable spot exchange rate at which the US dollar interest receipt was internalised.

The more appropriate accounting treatment of forward exchange contracts would therefore be to view forward exchange contracts as interest rate transactions and not as gains or losses on forward exchange transactions.

In the quoted example in ED109, the following results will be achieved:

On transaction date:

Inventory	415 000	
Accounts payable		415 000

Purchase of foreign currency denominated inventory.

Interest charge on foreign currency transactions	10 000	
Interest payable		10 000

Interest cost of forward cover contract.

On settlement date:

Accounts payable	415 000	
Interest payable	10 000	
Bank		425 000

Settlement of foreign currency account.

The volatility of the spot exchange rate therefore has no bearing on this specific transaction. When the transaction runs across the balance sheet date, the following will apply:

On transaction date:

Inventory	415 000	
Accounts payable		415 000

Being purchase of inventory.

On balance sheet date:

Interest charge on FEC's	5 000	
Interest charge on FEC's not yet incurred	5 000	
(balance sheet item)		
Interest payable		10 000

Being appropriation of interest expense on FEC's.

On settlement date:

Interest payable	10 000	
Accounts payable	415 000	
Bank		425 000

Settlement of foreign currency liability and interest cost on FEC.

Interest charge on FEC's	5 000	
Interest charge on FEC's not yet incurred		5 000

Realisation of interest cost in subsequent accounting period.

In so doing the true nature of the forward exchange contract is exposed, giving greater transparency to the financial statements without complicating the matter with a number of variable exchange rates.

The insignificance of forward exchange rates after the establishment of a forward exchange contract is illustrated in the following examples:

Example 5.5: Cash flows on extensions of forward exchange contracts

Assume a company establishes a three-month FEC at a forward rate of ZAR 4,5800 / USD. At the time the spot exchange rate was 4,5000. On expiry of the contract, the company wishes to extend the contract for a further three months. At that time the spot exchange rate is 5,0000 and the forward rate is 5,0900. Table 5.14 illustrates the resultant cash flows where the company buys USD 1 000 000 / ZAR.

Table 5.14: Cash flows on extensions of forward exchange contracts at different extension rates

Variables:		Cash flows for company:			
Assuming a spot rate on extension of 5,00					
US dollar amount:	1 000 000		30/06/00		30/09/00
Transaction date:	31/03/00	USD	ZAR	USD	ZAR
Settlement date:	30/09/00				
Spot exchange rate:	4,5000	Original FEC			
FEC rate:	4,5800	1 000 000	(4 580 000)		
Extension		Extension			
Transaction date:	30/06/00	(1 000 000)	5 000 000	1 000 000	(5 000 000)
Settlement date:	30/09/00				
Spot exchange rate:	5,0000	Cash flow:	420 000		
FEC rate:	5,0900				
		Net cost to company			
		Cash flow - 30/06/00			420 000
		Extended FEC			(5 090 000)
					(4 670 000)
Assuming a spot rate on extension of 2,00					
US dollar amount:	1 000 000		30/06/00		30/09/00
Transaction date:	31/03/00	USD	ZAR	USD	ZAR
Settlement date:	30/06/00				
Spot exchange rate:	4,5000	Original FEC			
FEC rate:	4,5800	1 000 000	(4 580 000)		
Extention		Extension			
Transaction date:	30/06/00	(1 000 000)	2 000 000	1 000 000	(2 090 000)
Settlement date:	30/09/00				
Spot exchange rate:	2,0000	Cash flow:	(2 580 000)		
FEC rate:	2,0900				
		Net cost to company			
		Cash flow - 30/06/00			(2 580 000)
		Extended FEC			(2 090 000)
					(4 670 000)

It is therefore clear that irrespective of the exchange rate on the date that the contract is extended, the interest cost of hedging this specific transaction remains the same, and is calculated as follows:

Spot rate when FEC was entered into:	4,5000
Forward rate on settlement date:	5,0900
	0,5900
Less: Positive cash flow on extension date	(0,4200)
Net interest cost	0,1700

The interest cost so calculated is USD 1 000 000 x 0,1700, which equals ZAR 170 000.

In the second example the interest cost will be calculated as follows:

Spot rate when FEC was entered into:	4,5000
Forward rate on settlement date:	2,0900
	(2,4100)
Add: Negative cash flow on extension date	2,5800
Net interest cost	0,1700

The interest cost so calculated is USD 1 000 000 x 0,1700, which equals ZAR 170 000.

The interest cost in both instances are the same, irrespective of the prevailing exchange rates, however the final result should still be adjusted to reflect the interest effect for the period from the extension date until maturity on either the negative or positive cash flow which resulted on the differing exchange rates, i.e. the original FEC rate and the spot rate on the extension date.

Example 5.6: Cash flows on cancellation of forward exchange contracts

Companies often have a need to pay for foreign commitments at dates earlier than those for which FEC's were established, however, the cash flow effects remain the same, irrespective of the spot rate on redemption date. This is illustrated in table 5.15.

Table 5.14: Cash flows on extensions of forward exchange contracts at different extension rates

Variables:		**Cash flows for company:**			
Assuming a spot rate on extension of 5,00					
US dollar amount:	1 000 000		30/06/00		30/09/00
Transaction date:	31/03/00	USD	ZAR	USD	ZAR
Settlement date:	30/06/00				
Spot exchange rate:	4,5000	Original FEC			
FEC rate:	4,5800	1 000 000	(4 580 000)		
Extension		Extension			
Transaction date:	30/06/00	(1 000 000)	5 000 000	1 000 000	(5 090 000)
Settlement date:	30/09/00				
Spot exchange rate:	5,0000	Cash flow:	420 000		
FEC rate:	5,0900				
		Net cost to company			
		Cash flow - 30/06/00			420 000
		Extended FEC			(5 090 000)
					(4 670 000)
Assuming a spot rate on extension of 2,00					
US dollar amount:	1 000 000	30/06/00		30/09/00	
Transaction date:	31/03/00	USD	ZAR	USD	ZAR
Settlement date:	30/06/00				
Spot exchange rate:	4,5000	Original FEC			
FEC rate:	4,5800	1 000 000	(4 580 000)		
Extention		Extension			
Transaction date:	30/06/00	(1 000 000)	2 000 000	1 000 000	(2 090 000)
Settlement date:	30/09/00				
Spot exchange rate:	2,0000	Cash flow:	(2 580 000)		
FEC rate:	2,0900				
		Net cost to company			
		Cash flow - 30/06/00			(2 580 000)
		Extended FEC			(2 090 000)
					(4 670 000)

It is therefore clear that irrespective of the exchange rate on the date that the contract is extended, the interest cost of hedging this specific transaction remains the same, and is calculated as follows:

Table 5.15: Cash flows on redemption of forward exchange contracts at differing spot rates

Variables:		Cash flows for company:			
Assume a spot rate of 5,00 on redemption date.					
US dollar amount:	1 000 000		30/06/00		30/09/00
Transaction date:	31/03/00		USD ZAR		USD ZAR
Settlement date:	30/09/00				
Spot exchange rate:	4,5000				Original FEC
FEC rate:	4,6600				1 000 000 (4 660 000)
			Spot purchase of USD		Cancellation of FEC
Redemption date:	30/06/00		1 000 000 (5 000 000)		(1 000 000) 5 080 000
Original FEC date:	30/09/00				
Spot exchange rate:	5,0000		Cash flow: (5 000 000)		+ 420 000
FEC rate:	5,0800				
			Net cost to company		(4 580 000)
			(The original spot rate of 4,50 plus the interest cost for three months of 0,0800.)		
Assume a spot rate of 2,00 on redemption date.					
US dollar amount:	1 000 000		30/06/00		30/09/00
Transaction date:	31/03/00		USD ZAR		USD ZAR
Settlement date:	30/09/00				
Spot exchange rate:	4,5000				Original FEC
FEC rate:	4,6600				1 000 000 (4 660 000)
			Spot purchase of USD		Cancellation of FEC
Redemption date:	30/06/00		1 000 000 (2 000 000)		(1 000 000) 2 080 000
Original FEC date:	30/09/00				
Spot exchange rate:	2,0000		Cash flow: (2 000 000)		+ (2 580 000)
FEC rate:	2,0800				
			Net cost to company		(4 580 000)
			(The original spot rate of 4,50 plus the interest cost for three months of 0,0800.)		

By entering into forward exchange contracts without any underlying foreign currency liability or source of income, two exposures are raised. Firstly exposure to adverse movements in the spot exchange rate and secondly, exposure to movement in interest rate differentials of the underlying currencies. Table 5.16 illustrates the cash flow effects of an outright cancellation.

Table 5.16: Cash flow effects of outright cancellations

Assume a spot rate of 5,00 on cancellation date:

			30/06/00		30/09/00	
US dollar amount:	1 000 000					
Transaction date:	31/03/00		USD	ZAR	USD	ZAR
Settlement date:	30/09/00					
Spot exchange rate:	4,5000				Original FEC	
FEC rate:	4,6600				1 000 000	(4 660 000)
Cancellation date:	30/06/00	Cancellation of FEC			(1 000 000)	5 040 000
Original FEC date:	30/09/00					
Spot exchange rate:	5,0000	Gain on FEC cancellation				500 000
FEC rate:	5,0400					
Exchange gain on original FEC (1 000 000 x (5,00 - 4,50)						500 000
Financing costs not recovered (1 000 000 x [(5,04-5,00)-(4,66-4,50)]						(120 000)
						380 000

Assume a spot rate of 2,00 on cancellation date:

			30/06/00		30/09/00	
US dollar amount:	1 000 000					
Transaction date:	31/03/00		USD	ZAR	USD	ZAR
Settlement date:	30/09/00					
Spot exchange rate:	4,5000				Original FEC	
FEC rate:	4,6600				1 000 000	(4 660 000)
Cancellation date:	30/06/00	Cancellation of FEC			(1 000 000)	2 040 000
Original FEC date:	30/09/00					
Spot exchange rate:	2,0000	Loss on FEC cancellation				(2 620 000)
FEC rate:	2,0400					
Exchange loss on original FEC (1 000 000 x (2,00 - 4,50)						(2 500 000)
Financing costs not recovered (1 000 000 x [(2,04-2,00)-(4,66-4,50)]						(120 000)
						(2 620 000)

In order to properly assess the exact magnitude of the exposures raised through forward exchange transactions it is therefore necessary to be more precise in accounting for such transactions. In paragraph 5.4 below, hedge issues will be elaborated upon further.

5.3 Accounting for financial futures contracts - accounting statement 208

The accounting treatment of gains and losses on futures contracts is subject to the purpose for which a contract was entered into. The intention is either speculative or for hedging purposes.

A speculator enters into a futures contract in the hope that a profit will be made on anticipated future price movements *vis-à-vis* the price of the futures contracts.

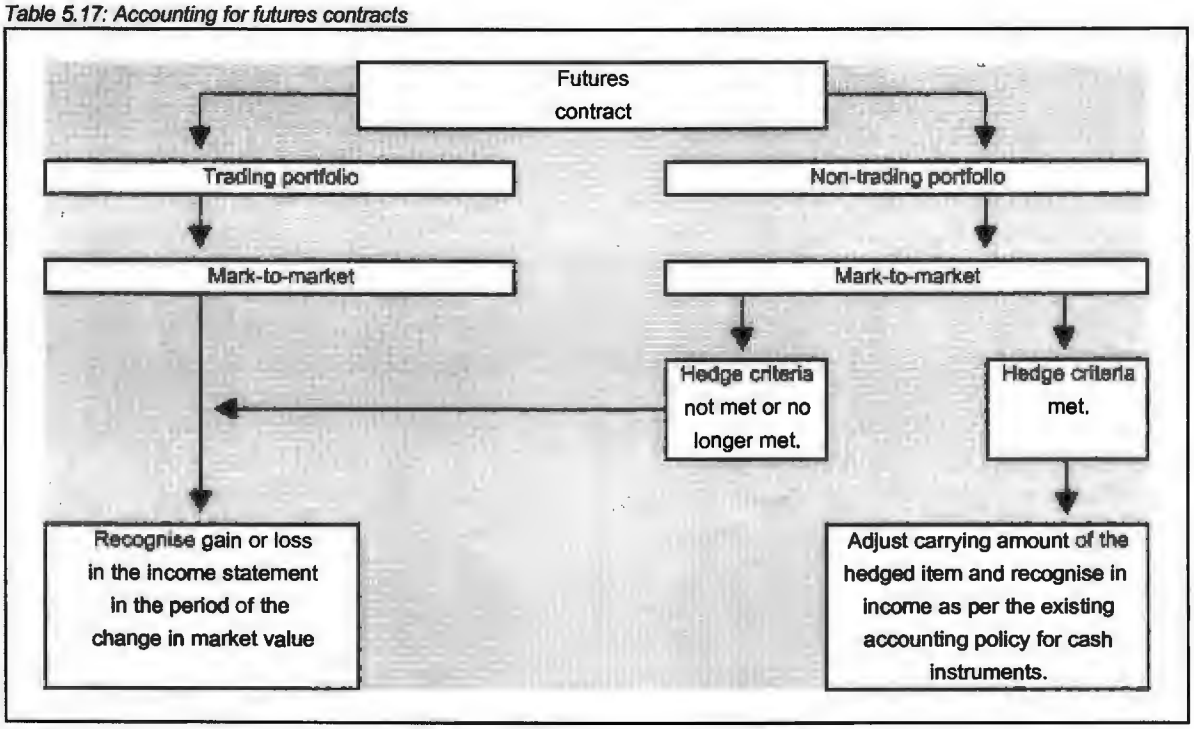
Futures are usually used to hedge certain portfolio's of interest rate, equity or commodity instruments. A hedge is obtained by ensuring that the number of futures contracts bought or sold correlates inversely with the underlying portfolio. The higher the correlation, the more cost effective the hedge will be.

In terms of guideline AC208 four hedge criteria are used, all of which must be met in order for a futures contract to qualify as a hedge (SAICA 1991):

I. The transaction forms part of a non-trading portfolio.
II. The position to be hedged is specifically identifiable and exposes the enterprise to price and interest rate risk.
III. The transaction is specifically designated as a hedge.
IV. High correlation is probable at inception and is achieved on an ongoing basis so as to reduce or substantially reduce the risk of loss from the hedged position.

Table 5.17 illustrates the diagram which explains the decision process regarding accounting, which appears in appendix 1 of guideline AC208.

Table 5.17: Accounting for futures contracts



Hedging may also occur via the use of a financial instrument different from the item intended to be hedged. This is possible provided a clear economic relationship exists between the two financial instruments and a high degree of correlation is probable.

It is also possible that hedges may be entered into for anticipated transactions. Apart from the four hedge criteria required by the guideline, it is also necessary that the following conditions be met:

I. The significant characteristics and expected terms of the anticipated transaction are identified.

II. It is possible that the anticipated transaction will occur.

The disclosure requirements relating to futures contracts are designed to provide users of financial statements with relevant and reliable information.

Guideline AC208 requires the following disclosure standards:

Paragraph 40

Disclosure of the accounting policy used. This is necessary since intent may vary from enterprise to enterprise. Futures can be regarded as earned for investment, for hedging of existing exposures or for hedging of anticipated transactions.

Paragraph 41

Disclosure of the risk profile of the futures contracts in the trading portfolio. Typically this may include the nature, terms and contract amounts of contracts.

Paragraph 42

Disclosure of information relating to hedges as well as the extent of the hedge being provided.

Paragraph 43

Disclosure of gains and losses arising from futures contracts, hedging anticipated transactions. Disclosed as prepayments or accruals in the balance sheet.

Paragraph 44

Disclosure of gains or losses from futures contracts recognised during the period, taken to income.

Paragraph 45

Separate disclosure of margin deposits under current assets.

5.4 Hedge issues

The term hedge is a very general term, but could be construed as actions to reduce or remove particular risks. It usually results in acquiring a financial instrument of which the value or cash flows move inversely to those of the underlying instrument that is being hedged. This relationship may not always be perfect, but will in all likelihood reduce price risk to the extent that it has a

negligible financial impact on the outcome at a specified reporting date or on maturity of the two instruments. (IASC 1997:135.)

Of primary importance to the hedge decision must firstly be the firm intention of management to remove or reduce specific price risks and secondly, that the specific hedge is economically effective. The hedge should therefore reflect the desired financial outcome in instances of adverse price movement. Assuming that the enterprise in the previous example incurs a foreign currency liability of USD 1 000 000 and it enters into a forward exchange contract worth USD 2 000 000; it has not only hedged its underlying currency exposure, but has now established an opposing currency exposure, which is not hedged. That portion of the hedge which now exceeds the underlying exposure, should be deemed an exposed currency position and accounted for as such.

- *Present accounting treatment for hedge transactions*

The present accounting statements governing hedge transactions are embodied in AC112 and AC107. These statements do not deal with hedging transactions specifically and only by implication.

More specific reference is made to hedge transactions in ED109 and ED107, although it is not dealt with in comprehensive detail. In ED109, hedging is only referred to in paragraph 20, which deals with the investment in foreign entities, and by implication in the technical release where reference is made to forward exchange contracts. In ED107, hedging is only dealt with in the section of the statement that deals with disclosure, and in particular reference is made to disclosure of hedges of anticipated future transactions. Hedging is thus dealt with from a disclosure perspective and not from an accounting perspective.

The following extracts from the annual report of Sentrachem Limited is a practical example of the application of exchange rate policies (Sentrachem 1996:46):

Example 5.7: Sentrachem notes to financial statements.

> *Notes to the Annual Financial Statements*
>
> *1.8 Foreign currency translations*
> *Financial statements of foreign subsidiaries are translated into South African currency as follows:*
> - *Assets and liabilities, both monetary and non-monetary, at rates of exchange ruling at the closing rate.*
> - *Income statement items are translated at an appropriated weighted average rate for the year.*
>
> *Differences arising on translation are taken directly to the foreign currency translation reserve.*
>
> > *1.8.2 Foreign currency transactions*
> > *Foreign exchange transactions are translated at the spot rate ruling at the date of transaction or at the hedged forward rates. At balance sheet date monetary items are translated at rates then ruling, or at hedged forward rates, where applicable. Exchange differences occurring on the settlement of monetary items or on the reporting of outstanding monetary items are brought to income for the period.*
> >
> > *1.8.3 Hedging activities*
> > *Where settlement costs arise on roll-over of forward exchange contracts entered into in anticipation of future transactions, such costs are deferred until such time as the anticipated transactions occur and are included in accounts receivable or accounts payable, as appropriate.*

In the instance of Sanachem (Pty) Ltd. (Sanachem) (Financial Mail 1997: 19) this very issue of "over hedging" of future export proceeds resulted in significant losses for the company. Sanachem entered into forward exchange contracts which far exceeded the anticipated export proceeds in that particular financial period, it therefore by implication took a position on the USD/ZAR exchange rate without an underlying exposure. If it had disclosed this information sooner, by recognising the currency liability which it raised through the unhedged dollar sale against the rand, shareholders could have acted upon the results much sooner. The reason that this was not detected was simply because the holding company, Sentrachem, never disclosed the fact that its subsidiaries actually engaged in foreign exchange trading. The financial director's report includes the following paragraph:

> *Sentrachem continues to provide a central treasury function which serves divisions and subsidiaries... The South African operations hedge all their net transactional exposure arising on inventories, trade receivable and payables fully*

> *through the use of forward foreign exchange contracts. A treasury committee has been formed, consisting inter alia of the financial directors of all major operating divisions and subsidiaries.* (The purpose therefore is to consider policy and to proactively approve changes within defined limits.)

It is clear that the significant over-exposed position went unnoticed in the 1996 annual report. Nevertheless, had these contracts been recognised as foreign currency liabilities (on-balance sheet presentation) through fair value accounting, management may have detected potential losses sooner. The IASC discussion paper identifies three criteria *(vide supra)* when hedge accounting should be considered (IASC 1997:135). A fourth issue, namely company policy or management intent should govern the overall hedging philosophy of the enterprise.

- *Hedge theory*

In the discussion paper, which was released in March 1997 - *Accounting for financial assets and liabilities*, the IASC acknowledges the fact that there are many conceptual and practical problems with hedge accounting, and that it also requires complex rules that ultimately rest on management's decision whether or not to designate a qualifying transaction as a hedging relationship. The objective of hedge accounting is to recognise the hedging instrument and the position being hedged on a symmetrical basis, so that the balance sheet items carry the same values, and the exchange gains and losses arising on the various positions are taken to income in the same accounting period. (IASC 1997:136.)

The discussion paper raises practical situations in which hedge accounting is applied (IASC 1997:135):

I. Hedges of uncommitted transactions

This situation arises where the financial instrument is acquired to hedge future exposures. It implies the hedging of a future cash flow risk in an expected non-contracted future transaction. No underlying asset or liability therefore exists.

II. Corrections to measurement differences

When the hedging instrument is measured differently to the hedged position. An underlying asset (inventory) may be measured at cost, whereas the hedging instrument (currency option) may be measured at fair value.

III. Corrections to recognition differences

These differences arise where hedge instruments are recognised, but the underlying hedge position is not yet recognised because of differing accounting treatment. Interest rate swaps entered into to hedge future borrowings negotiated under specific capital projects.

Hedging should be viewed as a philosophy, more than an accounting action, since it is representative of the financial intentions of the management of the company as well as the financial objectives and strategies that drive the underlying business of the enterprise. It is in this framework that management should then present a policy that will govern its activities in the financial markets. Irrespective of the long debate that continues globally regarding accounting for financial instruments enterprises should primarily consider their particular micro economic environment and then more broadly the macro economic environment in which they are judged.

Finally it is the responsibility of management to satisfy the stakeholders in the company that all has been done to ensure that financial information is best represented at all times.

- *Concerns raised by the International Accounting Standards Committee (IASC)*

The IASC in its discussion paper raises the issue of matching, referring specifically to matching of financial instruments in an attempt to eliminate mis-matches. The sole objective of matching is to avoid having to recognise gains and losses in one period, which are offset by gains and losses in another period. (IASC 1997:134).

This has resulted in the development of hedge accounting, which is the process of recognising and measuring of instruments and positions, so that they are recognised on the balance sheet at the same values with offsetting gains and losses being recognised in income in the same accounting period. Hedge accounting is therefore a system of special adjustments that are intended to correct mismatches by deferring gains and losses on designated hedge instruments to periods when the offsetting gains and losses are recognised on the hedged instrument. (IASC 1997:134.)

The first concern raised is that of deferring gains and losses to subsequent accounting periods. Conceptually, it is difficult to justify the treatment of gains and losses as assets or liabilities relating to transactions occurring in subsequent accounting periods. The issue of hedges on anticipated uncommitted transactions further amplifies this concern. In this regard the IASC has made the following conclusion (IASC 1997:136):

> *Deferral hedge accounting for anticipated transactions (i.e. balance sheet deferral of gains and losses on financial instruments to future periods in which the anticipated transactions are expected to take place) is not supportable within the IASC Framework and is not consistent with the principle proposed for recognition[3] and the principle proposed for measurement on initial recognition and the principle proposed for measurement on initial recognition[4].*

Deferring a gain or loss on a financial instrument used to hedge an anticipated uncommitted position is, therefore, not defensible in a financial accounting model whose purpose it is to represent existing assets and liabilities and income earned as a result of past events and transactions.

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[3] An enterprise should recognise a financial asset or liability on its balance sheet when it becomes a party to the contractual provisions that comprise the financial instrument.

[4] When a financial asset or financial liability is recognised initially, it should be measured at the fair value of the consideration given or received for it.

Further concerns raised are that it is difficult to design effective hedging rules around anticipated uncommitted transactions. Firstly, it is optional whether or not an instrument will be designated as a hedge - it is debatable whether anticipated transactions will occur and whether the hedge will be effective. Secondly, hedge accounting for anticipated uncommitted transactions is arbitrary and difficult to embody in a set of principles.

The IASC is also concerned with the issue of hedges pertaining to positions not measured at fair value. If the hedged item is not measured on a fair value basis, recognition of the difference between its cost carrying value and its fair value requires a future realisation event, eg. the future sale of inventory. The future event is an anticipated transaction and the IASC is of the opinion that such hedges should be viewed as hedges of anticipated uncommitted transactions.

In chapter 6, hedge issues are considered from a more practical perspective, given the suggested alternatives of the IASC regarding fair value accounting.

5.5 Financial instruments: disclosure and presentation - exposure draft 107

This exposure draft is the first to follow after the release of the discussion paper, E48, and deals specifically with disclosure and presentation of financial instruments. It is the objective of this draft to enhance financial statement users' understanding of the use of financial instruments, both on- and off-balance sheet. It expressly deals with both recognised and unrecognised financial instruments, and their treatment from a presentation and disclosure perspective. It is with regard to the recognition principles that the draft differs from the IASC discussion paper, in which the discussion paper proposes recognition of all financial instruments for purposes of fair value measurement.

- *Presentation of financial information*

Exposure draft 107 defines presentation as follows:

> *Paragraph 20*
> *The issuer of a financial instrument should classify the instrument, or its component parts, as a liability or as equity with the substance of the contractual arrangement on initial recognition and the definitions of a financial liability and an equity instrument.*

Although this paragraph only refers to issuers it is assumed that the same requirements regarding substance and form will apply to holders of financial instruments. The overriding emphasis of this statement is to clearly distinguish between equity and debt. In this regard the statement pronounces that substance takes precedence over form. It further requires the recognition of the component parts of compound financial instruments in order to draw the relevant distinctions between financial liabilities and equity. (SAICA 1996:6.)

It may also be the case that the holder of a financial instrument has the rights to other types of assets at a given future date, i.e. the delivery of commodities, which could be exchanged for shares of the issuer. The equity component should be separated from the underlying commodity component and presented in equity (SAICA 1996:9). Where offsetting is governed by a legally enforcing right or where the enterprise intends to settle on a net basis or to liquidate the asset and liability simultaneously, the underlying assets and liabilities may be offset (SAICA 1996:35).

It should be noted that offsetting do not refer to the treatment of exchange gains or losses inherent in such a transaction, it simply deals with the removal of offsetting financial assets and liabilities from the balance sheet.

The statement does not provide guidance in terms of financial assets and liabilities that pertain to anticipated future transactions. An enterprise enters into a forward starting interest rate swap to fix the interest payment on a long term loan. Although the enterprise and the financier have committed to this transaction, the loan has not yet been drawn down, which event will take place

on the progress of a specific project. The three-year loan, which is recognised as a financial liability, determines that the enterprise will pay interest at the prevailing 90-day bankers acceptance (BA) rate, quarterly in arrears. Subsequent to negotiating this transaction, management expressed the opinion that interest rates in the third year of the loan will be significantly above present levels and that a forward starting swap should be entered into to contain future financing costs. It enters into a forward starting swap whereby the enterprise will pay quarterly fixed rates against floating 90-day BA rates. The question arises whether the swap should be presented as a financial instrument on balance sheet or whether it should be regarded as a hedge of an anticipated future transaction. Theoretically it meets all the requirements of this statement and could be presented on balance sheet. However, substantially it relates to future financial periods and would therefore have an impact on the future performance of the enterprise.

By presenting this information in a supplementary financial statement that deals with future transactions and anticipated future transactions the enterprise would both acknowledge its actions and ensure the required levels of transparency are met. This issue is further elaborated upon in chapter 6.

- *Current disclosure requirements of accounting statements*

  Disclosure has been dealt with substantially in a number of statements of which the most pertinent requirements relating to this subject are illustrated in table 5.18.

Table 5.18: Disclosure requirements of accounting statements.

Statement	Disclosure requirements
AC 107	*Contingencies and events occurring after the balance sheet date* # Nature of the contingency. # Uncertain factors that may affect the future outcome. # The amount and financial effect; before and after tax.
AC112	*Accounting for the effects of changes in foreign currency exchange rates* # The amount of exchange gains and losses on foreign borrowings taken to income. # Information on uncovered foreign currency monetary items. # Sufficient information on forward exchange contracts which do not relate to specific balance sheet items. *Financial statements of foreign operations* # Methods used to translate results. # The net exchange difference for the period - taken to owners' interests. # The accumulated balance on the foreign currency translation reserve - included in owners' interests.
AC 208	*Accounting for financial futures contracts* # Accounting policy used in accounting for financial futures. # The risk profile of contracts in trading portfolios. # Futures contracts accounted for as hedges; disclose hedged positions and the extent of the hedge. # Gains or losses for both hedges as well as trading positions. # Separate disclosure of margin deposits.

The recently published exposure drafts are more explicit and require disclosure as expounded in tables 5.19 and 5.20.

- *Disclosure requirements of exposure draft 109*

  This statement will replace the existing AC 112 and table 5.19 explains the disclosure requirements of ED 109.

Table 5.19: Disclosure requirements of ED109

Paragraph	Disclosure requirements
43	*General disclosure* # Amount of exchange differences included in net profit or loss, distinguishing between borrowings, investments and operations. # Net exchange differences classified as equity, as a separate component and reconciled to opening balances. # Exchange differences included in the carrying amounts of assets as a result of severe currency depreciation.
44	*Difference between reporting currency and domicile currency* # Reasons for using different currency. # Reason for changes in currencies used.
45	*Change in classification of foreign operations* # Nature of the change. # Reason for the change. # Impact on shareholders' equity # Impact on net profit and loss for prior periods had the classification occurred at the beginning of the earliest period.
46	*Accounting methods* # Translation of goodwill and fair value adjustments arising on the acquisition of a foreign entity.
46	*Disclosure of foreign currency risk management policy* # Reasons for not reducing the carrying amount, including the nature of evidence that supports the decision.

- *Disclosure requirements of exposure draft 107*

Table summarises the existing disclosure requirements of ED 107, which is then discussed in terms of the suggested changes embodied in the discussion paper.

Table 5.20: Disclosure requirements of ED107

Paragraph	Disclosure requirements
49	*Terms, conditions and accounting policies* # For each class of financial asset, liability or equity. # For both recognised and unrecognised financial instruments. # Extent and nature of financial instruments. # Terms and conditions that may affect the amount, timing and certainty of future cash flows. # Accounting policies and methods adopted for recognition, as well as the basis of measurement.
58	*Interest rate risk* # Contractual repricing or maturity dates of interest rate exposure. # Where applicable, effective interest rates.
68	*Credit risk* # Amount of maximum credit risk exposure at balance sheet date. # Exclusion of the fair value of collateral in cases of default. # Significant concentrations of credit risk.
79	*Fair value* # For each class of asset, information about fair value. # When it is not practicable, that fact should be disclosed together with information about the principle characteristics of the instrument.
90	*Financial assets carried at an amount in excess of fair value* # The carrying amount and the fair value amount. # Reasons for not reducing the carrying amount, including the nature of evidence that supports the decision.
93	*Hedges of anticipated future transactions* # Description of the anticipated transaction, including the period of time until they occur. # Description of the hedging instruments. # The amount of any deferred or unrecognised gain or loss and the expected timing of recognition.

- *Alternatives proposed by the IASC discussion paper*

  It is necessary to consider those adjustments proposed by the discussion paper since these would materially alter the existing requirements of ED107.

  Terms, conditions and accounting policies

  The discussion paper proposes the removal of the terms recognised and unrecognised, since the objective of the discussion paper is to recognise all financial assets and liabilities at their fair value. It further requires the removal of cost-based accounting policies and to reflect the recognition, de-recognition and fair value principles of the discussion paper.

  I. Recognition

  The discussion paper defines recognition as follows (IASC 1997:47):

  > *An enterprise should recognise a financial asset or liability on its balance sheet when it becomes party to the contractual provisions that comprise the financial instrument.*

  It differs from E48 in that E48 approached recognition from a perspective of recognising assets and liabilities based on the transfer of risks and rewards, whereas the discussion paper considers the contractual obligation that is established. The latter is technically more correct, since defining the term *substantially all risks and rewards* (IASC 1994:26) could be very esoteric. A typical example is asset securitisation, where banks buy debtor receivables in exchange for cash. The inherent risk and reward split is usually very ambiguous and often not well defined, especially where the securitisation agreement contains very limiting default clauses.

  The exposure draft further requires that costs or values of financial instruments should be measured reliably. In the discussion paper this issue is dealt with from a valuation perspective and not from a recognition perspective.

The discussion paper's requirement of contractual agreement therefore excludes hedge accounting of anticipated future transactions where the probability of occurrence is very high (IASC 1997:54). E48 makes an exception to the risks and rewards principle and allows for hedge accounting of anticipated future transactions (IASC 1994:60).

II. Discontinuing recognition

As with recognition, the de-recognition of a financial instruments is viewed by the discussion paper from a contractual perspective. It defines discontinuing as follows (IASC 1997:51):

> *An enterprise should remove a financial asset (or a portion of a financial asset) from its balance sheet when the enterprise realises the rights to benefits specified in the contract, the rights expire, or the enterprise surrenders or otherwise loses control of the contractual rights that comprise the financial asset (or a portion thereof).*

Likewise the discussion paper defines a financial liability as follows (IASC 1997:52):

> *An enterprise should remove a financial liability (or a portion of a financial liability) from its balance sheet when it is extinguished (that is, when the obligation specified in the contract is discharged, cancelled or expires), or when the primary responsibility for the liability (or a portion thereof) is transferred to another party.*

In both definitions the issue of control is implied. If an enterprise loses control over the asset or passes on the performance inherent to liabilities, it should discontinue recognition. However, control is not always clearly quantifiable, which is the case with options. The future outcome of the result of an option is dependent on price fluctuation of an underlying financial instrument, which is not controllable by the holder or writer of the option. The flow of a future benefit or cost is therefore contingent on price movement and not determinable. Although the valuation of the expected cost or benefit is not controllable, the enterprise has still acquired a recognisable financial asset or liability.

III. Fair value measurement

The concept of fair value is introduced as part of an enterprise's basis from which it accounts for assets and liabilities. The fair value concept should not be seen as a replacement for any of the existing bases of accounting, but rather as supplementary and an attempt to enhance the transparency of financial statements. The discussion paper defines fair value as follows (IASC 1997:73):

> *Fair value is the amount for which an asset could be exchanged, or a liability could be settled, between knowledgeable, willing parties in an arm's length transaction.*

It is necessary to consider fair value accounting for certain types of financial transactions, especially where it does not make economic sense to account for financial instruments, based on their historical cost. In this regard the measurement of a currency option, based on its historical cost is a good example.

Example 5.8: Accounting for options.

An enterprise purchases a USD-call / ZAR-put option at a strike rate of USD 1,00 = ZAR 4,55, expiring in three months' time. On the transaction date the spot exchange rate was 4,50 and the premium (cost) payable was 3,5%. The three-month forward exchange rate at the time was 4,62. The fair value of a USD 10 million call option on initial recognition would therefore be ZAR 1 575 000 (USD 10 000 000 X 3,5% X 4,50). The enterprise has acquired the right to purchase a foreign currency asset in three months' time at an exchange rate of 4,55. However, it is not obliged to do so, which does not necessitate the recognition of a USD 10 million currency asset, but a currency option worth ZAR 1 575 000. If it had sold this option, the enterprise would have been obliged to deliver USD 10 000 000 in three months' time, had the option been exerciseable. It would then have to recognise a foreign currency liability of USD 10 000 000 on its balance sheet or as a minimum, the fair value of the option sold. Two further matters need consideration:

1. Acquisition of the underlying asset

The objective of this transaction is to acquire a foreign currency asset at a pre-determined exchange rate. This will enable the enterprise to determine the cost of inventory or to fix service payments or simply to hedge a foreign currency liability.

2. The intrinsic value of the currency option

The option as a financial instrument could be viewed independently from the underlying acquisition of foreign currency. It could therefore be seen as a speculative transaction by the enterprise to simply take a view on the value of the US dollar and its present volatility.

A number of scenarios arise that can determine the accounting treatment of this option.

Firstly, had the option been purchased to acquire inventory, it could be viewed as a substitute for a forward exchange contract, given the fact that it limits adverse currency movement to the option strike rate. It is obvious that the period cost for having the benefit of limited exchange rate risk and the potential to gain from benign currency movements will result in a greater cost initially. The option premium is therefore a period cost.

The following accounting entries apply:

Inventory (USD 10 000 000)	45 000 000	
Foreign currency asset	45 500 000	
Accounts payable (USD 10 000 000)		45 000 000
Contingent liability		45 500 000

Being the acquisition of inventory and foreign currency to pay for the acquired inventory.

Technically the option premium consists of two elements, namely the intrinsic value and the time value of the currency option. The intrinsic value can be measured as the excess over the time value and is determined by the volatility of the specific instrument and the strike level *vis-à-vis* the spot rate at the time of purchase. The time value is essentially the financing element in determining the option price over the period from transaction date until expiry.

Theoretically the option premium should therefore be split to show the financing element and the value of the excess. Another way of considering the value of an option, is by an analysis of put / call parity. Put / call parity is the price level at which a put option and a call option theoretically cost the same. In terms of a forward transaction, this will usually be the forward rate, which is determined by the forward exchange market. Any deviation from this level would result in the creation of intrinsic value. Although an option which is priced out-of-the-money should by implication have negative intrinsic value, this situation is not attainable because of the risk-reward theory inherent in options. The seller of an option always assumes certain risks and obligations however remote those may be. Intrinsic value can therefore never be less than zero. The option in this example was bought at a strike rate of 4,55, whilst the fair market value, given put / call parity at the forward rate was 4,62. It is assumed that the financing element priced into the option would be the time value of money for the three-month period.

In practice the option premium is usually accounted for in its entirety as a financing cost and taken to income. However, it could be argued that the intrinsic value is really of a capital nature, since it represents the premium at which a financial instrument is acquired over its present fair value.

Example 5.9: Option accounting

Assume in this example that the financing element of the option premium is 1,5%, with the balance of 2,0% being the intrinsic value of the option. Theoretically, the option should be accounted for as follows:

Financing charges	675 000	
Intrinsic value	900 000	
Cash		1 575 000

Being the difference between the period cost element and the "asset element" of the option premium.

In this example it is argued that the enterprise does not enter into different types of currency transactions or to risk manage its currency exposures on a day-to-day basis, but that it is uncertain as to whether the currency would appreciate or depreciate. Its worst case scenario is therefore the option premium and booking inventory at an exchange rate of 4,55. Any subsequent benefits that may flow from this transaction should therefore be for the inventory account.

Suppose that on maturity of the option the spot exchange rate is USD 1,00 = ZAR 4,25. The option will expire worthless, since the enterprise can access the spot market at a better rate than the strike rate of the option. The following accounting entries will apply:

Accounts payable	45 000 000	
Inventory		2 500 000
Bank		42 500 000

Being settlement of accounts payable for inventory purchased.

Contingent liability	45 500 000	
Foreign currency asset		45 500 000

Being reversal of financial asset acquired through currency option.

Suppose that on maturity the spot exchange rate was USD 1,00 = ZAR 4,90. The following entries will then apply:

Contingent liability	45 500 000	
Bank		45 500 000

Acquisition of foreign currency asset to settle foreign creditor (accounts payable).

Accounts payable	45 000 000	
Inventory	500 000	
Foreign currency asset		45 500 000

Being settlement of accounts payable, and adjustment of inventory costs.

The option could also have been acquired for speculative purposes, in which case the fair value would be represented by the option premium. In this instance the option is seen as the financial instrument and not so much the underlying currency. Any deviations in fair value would be taken to income. Thus, the option would appear on the face of the balance sheet as a financial instrument, priced at its fair value on the reporting date.

The following accounting entries will apply:

Foreign currency option	1 575 000	
Bank		1 575 000

Being acquisition of financial instrument.

The objective of such a purchase would always be to benefit from an exchange rate environment in which the option could be sold for a profit. Options bought for speculation are not bought to be kept until maturity, since this will result in realising the full option premium as a transaction cost.

Suppose, one month after the purchase of the option, the exchange rate has deteriorated to USD 1,00 = ZAR 4,75 and the option value has increased from 3,5% to 4,0%. The option could therefore be sold for ZAR 1 900 000 (USD 10 000 000 X 4,0% X 4,75). Had this also been the enterprise's reporting date, the financial asset would therefore be revalued at its fair value of ZAR 1 900 000, with the difference being taken to income.

It is clear that the application of fair value could have different outcomes depending on the enterprise's underlying policies and financial objectives. This issue is elucidated in chapter 6 in the analysis of value-at-risk.

Disclosure of hedges of anticipated future transactions

ED107 requires that an enterprise should disclose a description of the anticipated transactions, including the time period; a description of the hedging instruments; and the amount of deferred gains and the expected timing of recognition thereof (IASC 1996:30).

The discussion paper proposes the following changes (IASC 1997:175):

A description of the enterprise's risk management policies regarding anticipated transactions; a description of the designated transactions as well as a description of the designated hedges; a description of the key aspects of the hedging relationships, including significant assumptions regarding mismatches between anticipated transactions and hedges as well as details of future reporting periods and the timing of recognition of the outcome.

The discussion paper further requires disclosure of the amounts of gains or losses on these transactions reported in other comprehensive income, and the amount transferred to the statement of profit and loss. The cumulative amount of gains and losses in other comprehensive income at the end of the reporting period.

Risk management policies

Although it is not a requirement of accounting statements to disclose information about risk management policies, such disclosure will contribute to improved information dissemination to users of financial statements.

The disclosure of risk management policies should set out to achieve meaningful analysis of comparable information that is not excessively aggregated to obscure essential financial information in terms of treasury activities. It should also not be too elaborate and hence supply information that is unmanageable and superfluous. In this regard preparers of financial statements should guard against publicising proprietary information that may extinguish the competitive advantage of the enterprise. (IASC 1997: 181.)

In terms of the discussion paper on financial assets and liabilities released by the IASC a number of approaches may be viable regarding policy disclosure. These include tabular representation of financial instruments by type with various analysis, such as sensitivities to interest and exchange rates, gap analysis, duration analysis and information on value-at-risk. (IASC 1997:182.)

Although detailed disclosure may prove costly in terms of information systems and programmes supporting such analysis, it should be compared to the potential financial impact of improper or insufficient disclosure. Poor accounting disciplines in terms of these disclosures may lead to improper management control over treasury operations as was evident in the Sentrachem debacle with one of its subsidiaries *(vide infra)*.

It would seem that globally, accounting practice is moving more towards greater disclosure of risk management and related derivatives policies. The following are examples of practice evolving:

- In the United States, FASB standards require extensive disclosures about financial instruments with particular reference to derivatives and financial instruments with off-balance sheet risk. Amongst others it encourages disclosure about market risk of derivatives and it lists possible approaches and measurement techniques. (IASC 1997:182.)

- In the United Kingdom, the ASB discussion paper, *Derivatives and other financial instruments* (1996), states that disclosures about the market risk of financial instruments are important and should be provided. It encourages quantification of market risk and proposes disclosure of information and methods used to manage these risks. (IASC 1997:182).

- The Securities Exchange Commission (SEC) in the United States recently issued requirements for disclosure of market risk inherent in derivatives, other financial instruments and derivative commodity instruments:

> *An enterprise may choose between three methods for disclosing quantitative information:*
>
> 1. *Tabular presentation of expected future cash flow amounts, contract terms and maturity dates.*
> 2. *Sensitivity analysis reflecting the extent of market changes on the value of the enterprise's risk-sensitive instruments.*
> 3. *Value-at-risk methodology, measuring potential loss of value from market movements over a specified time period. (IASC 1997:183.)*

- The Australian Standard extends the requirements of IAS32 to include in its disclosure, objectives for holding or issuing derivative financial instruments, the context needed to understand those objective and its strategies for achieving those objectives (IASC 1997:183).

The issues surrounding disclosure requirements and the extent to which risk management policies should be elaborated on in financial statements are not finite and still require further debate. This is also clearly evident in the IASC's discussion paper. However, preparers of financial statements should bear in mind their responsibility towards users of financial statements and that a meaningful and sufficient level of visibility is attained through disclosed financial information so that users and investors may clearly understand the economic impact the said financial information may elicit.

ED107 encourages, but does not require disclosure of risk management policies. The discussion paper views the development of thesis policies as a further challenge to be addressed, and to ensure that a meaningful risk management policy framework be developed to move towards a holistic value-at-risk measurement model. This issue is further elaborated upon in the following chapter.

5.6 Conclusion

The debate surrounding accounting for financial instruments is not finite and will still elicit many opinions and controversy. The primary task of accountants having a responsibility to stakeholders, is to ensure that the most transparent and effective application of available guidelines and statements, befitting the enterprise's business, will result in the meaningful disclosure of the financial results of that enterprise.

Hedging investments in foreign entitities

Present accounting guidelines, both AC112 and ED109, allow for the manipulation of financial data and does not give proper guidance in terms of the removal of hedges (Hemus 1997:188). It is in this regard that progress towards comprehensive value-at -risk accounting *(vide supra)* will add

to the removal of manipulative accounting. It is also of concern that the IASC has not considered the accounting for exchange differences arising on net equity investments and related hedges; it has concluded that these issues fall outside the scope of its present discussion (IASC 1997:165).

Foreign exchange differences

Unless all financial instruments are accounted for at fair value, exchange differences arising on forward exchange contracts, entered into to hedge assets or liabilities, will always reflect period costs and not exchange gains or losses. Only in instances where forward exchange contracts were entered into as a speculative exchange transaction, without an underlying commitment or asset, will such differences constitute exchange gains or losses (Hemus 1997:179).

Continued disagreement by regulatory authorities

The continued debate surrounding derivatives accounting and the extreme differences that continue to exist between market users and accounting bodies clearly illustrate the point that no finality has been reached regarding widely accepted accounting methodology for derivatives and related financial instruments. As recently as August 1997, the Financial Accounting Standards Board (FASB) chairman, Edmund Jenkins rejected Federal Reserve chairman, Alan Greenspan's criticisms of its approach to develop new accounting rules for derivative and hedging transactions. The FASB seems determined to go ahead with its plans to issue a final statement by December, 1997, without further consultation with the market. The FASB has however admitted that its accounting proposal is piecemeal, which prompted authorities to suggest scrutiny by the US Congress. (IFR 1196 1997:88.)

The FASB furthermore committed to its goal of comprehensive fair value accounting for all financial instruments, away from existing accounting practices and alternatives proposed by the Federal Reserve (IFR 1196 1997:88). However, Greenspan proposed that the FASB limit fair

value reporting to large companies, which should be disclosed in a separate financial supplement. The Federal Reserve also advocated that the draft proposal then be re-exposed for comment.

From a theoretical perspective the FASB will in all likelihood produce a statement that will certainly be criticised by market users, and that may even have to be adapted as new ideas and proposals are forthcoming from the market. However, it should be seen as a starting point to move towards a coherent set of guidelines which will be sufficiently homogene that it will find acceptance with the broadest possible audience.

The FASB's endeavours to have the immediate introduction of fair value accounting regulated through a final statement is perhaps premature, although it may be the most acceptable solution for accounting for financial instruments. This very pure view is clouded by existing well-entrenched accounting concepts and by the IASC's own admission that fair value accounting is often seen as 'what if' accounting with insufficient substance. It is also difficult to apply fair value accounting to hedges of non-financial assets, which will require fair value accounting of the non-financial asset to ensure the most correct reflection of the asset and its hedge. In this regard the most acceptable solution is probably a hybrid of accounting methods, until sufficiently wide acceptance is shown for comprehensive fair value accounting.

The main issues that need further elaboration are the following:

Fair value accounting of non-financial assets and liabilities

It is necessary to consider this issue, especially where financial instruments, which are accounted for on a fair value basis, hedge non-financial assets and liabilities. This issue is complicated by the fact that existing accounting policies need to be changed and could have far reaching effects on the financial outcome of the relevant non-financial asset or liability.

Hedges of anticipated uncommitted transactions

Many enterprises enter into transactions using financial instruments that will only impact the financial outcomes in future periods, and which are not recognised because it relates to uncommitted transactions. These instruments therefore do not appear on the balance sheet although it may materially influence future transactions and hence the expected financial performance of the enterprise. Such instruments should be recognised and accounted for in order to ensure optimal transparency of the enterprises financial position.

Introducing value-at-risk models

To introduce a comprehensive value-at-risk accounting model may prove to be costly and superfluous. It is therefore necessary to consider less comprehensive alternatives that will result in acceptable transparent accounting. Enterprises should therefore embark on an accounting programme that will eventually ensure full fair value accounting over time.

In chapter 6 more emphasis is placed on developing the concept of fair value accounting and value-at -risk ideas, as well as reconciling the present differences in accounting philosophies by offering alternatives that may find wider acceptance.

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Chapter 6

Practical accounting considerations - application of the value-at-risk statement

6.1 Introduction

Financial reporting internationally is guided by the International Accounting Standards Committee (IASC), with strong influence coming from the United States body, the Financial Accounting Standards Board (FASB), the United Kingdom Accounting Standards Board and the Canadian Institute of Chartered Accountants. In 1989, the IASC issued a document entitled "Framework for the Preparation and Presentation of Financial Statements", which has been adopted by the South African body, the Accounting Practices Board (APB). This framework was subsequently issued in the guise of AC000, a statement of generally accepted accounting practice in the AC100 series.

The Framework further emphasises two aspects that are of importance from a South African viewpoint (Hemus 1998:3):

(i) South African reporting has moved strongly towards cash flow statements in preference of funds flow statements, whereas the Framework uses the term *'changes in financial position'*.

(ii) Company financial statements include directors' reports and other information required by the Companies Act in South Africa. The Framework includes in financial statements, the balance sheet, income statement, and statement of changes in financial position with attendant notes.

Financial statements are prepared for a variety of needs, and various user groups may use financial reports for different reasons. Investors may assess the statements to ensure that the enterprise is able to pay dividends, whereas lenders of funds will want to ensure that the enterprise is able to service interest commitments and eventually repay loans.

- *First principles of accounting*

AC000 states that the objective of financial statements is the following (SAICA 1990):

> *To provide information about the financial position, performance and changes in financial position of an enterprise that is useful to a wide range of users in making economic decisions.*

Further consideration should, however be given to the quality of the financial information provided, and in terms of SFAS No. 1 certain criteria are mentioned to enhance the quality:

(i) the enterprise's resources, obligations and owners' interest,

(ii) earnings performance

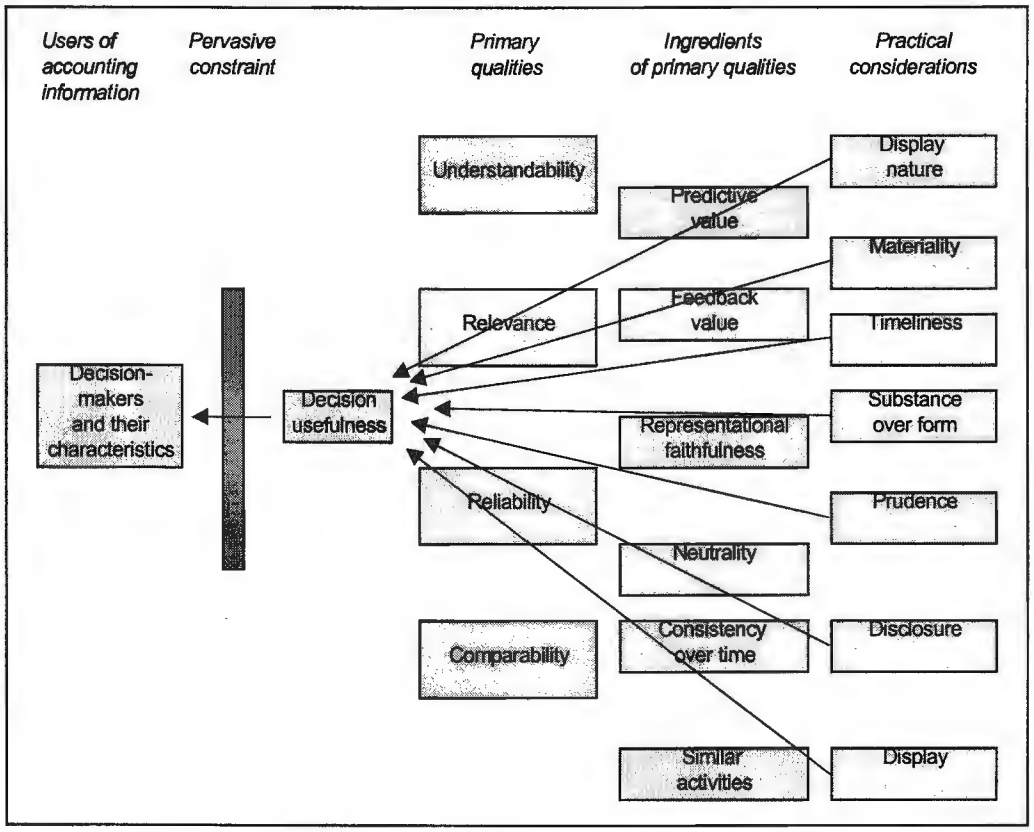
(iii) liquidity, solvency, funds flows, and

(iv) details about management's stewardship and performance.

Furthermore the information presented in financial statements should be understandable, relevant, reliable and comparable. In terms of relevance, it should be relevant to decision-making needs and materiality, whereas in terms of reliability, it should always faithfully represent the financial position of the enterprise, giving precedence to substance rather than form. In terms of comparability it should compare like with like and be reliable over time. (Hemus 1998:21.)

Everingham (1998: 6-6) illustrates the characteristics of accounting qualities in the following diagram:

Table 6.1: Characteristics of accounting information



In terms of the scope of this study, it is interesting to note the comments of AC000 on the reliability of information (SAICA 1990):

(i) represent faithfully the transactions and other events it either purports to represent or could reasonably be expected to represent and

(ii) be neutral, i.e. free from bias.

The objective of accounting therefore needs to be to supply reliable decision-useful information that will meet the majority of user needs.

- *Elements of the accounting process*

In setting up an accounting framework for a treasury operation, consideration should be given to the elements that constitute accounting (Hemus 1998:11). Firstly, assets represent those resources that are controlled by the enterprise, which will give rise to future economic benefits. Secondly, liabilities present obligations, the settlement of which will result in an outflow of resources. Thirdly, equity is defined as the residual of assets in the enterprise after all liabilities have been deducted..

Income is defined as increases in economic benefits n the form of enhancements of assets, whereas expenses are defined as decreases in assets through outflows, which are required to maintain the operations of the enterprise.

- *Further issues*

In terms of *going concern* it is assumed that the treasury business will continue indefinitely, albeit often with great risks. However, it sometimes does happen that strategic decisions are taken to withdraw from certain markets, especially if the risk/reward ratio turns negative. This may be as a result of banks losing whole trading teams to competitor institutions or that enterprises change strategic direction, for example a manufacturer may curtail direct exports to foreign markets.

The consistency of earnings, the quality of the trading team, the past performance of the treasury in a relevant market and the strategic trading objectives of the treasury are all indicative factors that will dictate the treasury's future existence in a specific market.

Although the continuation or discontinuation of trading activities of a division in a large trading operation may seem somewhat academic, it may eventually cause large scale economic losses. The take-overs of Barings by ING and Sechold by Investec Bank are

examples where treasury operations caused the complete collapse of strong and profitable institutions.

The second concept, namely that of *matching*, dictates that items of revenue and cost need to be recognised when incurred, rather than when money is received or paid. Items are matched in as far as a relationship can be established, i.e. option premia against the mark-to-market revaluation of a five-year interest rate cap. The difficulty in applying this concept derives from the fact that many treasury transactions are spread over a number of years and the decision to recognise income and expenditure becomes very subjective.

In terms of *consistency*, two distinctions are made; firstly, in a given accounting period similar items should receive the same accounting treatment, and secondly, accounting treatment should be the same from one accounting period to the next. This is sometimes difficult with the accounting treatment of derivatives and the continued progress that is made in terms of arriving at acceptable derivatives accounting standards.

Although the Group of 30[1] recommends consistency regarding the use of derivatives in terms of risk management policies, opinions differ regarding valuations of derivatives and therefore the subsequent accounting of the underlying instruments.

The *prudence* concept dictates that *revenue and profit are not anticipated but are recognised by inclusion in the income statement only when realized in the form of cash or of other assets the ultimate cash realisation of which can be assessed with reasonable certainty; provision is made for all known liabilities (expenses and losses). Whether the amount of these is known with certainty or is a best estimate in the light of the information*

[1] The Group of 30 refers to representatives of the top 30 industrial countries whom have made representations regarding the issue surrounding the risk of financial instruments and their effects on the enterprise.

available (SAICA 1983a).

6.1 Comparisons between accrual accounting and fair value accounting

As markets become more volatile and participation by users of financial instruments across financial markets increases, such instruments become more commoditised and as a result requiring valuation at market related values, rather that historical values. Although it is not always required within the accounting confines of an enterprise to express the values of financial assets and liabilities at their fair market rates, the tendency amongst regulatory bodies such as the Bank for International Settlements and the International Accounting Standards Committee is to move towards fair value accounting. In the ensuing paragraphs, the differences in accounting treatment with reference to interest rates, currencies and derivative instruments are explained by way of examples only and do not represent an exhaustive analysis of all fair value applications.

- *Interest rates*

Like with most other financial markets, investments in money market instruments can either be for long term investment portfolio purposes or for speculative or trading portfolio purposes. Traditionally long term investments or loans would be accounted for on an accrual basis over the life of the loan or investment. In terms of the fair value concept, these assets and liabilities need to be valued at fair value on a continuous basis.

I. Accrual accounting

Consider a money market investment of ZAR 10 000 000,00 in certificates of deposit with a tenor of six months. The interest earnings are calculated as 10% annual yield. After one month the interest accrued to the enterprise will be

(10 000 000,00 X 10% X 182 / 365) / 6 = ZAR 83 105,02

This amount therefore reflects the interest earned in the first month of the six-month period for which the investment was made. If the interest is only payable at maturity of the certificate of deposit, the enterprise raises a debtor reflecting the interest owing until settlement.

Suppose further that the enterprise has raised money for six months at a rate of 8,5% to make this investment. It can therefore be argued that the spread 1,5% between the investment and the loan is the net earnings to the enterprise. The interest owing on the loan will be accrued in similar fashion.

Assuming the enterprise has a year-end three months prior to maturity, it would have accrued three months' worth of interest, raising the debtor and reflect interest income as earnings for the three-month period. Likewise, it will raise a liability for interest owing and reflect the expense in the income statement.

II. Fair value accounting

The difference in accrual accounting and fair value accounting lies in the fact that the fair market value of the financial asset or liability is considered when the instrument is accounted for. Firstly it is necessary to explain the difference between fair value and market value. Fair value expresses the theoretical value for which a financial instrument could be bought or sold. This would usually be reflected in indicative pricing obtained from a counterparty on an arm's length basis. The market value can be seen as the fair value adjusted for variables relating to a specific transaction. Such variables include liquidity of the financial instrument, size of the transaction, credit ratings of counterparties as well as tenor of the underlying transaction. In the remainder of this chapter reference is only

made to fair value, which includes market value and assumes that fair values incorporate all variables.

In the given example the impact of time value of money will result in a different accounting analysis compared to the accrual method.

In terms of the accrual method the net profit at maturity will be the following:

Interest earned – 10 000 000,00 X 10% X 182/365	498 630,14
Interest paid – 10,000,000 X 8,5% X 182/365	423 835,62
Net interest earned	74 794,52

The accrual method assumes no time value of money and profit is accrued linearly until maturity.

From a fair value perspective the loan and the investment need to be revalued in terms of their respective market values at the time that the revaluation is done. Assuming interest rates have risen to 12%, the investment and the loan will now be revalued at the higher rate to determine the fair values of the respective instruments.

In terms of the certificate of deposit, the fair value calculation will be dependent on the cost that the enterprise will incur to liquidate the investment at 10% and to re-invest at the present higher interest rate.

The future value of the initial investment for the 182 day period is R 10 498 630,14. If after three months (90 days) interest rates have moved to 12% and the instrument needs to be revalued, the cost or benefit of liquidation needs to be calculated. By determining the re-purchase value of the instrument over the remaining three-month (92 days) period, which

yields an amount of R 10 190 405,28, the fair value of the instrument over its remaining life has been established, i.e. a R10 000 000,00 NCD at the given rates is worth R 10 190 405,28.

R 10 190 405,28 X 12% X 92/365 = R 10 498 630,14

The present value of the same instrument at 10% yields a value of R 10 240 513,10, which means that the opportunity cost or value at risk inherent in the investment is the difference between the two amounts, i.e. R 50 107,85.

It could be argued that the investment of R 10 000 000,00 is only worth R 9 949 892,15 as a result of the opportunity cost arising from the higher interest rates.

- *Currencies*

Foreign exchange transactions in essence consist of two elements; the spot rate or present market price at which one currency can be exchanged for another and the future rate or price at which two currencies can be exchanged. In terms of the latter, the same principles would apply as for other interest rate transaction, with the only exception that the yield curve will be determined by the differential between the yield curves of the respective currencies. The forward price of the rand against US dollar would therefore be reflected in the differential between the prevailing US interest rates and the SA interest rates for a specific period.

The spot rate is simply a reflection of the fair market price payable for any one currency against another at a point of time.

I. Accrual accounting

Consider the purchase of US dollars against the rand, to be settled in three months' time. At the time of the transaction the spot rate was 4,9000 and the forward rate 5,005. The

difference between the two rates reflects the interest differential between US and SA interest rates and is not an expectation of the spot rate in three months' time. This difference is therefore accounted for as a financing cost or benefit. By purchasing US dollars against the rand the enterprise has effectively acquired a foreign currency asset, which attracts a certain financing cost which in turn is reflected in the interest rate differential.

In this example the cost of USD 1 000 000,00 is ZAR 4 900 000,00, whereas the financing cost for the three-month period is R 105 000,00. This will be accounted for by accruing the cost over the three-month period and reflecting the cost of the foreign currency asset at 4,9000.

The following entries will be passed:

Investment in foreign currency asset	4 900 000,00	
Liability (foreign currency)		4 900 000,00
Finance costs (debtors)	105 000,00	
Liability (finance costs)		105 000,00
After one month - assuming even accrual of finance costs		
Finance costs (income statement)	35 000,00	
Finance cost (debtors)		35 000,00
At maturity		
Liability (finance costs)	105 000,00	
Cash		105 000,00

Liability (foreign currency)	4 900 000,00	
Cash		4 900 000,00

Neither the movement of the exchange rate between the US dollar and the rand nor the movement in the interest rate differential is reflected in the above entries.

II. Fair value accounting

Consider the impact of a five cent rise in the spot USD/ZAR exchange rate on a forward exchange contract, i.e. the enterprise bought USD forward for three months.

Original contract	:	USD 1 000 000,00 / ZAR
Spot rate	:	4,9000
Forward purchase rate	:	5,0050 - three months

The enterprise has a long currency position and a fixed interest cost resulting from the interest rate differential between the US dollar and rand for a three-month time period.

In practice it usually happens that a significant and sustainable weakening of one currency against another will cause the forward differential to widen at the time of the movement. This is as a result of the demand created in the market by buying the weakening currency and moving the underlying purchases into the forward market. In this instance the five cent rise of the US dollar against the rand will in all likelihood cause forward margins to widen across the yield curve. Assume a widening of 0,0250 cents across the curve on the same day of the original purchase.

The original contracts will now be revalued as follows:

Spot rate : 4,9500

Forward purchase rate : 5,0900

The rate of 5,0900 is derived from the original spot of 4,9000 adding the forward margin of 0,1050, adding the spot devaluation of 0,0500 and adding the forward increase of 0,0250.

Should the enterprise sell the contract at this point of time it will generate the following earnings:

On the foreign currency investment it will revalue its foreign currency investment, i.e. its US dollars at the fair market price at which it could sell the dollars in an arm's length transaction. In this instance the price would be 4,9500:

Foreign currency asset	500 000,00	
Revaluation reserve		500 000,00

Being revaluation of foreign currency asset at prevailing market price.

In terms of the financing costs incurred on the forward exchange contract, the interest rate differential has widened, which in terms of revaluation would benefit the enterprise. The fair value to the enterprise would therefore be the difference in the finance charge raised originally, i.e. R 105 000,00 and the finance charges it could recoup at the time of re-valuation, i.e. R 130 000,00, discounted at the prevailing interest rate applicable for the period to settlement of the contract. In this instance the contract was re-valued on the same day and the three-month rand interest rate will apply.

The fair value accounting methodology in terms of foreign currency assets and liabilities, both spot and forward, becomes a dynamic revaluation model as market prices move. The objective of fair value accounting is to express the value of financial assets and liabilities in

terms of present market conditions and not as assets and liabilities based on historical cost values.

- *Derivatives*

Derivatives typically represent instruments with qualities that offer certain rights and obligations that are dependent on future prices of the underlying instrument on which the derivative is based. Unlike cash-certain instruments, the cash outcome of a derivative is not known until maturity, which makes it difficult to quantify the estimated future value of the instrument. However, it is possible to determine the value of a derivative at any point of time, provided that a readily available market exists in which the instrument could be bought or sold. The price determined in this manner would for all intents and purposes represent the fair market value of the derivative.

I. Accrual accounting

Consider the purchase of a call option against the South African R150 government bond. Assume the spot rate or the present market rate of the bond is 13,50% yield and that the premium payable for a six-month call option struck at 13,00% is 10% of the underlying nominal. For purposes of this example assume a nominal of R 10 000 000,00. The premium payable is therefore R 1 000 000,00.

In this instance the option premium would be written off to income as and when incurred. The asset purchased, i.e. the R1 000 000,00 worth of government bonds would be deemed contingent and hence remain off balance sheet.

II. Fair value accounting

The SAICA statement on financial instruments, AC125 refers to the presentation of financial instruments at their fair value, which would be the quoted market price, adjusted for

transaction costs, at which an instrument could be bought or sold. It further requires the disclosure of the method adopted in determining fair value of an instrument or specific groups of instruments.

In terms of the call option in the above example, the fair value would be the quoted market price of the option at the time of valuation. Assume that the market price has moved to 11,00%, which effectively means that the call option is now worth less, given the strike price of 13,00%. In fact, the option strike is far out-the-money and will most likely only have some inherent time value. Assume a value of 1,00% at the time of valuation. The enterprise will therefore be able to receive R 100 000,00 on an option for which it paid R 1 000 000,00.

From an accounting perspective the value of the asset will be reduced to reflect the fair value, by debiting the difference to the income statement. However, it is necessary to consider the reason for this transaction. Firstly, had the option been bought as a hedge against an underlying short bond position, the income statement will reflect the mirroring entry on the revaluation of the underlying bond position. Secondly, had the option been bought as a pure speculative position, it would obviously only reflect the initial entry.

It is also possible to reflect the underlying bond position as an asset, which is effectively established by virtue of the call option, adjusted for the transaction costs raised through the option premium. The fair value would then be determined by revaluing the bond at the prevailing yield curve over the remaining life of the bond until maturity. The revaluation difference would then be taken to income.

6.2 Application of value-at-risk

Value-at-risk (VAR) is a single line expression of the expected maximum loss over a target horizon within a given confidence level (Jorion 1997:19). VAR provides users of financial statements with a summary measure of market risk incurred by the enterprise. It measures risk using the same currency as the reporting currency of the enterprise, although it captures all risks within the wider portfolio of instruments to which the enterprise is exposed.

One of the components of financial risk management is to evaluate and quantify the risks attached to the financial instruments to which the enterprise is exposed. In the instance of an ordinary money market investment the enterprise would, in its simplest form be exposed to interest rate risk, liquidity risk and credit risk. Enterprises have no control over the price volatility of financial instruments, but they can control their risk exposure through the application of these instruments and the subsequent measurement thereof.

If the enterprise had decided to fix the rate of its investment, it would run the risk that interest rates could rise and hence result in an opportunity cost to the enterprise. Likewise, the enterprise could fix its investment for a given tenor and then find that it requires its funds sooner. The enterprise therefore incurs liquidity risk, which would force the enterprise to borrow funds to meet its cash flow needs or to liquidate the existing money market investment. Finally, the enterprise could have invested its funds in an institution that failed financially, causing losses to its creditors, hence resulting in credit risk.

In order to express a meaningful opinion regarding the enterprise's exposure to the various risks, it is therefore necessary to break down the risk exposures into their various components. In this instance the money market investment can be evaluated in terms of its market risk, i.e. interest rate and liquidity exposure, and its credit risk exposure. In terms of VAR models, these exposures are quantified to express the potential loss of this investment at a given confidence level over a given time period.

Provided VAR models are sensibly applied to the enterprise's exposure to various financial risks it can become an effective instrument to support the accounting complexities emanating from financial instrument accounting. This can be explained by way of a number of practical examples, which are used throughout this chapter.

An enterprise has raised a rand loan to pay for imported capital goods for its manufacturing plant, which it bought three years ago. In terms of existing accounting practice, the asset would be raised and depreciated over its useful life, whereas the loan liability would be raised and interest would be accrued and expensed to the income statement until the capital is repaid. Recently proposed accounting concepts now requires the application of fair value accounting, where the loan, which is deemed to be a financial instrument, be revalued at its fair value or market value (IASC 1997:85).

This change in accounting practice could be complex and difficult to apply, especially in less sophisticated environments. Although VAR models may appear complex they succeed in establishing a simple method of evaluating all financial instruments in order to arrive at meaningful accounting values which could be used to express the enterprise's exposure to financial instruments. Exposures to market risks are broken down into their root components and then captured in the VAR Statement. By creating a provision for VAR the enterprise would have accounted for its exposure to all quantifiable market risks. The VAR Statement would also reflect the enterprise's exposure to financial instruments,

which would give shareholders and stakeholders an insight into the financial stewardship of the enterprise in terms of its financial risk management.

- *Mathematical concepts*

In order to understand and apply VAR techniques, it is necessary to consider certain mathematical concepts.

I. Expectations and probability

Whenever a financial instrument is bought or sold, either to generate a return or to hedge an existing exposure, the buyer or seller anticipates a certain outcome to which it can attach a calculated probability. To this end the expected value will be distributed over a number of outcomes, which is termed the *probability distribution*. The probability distribution function (pdf) must sum to unity and is defined by (Jorion 1997:68) as:

$$\sum_{i=1}^{n} p_i = 1$$

where p_i, represents the probability of occurrence of each of the outcomes, n.

The objective of measuring probability distribution, is to determine the probability that certain outcomes occur, for example the return on an investment. The above equation relates to a fixed set of returns and needs to be adjusted to provide for a continuous range of outcomes, which would be typical of financial instruments. The formula for *pdf* is therefore adjusted to provide for a continuous range of outcomes that must integrate to unity (Jorion 1997:71):

$$\int_{-\infty}^{\infty} f(x)\,dx = 1$$

where the *pdf* is redefined as *f(x)*, and must sum to unity over all possible values from $-\infty$ to ∞.

The expected value of the outcome as well as the variance of all possible outcomes usually determines the distribution of a fixed set of outcomes. The first is also known as the mean and can be expressed as, *E(X)*, (Jorion 1997:70):

$$\sum_{i=1}^{n} p_i \; x_i \quad = E(X)$$

where x_i is the value of each outcome, weighted by its probability of occurrence, p_i.

The dispersion around the mean, *E(X)* is calculated by computing the variance *V(X)*, or weighted sum of squared deviations around the mean. This calculation is necessary in order to eventually determine the volatility of a given investment, which will determine the value at risk of that investment. Jorion (1997:70) expresses the variance as follows:

$$\sum_{i=1}^{n} p_i \; \left(x_i - E(X)\right)^2 \quad = V(X)$$

The variance is measured in units of x squared and thus not directly comparable to the mean. The standard deviation or volatility is therefore defined as the square root of the variance, *SD(X)*, (Jorion 1997:70):

$$\sqrt{V(X)} \quad = SD(X)$$

In terms of the expectation and variance in instances of multiple outcomes, where outcomes may vary from $-\infty$ to ∞, it is necessary to adjust the formulae to allow for random variables.

This would therefore cause expectation *E(X)*, to be extended to (Jorion 1997:71):

$$\int_{-\infty}^{\infty} x f(x)\, dx = E(X)$$

And the variance extended to (Jorion 1997:71):

$$\int_{-\infty}^{\infty} (x - E(X))^2 \cdot f(x)\, dx = V(X)$$

where these extensions apply to a continuous range of outcomes, summing to unity over all possible values.

II. Normal distributions

Normal distributions are a graphical illustration of the behaviour of variables or a description of existing populations. The normal distribution or the "bell-shaped" curve is central to statistics and an essential part in the development of value-at-risk theory. Two important drivers in the normal distribution are the mean (μ), and the variance (σ^2). The first parameter represents the location and the second, the dispersion.

The distribution function can be expressed as follows (Jorion 1997:73):

$$f(x) = \frac{1}{\sqrt{2ps^2}}\, e^{-\frac{1}{2s^2}(x-\mu)^2}$$

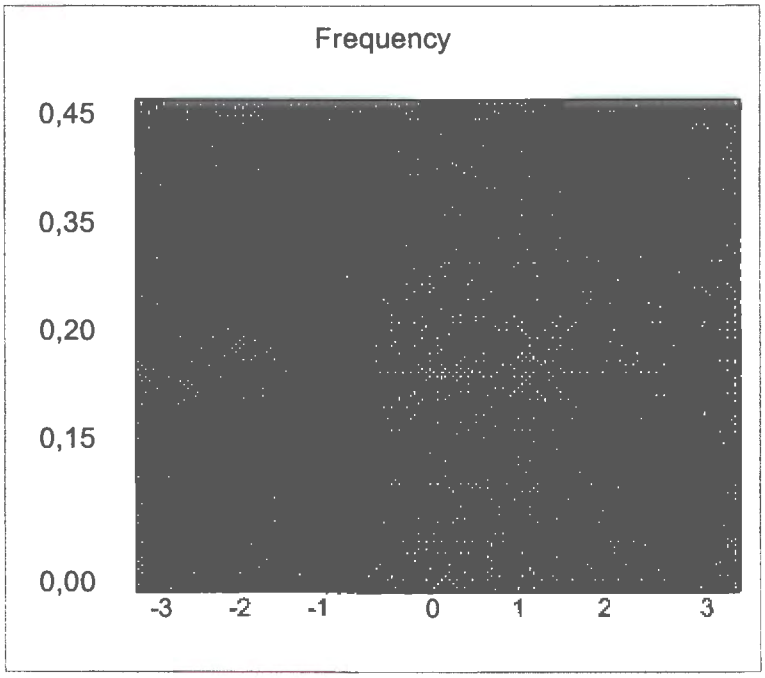
where p represents π, s represents σ, and e^y represents the exponential of y, where $y = -(1/2\,\sigma^2) * (x - \mu)^2$ and

$$\Phi(x) = f(x)$$

This function is also the primary formula in the Black-Scholes option-pricing model. The further application of this function has resulted in the development of normal distribution tables, which represents the *standard normal distribution function*.

Graph 6.1 represents this function.

Graph 6.1: Normal distribution



Consider a standard normal variable, ϵ, where approximately 95% of the values of z are contained between -2 and 2 and 68% of the distribution falls between -1 and 1. For example the 95% confidence limits for movements in an exchange rate, x, with a mean of 1,00% and a volatility of 12,00% is calculated as follows:

x_{min} = 1% - 2 X 12% = -23%

x_{max} = 1% + 2 X 12% = 25%

The confidence interval for ϵ translates into [-23%, 25%] for exchange rate movement, x.

The precise cut-off points are given in the table. These are points, q, by quantile, such that the area to the left or right represents a given probability, c. To find the value at risk at the one tailed 95% confidence level, the deviation below the mean is 1,645.

Arithmetically it is expressed as follows (Jorion 1997:74):

$$\int_{q}^{\infty} f(x)\,dx = c$$

In the following table the various cut-off points are given:

Percentile	99,99	99,90	99,00	97,72	97,50	95,00	90,00	84,13	50,00
Value	-3,715	-3,090	-2,326	-2,000	-1,960	-1,645	-1,282	-1,000	0,000

III. Risk and return

In terms of the calculation of value-at-risk, risk can be described as the dispersion of possible outcomes. A flatter distribution indicates greater, whereas a steeper curve will indicate less risk. Consider the risk-adjusted-return-on-capital (RAROC) calculation which is used by Bankers Trust; these examples demonstrate the inherent risks versus returns across markets (Jorion 1997:77).

Example 6.1:

Two traders, a foreign exchange trader and a bond trader (short-term treasury bills), have both made USD 10 million of profit. The question is which trader performed better and which trader incurred the greatest risk. The Bankers Trust RAROC system adjusts profits for capital at risk and allows for meaningful comparisons across risk positions.

Foreign exchange position

Assume a face value of USD100 million and USD/DM volatility of 12% per annum. Furthermore the bank assumes a 99% confidence level, i.e. the bank's capital must cover 99% of all possible losses. Given the 2,33 standard deviations below the mean (see table above) at a 99% confidence level, the worst possible exchange loss is calculated as 2,33 X 0,12 X USD100 million = USD28 million. The RAROC is therefore:

USD10 mln / USD28 mln or 36%.

Short term treasury position

Assume a face value of USD200 million and a risk ratio of 4% per annum. The maximum loss would therefore be 2,33 X 0,04 X USD200 million = USD19 million, which equates to a RAROC of 54%.

The bond trading activities therefore offers better value as a source of income.

In general the rate of return can be measured as the capital gain plus interest or dividends over a given time period. It can be expressed in the following formula (Jorion 1997:76):

$$(P_t + D_t - P_{t-1}) / P_{t-1} = r_t$$

This equation refers to the arithmetic rate of return, which implies a singular reinvestment of income at period ends. The geometric rate of return is more meaningful, since it allows for the valuation across currencies and over multiple periods. The geometric return is expressed as (Jorion 1997:78):

$$\ln [(P_t + D_t) / P_{t-1}] = R_t,$$

where D_t represents income payments, t the time period and P the value of the investment.

A final variable to be considered in determining value-at-risk, is the time period over which the VAR calculation will be done. In terms of understanding VAR, users of financial

statements will require information regarding the time period over which potential unfavourable outcomes will be measured. In order to compare risks across various time horizons, the econometric concept of time aggregation is used, which endeavours to express exposure with multiple maturities as a single number. For purposes of time aggregation it is assumed that returns are uncorrelated over successive time intervals - the current price of a financial instrument includes all relevant information about that instrument, therefore nothing is anticipated.

- *Principles of value-at-risk (VAR)*

Two factors need to be considered in computing VAR; firstly, the time horizon over which VAR will be computed and secondly, the confidence level at which VAR will be computed. The Basle Committee defines a 99% confidence level over a 10-day time horizon, which result is then multiplied by three to determine the minimum capital requirement for regulatory purposes.

Time horizons may vary depending on the type of portfolio that is evaluated. It could therefore happen that a currency portfolio might be evaluated over a 5-day time horizon, whereas a complex long-term investment portfolio may be evaluated over a one-month time horizon. The horizon usually corresponds to the liquidity of the underlying securities and the time needed to liquidate a portfolio.

The choice of a confidence level is very subjective and will depend on the express purposes for which the VAR evaluation is done. If it is done to determine the capital at risk, then the confidence level is more important than when it is only used to determine a company's risk across various markets.

The computation of VAR will be illustrated through a number of practical examples in which the mathematical concepts referred to in previous paragraphs will be applied.

To compute VAR for a portfolio, define the initial investment as W_0 and the rate of return as R. The portfolio value at the end of the target horizon is $W = W_0 (1 + R)$. The expected return and volatility of R, are represented by μ and σ. Define the lowest portfolio value at a given confidence level, c, as $W' = W_0 (1 + R')$.

VAR is therefore defined as the dollar loss relative to the mean,

$$VAR\ (mean) = E(W) - W' = -W_0 (R' - \mu).$$

In order to determine VAR, it is necessary to find the lowest absolute value of W' or the level of return, R', at which a loss will be realised or at which an exposure will be liquidated. At the given confidence level, c, it is now possible to express an opinion in terms of the probability of exceeding this value. VAR will therefore be derived from the probability distribution of the future portfolio value, $f(w)$:

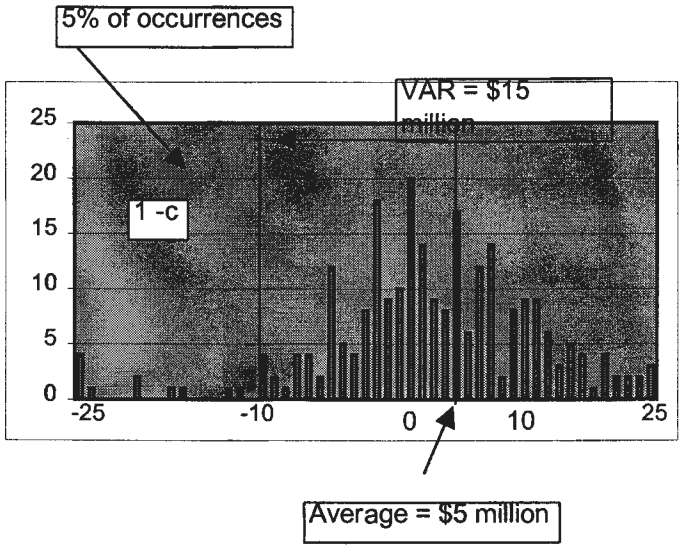
$$\int_{w^I}^{\infty} f(w)\, dw = c$$

Furthermore, the probability of a value lower than W', $p = P(w <= W')$, is $1 - c$; the following probability is then derived:

$$\int_{-\infty}^{W^I} f(w)\, dw = P (w <= W') = p = 1 - c$$

The area from $-\infty$ to W' must sum to $p = 1 - c$, for instance 5% at a 95% confidence level. The number, W' is called the sample quantile of the distribution. In the following example this calculation is illustrated by analysing JP Morgan's daily revenue reports for 1994.

If it is assumed that daily revenues are independently distributed, the VAR can be derived from the left tail of the graph, given the 95% confidence level:



From the given data the average revenue is about USD 5,1 million, and a total of 254 observations. To find *W'*, the number of observations to the left of the graph need to be determined, i.e. 254 X 5% = 12,7. There are 11 observations to the left of - USD 10 million and 15 observations to the left of - USD 9 million. By interpolation, *W'* is calculated as - USD 9,6 million, which gives a VAR relative to the mean of USD 5,1 million of USD 14,7 million. (Jorion 1997:88.)

The process is simplified by assuming distributions to being normal and the VAR can be calculated directly from the portfolio standard deviation. To calculate this number it is necessary to translate the general distribution, *f(w)* into a standard normal distribution, $\Phi(\varepsilon)$, where ε has a mean of zero and a standard deviation of unity.

Given that $W' = W_0 (1 + R')$ and that the cut-off return, *R* is usually negative in terms of potential loss in a portfolio, R can be written as $-| R' |$. Probability is then derived as follows:

$$\int_{-\infty}^{W} f(w)\,dw \quad = \quad \int_{-\infty}^{-|R|} f(r)\,dr \quad = \quad \int_{-\infty}^{-\alpha} \Phi(\varepsilon)\,d\varepsilon = 1 - c$$

The result of this equation is tabulated in tables of the cumulative standard normal distribution function. The area to the left of the of the standard normal variable will give the value of *d*, which will be written as follows:

$$\int_{-\infty}^{d} \Phi(\varepsilon)\,d\varepsilon = N(d)$$

This function also plays a key role in the Black-Scholes option-pricing model.

- *Value at risk for interest rates*

Most financial instruments are in some way linked to a singular or often a multiple stream of future cash flows. These cash flows represent a quantitative statement of the future value of money, which is reflected by the interest rate used to determine those cash flow streams. In order to evaluate a financial instrument with a given set of future cash flows, the instrument needs to be broken down into its component parts. A typical government bond would consist of the capital amount and a given number of future cash flows.

The market value of a bond, *P*, can be calculated as the present value of future cash flows (Jorion 1997:104):

$$\sum_{t=1}^{T} \frac{C_t}{(1+y)^t} = P$$

where

C_t = the coupon or principal payment or both in period t,

t = the number of periods to each payment,

T = the number of periods to final maturity,

y = the yield to maturity for the particular bond.

To convert the calculation from discretely compounded yields to continuously compounded yields; the equation will change as follows:

$$\sum_{t=1}^{T} C_t \cdot e^{-y^c \cdot t} = P$$

The term structure of interest rates is represented by the yield curve. The yield curve consists of fixed rate instruments with varying maturities over time, paying different coupons at fixed intervals until maturity of the relevant instrument. The yield curve could be constructed in many different ways and the following graph reflects an approach where the curve was drawn from a select number of government and government-guaranteed bonds in the South African bond market (Faure 1994:64).

This graph is not a finite illustration of the South African yield curve and does not necessarily represent the time value of the reporting currency, it is merely a subjective calculation of time value of a given yield curve.

Graph 6.2: The ZAR bond curve

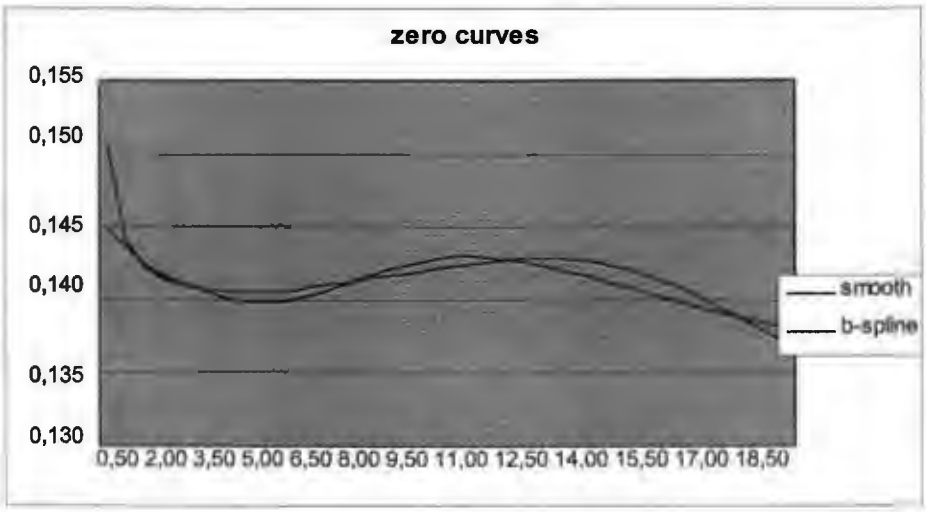


Table 6.2: Rates representing the zero-coupon curve

COUPON	REDEMPTION	COUPON	REDEMPTION
13,50%	1-Aug-20	12,50%	15-May-02
13,50%	15-Sep-15	12,50%	15-Apr-02
14,50%	30-Sep-10	12,50%	1-Apr-02
13,00%	15-Sep-10	12,50%	15-Jan-02
13,00%	31-Aug-10	10,00%	31-Oct-01
11,50%	30-Jun-10	8,00%	1-Sep-01
16,50%	1-Apr-10	11,50%	30-Nov-00
11,00%	1-Jun-08	11,50%	30-May-00
7,50%	1-Apr-08	11,50%	30-May-00
10,00%	31-Mar-08	11,50%	30-Nov-99
9,50%	15-May-07	11,50%	15-Feb-99
12,50%	21-Dec-06	10,75%	15-Dec-98
12,00%	1-Dec-05	15,00%	1-Oct-98
12,00%	28-Feb-05	11,50%	30-Jun-98
9,00%	15-Oct-02	12,00%	31-Mar-98

The zero-coupon curve represents a snapshot of spot rates plotted against time and are derived at by treating each individual coupon as a discount bond. It is more fitting to use than the ordinary yield curve because of its ability to express bonds in a homogenous manner from which the value of securities could be derived.

The zero-coupon curve is therefore a tool, which enables the user to effectively measure forward rates. A common hypothesis for interest rate expectations is that the forward rates

are the best estimates of future spot rates. Consider a two-year investment profile, which gives rise to the following equation:

$$(1 + R_2)^2 = (1 + R_1)\,(1 + E\,[\,R_{1,1}]\,)$$

where

R_2 is the two year investment rate and

$E\,[\,R_{1,1}]$ is the one-year rate expected in one year

Given the expectation hypothesis, the future spot rate, $F_{1,2}$ will be equal to $E\,[\,R_{1,1}]$.

By deduction the forward rate will be equal to the two-year spot rate plus the difference between the two-year rate and the one-year rate:

$$F_{1,2} = R_2 + (R_2 - R_1)$$

where R_2 represents the two-year rate and R_1 the one-year rate.

This equation can be modified to allow for continuous compounding as follows:

$$e^{[R2t2]} = e^{[R1t1]} \cdot e^{[F1,2(t2 - t1)]},$$

where *t2* and *t1* represents any combination of forward periods, which defines the forward rate as:

$$F_{1,2}\,(\,t_2 - t_1\,) = (R_2 t_2 - R_1 t_1)$$

It is therefore possible to determine future spot rates along the yield curve, which can be applied to determine the value at risk. The following graph and table illustrate the derived rates of a typical upward-sloping yield curve:

Graph 6.3: Spot and forward rates of a typical upward-sloping yield curve

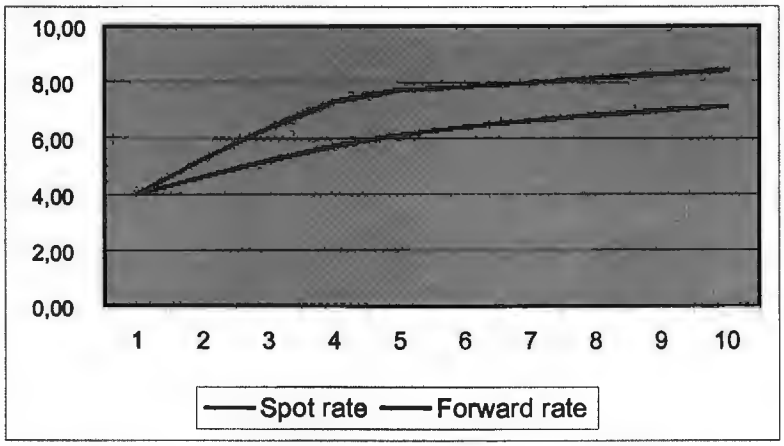


Table 6.3: Spot and forward rates of a typical upward-sloping yield curve

Maturity	Spot rate	Forward rate	Par yield	Discount
1	4,000	4,000	4,000	0,9615
2	4,618	5,240	4,604	0,9136
3	5,192	6,360	5,153	0,8591
4	5,716	7,393	5,640	0,8006
5	6,112	7,712	6,000	0,7433
6	6,396	7,630	6,254	0,6893
7	6,621	7,980	6,451	0,6383
8	6,808	8,130	6,611	0,5903
9	6,970	8,270	6,745	0,5452
10	7,112	8,400	6,880	0,5030

Consider the risk of return in a three-year bond over a one-year time horizon. Assuming a face value of USD100 million and by applying the rates in table 6.3, the one year spot rate is 4,00% and the forward rates are $F_{1,2}$ = 5,24% and $F_{1,3}$ = 5,79%; the bond is initially selling at par with a coupon of 5,153%. If it is assumed that changes in spot rates are normally distributed, the distribution of 500 forward rates reveals that the average rate of a one-year investment is 5,24% and that of the two-year investment, 5,82%. Furthermore the average price of a three-year bond over a one year period is 98,87, giving a total return of 5,153% + (98,87 - 100,00) / 100 - 4,02%, which is very close to the risk-free rate of 4,00%.

The VAR can be calculated from the standard deviation of the one-year distribution, which is 1,87 at a 95% confidence level, giving a cut-off value of 95,75. Therefore the risk of capital

loss for a USD100 million investment over a one-year time horizon, given a 95% confidence level is 98,87 - 95,75 = USD3,12 million.

It is again illustrated that the expected future value of the investment (future spot rates) and the level of confidence that is assumed for a given financial instrument determine the VAR calculation. In this regard it is important to consider the volatility of price movement of a given instrument over a specified time horizon in order to determine the level of comfort with a selected confidence level.

One further aspect to consider in the determination of value at risk for interest rates is the usage of duration. The concept of duration was originally defined by Macauly in 1938 as the weighted maturity of each bond payment, where the weights are proportional to the present value of the cash flows (Jorion 1997:118):

$$\sum_{t=1}^{T} t \cdot w_t = \sum_{t=1}^{T} t \cdot \frac{\frac{C_t}{(1+y)^t}}{\left[\frac{\Sigma C_t}{(1+y)^t}\right]} = D$$

where the weights are proportional to the present value of the cash flows and *t* represents the time to cash flow, *C* the cash flow and *y* the yield.

Table 6.4 illustrates this equation.

Table 6.4: Example of duration calculation

Time	Payment	Yield	PV of payment	Time X PV
1	6	6,00	5,66	5,66
2	6	6,00	5,34	10,68
3	6	6,00	5,04	15,11
4	6	6,00	4,75	19,01
5	106	6,00	79,21	396,05
Sum			100,00	446,51
Duration				4,4651

Consider a portfolio of USD100 million, equally invested in a five-year bond and a one-year bond. Their respective durations are 4,465 years and 1,000 years. The net portfolio duration is thus 0,5 X 4,465 + 0,5 X 1 = 2,733 years.

Duration can be applied to calculate VAR, by determining the worst change in yield of any particular investment. This can be derived from its expected outcome based on past performance, i.e. the maximum possible change in a given yield over a specific time horizon, which is then multiplied by the duration and the total portfolio value.

Over the last 40 years the 95% one-month cut-off returns for five-year notes was -1,7%, i.e. there was only a 5% chance that a portfolio would lose more than 1,7% over a one-month horizon. Assuming that a five-year note carries a duration of 4,5 years, and that the worst increase in yields over a one-month period is 0,38%, then the worst loss is:

Worst loss = duration X portfolio value X yield change

= 4,5 X 100 X 0,38

= 1,7

(Jorion 1997:122.)

- *Value at risk for currencies*

Value at risk for currencies is derived from similar variables as for interest rates, but needs to be adjusted to incorporate the volatility of price between the respective currencies for which the VAR calculation is performed. Currencies that form a specific portfolio are linked as a result of their relative performance against each other.

In order to demonstrate the calculation of value at risk, it is necessary to explain two elements that drive the VAR calculation. Firstly, the volatility of price, which is the frequency and extent to which the currency deviates from its mean over a given time period. These

rates have been derived from the historical price movement of the currency and have been tabulated by many risk management companies and banks. The price volatility of a currency is therefore given.

Secondly, it is necessary to determine the relationship between two currencies in a portfolio. Like with price volatility, the correlation between two currencies is given in similar tabular format. These tables are readily available from information vendors on the Internet.

The calculation of VAR for currencies is illustrated by way of the following practical example (Jorion 1997:207):

A vehicle manufacturer in the United States generates annual turnover of USD52 billion. It has an assembly line in Canada, which exports USD9,2 billion per annum to the US. Furthermore its direct exports amount to USD1,4 billion to Germany and USD1,3 billion to Japan.

Assuming no cyclical trends, the VAR of the company's cash flows over a one-month horizon the monthly cash flows can be translated to the following:

Canadian dollar	- USD767 million
German marks	+USD117 million
Japanese yen	+USD108 million

By extracting the volatility and correlation information for the various currencies it is now possible to calculate the correlation and covariance matrices, which will determine the VAR. These matrices are given in table 6.5.

Table 6.5: VAR computation for multiple currencies

	Risk (%)	Correlation (R)			Covariance matrix			Cash
	(V)	CAD	DEM	JPY	CAD	DEM	JPY	flow (x)
CAD	2,747	1,000	-0,208	-0,216	-0,5806	-0,0415	-0,0515	-767
DEM	6,220	-0,208	1,000	0,787	0,2723	0,4526	0,4254	117
JPY	8,046	-0,216	0,787	1,000	0,3659	0,4609	0,6992	108

	Total VAR		Incremental VAR	
	(V'RV)x	x(V'RV)x	beta (V'RV)x/Total VAR	beta X VAR
CAD	-0,6736	514,97	-0,00083	18,00
DEM	1,1503	134,23	0,00141	4,70
JPY	1,5259	165,41	0,00187	5,80
Total VAR		814,61		28,50
Portfolio VAR		28,56		

Table 6.5 summarises the risk and correlation of the various currencies, which confirms that the mark and yen are twice as volatile as the Canadian dollar to the US dollar. The lower panel shows the VAR computation, which is derived by calculating the vector emanating from the covariance matrix.

The covariance matrix is derived as follows:

CAD : $V_1^2.x_1 + V_1 V_2 x_2 + V_1 V_3 x_3$

DEM : $V_2^2.x_2 + V_1 V_2 x_1 + V_2 V_3 x_3$

JPY : $V_3^2.x_3 + V_1 V_3 x_3 + V_2 V_3 x_2$

This covariance notation is used for most multiple correlation models, *vide supra*.

In dealing with portfolio's it is necessary to note that the VAR of the portfolio can be computed from the covariance matrix over the target horizon Σ and the number of standard deviations corresponding to the specified confidence level (Jorion 1997:207):

$$\text{Value-at-risk} = \sqrt{\alpha\, x' \Sigma x}$$

where α is set at 1,65 for a one-tail 95% confidence level and x represents the delta positions, aligned on each of the risk factors.

The beta is calculated by dividing each VAR element by the total VAR, whereas the marginal contribution of each element to the total VAR is calculated by multiplying the cash flow of each element with the beta and the square root of the total VAR.

In this example it can be said that the contribution of the Canadian dollar to the overall VAR position of the company is USD18,8 whereas for the mark and the yen it is USD4,7 and USD5,8 million respectively. It is obvious that the Canadian dollar risk is greater because of its greater net exposure.

From an accounting perspective it should be clear that the prevailing information is essential in decisions whether exposures should be hedged or whether provisions should be made for the underlying exposures.

- *Value at risk for derivatives*

This section deals with the essential aspects that need to be considered in the calculation of VAR for derivatives. The extent to which derivative instruments vary in terms of the method of calculation and the complexity of the underlying products that drive many of these instruments does not allow for an exhaustive analysis of all possible VAR calculations nor the analysis of all possible VAR methodologies. The following paragraphs deal with those applications based on the Black-Scholes model, which is the most commonly used in international practice.

The only additional variable that is added when considering derivatives based on financial instruments is that of uncertainty. The underlying financial instrument is therefore made more complex by adding this variable. To determine the VAR of a derivative it is therefore necessary to disaggregate the instrument into its component parts and to determine the VAR of each component. It is therefore not a too difficult task since most instruments will

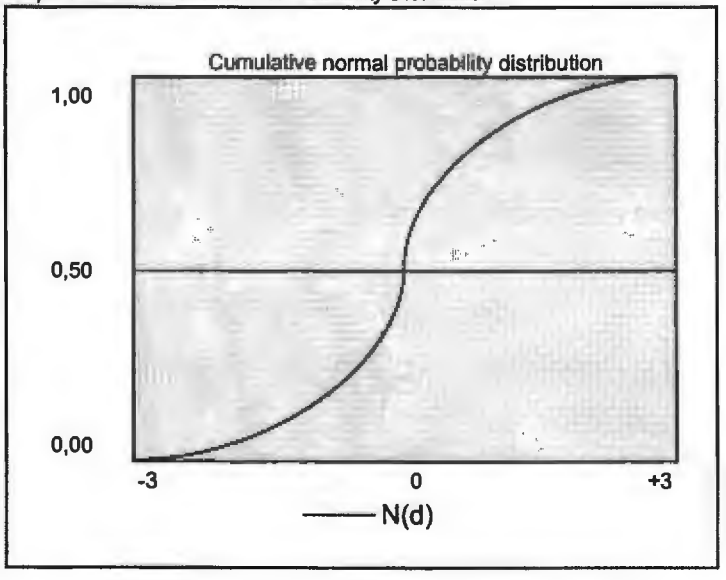
contain the variables, which are dealt with in previous paragraphs. This section therefore focuses on the uncertainty elements contained in the relevant instruments.

Since most derivatives relate to future periods, they contain by deduction an interest element and a time element.

Prior to elaborating on VAR for derivatives, the basic options pricing philosophy is briefly reviewed *vide infra*.

Graph 6.4 explains the source principle of the option pricing formula, namely cumulative normal probability distribution.

Graph 6.4: Cumulative Normal Probability Distribution



The function that supports this graph is the root function in the Black-Scholes option-pricing model:

$$\int_{-\infty}^{d} \Phi(\varepsilon)\, d\varepsilon = N(d)$$

Where $\Phi(\varepsilon)$ represents the standard normal distribution and the graph increases monotonically from 0, for d = - ∞ to 1, for d = ∞, going through 0,50 as d passes through 0.

To find the VAR of a standard normal variable, select the desired confidence level on the vertical axis - in this instance 5%, which corresponds to a value of α = -1,65. It is then possible to retrace the cut-off return $R' = -\alpha\sigma + \mu$. VAR is therefore simply a multiple of the standard deviation of the distribution times an adjustment factor that is directly related to the confidence level.

Forward contracts

For purposes of the following explanations, forwards and futures are regarded as derivatives in their simplest format. To determine the price of the contract, the following variables need to be considered (Jorion 1997:128):

S_t = spot price

F_t = forward price

r = risk free rate

y = asset yield

t = time to maturity.

The risk free rate to maturity of the asset times the future price of the asset should be equal to the spot price of the asset times the asset yield. This is known as the *cost of carry* and by using continuous compounding results in the following equation:

$$F_t . e^{-rt} = S_t . e^{-yt}$$

To price an outstanding forward contract where the original purchase price was *K*, the formula changes to:

$$f_t = S_t . e^{-yt} - K . e^{-rt}$$

where

f_t = current value of contract,

K = original purchase price.

Jorion (1997:130) illustrates the effect of these equations by way of the following example:

In February 1993, Showa Shell of Japan, an affiliate of Royal Dutch Shell announced that it had incurred an exchange loss of almost Yen125 billion in forward contracts. This was more than three times the company's profit of Yen40 billion of the previous year. The company purchased oil in US dollars and during 1990 it commenced a strategy of purchasing excess forward cover. The problem was further compounded by Japanese accounting rules, which allowed for the extension of contracts without realising the exchange loss.

The company locked in forward rates at approximately Yen 145 / USD; by December 1992 the dollar weakened to Yen 125 / USD. Given a position of USD 6,4 billion, the loss in terms of the above equation is computed as:

USD 6,4 (125 - 145)

USD 128

For purposes of portfolio analyses, exchange contracts can be written as follows:

Long forward contract = Long foreign currency spot + long foreign interest rate + short local interest rate.

Table 6.6 illustrates the calculation of VAR for forward contracts.

Table 6.6: Risk and correlation matrices for forward contracts

	Price	VAR	Correlations		
			DEM	DEM	USD
		%	spot	1Y	1Y
DEM spot	$0,6962	6,2201	1,0000	0,1912	0,0400
Long DEM	3,9375%	0,2876	0,1912	1,0000	0,2937
Short USD	5,8125%	0,4696	0,0400	0,2937	1,0000
Forward	$0,7088				

Position	Present value factor	Cash flows	PV of cash flows (x)	Total VAR (V'RV)x	x(V'RV)x	Incremental VAR beta X VAR
DEM spot			66,99	2606,72	17,461	$4,155
Long DEM	0,9621	DM100	66,99	25,79	1,727	$0,041
Short USD	0,9451	$70,88	66,99	-4,30	0,288	$0,007
Total					17,663	$4,203
VAR (USD mln)					$4,203	

The risk of a forward contract includes both currency risk and interest rate risk. By changing the maturity in this example from one year to ten years, the VAR will change from USD4,204 million to USD4,867 million.

Forward rate agreements (FRA)

The forward rate mechanism allows contracting parties to receive a benefit or to pay an obligation, which is dependent on future interest rate movements. The forward rate is that rate where it equals the return of the forward investment with the initial investment, rolled over at the forward rate:

$$(1 + R_2t_2) = (1 + R_1t_1)\,[1 + F_{1,2}\,(t_2 - t_1)]$$

where R_2t_2 represents the forward leg of the FRA, R_1t_1 the short leg of the FRA, invested at a rate $F_{1,2}\,(t_2 - t_1)$ to equal the return on a t_2 period investment with a t_1 period investment, rolled over at the forward rate.

Consider the example of a USD 100 million, 6 X 12 FRA (Jorion 1997:223); if the 360-day spot rate is 5,8125% and the 180-day rate is 5,625%, the forward rate must satisfy the following equation:

$$[1 + F_{1,2} / 2] = (1 + 5{,}8125\%) / [1 + (5{,}625\%/2)]$$

$$F = 5{,}836\%$$

The present value of the notional USD 100 million in six months' time is,

$$\$100 / (1 + 5{,}625\% /2) = 97{,}264.$$

The VAR calculation of FRA's is based on the zero coupon curve, using six and twelve month zero's. Table 6.7 explains the calculation (Jorion 1997:223).

Table 6.7: VAR calculation for FRA's

Term (days)	PV of flows (x) factor	Risk (V) %	Correlation matrix (R)		VAR (V'RV)x	x(V'RV)x	Incremental VAR beta X VAR
180	-$97,264	0,1629	1,0000	0,8738	0,00039	-0,0381	-$0,116
360	+$97,264	0,4696	0,8738	1,0000	0,00141	0,1454	$0,444
Total	0					0,1072	$0,327
VAR (USD mln)						$0,327	

Interest rate swaps

Interest rate swaps usually comprise a fixed leg and a floating leg, of which either can be the paying stream or the receiving stream. The floating leg can be compared to a floating rate note and the fixed leg to a coupon-paying bond. By treating the swap in this manner it is decomposed into its component parts for purposes of the VAR calculation.

The following example of a USD100 million, five-year interest rate swap, paying an annual fixed rate of 6,1955% against floating annual LIBOR, illustrates the VAR calculation (Jorion 1997:224):

Table 6.8: VAR calculation for interest rate swaps.

Term year	Fixed flow	Floating flow	Rate % per annum	PV of flows ($) x	VAR V	VAR of flows x X V	Incremental VAR ($m)
1	-6,195	-	5,813	-5,855	0,470	-0,0270	0,024
2	-6,195	-	5,929	-5,521	0,987	-0,0540	0,053
3	-6,195	-	6,034	-5,196	1,484	-0,0770	0,075
4	-6,195	-	6,130	-4,883	1,971	-0,0960	0,096
5	-106,195	-	6,217	-78,546	2,426	-1,9050	1,905
VAR (USD mln)						$2,160	
VAR (USD mln)							$2,152

The VAR calculation in the table is taken from the tables of *Risks and Correlation's* for US zeros at a 95% confidence level. The difference in the diversified VAR of USD2,160 million and the undiversified VAR of USD2,152 million stems from the fact that the diversified VAR is purely the summation of the individual VAR values, whereas the diversified VAR is a result of each VAR's marginal contribution to the portfolio.

In terms of risk exposures it is interesting to note the case of British municipalities in which municipalities entered into interest rate swaps, which turned out to produce large losses. The British High Court ruled these swaps invalid on the basis that the municipalities did not have the authority to enter into these transactions and therefore that the cities were not responsible for the losses. As a result, swap counterparties were exposed to losses amounting to USD800 million. (Jorion 1997:18.)

Options

Unlike the derivatives discussed in previous paragraphs, options are non-linear contracts, which make the VAR calculation different. Option valuations can therefore not be based on delta normal assumptions, since the delta hedging may fail for large moves in the underlying asset price.

The Black-Scholes option pricing model is base on certain assumptions, which are formulated by Phillipe Jorion, a professor in Finance at the University of California as follows:

1. *The price of the underlying asset is continuous and follows a random walk process called a* geometric Brownian motion.
2. *The interest rate and variance are known and constant.*
3. *Capital markets are perfect (short sales are allowed, there are no transaction costs or taxes, and markets operate continuously.)*

Several risk factors make up the value of an option (Jorion 1997:137):

S : the asset price

σ : volatility

r : the risk free rate

y : the asset yield.

The major risk factor is the asset price. By holding a call option is to almost hold a fraction of the asset, which changes in size over time. The reason for this is that the chance of the option being exercised is only fractional, although it may be a very large fraction as is the case with deep in the money options. For the writer of the option to hold the full value of the underlying asset as a hedge would be superfluous and expensive; the hedge ratio or *delta* in terms of a call option would be a 'long' position of the underlying asset, which would be fraction of the notional amount of the option. Delta for a call option is calculated as follows:

$$e^{-yt} \cdot N(d_1) = D$$

where D represents the delta position, and is written as a derivative of the call option with respect to the spot price of the asset; the spot price of the asset is represented by $N(d_1)$ and e^{-yt} the continuously compounded yield. For a put option the equation changes to:

$$e^{-yt} \cdot [N(d_1) - 1].$$

Because delta valuation is not fully reliable, a better approximation is an enhanced calculation of the option's delta-gamma. Gamma is the change in delta as the underlying asset price changes. The gamma can be derived as follows:

$$\frac{e^{-yt}\cdot\Phi\left(d_1\right)}{S\sigma\cdot\sqrt{\tau}} = G$$

where S represents the current price of the underlying asset and $\sigma\sqrt{\iota}$, a measurement of the volatility over the life of the option.

The VAR of the option can now be written as:

$$\alpha\cdot\sqrt{D^2\cdot S^2\cdot\sigma^2+\frac{1}{2}\cdot\left(G\cdot S^2\cdot\sigma^2\right)^2} = VAR$$

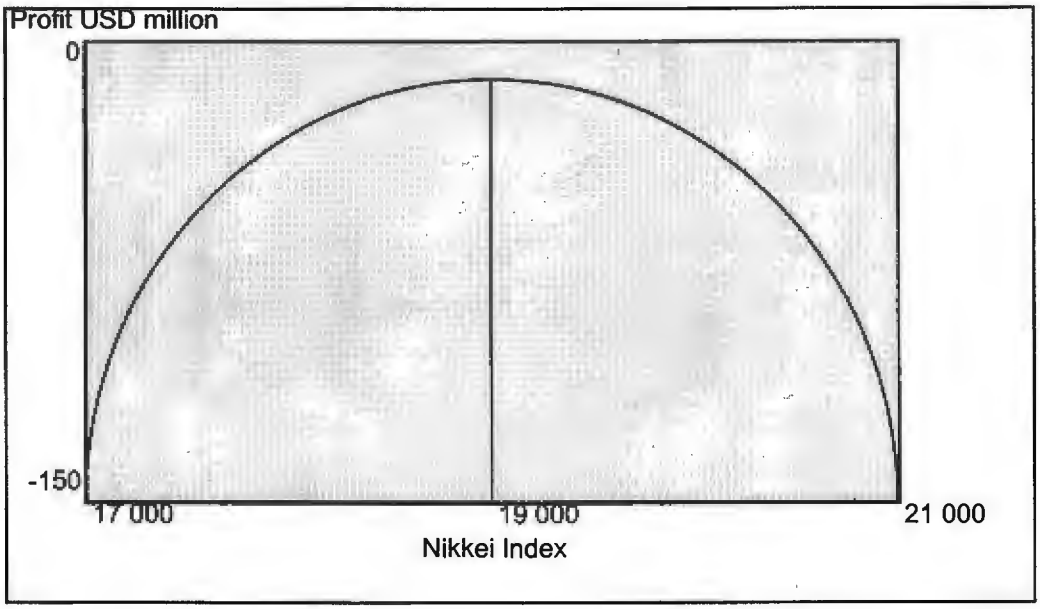
where gamma is represented by G.

The application is illustrated by way of an analysis of the option position that resulted in the Barings Bank losses (Jorion 1997:144).

Barings had a straddle position, i.e. it sold both puts and calls against the Japanese, Nikkei 225 stock index. Leeson[2] held a long Nikkei futures position of USD7 billion against which he sold about 35 000 call and put options each on Nikkei futures. The option positions created the potential for large losses, since either the put or the calls would be exercised in a volatile market. This strategy is only valuable as a premium generator in a stable market for a very short time period.

[2] Nick Leeson was the trader at Barings Bank responsible for its Asian markets trading.

The call position can be valued as 35 000 times the contract value (Yen 500) divided by the ruling USD/Yen spot rate at the time (Yen 100), which equals USD0,175 million. Variations in the position are equivalent to the option delta times variations in the Nikkei index times USD0,175 million, which is explained in the following diagram:



In terms of the graph the VAR at 19 000 was zero, which was obviously highly misleading, because any move in the index would have resulted in losses. Given a mean of USD-2,3 million and a standard deviation of USD3,0 million, and using normal distribution at the 95% confidence level, the VAR will be 1,65 (the 5% left quantile) times the standard deviation of USD3,0 million, resulting in a VAR of USD5,0 million.

The distribution can be approximated by the delta-gamma approach (Jorion 1997:147), where the gamma of one call option is given as G = 0,000422. Total gamma is therefore, USD0.175 million X 0,000422 = USD0,0000739 million. Given a delta of zero, and daily volatility of 1,26%, the expected return over a one-day horizon is,

$$\frac{1}{2}\cdot G\cdot\sigma(dS)$$

which results in, 0,5 X 0,0000739 (19 000 x 0,0126)^2 = USD-2,1 million, being very close to the actual mean of USD-2,3 million.

The position VAR is derived from the VAR equation as follows:

$$\alpha \cdot \sqrt{\frac{1}{2} \cdot \left(GS^2 \cdot \sigma^2\right)}$$

which amounts to the following:

1,65 x $\sqrt{}$ 1/2 (0,0000739 x 19 000^2 x 0,0126^2)^2 = USD4,9 million, which is also very close to the approximated VAR of USD5,0 million. This is substantially different to the zero VAR position shown by the graph when the Nikkei was trading at 19 000.

6.4 Reporting on value-at-risk

In previous paragraphs methodology was researched to find meaningful methods on valuing financial instruments. It is now necessary to report to the stakeholders of the enterprise on the numbers so derived. In terms of the accounting statement issued by the Accounting Practices Committee (APC) of the South African Institute of Chartered Accountants (SAICA) that deals with financial instruments, AC125, *Financial instruments: disclosure and presentation*, paragraph 79, requires that information about the fair value of the asset or liability should be disclosed.

Furthermore, the exposure draft, issued by the same body, dealing with contingencies and provisions, ED118, Provisions, contingent liabilities and contingent assets, paragraph 76, requires recognition of and provision for contingent assets and liabilities, when the following prerequisites are met:

- The contingency exists as a result of past events and
- The outcome of the event is uncertain (Hemus 1998:379.)

Once the value-at-risk (VAR) across the various categories of financial instruments have been measured, the question arises whether a provision should be made for the net VAR position. Provided no other provisions have been made for any of the financial instruments on which the enterprise is reporting its VAR, provision should be made for the potential loss due to VAR. The mere fact that the enterprise has already analysed its position to the extent that it can report the VAR, already offers stakeholders an insight into the exposure that the company has to financial instruments. Stakeholders can therefore express an opinion as to the potential losses the company can incur in instances of adverse price movements of the relevant categories of financial instruments.

- *The value-at-risk statement*

The value-at-risk statement or VAR statement, is a structured format in which the enterprise discloses its exposure to financial instruments in a manner which recognises, comprehensively its exposures across instruments and markets, and measures the recognised exposures in a homogenous manner through the VAR calculation. This statement disciplines the enterprise to review its risk operations comprehensively and to determine whether its exposures are manageable within its policy constraints.

The most important benefit of the VAR statement is that it reports its exposures effectively in the reporting currency, irrespective of the origin of the financial instrument. It is therefore possible for a South African enterprise to reflect the Australian dollar interest rate swap of its Australian subsidiary alongside the German mark / rand forward exchange contract in the same homogenous calculation. Stakeholders will therefore immediately be able to determine the VAR of a multi-national enterprise across many markets and financial instruments in the reporting currency of that enterprise.

The VAR statement contains three sections:

- Policy
- Definition of exposures
- Value-at-risk calculation

The *Policy* section reflects the enterprise's policy with regards to trading in the financial markets, hedging of underlying exposures, and accounting treatment of its stated activities. This section will therefore substantially reflect the disclosure requirements of the various accounting statements pertaining to financial instruments.

The *Definition of Exposures* section is an attempt to discipline enterprises to disclose, in as far as possible, the aggregate of its direct and indirect exposures to commodities and financial markets across the spectrum of its operations. The enterprise may elect not to report the VAR in some of these instances, especially where indirect exposures may only have a marginal impact value-at-risk. However it enables stakeholder to express an opinion on the enterprise's volume of exposure to specific categories of markets.

Finally, the *Value-at-risk calculation* quantifies the stated exposures in a meaningful manner. Each asset class will be quantified individually and aggregated to give the total VAR of the enterprise.

In terms of the quoted examples, which were illustrated in previous paragraphs, the VAR statement is illustrated in table 6.9.

Table 6.9: The value-at-risk statement.

ABC Company
Value-at-risk statement as at 30 June 19.01
(page numbers reflect pages in this chapter from which values were sourced)

Asset class	Currency	Maturity profile of nominal exposures 0-1 year	2-5 years	>5 years	VAR
Bonds *(page 192)*	USD		200 000 000		1 700 000
Currencies *(page 194)*	CAD	-767 000 000			28 500 000
	DEM	117 000 000			
	USD	108 000 000			
Forward contracts *(page 199)*	DEM	100 000 000			4 203 000
Forward rate agreements *(page 200)*	USD	100 000 000			327 000
Interest rate swaps *(page 201)*	USD		100 000 000		3 160 000
Total portfolio VAR					36 890 000

Instead of determining the fair value of individual instruments and to change accounting policies to accommodate the concept of fair value, enterprises achieve the same result by determining the value-at-risk and providing against that. Value-at-risk offers an opportunity to enterprises to quantify exposures to financial instruments and to account for such exposures in a homogenous manner.

In this example the enterprise's potential loss of value as a result of its exposure to financial instruments is USD 36,90 million. Provided these instruments are not part of a specific hedge the enterprise could be at risk of economic loss in this amount. In terms of hedged positions, consideration should be given to the effectiveness of the hedge and the hedge instrument. If the correlation is extremely high, the hedge instrument should not be included in the VAR calculation. This should also be applied to hedges of anticipated transactions, although such transactions are complicated by the additional uncertainty factor.

The following example of the VAR statement is generic and attempts to give guidelines to the analysis of an enterprise's exposure to financial instruments. It includes policies for trading operations and the accounting thereof; exposures to major classes of instruments and their maturity profiles, and finally the value section, which determines the value-at-risk of each instrument class. The stated information is an example of the type of information that is required and may obviously change dependent on the operations of the enterprise.

Newco Limited

Value-at-risk statement

Policy
Financial instruments are valued on a fair value basis for the classes of instruments for which liquid and tradeable markets exists. Instruments or classes of instruments that are not traded in liquid markets are valued at the maket value on balance sheet date.

The company follows a dynamic hedging policy and will enter financial markets when market exposures require hedging in terms of stated policy.

Interest rates
At least 30% of interest rate exposure in the reporting currency should be fixed at all times the remainder of exposure may be managed in terms of the mandate given to the treasury committee, subject to the net cash position of the group.

Currencies
The company is a net importer of foreign currency an maintains a policy the at least 70% of all foreign currency exposures should be hedged interms of the treasury mandate. Hedges imply the use of any instrument that will substantially remove currency exposure. Hedges must at least prove to be 90% effective to qualify as a hedge.

Commodities
The company only has indirect exposure to commodities, which is deemed sufficiently remote not to materially influence the groups performance

Equities
The company's equity exposures are dealt with as investements and are valued at the fair value on balance sheet date.

Derivatives
Derivatives other than those used as hedges against currency and interest rate exposures are valued on a fair value basis. Policy does not permit the selling of derivative instruments, except in instances where derivatives holdings are liquidated, hedges unwound, or where the sale of a derivative forms part of a hedging strategy.

Definition of exposures

Interest rates
The company has varying exposures across the yield curve, which include cash, bonds and long term loans. The company has entered into interest rate swaps to hedge certain long term loans or portions thereof. It also enters the bond options market from time to time to hedge bond investment exposures.

Currencies
The company has import exposures to the German mark, the Japanese yen, the US dollar and a number of Asian currencies which are not material and irregular. The company has export exposures to the Mauritian rupee and the Zimbabwe dollar. In instances where forward markets are not available to hedge foreign exchange exposures, the company endeavours to borrow in the currency of export or to invest in the currency of import. Derivatives instruments are used to hedge exposures along with forward exchange contracts.

VAR calculation

Asset class	Currency	Maturity profile			VAR
		0-1 year	2-5 years	>6 years	(ZAR)
Interest rates					
Assets	SA rand	2,000,000	10,000,000		850,000
	US dollar	1,500,000			175,000
Liabilities	SA rand			10,000,000	1,200,000
	German mark		3,000,000		750,000
	Zimbabwe dollar	500,000			50,000
Currencies					
Assets	Mauritian rupee	75,000,000			75,000
	Zimbabwe dollar	50,000,000			500,000
Liabilities	US dollar	75,000,000			1,750,000
	German mark	110,000,000			2,000,000
	Japanese yen	150,000,000			900,000
Derivatives					
Interest rate contracts					
Swaps	SA rand			5,000,000	50,000
Options	German mark		3,000,000		150,000
Futures	US dollar	500,000			25,000
Currency contracts					
Forwards	US dollar	35,000,000			1,000,000
	German mark	50,000,000			750,000
	Japanese yen	75,000,000			800,000
Options	US dollar	20,000,000			25,000
	German mark	25,000,000			20,000
	Japanese yen	50,000,000			7,500
Total VAR					11,077,500

Basis for calculating VAR

The VAR calculation is based on a 95% confidence level over a one-month time horizon, using incremental VAR, which allocates the marginal contribution of each asset in each asset class to the total VAR of each asset class.

The numbers reflected in the VAR calculation are merely for illustration and do not represent any derived calculations or relationship between the assets size and the VAR amount.

The VAR statement therefore presents a comprehensive analysis of an enterprise's exposure to financial instruments. It enables stakeholders to immediately understand the potential value that could be lost to financial instruments in relations to the size of the enterprise's balance sheet. The statement furthermore reflects the quality of decisions in terms of the purchase or sale of financial assets and liabilities, because the VAR number reflects the value of the underlying contracts.

6.5 Conclusion

Many of the issues raised in this chapter may be controversial or may seem unnecessarily complex, but it endeavours to create an awareness of the importance of the issues relating to financial instruments and the serious financial implications it may have on enterprises if not properly accounted for. It suggests an alternative to the very wide range of opinions that are held on accounting for financial instruments and attempts to solve the complexities surrounding valuation of financial instruments. The difficulty in accounting for financial instruments often stems from the diverse nature of instruments and the very unique qualities of individual asset classes; the VAR approach attempts to move towards a more unitary valuation environment.

It is admitted that the contents of this chapter may be flawed in many ways, and that more research will result in better and improved philosophies on value-at-risk. However, it is certain that the dynamic environment that constitute the financial markets will compel regulating bodies and monetary authorities to find accounting solutions to the ever growing needs and demands of the market. In this sense financial stewards have a responsibility towards the stakeholders of the enterprises, which they represent, to ensure that financial information published for decision-making purposes fairly and

accurately reflect the exposures that such enterprises may have to complex markets and instruments.

The many cases of failure to just this are clear testimony of dire financial results of bad accounting and should remind business of the consequences of being ignorant to the effects of exposures to financial markets.

Finally, enterprises are in the business of managing risks. It is therefore appropriate that its often biggest exposure to risk, namely its interests in financial markets, should be managed properly. This chapter attempts to give impetus to the cause of managing and accounting for financial instruments. As volatility and the complexities of financial markets increase, so will the extent of the enterprise's exposure increase, and will it constantly be required by the providers of capital to remain aligned to market's constant change. The contents of this chapter is therefore not finite, but the first entry to better understand the risks and variables which are the drivers of today's markets.

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Chapter 7

Summary and conclusions

7.1 Introduction

This subject, which is financial instruments and the accounting thereof, provides substantial material to deliberate upon from an accounting perspective. In this regard the concluding remarks provide a base from which the subject matter could further be developed, rather than a finite verdict on the issue of accounting for financial instruments.

The one aspect that has become clear during the development of this thesis, is the fact that accounting is an exact science and although the instruments, which are subject to this deliberation purport to be inexact, accounting science offers the only framework within which financial instruments could be evaluated and accounted for. It may be said that the framework is flawed and incomplete, but it is the responsibility of accounting bodies and regulatory authorities to ensure that the framework will be sufficiently robust to meet the demands of the financial markets. In this regard the recent releases of discussion papers by the International Accounting Standards Committee and their further intended releases to complete the framework, should be used as the basis for elevating the technical level of accounting for financial instruments.

Regrettably, too many parties have too many different views on this issue, which could further delay the process of harmonisation of financial instrument accounting. It is clear that accounting bodies and monetary authorities do not share the same views on very pertinent aspects of this subject, leaving the much uncertainty with the participants in the global financial markets.

Until now the developments in financial markets were driven by banks and financial institutions, with the result that accounting issues were of less importance than the immediate financial rewards that financial instrument trading brought about. Accounting bodies and practicing accountants therefore have to accelerate through the process of understanding the markets and the instruments that constitute these markets in order to express meaningful opinions on the financial activities of the enterprises that they serve.

7.2 Accounting and risk

Risk can be defined as the volatility of unexpected outcomes, which resides in the value of financial assets and liabilities. Enterprises are generally exposed to three types of risks, namely business risk, strategic risk and financial risk. (Jorion 1997:4.)

In terms of the latter, enterprises have a direct exposure to financial or opportunity loss, once it enters the financial markets through buying or selling a financial instrument. Understanding risk means that financial managers can consciously plan for the consequences of adverse outcomes and therefore be better prepared for the uncertainty they face in the financial markets.

The fundamental changes in the global financial markets lie at the root for change in accounting for financial instruments. Global financial market development and improvements in information technology are leading factors in enabling enterprises to use derivatives in a cost effective manner. These factors have further led to the development of complex and innovative products as well as the aggregation, dis-aggregation and the design of multiple methods of transferring or assuming various financial risks.

An enterprise can substantially change its financial risk profile virtually instantaneously, by entering into interest rate or foreign exchange swaps, or by acquiring options or forward exchange contracts to hedge or take positions on future price movements. The potential for large losses resulting from the use of derivatives has been well demonstrated by the highly publicised financial disasters of many prominent public enterprises. These situations have heightened public concern about accounting and disclosure, as well as management controls.

The developments in the financial markets should therefore be linked to the accounting controls of the market participant. In efficient markets security prices impound all publicly available information. Lack of timely and accurate information can distort prices and heighten uncertainty. The result of all this is that enterprises will incur greater costs as capital providers protect themselves against potential uncertainty. Relevant and reliable financial information emanating from the enterprise is crucial to the efficient operation of the global financial markets within which the enterprise operates.

The inability of accountants and advisors to the enterprise to understand the markets and risks to which the enterprise is exposed, will lead to a different albeit significant risk position to those advisors. Enterprises are often reliant on their financial advisors to express an opinion on the products and instruments they intend using. Advisors therefore have a responsibility towards the enterprises that they serve, to understand the instruments of the financial markets and the impact that the use of such instruments may have on the financial results of the enterprise. Ignorance by financial advisors or incorrect interpretation puts advisors at risk of litigation. This will especially become more prevalent as markets become bigger, more transparent and more regulated.

The interest rate swap case in which British municipalities entered into interest rate swaps, is once again mentioned to illustrate the extent of risk exposures. The British High

Court ruled these swaps invalid on the basis that the municipalities did not have the authority to enter into these transactions and therefore that the cities were not responsible for the losses. As a result, swap counterparties were exposed to losses amounting to USD800 million. (Jorion 1997:18.)

7.3 Financial instruments - a growth business

The evolution of the financial markets have resulted in a vast and extremely volatile growth business that has some influence on almost all enterprises, no matter how small or geographically remote it may be. The most important factor driving financial markets is volatility and the following points illustrate the development of volatility in recent history:

- In 1971 the fixed exchange rate system collapsed, leading to the introduction of currency volatility.
- Large swings in interest rates and high inflation during the middle seventies, resulted in significant oil price shocks.
- On 19 October 1987 the US stock market collapsed, wiping out capital of USD1 trillion.
- At the end of 1989 Japanese stock prices fell, with the Nikkei index plummeting from 39 000 to 17 000 three years later. A total of USD2,7 trillion in capital was lost.
- In September 1992 the first attempt of European monetary unification failed, leading to currency market turmoil.
- During 1994 the United States Federal Reserve commenced a series of six consecutive interest rate hikes, resulting in unparalleled bond market volatility and the erasure of almost USD1,5 trillion in capital.

It is therefore clear that markets and the action of monetary authorities are unpredictable and have significant impacts on markets. In this regard market participants have been

forced to develop tools to combat volatility and capital erasure. The following diagram explains the development of financial instruments (Jorion 1997:10):

Table 7.1: Development of risk management tools.

Date	Financial instrument
1972	Foreign currency futures.
1973	Equity options.
1975	T-bond futures.
1981	Currency swaps.
1982	Interest rate swaps, T-note futures, Eurodollar futures, equity index futures, options on T-bond futures, exchange-listed currency options.
1983	Options on equity index, options on T-note futures, options on currency futures, options on equity index futures, interest rate caps and floors.
1985	Eurodollar options, swaptions.
1987	OTC compound options, OTC average options.
1989	Futures on interest rate swaps, quanto options.
1990	Equity index swaps.
1991	Differential swaps.
1993	Captions, exchange-listed FLEX options.
1994	Credit default options.

Not only has the variety of instruments developed exponentially over time, but has there been an even more staggering growth pattern in traded volumes. In the accompanying table, the US dollar value of existing derivatives positions is shown. From 1986 to 1994, the market for derivatives has grown from USD 1 083 billion to USD 20 000 billion. The Bank for International Settlements has recently estimated that the total notional amount of over-the-counter (OTC) contracts, including forward and option contracts, amounted to USD 40 700 billion. The total estimated market is therefore approximately USD 60 trillion, which, if compared to the total annual gross national product of the United States of USD 7 trillion, is a vast number.

The derivatives market is much greater than the total value of global stocks and bonds, which amount to approximately USD 35 trillion. The total value of off-balance sheet instruments for US commercial banks amounted to USD 17,9 trillion in 1995, whilst total

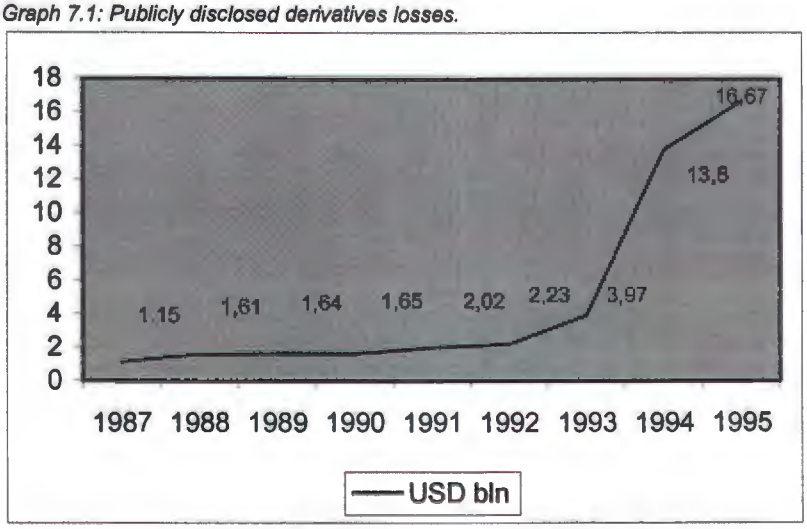
assets amounted to USD 4,2 trillion and capital of merely USD 332 billion. This further illustrates the immense leverage capability of derivatives instruments.

Table 7.2: Outstanding derivatives contracts (USD billion).

	1986	1990	1993	1994
Exchange traded instruments	**583**	**2,292**	**7,839**	**8,838**
Interest rate futures	370	1,454	4,960	5,757
Interest rate options	146	600	2,362	2,623
Currency futures	10	16	30	33
Currency options	39	56	81	55
Stock index futures	15	70	119	128
Stock index options	3	96	286	242
Selected OTC instruments	**500**	**3,450**	**7,777**	**11,200**
Interest rate swaps	400	2,312	6,177	8,815
Currency swaps	100	578	900	915
Caps, collars, floors and swaptions	-	561	700	1,470
Total	**1,083**	**5,742**	**16,616**	**20,038**

The dire result of this spectacular growth was that financial losses as a result of poorly managed and executed derivatives trading experienced the same exponential growth and is illustrated in the graph below (Jorion 1997:25):

Graph 7.1: Publicly disclosed derivatives losses.



As markets continue to grow it is certain that the financial instruments and related products will become more complex and have much wider application, hence resulting in more frequent use by more market participants. It is therefore envisaged that the potential for financial losses will grow accordingly, which will place increased responsibility on monetary authorities to manage and control these markets.

7.4 Accounting for financial instruments - global realignment

It is only recently that accounting for financial instruments became a concern to the international accounting bodies. Previously financial instruments consisted mainly of simple receivables, payables and debt instruments, which were carried conservatively on a cost basis. However, pressure mounted towards the late eighties for accounting bodies to produce guidelines on financial instruments, which resulted in the release of E40, the first exposure draft to give comprehensive guidance on financial instruments.

This exposure draft, entitled *Financial instruments*, was subsequently superseded by exposure draft E48, a discussion paper on financial instruments, entitled *Accounting for financial assets and financial liabilities*, which was released in March 1997, and finally an accounting statement on presentation and disclosure of financial instruments.

Still to be released, is an accounting statement on the recognition and measurement of financial instruments, which will complete the duo of accounting statements on financial instruments. It is with regard to the recognition and measurement of financial instruments that monetary authorities and accounting bodies have expressed grave differences. This is evident in many discussions between the US Federal Reserve and accounting bodies, which was elaborated upon in chapter five *(vide infra)*.

Accounting practices in many countries have moved towards accounting methodology that embraces the concept of fair value. The traditional method of valuing assets and liabilities on an historical cost basis has proved to be inadequate. The result has been the use of 'mixed' accounting models to provide the best attempt at valuation.

In current practice many derivative instruments are not recognised as a result of historic cost accounting. The initial cost of a forward exchange contract is nil, which effectively renders it without value and without an adjustment to its fair value. Exposure to this instrument is therefore hidden in terms of historical cost accounting. The historical cost of financial instruments therefore has little or no relevance to its present value, which is why the accounting framework for financial instruments required an adjustment.

It has been the primary purpose of this thesis to contribute to this adjustment process through the concept of value-at-risk and its application from an accounting perspective. It is admitted that this adjustment process is complex and that the results of this thesis are in many ways insufficient in terms of all possible accounting applications. However, it provides an alternative viewpoint and endeavours to contribute to the complex issue of recognising and measuring financial instruments.

7.5 Construct of the thesis

In this thesis a number of issues that is deemed important in moving towards greater understanding of the subject matter have been analysed and discussed. The chapters were constructed in a manner which eventually resulted in the production of a value-at-risk statement.

In chapter two an overview was given of global accounting and regulatory developments of recent years. This was necessary to ensure that a platform was created from which accounting and regulatory issues could be considered and evaluated, especially as these pertain to financial instruments.

The purpose of chapter three was to evaluate the risks pertaining to financial markets and more specifically towards accounting issues regarding financial instruments. This chapter was followed by an evaluation of the basic mathematics for financial instruments in chapter four. In order to express an informed opinion on the value of a financial instrument, it is necessary to be conversant in the terminology and mathematical calculations that are widely applied in the financial markets, which was the purpose of this chapter.

In chapter five, an analysis was given of the applicable accounting concepts and how these concepts have evolved. Consideration was given to the technical application and a number of unresolved issues. A further objective of this chapter was to provide the theoretical framework within which the value-at-risk concept could be developed as it pertains to accounting.

In the final chapter, the concept of value-at-risk is analysed for purposes of accounting for financial instruments. Mathematical concepts and the application thereof, for purposes of evaluating financial instruments were explained, giving examples of their application, The chapter is ended with a suggested alternative for the presentation of recognised financial instruments. Furthermore, disclosure requirements were embodied in the value-at-risk statement in alignment with existing accounting practices. This chapter also explains the practical application of the value-at-risk statement to various quoted examples.

7.6 Epilogue

The exciting and demanding world, which constitutes the financial markets, require innovative and effective accounting procedures, which will prove to be transparent and credible to the stakeholders in enterprises as well as the financial stewards of those enterprises.

Many issues are yet unresolved, which leaves room for further research and development as the accounting framework for financial instruments evolves, and the markets themselves move towards greater transparency and unity. In this regard the issue of value-at-risk needs further refinement, especially in its application from a South African viewpoint. It also requires a further broadening to include issues such as credit-value-at-risk and business-value-at-risk.

The development of accounting theory and its application to financial instruments is not finite; it is dynamic and ever evolving, which allows for continued research and enhancement to an exact science that is the mainstay of global finance.

Recommendation

The advent of financial instruments, their exponential growth attributes and the inadequacy of historical cost accounting concepts to evaluate these instruments, require a strong recommendation that accounting bodies adopt valuation techniques that are in line with current financial market practices. This thesis has set out, in very comprehensive terms, such an alternative in the form of value-at-risk accounting. Enterprises should become more adept with the mathematical and accounting issues at stake in transacting financial instruments and should therefore incorporate financial methodology and technology into their accounting frameworks to properly provide for and quantify risk exposures to financial instruments.

Glossary of terminology

A

Accreting principal swap
A swap where the notional principal increases over time.

Accrued interest
The current value of the next coupon payment due on a debt instrument.

American-style option
A put or call option that can be exercised at any time over the life of the option until maturity of the option.

Amortizing swap
A swap with a declining notional pricipal over the life of the swap.

Arbitrage
The riskless purchase or sale of a security in one market with the immediate opposite purchase or sale in another market for the purpose of incurring a profit.

At-the-money options
An option where the market price or rate of the underlying is equal to the strike price.

B

Backwardation market
A futures/spot market relationship in which the futures price is lower than the spot price.

Bankers acceptance swap
Also a BA-swap. An interest rate swap with the bankers acceptance as the floating rate.

Barrier options
Options that are strike rate dependent throughout the life of the option. If the strike rate is achieved prior to maturity of the option, the option is triggered to settle or to expire worthless. An example is a knock-in option, which is triggered if the knock-in level is reached.

Base currency
The currency in which an investor or issuer maintains its books of account. Also known as the reporting currency.

Basis
The difference between the forward price or yield and the spot price or yield of an instrument such as a futures contract or the forward component implicit in an options contract.

Basis point
One, one-hundredth of a percentage point, also expressed as 0,01 percent. See also currency points.

Basis risk
The possibility of loss from imperfectly matched risk offsetting positions in two related, but not identical markets. Exposure to loss from a maturity mismatch caused by a change in the yield curve.

Basis swap
A swap in which counterparties calculate swap payments relative to different floating rates or basis instruments.

Basket
A set of related instruments whose prices or yields are used to create a synthetic composite instrument.

Bear or bearish
A view or position that will profit from a declining market.

Bear spread
A combination of options whose value increases when the value of the underlying instrument declines.

Benchmark
A reference index, price or return which serves as a basis for performance measurement, comparison or return calculation.

Beta factor
A measurement of the stock price volatility relative to a broad market index. If a stock moves up or down twice as much as the market, it has a beta of two.

Bid-ask spread.
Also the bid-offer spread. The difference between the bid and offer price or rate, reflecting the quality and liquidity of the market.

Bull or bullish
A view or position that will profit from a rising market.

Bullet swap
A swap with a constant notional principal, with full repayment of the notional principal at maturity.

C

Call option
An option to buy a security.

Cap
A derivative on a security that limits the upper price or yield in terms of the performance of the underlying security.

Collateralized security
A debt instrument secured by an asset or pool of assets.

Confidence intervals
An estimate of the probability (confidence) that an observation will fall within or outside a range designated by standard deviation intervals.

Convexity
A measure of the way duration and price change on a particular instrument when interest rates change.

Correlation coefficient
A statistical measure of the extent to which two variables (usually prices or rates in financial market applications) move together.

Coupon
The nominal annual rate of interest on a bond or note usually expressed as a percentage of the face value.

Covariance
A measure of the correspondence between the movement of two random variables such as securities prices or returns. The correlation coefficient is a normalised covariance measure that is independent of the units of measurement.

Cross-currency basis swap
An interest rate swap with both counterparties as floating rate payers in their respective currencies.

D

Day-count basis
The method which is applied to calculate the number of days in an interest rate calculation.

Deferred swap
Any swap in which some or all payments are delayed for a specific period.

Delayed start swap
A swap with a forward start date.

Delivery
The exchange of funds for a cash instrument, commodity, or cancellation of a cash settlement obligation.

Delivery versus payment (DVP)
A settlement procedure that coordinates the exchange of cash for securities to eliminate most settlement risk.

Delta
The change in option price for a given change in the price of the underlying. The neutral hedge ratio.

Delta/gamma hedge
A risk-offsetting position – consisting in part of short-term option contracts – that neutralises the market risk of an underlying position in an instrument with some embedded option features.

Derivative instrument
A contract or convertible security that changes in value in concert with, and obtains much of its value from price movements in a related or underlying security, future, or other instrument or index.

Difference option or differential option
An option on the forward interest rate differential between comparable instruments denominated in different currencies. Also called a differential option.

E

Embedded option
An option that is an inseparable part of another instrument.

European option
A put or call option that can only be exercised on its expiration date.

Exchange rate agreement
A synthetic agreement for forward exchange (SAFE) that increases or decreases in value as the spread between the two forward currency exchange rates moves up or down.

Exchange-traded contracts
Standardised options and futures listed and traded on an organised exchange.

Expiration date
The date after which an option is void.

Extendable swap
One or both parties to a swap have the option to extend the swap for an additional period beyond maturity.

F

Face value
Value of a bond or other debt instrument at maturity. Notional principal amount.

Fair value basis
The value or range of values of the difference between the forward or futures price and the spot price that offers no opportunity for profitable arbitrage at current carrying costs.

Fair option value
The option value computed by a probability-type option valuation model. The price at which both the buyer and the writer of the option should expect to break even, neglecting charges and after an adjustment for risk.

Floating rate note
A fixed principal instrument, often utilised in swaps, which has a long or even indefinite life whose yield is periodically reset relative to a reference index rate to reflect changes in short-term interest rates.

Floor
A derivative on a security that limits the lower price or yield in terms of the performance of the underlying security.

Forward
A contractual obligation between two parties to exchange a particular asset or instrument at a set price on a future date.

Forward currency swap
A currency swap with a forward start on terms agreed upon in advance.

Forward exchange agreement
A contract whose value at maturity is based on differences between the forward rate on the start date and the spot rate at settlement.

Forward outright rate
The actual forward exchange rate as distinguished from the swap rate premium or discount.

Forward points
A number added or subtracted from the spot currency exchange rate, reflecting the interest rate differential between the two currencies to the maturity of the forward contract.

Fungibility
The standardisation and interchangeability of listed option and futures contracts, permitting either to an opening transaction

G

Gamma
The change in delta divided by the change in the underlying instrument's price. A measurement of the rate of change, of the rate of change in the option price with respect to the underlying price.

Garman-Kohlhagen model
A currency option valuation model similar in structure to the Black-Scholes model with separate terms for foreign and domestic interest rates.

H

Hedge
An action which reduces risk, usually at the expense of potential reward.

Hedge accounting
A set of accounting principles which permits a related series of risk offsetting transactions to appear together on accounting records with the object of presenting a more realistic picture of the impact an investment strategy has on a portfolio of assets or on the management of liabilities.

Historical volatility
The variance or standard deviation of the change in the underlying instrument's price, rate or return during a designated period in the past.

Holding cost
Annualised expenses associated with maintaining an ongoing position in a security or market.

I

Implied forward interest rate
The interest rate for a specific forward period, calculated from the incremental period return in adjacent instruments on the spot zero coupon yield curve.

Implied volatility
The value of the price or rate volatility variable that would equate current option price and fair value.

In-the-money
An option which has intrinsic value because the current market price of the underlying instrument exceeds the strike price of a call option or is below the strike price of a put option.

Index
A number calculated by weighting a number of prices or rates according to a set of pre-determined rules.

Initial margin
The collateral deposit or performance bond deposited with a broker at the time a derivative position or an underlying security position is taken.

Interest rate collar
A combination of interest rate caps and floors, limiting the risk of interest rate exposure to the cap and floor levels.

Interest rate differential
The yield spread between two otherwise comparable debt instruments denominated in different currencies.

Interest rate guarantee
An option on a forward rate agreement.

Interest rate option
A right, but not an obligation to pay or receive a specific interest rate on a pre-determined principal for a set interval.

Interest rate parity
The principle by which forward currency exchange rates reflect relative interest rates on risk-free instruments denominated in alternative currencies.

Issuer
The legal entity that issues, and usually assumes any obligations for an investment instrument.

K

Kappa
The change in the option price in response to a percentage point change in volatility. Kappa measures the sensitivity of option value to a change in implied volatility.

Kurtosis
A measure of the extent to which observed data fall near the centre of a distribution or in the tails.

L

Lambda
The percentage change in an option price divided by the percentage change in an underlying price. A measurement of the option's leverage.

Leverage
An investment or operating position subject to a multiplied effect on profit or position value from a small change in sales quantity or price.

Libor
See London-interbank-offered-rate.

Liquidity
A market condition in which enough units of a security or other instrument are traded to allow large anonymous transactions to be absorbed by the market place without significant price impact.

Lognormal distribution
Prices are said to have a lognormal distribution if the logarithm of the price has a normal distribution.

London-interbank-offered-rate (Libor)
The primary fixed income index reference rates used in the Euromarkets. Rate reference vary by currency, i.e. Aibor, for Amsterdam-interbank-offered-rate or Fibor, for Frankfurt-interbank-offered-rate.

Long
A position which will benefit from a rising market.

M

Margin
The required equity or other performance bond that an investor must deposit to collateralise an investment position.

Mark-to-market
To price a position or portfolio at current market prices.

Market maker
Any dealer who regularly quotes both bid and offers in a particular security or instrument, and is ready to buy and sell in volume at the quoted prices.

Mean
The arithmetic average of a population or series of observations.

Median
The middle observation in an ordered distribution. After the mean, the most common measure of central tendency.

N

Natural hedge
The shift of production facilities, working capital, or borrowing arrangements to an alternative currency area to offset undesirable cash flow exposures.

Normal density
The integral under the normal distribution function between two points or between one point and infinity.

Normal distribution
A probability distribution, which describes the behaviour of many man-made or natural phenomena. About two-thirds of total observations fall within one standard deviation on either side of the mean of a normal distribution. About 95% of observations fall within two standard deviations and about 99% of observations within three standard deviations.

Notional principal
The nominal value used to calculate swap payments.

O

Off-balance sheet instrument
A notional principal contract that changes an economic unit's risk structure without appearing as an asset or liability on the balance sheet.

Offset
A position with identical, but opposite price or rate responses which cancels some or all of the market risk of an open position, but not necessarily the position's credit or settlement risk.

Omega
Currency risk associated with translating the value of a currency option position into a different currency.

Opportunity cost
The value of a lost chance or a potential profit that was not realised because an action by the investor or borrower which eliminated the potential for the resultant profit.

Option
A stipulated right, without obligation to the buyer of the option, to buy a security, commodity or property at an agreed price and to a pre-determined expiry date.

Option premium
The amount of money an option buyer pays for the rights associated with the respective option.

Out-of-the-money
An option that has no intrinsic value because the current market price of the underlying instrument is below the strike price of a call option or above the strike price of a put option.

Over-the-counter (OTC)
A security or other instrument that is not traded on an organised exchange or a market that is not part of an organised exchange.

P

Parallel shift
A movement of each point of the yield curve, up or down, by the same amount.

Path-dependent option
The value of a path-dependent option depends partly or exclusively on the price pattern followed by the underlying instrument to maturity of the option.

Positive carry
The net gain from carrying a position when the cost of funds is less than the yield on the securities held.

Present value
The current value of a future cash flow or series of cash flows discounted at an appropriate interest rate.

Price risk
Exposure to loss as a result of a change in the price of a commodity or a financial instrument.

Purchasing power parity
The principle that over time, currency and exchange rates will adjust so that the cost of similar goods and services will tend to be the same in all markets and in all currencies.

Put-call parity
A boundary condition, which holds relative put and call price relationships within a narrow range.

Put option
An option to sell a security.

R

Ratio spread
An option spread in which the number of contracts purchased and the number of contracts sold are not equal.

Realised yield
The return actually earned on an investment in a security over a period of time, including the return on reinvested interest or dividend payments.

Reinvestment rate
The interest rate or yield at which any cash flow from coupon or principal payments can be reinvested.

Repo rate
The financing rate for government securities sold against repurchase agreements.

Repurchase agreement
A financing arrangement used primarily in the government securities markets whereby a dealer or other holder of government securities sells the securities to a lender and agrees to repurchase them at an agreed future date at an agreed price which will provide the lender with an extremely low risk return.

Reset date
The date at which a swap's periodic payment terms are established.

Rho
The dollar change in an option price in response to a percentage point change in the risk-free interest rate.

Risk
Exposure to change that will have an adverse economic or financial result on the enterprise that is exposed.

S

Securitisation
The process of converting assets which would normally serve as collateral for a bank loan into securities which are more liquid and can be traded at a lower cost than the underlying asset.

Short
An investment position that will benefit from a declining market.

Short sale
The sale of a security or other financial instrument not previously owned by the seller in the expectation that it will be possible to repurchase that instrument at a lower price some time in the future.

Spot price
The current market price. In terms of currencies the spot rate has a two-day time value to delivery.

Spread
The difference between the bid price and the ask price of a security.

Standard deviation
The square root of the mean of the squared deviations of members of a population from their mean.

Stochastic process
A mathematical model tracking the occurrence, at each moment after the initial time, of a random phenomenon.

Straddle
A combination option consisting of one put and one call, both short or both long. Either option is saleable separately and the strike prices are the same.

Strike
The price or rate at which an option begins to generate a settlement value at expiration.

Swap
A contractual agreement to exchange a stream of periodic payments with a counterparty.

Swap curve
A yield curve illustrating the relationship of swap rates at various maturities. Usually based on the zero coupon curve.

Swap rate
The market rate on the fixed rate side of the swap.

Swaption
An option to enter into a swap contract.

Synthetic instruments
Instruments that largely reflect the qualities and bahaviour patterns of the underlying securities or derivative instruments which they intend to mirror.

T

Tail
A reference to the ends of a probability distribution where the chances of an occurrence get relatively small. One-tailed distribution usually refers to the negative probability of occurrence for purposes of calculating the value-at-risk of a position or portfolio.

Tenor
The term or life of a contract or instrument.

Term structure of interest rates
The pattern of interest rates on default-free debt instruments with various terms to maturity, often illustrated graphically by a yield curve.

Theoretical value
The value of an option as determined by a specific option model based on the model's input parameters.

Theta
The sensitivity of an option's price to the passage of time with the price of the underlying and implied volatility unchanged.

Time value
A reference to the difference between an option's price and its parity or intrinsic value.

Transaction risk
Currency exchange rate risk for the period between the date of the contract and the date that payment is made.

Translation risk
Currency exchange rate risk that affects the valuation of balance sheet assets and liabilities between financial reporting dates.

U

Underlying
The security, cash, commodity, forward, futures contract, swap, or other contract or instrument which is the subject of a risk management contract between two parties, known as the counterparties.

V

Value date
The date on which parties to a currency or swap transaction calculate and exchange payments to settle their respective obligations.

Variance
The mean of the squared deviations of each member of a population from the population mean. The square of the population standard deviation.

Variation margin
The cash transfer that is required after each trading day in a futures market to mark long and short positions to the market.

Vega
The change in the underlying cash price of the option in response to a percentage point change in volatility, when volatility is measured in percentage terms.

Volatility
A statistical measure of the tendency of a market price or yield to vary over time. Volatility is usually measured by the variance or annualised standard deviation of the price.

Volume
The number of shares, bonds, notes or any other securities traded in a market.

Y

Yield curve
A graph illustrating the level of interest rates as a function of time.

Z

Zero coupon bond
A debt instrument sold at a discount to its face value. The bond makes no payments until maturity at which time it is redeemed at face value.

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