EVALUATION AND CONTROL OF RISKS AND MEASUREMENT OF PERFORMANCE OF TREASURY ACTIVITIES IN A DEALING ROOM : THE CASE OF AN INTERNATIONAL BANK IN HONG KONG

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ABSTRACT

After the occurrence of a number of recent events resulted in tremendous losses in the financial books of world class conglomerates, regulators and financial institutions are concerned about the need to impose much tighter control on treasury activities with special emphasis on derivatives products.

The job of evaluation and control of risks of treasury activities in a dealing room is important and complex in view of the growing size of these activities and the rapid development of new products. Use of advanced technology in the computer systems to come up with various kinds of exception reports and risk analyses can help improve the situation. However, no risk control system, no matter how sophisticated it can be, is an absolute guarantee against loss if the persons on whom such controlling functions are delegated do not understand how to discharge their duties and the general attitude of senior management towards speculative trading is sharply divergent from prudent practices.

Another aspect of the treasury activities which is also crucial but has not attracted so much attention is the measurement of performance of these activities. If one takes a closer look at the whole revaluation process, one can see that it is possible for the systems of two banks to generate quite different profit and loss figures for the same group of inter-related transactions because the computation depends a lot on the methodologies used and internal policies of the banks.

After the Barings' case, it is expected that the regulators will issue more guidelines for banks to follow and there will also be more frequent on-site visits to understand the actual situation of the banks. It is known that the Hong Kong Monetary Authority has recruited expertise in

derivatives and is going to recruit more. External auditors are also expected to play an even more important role in this respect. Banks will be required to disclose much more on risk control and performance in treasury activities, possibly with explanations for large fluctuations in their trading results.

The good side of all these regulations is that they force the management to critically review the company's policy, the effectiveness of their internal control system and their attitude towards aggressive traders.

The trend towards more transparency can gradually change people's attitudes towards the use of various financial instruments. Other constructive ways to deal with treasury business include the promotion of greater awareness of the risks of these products among market participants and the development of a proper regulatory framework to guard against irresponsible actions.

It is the writers' belief that further development of treasury activities can improve the efficiency of the financial markets by offering more alternatives to the market participants and by minimizing the transaction costs provided that there are corresponding up-grade in technical know-how and quality of staff, and tightening of control by the management teams.

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CHAPTER 1

INTRODUCTION

1.1 Scope and Objectives

In recent years, there is an increasing trend that the Hong Kong branches of a number of international banks invest more and more of their resources in the expansion of dealing room activities besides engaging in traditional banking activities such as lending and borrowing business.

A dealing room serves a number of purposes. To find the cheapest source of funds and to minimise risks are some of the typical examples. To serve the foreign currency needs of the customers of the bank is another function of a dealing room. The other two functions which are also worth mentioning are : (i) the Asset and Liability Management and (ii) the trading / arbitrage function. The relative importance of the second one varies a lot from one bank to the other depending on the capability of the staff involved, capital invested and the risk aversion attitude of the management.

For those international banks which already have extensive network covering almost every major financial centre, expansion of business into this new area does not necessarily mean entering into an unknown world because their Head Offices can usually provide the necessary expertise and support in the initial implementation phrase. However, even so, recruitment of appropriate front-line staff (traders) with the right experience and calibre is an aspect that no bank can find it easy to comprehend, not to mention the huge investment in installing an up-to-date powerful computer system, dealing communication system and the cost of establishing a team of competent supporting staff who can process

the various types of transactions and an independent team who can properly monitor the risks involved.

The objective of this paper is to compare the two aspects of the treasury activities in a dealing room of one international bank in Hong Kong against the market practices accepted and adopted by well-known international banks of the world.

These two aspects are :

- Evaluation and Control of Risks and
- Measurement of Performance of Treasury Activities.

It is not the writers' intention to analyse the materials obtained from our study from a technical perspective nor to present them in a form similar to an audit report because we think that this approach will not facilitate any attempt to understand treasury activities by non-technical people. To increase the transparency of this subject matter, we try to present the case in relatively simple terms. More details about these two aspects are described in the following paragraphs.

1.1.1 Evaluation and Control of Risks

Because of the complexity of the trading / arbitrage function of a dealing room, sophisticated risk control tools and advanced revaluation models have to be in place to monitor such business adequately and to reflect the trading performance correctly.

As far as the bank's profit and loss and the bank's solvency are concerned, here risks mean the extent of the impact of various events (price changes, interest rates changes, economic, political, etc) on the uncovered positions of the company.

An useful and commonly employed approach is to find out the probability and size of each of the specific events which can have significant bearing on the bank's financial position and then to develop standard scenarios of market movements to enable us to estimate the variations in results under different scenarios.

It is important to point out that no risk control system is an absolute guarantee against loss. What a good and effective system can do is to control the total amount of possible loss to a tolerable level so that the bank can assure itself that the management staff know what is actually at risk and the bank does not suffer losses from risk that were ignored or misunderstood. With that downside risk under control, the management of a bank can then feel comfortably with the way that risk-takers conduct their business of serving customers and earning profits.

The fact that each treasury decision involves a change in the risk of the organisation makes it important for the opportunity gains and losses to be weighted against these risks to provide an accurate picture of the treasury performance.

For the very large banks, they employ quite sophisticated techniques to evaluate their daily portfolios and impose stringent rules on all staff involved to make sure that the approved trading limits are adhered to and the correct results of these activities are measured and reflected.

However, in general, not every foreign bank in Hong Kong have its dealing room activities subject to the same level of control as that prescribed by the experienced multinational banks due to various reasons e.g. system constraints, availability of human resources with the required calibre locally, etc.

We intend to study some risk evaluation and control approaches which are quite popular and widely accepted by international banks in the developed countries. Using these

practices as a reference, the current risk evaluation and control systems of one foreign bank in Hong Kong are analysed and reasons for significant variances from the recommended market practices are sorted out. Since not all constraints, imposed by peculiar market situation in Hong Kong or due to limited financial resources locally, can be removed in the short run in actual practice, recommendations are restricted to those which can be managed by the Hong Kong branch.

1.1.2 Measurement of Performance of Treasury Activities

In this paper some general principles of performance measurement[1] are put forward to illustrate why gross income or net contribution (after deduction of operational costs) is not sufficient for use as the sole yardstick in measuring performance of these activities and why it is important to review the soundness of the revaluation systems in use.

Market-based measurement techniques are important because they offer an assessment of a dealer's performance relative to some benchmark, and relative to the risks taken to achieve that performance.

We must also properly account for the impact on the bank's financial stability arising from the change in the level of risks inherent in various products being traded. To generate high returns from high risk instruments may not be a difficult task and so such high returns do not necessarily mean superior performance over reasonably good results generated from low risk products.

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1 Stern, Joel M. and Donald H. Chew. New Developments in International Finance. Basil Blackwell Ltd., 1988 pp.147-161.

All relevant costs incurred to support the trading of a dealing room product (such as funding costs for maintaining the portfolio) must also be carefully analysed to make sure that they are properly captured otherwise we may be comparing performance of financial products on inconsistent bases.

Finally, the choice of revaluation rates and the revaluation methodologies adopted play an important role in the performance measurement because they are the basic factors which determine the profit figures of the dealing room activities. Only if we are confident that the most appropriate rates and methodologies are chosen and implemented can we have confidence in the performance measurement system.

However, it is possible that due to system constraints or out-dated cost allocation methodology, certain important profit / loss components (eg. cost of carry / funding costs) are missing or being misclassified or misallocated in the management report thus giving a misleading picture of the actual results of the traders. This can lead to inefficient allocation of resources based on wrong information.

Based upon what we discussed above, the procedures and methodology employed by one international bank in measuring the gains or losses arising from its treasury activities are analysed. It is expected that there are some imperfections in the current system of performance measurement. The reasons why the deficiencies are there enable us to understand more deeply about the constraints faced by the chosen bank. As stated earlier in the section of risk control, recommendations are restricted to those which can be managed by the Hong Kong branch.

1.2 Methodology and Sources of Information

Some of the information we need for this paper has been obtained from the manuals written by international players[2]. These manuals provide a lot of practical examples about how the treasury activities should be conducted and supervised.

Contemporary ideas relevant to the risk control and performance measurement of certain popular products are extracted from books, magazines, newspapers and some technical journals[2] in the relevant field. In contrast to the above manuals which concentrate on the internal operational and control aspect, these references provide not just a theoretical background for understanding more about the subject matter but also a much broader perspective of the treasury business (including the attitude of the regulators).

Besides, relevant working experience of the writers also forms part of the reference materials of this paper. As far as possible, ideas coming from discussions with external auditors and the Hong Kong Monetary Authority are included to give a more up-to-date picture of the situation in Hong Kong.

In the process of collecting information from other foreign banks, some difficulty was encountered. Because the Hong Kong Monetary Authority conducted a similar survey by end of 1994, information about the internal risk management of a bank is very sensitive. Questionnaires cannot be simply sent to any banks otherwise very poor response can be expected. Due to this special reason, we could only manage to obtain consent from the internal auditor / internal control manager / operations manager /accountant of five foreign banks in Hong Kong (including the chosen bank) to supply the relevant information.

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[2] See Bibliography

Interviews have been arranged with them to get an in-depth understanding of the existing practice. Questions have been raised to the interviewees to see why certain methods are preferred to the others and to what extent adaptations are required to be made to fit the local situation.

Chapter 2

EVALUATION AND CONTROL OF RISKS

In this chapter, the details of the "Risk Management Guidelines for Derivatives" issued by the Balse Committee in July 1994 are discussed because these are guidelines highly recommended by the Hong Kong Monetary Authority for banks in Hong Kong to follow. These guidelines are quite comprehensive because many aspects of risk monitoring are covered. They stress very much on the oversight by board of directors and adequate integration of the risk management process. They expect banks to develop a risk management system that integrates prudent risk limits, appropriate measurement procedures, sound information system, continuous risk monitoring and reporting together. There should also be audits conducted in an effective manner on a regular basis because auditing also forms an important part of the whole risk management system. Before we elaborate each of these in more details, it is worthwhile to mention some of developments in financial instruments all over the world.

The following scenario was described in a well-known magazine[3]: "The nightmare of central bankers: 'A big bank suddenly defaults on an interbank obligation". Other banks panic, cutting credit lines indiscriminately. Runs develop on the defaulting bank and on others that might be affected by its collapse.' Very soon, a large portion of the world's financial system is in jeopardy."

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3 "DERIVATIVES - The beauty in the beast". The Economist. May 14, 1994.

Although all these sound very alarming and frightening, some regulators do not rule out the possibility that one day this sort of catastrophe will really happen as a result of the fast-growing market for the financial instruments -such as futures, swaps, options and other derivative[4] products.

The rapid growth of derivatives trading around the world in recent years has been accelerated by the internationalisation of capital markets in general; by technological advances in computers and telecommunications; and by the increasingly fierce competition among big banks and securities houses. It is estimated that the total value of all outstanding derivatives now jumping into the trillions of dollars.

[4] According to Guidelines issued by Basle Committee on Banking Supervision in July 1994, here a derivatives instrument is defined as a financial contract whose value depends on the values of one or more underlying assets or indexes. This covers a wide spectrum of financial products including forwards, futures, swaps, etc.

Chart 1

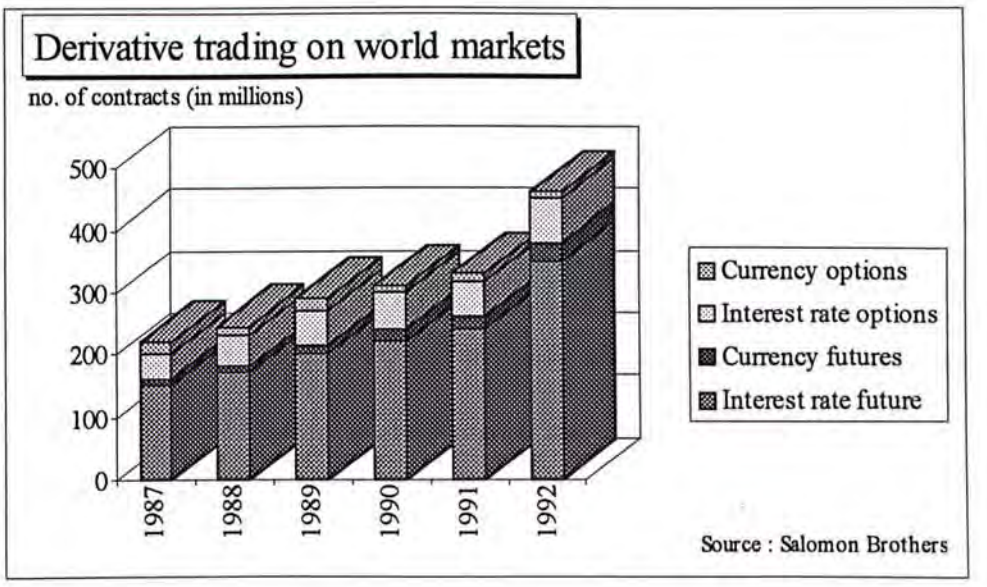
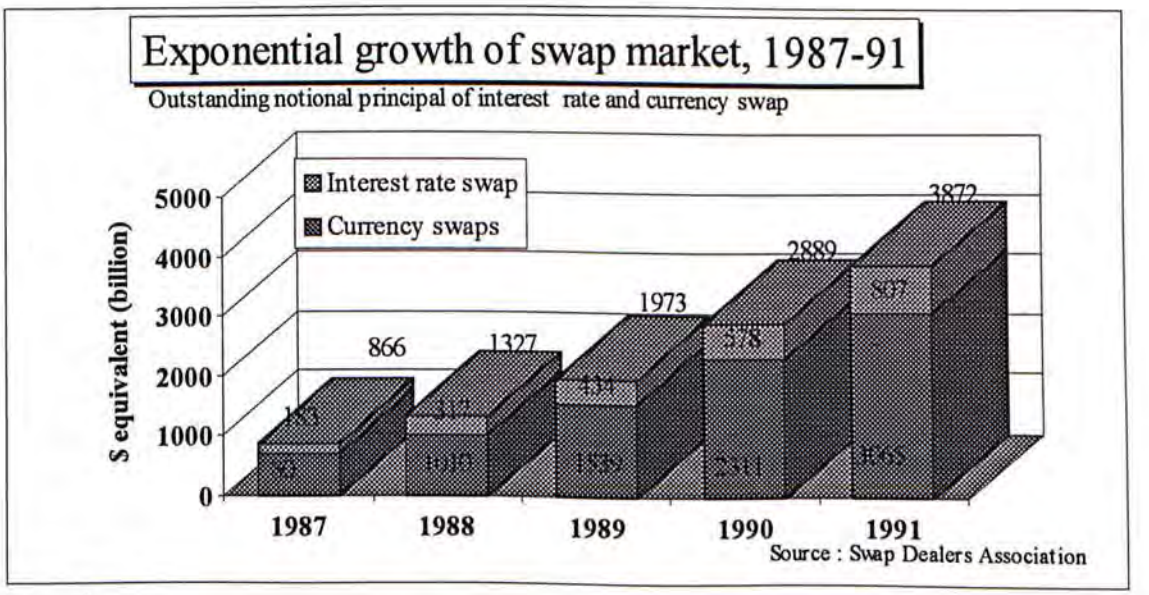


Chart 2



Bankers in derivative trading often use very advanced mathematical models and commonly employ jargon of algorithms and Greek letters. Small companies (but big companies are not uncommon) sometimes end up buying derivative products whose risks they do not fully understand. A recent good example is that of Procter & Gamble, a consumer-goods manufacture, which announced April 94 that it had lost US$102m through a disastrous gamble on interest-rate movements. In May another American company, Air Products and Chemicals, said that it had lost US$60m in the same way. The most recent shocking case is the substantial loss of around US$1 billion in trading Nikkei Index Future and Bond Future Option (although this case might involve fraud and it is still under investigation) by one well-known company.

Derivatives are a little-understood market with very big numbers attached. But that does not necessarily make them a threat to the system. On the contrary, used properly, derivatives can spread and even reduce risk in absolute terms rather than increase it. Derivatives can also be used to reduce financing costs.

It is now generally acknowledged by financial institution that a key component of a robust framework for the management of the risks is a strong structure of risk management controls within institutions which are exposed to various financial products and instruments.

In order to safeguard their own position, banks may well terminate or restrict activities with market participants when there may be doubts as to the adequacy of their management controls. Moreover, to protect the interests of a bank, it is expected that the bank will check carefully that a counterparty (a) has the power to enter into a proposed transaction, (b) is represented by an officer with actual or ostensible authority (c) is creditworthy.

Sometimes market forces may also lead firms to ignore or under-estimate risks, including those arising from known control efficiencies. Commercial pressures can create a temptation towards entering into certain transactions, including innovative transactions without first conducting an in-depth study on risks.

2.1 Scope of Risk Management

The key elements and basic principles of sound management practice for users of financial instruments include[5] :

1. Appropriate oversight by boards of directors and senior management
2. Adequate risk management process that integrates prudent risk limits, sound measurement procedures and information systems, continuos risk monitoring and frequent management reporting; and
3. Comprehensive internal controls and audit procedures

[5] "Risk Management Guidelines for Derivatives." Balse Committee on Banking Supervision. July 1994.

In light of the recent reported case involving derivatives, my personal opinion is that a fourth factor should also be added :

> "Adequate control over the company's directors and senior management by government regulatory bodies to reduce the possibility of their authorisation of excessive trading or their passive attitude towards signals of over-trading"

We must not forget that even the well-recognised independent role of directors in checking the affairs of the company can be seriously eroded by the possibility of "free-riding". Here the government's regulatory bodies must step in and play an important role in protecting the interests of the company's shareholders and the public interests at large. There is no excuse for the regulatory bodies to isolate themselves from the commercial world.

Their job is to conduct constant supervision and maintain effective dialogue with the potential big risk-takers especially during periods of massive disturbances in the financial markets such as huge appreciation or depreciation of world's major currencies, stock market crashes, etc.

2.1.1 Board and Senior Management Oversight

The Balse Committee states that an institution should maintain written policies and procedures which clearly outlines its risk management guidance for financial instruments activities. At a minimum these policies should identify the followings:

1. the risk tolerances of the board of directors; and

2. the lines of authority and responsibility for managing the risk of these activities

Individuals involved in these activities (e.g. the controlling or the operational units) should be made fully aware of all policies and procedures that are pertinent to their specific duties.

The board of directors should approve all significant policies relating to management of risks throughout the institution.

The responsibility of senior management is to ensure that there are adequate policies and procedures, adequate systems for measuring risk, appropriate internal trading limits, effective internal controls and an independent and comprehensive risk-reporting process for conducting such risky operations.

The written policies and procedures for risk management process should include: (a) a description of the financial products, markets and business strategies; (b) the resources required to establish sound and effective risk management systems; (c) an analysis of the impact of the proposed activities (including the risk aspect) on the company's overall

financial condition and capital levels; (d) the procedures the bank will use to measure, monitor and control risks; (d) an analysis of any legal restrictions and enforceability.

It is of utmost importance that these policies should be consistent with the organization's broader business strategies, capital strength, management expertise and overall attitude towards taking risk.

On a regular basis, the board should be informed of the risk exposure of the institution and should regularly review and revise the institution's risk tolerance regarding these activities.

(Concentration of resources in a certain line of risky business without fully assessing the immense downside risk can lead to a disastrous situation. A good example is the recent Barings' case where the limits imposed by Bank of England on the maximum exposure that Barings could take in its individual line of businesses were not followed.)

Any significant changes in such activities or any other new activities should be approved by the board of directors or by an appropriate designated qualified senior management.

There should be frequent communication among the board, senior management, staff of risk management functions and the traders regarding procedures for measuring and managing risk.

2.1.2 Independent Risk Management and Control Functions

One general policy is that compensation policies - especially in the risk management, control and senior management functions - should be designed in such a way that is sufficiently independent of the performance of trading activities in order to avoid the possibility of giving incentives for excessive risk taking that can occur.

The process of measuring, monitoring and controlling risk should be managed independently of individuals conducting the dealing activities.

(From the information recently released regarding the Barings' case, it seems that this basic principle was violated as the trader was also given the power to influence the internal operation.)

An independent system for reporting exposures to both senior-level management and to the board of directors is absolutely essential.

The personnel responsible for independent risk management functions should have a complete understanding of the risks associated with all of the bank's treasury activities. These qualified individuals should be paid enough to assess these risks effectively.

(Again, according to the latest information, Barings' senior management possibly made a fundamental mistake in not replacing good senior control managers who resigned earlier, based on a wrong perception that by doing so the company could save a lot of costs.)

2.1.3 Integration of People, System and Organisation

It is worth mentioning that all system is implemented by people. One American bank made it very clear that "Good people" sourced from a proper human resources management process, which begins with recruiting and hiring, extends through training and developmental experiences, and includes effective management and supervision. Appropriate rewards, motivation both financial and non-financial are important.

As the risk measurement and management can be very complex, the process of risk management for dealing room activities should be integrated into the institution's overall risk management system to the fullest extent possible.

The risk exposures of any company should be fully supported by an adequate capital reserves on a fully consolidated basis. It is inappropriate that the product mix and overall limit are set on different assumptions and strategies.

It must be emphasized that no risk control system is an absolute guarantee against loss. What the system aims to do is to control the total amount of possible loss to a level that the corporation is willing to tolerate.

2.2 Risk Management Process

It is suggested by the Balse Committee that the primary components of a sound risk management process are the followings:

- a comprehensive risk measurement approach;
- a detailed structure of limits
- guidelines and other parameters used to govern risk taking; and
- a strong management information system for controlling, monitoring and reporting risks.

The findings and recommendations contained in the G30 risk management study chaired by Dennis Weatherstone, the Chairman of JP Morgan and a founding member of the Group of Thirty are now the current market standard used widely by the external auditors to check against their client's existing practices. Some of their recommendations are as follows :

a. Policies governing the use of derivatives should be defined with particular emphasis on stipulating clearly the purposes for which these transactions are to be undertaken.

b. The company should regularly estimate the future funding requirements as a result of their derivatives portfolios.

c. There must be periodical review and approval of pricing models used by the company in both the front and back office. Where different systems are used, there must be proper reconciliation procedures.

d. In the financial statements of the company, there should be enough disclosures about the management's attitude to financial risks and analysis of the exposures and the inherent credit risk in these exposures.

2.2.1 Risk Management

The company's system for measuring the various risks should be both comprehensive and accurate. Risk should be measured and aggregated across trading and non-trading activities.

Risk measures and the risk measurement process should be sufficiently robust to reflect accurately the various types of risks that the institution has to face. Risk measurement standards should be understood by relevant personnel at all levels of the institution.

The process of marking open positions of treasury products to market is fundamental to measuring and reporting exposures accurately and on a timely basis. An institution active in dealing foreign exchange, derivatives and other traded instruments should have the ability to monitor credit exposures, trading positions and market movements at least daily (preferably on a real-time basis).

Basle Committee mentioned about analysing stress situations. Sound risk measurement practices should cover identification of possible events or changes in market behavior that could have unfavorable effects on the institution and assessment of the ability of the institution to absorb the impact of these effects. These analyses should consider not only probability of adverse events but also "worst case" scenarios.

Such approach is to find out the probability and size of the specific events e.g. changes in prices, market illiquidity, etc which can have significant impact on the company's financial position and then to develop standard scenarios of market movements to enable us to estimate the variations in results under different scenarios.

The stress tests should not just be limited to quantitative exercises which only estimate potential losses or gains but should also include more qualitative analyses of the actions management might take e.g. the kind of contingency plans outlining operating procedures in case of a real occurrence of such events.

2.2.2 Limit Control System

A sound system of limit control system should ensure that positions that exceed certain predetermined levels receive prompt management attention.

The limit system should be consistent with the objectives and strategies of the organisation's overall risk management process and with the adequacy of its capital reserves. An appropriate limit control system should allow management to control exposures through effective reporting system, to alert discussion about opportunities and risks and to monitor actual exposures against predetermined tolerances.

Global limits which should be consistent with the overall risk measurement approach have to be set for each major type of risks involved in an institution's dealing room activities.

2.2.3 Reporting System

An accurate, informative and timely management information system should be in place to ensure the prudent operation of treasury activities. To achieve this, the critical factor is the quality of the management information system. Risks should be reported to appropriate levels of senior management and to the board of directors by an independent body. Exposures and profit and loss statements should be reported at least daily to managers who supervise and are independent of those dealing activities.

Management information system should transform the actual risk exposures from a complex and technical form to one that can be easily read and understood by senior managers and directors, who may not have specialised and technical knowledge of derivatives products.

2.2.4 Management Evaluation and Review

Management should ensure that the various components of the institution's risk management process are regularly reviewed and evaluated. This review should take into account of the changes in the activities of the institution and in the market environment because the changes may have created exposures that require additional attention. Any material changes to the risk management system should also be reviewed.

The risk management functions should regularly assess the methodologies, models and assumptions used to measure risk and to limit exposures. There should be proper documentation of the risk measurement system to enable subsequent reviews to be conducted. The purpose of the review includes examining whether existing measures of exposure and limits are appropriate in light of the institution's past performance and current capital reserves.

The institution should also develop an effective process to evaluate and review the risk involved in products that are new to it. It should only become involved in a product at significant levels until senior management and all relevant personnel understand the product and are able to integrate the product into the institution's risk measurement and control systems.

2.3 Various Types of Risks

Broadly speaking, risks can be generally grouped into Market Risk, Liquidity Risk, Credit Risk, Operation and Legal Risk.

2.3.1 Market Risk Management

Market risk[6] is the risk to an institution's financial condition resulting from adverse movements in the level or volatility of market prices. In addition, all trading activities are affected by market liquidity and by local or world political and economic events.

In general, market risks cover

- Market Illiquidity

  The liquidity of a market is its ability to absorb sudden shifts in supply and demand without excessive price fluctuation. In an illiquid market, closing a position may cost more than the changes in price already recorded.

- Price Risks

  A. Foreign Exchange Risk

  This is the impact of foreign exchange rates variations on the bank's uncovered positions

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6 Forex and Debt Markets - Procedure Manual. Bank XX, 1994. pp.17-21.

B. Interest Rate Risk

This is the risk of gain or loss to which an institution is exposed due to possible changes in interest rates levels on its uncovered positions

The different components of interest rate risk are:

Yield curve parallel shift - It means the possible change in P/L if interest rates for all maturities move the same number of basis points at the same time in one currency.

Yield curve swing (or slope risk) - The risk associated with situation where for example, 6 months rate moves up when 1 year rate does not move.

Spread risk - It refers to possibility of different evolutions between instruments whose characteristics (rate, maturity) are similar. For example, a security is hedged by an IRS and their market price can differ.

2.3.1.1 Market to Market Evaluation

Market risk is commonly measured by market participants using a value-at-risk approach, which measures the potential gain or loss in a position that is associated with a price movement of a given probability over a specified time horizon. The institution should revalue all trading portfolios and calculate its exposures at least daily.

Although an institution may use risk measures other than value at risk, the measure used should be sufficiently accurate and rigorous. These risk measurement systems should be adequately incorporated into its risk management process.

The results of any market risk models that base upon simulations or forecasts of future prices should be compared with actual results. If the projected and actual results differ

materially, the assumptions used to derive the projections should be carefully reviewed or the models should be modified.

To limit the extent of market risk, stop-loss limits and guidelines should be in place for large market players. An institution whose treasury activities are limited in volume and confined to end-user activities may need less sophisticated risk measurement systems than those required by an active player.

2.3.1.2 "Worst Reasonable Case" Scenario / "Stress" Scenario Analysis[7]

In this paper, a "worst reasonable case" scenario analysis is selected and described in the following section.

The purpose of performing such scenario analysis is to give an indication of the possible risk inherent in relevant markets and products should the market factors affecting the profitability of the bank move adversely up to an extent perceived by the bank as the worst situation. It is assumed that

1. the liquidity of the market allows opportunities to square a risk exposure rapidly at any time by unwinding the position.
2. the theoretical probability of a move equal or stronger than the scenario is extremely low (0.1%), which means that a rather wide confidence interval is defined. The scenario event is expected to occur once every four year (252 working days per year)

The risk scenario allows to assess the statistical loss at a 0.1% probability. The process of evaluation is as follows.

[7] Forex and Debt Markets - Procedure Manual. Bank XX, 1994. pp.26-8.

This bases upon the same major assumptions as all option pricing modes, that is a lognormal distribution for prices.

Historical volatility (or standard deviation) is calculated on a fairly large sample of market data (usually 4 years) and a short term horizon (5 days). The risk scenario calculations are updated on a monthly basis on the major currency and interest rate markets.

$$S_W = S_0 e^{\pm(3\bar{\sigma}\sqrt{t} - \frac{1}{2}\bar{\sigma}^2 dt)}$$

where
S_0 = initial price
$\bar{\sigma}$ = volatility.
t = time horizon.

the scenario may be approximated by :

$S = \mu + 3\bar{\sigma}$ with μ = average trend

If σ is the annualized volatility and with 252 working days per year, then :

$$S = \mu \div 3\sigma\sqrt{\frac{1}{252}}$$

A "Stress" scenario analysis

This process is used to cope with the lepto-kurtosis shape of actual distributions, which implies a higher frequency of extreme moves than in the theoretical normal distribution mode.

The process provides a new and larger standard deviation to be referred to. Such market swings are recorded on stress situations as stated by the Group of 30 report relating to derivative products and released in May 1993.

Practically, the stress scenario is derived from the "worst reasonable case". The volatility taken into account is no more than 3 standard deviation, but is

$$S = \mu + \bar{\sigma} \div 3\bar{\sigma}_{\sigma}$$

with $\bar{\sigma}$ = average 5 day volatility

and $\bar{\sigma}_{\sigma}$ = standard deviation of the 5 day volatility

S relies on the magnitude of the volatility swing with a 0.1% probability. While the "worst reasonable case" assumed a stable volatility, the "stress scenario assumes only that the standard deviation of the volatility is stable.

According to the normal distribution, it is known that 99.87% of the price changes lie within a range of 3 standard deviations (which is the average 5 days volatility in this example). Within such price interval, the worst loss situation is taken to be the possible maximum loss that the bank might incur.

The "worst case" scenarios are applied to the trading limits of the various profit centers (assuming they have positions up to 100% of all their limits). A maximum loss is calculated for each activity disregarding any covariance risk alleviation (i.e. the portfolio effect).

2.3.2 Liquidity Risk Management

In the Guidelines for Derivatives issued by Balse Committee, a bank faces two types of liquidity risk in its dealing room activities :

1. risk that a bank may not be able to, or cannot easily, unwind or offset a particular position at or near the previous market price because of inadequate market depth or because of disruptions in the market place.
2. risk related to the general funding of the bank's dealing room activities, i.e. the funding liquidity risk with which the bank will be unable to meet its payment obligations on settlement dates or in the event of margin calls.

When a bank makes a decision on the size of limits, the size, depth and liquidity of the particular market must be evaluated properly to avoid establishing unrealistically high limits based on inadequate assessment of the actual situation.

2.3.2.1 Controlling the Liquidity Risks

A bank must anticipate the possibility that it could be totally shut out from gaining access to one or more markets probably due to concerns about the institution's own creditworthiness or the creditworthiness of a major counterparty or generally unstable market conditions. At such times, the institution may have less flexibility in managing its liquidity risk exposures.

A bank should evaluate the potential liquidity risks associated with the early termination of derivatives contracts. Early terminations also may open up additional and unexpected market positions. Management and directors should be aware of these potential liquidity risks and should address them in the institution's liquidity plan.

2.3.3 Credit Risk Management

In credit risk management, as recommended by the Balse Committee, a bank should evaluate the following two credit risks at the customer level across all products:

1. Settlement credit risk, i.e. on settlement day, the exposure to counterparty default may equal the full value of any cash flows or securities that institution is to receive.
2. Pre-settlement credit risk, i.e. prior to settlement, credit risk is measured as the sum of the replacement cost of the position, plus an estimate of the institution's potential future exposure from the instrument as a result of market changes. Replacement cost should be determined basing upon current market prices (or generally accepted approaches for estimating the present value of future payments required under each contract).

2.3.3.1 Limiting / Controlling Credit Risk

An institution can use master netting agreements and various credit enhancements such as collateral or third-party guarantees to reduce its counterparty credit risk.

An institution's credit exposures should be adjusted by these risk-reducing features only to the extent that the agreements and recoursed provisions are legally enforceable in all relevant jurisdictions.

2.3.3.2 Credit Risk Limit

As a matter of prudent policy, transactions with a counterparty should not commence until a credit line has been approved. It is important that credit limits be determined by personnel who are independent of the treasury dealing function and that these personnel use standards consistent with those used for other activities. Again, as mentioned earlier in other sections regarding the setting of limits, counterparty credit lines should be consistent with the organization's policies and consolidated exposures.

If credit limits are exceeded, exceptions should be handled according to the institution's policies and procedures. In addition, the bank's reports should adequately provide traders and credit officers with relevant, accurate and timely information about the credit exposures and approved credit lines.

2.3.4 Operation Risk Management

Operations risk is the risk that limitations or unexpected problems in information systems or internal controls will result in unexpected loss. This risk arises from human error, system failures and inadequate procedures and controls. This risk can be very much magnified in the case of certain derivatives because of the complex nature of their payment structures and calculation of their values.

2.3.4.1 Proper Management and System Support

The board of directors and senior management should ensure the proper allocation of resources (financial and human power) to support operations and systems development and maintenance.

The level of sophistication of the systems support and operational capacity should be adjusted and be in line with the size and complexity of the dealing business activity. For example, they must adequately accommodate the types of dealing room activities in which the bank engages. This includes the ability to efficiently capture, process and settle the volumes transacted through the business unit and to provide accounting support for the complexity of the transactions booked. The output must provide timely and accurate information to allow business unit management and senior management to monitor risk exposures.

2.3.4.2 Proper Internal and Operational Control

It is important to segregate the operational duties, exposure reporting and risk monitoring from the business unit for proper internal control purpose. Proper internal control should incorporate the entry of transactions into the computer system, transaction numbering, date and time recording and the confirmation and settlement processes.

The operations department or another independent unit should be responsible for ensuring proper reconciliation of front and back office information on a regular basis such as the verification of the size of open position, profit and loss figures and transaction-by-transaction details.

The bank should ensure that the methods in valuing its treasury product positions and that the assumptions underlying those methods are reasonable. The pricing procedures and models chosen by the bank should be consistently applied and well-documented. Prior to use models and supporting statistical analyses should be validated either internally by competent staff or externally by competent auditors or consultants with expertise knowledge in relevant fields.

A series of "worst-case" or "what if" scenarios, such as a power loss, a doubling of transaction volume or a mistake found in the pricing software should be carefully examined. There should be periodic reviews of procedures, documentation requirements, data processing systems and contingency plans.

2.3.5 Legal Risk Management

Legal risk is defined as the risk that contracts are not legally enforceable or documented correctly by the Balse Committee.

Legal risks should be controlled through policies developed by the bank's legal counsel that have been approved by the bank's senior management and board of directors. At a minimum, there should be guidelines and processes in place to ensure the enforceability of counterparty agreements.

For example, in the case of Hazell v. The Council of the London Borough of Hammersmith and Fulham and Others, the House of Lords held that, as a matter of public law, entering into swap transactions was beyond the legal capacity of the counterparty. This reduces the efficiency of the market in risk management products.

2.3.5.1 Enforceability of Agreements

Prior to entering into its treasury product transactions with its counterparties, a bank should reasonably satisfy itself that its counterparties have the legal and necessary regulatory power and authority to engage in those transactions and that the counterparties' obligations arising from them are enforceable.

Similarly, a bank should also ensure that its rights with respect to any margin or collateral received from a counterparty are enforceable and exercisable.

2.3.5.2 Making Use of Netting Agreements

The netting arrangements can reduce credit and liquidity risks and increase the potential to do more business with existing counterparties within existing credit lines. One further benefit that can be drawn is a reduction in the need for collateral to back up counterparty exposures to the bank.

2.4 Internal Control and Audit

A bank relies very much on its system of internal controls and audit to ensure effective and efficient operations. Existence of effective controls help ensure reliable financial and regulatory reporting and give certain guarantee to its ability in compliance with relevant laws, regulations and policies of the institution.

The scope covers assessment of the effectiveness of risk management, the evaluation of the adequacy of management information systems and the checking of the degree of adherence to control procedures regarding approvals, confirmations and reconciliation, etc.

Reconciliation control is particularly important where there are differences in the valuation methodologies or systems used by the front and back offices.

2.4.1 Internal Audit Activities

There must be an review of the frequency, scope and findings of independent internal and external auditors and the ability of those auditors to review the institution's dealing room activities.

At a minimum the Balse Committee recommends that the audit function should include the followings: (a) Testing of operations functions such as transaction and confirmation controls (check of rates used by traders / operations); (b) Assessment of unusual situations such as deals at off-market rates, unusual changes in volume, and after-hour and off-premises trading; (c) Independent verification of accuracy of pricing models and risk measurement methodologies. The evaluation of internal control and segregation of duties are of utmost importance.

Chapter 3

PREVAILING MARKET FOCUS ON RISK MANAGEMENT

In this chapter, some of the recent comments made by the Hong Kong Monetary Authority (HKMA) and the Bank of England senior adviser are summarised. They should reflect some of the prevailing market focus on risk management. In connection with this, we think that it is also worthwhile to extract a section from an article on derivatives in the Bank of England Quarterly Bulletin which indicated their major concern over the development of the derivatives market.

Recently the Hong Kong Monetary Authority (HKMA) required all authorised institutions in Hong Kong to review their risk management and internal control systems immediately and asked them to submit a report[8] to the HKMA within a short time period of time.

The recent requests by the HKMA for information about the trading strategy and level of management supervision and the writers' impression obtained from a number of discussions with their specialised team in derivatives products seem to suggest that the attention of the HKMA has been shifted to the following areas:

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8 Letter with subject heading - Barings The HKMA. March 6, 1995

3.1 Management Supervision and Internal Control System within Local

Senior management (both local and Head Office) are asked to re-examine whether they are fully aware of the trading strategy of its dealers and whether such strategy is consistent with the policy laid down by the board of directors.

The current focus mainly covers proper compliance with pre-determined limits and the timely reporting of the risk exposures and performance of the institution to both the local and the Global Controlling Units and Senior Management concerned.

It is of utmost importance that, within the organisation structure, there must be clear segregation of duties in place and there is a separate risk and credit controlling body who reports independently on trading activities to senior management.

In addition, regular review (e.g. by internal auditors with the necessary expertise) is necessary to ensure that the risk controlling procedures are being strictly observed by the department(s) concerned and any deviation will be reported and remedial actions taken promptly.

3.1.2 Client Suitability and Risk Disclosure

The institution must demonstrate that it has proper policy for trading with client. The policy includes evaluation of the client's financial needs and status in respect of the transaction entered into by the client.

The inherent risk in the transaction concluded should be fully explained and disclosed to client's treasury staff and senior management in order to ensure they are fully aware of the risks involved.

3.1.3 Resources to Support Existing Range of Treasury Products

The senior management have to evaluate the reasonableness of proposed activities in relation to the institution's overall financial condition and capital levels so as to ensure risk is under control and to avoid over-stretching of capital resources.

The institution must have qualified and experienced staff to manage the treasury products being traded in both front-line and back-office.

Nowadays, integrity and experience of key staff (especially in the controlling departments) are subject to careful scrutiny by regulatory authorities. It is quite common for regulatory bodies to request the institution to provide them with the career history and other background information of senior controlling staff.

3.2 A Central Banker's View on Derivatives

In the Bank of England Quarterly Bulletin dated August 1994, an article was written with the heading "Derivatives - a central banker's view". It admitted that some derivative products were complex to the point where the risks being taken were not obvious to the buyer or user. The good side of derivatives was that the efficiency of financial markets was improved and risks were re-allocated to risk-bearers who were willing to bear them. Contrary to our general perceptions, such innovation was welcome to central bankers.

Besides market risk and counterparty or credit risks which have been detailed in the previous sections, the following areas were also discussed which I would consider worth repeating here.

A. Liquidity Risks

The author, Mr. Brian Quinn, an Executive Director of the Bank of England, was not too optimistic about liquidity risks. He said there were some signs that individual instruments (e.g. bonds) and markets were drying up and this was happening on a wider scale during the current period of market instability. This could lead to greater volatility in price movements not only in that market but in other markets connected or linked, in a way not previously observed. As a result, regulators watched closely at the stress tests and behavioral assumptions built into the risk models used by companies active in derivative trading.

B. Comparatively Concentrated Risk

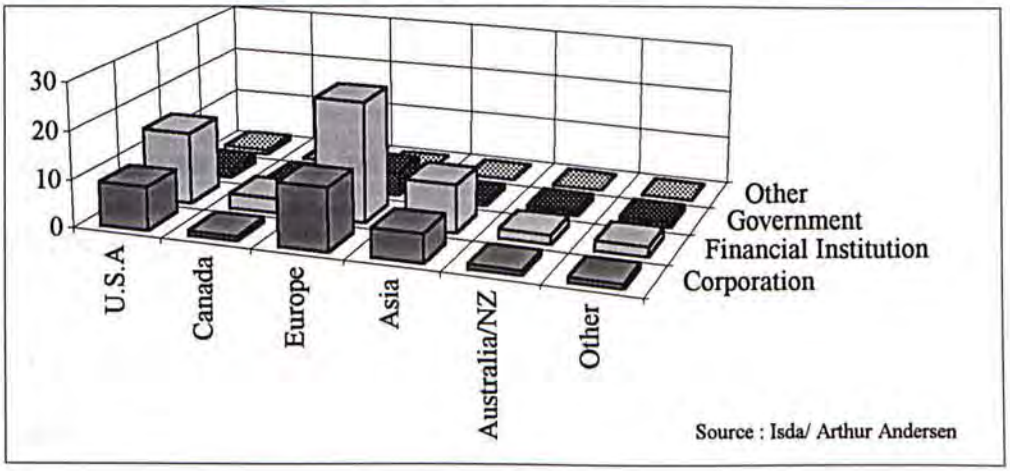
In the article, it was stated that both in the London and New York markets, over three quarters of the business in swaps and options was being conducted by a small handful of authorised firms. As long as these firms operated well, this phenomenon did not warrant any immediate attention. However, one could not rule out the possibility that serious problems being encountered by a large player in derivatives might hit automatically others who were known to be very active in the business.

The suggestion put forward was greater transparency and disclosure accompanied by common and satisfactory accounting rules (not only to the market but also to regulatory authorities).

Chart 3

Distribution of interest rate swaps by global region, 1991

End-user business/ location analysis (Total notional principal (US$ equivalent) by %)



Comments recently made by Mr. Colin Miles (Bank of England senior adviser)

Mr. Colin Miles, in his speech at a Ferrier Hodgson and Marfan seminar in Hong Kong, said cross-bordering monitoring of derivatives instruments was essential. He also said the European Union was set to implement its Capital Adequacy Directive (CAD) from January 1 1996[9].

An extract of the news is given below :

" Under this directive, there would be a distinction made between risks attached to a bank's loan book and trading book. Positions in each instrument in the trading book are to be calculated on a net basis and must be marked to market daily. A distinction will also be made between specific issuer related risks and the general market risks arising from movement in interest rates and equity prices.

Long and short positions adopted in portfolios will be offset in calculating market risks. Foreign exchange risks will be assessed across the whole of a bank's balance sheet.

The total minimum capital requirement is equal to the charges for specific general market and counterparty risk in the trading books, plus the balance sheet wide charge for foreign exchange risk, plus that for credit risk in the loan book."

It is expected that the Hong Kong Monetary Authority will study this directive seriously.

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9 South China Morning Post. March 25, 1995.

Chapter 4

THE CASE OF AN INTERNATIONAL BANK IN HONG KONG

In this chapter, an in-depth analysis of the risk monitoring system of the chosen bank is presented. Before going into details, it is better to describe some key features of the bank including the range of products traded, the trading strategy and the organisation inside the dealing room to enable the reader to grasp the rationale behind the selection of the present system. Some reasons explaining why we choose this particular bank as the target bank for analysis are also mentioned.

Because of the reliance on the Global Risk Control Department to carry out some monitoring tasks at Head Office, the organisational structure of the Global Department is also described.

The analysis begins at the point where limits are approved by the board. The reporting line of the internal risk control unit is highlighted as one important weakness. Regarding the functionalities of the systems, some key features on market risks are presented in detail and examples are used to illustrate the underlying concepts. There is also a table summing up the standard of limits used to measure the risks of various products. One little example shows how the bank measures option risk. Other types of risk control such as legal and operational risks are described briefly.

After the factual presentation, we analyse some of the reasons for not being able to implement a sound control system. Based on the prevailing market practices, some areas for further development are highlighted.

4.1 Overview of Activities of the Chosen Bank

At present, the chosen bank is a market maker (which provides bid and offer rates to other banking institutions) in Hong Kong Exchange Fund Bills and Notes. Being a market maker, in addition to being eligible to purchase these Bills and Notes of any maturities, it can also sell short these instruments in other maturities under the condition that the net of all these long and short positions is positive or in other words, it must end up in a net long position.

There are mainly 4 profit centres inside the dealing room, namely :

* Forex (Spot, Forward and options)
* Money Market Funding / Trading
* Interest Rate Derivatives
* Bonds / Papers

The chosen bank engages in arbitrage activities across various products. For the money market funding centre, the product range covers interbank loans and deposits, interest rate swaps, foreign exchange, securities, future rate agreements, etc. All of these are interest rate related instruments to allow the dealers to select the most suitable ones to hedge their

overall net open maturity mismatch positions. Hence, they are computed on accruals concept. Although the product range of the money market trading desk is very similar to that of funding, the instruments are used for trading and are marked to market on a daily basis.

For interest rate derivatives profit centre, in addition to the type of instruments mentioned earlier, dealers are allowed to trade interest rate futures and currency swaps.

On average, there are around two to three hundred currency deals and around three hundred interest rate deals concluded on a daily basis. Some of the counterparties are customers but most are financial institutions with offices in Hong Kong or abroad.

Traders here in Hong Kong work for the Asian region in respect of some products and for the 24-hour non-stop global option market of the group.

Overall speaking, judged from the range of activities and volume of trading, the chosen bank is not as active as other top class American or European banks dealing in almost every type of treasury products as market makers. Moreover, the chosen bank only occasionally trades in equity-linked instruments and the currency option deals concluded with individuals or corporate clients are immediately covered with another branch equipped with option pricing models.

As a whole, treasury activities are relatively important to the branch's business and are expected to grow significantly in the near future serving as an important component / link in the global trading business of the banking group.

4.2 Reasons for Choosing one Particular Bank for this Case Study

Each bank's risk control and performance measurement systems are shaped to some extent by the business strategy of the management at Head Office and those located in Hong Kong. The stage of development also affects the level of sophistication of the whole system. It is essential to understand the inter-relationship of various aspects of a bank, e.g. the risk taking attitudes, trading strategies, organisational set-up, etc. before one can really appreciate the advantages of that system and recommend solutions to those areas which can be further improved. This is to avoid comparing a system against another one which is designed for a completely different purpose otherwise the judgement made will not be meaningful.

Because of the above reason, only one particular bank is chosen. Besides, in Hong Kong only a few international banks install very complex systems for treasury activities. A lot of other players are medium size ones which only specialise in a limited range of products. Hence, in our opinion, the chosen bank is a typical example from where we can see both the merits of its present system in coping with the existing business and weaknesses in other control areas. These will be described in more details in later sections.

4.3 Organisational Structure of Global Control Department

At Head Office of the chosen bank, the Global Control Department is divided into the following sections:

- Market Risk Controlling section
- Product Risk Controlling section
- Counterparty Risk Controlling section
- Country Risk Controlling section
- Financial Model Evaluation and Assessment section

There is clear definition of roles, responsibilities and authorities of each section in controlling and monitoring of relevant risks.

4.4 Risk Control System of the Chosen Bank

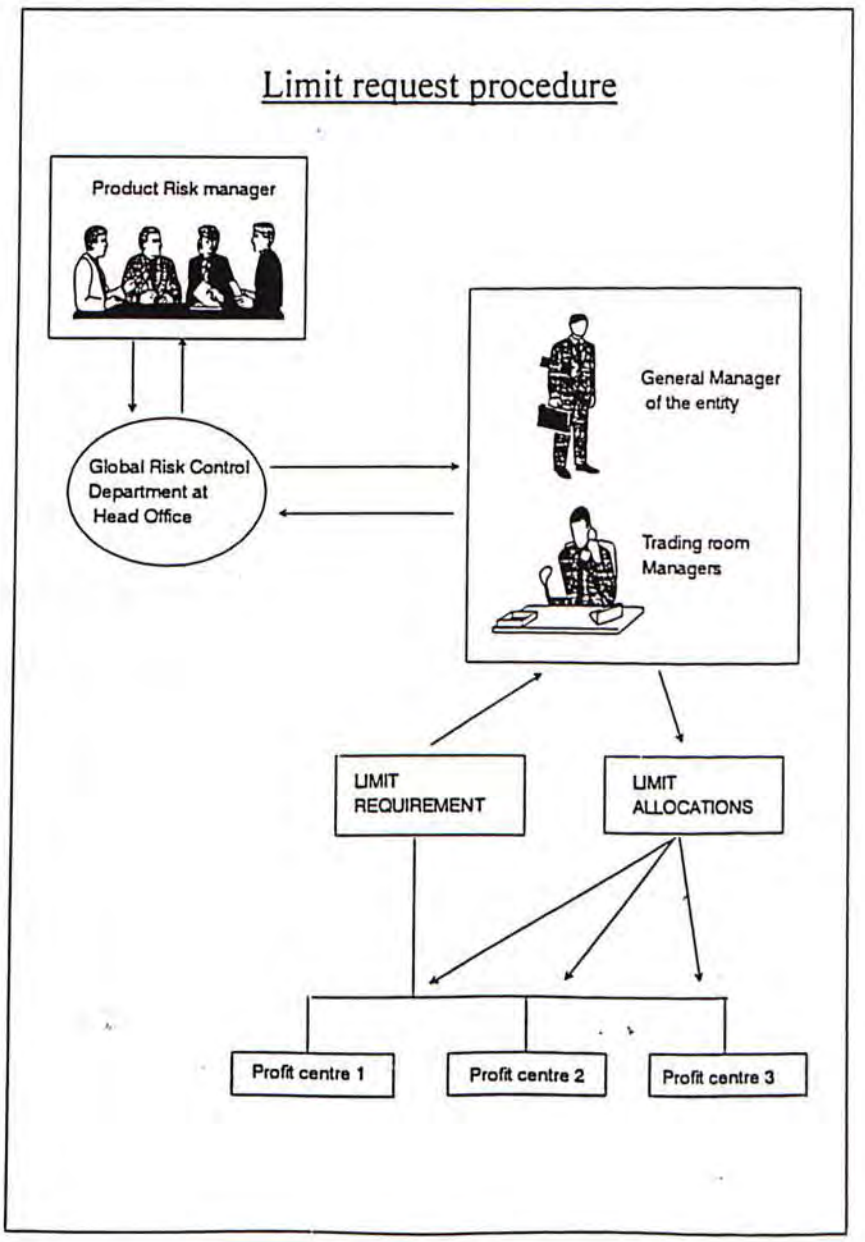
4.4.1 Board and Senior Management Oversight

In terms of management supervision, Hong Kong branch follows limits and guidelines approved by the Board of Directors at Head Office and the branch has a small risk controlling unit located inside the dealing room. The risk manager reports directly to the treasurer.

New products can only be introduced with the approval of Head Office in order to obtain the necessary trading limits otherwise only strict back-to-back transactions (which do not involve any market risks) can be entered into.

In general, there are two levels of approvals for limit excess. The first level is obtained from the local management for excesses up to a certain amount and then larger excesses have to be approved by senior officer at Head Office.

Any requests for significant increase in limits exceeding local authority have to go through the following procedures at Head Office. First such requests must be screened by the Risk Department. Then, if they pass this screening phrase, they will be sent to the Global Product Head for his decision and then to be sent to the Bank's Risk Committee (at Executive Board Committee Level) awaiting final approval.



4.4.2 Independent Risk Management and Control Function

Here in Hong Kong, the person responsible for risk control is not entirely independent because such person only reports to the treasurer instead of reporting directly to the local chief executive or to Head Office.

A lot of reliance has been placed on the Risk Management at Head Office to spot out any excesses or irregularities for two major reasons. One reason is that it is too costly as compared to the volume and profitability of activities conducted locally to justify the recruitment of a team of experienced personnel in Hong Kong to carry out detailed and sophisticated analysis of various market risks. Another reason is that the software required to compute all the market risks is too complex and expensive for installation in the local site.

At day end an extract of the local database is downloaded into a special file for immediate transmission to Head Office electronically. Head Office has access to the transaction data of the branch. It can carry out much in-depth study of mismatches and risk exposures by other softwares installed at Head Office. From time to time, instructions to demand for covering of certain open positions will be sent back to Hong Kong for action in case of limit excess.

4.4.3 Risk Management

Risk exposures arising from treasury activities can be measured daily on a consolidated basis for each type of the major risks (market risk, credit risk, liquidity risk, etc). The risk evaluation model is a self-developed one copied from the development center.

It has been properly tested and verified by external consultants and external auditors of the bank.

4.4.3.1 Description of Risk Management Systems

The computer system runs on a mainframe in an IBM environment. It is basically a back-office system which requires back-office staff to do the ticket input and then the system produces a lot of reports for control and accounting purposes. This is different from a front-end system in that dealers are responsible for deal input and control of open positions because they can check real time whether any key data on a ticket is input incorrectly leading to deviations from their own expectations.

The system uses a series of revaluation rates which are used for calculating the net present value and currency conversion. There are four types of time series used for revaluation : yield curves for each currency; forex rates; prices for specific products; specific floating rates such as HK Dollar Prime.

The system generates a zero coupon curve from these market rates and hence the discount factors required for the net present value and sensitivity calculations.

Formulae

C_i = Cash Flow at date i

df_i = Discount factor as mentioned above

t_i = Time between spot date from the yield curve point and date of cash flow C_i expressed in years (number of days / 365.25)

Net Present Value	NPV of $C_i = C_i * df_i$
Sensitivity	Sensitivity of $C_i = -t_i * C_i * df_i$
Convexity	Convexity of $C_i = t_i^2 * C_i * df_i$

Sensitivity is the main measure of interest rate risk used by the dealers, local management and Head Office. Sensitivity measures the change in profit/loss for a given change in interest rates.

For a 20 basis point movement, the change in net present value due to convexity is:

1/2 * 20/10000 * 20/10000 * Convexity

As one can see from the formula, the change in NPV is not a linear function of the variation of rates but to the square of the variation of rates.

For a Treasury bond or a Treasury note future, the sensitivity and the convexity are the sensitivity and the convexity of the cheapest to deliver bond or note. Cash flows are those of the cheapest to deliver.

There is a daily report on which the equivalent cash flow, net present value and sensitivity are shown. From this daily report it is possible to analyse the interest rate exposure according to

- Plain interest rate risk (P/L for a parallel shift in rates)
- Spread risk between different products (swaps vs bonds vs futures)
- Yield curve risk (P/L rotation in the yield curve)

An example is given below for illustrative purpose.

Revaluation +1 basis point:

Month	Govt.	Swaps	M.Mkt.	Govt.	Swaps	M.Mkt.	NET
1	0.0000	0.0000	8.2500	N/A	N/A	-77	-77
2	0.0000	0.0000	8.3750	N/A	N/A	0	0
3	7.5300	8.5625	8.5000	-1	-15	0	-16
6	7.8900	8.9375	8.8750	2	-14	14	3
9	0.0000	0.0000	9.0000	N/A	N/A	10	10
12	8.2800	9.1875	9.1250	72	-719	726	79
18	0.0000	0.0000	9.2750	N/A	N/A	229	229
24	8.6800	9.4300	9.4300	2.240	-2,433	0	-192
36	8.7800	9.5700	9.5700	471	-375	0	95
48	8.8600	9.6400	9.6400	-240	620	0	381
60	8.9400	9.7000	9.6400	9,474	-9,618	0	-144
84	9.1000	9.8600	9.6400	-850	679	0	-171
120	9.2200	9.9800	9.6400	-24,258	24,326	0	67
180	9.2200	9.9800	9.6400	0	0	0	0
240	9.2200	9.9800	9.6400	0	0	0	0
360	9.2200	9.9800	9.6400	0	0	0	0
Whole yield curve +1 bp				-13,084	12,446	902	263

In this example[10], a small portfolio of swaps are hedged with Treasuries and Future Rate Agreements. The three yield curves that were used to revalue the instruments are shown above: for Swaps, the yield curve runs from 8.5625% at 3 months to 9.98% at 120 months. The numbers in the column labelled Swaps, running from -15 to 24,326, give the dollar change in the market value (present value) of the portfolio if the corresponding point on the Swaps yield curve is increased by one basis point.

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[10] Risk Management Manual. Bank YY 1989. pp.66-7

For example, an increase in the swaps' 5-year yield from 9.70% to 9.71% will decrease the value by $9,618. Similarly, an increase in the Governments' 5-year yield from 8.94% to 8.95% will increase the value by $9,474. Thus, if both 5-year yields move by one basis point, the value of the portfolio will only change by $144. This is because the holding of 5-year Treasuries was adjusted so that it would have approximately equal and opposite sensitivity to the holding of 5-year swaps. The same is then applied at all points of the yield curve.

If all three yield curves move up by one basis point there will be a loss of $13,084 on the Treasuries, a gain of $12,446 on the swaps, and a gain of $902 on the FRAs, for a total gain of $263. If the overnight two standard deviation yield curve movement is 20 basis points, then the potential loss amount is 20 times $263 or $5,260.

It is this ability to position a portfolio to take advantage of the expected changes while minimising the effect of any other unexpected changes that makes using sensitivity such a powerful technique.

4.4.3.2 The branch is given limits for each type of risks involved in its treasury activities

Position limits are set in terms of nominal contracts value and also in terms of capital at risk i.e. the limit in terms of amount of capital reserve needed to be set aside to conform with legal requirements using a marked-to-market approach.

Type of Instruments	Standard of Limit
(i) Interest Rate Products	A. Average Daily Mismatch for the Month/Year B. Sensitivity Analysis of Int. Rate Risk
(* B involves computing the NPV and sensitivity of any cash-flow by interpolating the the zero-coupon rates)	
(ii) Foreign Exchange Products	Maximum amount of open positions for individual currency and for algebraic sum of all positions within same group
(iii) Futures	Maximum of arithmetic sum of the net positions of each maturity
(* In accordance with listed market rules, the open positions of the whole group is usually limited at 20% of the total market open positions.)	
(iv) Interest Rate Swaps	Maximum of the arithmetic sum of nominal amounts for all unmatched deals
(v) Options Related Products	Maximum sensitivity of the P&L for a given scenario of underlying price and volatility swing. There are also limits on time-decay expressed in maximum loss.

In the bank, the risk monitoring system for options takes into account of :

- Value of the underlying (i.e. spot foreign exchange, Nikkei cash index, cash price of a specific stock, etc.)

- Time (time to maturity of an option)

Sensitivity to movements in time (time decay) is usually expressed as the expected change in value for a one day movement in time

- volatility

- interest rates

The bank uses a "small matrix" and "large matrix" limits to allow the staff to monitor the overall convexity of the book (non linearity in P/L movement to changes in the above factors) within a standardised band of movements in the factors.

Small Matrix

1) + / - 1.5% change in spot price

2) + / - 6.0% change in volatility

(If the portfolio consists of transactions with various maturity buckets, spot price and volatility used is of those transactions with the nearest maturity date)

Large Matrix

1) + / - 6.0% change in spot price

2) + / -20.0% change in volatility

Abscissa: Spot	Central value : 20.6875K	Step: 310.3050
Ordinate: Vol.	Central value : 21.2000	Step: 1.2720

		20.3772K	20.6875K	20.9978K
19.9280	P&L	28,798,139	26,629,629	23,898,539
	Delta	-5.92	-7.93	-9.56
	Gamma	-1.47	-1.19	-1.00
	Theta	383783	367039	358293
	Vega	-1980950	-1609981	-1335054
	Rho	-725003	-738419	-749160
	R.P&L	4,489,759	2,321,249	-409,842
21.2000	R&L	25,951,138	24,308,381	21,979,122
	Delta	-4.00	-6.45	-8.44
	Gamma	-1.79	-1.46	-1.21
	Theta	443529	417778	400455
	Vega	-2501554	-2048212	-1692858
	Rho	-711358	-727383	-740271
	R.P&L	1,642,757	0	-2,329,259
22.4720	P&L	22,421,908	21,400,482	19,569,019
	Delta	-1.79	-4.67	-7.02
	Gamma	-2.09	-1.72	-1.44
	Theta	511462	477153	451357
	Vega	-3050974	-2529761	-2104224
	Rho	-695616	-714201	-729319
	R.P&L	-1,886,473	-2,907,898	-4,739,362

Abscissa: Spot	Central value : 20.6875K	Step:1241.2200
Ordinate: Vol.	Central value : 21.2000	Step: 4.2400

		19.4463K	20.6875K	21.9287K
16.9600	P&L	39,184,027	30,171,637	15,459,702
	Delta	-3.24	-9.92	-13.70
	Gamma	-1.90	-0.66	-0.68
	Theta	333935	284728	327432
	Vega	-2170267	-848188	-716126
	Rho	-706143	-754347	-779114
	R.P&L	14,875,646	5,863,257	-8,848,678
21.2000	P&L	24,794,110	24,308,381	11,966,895
	Delta	7.88	-6.45	-12.67
	Gamma	-3.45	-1.46	-0.80
	Theta	588901	417778	377485
	Vega	-4600138	-2048212	-1039398
	Rho	-635043	-727383	-766498
	R.P&L	485,730	0	-12,341,486
25.4400	P&L	608,027	12,111,926	5,745,731
	Delta	20.36	0.42	-9.52
	Gamma	-4.30	-2.29	-1.23
	Theta	902020	644841	505232
	Vega	-6739535	-3741807	-1984625
	Rho	-551901	-676920	-739750
	R.P&L	-23,700,354	-12,196,454	-18,562,649

Exposure for Small Matrix: Worst scenario, which is an exposure of Yen 4,739,362.

Exposure for Large Matrix: Worst scenario, which is an exposure of Yen23,700,354.

4.4.4 Operational Risk Management

The current computer system can produce daily reports (profitability, limit utilization and sensitivity reports). After the back office staff have checked these reports, they are sent to the treasurer for his signature to signify his concurrence before submission to the local chief executive and Head Office. The chief executive is not directly involved in the daily trading activities.

The competitive edge over some other banks in Hong Kong is that the computer system is highly integrated with various modules in the main system. Hence one computer system can handle different products so that the common problem faced by other banks in connection with interface with a number of external standalone sub-systems (due to constraint of the main-frame system) developed by different manufacturers does not happen here.

Exception reports are mainly produced by the system either daily or weekly except for some sophisticated ones which are not monitored locally, e.g. option volatility risks, yield curve risks, etc.

4.4.5 Legal Risk

Since one of the hottest topics nowadays is whether the counterparties to the transactions have the authority and any necessary approvals to enter into such transactions, there are standard procedures stating clearly the steps to be followed in dealing with all counterparties and the form of standard documentation required to be signed in order to safeguard the interests of the bank in case of disputes.

For the case of corporate clients, the chosen bank only deals with big corporations which are large enough to have expertise in derivative products. Some even have dealing rooms bigger than the one in the chosen bank. A list of these pre-authorised clients is sent to the traders in the dealing room to ensure that derivative transactions are only done with these clients.

For private banking clients, before any such derivative product is marketed to any of the clients, the background of these clients will be checked by the department head. So far only principal guaranteed products are sold (only the return of the investment will be affected in the worst scenario or in other words the investors will not incur capital loss). Regarding options, customers are only allowed to purchase call options and not allowed to write options to limit the risks. Periodical reports showing the latest market values are sent to the customers normally on a monthly basis informing them of the entire portfolio value.

One area which can be improved in the future is to provide customer with sensitivity analyses of the potential risks in treasury business. It was once suggested that corporate clients should be provided with the same marked-to-market results of their derivatives activities with the bank. However, due to the complexity of the products involved and given the fact that there are many different options available for big corporations to evaluate their contracts according to the purposes of these products in their global books, the bank does not apply the treatment offered to private clients to corporations.

4.4.6 Internal Control and Audit

In regard to the system support, the branch has got a number of documentation of the methodologies and models use to measure risk and to limit exposures of the treasury activities. The only problem is that the rationale behind the selection of such methodologies and models is not well spelled out in the documentation kept locally because they were not developed here.

Whenever a major update or change in existing approaches is required, there is heavy reliance on information provided by the development center outside Hong Kong. As it is also a major financial center, it has the advantage of being close to the place where most of the latest developments in treasury products emerge.

Normally these models and assumptions are subject to review once a year to keep in line with the contemporary market practice.

4.5 Problems in Implementing Sound Control System

4.5.1 Limited Human Resources

Due to the size of branch, only limited resources can be allocated to the non-profit making units. An independent treasury control unit is no exception although it can be argued that it can alert management in safeguarding the financial strength of the company and hence can act as a powerful weapon in the detection of substantial actual or potential loss. However, the reality is that a potential benefit can be quite hard to justify its costs before its seriousness is well recognised.

Due to shortage of manpower, certain reliance has to be placed on dealers' own discipline and integrity because it is almost impossible to check whether the system generated open positions and profitability are the same as those appeared on the dealers' blotters. (Dealers usually only disagree if the profits are under-estimated or not in their favor).

4.5.2 Powerful Risk Analytical Tools are too costly for an individual branch

This is why some analytical tools are installed only at Head Office. Local staff are only informed of any discrepancies or limit excess so found out. However this poses one risk that deals might be input incorrectly into the system leading to inaccurate analysis at Head Office. This can cause delay in taking remedial actions because amendment to reflect the true position can only be made only on the following day to update the risks managed at Head Office.

4.5.3 Management Philosophy Biased towards Profit Making

Marketing and business orientation strategy sometimes conflict with principles of sound internal control system.

It is easy for people to understand and appreciate the principles of a sound control system but when it comes to actual practice where profitability and business opportunities are of paramount importance, things are interpreted differently by even the senior management. Some deviations from the best practice are tolerated as long as the risks assessed by management are not exceptionally high.

But who really can make a fair assessment of the risks involved arising from such deviations? Usually this important aspect is heavily influenced by traders.

For example, incomplete documentation with the customer may be accepted and trading be allowed for the sake of business and good relationship. Proper legal protection was not taken seriously at the time of trading because the customer's financial position was still sound. Nobody really insists on the finalisation until the customer's situation has deteriorated but by that time it is already too late to take remedial action.

4.5.4 Necessary Skills in Control Department are in Short Supply

Even if the chosen bank finally decides to put relatively larger amount of resources into risk control, the supply of skilled personnel in the market is a barrier to achieving the intended goal.

Hong Kong is still at the early stage of trading in derivatives. Hence it has to import a lot of skills from abroad because locally there are not too many experts in this field.

One further headache is to retain good staff who are scarce commodities in the market. High turnover certainly will weaken the quality and effectiveness of this control function.

4.5.5 Time Lag in Coping with Fast Growing Market Development

The pace of development in the dealing room products far exceeds the ability of the company in streamlining the existing operation not to mention the need for adequate supervision and control and the additional requirement to plan for introduction of new products.

One must not think that one is living in a steady environment where one can freely adjust its speed of development so as to narrow the knowledge gap of the control staff and to improve the internal support deficiency. The actual fact is that the time lag is getting larger and larger as product innovation continues to advance ahead. A systems manager or a control head is already too happy if he or she can see that daily jobs are being done smoothly without committing serious mistakes. How to master the skills to cope with today's jobs is a more realistic goal for these staff than planning for tomorrow's problems.

4.6 Suggested Areas for Further Improvement

4.6.1 Change in Management's attitude and philosophy towards risk Management

The writers' opinion is that effective risk control must start at the top. Hard working staff equipped with the necessary skills can improve the situation. However, how can one expect this group of staff be motivated to discharge their duties if senior management allow traders to do whatever they like and tolerate traders to deviate from established guidelines day after day? Limit control and exception reporting become a routine job without any meaning if excesses are so frequent that nobody cares about respecting the pre-set limits.

It is hoped that the Barings' case can trigger management to give a serious thought towards the significance of risk management. System deficiencies and lack of skilled personnel are obvious barriers but improvements can only be made in the right direction if senior management sincerely want the control function to operate to protect the bank's interests even at the expense of earning less money.

4.6.2 Setting up of Independent Control and Reporting Channel

Currently the risk control unit is integrated in the dealing room management function. The treasurer acts as both the head of traders and the head of the risk control unit. He can influence the decision to take actions against certain irregular behaviour by interpreting the situation differently.

Hence, the risk control unit has to be made independent by reporting to the chief executive or to the Risk Department at Head Office directly.

4.6.3 More Rigorous Management Supervision

Market risks can increase remarkably within a short span of time if movements in rates or prices suddenly go beyond those levels normally envisaged.

Management must be prepared to react fast and adjust trading limits accordingly. Exceptions to guidelines must be handled in a strict manner to deter future occurrences. It does not mean that there is no flexibility but such authority can only be delegated to one or two designated senior staff who must exercise this discretion only under exceptional circumstances.

4.6.4 Upgrade the Status and Delegate more authority

Making the controlling unit independent is one way to show management's concern over the importance of its role. However, if the risk control head is too junior, too many decisions have to be made by senior management making this arrangement not practical.

Delegating more authority and giving the control staff higher status can be a more productive way. Certainly this change will not be welcome by all traders but one must strike a right balance between higher risks and reasonable profits.

4.6.5 Training and Development of Existing Staff

To better equip the control and the operational staff, organising relevant training courses for these staff either through internal secondment from Head Office or with the assistance of local external consultants is something that has to be done. Just having some people there doing superficial checking will not automatically guarantee the intended objectives.

4.6.6 Explore the Benefits of Netting Arrangements

So far little effort has been spent on exploring the benefits of netting arrangements between the bank and the counterparties. Proper use of these in a prudent manner (with great emphasis on legal enforceability) can greatly reduce risks and increase the volume of business at the same limits.

4.6.7 Modify the Bonus System for Traders

It has been suggested by many people that traders must not be tempted too much by generous bonus schemes otherwise they tend to gamble with the bank's money irresponsibly.

In fact, many banks have already deferred the payment of bonus to traders two to three months after the year end so that the performance during this pro-longed period is also taken into consideration in the computation of bonus. A new suggestion is to use an average figure for results achieved in two consecutive years rather than one to promote the adoption of a more longer term strategy among the traders. One must not forget that a

bank is not supposed to use depositors' moneys to facilitate gambling in the financial markets.

4.6.8 Follow the Market Trend towards more Disclosure to Clients

The bank should instruct the marketing officers to explain the potential risks in the financial products to be offered to the customers. Then the front-line staff must not forget to inform the customers of the profits / losses of the customers' existing portfolios especially if these customers are not big or sophisticated enough to monitor the risks themselves.

Every time the customers must be asked to sign documents that they are aware of the risks involved and to sign on dealing tickets to evidence their authorisation of the dealings with the bank. All these help reduce the bank' exposures and protect the bank's reputation against possible law suits.

4.6.9 Installation of Value-at-risk Evaluation Model for Complex Products

Although it has been confirmed by the external auditors that a discounted cash flow approach with information on sensitivity and convexity is sufficient for the present range of products, the bank should envisage the installation of a powerful value-at-risk model in line with the market practice should there be a change in business policy in the near future when either the volume of trade increases or when the bank is diversifying into other derivatives products. Simulation approach can give the management much more opportunities to assess the impact of various market movements on the bank's financial position.

Normally there is a time lag for the physical installation and time lag for the training of staff to use the machine / software, early planning is important to ensure risks can be measured when they arise.

Chapter 5

MEASUREMENT OF PERFORMANCE OF TREASURY ACTIVITIES IN A DEALING ROOM

In this chapter, some of the general principles about measurement of performance of treasury activities are described. Besides the theoretical aspect, practical examples are included to illustrate how these theories are put into practice by some international banks. This chapter also lists out points which are relevant to performance measurement from a practical perspective e.g. possibility of trading results being exaggerated by the dealers.

It is quite common to think of profitability in terms of gross revenue generated or net accounting profits after deduction of associated operational costs in the generation of revenues. Each year profit targets are set and the amount of performance bonus of the highly paid traders is closely linked to these targets. Hence, there is no doubt that the evaluation methodology plays an important role in assessing the profitability of these businesses.

However, the above common ways of judging performance / profitability of a group of products / traders suffer from many defects. Some of them are described briefly here. Firstly inadequate attention is paid to the various degree of risks attached to different types of businesses / financial products. The possible impact on the company arising from changes in strategy has not been taken into full consideration. Secondly gross revenues or net profits (after deduction of operational costs) can be a misleading yardstick if certain important cost components are omitted such as the necessary funding costs in supporting the trades. One simple example is that one cannot just count the gross interest income of a

loan without considering the interest expense that one has to give away on the borrowing side. Thirdly, one has to check carefully the methodology in the evaluation of profits. Sometimes traders employ profit computation methods different from those approved to be used in the accounting system. Their reported profits need to be carefully examined and reconciled to those obtained from other internal systems before accepting them as an indicator of performance. Fourthly, management must pay attention to the set of benchmark rates used by the traders to do the revaluation. As explained in more detail below, the choice of benchmark rates can lead to misleading results as to the actual capability of the traders in earning profits for the company.

5.1 Principles for Performance Measurement

To have a better understanding and assessment of the performance of dealing room activities, the following principles for evaluation of profits are suggested below.

The basic principle of performance measurement of treasury decisions is that it should be based upon measurement of opportunity gains and losses together with consideration of the risks involved.

It is obvious that the degree of complexity involved in the case of an international bank is much higher than what was described above.

The followings sum up some of the common principles employed in this important exercise[11] .

(i) Market Value Measurement Approach

As far as possible, market prices should be used. If a particular transaction has no observable market price, a price has to be imputed from a similar transaction where a market price is available.

Please refer to (iii) The Benchmark described below for an example of using Futures revaluation prices as input rates into an revaluation model to get the imputed prices for revaluing FRAs positions and vice versa.

(ii) Opportunity Gains and Losses

Economic gain made by the treasury decision is the extra income relative to that earned by an alternative. This concept of opportunity gains and losses must be applied so as to truly reflect the performance of the traders. For example, one must not count all interests earned as opportunity gains but only the portion of interests earned above the normal level (further elaboration of the normal level is given in the section of "Benchmark").

11 Stern, Joel M. and Donald H. Chew. New Developments in International Finance. Basil Blackwell Ltd, 1988 pp.147-161.

(iii) The Benchmark

The reason for choosing a benchmark is that we can only evaluate a transaction if we know the opportunity cost and that opportunity cost implies an alternative transaction. In the search for the appropriate benchmark, one has to take into account of the following criteria :

a. Does the benchmark represent a policy that could actually have been followed?

b. Could the benchmark be specified at the beginning of the performance period?

c. Does the benchmark provide a lower-cost strategy than some of the alternative transactions?

Take the case of the manager of the liquid balances, his goal is to earn the highest rate of return possible but under the constraint that the minimum legal liquidity requirement must be met. The three dimensions of the cash management decisions are : rate of return, risks and liquidity.

One possible benchmark can be the policy of holding all the balances in very short term deposits or short term government papers. This will be the strategy with the lowest risk and the highest liquidity since the markets for these securities are the most heavily traded. If the manager knew precisely the future inflows and outflows to the liquidity pool, he could pursue a policy of matching precisely the maturity of the instruments held with the cash requirements of the organisation. The benchmark strategy would then consist of holding government securities with maturities matching the maturity profile of the cash requirements. The performance measure would then be the return on the actual policy relative to the rate of return on the benchmark.

For certain products, sometimes it is necessary to use the average of two prices quoted in any two of Reuters pages to reduce the danger of getting biased rates. A procedure was written by one Swiss bank to demand all relevant parties within the bank to comply with the procedures because benchmark rates are so important in the whole revaluation process. A copy of this procedure is attached in the appendix for reference purpose.

Take the example of Futures revaluation rates, one bank stipulates that official settlement price has to be used wherever possible. Last price should be used if last price is within market bid and offer. If there is no last price or the last price falls outside the market bid and offer range, the mid price should be used. If there is only one-sided quote, dealer has to provide rate and then an independent party has to sign off. Finally, if there is no last price and no market bid / offer price for a particular month, last settlement rate will be used for daily revaluation. Then the corresponding Futures contract rates will be used by an approved revaluation model to mark to market outstanding FRAs positions. For Hong Kong dollar futures, since there is no active HKD interest rate futures market, equivalent Futures rate derived from interbank FRA rates will be input into a revaluation model to mark to market outstanding FRA positions.

(iv) Risk Assessment

Each treasury transaction involves a change in the risk to be borne by the organisation. It is not difficult to explain why high income is not always better than a moderate level of profits if higher income can only be earned by assuming enormous amount of risk outside the tolerance limit of the investor.

Hence, the gains must be weighted against these risks before any meaningful comparison of the results of two different strategies can be properly made.

For example, the purchase of lower-graded papers can increase your yield as compared to the first class securities because higher risk instruments usually attract investors by offering higher rates. The change in risk arising from such action must be reflected clearly otherwise any interpretation of the gross result can be misleading.

The most common sources of risk for treasury transactions are the fluctuations of exchange rates and interest rates.

5.2 Other Important Aspects of Performance Measurement From a Practical Perspective

(A) Separate Pools for Hedging and Trading Deals

Broadly speaking, computation of profit and loss of a transaction can be either computed on accruals or marked-to-market basis depending on the underlying purpose. The performance results can be drastically different if deals are classified incorrectly intentionally or by mistake.

For example, when an open position is closed and some profits are realised from the difference between the price of an original deal and that of the closing deal, such profits are taken up-front if the deals are for trading but they will only be recognised in the profit and loss account over the remaining life of the deals if the deals are for hedging. What a big difference it can make!

Assuming that the deals are for hedging

profits = HK$ 4 million

period for amortisation = 2 years

the profits declared by this dealer for the first year can only be HK$ 2 million instead of the full amount.

Of course, the same theory applies when losses are made.

Hence, there should be two pools : one for hedging and the other for trading. Each is subject to different evaluation methodologies.

Once a deal is classified as hedging or trading, it should remain in that pool until and unless there is a good reason for a change to be made. Such action has to be well supported by detailed reasons and approval must first be obtained from a senior supervisor. This tight control can eliminate to a great extent the chance of "over-hedging" which sometimes is used by traders as a means to hide losses (Details are described in Section 5.4 below).

(B) Net Present Value

While a number of systems available in the market can compute marked-to-market results, not all of them generate net present values[12] of the trading results.

Clearly a million dollars profit to be realised one year later means a different thing as compared with the same amount of money which you can realise today.

A lot of arguments can be avoided if net present values are used so that all P/Ls are compared on the same basis ie at today's value.

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12 The net present value of a transaction is arrived at by discounting all its cash flows at a given discount rate.
It is equal to the total of each of its cash-flow multiplied by the discount factor. The net present value of a profit centre is the sum of the opening balance (cash with discount factor = 1) and of the net present values of all the transactions.
NPV of C_i = C_i * DF_i
where C_i = Cash Flow at date i
DF_i = Discount Factor

(C) P/L per Trading Desk (Profit Centre Accounting Approach)

In the past, management placed a lot of emphasis on P/Ls by product and regarded these product P&Ls as indicators of performance per group of dealers because at that time each dealer or group of dealers only specialised in one or a few product types.

Now it is a general trend that a trader has to deal with a wide range of financial instruments (to take advantage of all possible differences in prices / rates across similar products) to achieve his profit target. However, since different instruments / products require different funding / capital requirement, just by measuring the gross profits per product can be very misleading and can distort the whole picture.

For example, for the same dealer or dealers within the same group:

Gains in futures transactions = HK$ 10 million

Losses in treasury notes = HK$ 14 million

(In fact, a loss of HK$ 4 million was made from these transactions.)

Management must not jump into the conclusion that more futures transactions should be done simply because of the "good" profits generated from this financial instrument.

Another important factor is the funding cost. A dealer who purchases a number of bonds can enjoy interest incomes (and possibly some capital gains should the value of the bonds go up as well). But he first has to borrow money from the funding desk to buy such bonds. Ignorance of the associated funding costs can be very misleading in comparing the profitability of different traders across the board.

Therefore it is important to treat each trader (or collectively each team of traders - known as profit centre) as one unit. All incomes / costs elements involved such as interest

incomes or funding costs have to be included besides the gross profits coming from revaluation of the products.

Funding costs in the purchase of bonds are just one example. Exchange gains / losses arising from the outstanding uncovered gains / losses in foreign currencies should also form part of the overall result because ultimately all these bits add up to the bank's entire result. But dealers sometimes forget to include the foreign exchange rate impact on these foreign currency incomes / expenses because many only count their day trade results.

(D) Inter-departmental Deals

Occasionally internal deals among different profit centres are concluded to avoid additional costs to be incurred for doing a deal with an outsider (such as brokerage costs). Such deal at the time of conclusion must be priced at the prevailing market rate to fairly allocate the subsequent P&L arising from rate fluctuations to all profit centres concerned. Such internal transactions must be subject to constant review by an independent party to detect any irregularities.

It is stated clearly by the external auditors that except for timing differences where one side of an internal deal is computed on accruals basis (because this transactions is used to hedge an open position in the hedging pool) while the other side is revalued on mark to market methodology (because this transaction forms part of the trading pool), the internal deals should not generate any P/L. Care must be taken to check whether any P/L arises from internal deals. If yes, the reasons have to be traced thoroughly.

(E) P/L per Trader

An even better control over performance evaluation can be exercised if the system can provide a separate P&L per trader so that

- each trader's system generated performance can be checked against the trader's declared result. This makes the reconciliation work much simpler.
- the trading strategy of each trader may be different and hence the most appropriate benchmark rates can be applied to suit the individual needs.

5.3 Dealers' General Attitude towards Performance Targets

Simply because dealers' bonuses and salaries are so closely linked to their profit contribution that there is no doubt that they will try their best to achieve the performance targets in every possible way. With the exception of a limited number of highly self-disciplined traders, traders in general tend to over-exaggerate their gains and hide their losses. Proper systems in terms of internal controls and revaluation of portfolios must be in place to evaluate their trading results and to reflect all the relevant risks before one can feel confident about the results of the treasury activities reflected in the financial books.

5.4 Possibilities of Over-exaggeration of Trading Results / Hiding of Losses

(i) Dealers only reported the outstanding positions without estimating the cost of carry eg. to run their outstanding positions by paying borrowing costs in the days or months to come before liquidation of such positions (eg. up to the maturity date).

One typical example is where a forward foreign exchange swap dealer has a maturity mismatch position e.g. spot buy YEN against USD and forward sell YEN against USD. The open foreign exchange position is very small because both the USD and YEN positions are almost squared leaving small differences which include the interest elements. But considering the fact that the bank has to finance USD all the way until the forward transaction delivery date at a higher interest rate than that which can be earned from placing YEN on the market (an interest differential of a few percentage points), this cost of carry is not something which can be disregarded.

(ii) When the existing market trend clearly is not in traders' favour, they switch their deals from trading portfolios to hedging pools so that losses are not required to be recognised immediately in the profit and loss account. Instead, in the hedging pools, any losses can be amortised over relatively longer periods because accrual concept is employed for this pool.

(iii) Profits of long term deals are taken up-front entirely

without considering for the subsequent costs.

This is different from (i) above in that the cost of carry may not be significant but the existence of these deals block the chance of entering into future profitable deals as a certain part of the limit has been used up. There is a possible opportunity loss. Secondly because such deals attract additional capital reserve requirement and may

require some servicing costs in the form of manpower in advising the parties concerned periodically. Exclusion of these costs will lead to erosion of profits in future years' results.

One of the banks under survey reported to set aside each year 0.50 to 0.75 basis point on the nominal principal amount of each of its long term contracts e.g. interest rate swaps, long term foreign exchange forward deals, etc. to account for the future costs.

(iv) In the less liquid markets, use of biased evaluation prices in favour of the traders can be concealed by traders as there is little information about the "correct" market prices for these deals.

5.5 Actions to be Taken by Banks to Reduce the above Risks

Regarding (i) and (iii) mentioned in (5.4), it is important to set clear guidelines on the computation of profits to reduce the chance of any manipulation of figures or non-disclosure of hidden costs.

Regarding (ii) above, there must be adequate reasons for switching deals from the trading pool to the hedging one. Prior approval from a relevant department head is normally required. Usually the open positions of each pool are subject to detailed investigation by an independent team to detect any errors or hiding of gains/losses. Over-hedging is normally a signal for such irregular behaviour.

As mentioned earlier, market prices should be used as far as possible. If due to reason of thin trading and / or abnormal terms, there is no observable market price, there are two approaches to tackle the difficulty.

One is to try to obtain prices from brokers active in that type of trade. Information from more than one source is preferable because then you can compare the data obtained and raise questions on the assumptions made in deriving the data. The most suitable set of prices can then be selected for revaluation purposes.

A second way is to develop / purchase an evaluation software for that particular type of product. In the market, there are a number of softwares / hardwares available such as "Devon" for option pricing, "FRA Trader" or "SWAPBOOK" for Forward Rate Agreements, etc.

You can assign different parameters so that the computed price from your set of assumptions fits into your particular requirement.

It is common for a bank to install two identical systems in both the dealing room for the traders to use and another one in the settlement area for the back-office staff to do a counter-check of the accuracy and integrity of the same set of transactions.

Chapter 6

THE CASE OF AN INTERNATIONAL BANK IN HONG KONG

In this chapter, the methodologies used in performance measurement of treasury activities of the chosen bank are described. There are certain factors which make the overall revaluation process less satisfactory than that originally expected. These factors are analysed and areas which can be further improved are also suggested. Before going into details, the situation before implementation of the current system is shown below because this has some influence on the management at the time they selected the present system.

6.1 Situation before Implementation of New Computer System

A few years ago, the bank began expansion of its dealing room activities. More traders were recruited (some had very good experience gained in world class international banks). They were equipped with knowledge of sophisticated products and possessed practical experience in contemporary market trading strategies.

The major obstacle facing the traders came from the deficiencies of the computer system in terms of functionalities in handling so many products and in terms of capacity in processing so many transactions a day.

The latter problem was solved through the acquisition of a number of hardwares and some softwares to increase the speed and upgrade the storage of the system.

The former problem, however, was much more difficult to solve because of severe constraint on the original system design which was already quite out-dated by the prevailing standard.

Most of the profits and losses of different types of products / transactions were computed on the basis of accruals concept although a lot of them in fact were definitely trading in nature.

Marking-to-market of these products / instruments could hardly be implemented without a major re-designing of the whole system at high costs. On top of this, there was no guarantee of satisfactory system performance in terms of response time after the change. Dealers reported their own profit figures based on their own record and methodologies. Since there were so many alternatives available, huge discrepancies were found between the two sets of P/L figures (one coming out of the system and the other manually prepared by the dealers) leading to endless discussions.

At last a decision was made to purchase a standalone system to handle trading deals. It was made in the hope of serving as a transitional arrangement before a much more powerful mainframe system could be installed.

New problems arose since the deals had to be input twice : once in the old system for ledger keeping purpose and a second time in the standalone system for the revaluation of P/Ls which had to be re-input into the old system to reflect the marked-to-market performance.

Discrepancies were detected from time to time due to input error and inadequate resources were to be allocated to the maintenance of two systems at peak periods.

Having spent hours on fixing the problem, it was finally discovered that dealers used an approach in revaluing their open positions different from the one used by the standalone system in producing its marked-to-market results (Swap points were used by dealers whereas the standalone system employed outright forward prices).

The consequence was that still there were differences in the P&L figures generated by the system and those declared by the dealers except that the size of the difference involved was relatively smaller. No one could really tell which set of figures were fair and management had to tolerate such phenomenon.

The above illustrated the importance of an appropriate system which normally embodies the 4 general principles described earlier in Chapter 5, i.e.

- market value measurement approach
- opportunity gains and losses
- benchmark
- risk management

6.2 Current Situation

Lessons learnt from the old system prompted the management to select a new system more carefully because the decision could have long term impact on the bank's future year's of performance.

The new system covers important aspects as described below:

(A) Separate Pools for Hedging and Trading Deals

There are two pools : one for hedging and the other for trading. Each is subject to different revaluation methodologies.

Once a deal is classified as hedging or trading, it would remain in that pool until and unless there is a good reason for a change to be made. Such action has to be approved by either the treasurer or his deputy.

Periodically, the staff responsible for controlling of maturity mismatches will receive a report showing the mismatches by maturity bucket per profit centre for them to detect any large mismatches in the hedging profit centres which normally should not run significant mismatch positions. This tight control can eliminate to a great extent the chance of "over-hedging".

The P/L of a transaction can now be reflected fairly according to the real purposes as far as system functionalities are concerned.

(B) Net Present Value for New Deals and Outstanding Deals

The existing system can produce net present values of all the cash-flows in the system on a daily basis with separate totals for new deals and outstanding deals done previously.

Dealers, settlement or accounting staff can trace back to the NPVs of the cash-flows of outstanding deals on any two consecutive dates to find out the reasons for any sudden fluctuation in the P&Ls for the latter day.

For new deals, they can see the results from separate P/L totals to enable them to identify the source of any P/L discrepancies.

(C) DAILY P/L per Profit Centre

On a daily basis, the system produces a detailed list of the P&L components of each profit centre showing the activities for the day for the staff concerned to check. Discrepancies down to the product level per profit centre can be detected easily.

For example, take the case of the profit centre of "Interest Rate Derivatives", the P/Ls per product (and then by currency) are shown for easy reconciliation :

a.	Results on Money Market Products	-4,000,000
b.	Results on Financial Futures	100,000
c.	Results on Interest Rate Swaps	3,500,000
d.	Results on Foreign Exchange	-4,400,000
e.	Results on Currency Swaps	7,000,000
f.	Results on Securities	3,000,000
g.	Results on FRA	500,000
h.	Results on Cash	-2,000,000
i.	Brokerage Fees	-500,000

The above analysis serves a number of purposes:

- The result of each product can be checked, even down to contributions by currency (e.g. most of the loss for the results on Money Market $-4,000,000 came from HK Dollar), the dealer can be able to track whether his expected result does show up in the daily system report or not.
- The overall profits generated as a result of trading activities across a number of products are captured under one profit centre to allow management to assess the trading performance of one or a group of dealers majoring in this group of products.

  Gains on one product may not produce an overall positive result because the loss on another product may exceed the gains on the first product. Hence, profitability by product may not always give the management a complete picture.
- Both external and internal funding costs are included under the Results on Money Market.
- Results on Cash can give an idea about the profits already realised.

(D) Capital Reserve Requirement for Each Product within Each Profit Centre

The system is able to produce a report showing the legally required capital reserve requirement of each transaction within a profit centre by product type so that the profits generated from that product can be weighted against the costs of additional capital needed to support the relevant transactions. This gives management a better tool to measure the performance of the trading team against the level of risks of their portfolios.

Another purpose is to enable the chief dealer concerned to watch closely the capital consumption because this is also one of the constraints placed on dealers in meeting the profit targets.

For example, for an interest rate swap, the credit equivalent risk of this instrument has to be computed first according to a set of internationally accepted rules (as described below). Then the appropriate counterparty risk weighting is applied to this credit equivalent amount according to the nature of the counterparty (e.g. a bank has a lower weighting than a corporate because of perceived lower risk). From this final product, the amount of capital reserve requirement is arrived at.

An extract of the formula for the computation of credit equivalents for an interest rate swap is given below on the assumption that mark to market methodology is employed :

		Weight of Credit Equivalent
a.	< 1 year	positive mark to market figure
b.	> 1 year	positive mark to market figure + 0.5% of the nominal amount

A 18 months interest rate swap with a corporate shows a positive mark to market of 20 on a nominal value of 10,000. The risk is:

(20 + 0.5% * 10,000) * 50% = 35

where 50% is the counterparty risk weighting for a corporate.

(E) Flexibility in Accepting Different Methods for Revaluation of Open Positions

There are flexibilities in the system to accept the following two types of revaluation rates :

- direct input of market closing prices obtained from Reuters or other sources without further computation
- rates computed on the basis of a proven revaluation model

Hence, depending on the special features of the products and the availability of appropriate market rates, the system can do the revaluation in a flexible manner.

(F) Adequate Tools for Analysis of Risk / Rates Movement

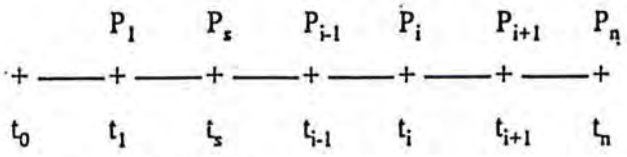
Sufficiently detailed analysis of the exposures already committed are produced daily for management to assess the risk.

Sensitivity reports showing the likely impact of price change on the P&L are produced and compared to the pre-set limits to check whether current earnings are earned within tolerable limits or not. Other risk limits like maturity mismatch, etc are also checked to see whether good profits are only made at the expense of putting the bank at substantial risk.

There is also a report showing the change in net present value for every increase in 20 basis point movement. Such report is very helpful in tracking the reasons for any big fluctuation in the system P&L figures. From this report an estimate of the impact of any movement in rates can be computed relatively easier.

The methodology used in splitting the cash flows on the points of the yield curve and computation of the sensitivity is described below.

Each yield curve is a time series made of various points:P1, P2, ..., Ps(SPOT), ... , Pi, Pn.The purpose of this section is to split each cash flow on the two nearest Pi points:



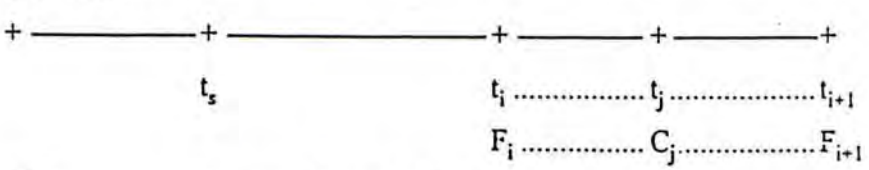
t_0 = system date = 0
t_s = time between t_0 and spot date expressed in year
t_i = time between t_i and spot date expressed in year

If cash flow C occurs between computation date and spot date, then it will be translated to spot date using the following formula:

df = discount factor for date of cash flow
C = amount of original cash flow
Fs = amount of cash flow that will appear on spot date
$F_s = C \cdot df$

Therefore there are no more cash flows prior to spot date.

If cash flow Cj occurs after the spot date, each cash flow will be split in two cash flows occuring on the two yield curve points that are just before and after the cash flow C date.



df_i = discount factor for date i
df_j = discount factor for date j
F_i = cash flow for date i derived from Cj
F_{i+1} = cash flow for date i+1 derived from Cj
t_i, t_{i+1},t_j are expressed in years (number of days from spot date / 365.25)

F_i and F_{i+1} are determined as follows:

$$F_i \cdot df_i + F_{i+1} \cdot df_{i+1} = C_j \cdot df_j$$

$$- t_i \cdot F_i \cdot df_i - t_{i+1} \cdot F_{i+1} \cdot df_{i+1} = - t_j \cdot C_j \cdot df_j$$

Computation of the NPV and sensitivity

All cash flows have now been converted in x cash flows, x being the number of points in the yield curve from spot date (included) to maturity date (included).

$F_1,....F_i,.....F_n$: cash flows for each yield curve point

$df_1,...df_i,...df_n$: discount factor for date of yield curve point

$t_1,....t_i,....t_n$: time expressed in years between spot date and yield curve point date. (t1 = spot date = 0).

Net present value for ith bucket = $F_i \cdot df_i$

Sensitivity for ith bucket = $- t_i \cdot F_i \cdot df_i$

Variation of the net present value

Computation of the variation of the net present value for 20 basis points of movement in the rates.

Variation of NPV = 0.002 . sensitivity

$= - 0.002 \cdot t_i \cdot F_i \cdot df_i$

(G) Integrated System

P/Ls are all computed in one complex integrated system so that analysis can be done at different perspectives eg. by product, by profit centre, etc. All risk exposures of each customer can be clearly consolidated and reflected at any moment easily.

6.3 Reasons for Inability to Measure the Performance of Treasury

Some Dealing Room Products are Quite Complex to understand and to Revalue properly in the system

Generally traders use different combinations of financial products to take advantage of price discrepancies across different products / market places and to speculate on the market developments in exchange rates and interest rates. Since certain groups of transactions within the same product are inter-related to another product, this can give rise to the following phenomenon :

- gains in one product do not imply good performance in that product and vice versa because of reasons stated above
- the choice of revaluation rates must be carefully examined because as mentioned earlier, the benchmark rates must be consistent with the actual strategy pursued.

  Revaluation methodology for trading deals is different from that to be used for hedging pools.

  Depending on the purpose of a particular product in the portfolio, the most appropriate benchmark revaluation rate must be selected otherwise the trader will not know how the system generated P&L is arrived at. For example, for revaluation of foreign exchange forward transactions, at least two sets of revaluation rates are used to reflect the difference in purpose and trading strategy of the foreign exchange traders and the traders dealing in derivatives products. In Reuters there are so many similar sets of revaluation rates for each product that a wrong choice may be made unknowingly if the nature and purpose of that product is not clearly described by the traders.

So it is not difficult to imagine how hard it is to ensure that the whole process can be error free.

No Guarantee that Data and Revaluation Methodologies used by traders to compute their performance are correct

Since there is no front-line system to help dealers in managing their positions and P&Ls, we have to rely on manual computation by dealers according to data kept in their blotters. Since the reliability of the P&L figures generated by the mainframe depends very much on the accuracy of data input by settlement staff, reasons for any discrepancies between the two sources cannot be determined without enormous efforts being put into the investigation process.

Lack of Guidelines from Head Office

There are insufficient guidelines from Head Office in defining clearly the need for full disclosure of hidden costs in long term contracts and the formula in calculating the amount to be amortised and charged to the current year's profit and loss accounts. For long term contracts, a reservation of even 0.50 basis point per year on the nominal principal for future matching of related costs can substantially affect the profitability of these contracts.

Lack of Experienced Staff to check the revaluation rates for relatively illiquid products such as long term swaps / bonds

This is an area which requires closer attention. Formal guidelines are important in setting out clearly the source of information acceptable to the bank. Checking of these rates must be carried out by independent staff from independent sources e.g. from another broker

not involved in the transaction or from other banks, to avoid hiding of losses for a long period of time (possibly until sometime near to the maturities of these contracts).

Do Not Possess the knowledge to quantify risks

For sophisticated products, sometimes it is difficult to find an objective approach to adjust for the risks before comparing the performance of products on a fair basis

In some cases it is relatively easier (though a bit subjective) to discount for the higher risks e.g. use a higher discount rate for the incomes earned from lower graded commercial papers. But things become a lot more arbitrary when derivatives or even a combination of derivatives are used.

6.4 Suggested Areas for Further Improvements

As already mentioned in (4.3) - Suggested Areas for Further Improvements in connection with evaluation and control of risks, training and development of staff concerned through sending them to external theoretical courses and through internal familiarisation with the system functionalities are very helpful in improving the current situation. Apart from these, the following points are suggested :

Seek External Consultant's Advice

Many international audit firms also provide consultancy services. Their practical knowledge obtained through extensive auditing and provision of consultancy services to a wide variety of clients in the LOCAL banking industry is very valuable. How to adjust for differences in risks in the performance evaluation process across different groups of dealing room products should be one of the subject matters for discussion with these consultants if such information is not available elsewhere.

But to save costs, the scope of their requested service must be defined in a precise manner after having carried out an internal study among departments to spot out critical areas and major weaknesses.

Special Treasury Support Team

Launching of new products must be well planned and co-ordinated. Too short of a notice for the introduction of new products usually leads to confusion and inefficient co-operation among departments involved.

Sometimes it is not always possible for traders to talk to many people to explain the products and specify their needs. One or two qualified staff have to be permanently assigned to act as the bridge between the front traders and the systems and settlement staff in the back office.

Guidelines and Documentation from Head Office for special features of certain products

The limited facilities possessed by an individual branch in Hong Kong render it impossible to do research in every product allowed to be traded locally. Clear guidelines written at Head Office for implementation world-wide alleviate the burden of individual branch to repeat the same expensive process. These should cover the choice of revaluation methodologies, appropriateness of revaluation rates under different situations, type of costs to be recognised in the P&L account for long term contracts, etc. Local minor adaptation may be necessary in certain occasions but that can be sorted out by external consultants at limited costs if expertise is not available in-house.

Installation of a Separate Front-line System for Dealers

Many big international banks have already installed front-line system for dealers to input deals directly into such system so that open positions and P&Ls can be obtained on real-time basis. Information captured by this system is then transferred to the back office system for the settlement staff to check and confirm. Discrepancies about key information such as amount, rates, value dates, etc can be detected on the same day and dealers have to amend errors accordingly. After this real-time checking and correction exercise performed

by both parties, the batch run results usually attract less unfavourable comments from the dealers.

Analysis of Potential Gains/ Losses arising from Marking to Market Loans and Deposits

(on the accounting side, P&L based on the accrual method)

Although there is no accounting requirement for marking to market these loans and deposits, it is preferable for management to get an idea of the potential gains/ losses of these transactions based on prevailing market rates.

If there are large uncovered maturities mismatches among loans and deposits, the risks can be substantial in case interest rates move up or down sharply. Since all the interest incomes / expenses are computed on accrual basis, the effect of the change in rates will only be gradual. However, it has a long term significance. the sooner the potential gains / losses are known, the earlier actions can be taken to rectify the situation. This is an area sometimes being overlooked by management in measuring the performance of treasury activities.

Chapter 7

PRACTICES OF OTHER FOREIGN BANKS IN HONG KONG

In this chapter, information collected from other sources regarding the practices of some foreign banks in Hong Kong is presented. It is said that the local derivatives business in Hong Kong are mainly handled by 53 institutions and the active players are mainly foreign banks.

Not to the surprise of the writer, it is said that the quality and expertise knowledge of the control personnel still require to be upgraded.

From the information gathered from our own designed questionnaires and interviews with the respondents, sophisticated risk assessment simulation models are not usually installed in the foreign branches in Hong Kong. Only three out of five banks being surveyed indicated that their basis of trading limits set to contain market risk covers gap limits and limits in terms of earnings or capital at risk while the others use relatively simple criteria such as nominal contract value. Some respondents complained that they encountered difficulty in reconciling performance figures of treasury activities to those supplied by the dealers.

7.1 General Situation

Having described different approaches adopted by the chosen bank regarding evaluation and control of risks and performance measurement, it is worth mentioning some of the findings about the derivatives activities of other banks in Hong Kong.

Mr. David Carse, the Deputy Chief Executive (banking) of the Hong Kong Monetary Authority, remarked that the policies and procedures on risk management of derivatives products adopted by less than one half of the authorised institutions had not yet been approved by the board of directors of these institutions[13]. Moreover, on the whole, there was still some room for improvement as far as the quality of risk management is concerned.

It is found that around 90% of the local derivatives business in Hong Kong is handled by 53 authorised institutions which have been approved for dealing in derivatives. Out of this number, 25 institutions (mainly foreign ones) are quite active players.

As per latest findings, there is a large proportion of companies having a system of prudent risk management guidelines but there are also exceptions.

Moreover, it is found that the quality and expertise knowledge of the personnel responsible for internal risk control still require to be further upgraded.

Furthermore, some companies still use rather simple approach in setting limits for derivatives activities. For example, in measuring the value of derivatives contracts, only the nominal amounts are used instead of market risk adjusted figures.

[13] Hong Kong Economic Journal, March 25, 1995.

7.2 Current Practices of Some Active Players

We try to collect more information about the current practices of active players in the market by sending questionnaires and attending interviews with the respondents to get a thorough understanding of the situation.

However, in the process of data collection, some difficulty was encountered. Because the Hong Kong Monetary Authority conducted a similar survey by the end of 1994, information about the internal risk management of a bank becomes very sensitive. Questionnaires[14] cannot be simply sent to any banks otherwise very poor response can be expected. Due to this special reason, we can only manage to obtain consent from the internal auditor / internal control manager / operations manager / accountant of five foreign banks[15] in Hong Kong (including the chosen bank) to supply the relevant information.

Questionnaires have been sent to senior staff occupying positions such as internal auditor or control manager or accounting manager of five other foreign banks (including the chosen bank) in Hong Kong to understand their practices towards control of risks and performance measurement. Interviews have also been held to dig out more information regarding their reply to the questionnaires.

Some of the findings of this survey are described below with the purpose of giving a broader view of the relevant practices followed by foreign banks in Hong Kong.

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[14] Form of the questionnaire is attached in Appendix 1.

[15] Some brief background of these banks are given in the Appendix 2.

7.2.1 Overall View on Dealing Room Activities of these Banks

Dealing room activities are considered by staff of these banks to be important or very important as compared to other activities of the organisation. Common features include high to very high growth rate of development (20 - 50% or more than 50% growth on average basis) of their dealing room activities during the past two years and great emphasis of these activities on trading.

7.2.2 Policies and Procedures on Risk Management

From the replies, all five have written policies and procedures on risk management and they are approved by the board of directors or designated senior management.

7.2.3 Independent Risk Management Unit

Four out of five banks have independent unit for risk management and they all report to local management not directly responsible for trading rather than reporting directly to the Board of Directors.

7.2.4 Risk Management

Regarding the functionalities of their computer systems, only two of them can consolidate the various types of risks (market risks, credit risks and liquidity risks) arising from their dealing room activities. Conducting stress analysis locally is not a practice.

Nevertheless, their trading portfolios are marked to market on daily basis and risk evaluation models (either self-developed or market standard model), if employed, are used to measure the market risks.

Consistent with the preliminary findings of the HKMA, market risk position limits are mostly set in terms of nominal contract value rather than on market risk adjusted basis. These limits are monitored daily and there are established procedures for detection and reporting to local or Head Office senior management. These reports on risk exposures and performance are sent out regularly. However, one deficiency is that only three out of five have documentation of the methodologies, models and assumptions used to measure risk. A lot of reliance has been placed on the system to come up with accurate figures for monitoring purposes.

7.2.5 Dealings in Derivatives with Customers

All five reported to have policies to ensure that the customers have the authority to enter into derivatives transactions and that their obligations are enforceable. Four banks have steps to ensure that these customers understand the nature and risks of these transactions.

7.2.6 Involvement of Internal Auditors

Quite consistently, internal auditors do not audit and review the effectiveness of the company's risk management system on a regular basis.

7.2.7 Performance Measurement

Four banks are reported to have policy to include associated funding costs of a financial instrument in the computation of the overall profitability of that product. For trading deals with longer maturity dates, brokers' rates or rates supplied by other branches / Head Office are used for revaluation purposes.

According to the reply from the accounting and internal control staff, they all feel that their companies encounter big difficulty (in terms of size of discrepancy) in reconciling the profit figures of the dealing room activities generated by the computer system against those provided by the dealers.

Chapter 8

CONCLUSION

Before the Hong Kong Monetary Authority (HKMA) has announced the results of its survey on the extent of management supervision and the adequacy of internal control systems of a number of banks in Hong Kong, it is hard to say whether the risks control systems of other banks are better or worse than that of the chosen bank.

Since the degree of involvement in treasury business varies substantially from one bank to the other, one single set of rules for all banks is not practical. Taking the case of the chosen bank as an example, because the scope of treasury activities is limited, it does not make much difference whether the branch in Hong Kong uses very sophisticated simulation models for evaluation and control of risks. However, for international players active in a diversified range of products including newly invented derivatives products, a much tighter control is then critical.

According to the limited information released by the HKMA, mainly foreign banks are active in local derivatives business. Besides, less than half of the authorised institutions in Hong Kong do not have their risk management guidelines approved by the board and only relatively simple control technique is employed by a number of banks. Although the recent survey conducted by the HKMA has not been fully completed, the authority already hinted that there are rooms for further improvement in the derivatives business.

From what we can see in the recent failure of Barings and the details of the case study as described in the preceding chapters, we feel that senior management should pay adequate attention to the areas mentioned below.

The results of the study on the two aspects of the treasury activities in a dealing room of one international bank in Hong Kong and the case of Barings highlight the importance of integration of people, system and the organisation.

Deficiencies in the functionalities of the system certainly limit the ability of the organisation to evaluate and control risks and can lead to misinterpretation about the performance of the treasury activities.

However, one area which is usually not given enough emphasis is the importance of the role played by the people in the organisation. Starting from the moment of recruitment of new staff, a company must have clear ideas about the quality of staff that it needs to carry out the required functions. Offering of continuous training opportunities and development of staff's potential to keep them up-dated on the current issues are equally important in ensuring that they can discharge their duties properly as far as evaluation and control of risks, and the measurement of performance of treasury activities are concerned. Staff should be able to independently assess the appropriateness of the revaluation rates and the effectiveness of the models to measure performance and to evaluate risks. Any exceptions and deviations from established practices should be reported to a senior line manager not involved in trading.

Regarding the computer system, one must not over-exaggerate its power and view it as a highly intelligent machine which can understand the real nature of all transactions input and handle the tasks without any human decision.

In reality, the more flexible the system is designed to be, the greater is the demand on the user for the selection of the most appropriate alternative depending on the peculiarities of the transaction. The real power of the system is that it can cope with a wide

range of requirements but it does not mean that you can dispense with people. "Garbage in, garbage out" is true for any computer system.

Turning to the internal policies of the company and the management's attitudes towards treasury activities, segregation of duties are clearly critical because this is fundamental in guaranteeing the proper functioning of basic controls. But it is an issue which is far more difficult to resolve than many people can imagine. In a branch with limited resources, one cannot expect that a high level of segregation of duties actually takes place because of the simple fact that there are not enough people to be allocated to so many tasks. In the face of intense competition from so many professional institutions, placing a lot of constraints on the trading team means a loss of money making opportunities and recruitment of staff to a level slightly higher than the absolute minimum means less cost effectiveness in running the business. Sometimes when there is severe staff turnover, the employer does not have any better alternative but to sacrifice some internal controls in the hope that the situation will turn better soon. Possibly during this period, unexpected events lead to huge losses and quite naturally these control loopholes will be exploited. Therefore, one must not judge the riskiness of a system on the assumption that the operation is normal and smooth but to examine whether there is any contingent plan for abnormal situation and how well this plan can be implemented.

Finally it is the management's attitude towards risk taking that makes a world of difference. If the management play down the role of the independent control unit for the sake of giving a free hand to the traders, the intended function of a control unit is hampered severely. Here, we are talking about the real attitudes rather than the organisation set-up because the effectiveness of the whole set-up dèpends very much on the way senior management interpret exceptions and warning signals. Continuous ignorance of all these

signals can undermine any well planned risk monitoring system. All these are quite clearly demonstrated in the recent collapse of Barings.

Too heavy reliance on self-discipline can be dangerous especially when high risk business is involved. Without adequate pressure coming from the regulators, not every bank in the treasury business will go ahead in implementing controls which require substantial initial investments. It is the job of the HKMA to set minimum standard for the participants and to be flexible enough in demanding more sophisticated systems from active players according to the level of risks and the capability of the parties concerned.

Having all the rules and regulations in place does not automatically eliminate any chance of failures if nobody ever enforces these regulations on a continuing basis. More disclosure requirements on the activities and amount of open positions carried by the banks together with information about the trading strategy adopted should enhance the understanding of the regulators towards the financial status of the banks under their supervision. But more importantly is that the regulators must be prepared to take a proactive approach. Waiting for information to be supplied on a regular interval cannot be regarded as a sound practice by any standard when the market situation changes drastically over a very short span of time. Communication must be initiated by the regulators and demand for more details be followed up should the interest rates, currency exchange rates, stock prices or any other important financial indicators suddenly rise sharply or experience a free-fall. To be effective, remedial actions must be taken at the right time.

Banks in Hong Kong have not developed into the stage as achieved by other western countries in the area of treasury activities. Human resources equipped with the necessary expertise and experience are in short supply. Not too many banks in Hong Kong employ sophisticated models for risk control and performance measurement purposes.

Moreover, staff turnover rate is high. All these have a negative impact on the total efforts put into improving the current situation.

However, the outlook is not completely pessimistic. The recent Barings' case should give a good lesson to all institutions dealing in financial instruments. The actions to be taken by the regulators locally certainly will invoke management to take a much more conservative approach. It is hoped that actions can be taken at this moment to set a good foundation for the future healthy growth of treasury activities in Hong Kong.

Appendix 1 : Summary of Response on Questionnaire

SUMMARY OF RESPONSES ON QUESTIONNAIRE (ON DEALING ROOM RISK MANAGEMENT AND PERFORMANCE EVALUATION APPROACH)

(Total Number of Banks Responded : 5)

(1) As compared to other activities of your company in Hong Kong, how would you judge the degree of involvement of dealing room activities of your company in terms of human resources and expected profitability?

-	very important	[2 banks]
-	important	[3 banks]
-	fairly important	[ ]
-	not important	[ ]

(2) How would you judge the average pace of development of your company (Hong Kong only) in dealing room activities in the past 2 years in terms of number of dealers and other supporting staff?

-	very high growth (>50% yearly)	[2 banks]
-	high growth (20 to 50%)	[3 banks]
-	no / medium growth (0 to 19%)	[ ]
-	declining	[ ]

(3) Please indicate in Hong Kong whether your company's dealing room activities are concentrated on trading or hedging.

-	trading	[4 banks]
-	hedging	[*]

* for 1 bank, trading and hedging portion is almost the same

(4) Does your company have written policies and procedures on risk management of its dealing room activities for use by your operation in Hong Kong?

-	Yes	[5 banks]
-	No	[ ]

If yes, please state if these policies are approved by the board of directors or designated senior management

- Yes [5 banks]
- No [ ]

(5) Has your company established locally an independent risk management unit / department for monitoring risks involved in the activities mentioned in point (4) above?

- Yes [4 banks]
- No [1 bank]

If yes, please state to whom such unit / department reports

- directly to the Board of Directors [ ]
- local management not directly responsible for trading [4 banks]
- senior management at Head Office not directly responsible for trading [ ]

(6) Can your local system consolidate the various types of risks (market risk, credit risk, liquidity risk) arising from your dealing room activities?

- Yes [2 banks]
- No [3 banks]

(7) How frequently are trading portfolios marked to market?

- Daily [5 banks]
- Weekly [ ]
- Monthly [ ]
- Less than once a month [ ]

(8) Does your company in Hong Kong use any risk evaluation model to measure the market risks of your dealing room products?

- Yes [4 banks]
- No [1 bank]

If yes, please indicate the source of the model used

- Self-developed packages [1 bank]
- Standard models from the market [ ]
- A combination of both [3 banks]

(9) Does your company in Hong Kong conduct stress analysis to assess the unusual adverse changes in prices or volatilities on the exposures of your dealing room activities?

- Yes [ ]
- No [5 banks]

(10) Does your company set limits for each major type of risk involved in the dealing room activities in Hong Kong?

- Yes [5 banks]
- No [ ]

(11) Does your company in Hong Kong have established procedures for detection and reporting to local or Head Office senior management of any excesses over pre-set limits?

- Yes [5 banks]
- No [ ]

(12) What is the basis of the limits set to compute market risk?

- Position limits in terms of nominal contract value [5 banks]
- Position limits in terms of earnings or capital at risk [only 2]
- Loss limits [4 banks]
- Gap limits [4 banks]
- Others (please specify) [ ]

* the respondent can take more than 1 choice.

(13) How frequently is compliance with market risk limits monitored?

- Daily [4 banks]
- Weekly [1 bank]
- Monthly [ ]
- Less than once a month [ ]

(14) How frequently is compliance with credit risk limits monitored?

- Daily [3 banks]
- Weekly [1 bank]
- Monthly [ ]
- Less than once a month [ ]

(15) Does your company have policies to ensure that its counterparties have the authority to enter into derivatives transactions and that the counterparties' obligations are enforceable?

- Yes [5 banks]
- No [ ]

(16) Does your company have policies and procedures to ensure that each of its customers understands the nature and risks of derivatives transactions entered into with your company?

- Yes [4 banks]
- No [ ]

* 1 bank did not respond to this question.

(17) Does your company send sensitivity analyses of the potential risks in derivatives transactions to your customers?

- Yes [1 bank]
- No [4 banks]

* But one bank provides tools to customers to compute sensitivity.

(18) Does your local management or senior management at Head office receive regular reports on risk exposures and performance of its dealing room activities?

- Yes [5 banks]
- No [ ]

If yes, please state the frequency

- Daily [4 banks]
- Weekly [1 bank]
- Monthly [ ]
- Less than once a month [ ]

(19) Does your company have documentation of the methodologies, models and assumptions used to measure risk and to limit exposures of its dealing room activities?

- Yes [3 banks]
- No [2 banks]

(20) How frequently do your internal auditors in Hong Kong audit and assess the effectiveness of the company's risk management and controlling procedures on dealing room products?

- Daily [ ]
- Weekly [ ]
- Monthly [1 bank]
- Less than once a month [2 banks]

* 2 banks did not respond to this question.

(21) Besides the use of market rates as quoted on Reuters, Telerates or other well known media, does your company use any evaluation models to compute the performance of your dealers?

- Yes [2 banks]
- No [3 banks]

If yes, please indicate the source of the model used

- Self-developed packages [2 banks]
- Standard models from the market [ ]
- A combination of both [ ]

(22) In your organisation in Hong Kong, is there any independent person who verifies or approves any transfer of deals from a trading portfolio to a hedging pool?

- Yes [3 banks]
- No [2 banks]

(23) For trading deals with maturity dates going beyond 2 years, please indicate the source of market rates for marking these deals to market.

- From other brokers [3 banks]
- From other branches / Head Office of your bank [2 banks]
- From in-house evaluation model [ ]
- From other source _____

* only 3 banks responded to this question. Out of these 3, 2 also obtained rates from other branches / Head Office.

(24) Does your company have any policy which requires the inclusion of the associated funding costs of a financial instrument in the computation of the overall profitability of that product?

(For example, this may apply to the case of holding certain securities such as bonds.)

- Yes [4 banks]
- No [ ]

* 1 bank did not respond to this question.

(25) In your opinion, does your company encounter big difficulty (in terms of size of discrepancy) in reconciling the profit figures of the dealing room activities generated by the computer system against those provided by your dealers?

- Yes [2 banks]
- No [3 banks]

If yes, in your opinion, is there any need for your company to allocate more resources to address this issue?

- Yes [2 banks]
- No [ ]

END OF THE QUESTIONNAIRE

Thank you very much for your kind co-operation in filling this form.

You are kindly requested to put down your name and some more details about yourself and your company at the space provided below. You may just state your surname if you so desire.

Name of Respondent :

Initial of Respondent :

Your Position : Internal Control Officer /
Dealing Room Support Officer /
Internal Auditor / Accountant /
Others : _____

Country of Incorporation of your company : _____

Appendix 2 : Brief Background Information

Two are American banks quite active in derivatives business. Of these two banks, one is majoring in brokerage business. The other two are Swiss banks one of which is much more aggressive than the other as far as treasury business is concerned. The more active Swiss bank is the market maker in a number of financial instruments.

At least three out of these four banks are rapidly expanding their treasury business in Hong Kong. Including other subsidiaries located in Hong Kong, each of these banks employs a few hundred staff.

As far as risk evaluation and control are concerned, middle level managers should be quite familiar with the situation because they are the ones who carry out the daily monitoring activities. Some of the respondents are internal control manager / internal auditor who have practical experience in the relevant field.

Appendix 3 : Procedure Manual on Benchmark Rates

Revaluation Rates for Futures and FRAs

1. Purpose

The purpose of this notes is to define the procedures on how to determine the revaluation rates for Futures and FRAs in order to avoid any inconsistency in the process of mark-to-market.

2. Sources of Revaluation Rates

A separate paper will define the sources of revaluation rates for various Futures contracts. Any exception to the predetermined sources of rates must be concurred by TMOF.

3. Procedures to determine Futures revaluation rates

3.1 Priority:

1. Use official settlement price where possible
2. Use last price if last price is within market bid and offer
3. Use mid-price if there is no last price OR last price outside the market bid and offer range
4. If no bid or no offer (one-sided quote), Dealer provide rate and TMOF sign off.
5. If there is no last price and no market bid/offer price for a particular contract month, last settlement rate will be used for daily revaluation. But for month-end revaluation, the revaluation rate should be provided by Dealer and concurred by TMOF.

3.2 Any exception to the procedures stipulated in section 3.1 should be concurred by TMOF.

4. Revaluation Rates for FRAs other than HKD-denominated

4.1 The corresponding Futures contract rates will be used to mark-to-market outstanding FRAs positions.

4.2 The Futures rates for evaluating FRA positions should be the same as the rates used to mark-to market Futures positions.

4.3 Short-term Money Market Rates

The source for money market rate to the first Futures contract will be the same as that adopted by HIBAS which is defined in a separate paper. At month-end, rates captured at 5:00 p.m. by

HIBAS will be provided by TMOF for dealer to input into FRA trader. For daily revaluation, money market of the designated sources at 4:30 p.m. should be used.

5. Revaluation Rates for HKD FRAs

5.1 Since there is no active HKD interest rate futures market, equivalent Futures rates derived from interbank FRA rates will be input into FRA trader to mark-to-market outstanding FRA positions.

5.2 The corresponding average mid rates quoted on TFHK and 4826 will be used to derive equivalent Futures prices using a linear interpolation method.

5.3 The derived HKD Futures prices will be provided by Dealer daily and be concurred by TMOF at each month-end.

5.4 Telerate page 9898 will be used as the source of short-term HKD money market rates.

5.5 Any exception to the above procedures should be concurred by TMOF.

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TYPE	CCY		SOURCE		
			REUTERS	BLOOMBER	TELERATE
FX SPOT	AED		RIC	-	-
	ATS		RIC	-	-
	AUD		RIC	-	-
	BEF		RIC	-	-
	CAD		RIC	-	-
	CHF		RIC	-	-
	CNY	(Updated once a month)	SAEC	-	-
	DEM		RIC	-	-
	DKK		RIC	-	-
	ESP		RIC	-	-
	FIM		RIC	-	-
	FRF		RIC	-	-
	GBP		RIC	-	-
	HKD		RIC	-	-
	IDR		RIC	-	-
	IEP		RIC	-	-
	INR	(Updated once a month)	IOSM	-	-
	ITL		RIC	-	-
	JPY		RIC	-	-
	KRW	(Updated once a month)	WONA	-	-
	KWD		RIC	-	-
	LKR	(Updated once a month)	HSBS	-	-
	MYR		RIC	-	-
	NLG		RIC	-	-
	NOK		RIC	-	-
	NZD		RIC	-	-
	PHP	(Updated once a month)	PNBM	-	-
	SAR		RIC	-	-
	SEK		RIC	-	-
	SGD		RIC	-	-
	THB	(Updated once a month)	BOAT	-	-
	TWD	(Updated once a month)	TPFI	-	-
	XEU		RIC	-	-
	ZAR		RIC	-	-

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TYPE	CCY		SOURCE		
			REUTERS	BLOOMBER	TELERATE
FX FWD	AED		FWEX	-	-
	ATS		FWEE	-	-
	AUD		FWEM	-	-
	BEF		FWDY	-	-
	CAD		FWEC	-	-
	CHF		FWDV	-	-
	DEM		FWDT	-	-
	DKK		FWEF	-	-
	ESP		FWEK	-	-
	FIM		FWEG	-	-
	FRF		FWDZ	-	-
	GBP		FWDW	-	-
	HKD		FWEN	-	-
	IDR		PREE	-	-
FX FWD	ITL		FWEA	-	-
	JPY		FWDU	-	-
	KWD		FWET	-	-
	MYR		FWER	-	-
	NLG		FWEB	-	-
	NOK		FWEH	-	-
	NZD		FWEP	-	-
	SAR		FWES	-	-
	SEK		FWEI	-	-
	SGD		FWEO	-	-
	THB	(Updated once a month)	PREE	-	-
	XEU		FWEQ	-	-
	ZAR		FWED	-	-

10 January 1995 Revaluation Rates ATTACHMENT I

TYPE	CCY		SOURCE		
			REUTERS	BLOOMBER	TELERATE
FX OPTION Volatility	USD/DEM		MGOQ, BLRA	-	-
	USD/CHF		GFIN	-	-
	USD/JPY		BLRA	-	35363
	GBP/USD		MGOQ	-	-
	DEM/JPY		MGOR, BLRA	-	-
	AUD/USD		MGOQ, BLRA	-	-
MM	AED		FWEX	-	-
	ATS		FWEE	-	-
	AUD		FWEM	-	-
	BEF		FWDY	-	-
	CAD		FWEC	-	-
	CHF		FWDV	-	-
	DEM		FWDT	-	-
	DKK		FWEF	-	-
	ESP		FWEK	-	-
	FIM		FWEG	-	-
	FRF		FWDZ	-	-
	GBP		FWDW	-	-
	HKD	(FOR OSTS, SAME AS HKD IRS)	HSBB	-	9898/9899
	HKD		FWEN	-	-
	IDR		INJA	-	-
	ITL		FWEA	-	-
	JPY		FWDU	-	-
	KWD		FWET	-	-
	MYR		FWER	-	-
	NLG		FWEB	-	-
	NOK		FWEH	-	-
	NZD		FWEP	-	-
	SAR		FWES	-	-
	SEK		FWEI	-	-
	SGD		FWEO	-	-
	USD	(FOR OSTS)	DEPO	-	-
	USD		RIC	-	-
	XEU		FWEQ	-	-
	ZAR		FWED	-	-

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GLOSSARY

AAA
The highest investment grade assigned by the rating agency Standard and Poor's corporation.

Arbitrage
Buying or selling an asset in one market and simultaneously entering into an opposite transaction in another market with the expectation of profiting from price anomalies.

Basis
The difference between the cash price of a financial instrument and its related futures contract. In the case of government bonds, the basis is often referred to as the clean price of the bond less the sum of the futures price and the bond specific conversion factor.

Basis Point

0.01% or 1/100th of 1%. Used to express minimum yield quotations for interest sensitive securities. Also used to express minimum price quotations in certain markets, e.g. Eurobonds and certain government bond and futures markets, often termed pip.

Bid
The amount that a purchaser is prepared to pay for a security / financial instrument. In the case of swaps it generally represents the fixed rate that a counterparty is prepared to pay in exchange for receipts based on a specified floating rate index, e.g. Libor. See also "Offer".

Call option
A call option affords the holder the right to buy a specified amount of the asset upon which it is written at a price agreed at time of purchase. Depending on the option type the holder can exercise this option either on the option maturity date only (a European option) ar at any time prior to expiration (an American option).

Close out
The taking of an offsetting position in a financial contract.

Convexity
Convexity measures the degree of curvature of the price yield relationship of duration. It is a measure of the sensitivity of the duration of a fixed series of cash flows to reasonably large yield changes.

Cost of carry
The net cost of financing a position in a financial instrument. This is given by the interest received from holding a long position in the security less the cost of funds borrowed to purchase the assets.

Currency option
The right to buy (in the case of a call) or sell (in the case of a put) a specified amount of one currency against another (usually US dollars) at a specified price during a given contract period.

Currency swaps
The payment of a series of cash-flows denominated in one currency in exchange for a series denominated in another currency. Both parties agree to make an exchange of principal sums at maturity at an exchange rate agreed at time of transactions. This eliminates exchange rate risk. Initial exchange of principal sums is common but not necessary.

Default
Failure to perform contractual obligation, written or verbal.

Delivery
The tender and receipt of an eligible financial instrument or cash in settlement of a futures contract or option contract.

Derivative instrument
Any financial instrument that has its genesis in another financial instrument without which it could not exist.

Discount Factor
Derived from the discount rate. That percentage amount being less than 100% which when multiplied by a future sum will reveal the present value of that future sum.

Discount rate
1. The rate of interest which is used to find the present value of a future sum of money by discounting back.
2. The official central bank rate for discounting eligible bills of the financial system.

Expiration Date
The maturity date for option products. The last day that an option holder can exercise his option.

Foward Rate Agreement (FRA)
A contract whereby two counterparties agree to exchange single period short-term interest-rate payments over a future predetermined period of time. Principal amounts are agreed upon at time of transaction but never exchanged and settlement is always in cash.

Futures contract
A contract of standardised terms to buy or sell a specified quantity of a certain financial instrument of commodity at a certain price on a given future date.

Hedging
The taking of an offsetting position in a different financial instrument of different maturity of the same instrument to that being hedged.

Implied volatility
Measurement of the volatility of assets by analysing the volatility of options written on those assets.

Interest-rate futures contract
A financial futures contract that trades off a fixed income debt security of deposit.

Interest-rate option
An option written on an interest-rate sensitive financial instrument of index.

Interest-rate swap
An agreement between two counterparties to swap interest-rate exposures, e.g. from floating to fixed or vice versa. No principal sums change hands, instead interest is paid on notional principal sums.

Long
To be long in the context of financial instruments is to own such instruments. If a trader is long bonds he own bonds.

Mark to market
The process of revaluing physical securities and/or derivatives according to their current market values. Marking to market usually takes place at the end of each business day.

Market risk
The risk that movements in market values (e.g. interest rates) will affect the value of an open or hedged position.

Mismatch risk
In the case of swaps, the risk that arisies from entering into a swap where the cash-flow frequencies on both sides of the swap do not exactly mathc, e.g. annual versus semi-annual payments. Such risks might include hedging risks, reinvestment risks and credit risks.

Netting
As concerns swap transactions or other financial instruments :

1. the netting of two-way interest payments which are due on the same day.
2. the legal authority to net together for accounting purposes the value of each swap held with any one counterparty.

Opportunity cost
A way of determining cost in terms of the value of alternatives that are foregone in achieving a certain objective.

Option
See call option and put option.

Parallel shift
An equal movement in yields for all maturities within a certain section of a yield curve.

Put option
A put option affords the holder the right to sell a specified amount of the asset upon which it is written at a price agreed at time of purchase. Depending on the option type the holder can exercise this option either on the option maturity date only (a European option) ar at any time prior to expiration (an American option).

Short
To sell an asset that is not owned by the seller with the view of purchasing it at a lower price some time in the future.

Standard deviation
A statistical measure of the dispersion of a given set of values from the mean. It can be regarded as a measure of the tightness of the probability distribution of possible outcomes. It is calcualted by summing the squared difference of each observed value from the mean of the distribution and then divided by the number of observations.

Swap
A financial transaction in which two counterparties agree to exchange streams of payments over time.

Time decay
The erosion of time value as an option approaches its expiration date.

Underlying
The physical financial instrument upon which financial derivatives are traded.

Variance
Standard deviation squared.

Yield curve
A graphical representation of the term structure of interest rates.

Yield to maturity
The redemption yielded on a bond at a given price if held to maturity.

Zero coupon bond
A non interest paying bond issued at a deep discount to par. The bond provides the investor with a predetermined yield to maturity if held to its redemption date.

(Source : Feeney, Fracnis D. A Guide to International Financial Derivatives. Woodhead - Faulkner (Publishers) Limited. 1991 pp. 205 - 237)