Section III

FOREIGN EXCHANGE RISK

Contents

INTRODUCTION

By the nature of its operations, the Bank must inevitably deal in the currencies of its customers' operations. Such exposure has made it necessary for the Bangladesh Bank to require all scheduled banks to put in place the risk management processes and procedures, so as to mitigate if not totally avoid losses due to market forces which it cannot control or to laxity in internal control procedures. Furthermore, it is recognized that there is a fine line between hedging a foreign exchange position and speculative behavior and, therefore all actions taken in the trading room or outside should be closely monitored.

This section of the Risk Management Reference Manual contains the policies and procedures that will assist the Bank in ensuring foreign exchange risks in trading and associated support activities do not translate into material financial losses.

1. Mission Statement & Objectives

Mission Statement

The provision of foreign exchange for customers' legitimate needs, as well as maintaining foreign exchange accounts for the purposes of marginal security and settlement, are integral to the Bank's operations. The Bank shall provide its customers with efficient, competitive foreign exchange services, without exposing itself to market and operational risks; it shall not engage in speculative transactions, and will only hedge its positions as needed and within approved prudential limits. It shall undertake its operations with a trained corps of officers and staff, who shall conduct themselves with the highest degree of prudence and professionalism.

Operational & Performance Objectives

- *Compliance with Foreign Exchange Regulations*

  The ability of the Bank to provide foreign exchange services is dependent on maintaining its license from the Bangladesh Bank. Accordingly, it must comply with all statutory obligations to ensure it has unimpeded access to and use of its foreign exchange resources for the benefit of its customers. This will require knowledge of all laws and regulations, as well as faithful compliance with all reporting requirements.

- *Liquidity*

  The Bank shall maintain sufficient levels of foreign currency reserves to comply with statutory open-position limits/operational needs. It shall estimate its liquidity requirements on a periodic basis for this purpose.

- *Transactions*

  The sale and exchange of foreign exchange, and the settlement of foreign currency obligations, shall be undertaken within authorized counterparty and dealing limits. All transactions shall be faithfully recorded for accounting, monitoring and audit purposes. Off-premises transactions shall, as a preventive measure, not be allowed under any circumstances. Traders shall perform their functions ethically and professionally in accordance with a code of behavior.

- *Monitoring*

  The Bank shall maintain a data base containing up-to-date information on foreign exchange rates to track and statistically analyze their movements over time for risk modeling purposes.

- *Reconciliation*

  Reconciliation of accounts shall be undertaken diligently, and with due consideration for the need to provide timely information concerning the Bank's exposed positions and outstanding balances in all its accounts both locally and abroad.

2. Foreign Exchange-based Operations

2.1 Risk Associated with Foreign Exchange Operations

The key risk areas are broadly categorized as follows:

2.1.1 Credit Risk

This is defined as the failure of an obligor or counter-party to perform as agreed in accordance with exchange/settlement arrangements on a stipulated/value date.

2.1.2 Liquidity Risk

It is defined as the inability to meet obligations in any currency when due, owing to either lack of funds by either of the contracting parties or to systemic problems in markets that make it difficult to purchase the amounts needed for settlement. Accordingly, there is a close relationship between liquidity and credit risks.

2.1.3 Market Risk

It is defined as the potentially adverse change in the current economic value of a position (i.e., its market value) due to changes in the associated underlying market risk factors.

Market Risk terminology

a) *Market Factor*

It is defined as a VaRiable (i.e., a market price or rate, such as spot FX rate or an interest rate) that can impact the economic valuation of a contractual position. It is a part of the market risk management activity to identity relevant market factors and to take them into consideration in the establishment of the independent market risk limit frameworks.

b) *Factor Sensitivity*

It is defined as the change in the value of a position for a defined change in a market risk factor (e.g., the change in the value of a spot foreign exchange position for a 1% change in the spot FX rate).

c) *Volatility & Correlation*

This refers to factors that are used to statistically calculate the relationship (correlation) between market VaRiables/parameters and the range of movements (volatility) by which one VaRiable influences another. This is used in portfolio risk measurements, such as value-at-risk (VaR).

d) *Value-at-Risk (VaR)*

VaR is a statistical tool that is used to estimate the potential decline in the value of a position or a portfolio, under normal market conditions, within a defined confidence level, and over a specific time period. (Refer to Appendix 7).

2.1.1 Operational Risk

This broadly refers to:

a) the risk of losses arising from the failure (or inadequacy) of internal controls and procedures, or of information systems; and

b) the risk, and adverse consequences, of non-compliance with anti-money laundering statutes and policies.

2.2 Treasury Activities

Today's financial institutions engage in several activities, ranging from the basic services (e.g., import, export and remittance) to more complex operations (e.g., derivatives and complex structured products). The latter require a high degree of expertise that is difficult to achieve in the transaction- origination departments and, as such, are housed in a separate department i.e., Treasury.

Treasury activities can normally be categorized into four areas:

2.2.1 Money Market

This refers to the day-to-day activities where the Bank addresses its short-term cash requirements, by either lending/investing its excess liquidity or borrowing to cover liquidity short-falls.

2.2.2 Fixed Income

This refers to a sub-set of the investment universe where instruments with fixed pricing are the traded commodities.

2.2.3 Foreign Exchange

This refers to the buying and selling of funds denominated in VaRious currencies, where the Bank may dispose of its excess stock or purchase its operational requirements (e.g., to settle L/C transactions).

2.2.4 Asset-Liability Management

This refers to the Treasury functions that are associated with the execution of ALM strategies (described in Volume 2 Section II of the Risk Management Reference Manual).

2.3 Products

Some of the typical products that would fall under treasury's functions are listed as follows:

- Spot foreign exchange
- Forward foreign exchange
- Currency swap
- Interest rate swap
- Forward rate agreement
- Non-deliverable forward exchange
- FX options
- Overnight deposits
- Term deposits
- Coupon securities
- Discounted securities

2.4 Remittance Activities

A major source of the Bank's foreign exchange is the inward remittances from overseas by migrant workers, non-resident nationals, etc., as well as export proceeds. It is therefore the Bank's duty to handle these funds with care and efficiency in order to: to protect its reputation as a reliable remittance channel; ensure that money-laundering is prevented; and maintain liquidity.

2.5 Treasury Functions

Following is a list of some of the functions that a Treasury Department performs:

- **Statutory management**
- **Limits monitoring & management**
- **Adherence to internal as well as regulatory policies**
- **Minimization of risk exposures**
- Optimization of risk returns through specialization
- **Monitoring & management of various foreign exchange and money market positions**
- **Monitoring & management of various cash flows and cash positions**
- Funding of the balance sheet at optimum prices
- Propose interest rate matrix to the Alcom
- Propose various investment options to the Alcom
- Analyze various economic trends and propose balance sheet strategy to the Alcom
- Quote various foreign exchange rates to customers
- **Deal in foreign exchange for position covering** as well as for own account trading
- Various funding activities through currency swaps
- **Closely liaise with regulators**
- Provide structured treasury solutions to customers
- Remain vigilant for any arbitrage opportunities
- Undertake marketing activities for future business growth
- **Propose or renew VaRious internal limits**
- Estimate daily P&L and work with reporting unit in resolving any differences
- **Record all foreign exchange and money market positions and check for differences with system-generated/back-office reports**

(Note: At the time this manual was prepared, Agrani Bank was performing only those above-listed activities in bold lettering which are related to asset-liability management.)

3. Principal Guidelines

The success of the Bank’s foreign exchange business, and particularly its trading operations, depends on the ability to manage effectively the various risks encountered in the trading environment. The organization's policies and processes require development over time to ensure that the activities of this business are undertaken with a high degree of control.

3.1 <u>Dealing Limit</u>

The limit which is allocated to a dealer for sale/purchase of foreign currency on a particular day by the authority is termed as dealing limit. A specific dealing limit is allocated to a dealer as per approval of Bank's Board of Director, depending on his official capacity, which may be reviewed or change in accordance with circumstances.

The Bank’s dealing room is allocated with specific dealing limit of USD 1.75 million. Details are as follows:

Overall Dealing Room Limit for Total Open positions at any point of time	**US$ 1.750 million**
Total Overnight Limit for Dealing Room	**US$ 875,000.00**

Head of Treasury AGM Chief Dealer	Overall Position Limit Single Deal Limit Overnight Limit * Overall Stop Loss Limit Trigger Level (Defined as: Notifying dealing room supervisor if position hit a loss at this level, the MD-CEO will nominate an overall supervisor of dealing room)	US$ 1.00 MM US$ 500,000 US$ 500,000 US$ 2,500 US$ 1,500
Principal Officer	Overall Position Limit Single Deal Overnight Limit * Overall Stop Loss Limit Trigger Level (Defined as: Notifying dealing room supervisor if position hits a loss at this level, the MD-CEO will nominate an overall supervisor of dealing room)	US$ 500,000 US$ 250,000 US$ 250,000 US$ 1,500 US$ 1,000
Senior Officer	Overall Position Limit Single Deal Overnight Limit * Overall Stop Loss Limit Trigger Level (Defined as: Notifying dealing room supervisor if position hit a loss at this level, the MD-CEO will nominate an overall supervisor of dealing room)	US$ 250,000 US$ 125,000 US$ 125,000 US$ 1,250 US$ 1,000

* N.B: For the time being, overnight limits are held in abeyance until further notice.

The following are additional guidelines with regard to the front-office dealing room operations.

3.1.1 The overall dealing room limits should be monitored by the back office, and the dealing room supervisor should be notified immediately upon any breach of the limits by the back office-in-charge.

3.1.2 A reporting format may be prepared to report overall daily trading activities, which is to be submitted to the FX dealing room supervisor at the end of each day including: positions taken and squared, profit/losses and outstanding open positions.

3.1.3 The dealing room supervisor will have the discretion to allow trading during holidays and any off-site dealing activities.

3.1.4 All transactions should be conducted through the dealing room by using the dealing room phones.

3.1.5 A Voice recorder for the dealing room and telephone lines should be in place.

3.1.6 The mid-office/back office should cross-verify the open position statement with the dealing room supervisor on a daily basis.

3.2 Mandatory leave

Dealing is very sensitive and it involves different types of risk due to adverse market movement. There is also risk of mistakes not being unearthed. Thus, all dealers are required to be away from their desks by turn at a stretch for some days during a given year. During this period, his functions are to be run by other dealers and he is not expected to be in contact with his treasury colleagues. This type leave is called a “Mandatory Leave”. Management has decided to allow a leave period of 15 days in a year for each dealer. Dealers are at liberty to avail of such leave at any time, upon sanctioning by proper authority and adjustment of duty schedules.

3.3 Position reconciliation

All dealer positions are to be reconciled with the positions provided by the Treasury back office. Position reconciliation must be done prior to commencement of the day's business.

3.4 Nostro A/C reconciliation

The Bank maintains VaRious *Nostro* accounts in order to conduct operations in different currencies including Bangladesh Taka. NOSTRO Accounts play a vital role in dealings since all deals are executed & settled through them. So the reconciliation of *Nostro* Account transactions should be done properly and in a timely manner. Officers engaged in reconciliation activities should follow the following prescriptive guidelines:

3.4.1 Ensure that all items are properly matched or reconciled.

3.4.2 All matches are cross-referenced between our books (shadow Ledger) and the Foreign Bank's statements.

3.4.3 Detailed particulars of unmatched / outstanding entries are to be recorded properly.

3.4.4 Preparation of a reconciliation balancing report on monthly/quarterly basis, which must include "our book" balance and related 'statement balance', and a listing of all open items.

3.4.5 The officer-in-charge of the back office must set time limits for reconciliation of open items or differences found to be irreconcilable.

3.4.6 Persons reconciling *Nostro* A/Cs are to be independent of originating, responding to, authorizing or booking transactions, and must not reconcile the same A/Cs for a continuous period more than twelve months.

3.4.7 The officer-in-charge of the back office must review all the reconciliation statements of *Nostro* A/CS on quarterly basis for effective control

3.4.8 L/C-related unmatched items equivalent to USD 200,000 and above that remain outstanding for more than a day are to be brought to the attention of AGM for review.

3.4.9 With regard to other L/C-related unmatched items equivalent to US$50,000 up to $199,999 that have remained outstanding for more than a day are to be brought to the attention of the officer-in-charge for review.

3.4.10 The following table shows the maximum time limit after which unmatched items must be referred to the respective Assistant General Manager, Reconciliation Section, who may take obtain the assistance of the Deputy General Manager of the Foreign Currency Management Division:

Type of Transaction	Transit Time
L/C payments	3 days, ACU-7 days
Foreign exchange settlements	Nil. Immediately notify respective department if settlement does not occur on value date
TC encashment	21 days
Outward remittances	3 days
Draft payments	30 days
ACU cover funds sent through Bangladesh Bank	7 days
Credits to our accounts with insufficient details	20 days
Correspondent Bank charges recoverable from our customers or otherwise	30 days
Any other credits to our accounts, where we have not passed corresponding debit entry	7 days
Any other transactions where we have debited, but they do not credit	7 days
Any other transactions where they have debited, but we do not credit	7 days
Any other transactions where we have credited, but they do not debit	7 days

A detailed flow chart of the reconciliation process is been shown in Appendix I.

3.5 After-Hours Dealing

After-hours dealing refers to transactions initiated when the dealer's own trading room is scheduled to be closed. Locally, business hours are from 9.00 A.M. to 4.00 P.M. The Bank's dealers generally start their transacting after 12:00 noon due to the time gap with the markets in London and New York. The Bank has taken steps to allow our dealers to do after-hours deals within existing dealing limits; thus deals after 4.00 P.M. may be treated as after-hour deals. All such transactions are to be properly entered in FX blotter and Foreign Currency Control Ledger (FCCL). Deal slips are to be handed over to the Treasury Back/Mid-offices as early as possible after holding positions.

3.6 Off-Premises Dealings

A transaction done by a dealer who is not physically located in the dealing premises (irrespective of the time of day) is referred to as an "off- premises" deal. This type of deal needs to be treated separately from a deal done within the dealing room, as it utilizes communication tools that are not as special as those of the dealing room. For example, an off-premises deal done on the phone is generally not recorded and thus there is no record in case of any future dispute. The back office is not in a position to take immediate action (confirmation, settlement, etc.) in case of off-premises deals. For this reason, the Bank's Management has decided that such activity should not be encouraged and may be undertaken ONLY upon satisfaction of the following conditions:

3.6.1 There must have laid down procedures of accounting for any off-premises deal transactions on a case by case basis;

3.6.2 Management must specifically designate, in writing, particular dealer(s) with the authority for such transactions; and

3.6.3 The necessary tools/facilities are available for recording

3.7 Stop-Loss Limits

Bank Management has allocated a dealing room limit as well dealing limits to individual dealers. With the possibility of exposure loses always present due to adverse market movements, the Bank has determined that it is a position to absorb losses only within the following risk limitations:

Designation	Stop loss limit
Head of Treasury and Chief Dealer	USD 2,500
P.O.	USD 1,500
S.O.	USD 1,250

3.8 Mark-to-Market

Mark-to-Market is the process through which all outstanding positions are valued at current market rates to ascertain the probable Profit / (Loss) at a particular point of time. Treasury mid-office shall determine the mark-to-market rate of the outstanding deals (on a per-dealer basis) weekly, and the resulting cumulative positions should be reported to the Alcom through the Head of Treasury.

3.9 Valuation

The process of revaluing all positions at a pre-specified interval is known as valuation. This function is to be carried out by Treasury back office by gathering and applying revaluation rates. Dealers are required to have their profit / (loss) estimates which must be tallied with the ones provided by the Treasury back office. Any difference between these two must be reconciled to an acceptable level.

3.10 Model Control Policy

Treasuries use quantitative models for the following reasons:

- To generate valuations used in financial statements; and
- To produce market risk measurements used by independent risk managers in monitoring risk exposures

3.10.1 All financial models that are used for updating organization's independent risk monitoring, must be validated and periodically reviewed at least annually by qualified personnel <u>independent</u> of the area that creates such models. The models include valuation and risk measurement systems that are developed in-house, certain models on spreadsheets and models within vendor systems.

3.10.2 Model validation is the process through which models are independently and comprehensively evaluated by reviewing underlying assumptions, verifying mathematical formulae, testing the models to verify proper implementation and assessing any weaknesses, and ensuring appropriate application. The validation process of a model reduces the risks associated with using a model that has flaws in the underlying assumptions, errors in its implementation and/or is used inappropriately.

3.10.3 The originator of a model must ensure that it is documented, resides in a control environment, and that any change to an existing model is documented and reported. Treasury units using the financial models, in conjunction with their systems support group, are ultimately responsible for ensuring that all models reside in controlled environments.

3.10.4 A model validation process is not applicable to financial models which only perform simple arithmetic operations. On the other hand, the process must be applied to the following: value-at-risk calculations, earnings-at-risk calculations, interest accrual calculations, and aggregation or consolidation of risk exposures to compare against risk limits.

3.11 Internal Audit

In view of the complexities of foreign exchange business, internal audit is a significant activity that serves to review and check the adequacy of the key control issues. This function should include:

- Checking for adherence to the various risk exposure limits;
- Checking for compliance with internal & regulatory requirements;
- Adequacy of statutory management

For additional safety, a concurrent audit process can be put in place by the Treasury's mid-office to ensure the office's functioning in an appropriate manner on day-to-day basis.

4. Organization Structure

All treasury functions require clear demarcations between the direct dealing and all settlement and support functions, i.e., the "treasury front office" that would be involved only in dealing activities and "treasury middle and back office support units" that would be responsible for all related support functions. This is required for control reasons, i.e., different persons/department should be responsible for the dealing and the settlement, measurement, reporting etc. Pursuant to the guidelines of "Foreign Exchange Risk Management" by Bangladesh Bank, the Bank has the following set up:

- Front Office — Involved only in dealing activities
- Back Office — Responsible only for settlement & support functions
- Mid Office — Responsible only for monitoring and managing organization's balance sheet risk at a more detailed level.

4.1 <u>Centralized Foreign Exchange and Money Market</u>

The Bank performs Foreign Exchange and Money Market activities simultaneously. Foreign Exchange Dealing and Money Market (MM) operation are closely correlated and interdependent in terms of over-all profitably and liquidity. These functions are required to be housed in the same area. Prudent management and efficient trade-offs between interest and exchange rates of the Money Market (MM) and Foreign Exchange (FX) operations can maximize the Treasury unit's profitability. As per Bangladesh Bank Guidelines recently our Foreign Exchange Dealing Room and Money Market activities are now centralized in the same floor, and both Money Market & Foreign Exchange operations are now under the direct control of Managing Director & Chief Executive Officer.

4.2 <u>Separate Trading and Risk Management Units</u>

The front-office traders are required to conduct their trading operations within a prescribed framework of risk limits. On the other hand, a separate middle office unit shall be responsible for identifying the risk areas and their appropriate limits.

The responsibilities of trading and risk management units are:

4.2.1 Traders/Risk-Taking Units

a) Maintain compliance with the market risk limit policies and remain within their approved independent market risk limit framework at all times;

b) Ensure that no limit breaches occur, and arrange for pre-approval of transactions requiring higher amounts;

c) Inform the market risk management unit regarding any shift in either strategy or product mix that may necessitate a change in the market risk limit framework; and

d) Seek approval from the market risk management unit prior to engaging in trading of any new products

4.2.2 *Market Risk Management Unit*

a) Review policy at least annually and update as required;

b) Independently identify all relevant market risk factors for each risk taking unit;

c) Develop proposals for the independent market risk limits/triggers, in conjunction with the risk - taking units;

d) Ensure that limits/triggers are appropriately established;

e) Independently monitor compliance with established market risk limits/triggers;

f) Ensure ongoing applicability of the market risk limits/triggers, and formally review framework at least annually;

g) If applicable, review and approve limit frameworks, as well as limit change requirements;

h) Review and approve any temporary limit requirements;

i) Recommend corrective actions for any limit excesses;

j) Maintain documentation of limit breaches, including corrective action and resolution date.

4.3 Organizational Chart

An Organizational Chart has been established, together with a description of the functional roles and responsibilities applicable in the operational scope and context the local environment. As shown in the chart in Appendix 2, the structure is designed to strengthen internal control mechanisms and to ensure effective monitoring of balance sheet risks. It is also evident that the reporting lines for the officers maintaining the treasury front office and back office are different; this is required only for control reasons.

4.4 Job Descriptions

The job description of an ideal treasury Front Office, Back Office and Mid Office are as under:

4.4.1 *Treasury Front Office*

a) Head of Treasury & Chief Dealer

- Has over-all responsibility for all treasury activities;
- Responsible for treasury financial plan;
- Determines overall treasury business and risk strategy within internal and regulatory limits;
- Ensures proper execution of dealing limits;
- Monitors all dealers' positions and ensures dealers adhere to all internal, regulatory as well as dealer-specific limits;
- Decides on particular positions during adverse situations;
- Continuously develops systems, processes, business strategies etc.;
- Membership in the Alcom; and
- Proposes over-all balance sheet strategy to the ALCO.

b) <u>Cross Currency Dealer</u>

- Forms market views on the basis of historical information and developments;
- Monitors exchange positions;
- Monitors counterparty limits;
- Collates all cross-currency exchange positions;
- Ensures transactions are within all internal and regulatory limits, including counterpart limits; and
- Trades and squares positions profitably

c) <u>Securities and statutory Management Dealer</u>

- Maintains CRR and SLR;
- Invests in Treasury Bills portfolio;
- Engages in Repo activities;
- Proposes statutory investments to the Alcom through the Head of Treasury

d) <u>USD/BDT Dealer</u>

- Trades spot and forward positions arising from import/export/remittance activities, etc.;
- Collates the whole Bank's USD & BDT positions;
- Ensures transactions are within all internal and regulatory limits, including counterpart limits; and
- Trades and squares positions profitably

d) <u>Local & Foreign Currency Market Dealer</u>

- Engages in overnight/call money activities;
- Engages in term market activities;
- Engages in currency swaps;
- Places foreign currency;
- Prices foreign currency in the money market
- Funds Nostro accounts;
- Spots and takes advantage of arbitrage opportunities in accordance with regulation;
- Ensures that transactions are within all counterparty limits;
- Operates within all given balance sheet gap limits; and
- Trades and squares positions profitably

e) <u>Balance sheet Manager</u>

- Manages all balance sheet gaps;
- Monitors market factors;
- Forecasts market direction and interest rates; and
- Analyzes risk reports for presentation to the Alcom

4.4.2 Treasury Back-Office

a) Manager/In-charge - Local Currency *Nostro* Reconciliation

- Reconciles all local currency *nostro* accounts on a day-to-day basis;
- Immediately advises money market dealers and balance sheet manager of any discrepancy;
- Tracks unmatched items for reconciliation purposes;
- Claims or arranges payment of good value date effects for any late settlements; and
- Sends chases for any unsettled items until settled

b) Manager/In-charge - Foreign Currency *Nostro* Reconciliation

- Reconciles all local currency *nostro* accounts on a day-to-day basis;
- Immediately advises USD/BDT or cross-currency dealer of any discrepancy;
- Tracks unmatched items for reconciliation purposes;
- Claims or arranges payment of good value date effects for any late settlements; and
- Sends chases for any unsettled items until settled

c) Manager/In-charge - Foreign Currency Position Reconciliation

- Receives copies of USD/BDT and cross-currency dealers' position blotters;
- Reconciles all foreign currency positions between accounted-for records and USD/BDT & cross-currency dealers' blotters on a day-to-day basis;
- Immediately advises USD/BDT or cross-currency dealers of any position discrepancy;
- Investigates and matches un-reconciled amounts; and
- Advises USD/BDT and cross-currency dealers of correct currency positions prior to commencement of the day's dealing activities

d) Manager/In-charge - Local Currency Position Reconciliation

- Receives copies of money market dealers' position blotters;
- Reconciles all local currency positions between accounted-for records and money market dealers' blotters on a day-to-day basis;
- Immediately advises money market dealers of any position discrepancy;
- Investigates and matches un-reconciled amounts; and
- Advises USD/BDT and cross-currency dealers of correct currency positions prior to commencement of the day's dealing activities
- Investigates and matches un-reconciled amounts; and
- Advises money market dealers of correct positions prior to commencement of the day's dealing activities

e) <u>Manager/In-charge - Foreign Currency Settlements</u>

- Settles all foreign currency deals done by USD/BDT, cross-currency and foreign currency market dealers;
- Sends and receives confirmations of all deals done by USD/BDT, cross-currency;
- Checks foreign currency *nostro* statements for settlements of major items;
- Checks all related accounting entries; and
- Generates various required MIS reports

e) <u>Manager/In-charge - Local Currency Settlements</u>

- Settles all local currency deals done by Local Currency money market dealers;
- Sends and receives confirmations of all deals done by local currency money market dealers;
- Checks local currency nostro statements for settlements of major items;
- Checks all related accounting entries; and
- Generate various required MIS reports

f) Manager/In-charge - Regulatory reporting (Central Bank Reporting)

- Sends all required periodic regulatory reports
- Responds to various queries from regulator regarding reports;
- Coordinates with other departments in receiving required information for reporting purposes; and
- Creates awareness among various related departments concerning the importance of effective and accurate reporting

4.4.4 Mid Office

a) Manager/In-charge Risk Reporting

- Monitors limit utilizations against all internal and regulatory risk limits;
- Reports on dealing activities within sanctioned limits;
- Monitors and reports on stop-loss/cumulative loss limits;
- Monitors daily P&L; and
- Generates various required MIS reports

4.5 <u>Restrictions</u>

There are certain activities that are restricted with respect to traders and back office staff, as follows:

4.5.1 Treasury traders are restricted from:

a) deal processing (i.e., accounting entries, sending/receiving deal confirmations, issuing/receiving Bangladesh Bank cheques; and sending settlement instructions like Swift messages, telexes, etc.)

b) Generating revaluation rates;

c) Running the revaluation process;

d) Regulatory reporting;

e) Involvement in raising rate appropriateness issues;

f) Setting up and/or approving counterparty credit limits; and

g) Setting up and/or approving market risk limits.

4.5.2 Treasury Back-Office is Restricted From:

a) Dealing activities (i.e., deciding on exchange rates/quoting prices; striking deals with counterparties; raising deal slips; and altering deal details;

b) Updating position blotters;

c) Deciding on *nostro* funding;

d) Approving counterparty credit limits; and

e) Approving market risk limits.

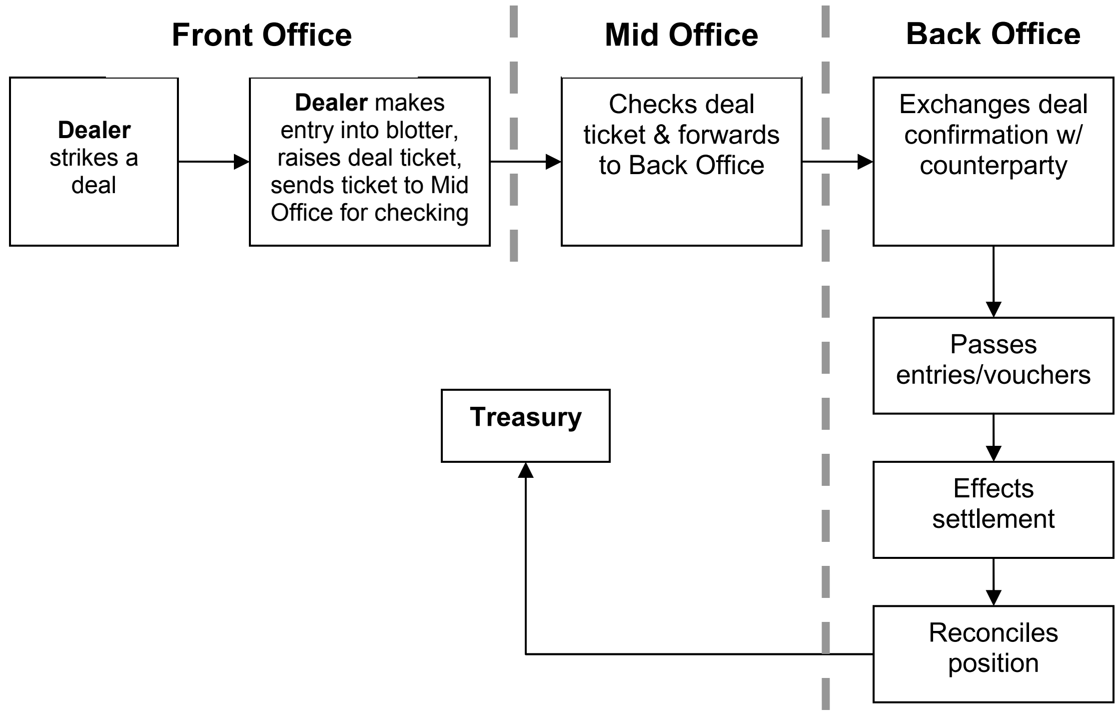
5. Procedures and Processes

The Bank will adopt the best practices for the proper treasury set-up and processes. The following section is a description of how this shall be done.

5.1 <u>Process Flow Description</u>

A transaction normally starts with a dealer striking a transaction/deal in the market, maintaining his/her own record for monitoring the exchange position. Within a reasonable time, he/she passes on the detailed information of the deal to the Treasury back office through the middle office. The middle office first checks the deal slip and transfers the same to the back office. The back office, after confirming arrangements with the counterparty, will pass the accounting entries/vouchers, make the settlement, reconcile positions and then inform the Treasury Head of the accurate position through the middle office. The back office runs valuations on a periodic basis and checks the day-to-day treasury activities.

This process is shown in the flowchart below:



The dealing function requires the dealers to make very quick decisions either for taking advantages of any market movements or for unwinding an unfavorable position. The treasury dealing is a wholesale function which involves large lots. In a treasury dealing the job of a dealer requires:

- Proper information sources, e.g., Reuters Money 2000, Bloomberg, financial TV channels etc., adequate and dedicated communication tools, e.g., Reuters Dealing System, telephone, fax, telex etc.;
- Specially designed dealing desks to appropriately accommodate the various information and communication tools;
- High level of dealing skills;
- Quick, independent decision-making authority; and
- Specific task allocation/specialization.

In order to achieve an optimum level of efficiency, returns and (most importantly) controls, there are certain processes that the organization's management must put in place. The very basic things that would be related to our market environment are explained below:

5.1 Dealing Room

The dealing room is an area which is specifically allocated for the dealers, equipped with modern communication tools for smooth function of their job. Since the dealers have access to global live prices of various products, using different communications tools, access to this room is restricted only to the dealers and related trading personnel.

5.2 Taped conversation

Generally, dealers execute their deals over the telephone. Deals conducted in this way do not provide hard evidence and, in a fast dealing environment, there is a risk of committing mistakes with regard to rates, amounts or value dates, etc. As such, all telephonic conversions taking place in the dealing room required to be taped as these can assist in resolving any disputes that may arise. Consequently:

5.2.1 All telephone lines of the dealing rooms must be taped; and
5.2.2 Counterpart dealers must be given foreknowledge that conversations are being taped; and
5.2.3 Dealing over mobile phones must be restricted unless under special circumstances allowed by the Head of Treasury

5.3 Deal Recording

Under an active trading environment, when a dealer continues to deal, his focus remains on the market. As such there is a risk of forgetting about a deal, or a part of deal, or making mistakes in recording a deal.

To eliminate this risk, a dealer must record the deal immediately after the deal is concluded with the counterparty. The deal recording is to be done in the following ways:

5.3.1 Position blotter

Immediately after execution of a deal, the dealer is to record the deal on the position blotter and up-date his position. The dealer should remain aware of his position at all times. This is required to capture any immediate opportunity, or to be in a position to immediate react to any adverse situation. A sample blotter has been shown in Appendix 3.

5.3.2 Deal Slip

A slip or memo on which the details of the deal is recorded is known as the deal slip or deal ticket. Deal slips contain details of payment instructions, value dates, currencies, amounts etc. A dealer is to record the details of all deals on deal slips immediately after execution of a deal. The deal slip must be passed on to the Treasury Back Office at the earliest possible time for their further processing of deal. All deal slips should be pre-numbered for control reason. The Treasury Back Office must monitor for any breakage in sequence of the deal slips. Where pre-numbered deal slips are in place, any cancelled deal slip must also be forwarded to Back Office for appropriate recording. A typical format of deal slip is shown in Appendix 4.

5.4 Deal Delay

All deals done by dealers are required to be processed by the Back Office, for which reason they need to be informed the details of the deals within certain time periods. The deal tickets must be sent to the treasury Back Office within shortest possible time.

The timeliness of raising deals slip and passing them on to Back Office is not only sound business practice but also critical for monitoring of credit risk, price risk and regulatory compliance.

The following table provides guidelines of deal capture standards:

Product	Deal-slip raising/System Input Time	Deal-slip to reach back-office
Spot FX	Within 15 minutes	Within 30 minutes
Forward FX	Within 10 minutes	Within 25 minutes
FX Swaps	Within 15 minutes	Within 30 minutes
Call/Notice Money	Within 10 minutes	Within 25 minutes
Money Market Term	Within 10 minutes	Within 25 minutes
Foreign Currency Deposits	Within 10 minutes	Within 25 minutes
Treasury Bills Purchase	By 10:30 a.m. on payment day	Within 30 minutes
Repo	By 12:30 p.m.	Within 30 minutes
Reverse Repo	By 12:00 p.m.	Within 30 minutes

For monitoring of the proper functioning of the process, treasuries where manual deal slips are raised should use time stamping on the deal tickets.

5.5 Counterparty Limits

The issue of counterparty limits arises from the risk that a customer with whom an organization has a reciprocal agreement defaults. Credit risk is the risk that the counterparty to a financial transaction (for example, a foreign exchange contract) may be unable to perform its obligation. The extent of risk depends on whether the other party's inability to pay is established before the value date or is on the same value date of the foreign exchange contract.

Management has set limits for the counterparties, which may be altered according to changing circumstances revealed either in periodic reviews (at least annually) or real-time credit or market risk assessments.

Settlement risk

The risk on settlement day that one party pays funds or delivers a security to fulfill its side of the contractual agreement, but the other counterparty fails on its side to pay or deliver. This occurs when items of agreed-upon originally equal values are not simultaneously exchanged between counterparties, and/or when an organization's funds are released without knowledge that the counter value items have actually been received. The risk is that the organization delivers but does not receive delivery. In this situation 100% of the principal amount is at risk. This risk may be greater than 100% if, in addition, there was an adverse price fluctuation between the contract price and the market price.

Pre-settlement risk

This is the risk that a client defaults on its agreement with the organization before the settlement day. Whilst the organization has not paid away any funds, it still has to replace the contract at the current market rates, which might have moved against it. In this case, the organization is exposed to possible adverse price fluctuations between the contract price and the market price on the date of default or final liquidation. The organization's loss would then be the difference between the original contract price and the current market price on the date of default.

As a good practice, all banking organizations must have appropriate counterparty limits in place for their treasuries. The limit structure depends on each organization's credit risk appetite based on their credit risk policies as well as target market criteria. All such credit risk limits should be set by the organization's credit risk approving unit, which is independent of the treasury dealing function.

5.6 Triggers

A trigger is a level of a position at which an organization decides that the management should be informed with regard to either a market value of a position or an unusual trading volume, etc. This is a pre-determined level given by the management, and when a trigger point is reached, management should be informed of the same.

The Bank has allocated the following trigger level for the dealers which may be changed with the according to future circumstances:

Designation	Trigger Level
Head of Treasury & Chief Dealer	USD 1,500
Principal Officer	USD 1,000
Senior Officer	USD 1,000

5.7 Stop-Loss Order

A stop-loss limit for a product is generally a certain percentage of the organization's prior year's profit from that product. For example if an organization's FX trading revenue for the year 2002 was USD *A* management, through its market risk management unit, may decide to accept a maximum of 10% loss of that amount "*A*" during the current year. In that case, the stop-loss limit for that organization for 2003 would be *A* X 10%. In managing the business within stop-loss limit, treasuries running overnight positions (within their overnight limits) must have the appropriate overnight watch order.

5.8 Appropriateness of dealing

While transacting with a client, a dealer should be aware of the counterparty's dealing style and product mix, and assess (prior to concluding a deal) whether the customer is dealing in an "appropriate" manner. A dealer should have the responsibility to ensure that the volumes of activity and types of products transacted by a client are appropriate for that particular client and the risks of these transactions are clearly understood by them. Prior to conclusion of any deal, a dealer needs to be assured that the counterparty is authorized to enter into such a transaction (both from counterparty's internal and regulatory perspective).

To address the appropriateness issue, it might be a good idea for the organization to get a standard agreement signed by all its counterparties. Such an agreement can be drafted by BAFEDA and can be made mandatory for all members to sign.

5.9 Rate appropriateness

This exercise is carried out by the treasury back-office to check for whether all deals have been conducted at market rates. Any deals done at off-market rates must be raised to the respective dealer for a satisfactory explanation, and brought to the notice of the chief dealer. In case of a non-acceptable justification provided by the dealer, the organization may decide to conduct further investigation.

This monitoring process needs to be in place to guard against the application of any inappropriate rates.

Treasury front offices primarily use Reuters for pricing of its products and treasury back office operations should also collect most of the data for their independent verification process from the same source.

5.10 Deal Outstanding Limit

It is a good practice to monitor the total deals outstanding the treasury unit. This exercise should be carried out by the treasury back office to check against any unusual volumes of activity. Each treasury would have its own volume trend and the treasury back office should monitor whether all activities are being carried out within the usual trend. Management may decide to set a limit for all outstanding FX contracts at any given point of time. In a fast dealing environment, a dealer may make a mistake and execute a deal with an additional zero that would make the deal amount much higher than intended. Mid-office may monitor the deals outstanding of the treasury as an independent unit, highlighting for Alcom management's attention such deviations for its appropriate action.

5.11 Daily Treasury Risk report

The treasury back-office is required to summarize all daily positions, particularly the end-of-day positions on a report format for the information of senior management. Such a report should contain information about:

° outstanding open positions against limits,
° the different currency-wise outstanding exchange positions (against limits if applicable);
° the outstanding foreign exchange forward gaps in different tenors;
° tenor-based MCO report
° interest rate exposures of the balance sheet;
° counterparty credit limits usage;
° the day's P&L against trigger & stop-loss limits, etc.

A format of daily treasury report for the Senior Management is shown in Appendix 5.

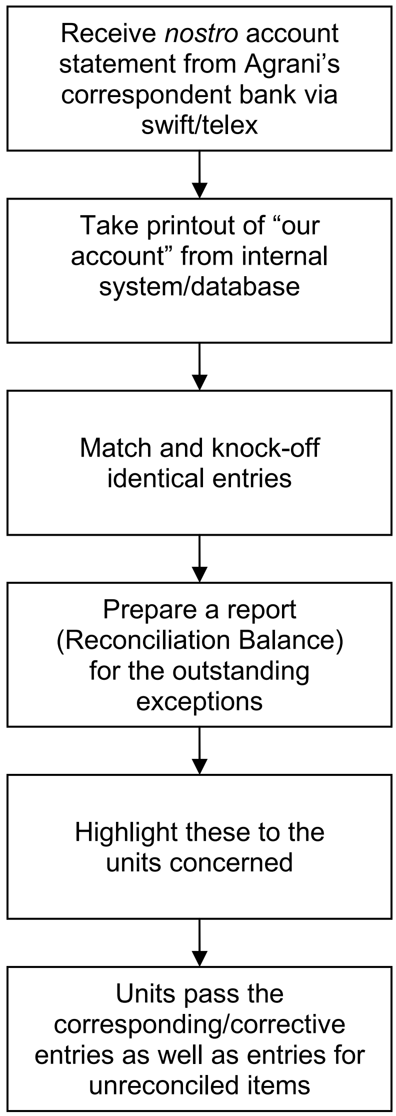
5.12 Code of Conduct

Dealing is job of specialized nature. Thus, dealers are expected to behave professionally and ethically, in accordance with a code of conduct that is shown in Appendix 6.

5.13 Conversation Language

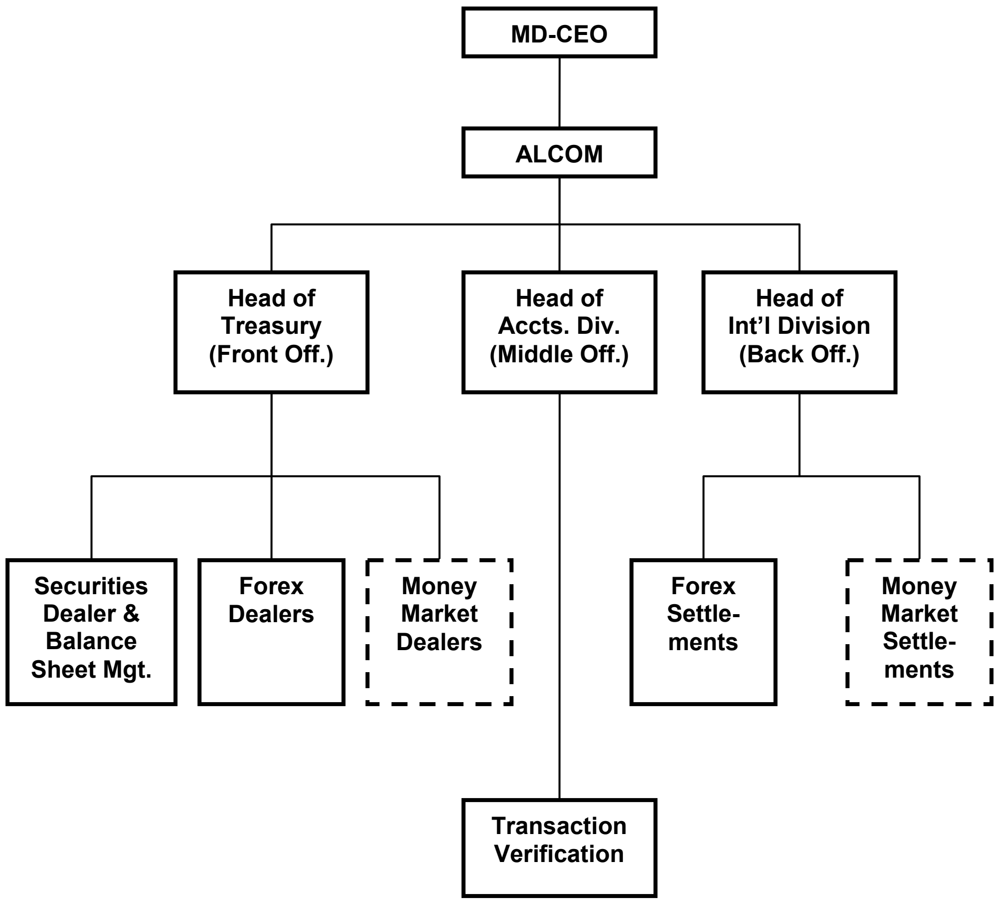
All dealing-related conversations taking place in the treasury must be in an acceptable language for operational clarity. To elaborate, all conversations on the Reuters Dealing System must be in English and all conversions over telephone must be restricted to either Bengali or English.

Reconciliation Flowchart



Appendix 2

Simplified Organization Chart for Foreign Exchange Treasury Operations



Appendix 3

Position Blotter

(Facsimile)

Agrani Bank
International Division
Dealing Room
Head Office
Dhaka

Date:

Dealer #	FC Purch	FC Sale	Rate	FC Earning	Profit as of ____	Loss as of ____	Profit up to	Cum. Net Profit (F + H)	C/F Position Outst.	Net Position Outst.	Remarks
A	B	C	D	E	F	G	H	I	J	K	L

Prepared by: ______________________________

Head of Treasury: ______________________________

Received by Mid Office ________________________
Name: ________________________

Appendix 4

DEALER SLIP

(Facsimile)

Agrani Bank
Fund Management Division
Dealing Room (Front Office)
Head Office
Dhaka

Deal Slip __________ Date: _______________

CASH/SPOT/FORWARD

Sold Currency Settlement Instruction

Currency: __________
Value Date: __________
Amount Sold __________ In Words: (______________________________________
____)

Counter Party Name ____
Account # *A.P.T.I.*

Bought Currency Settlement Instruction

Exchange Rate: ________ Reuter Rate: __________ Time: __________
Deal Date: _________
Currency: _________
Amount: __________ In Words: (______________________________________
____)
Payment Received From/Through: ____

Account #: _____________
Dealer's Name with P.A. #: ____

___________________ ________________
Signature of Dealer Chief Dealer

Checked by Mid Office:

Name: ___________________________ Signature: ___________________________
P.A. # ________________ Time: __________

Back Office:

Confirmation Sent: _____________
Name: ___________________________ Signature: ___________________________
P.A. # ________________ Time: __________

Appendix 5

Daily Treasury Report

(Facsimile)

Agrani Bank
Foreign Currency Management Division
Head Office, Dhaka

Expected Closing Balance as on __________

Figure in Lac

A. Sl. No.	Bank's Name	Opening Balance	Payment or Transfer Dr	Payment or Transfer Cr	Outward/Inward Remittance Dr	Outward/Inward Remittance Cr	Expected Closing Balance
1							
2							
3							
4							
5							
6							
7							
8							
9							

B. F.C. required to be retained for payment of LC/Services

	Branch Name	Payment Against	Required F.C.	Equiv. US$	Executing Foreign Bank	Expected Value Date
1						
2						
3						
4						

C. Expected Fund Position as on _________, US$ {____-____} = (+/-) _____ Lac

____________________	____________________	____________________
D.G.M.	A.G.M. Treasury Back Office	S.O. Treasury Back Office

Copy to:

1. The Managing Director & CEO
2. The Dy General Manager, F.C.M.D.
3. The A.G.M., Fund Management (Front Office)

Code of Conduct for Foreign Exchange Dealers

A. General Code

1. Purpose

The aim of the code of conduct is to set out the manner and spirit in which business should be conducted, in order to ensure that the Bank enjoys a reputation for high standards of professionalism, integrity, and ethical conduct in the foreign exchange market.

2. Responsibilities of Management for Dealing Activities

It is the responsibility of the management of the Bank to control the activities of personnel engaged in dealing (Treasury Front Office & Back Office staff). Management has therefore set out in writing, the authorities and responsibilities within which dealers and the supporting officers should operate their business. These include:

- *General dealing policy including reporting procedures;*
- *Persons authorized to deal;*
- *Instruments to deal with;*
- *Limits on open positions, mismatches, counterparties, and stop-loss situations, etc.*
- *Confirmation and settlement procedures;*
- *Relationships with other foreign exchange banks, brokers, and customers; and*
- *Other relevant guidance considered appropriate.*

3. Responsibilities of Staff for Dealing Activities

All personnel engaged in dealing activities (both dealers and support staff) must observe the following code as their fundamental behavior in the dealing activities:

- *They must keep dealing activities within the responsibilities and limits authorized by the management, and observe the instructions given by management for supervisors in each section (dealing room and back office) concerned.*

- *Situations that arise during dealing activities, as well as other issues, which might have serious repercussions on the Bank must immediately be reported to the management or supervisors for their instructions.*

4. Use of Market Terminology & Definitions

Management should ensure (by checking from time to time) that the dealing staff use commonly-accepted expressions, and have knowledge of their meanings in dealing activities, to avoiding misunderstanding.

5. Dealing Unit and Back Office

Management has clearly separated the Treasury Front Office from Back Office.

- *The Back Office should, among others, be responsible for timely and prompt verification of all incoming confirmations.*

- *The Bank should not start foreign exchange trading with less than two trained and authorized people in its dealing room.*

6. Recording Deals

A dealer must record all the details of a transaction in a deal slip/ticket immediately after the deal is concluded. The deal slip must be forwarded to the back office as soon as possible (within 30 minutes) for further processing.

7. Accounting

The back-office must work with the Bank's accounting department to ensure that all transactions and violations/changes are accounted for promptly. Because of two-day settlements, the value date accounting is inadequate for the monitoring of risk positions and, hence, accounting must be established on a per-transaction basis.

B. Code regarding Dealing practices

1. Opening hours in the Foreign Exchange Market

The opening of dealing is normally at 9.00 A.M. It can be modified by the relevant authorities according to changing circumstances; it should however, be defined.

2. Confirmation Procedures

- *Dealers must confirm verbally;*
- *After dealers' confirmation, it is the back-office's responsibility to carry out reconfirmation independently from those who initiated deals. All reconfirmations should include the following information as a minimum requirement:*
    - *Date of transaction*
    - *By which means effected (phone, telex)*
    - *Name and location of counterpart*
    - *Rate, amount and currency*
    - *Type and side of deal (buying and selling)*
    - *Value date, maturity date, all other relevant dates*
    - *Standard terms/conditions applicable; and*
    - *All other important and relevant information.*

Upon receipt, all reconfirmations must immediately be thoroughly verified, and appropriate action taken to rectify differences. A new reconfirmation (or write-in agreement to a correction) must be requested from, and provided by, the Bank whose original reconfirmation was incorrect.

3. Payment/Settlement instructions

Payment/settlement instructions should be passed as quickly as possible to facilitate prompt settlement. The use of standardized payment instructions between counterparts who regularly deal with each other is recommended as their use can make a significant contribution to reducing both the incidence, and the size of differences arising from mistaken settlement of funds.

4. Confidentiality

Confidentiality and anonymity are essential to the operation of a professional foreign exchange market. Participants in the market-commercial clients as well as Banks-can expect to have their interests protected, and to ensure that Bank employees are trained to readily identify information that is confidential or situations where anonymity is essential so that such information is handled accordingly. Whenever confidentiality is broken, management has to see that instructions are issued swiftly to correct the conditions that permitted such a situation to arise in the first place.

These instructions should revolve around these premises:

- *Dealers operating in the market are responsible for maintaining confidentiality.*
- *Dealers are not permitted to pass on information (whether inside or outside the Bank) except on explicit, written permission from the parties involved.*

C. *Ethical Rules*

1. Trading for personal account

- *Traders should give full attention to the Bank's business and should not be distracted by their own financial affairs; and*

- *Dealers are not allowed to deal for their own account in any instrument, lest they be exposed to situations where ethical issues or biases arise.*

2. Protection against fraud

All staff should pay great vigilance to fraud attempts particularly in the following cases:

- Deals which do not include pre-agreed standard settlement instructions;

- Deals whose payment is made in favor of a third party;

- Inability to make reconfirmation after concluding the deal; and

- Other deals which have different standards than those pre-agreed.

3. Entertainment, gifts, and gambling

Neither management nor employees should offer inducements to conduct business, or solicit them from the personnel of other institutions.

Where inducements are recognized in the normal course of the business, management should formulate separate policies in this area which include guidance on the provision and receipt of entertainment and gifts by staff. This should include what may or may not be offered or accepted, together with procedures for dealing with gifts judged to be excessive, but which cannot be declined without causing offences. Similar guidelines should be established regarding gambling with other market participants.

VALUE AT RISK (VaR)

Value at Risk, commonly referred to by its acronym *VaR*, is a statistical measure of the worst probable loss on a position or portfolio of positions that can be expected over a specified period of time to a given level of confidence. The calculation of *VAR* requires a number of inputs:

- Market value of the position
- Daily volatility of the currencies
- Holding period
- Level of confidence

Market Value of position:

The market value of position, expressed in US Dollars, is the base point from which expected losses are calculated. In other words, adding or subtracting (depending on whether the position is long or short) the *VaR* on a position to the market value will give the worst probable market value of the position.

Daily Volatility:

Foreign Exchange volatility is calculated from the daily movements in the foreign exchange rate over a specified historic time period. A key assumption in the calculation of historic volatility is that recent events play a more significant role in determining likely rate movements in the future than events, say, which took place a year ago. As a result, recent rate movements are usually given higher weight in the calculation of volatility. An alternative method commonly used in the market is to limit the historic period used to calculate volatility, and not apply any weighting. A third method is to use implied volatility i.e. the actual volatility traded in the market.

Whatever method is used, the risk manager should be aware of the difference between implied and historic. If the difference is significant, then it may be necessary to tune the calculation of historic volatility to bring it in line with implied volatility.

Historic volatility is calculated by simply taking the Standard Deviation of the daily changes in the rates for the historic time period selected. To compare historic to implied volatility, the daily volatility needs to be converted to an annualized basis. This is done by multiplying the daily volatility by the square root of the number of trading days in a year (say 260).

Holding Period:

The holding period for *VaR* refers to the liquidity of the position i.e. how long it will take to liquidate the position in terms of number of trading days. The majority of positions (regardless of size) in freely floating currencies should be able to be liquidated within a twenty-four hour period.

For these currencies, the holding period will therefore be set to one day. However, positions in currency that is not liquid may take several days to unwind, which may depend on the size of the position or general market conditions. In these cases, the holding period should be extended appropriately.

Level of Confidence:

The level of confidence selected determines the probability and frequency that there will be a rate movement in excess of the predicted (i.e. *VaR*) amount.

Market volatility is quoted to one standard deviation, thereby inferring that once in every five trading days the calculated worst probable loss will be exceeded. At two standard deviations, this raised to one in every forty trading days. At three standard deviations this is increased to once in every two hundred days.

Based on the normal distribution of rate changes, the percentage of the distribution, defined by the number of Standard Deviation (σ), Level of Confidence will define the probability of a rate movement occurring outside the worst probable rate. The approximate relationship between Confidence Level and Standard Deviation is as follows:

1. σ =60% Confidence Level
2. σ =95% Confidence Level
3. σ =99% Confidence Level

However, since the concern is only with the half of the distribution that may cause a loss on a position, the Confidence Levels are raised as follows:

1. σ =80% Confidence Level
2. σ =97.5% Confidence Level
3. σ =99.5% Confidence Level

These Confidence Levels in turn can be expressed as frequency of occurrence (how frequently our expectation of worst probable rate movement will be exceeded in terms of number of trading days).

80% Confidence Level =1 in 5 days

97.5% Confidence Level=1 in 40 days

99.5% Confidence Level=1 in 200 days

Market volatility is quoted to one standard deviation, thereby inferring that once in every five trading days the calculated worst probable loss will be exceeded. At two standard deviations, this raised to one in every forty trading days. At three standard deviations this is increased to once in every two hundred days.

CALCULATION OF FOREIGN EXCHANGE *VaR*

Gross *VaR*:

Gross *VaR* is calculated as follows, using the inputs discussed above:

Gross *VaR* = Market value of the position X Daily Volatility X Level of confidence X $\sqrt{\text{Holding Period}}$

Net *VaR*

Net *VaR* reduces the Gross *VaR* calculated on a portfolio of positions by taking into account the way foreign exchange rates move in relation to each other. As with volatility, this Portfolio Effect (using the Marckowitz's Portfolio Theory) or Correlation is also calculated from the same historic period. Correlations range from +1 to -1. A+1 correlation indicates that two currencies move identically to each other against the US dollar. A^{-1} correlation indicates that two currencies move in diametrically opposite directions to each other against the US dollar. A Zero correlation means there is no relationship between the ways the currencies move.

For example, studies reveal that there is positive correlation between Euro and Swiss Franc, which indicates that a long Euro position is hedged by the short CHF position. The Gross *VaR* calculated on each position can therefore be reduced proportionately. Just as the loss is limited, so is the profit potential in EUR/CHF position is limited.

The following table shows how positive and negative correlations between currencies affect Net *VaR* calculation:

Position A (Any currency)	Position B (Any currency)	Correlation	Correlation term sign (Effect on Net *VaR*)
Short (+)	Short (+)	Negative (-)	Negative (-)
Long (-)	Long (-)	Negative (-)	Negative (-)
Short (+)	Long (-)	Positive (+)	Negative (-)
Long (-)	Short (+)	Positive (+)	Negative (-)
Short (+)	Short (+)	Positive (+)	Positive (+)
Long (-)	Long (-)	Positive (+)	Positive (+)
Short (+)	Long (-)	Negative (-)	Positive (+)
Long (-)	Short (+)	Negative (-)	Positive (+)

The correlation term sign indicates whether the portfolio effect will be added or subtracted in the Net *VaR* calculation. It should be noted that the *Net VaR* calculation cannot increase the aggregate of the Gross *VaR* on each position, rather reduces it to the extent of the correlation.

It should also be noted that a zero correlation does not mean that Net *VaR* will equal aggregate Gross *VaR*. There will be a reduction in Gross *VaR* on the basis that even a random movement between currency rates may to some extent reduce risk.

Calculation of Net *VaR* for Two Currencies:

$$\text{Net } VaR = \sqrt{(VaR^2_{x,a}+VaR^2_{x,b}+VaR^2_{y,a}+VaR^2_{y,b})+2r_{x,y}\begin{bmatrix}(VaR_{x,a}XVaR_{y,a})+(VaR_{x,a}XVaR_{y,b})+\\(VaR_{x,b}XVaR_{y,a})+(VaR_{x,b}XVaR_{y,b})\end{bmatrix}}$$

Where,

*VaR*x,a	= Gross *VaR* of currency 'x' in case of short position
*VaR*x,b	= Gross *VaR* of currency 'x' in case of long position
*VaR*y,a	= Gross *VaR* of currency 'y' in case of short position
*VaR*y,b	= Gross *VaR* of currency 'y' in case of long position
rx.y	= Coefficient of Correlation between currencies 'x' and 'y'

Calculation of Net *VaR* for Four Currencies:

$$\text{Net } VaR_{w,x,y,z} = \sqrt{\begin{array}{l}(VaR^2_{w,a}+VaR^2_{w,a}+VaR^2_{x,a}+VaR^2_{x,b}+VaR^2_{y,a}+VaR^2_{y,b}+VaR^2_{z,a}+VaR^2_{z,b})+\\ 2r_{w,x}\ [(VaR_{w,a}xVaR_{x,a})+(VaR_{w,a}xVaR_{x,b})+VaR_{w,b}xVaR_{x,a})+(VaR_{w,b}xVaR_{x,b})]+\\ 2r_{w,y}\ [(VaR_{w,a}xVaR_{y,a})+(VaR_{w,a}xVaR_{y,b})+VaR_{w,b}xVaR_{y,a})+(VaR_{w,b}xVaR_{y,b})]+\\ 2r_{w,z}\ [(VaR_{w,a}xVaR_{z,a})+(VaR_{w,a}xVaR_{z,b})+VaR_{w,b}xVaR_{z,a})+(VaR_{w,b}xVaR_{z,b})]+\\ 2r_{x,y}\ [(VaR_{x,a}xVaR_{y,a})+(VaR_{x,a}xVaR_{y,b})+VaR_{x,b}xVaR_{y,a})+(VaR_{x,b}xVaR_{y,b})]+\\ 2r_{x,z}\ [(VaR_{x,a}xVaR_{z,a})+(VaR_{x,a}xVaR_{z,b})+VaR_{x,b}xVaR_{z,a})+(VaR_{x,b}xVaR_{z,b})]+\\ 2r_{y,z}\ [(VaR_{y,a}xVaR_{z,a})+(VaR_{y,a}xVaR_{z,b})+VaR_{y,b}xVaR_{z,a})+(VaR_{y,b}xVaR_{z,b})]\end{array}}$$

Where,

*VaR*w,a	= Gross *VaR* of currency 'w' in case of short position
*VaR*w,b	= Gross *VaR* of currency 'w' in case of long position
*VaR*x,a	= Gross *VaR* of currency 'x' in case of short position
*VaR*x,b	= Gross *VaR* of currency 'x' in case of long position
*VaR*y,a	= Gross *VaR* of currency 'y' in case of short position
*VaR*y,b	= Gross *VaR* of currency 'y' in case of long position
*VaR*z,a	= Gross *VaR* of currency 'z' in case of short position
VARz,b	= Gross VAR of currency 'z' in case of long position, and
rw.x	= Coefficient of Correlation between currencies 'w' and 'x'
rw.y	= Coefficient of Correlation between currencies 'w' and 'y'
rw.z	= Coefficient of Correlation between currencies 'w' and 'z'
rx.y	= Coefficient of Correlation between currencies 'x' and 'y'
rx.z	= Coefficient of Correlation between currencies 'x' and 'z'
ry.z	= Coefficient of Correlation between currencies 'y' and 'z'