



Government Securities Book-Entry System: System Requirements for Egypt

The Egypt Capital Markets Development Project



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BOOK-ENTRY SYSTEM REQUIREMENTS FOR EGYPT

I Introduction

The purpose of the requirements report is to define *what* functions should be included in the proposed book-entry system for the government securities of Egypt. The subsequent systems design will determine *how* the system will perform those functions.

To determine the appropriate requirements, it was important to become familiar with the Egyptian securities market so that the specific needs of the Egyptian market could be analyzed and evaluated. Accordingly, information was gathered by holding interviews with various participants in the government securities market—the Central Bank of Egypt (CBE) banks, brokers, the stock exchange, securities depository, and others.

Additionally, several analyses were conducted of items that needed to be resolved prior to determining the system requirements. First, what will be the numbering system for banks and securities? In a book-entry system, numbering systems are used to help identify the securities that will be maintained on the system and the banks that will be holding the securities and trading with each other. Therefore, evaluations were made to determine whether numbering systems existed in Egypt that could be adapted for use by the book-entry system or whether new ones had to be developed. The evaluation of numbering systems included those planned for the future, taking into account whether they were likely to be in use when the book-entry system is implemented. For purposes of this report, it was assumed that the book-entry system would be implemented in the year 2000.

Additionally, the method of paying for securities had to be studied. Can the book-entry system achieve delivery-versus-payment (DVP) with debits and credits to current accounts or must payments be handled in a different manner, separately from the book-entry system? Consideration had to be given whether DVP needed to be installed in phases.

Finally, in developing the requirements, it was important to recognize the rapidity with which changes are taking place in Egypt. Describing the current situation and defining system requirements was very much like trying to hit a moving target.

Moreover, although the users' needs were examined to help determine the requirements, adjustments may need to be made because of specific preferences, or because of changing conditions. Taking the above into account, the requirements that follow were judged to best satisfy the needs of Egypt.

II Overview

A Scope of Book-Entry System

The main purpose of a book-entry system is to maintain the records of securities ownership on a computer and eliminate the need to print and process securities in certificate form. Since the records are maintained in electronic form, several automatic processes can take place.

The book-entry system first creates records of ownership when securities are issued on behalf of the issuer—in this case, the Ministry of Finance. During the life of the security, the system will update any changes in ownership, usually caused by securities trades. Upon maturity, the system automatically initiates payment of the principal amounts to the owners of the securities based on the updated ownership records. In the case of bonds, the system can automatically calculate the interim interest amounts and initiate the payments.

It is possible to confine the scope of a book-entry system to one that processes securities transactions but is not concerned with the money involved. In such an approach, payments would be handled externally to the book-entry system and some—but not all—of the benefits of book-entry would be realized.

However, the scope of a full book-entry system includes securities and the associated payments. As mentioned, the main reason for changing records of ownership is because of the sale of securities in the secondary market. The book-entry system receives information as to the number of securities sold and the amount of payment involved in the sale. It then has sufficient data to execute both sides of the transaction—the change of security ownership and the related payment. In order to accomplish this, the book-entry system passes the payment information, directly or indirectly, to the accounting system that maintains current account balances. This exchange of assets—securities and funds—attains the delivery-versus-payment objective of minimizing settlement risk.

The system recommended for Egypt and defined in these requirements is a full book-entry system that incorporates the payments associated with securities transfers.

B Benefits of Book-Entry

Book-entry is the preferred and most appropriate vehicle for issuing government securities because of the many advantages it offers. Following is a summary of the benefits to be achieved, some of which were already discussed:

- Eliminating the need to print and manually handle paper certificates significantly reduces operating costs.
- The risk of lost or stolen paper certificates is eliminated. These types of losses can be costly and a major source of embarrassment to a central government.
- The ease with which trades are settled promotes secondary market activity.
- The actual settlement process can be executed much more rapidly. Transactions take place electronically instead of requiring physical delivery of certificates, occasionally across large geographic areas.
- The concurrent exchange of assets, securities for funds, further reduces settlement risk.
- The ease of execution and rapid settlement of trades provides a vehicle for attaining greater liquidity in the securities market.
- The CBE and MOF are provided an excellent vehicle with which to adjust money supply by engaging in repurchase agreements (Repos).
- Book-entry securities make excellent collateral for loans by the CBE because they can readily be received and released.

Finally, the many benefits of a book-entry system make these securities more attractive to the market. This usually results in lower financing costs for the issuers of the securities—Egypt and the MOF.

III Delivery-Versus Payment

An international work group established the premise that the less time between the trade of securities and the actual settlement of the trade the less risk is involved. This led to the establishment of the international standard that settlement should take place within two days after the trade takes place (T+2). It was also determined that in settling the trade the less time between the exchange of securities and the related payment the lower the risk. Therefore ideally the early settlement of trades and the simultaneous exchange of assets (securities and funds) virtually eliminate settlement risk. This established the delivery-versus-payment concept.

In order to choose the best payment method for securities transactions it was necessary to evaluate the various methods by which payments could be effectively made in Egypt. This analysis (as presented in the previously prepared "Evaluation Report") assessed whether payment for securities can be made electronically with the same transaction that records changes of securities ownership.

The analysis identified three alternative payment methods, two of which would achieve DVP in the book-entry system.

Method #1—Securities Only

One method is to develop a book-entry system solely to maintain records of securities ownership and not be concerned with the associated payment. Payments would be transacted externally to the book-entry system, presumably prior to submitting the securities transaction information. This approach achieves the benefits of book-entry that are associated with replacing paper securities with computer records, but does not achieve the benefit derived from delivery-versus-payment.

This alternative could be taken as a first phase, if no other alternative is feasible at the time the book-entry system is operational. By converting securities to electronic form, settlement risk would be lower than that which currently exists with securities in paper form. However, the time lag between the update of securities records and the payment for the securities would be beyond the control of the system.

Method #2—Simultaneous Updates

The second method attains the ultimate delivery-versus-payment scenario. The book-entry system would simultaneously update securities and current account records. The seller would receive a debit to its securities account for the par amount of the securities sold and a credit to its current account for the payment amount. The buyer would receive the opposite accounting entries. Settlement risk would be eliminated because all updates would be executed simultaneously.

This alternative would gain the ideal delivery-versus-payment scenario. However, this alternative would require that the book-entry and accounting systems both be on-line, real-time systems, available for simultaneous processing. It requires a complicated solution that would be very difficult to implement successfully.

Method #3—Same Day Updates

In the third method the updates to securities and accounting records are not technically simultaneous, but are executed within the same day. The book-entry system would update the securities accounts and simultaneously create debit and credit records (accounting entries) for the payment portion of the securities transactions. At the end of securities processing for that day the current accounts would be updated from information received from the book-entry system. Either of two variations could be implemented depending on the capabilities that exist with the CBE's current account system when the book-entry system becomes operational. The book-entry system would either (1) produce listings of the payment transactions or (2) generate accounting entries on tapes or disks. In the case of the former the payment information on the listings would be posted manually to the current account system. In the latter case, the current account system would update the current accounts based on the information received on the tape or disk.

This method, in either variation, meets the goal of achieving delivery-versus-payment virtually eliminating settlement risk. Although technically not 'simultaneous', the book-entry system would create the accounting entries for the payments portion of the securities transactions at the same time it is updating the securities records. The securities and account updates would take place on the same day.

Conclusion

The third method is the clear choice because it offers a delivery-versus-payment solution, regardless of the status of the current account system. If the new CBE current account (accounting) system meets its target date of year-end 1999, it should be capable of receiving the payment information from the book-entry system in electronic form. If not, the payment information could be posted manually from the listings produced by the book-entry system until the accounting system is ready. In either case, payments would be an integral part of the securities transaction and delivery-versus-payment would be achieved.

IV Evaluation of Settlement Options

The following evaluation (in addition to those conducted in the "Evaluation Report") was needed in order to determine which settlement approach is most appropriate for Egypt. Several methods of entering settlement instructions were identified and analyzed. In the analysis it was considered essential to retain the delivery-versus-payment and value-for-value concepts in the settlement process. It is assumed that, at least initially, CBE personnel will enter the transaction information into the book-entry system based on information received from the banks. It also assumes that at a later date banks would be able to enter their own transfer information directly into the system through the use of terminals.

The following methods were identified and evaluated:

Method #1—Only Seller Sends Instructions

Under this method only the seller (sender) of the securities forwards a security transfer (transaction) information to the CBE for entry into the system.

The sender's instructions cause the appropriate securities and funds debits and credits to take place. Once a sender's instructions initiate the transfer process, the only conditions that must be met before settlement takes place are that the instructions pass validation tests and that the sender has the specified securities in its account, available for delivery. The receiver of

securities is essentially a passive party to the transaction although it has the ability to reverse the transaction after it has been settled against its account

This method is currently in use at the Federal Reserve System in the United States. It is very efficient because it provides the ability to effect a transfer based on the entry of a single set of instructions. It eliminates the need to match instructions from both parties (the buyer) and reduces the time needed to actually effect a transfer.

In the case of an incorrect transfer, the receiver sends a reversal transaction which reverses the accounting entries, thereby negating them. This method results in a very rapid settlement system that is capable of handling very large volumes of transactions. The method remains effective because the percentage of transfers that are actually reversed is less than 1%.

However, this method is generally viewed as a less positive approach to executing securities transfers and the advantage of rapidly handling large volumes of transactions is unnecessary.

Method # 2—Automated Matching of Instructions

Under this alternative, both the buyer and the seller forward settlement instructions to the CBE for entry into the book-entry system.

The book-entry system may be thought of as being comprised of two modules (subsystems)—pre-processing and processing. The pre-processing module (subsystem) of the system would compare the two instructions. If the instructions are identical, the transaction proceeds to the processing module of the book-entry system. Settlement would occur through the appropriate securities and funds debits and credits to the accounts of the buyer and seller.

When the subsystem is unable to match the instructions, one of two approaches could be taken: (1) unmatched instructions could be recycled after corrections have been made, or (2) both sets of instructions would be returned to the buyer and the seller for correction and resubmission.

The volume of transfer instructions to be entered into the system would be twice that needed under the first method (#1—seller only) because buyers and sellers would need to forward transfer instructions. However, the required matching of instructions would provide greater assurance in the transfer process and eliminate the need for reversal transactions.

Method #3—Manual Matching of Instructions

This method is similar to the automated matching described above, but the matching of instructions takes place manually prior to the entry of the transaction into the book-entry system. It is based on the assumption that the volume of securities transfers will remain at a manageable level (less than 20 per day—a reasonable assumption for the foreseeable future).

Instructions from the buyer and seller would be received by the CBE and compared manually. If the instructions are identical, one transaction (representing both buyer and seller) would be entered into the book-entry system for processing. The appropriate debits and credits to the buyer's and seller's securities and payments would then take place.

As in the second method, if the instructions from the buyer and seller are not in agreement, the procedure would be to either (1) return the instructions to both parties, or (2) expedite the process by CBE personnel contacting the appropriate party(s) and making the correction(s).

The latter approach could be problematic for the CBE because it would mean assuming additional responsibilities

This method (#3) would achieve the benefit of providing assurance of the securities transfer process by receiving instructions from both parties, as in the second method (#2). However, it would be easier to implement because only one matched transaction would be entered into the book-entry system.

Conclusion

The third method could be implemented as a first phase. With this approach, CBE personnel would have the opportunity to first gain experience with the processing that takes place with a book-entry system and its operation. The software needed to match instructions could be designed as part of the book-entry system or it could be designed and installed later.

V Major System Functions

The following major functions describe *what* is needed from the users' perspective based on the information gathered and analyzed. The system designers should be free to be innovative in their solutions as to *how* the functions will be accomplished and the user should be able to their specific preferences. The only caveat is that the system's integrity should not be compromised.

A Securities Information

The new book-entry system must retain information related to the debt instruments (securities) of the MOF—Treasury Bills (T-Bills) and Treasury Bonds (T-Bonds).

1 Securities Identification Number

The system must be able to uniquely identify each security on the system using a Securities Identification Number.

- a The recommended numbering system is the standard International Security Identification Number (ISIN) that is twelve digits in length. The number is comprised of eight digits to identify the security, a ninth digit as a check digit, and a three-digit prefix to identify the country.
- b The check digit provides the ability to check the prior digits, thus helping to detect data entry errors including the transposition of digits.
- c The three-digit prefix identifies the country, Egypt in this case, in the event of international trading. Although not needed at this time, the system should be able to accommodate the prefix. Because it is a constant number, the prefix could be added readily to the first nine digits when needed.
- d The securities number must be publicized so that the market and system participants know the specific security that each number identifies. The use of published listings is advisable.

2 Securities Information Maintained

The system must be able to maintain the relevant data for each security. The data base must contain but is not limited to, the following information for each security on the system

- Securities Identification Number—a unique number for each security using the ISIN standard
- Securities Type—identifies whether this a bill or bond and any future type of security—a one digit code should be sufficient
- Securities Description—a narrative description of the particular security
- Issue Date—the date in dd/mm/yy form (assuming system implementation after the year 1999)
- Maturity Date—the same format as the above date
- Interest Payment Date (for bonds only)—the same format as the above date
- Interest Payment Rate (for bonds only)—using xx xxx format
- Minimum/Multiple to transfer and to hold securities—this could be used to eliminate impractical small, fractional amounts
- Total Outstanding Balance—the total amount actually issued—this is an important control number
- Authorized Outstanding Balance—the total amount authorized to be issued for that particular security (this is an optional field that can be used to verify that the Total Outstanding Balance does not exceed that authorized)

3 Adding New Securities

The system must be able to accept information concerning new securities to be added to the database and must be capable of changing information on existing securities

- a The MOF must provide to the CBE advance notification of the necessary information regarding the new security to be issued
- b The CBE must enter this information into the securities database several days prior to the issue date. The number of days prior should be decided by the MOF and CBE with due consideration to the lead-time needed by the securities market
- c When the database is updated, the system must be able to provide advance notification of new securities being offered. The information would include the Security Identification Number and other descriptive information. The notification and specific information would be decided by the CBE according to the market needs

4 Maintaining Accountability for Each Security

The system must maintain control of the securities balances *vis-a-vis* the Total Outstanding Balance maintained

- a When the securities are issued the system must establish the total outstanding balance for each security on the system. It must maintain the outstanding balance until the security matures and is redeemed.
- b The system must have controls that ensure that the aggregate of the detail of the holdings for that security (the security balance held in the subaccounts of banks) remains in balance with the Total Outstanding Balance for that security in the Security Information Maintained section.

B Bank Information

The system must retain information related to the securities owners (holders)—the banks

1 Bank Identification Number

The system must be able to uniquely identify each bank using a Bank Identification Number

- a The numbering system should be the established standard number used by the CBE for maintaining the banks' current accounts. Presumably it will be based on the numbering system used by the current Check Clearing System. Accordingly, it will be eight digits in length followed by a check digit that provides the ability to self-check the last digit of the number against the prior digits.
- b The number must uniquely identify each bank for purposes such as identifying securities owned (holdings), maintaining securities balances, and routing securities payments debits and credits to the appropriate funds (current) accounts.
- c The numbering system must be publicized so that the market and system participants know the specific bank that each number identifies. The use of published listings is advisable.
- d The numbers are the key identifications of the buyer and seller in transfer instructions and in securities transactions.

2 Bank Information

The system must maintain, and be able to access, specific information regarding each bank. The information should include but not be limited to

- Bank Identification Number—the key for system processing
- The full bank name—the official name used by the bank
- Abbreviated name—a shorter version of the name by which banks are frequently known and used to identify a bank
- Address—the mailing address

- Any restrictions on the activity of the account or securities account (subaccount) (This is an optional field, for possible future use by the CBE)

C Securities Account Structure

The system creates payment records to the banks' current accounts according to the Bank Identification Number. For securities, the system maintains record of securities holdings at the securities account level for each bank. It is recommended that the system set up five securities accounts (referred to as "subaccounts") for each bank to segregate its securities holdings.

1 Subaccount Designation

- The system must be able to identify banks' securities accounts (subaccounts) generically (e.g., Account 1, 2, etc.) and be able to identify them for specific purposes. Alternatively, an abbreviated descriptive code could be used (e.g., 'Reg' instead of '1', 'Cus' instead of '2' and 'Col' instead of '3'). Thus, it would require 10 or 12 digits to identify a securities holding account: nine digits for the Bank Identification Number including the check digit and a one or three digit code to identify the specific securities account (subaccount). Each securities account will maintain the total amount of each security held in that account.
- The recommended subaccount identifications and their purpose are as follows:
 - 1 or REG—the "Regular account for the banks' own securities holdings"
 - 2 or CUS—the "Customer account for the securities holdings of the banks' customers (in aggregate)"
 - 3 or COL—the "Collateral" account for securities pledged to the Central Bank
 - 4 for possible future use
 - 5 for possible future use

2 Securities Holdings (securities owned)

- The system must maintain the balance of the security held (owned) by each bank in its subaccounts (securities accounts).
- The holdings records maintain the total par amount of each security held by the bank; i.e., there is one record for each individual security held in a bank's subaccount.
- The securities holdings will be updated (added to or subtracted from) according to the information contained in the securities transaction.

3 Periodic Statements

The system must provide statements, in electronic and hard copy form, indicating the amount of securities held in each of the bank's subaccounts.

- These statements must be provided on a routine basis, at set intervals, as well as upon request.
- The statements must be produced and controlled at the subaccount level.

4 Collateral Accounts

The system must have the ability to reflect pledges of securities by the banks to the Central Bank of Egypt

- a The banks must be able to transfer securities into their collateral account (3 or "COL) from their own subaccount ("1 ' or REG)
- b The system must allow only the CBE to approve and release collateral to the bank s subaccount
- c The system must provide in electronic or hard copy form, to the CBE (pledgee) and the bank (pledgor), notice of any transaction that affects the balance in the collateral account
- d Periodically and upon request, the system must provide the CBE and the bank a statement of the securities pledged in the collateral account

D Fiscal Functions—Issuing, Paying Interest, and Redeeming

The system must provide the ability to process securities-related transactions from the initial issuance of the securities to their maturity and final redemption

1 Original Issue Processing

- a The system must maintain adequate controls to ensure that the securities that will be ' delivered to participants (banks and their customers) as original issues do not, in the aggregate, exceed the amount authorized by the MOF for that security (as maintained in the securities information data base)
- b When purchasing securities, the bank must specify the securities account (subaccount) to which a security will be delivered, and the current account to be debited with the payment. If the purchaser is a bank's customer, it should be so indicated on the securities transfer and the name of the customer should be included for informational purposes. It is not maintained in the holdings record within the "Customer subaccount (2 ' or 'CUS ')
- c On issue date, the system will "deliver the securities by (1) crediting the bank s subaccount (securities account) with the par amount of the securities bought and (2) debiting the bank's current account for the amount paid for the issue by creating a payment record
- d The system must create a debit payment record to the MOF account established for securities issued and considered ' outstanding. At the same time, the system must create a credit payment record to the MOF account with the amounts received from the sale
- e The total of the securities issued becomes the Total Outstanding Balance in the Securities Information record and is an important control in the system
- f The system must notify the banks, in electronic or hard copy form, of the securities credited and the funds debited to their accounts

2 Interest and Principal Payments

The system must have the ability to process interest and principal payments on behalf of the MOF to the securities holder of record

- a Based on the securities information records maintained the system must automatically determine when interest or principal payments are due and initiate the necessary processing to calculate the payment amounts
- b On the payment due date the system must generate payment records for each bank's holding in each subaccount, of the security paying interest or principal
- c Controls must be sufficient to ensure that the payments generated do not exceed the amount authorized in the securities information record
- d An advice of payments must be created and sent to the record holders and must provide the payment amount for each subaccount holding for that specific security
- e The system must provide detailed and aggregate accounting information to the CBE and MOF upon completion of the payments

3 Redemption of Securities

The system must have the ability to redeem or "pay down" securities on the same date that principal payments are being made

- a When principal payments are made (on the maturity date), the system must redeem the system by removing the securities from the appropriate subaccounts of the banks and notify the banks of their removal
- b In all instances, controls must be sufficient to ensure that the aggregate redemptions to be made will equal the control totals established for that security (as maintained in the securities information database)
- c The system must provide the CBE and the MOF with the aggregate amount of each security redeemed. This should be equal to the principal payments made

E Securities Transfers

The system must provide the banks with the ability to transfer securities from one of their securities accounts (subaccounts) to another bank's securities account. It must also be able to transfer securities from one of the bank's subaccount to another (see restrictions in Collateral Accounts section). Securities transfers update the securities ownership records.

1 Entering Transfer Instructions

The system must provide the CBE with the ability to enter securities transfer transactions on behalf of a bank based on the bank's instructions. This capability should be expandable so that in the future banks will be able to enter their own securities transfers through their own terminals connected to the CBE computer.

- a The system must provide the ability for the data entry of individual transfer instructions for immediate processing.
- b As an optional feature, the system could provide the ability to enter transfer instructions in advance of the settlement date—to be processed on the date specified. If this feature is provided, banks may desire to have the ability to correct and delete any advance transfer.

2 Editing Transfer Instructions

The system must perform various checks to assure the validity of the data.

- a The system edits and validations should include, but are not limited to, the following:
 - Verify the sending and receiving customer identification number.
 - Check for the presence of the subaccount from which the securities will be sent (subtracted) and a subaccount to which the securities will be received (added).
 - Verify that the customer subaccount (2 or ' Cus) is used, a third party name must be included in the instruction.
 - Verify that all required transfer data is present.
 - Validate the legitimacy of the securities identification entered against those known to the system.
 - Validate that there is sufficient inventory in the sender's account.
 - Check the reasonableness between the par amount of the securities and the payment amount based on parameters that have been set. (This is an optional feature that can be added at a later date as an additional settlement precaution.)
- b If there are errors in the transfer data, the transaction must be rejected and the rejection should be communicated to the seller and buyer.
- c To correct the error, the most practical approach is to reenter the entire transaction. (Otherwise, the transaction must be pended so that corrections can be updated to the pended transaction.)

3 Prior to Entering Transfer Instructions

The system must have the ability to differentiate between instructions received from the buyer from those received from the seller (A simple one-digit code should suffice i.e. B for the buyer and S for the seller)

The following functions may be performed manually at first by personnel from the CBE and automated at a later date

- a Securities transfer instructions from the buyer and seller must be compared against each other. A reference number used by both the buyer and seller is a useful method to help identify the same set of instructions
- b If both sets of instructions match, the securities transfer would be processed as described in the next section
- c If the instructions do not match the transfer, the transfer would be rejected back to the buyer or seller, depending on the error
- d Optionally, in the event of a 'non-match', the system may provide the ability to pend the transfer for a specified period of time and then be matched again later

4 Transfer Processing

Transfers may be from one bank to another, or between subaccounts of a single bank. Transfers between banks will generally be against payment. However, the system must be able to process securities transfers free —without payment amounts. Free transactions are generally between different subaccounts of the same bank. They in effect are repositioning securities between the bank's account and its customer account.

- a If against payment, the updating of securities ownership records (holdings) and the creation of payment records must be processed concurrently
- b Upon successful validation of a securities transfer, the system must subtract securities from the sender's subaccount holdings and simultaneously add securities to the receiver's subaccount holdings, i.e., update the securities records
- c Concurrent with the securities updates, the system must create records of the payment amounts to effect the debits and credits to the banks' current accounts
- d The system should "stamp" each transaction with the date and time the securities accounts were updated
- e The system must provide confirmation to the sender and receiver for each securities transfer in hard copy and/or electronic form
- f The system must provide for each bank the opening and closing balances for each security that had activity during the day. It should include the security balance before and after the securities transaction took place

5 Repurchase Agreements (Repo)

Certain securities transfers are conducted under repurchase agreements (Repos) wherein one participant (the sender) is selling securities to another participant (the receiver) under an agreement to buy back the securities at a later time. On the return date, the original receiver transfers the securities back to the original sender.

- a The book-entry system is not required to perform special processing for Repo transactions. However, given the importance of the Repo market, it would be useful to the banks if the system identifies transfers that represent repurchase transactions (Repos).
- b The identification of a Repo could be accomplished by allowing a separate transaction code to identify such transactions, but be processed in the same manner as regular securities transfers.

F Administration and Control

The system must provide various types of administrative and informational functions.

1 Inquiries and Reports

The system must provide CBE operating personnel with the ability to perform on-line inquiries to retrieve information from system databases.

- a The inquiry function must provide information from any system data base including
 - securities descriptive information,
 - bank descriptive information,
 - the status of securities transfer, and,
 - balances of securities held by banks in each subaccount, before and after transactions have taken place.
- b The system must provide the ability to inquire and retrieve statistical and historical data related to banks and securities.
- c The system must provide statistical and management information reports on transactions and securities holdings.
- d The system must have the capability to retain statistical information as it relates to the processing of securities.

2 Audit Capabilities

The system must provide auditing capabilities to facilitate the reconciliation of system databases. In this regard, backup tapes or disks need to be created daily.

- a The system must provide the ability to track each transaction, database change, and payment from the original entry of data to the completion of processing.
- b The system must maintain records for a period of time to be specified by the CBE in order to determine (1) beginning balances, (2) transactions, which affect the banks accounts, and (3) closing balances by transaction date.

VI Security Provisions

The book-entry system maintains records of securities ownership and as such should be treated with every precaution. The computer record represents securities and therefore should be thought of as a commodity with value. Additionally, all data should be treated as highly confidential because such information is of value to market participants.

A Physical Control

The computer room should be in an enclosed restricted area and access to the computer room should be restricted to authorized personnel only.

Because many computers are compact and portable, extra diligence is required. Also, information can be easily recorded on disk, diskettes, or magnetic tape. These devices and storage media can easily be hidden from view and removed from the premises.

B Data Backup

Program and data files should be backed up daily and placed in a secure storage area. It is advisable to store a second backup copy off premises.

C System Access

The book-entry system must have password protection to limit access to the system to authorized users only. Additionally, major system functions (data entry, error correction, etc.) should be restricted to specific authorized staff members.

D Data Entry

Extra precautions should be taken when entering data on behalf of banks since the transaction affects securities and funds—both valuables.

It is advisable to have a second person verify the data that is entered. Sight verification is an acceptable form of verification. However, the dual entry of data is advisable wherein a second person would re-enter the information. The data entered by the two persons could then be compared by the computer prior to its release to the book-entry system for processing.

The above comments are an overview of the type of security that should be emphasized when installing the book-entry system. Although some security provisions are already in place at the CBE, the various types are summarized here as a checkpoint of the various precautions that should be taken. The book-entry system is one where maintaining data integrity is an absolute necessity within the system and in its physical surroundings.