CHAPTER IV

DEVELOPING A FINANCIAL FORECASTING MODEL

To accomplish the objectives of the study a conceptual model of corporate financial forecasting is formulated in this chapter. Based on the same, three operational models are then developed. This is followed by a description of computer routines and properties of the financial forecasting model. Finally computer realisation of the financial forecasting model is discussed.

Conceptual financial forecasting model

The basis underlying the conceptual model of financial forecasting rests upon the dynamic planning behaviour of a firm as discussed in Chapter III. It also assumes that the model should be capable, at least to some extent, of implementation in a real world setting. The conceptual financial forecasting model is sketched in Figure 2.

As described in Figure 2 the design and implementation of the general conceptual financial forecasting model may be described in four phases. They are as follows:
A CONCEPTUAL FINANCIAL FORECASTING MODEL

Given: Measures of financial performance, and initial conditions in year t.

Forecasting costs and prices in years t, \( (t + 1), \ldots, (t + k) \)

Running the model to obtain the results of the product-mix policies and comparing the results to select a policy for implementation in the year t.

Formulating multiperiod product-mix policies for a horizon of \((k + 1)\) years on the basis of expected prices, costs and other relevant factors.

Implement the plan for the current year, analysing the results and making adjustments.

Update data and revise forecasts of costs and prices in years \( (t + 1), \ldots, (t + k + 1) \).
Phase one: Establishing measures of financial performance

Different firms at different stages pursue different goals. The appropriate measures of performance depend upon the goal of the firm. For the purpose of this study financial performance is measured in terms of earnings before taxes, net current assets, reserves and surplus and cash balance.

In a business the model building process starts suddenly in a particular year. In phase one, the initial conditions i.e., the conditions with which next year budget or long range corporate plans to be drawn are clearly specified. The initial conditions include variables such as stock of goods, opening cash balance, and other balance sheet items.

For any given period of time a textile mill is expected to have in mind a long-term plan for achieving its goals. The long-term plan is formulated on the basis of single valued expectations or forecasts about raw material and product prices (cotton, yarn and cloth). This plan is not likely to be carried out for the entire planning horizon, because forecasts being the manipulation of past figures or subjective estimates are subject to errors. As experiences are gained new information becomes available and forecasts are revised over time. As time passes on, goals, policies and environment change. Accordingly corporate plan must
also be revised. Hence it is reasonable to assume that a textile mill at the beginning of each year, formulates a long-term corporate plan as the basis for formulating the annual plan for implementation in the current year. Such a long-term or annual plan is known as ex-ante plan and the forecasts are known as ex-ante forecasts.

Since profitability of each product differs, alternative product-mix policies are drawn up for evaluating and selecting the best policy for implementation during the planning horizon as well as in the current year. The best plan is one which gives the highest mean value for the specified measures of financial performance.

Phase two: Running the model to get the results of alternative product-mix policies

Each ex-ante plan as formulated in phase one is implemented in a computer with the appropriate simulation programs. Since the single valued forecasts are subject to errors, error values for each random variable are generated and the results are obtained in terms of goals or selected measures of financial performance. The actual prices of raw materials and finished products may be different from forecasts. Therefore, the experiment is repeated or replicated a number of times and results may be obtained
on the average or the expected basis. This is possible with a computer simulation model. Replications will average out the effects of unusual or extra-ordinary happenings occurring for any single replication.

**Phase three: Implementation of the selected product-mix policy and analysis of results**

Having selected the best or a suitable product-mix policy for the planning horizon the firm takes action to implement the plan for the current year. The actual results may turn out to be different from ex-ante financial forecasts. This is likely to be true for several reasons. Due to change in government policies, power shortage, economic situation, changes in supply and demand for raw materials and finished goods, the current plan might have been adjusted during the course of implementation. Capital expenditure or investment decisions may not be the same as assumed for the corporate plan.

**Phase four: Revision of forecasts and ex-ante corporate plans**

At the end of the year, the current period plan becomes a realised or ex-post plan. The textile firm has gradually accumulated knowledge and experience and is thus
in a position to re-run the forecasting model. The actual
data for costs, prices, productivity and the like are updated.
The forecasting model is run and new forecasts are obtained.
Again alternative product-mix policies are drawn based on
changes in costs, prices and other conditions and ex-ante
corporate plans are reformulated over a new planning horizon.
After a year is completed that year gets removed from the
planning horizon and the year succeeding the last year of
the previous planning horizon is added. When the process
is repeated year after year, the time path of the firm's
financial performance can be traced.

An implication of the financial forecasting model
as described in the foregoing phases is that the process of
changing or moving the business activities of a textile mill
from one point in time to other is of primary concern. The
process of moving from period to period coupled with the
problem of uncertainty of cotton and yarn prices and the
incorporation of these aspects in the financial forecasting
model make the model of the firm dynamic, stochastic and
predictive.

Operational financial forecasting models

The financial forecasting simulation model consists
of three distinct but inter-related sub-models as discussed
The price forecasting model

In this study, forecasts of prices of raw cotton and yarn were made using simple regression with time as an explanatory variable, double exponential smoothing and triple exponential smoothing. These three forecasting techniques were chosen based on an experimental approach.

Cotton consumed in the mills for spinning yarn are classified into five categories viz., 20s, 40s, 60s, 80s and 100s counts (count refers to category of yarn). Sufficient data were collected to calculate annual average prices of cotton and yarn for each count. Five forecasting techniques were considered for the purpose of forecasting namely, simple regression, exponential smoothing (single, double and triple), adaptive response rate exponential smoothing, Winter's method of exponential smoothing and adaptive filtering. The following approach was used to select suitable forecasting techniques:

For each forecasting technique, other than adaptive filtering, results for each of the ten variables were printed showing actual, forecast, square of errors, sum of forecasts, sum of errors squared, mean squared error and the parameters of the equations. For adaptive filtering, only forecasts and
parameters of the equations are printed along with the mean squared error for each iteration.

Adaptive filtering and Winter's method need specifications of seasonality coefficients. To obtain these, a preliminary analysis of price data was made with the help of correlation and autocorrelation analysis. It was found out that a seasonality of three years (time lag of three years) existed in cotton and yarn prices.

In simple regression, time is taken as an explanatory variable. In the case of exponential smoothing, the smoothing constant (i.e., the alpha value) was changed from 0.1 to 0.9 in steps of 0.1 in order to select the best alpha value giving the least mean squared error. In the case of adaptive response rate exponential smoothing the initial smoothing constant is specified. The alpha value gets changed from forecast to forecast by an inbuilt equation. In Winter's method the values of the smoothing constants were changed from 0.1 to 0.9 in different combinations to select the suitable smoothing constants. Adaptive filtering was run by changing the necessary input parameters for given levels of accuracy.

After getting the computer print out for each forecasting technique, comparative results were tabulated
manually. Both mean squared error and forecasting ability were considered in choosing the suitable forecasting technique for the purpose of this study. Following this criteria it was found that simple regression was best suited for forecasting cotton prices and triple exponential smoothing with an alpha value of 0.2 for forecasting yarn prices (excepting 100s count for which double exponential smoothing had given good results with an alpha value of 0.3).

The cotton and yarn price fluctuations are of crucial importance to decide the profitability and stability of the cotton textile industry in India. Any financial performance forecasting system/model has to take into account this factor. It is argued in the textile industry circles that yarn prices do not increase in sympathy with increase in cotton prices. It is also true that the cost of stores and spares, power and fuel, chemicals and the like have increased to a considerable extent in the past ten years. Due to increase in the cost of living index, the labour cost is also increasing steadily year after year.

The profitability of different products differ in the textile industry. To maximise profits, a textile mill has to plan its product-mix. Change in profitability necessitates changes in product mix. Since price fluctuations are random, the fluctuation in profits are also random. A mill
has to select a suitable product-mix from among the alternatives. Planning the product-mix in a dynamic and uncertain price situation is very complicated. Computer simulation models offer a new tool to deal with this problem.

In economic reality cotton and yarn prices are influenced by a large number of factors in a developing country. Some of the factors may not be known even to the person most acquainted with the relationship being studied. Even when known to be relevant, some factors cannot be measured statistically. Some factors are random appearing in an unpredictable way so that their influence cannot be taken statistically into account and for some factors data may not be available. Moreover, there may be errors of measurement in the factors chosen for forecasting the cotton and yarn prices. These factors are accommodated in the computer simulation model through inclusion of stochastic error terms in the price forecasting equations.

An analysis of historical data on cotton and yarn prices had shown that there were unexplainable variations in the series. According to Bushoff and Sisson (1, p.169), "If historical data or direct observation suggests that unexplainable variations exist in the value of some phenomena, then the phenomena should be represented in a simulator as a stochastic process. The term unexplainable
as used here means that the analyst is unable or unwilling (e.g., for economic reasons) to seek a deterministic cause for the phenomenon." According to Donald Watts (2, pp. 172-173) "Parametric modelling attempts to discover the structure of a time series so that the residuals, after fitting the model, are purely random or white noise. All the information conveyed by the time series has thus been extracted so that a future observation is composed of a forecast value plus an unpredictable white noise term... Providing simulation inputs, however, is best done using a parametric approach." In the light of this observation only time series models were used for forecasting cotton and yarn prices.

Forecasting cotton prices: Simple Regression

Regression is a statistical model of fitting a line through data to minimise squared error. Usually least squares econometric method is used to arrive at the parameters of the forecasting equation. The actual value of time series is represented by the forecasting equation

\[ Y_t = a + bx_t + e_t \]

where,
- \( Y_t \) = actual value at time 't'
- \( a \) = a constant
- \( b \) = the rate of change
- \( x_t \) = the value of the explanatory (time) variable
- \( e_t \) = a stochastic error term.
The error term is assumed to be normally distributed with zero mean and standard deviation equal to the standard error of the forecast/regression. The random disturbance term "e" is introduced into the equation to take into account the influence of various errors such as errors of omitted variables, errors of mathematical form of the model, errors of measurement of the dependent variable and other unobservable phenomena. Time was taken as an explanatory variable in the least squares econometric model for forecasting cotton prices. This implies that the cotton prices are linearly related to time plus a certain value as determined by the distribution of the stochastic error term. This is true when the following are considered.

The cotton prices cannot come down below a certain minimum level in the long run. The Government of India fixes the minimum procurement price payable by the cooperative and governmental agencies in purchasing cotton direct from the farmers. The cost of cultivation of cotton increases due to increase in input costs. The Government of India takes into account this cost inflation while working out minimum procurement price. Due to pressure from farmers' organisations, political ideologies and increased cost of cultivation, the Government is compelled to increase the procurement price year after year.
Hence, linear relationship among the cotton prices and time holds good. However the actual prices vary depending upon various factors. The random fluctuations are taken care of by the inclusion of the stochastic error term.

Forecasting yarn prices: Exponential smoothing

Exponential smoothing had given good results with the least mean squared error and forecasting ability. This is so because exponential smoothing takes into account the trend and also the seasonal variations. "Exponential smoothing is a model that has been widely accepted by corporations using computer software. For example both IBM's IMPACT and HONEYWELL's FORECASTER use exponential smoothing as their base due to the mathematical characteristics of exponential smoothing (3)." When implemented in a computer exponential smoothing requires the minimum storage space. IBM's PLANCODE (4, p. 26), IBM's PSG and Social system's SIMPLAN (6, pp. 380-381) Planning software packages also contain routines for exponential smoothing due to its familiarity and suitability for business forecasting.

Through experimental approach in forecasting yarn prices it was found out that double exponential smoothing was suitable for forecasting the price of 100s count yarn
and triple exponential smoothing for other varieties. The method of exponential smoothing is based on averaging (smoothing) past values of a time series in a decreasing (exponential) manner. Double exponential smoothing takes into account the linear trend in the data, whereas triple exponential smoothing takes into account the seasonality also in addition to trend.

The forecasting equations are of the form

\[ Y_{t+T} = a_t + b_t T \] in the case of double exponential smoothing and,

\[ Y_{t+T} = a_t + b_t T + a_t T^2 \] in the case of triple exponential smoothing where,

\[ Y_{t+T} \] is a term representing a forecast of the price 'T' periods into the future and \( a_t \), \( b_t \) and \( a_t \) are the coefficients of the forecasting equation. Detailed discussion of calculation of the coefficients are given in Sullivan and Claycombe (7, pp. 91–99). Since the simulation model is designed to be a stochastic one, in order to take into account the reality and to afford flexibility, the forecasting equations are modified as follows:
\[ Y_t + T = a_t + b_t T + e_t \text{ in the case of double exponential smoothing and} \]

\[ Y_t + T = a_t + b_t T + c_t T^2 + e_t \text{ in the case of triple exponential smoothing.} \]

where \( e_t \) is a stochastic variate affecting the yarn prices in time period \( t \). It is assumed that \( e_t \) is normally distributed with calculated mean and standard deviation of residuals. Cloth price was forecasted using a non-stochastic simple regression model.

An autocorrelation analysis of residuals for cotton and yarn price forecasts had shown that the residuals were not autocorrelated. Correlation coefficients of forecast errors of cotton and yarn prices were calculated separately. It was found that error values of different forecasts were positively related to each other in varying degrees. This had necessitated calculation of a variance-covariance matrix for feeding into the multi-variate normal distribution routine to generate stochastic error values.

**Forecasting other items of cost of production**

Apart from raw materials cost, all the items of costs incurred in a textile mill are classified as under:
1. Salaries & wages
2. Power & fuel
3. Stores & spares
4. Repairs & maintenance
5. Processing charges
6. Depreciation
7. Selling, administration & general expenses
8. Interest
9. Miscellaneous expenses

Only deterministic forecasts were made for these items. Since the model was applied to the NTC (TN&K) Ltd., forecasts were all based on the Corporation's situation. A brief description of forecasting each item is given below.

Salaries and wages include all costs incurred in connection with manpower. Bonus and gratuity provisions were assumed to be a certain percentage of salaries and wages excluding bonus and gratuity. By analysis it was found out that salaries and wages are related to installed capacity. This is evident from the fact that there are certain standards for employment of labour which are expressed as number of employees per thousand spindles capacity. In the Indian environment labour cost is fixed. Even if there is low capacity utilisation workers cannot be
sent out. There can only be temporary lay-off. Therefore it is quite natural that labour cost is related to commissioned spindles. In the case of cotton mills one loom is taken as equivalent to fifty spindles as per norms established by the South India Textile Research Association, Coimbatore. With seven year data, salaries and wages were calculated per spindle for each year. Since labour cost was increasing year after year simple regression was used to forecast salaries and wages into the future. The forecasting model automatically takes care of increase in wage rates.

Power and fuel, stores and spares, selling, administration and general expenses were related to spindle-shifts worked. Hence these items of cost were calculated per thousand spindle-shifts worked for each of the past seven years. Simple regression was used to forecast the future cost.

Repairs & maintenance and depreciation were worked out as a percentage of gross fixed assets. Average percentage of the past seven years is taken as the rate for repairs & maintenance and depreciation.

Processing charges are incurred mostly for cloth. It refers to Bleaching, Dyeing and Printing expenses. Processing charges were expressed as a function of the output of cloth. Simple regression was used to forecast processing charges.
Interest consists of payment on long-term and short-term loans. Interest rates for the past were known. For future suitable assumptions are made regarding the interest rate. Miscellaneous expenses include mostly investment allowance. Investment allowance is a certain percentage of addition to plant and equipment as per Indian Income Tax Laws. Future miscellaneous expenses are estimated based on future capital expenditure programme.

Forecasting productivity

A simple regression model was used to forecast output of cloth per loomshift. Countwise output of yarn per spindle shift was estimated based on actual and expected output in the future. Excepting these two items, other aspects of productivity are not considered.

The financial forecasting simulation model

The simulation model in this study simulates financial performance. Financial performance of a business is measured and evaluated through a set of financial statements. Balance sheet or a statement of financial position reveals the financial position of a business as at the end of the year. It shows the firm's assets, liabilities and capital funds of
the owner. Profit and loss account or income statement shows the results of activities of a firm during a particular period. These are the two statements through which the dynamic changes in a firm are shown and evaluated ultimately.

The computer simulation model consists of a number of routines or modules. The components of the simulation model are grouped into a number of modules. They are cross-referenced to the flow chart (Figure 3) by numbering categories of the components and modules within the flow chart. The main program causes the computer to read values of the variables, parameters and initial conditions. Since data from the main program are used by many subroutines several times during the running of the model, the program is prepared in such a way that there is transfer of data from the main program to subroutines and vice-versa. This is possible through insertion of common statements.

The main program calls six subroutines. Each subroutine computes values of certain variables and returns them to the main program whenever it is called. The simulation model simulates the financial performance for the past six years for validation purposes and another five years into the future to evaluate the profitability of alternative product-mix policies. It also contains routines for printing the output variables for each year of the
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Main Program "FORCAST"

Start

Reserve storage arrays

Read values of variables, parameters and initialise variables

Call subroutine "INSTAT". This routine generates income statements items.

Call subroutine "HRAC". This routine computes raw materials cost

Call subroutine "SALES". This routine computes sales

Call subroutine "CASHF". This routine generates cash flow items

Call subroutine "CACL". This routine calculates current assets and liabilities

Call subroutine "LABT". This routine calculates Balance Sheet items

Print average values of output variables

Print values of output variables

End
SUBROUTINE "SALES"

Start \rightarrow Reserve storage arrays \rightarrow Retrieve data from the main program

Calculate sales value (SL5) \rightarrow Calculate selling price (SEPT) of yarn by adding error values to the forecasts \rightarrow Call Subroutine "AVN" to generate error values (ER 1)

Print error values (ER 1) \rightarrow Return
SUBROUTINE "RMC"

Start

Reserve storage arrays

Retrieve data from the main program

Calculate raw materials cost (RMC)

Calculate price of cotton (RMPT) by adding error values to the forecasts

Call subroutine "MVN" to generate error values (ER 2)

Print error values (ER 2)

Return
FIGURE 6

SUBROUTINE "INSTAT"

1. Start
2. Reserve storage arrays
3. Retrieve data from the main program

- Calculate earnings before taxes (EBT)
- Calculate cost of goods sold (CGS), cost of sales (CS) and total cost (TC)
- Calculate closing stock of finished goods (CSFG)

- Calculate provision for taxes (CPTAX)
- Calculate provision for dividend (CPDIV)
- Return
SUBROUTINE "CASHP"

Start → Reserve storage arrays → Retrieve data from the main program

Calculate closing creditors (CLCRs) → Calculate closing stock of raw materials (CSMRL)

Calculate total cash receipts (TR) → Calculate total cash payments (TP) → Calculate closing cash balance (CCLRB)

Return
SUBROUTINE "CACL"

Start → Reserve storage arrays → Retrieve data from the main program

Return → Calculate current liabilities (CL) → Calculate current assets (CA)
FIGURE 9

SUBROUTINE "BALLOT"

Start → Reserve storage arrays → Retrieve data from the main program

Calculate closing reserves & surplus (CRSS)

Calculate total liabilities (TL)

Calculate total assets (TA)

Return
FIGURE 10

SUBROUTINE "MVN"

Start → Reserve storage arrays

Retrieve data from the main program and through arguments from the calling program

Calculate stochastic error values (ER 1 & ER 2)

Call subroutine "GAUSS". This routine provides random normal variates

Call subroutine "HINV". This routine inverts the variance-covariance matrix

Return.

Call subroutine "RNDU". This routine provides random numbers
replication. The experiment is replicated fifty times each for ex-post and ex-ante simulation. After each run or replication is over the values of the output variables of that run as well as the average of all the replications (previous runs as well as the current run) are printed.

Sales (SLC) module (Figure 4)

This module generates sales. Sales consists of two items. One is sale of yarn which is calculated by the subroutine "SALES". The other is cloth whose sales are estimated by taking into account the loomshifts, output per loomshift and forecasted selling price of cloth. The sales of cloth (CTHS) is added with yarn sales to arrive at total sales. As already discussed, yarn prices are assumed to be stochastic. This sales routine calls another routine "MVN" (Multivariate normal distribution) for getting values of stochastic error term (Ex 1). The generated error values are added with forecasted selling price and sales value is computed.

Raw materials cost (RMC) module (Figure 5)

The subroutine "RMC" is concerned with computing raw materials cost (RMC). Based on commissioned capacity and utilisation, spindleshifts worked are arrived at. Allocation
of spindleshifts for each count of yarn is specified. Using the output per spindleshift total expected output of yarn is computed. With the help of cotton-to-yarn conversion ratio, required quantity of cotton is computed and fed into the computer. Stochastic error values (ER2) are generated by calling subroutine "MVN" to obtain cotton price and the cost of raw materials is returned to the main program.

Income statement (INSTAT) module (Figure 6)

The variables which are used in the model are classified into two categories. One is, those variables whose values are fed into the computer through the main program and the other, the variables whose values are computed or generated by the computer routines. The income statement module is contained in the subroutine "INSTAT". It takes certain data from the main program and computes closing stock of finished goods (CSFG), cost of sales (CS), earnings before taxes (EBT), provision for taxes (CPTAX) and provision for dividend (CPDIV). It supplies earnings before taxes to the main program before return.

Cash flow (CASHF) module (Figure 7)

This module is concerned with calculating cash balance (CLOB) at the end of each year. The subroutine "CASHF" takes
data from the main program and calculates total receipts (TR), total payment (TP) and ending cash balance as per the equations contained in the subroutine.

Current assets and current liabilities (CAACL) module (Figure 8)

The subroutine "CAACL" computes the values of current assets (CA) and current liabilities (CL). Current assets include cash balance (CLCB), inventory of raw materials (CSRM), finished goods (CSFG) stores and spares (CSS), closing debtors (CDRS), advances (CLADV) and miscellaneous current assets (CCA). Current liabilities include sundry creditors (CLCR), provision for bonus and gratuity (CLPBG), provision for income taxes and provision for dividend.

Balance sheet (BALST) module (Figure 9)

The subroutine "BALST" computes total assets (TA) and total liabilities (TL). Assets consist of net fixed assets (FAN) current assets (CA) and miscellaneous assets (TMA). The miscellaneous assets represent mostly accumulated losses in the ex-post simulation and zero in the case of ex-ante simulation. Liabilities include, share capital (CPTL), long-term loans (CLT), short-term loans (CST) and current liabilities (CL). This routine also calculates reserves and
surplus (CRS). Share capital, long-term loans and
short-term loans are estimated and fed into the computer
through the main program. In ex-post simulation they refer
to the actual figures and in the case of ex-ante simulation
they refer to estimates.

The subroutine "MVN" (Figure 10) is used to generate
stochastic error values in a multivariate normal distribu-
tion context. This routine is called by subroutine "SALES"
and subroutine "RAND". Each time "MVN" is called the
routine supplies five error values to the calling program
since there are five price variables in the calling
subroutine. Multivariate subroutine makes use of the
subroutine "GAUSS" which generates random normal variates.
Subroutine "RAND" provides uniform random numbers to the
"GAUSS" subroutine. The arguments in the subroutine "MVN"
provide the mean and standard deviation of the distribution.
Error values are calculated by taking use of the random
normal variates and variance-covariance matrix of forecast
residuals. "MVN" also makes use of a routine "MINV" to
invert the variance-covariance matrix.

After calculating values of all the response
variables for each year for each replication the main program
causes the computer to print the values of the generated
output variables. They are printed in a matrix form, the
columns representing the years and the rows representing the items of variables. After printing the output variables for each replication the main program calculates the average value of each variable for each year for all the previous replications including the current one.

Properties of the computer simulation model

Having described the structure of the model, some of the properties of the simulation model are discussed below:

First, the overall simulation model can be regarded as a system which possesses recursive dependency. The model developed here is recursive or causally ordered models. By replacing the equations of the model in the proper order, it is possible to solve each equation one at a time by substituting the solution values of previous equations into the right hand side of each equation. Given the initial conditions (opening stock of raw materials, finished goods, cash balance, net fixed assets and the like) and the product-mix policy, the computer simulation model generates the solution. By repeating the process year after year the time path of the financial performance variables are generated.

A simulation experiment is actually a dynamic representation of the response (a process) achieved by moving
the simulated model through time. Most of the variables in the simulation model are time dependent enabling the model to describe the dynamic characteristics of the firm's financial structure. The recursive inter-dependency makes the model dynamic because variables at different points of time are involved in the model in an essential way.

Secondly, computer simulation is actually a type of experiment. Experimentation involves replication or repeated observation. Since the simulation model developed here is stochastic, replication is possible. This is done by generating values of stochastic error terms through pseudo-random number generator. Since it is an experiment it makes experimental design and statistical analysis applicable to analyse the results obtained from the simulation experiment. The experiment here is used to evaluate the profitability of alternative product-mix policies. Techniques of data analysis like analysis of variance, multiple comparison and multiple ranking can be readily used with simulation generated data.

Thirdly, the simulation model developed in the study is, in general, a descriptive and predictive model. These are understood by the fact that the model describes the financial performance process and is used to forecast future performance. It also involves behavioural equations. The
Recursive feature of the simulation model makes it possible to estimate changes in the financial performance sequentially over time and then to generate the time path of performance variables several years into the future. The predictive ability of the model is also characterized by the fact that the model makes use of the econometric least squares estimation techniques and exponential smoothing which are viewed as forecasting systems predicting cotton and yarn prices.

Computer realization of the financial forecasting model

The operational models developed in the study are computerised in order to obtain solutions for the financial performance problems. The cotton and yarn price forecasting models were developed using a scientific micro-computer (HCL 1800). The programs were written in standard BASIC language. Some of the basic analysis like correlation and autocorrelation analysis were also made using a desk top micro-computer (DOM Spectrum).

Finally, the comprehensive simulation model was implemented in a 256 K Bytes Digital Equipment Corporation's PDP 11/70 computer system by writing programs in Fortran IV plus. (Fortran IV plus is an improved version of standard
Fortran IV for use in PDP 11/70 system). Price forecasting models are not linked to the final simulation model because they were implemented in different systems. Hence necessary data were fed through the simulation programs. The simulation experiment was conducted in the same sequence as depicted by the flow charts exhibited in this chapter. Analysis of simulated data was made manually due to non-availability of computer time and also due to economic considerations.

References


