CHAPTER I
INTRODUCTION

The Indian cotton textile industry presents a case of fluctuating fortunes arising out of uncertainties and managerial failures. This is evident from the number of textile mills which have fallen sick in the country. To correct such a situation the industry, being the largest one, calls for a planned approach to tap such policy areas which may yield better results. Some of the policy areas which need special attention are the selection of a suitable product-mix, timely expansion and modernisation, optimization of raw material mix and the application of cost control techniques. Among these, the selection of a suitable product-mix ranks the foremost since it influences the capacity utilisation and profitability. This has added significance due to the fact that such a decision is made under unpredictable fluctuations in raw material costs and prices of finished goods, especially yarn.

The cotton textile industry provides direct employment to about 0.9 million people and indirectly to several million people (1, p. 74). It contributes significantly to the growth and development of other related industries such as textile machinery, dye stuffs and chemicals. In recent years, the National Textile Corporation Limited (NTC) has been growing in relative
importance in the textile industry of India. This is reflected by the rapid expansion of textile production by the NTC. Turnover of the NTC mills in 1980-81 stood at Rs. 5760 millions which is 20 percent of the value of turnover of the industry as a whole(2, p. 5).

The increasing importance of the NTC can be explained by a number of factors. First, the number of sick mills have been increasing, resulting in aggravating unemployment on the one hand and reduced availability of yarn and cloth on the other. These sick mills were later on nationalised and taken over by the NTC. Secondly, NTC is looked upon as the single major competitor in the textile market. Finally, the NTC has assumed the major responsibility to implement the Government policy of providing cheaper cloth to the masses. In fact it is called the "Clothier of the Nation". The NTC since its inception in 1974, has registered a rapid increase in production which has been accomplished on account of modernisation and expansion. Today the NTC ceases to be "a hospital of sick mills" since it is emerging as an efficient profit yielding organisation in the public sector.

Statement of the problem

The textile industry is subject to the fluctuating fortunes due to market uncertainties. It has reduced the
profitability and internal generation of funds for modernisation and expansion. Such fluctuating fortunes should not be left to the winds of chance. It calls for systematic forecasting and planning.

Accompanying the problems and rapid growth of the cotton textile industry in general and the NTC in particular over the past several years there are a number of researchable questions over which the industry, Government, financial institutions and researchers are concerned. The most significant questions may be:

1. What is the impact of alternative product-mix policies on financial performance under random variations in costs and prices?

2. As firms expand institutional borrowings become necessary. Consequently textile firms and capital-lending agencies may be interested in knowing what would be the potential performance under alternative capital structures?

Answers to these questions are to be found for future planning in the textile industry. It requires a suitable financial model of corporate planning process and policy evaluation.
Objectives of the study

A textile firm has to face uncertainties in the raw cotton and yarn markets. These market uncertainties have decisive influence over formulation and implementation of corporation plans, financial control techniques and product-mix policies. The ultimate survival and prosperity of a firm depends on profitability and financial strength. Financial statements like Balance sheet and Income statement are the media through which the impact of dynamic changes in the working of a firm are evaluated. A firm has to prepare correct and timely financial reports for various purposes. These requirements have made the introduction of computer based financial forecasting imperative.

Product-mix decision is a major and significant problem in textile industry because such a decision is made under random variation in the prices of cotton, yarn and uncertain demand for cloth. According to Radhakrishnan (3, p.113) "Product-mix and profitability is a subject of paramount importance to the textile industry, but it has remained largely unexplored and untapped." An attempt has been made in this study to build a computer simulation model to evaluate the impact on profitability of alternative product-mix policies. The effort is centered on developing
a research technique and developing a model to describe and predict the financial performance of a textile firm under uncertain costs and prices. To meet the requirements of the study the following objectives are framed:

1. To study the problems and financial performance of the National Textile Corporation (Tamil Nadu & Pondicherry) Limited.

2. To construct a computer oriented financial simulation model for the cotton textile industry in general and the National Textile Corporation (Tamil Nadu & Pondicherry) Limited, in particular.

3. To explore the applicability of the financial forecasting model in analysing the impact of product-mix policies under conditions of random variations in costs and prices.

Hypothesis

With a view to analyse the third objective further, certain alternative product-mix policies are considered. They are:

1. To retain the existing product-mix (Policy-A).
2. To change, progressively laying emphasis on higher counts (Policy-B).
3. To change, progressively laying emphasis on lower counts (Policy-C).

To test the impact of these alternatives on profitability a hypothesis "that the expected financial performance is equal to each other of the three alternative product-mix policies" is set out.

Scope and coverage of the study

The researcher has not come across any study involving development and use of stochastic financial forecasting model of a textile mill to evaluate the impact of alternative strategies under uncertainty. Hence the present study may be considered a contribution to the advancement of knowledge in the use of corporate modelling and computer simulation experiments in the area of financial forecasting in Indian industries in general and the cotton textile industry in particular. The model possesses the following features:

First, the study intends to simulate future financial performance of the textile industry. Hence the research effort has been directed towards constructing a descriptive-predictive model of financial planning and evaluation.
Second, since the model is expected to generate future financial performance over a number of years under uncertain costs and prices the model is a dynamic and stochastic one.

Third, since the model is to be applied in a real world setting it is designed to fit empirical investigations to obtain the results. Results are obtained through mathematical, statistical and computer operations.

Lastly, the model is constructed in such a way as to have a continuing value as a tool for analysing other types of businesses as well.

The model is applied to the National Textile Corporation (Tamil Nadu & Pondicherry) Limited (NTC (TN&P) Ltd.) which is one of the nine subsidiaries of NTC. The NTC (TN&P) Ltd., was selected for the study for two reasons. In the first instance, records and executives are easily accessible to the researcher, being in the same place where the researcher works. Secondly, NTC (TN&P) Ltd., was interested in developing a model of a textile firm which can be modified later on to suit its requirements.

The NTC (TN&P) Ltd., owns twelve mills in the State of Tamil Nadu and one mill in the Union Territory of Pondicherry. Only consolidated data of all the 13 mills
available at the head office of the subsidiary at Coimbatore were used for the study. The NTC (TN&P) Ltd., also manages another mill viz., Sri Sarada Mills which is not directly owned. Hence, it is omitted for the purpose of this study. Six mills are composite and the rest are purely spinning units.

Time horizon for the study

The NTC (TN&P) Ltd., was registered in 1974, the first accounting year being 1974-75 (April 1 to March 31). The equations and parameters estimated were based on seven year data (1974-75 to 1980-81). The time period covered in the study is broken into two parts. The first part is from 1974-75 to 1980-81 which is used for the purpose of constructing the model and ex-post forecasts for validation purposes. The financial situation at the end of the year 1974-75 was taken as initial conditions for ex-post simulation. The actual performance data were rearranged and presented for six years from 1975-76 to 1980-81. The ex-post forecasts were made through a suitable computer model.

The second part consists of the period from 1981-82 to 1985-86. This forms the time horizon for ex-ante forecasts to demonstrate the application of computer based
simulation model to evaluate the alternative strategies. Ex-post forecasts for 1980-81 were used as the initial conditions for ex-ante forecasts.

Cotton price data used for forecasting relate to seventeen years for 20s and 40s counts and seven years for 60s, 80s and 100s counts. Yarn price data relate to twenty five years except 80s count for which only twenty years data were available.

Field work and data collection

All the data used in the study were collected from internal and external sources.

Internal sources

Internal data sources cover books, records and documents of the NTC (TN&P) Ltd. Data were also collected by interviewing the executives of the Corporation.

External sources

External data sources consist of two groups. One is published documents and Annual Reports of NTC (TN&P) Ltd. The other consists of magazines, books and other materials from various external sources.
Data relating to yarn prices were collected from "Indian Textile Bulletin", a quarterly publication of the Office of Textile Commissioner, Government of India, Bombay. Cotton varieties were classified according to the counts groups to which they belong. The price of each variety of cotton was collected and average prices were worked out for each count. Data on cotton prices were collected from "Indian Cotton Annual" published by the East India Cotton Association, Bombay. Cotton mixing cost of individual mills countwise were also collected and used in this study.

Data on past financial performance were taken as given in Annual Reports and other published sources. Data relating to future expansion, capacity utilisation, expected productivity and other information used in the study were obtained through interviews with top executives in charge of relevant functions at the head office. Suitable assumptions were made, wherever information was incomplete or unavailable, in consultation with the management. Some data were also collected from the South India Textile Research Association and the Southern India Mills' Association, both at Coimbatore. Reserve Bank of India Bulletins and handboks on Cotton Textile Industry by the Indian Cotton Mills' Federation also provided valuable data for the study.
Framework of analysis of data

Analysis of data consists of four stages. They are:

1. Analysis of Input data.
2. Design of the Simulation experiment.

Analysis of Input data

Correlation and autocorrelation analysis were made for cotton and yarn prices to ascertain the association and seasonality. Monthly, quarterly and annual data were used. This preliminary analysis was done with the help of a 8 K Bytes DEC Spectra micro-processor and a 48 K Bytes HCL-1800 scientific micro-computer.

Items of cost of production were expressed on the basis of spindleshifts worked, commissioned spindles and gross fixed assets. Simple regression was used to forecast some items of cost of production.

The researcher was interested in constructing a descriptive-predictive model of financial forecasting of a textile firm. The ex-ante simulation covers five years from 1980-81 to 1985-86. Cotton and yarn prices were
forecasted for five years into the future with appropriate forecasting techniques. An experimental approach was followed in selecting the appropriate forecasting techniques. The forecasting techniques considered in the study are Simple Regression with time as explanatory variable, Simple, Double and Triple Exponential Smoothing (with alpha values ranging from 0.1 to 0.9), Winter’s method of Exponential Smoothing (with parameters ranging in combination from 0.1 to 0.9), Adaptive Filtering technique and Adaptive Response Rate Exponential Smoothing.

Computer programs for each technique were prepared in BASIC language and forecasts were made by running the programs on a 48 K Bytes HCL 1600 scientific micro-computer. Mean squared error and forecasting ability of each technique were compared and suitable techniques were selected. For forecasting cotton prices simple regression resulted in minimum mean squared errors. For forecasting yarn prices, excepting 100s count yarn, triple exponential smoothing with an alpha value of 0.2, was found suitable. For 100s count yarn, double exponential smoothing had given good results. Hence forecasts as provided by these techniques were used for simulation experiments with the financial forecasting model.
Mean and variance of forecast errors were also calculated. Correlation and autocorrelation analysis of forecast errors were made to determine the covariance of error terms and independence of forecast errors. A variance-covariance matrix was constructed for cotton and yarn price forecast errors separately and used in the simulation experiment. Regression based error values were assumed to be normally distributed with zero mean and standard deviation equal to the standard error of the regression. Mean and variance of exponential smoothing based forecast errors were also calculated. They are arranged in a multivariate normal distribution context for experimentation.

Design of the Simulation experiment

The simulation experiment was designed for two purposes. One is for ex-post forecasts to generate data for model validation. Ex-post experiment was run for a period of six years. The experiment was repeated fifty times and value of response variables of interest were obtained.

The second purpose of the experiment was to obtain ex-ante forecasts for a period of five years from 1981-82 to 1985-86. Ex-ante forecasts were used for the purpose
of testing hypothesis regarding the impact on profits of alternative product-mix policies. Ex-ante forecasts were generated for three alternative product-mix policies. The hypothesis was tested based on the results of the forecasts for each of the three product-mix policies.

Variables which were used in the computer simulation model were divided into two categories. One is a set of variables whose values are fed into the computer and the other, variables whose values are generated by the computer itself through appropriate equations. Under the first category, some of the variable values are estimated and some are based on simple regression forecasts. The second category contains generation of prices of cotton and yarn. The stochastic error term for each variable under this category is generated through Monte Carlo simulation using multivariate normal distribution. Error values thus generated are added with the forecasts of the respective variables.

Generation of Output data

The model and the experiment were implemented in a PDP 11/70 computer system. The model and the experimental procedures were coded in Fortran IV plus (an improved Fortran IV for PDP 11/70). A set of output reports was
designed to have printouts of the values of important response variables. Common random number technique was used to generate stochastic error values. The experiment was repeated fifty times. The values of response variables for each replication were printed along with the average values for all the previous replications. The error values generated by the model were also printed to check the randomness.

Analysis of Output data

Ex-post forecasts

Values of each response variable were generated for a period of six years from 1975-76 to 1980-81. In order to evaluate the forecasting ability of the model, the average values for all the six years were calculated for important response variables. Then these values were compared with actual values of the same period and the model was validated.

The average value of all the fifty replications for each of the years was also calculated and compared with actual figures as per Annual Reports of the NTC (TN&P) Ltd.
Ex-ante forecasts

An experiment was run for each of the three product-mix policies. For each product-mix policy the experiment was repeated fifty times leading to a printout of the values of important response variables for each replication as well as the average of previous replications.

The simulated time period was five years from 1980-81 to 1985-86. The important response variables like earnings before taxes and reserves & surplus were compared for each product-mix policy.

Analysis of variance was used for testing the hypothesis in terms of each of the performance measures used in the study. 'F' ratios were calculated and compared with table 'F' values. Multiple comparison and multiple ranking procedures were used to rank and select a suitable product-mix policy.

Importance of the study

It is hoped that the study will be useful to the textile industry in general and NTC (TN&P) Ltd., in particular in evaluating the impact of price fluctuations,
product-mix policy decisions, corporate planning and also in the evaluation of other alternative strategies.

It is envisaged that the model developed by the researcher would help the financial institutions in evaluating credit worthiness and repaying capacity of textile mills, while making credit granting decisions.

It is also hoped that the model and the techniques developed are easily adaptable to any industry operating in a multi-factor multi-product environment. To the computer hardware and software firms the study would be quite useful in developing Financial Planning and Modelling Packages for application in the textile industry.

Above all, the study is expected to open new vistas in the area of business research by providing a new and important research technique to the researchers and academicians in India, at a time when the usefulness of such research works is not fully realised.

Limitations of the study

The main objective of the study has been to develop a research technique which could be used and improved upon by researchers in analysing similar problems in future.
The emphasis in the study has been mainly on developing a financial forecasting model for testing the impact of the randomness of prices on profits and other response variables. A secondary objective of the study was to demonstrate the applicability of computer simulation experiments in product-mix decisions.

In the light of the above two objectives simple regression and time-series forecasting models only were used in the study without considering the explanatory variables because of the difficulty in establishing their identity and in the collection of data relating to them. Although a sophisticated econometric model might have been helpful, it has been felt that econometric model building is altogether a separate topic of research and hence falls beyond the scope of this study.

Paucity of published and unpublished data has rendered financial modelling and forecasting very difficult, which is the common experience of researchers. Moreover reported figures are subject to hidden inconsistencies. Therefore data collected on "as is where is" basis have been made use of throughout the study, making necessary assumptions and adjustments which are relevant for financial forecasting and model building.
Despite these limitations, it is hoped that the study would be a contribution to the scarce literature on the methodology of business research in the country.

Organisation of the thesis

The thesis is organised into seven chapters.

In the first chapter the design of the study covering the problems, objectives, methodology, tools of analysis and the like are presented.

The second chapter contains an analysis of the environment and problems of the Textile Industry and the NTC. It also contains an analysis of the financial performance of the NTC (TN&F) Ltd.

The third chapter deals with concepts relating to financial forecasting models. Concepts relating to dynamic planning and performance behaviour of a textile firm and simulation experiments with financial models are also discussed.

Developing cost and price forecasting models, a financial simulation model and computer realisation of the models are presented in the fourth chapter.
The fifth chapter deals with an application of the financial forecasting model to the NTC (TM&P) Ltd. It discusses the environment of the operations simulated, assumptions made, empirical representation of the model and estimation of the parameters for running the model.

The sixth chapter is concerned with analysis of results. It covers a discussion of sample size, validation of the model, comparison of actual and simulated results, experimentation with the model and an analysis of experimental results.

The last chapter presents the summary and conclusion.

References

