

PERFORMANCE OF COTTON TEXTILE INDUSTRY AND FLUCTUATIONS
IN THE PRODUCTION OF COTTON YARN AND CLOTH IN INDIA AND
SOUTHERN REGION — A TIME SERIES ANALYSIS.

By

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M. A. ECONOMICS [FINAL]

A THESIS SUBMITTED TO THE BHARATHIAR UNIVERSITY IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS THROUGH
SRI AVINASHILINGAM HOME SCIENCE COLLEGE FOR WOMEN - COIMBATORE

May 1986

Acknowledgement



ACKNOWLEDGEMENT

Firstly I very much wish to acknowledge my sincere thanks and gratefulness to my guide **Ms.C.Jaya, M.A., M.Phil. (Madurai), Dip.Ed. (Madras)** for her invaluable help and guidance for the successful completion of this thesis work.

I express my heartfelt and sincere thanks to our **Professor Dr. (Selvi) B. Saraswathi Bhatji, M.A., Ph.D.,** Head of the Department of Economics, for giving her valuable suggestions and encouragements to me in completing this work.

My sincere thanks goes to **Dr. (Tmt.) Lakshmi Senta Rajagopal, M.S. (Tennessee), Ph.D. (Madras),** Principal, Sri Avinashilingam Home Science Autonomous College for Women, Coimbatore for helping to carryout this thesis work.

Words are inadequate to express my thanks to the persons and individuals who have helped me in my thesis work.

(C.S. RAJINI)

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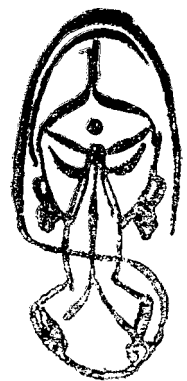
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Introduction



I INTRODUCTION

Industrialisation has been defined as a process in which changes of a series of strategical production functions are taking place. It involves those basic changes that accompany the mechanisation of an enterprise, the building of a new industry, the opening of a new market and the exploitation of a new territory (Hanson, 1980).

In order to achieve a balanced rapid growth of the economy, the methodology adopted in India was development and regulation of industries. During the last decades of planned development, industrial production has made rapid strides both in terms of quality and quantity. The production increased at an average growth rate of 5 per cent per annum during 1970-82. In spite of the considerable industrialisation that has taken place in India, the textile industry still occupies a key position in the economy. It gives direct employment to 20 per cent of all industrial labour and accounts for nearly 10 per cent of the foreign exchange earnings. It also constitutes 20 per cent of the total industrial production. The industry is also a supplier of yarn to the decentralised sector which provides employment to more than 4 million workers. It has an influence on agriculture because of its consumption of cotton and on industries because of its requirements of machinery, dyes and chemicals (Srinivasan, 1984).

There are 875 mills in India with an installed capacity of 231.6 lakh spindles and 2.1 lakh looms. India is now the largest single exporter of cloth to U.K. and one of the biggest to South East and West Asia. In 1975, India had the highest per capita availability of cotton cloth and since then there is a consistent increase in the demand for cotton cloth.

The textile industry in the Southern region consists of 420 spinning mills and 45 composite mills producing 37 per cent of the total yarn and 16 per cent of cloth. The production, processing and sale of cotton contributed nearly 20 per cent of the national income during the last two decades (Annual Report, SITRA 1984).

Historically it is difficult to say when the systematic analysis of periodically recurring fluctuations began. The classicalists firmly believed that the economy always returned to full employment equilibrium in the long run. The prekeynesians did recognise the possibility of fluctuations but regarded them as transitory. The keynesians and post keynesians described expansion, recessions, contractions and revivals as recurrent and regular. Keynes (1936) observed that "as the economy progresses there is some recognisable degree of regularity in the sequence of upward and downward movements in economic activity. The textile industry faced its expansion and crisis in the last three

decades. As the oldest and largest industry, it has been prone to sickness also. The increasing variety, the diverse characteristics, and fluctuating prices of raw materials have made the problems of adjustment to changing conditions more difficult. The existence of mills, handlooms and powerlooms using different levels of technology have resulted in a number of complex and intricate problems. The change in demand, increase in the cost of living index and the credit squeeze have resulted in the accumulation of stock. The power tariff was high in the Southern Region. The working of the handloom industry with the large scale industry was another problem. So, some of the mills had to close down (Radhakrishnan, 1984). National Textile Corporation was established in 1974 with the main view of managing the sick mills. At present there are 132 sick textile mills operating under the control of NTC. A number of indivisible benefits like permanent employment to 175 thousand workers, welfare measures such as housing, family planning etc., contribution to the per capita availability of cloth particularly to the weaker sections of society are accruing to the country because of the operations of the NTC (Srinivasan, 1984).

According to the qualitative and quantitative studies made by SITRA and AITRA, on the performance of the industry, the productivity in the textile industry was low and this was attributed to lack of standardisation, inefficient

financial resources and lack of modernisation. The popular view in low income countries is that fluctuations and stability in economic activity are given significance only recently. So, it is essential to examine the available evidence to ascertain if fluctuations do in fact show a regular occurrence and if they do, whether this can be explained in terms of economic and non-economic factors.

Considering the various problems of the industry, the Government of India is striving to take adequate measures to safeguard the interests of the industry. In June 1985, the new textile policy was announced to synchronise with a number of hopeful signs in the economy. The features of the policy are, restructuring, removing the structural rigidity, optimum productivity and soft loan scheme. Various committees have also been set up to study the problems of all sectors of the textile industry. It is in this context, the present study has been taken up to understand the present performance and fluctuations and forecast the development for the future. The specific objectives of the study were to:

- i. assess the general performance of the textile industry in terms of production, employment, capacity utilisation and profit;

- ii. estimate the growth rate in the production of cotton yarn and cloth.

iii. examine the extent of fluctuations in the production of yarn and cloth;

iv. analyse the trend, cyclical and seasonal fluctuations in the production of yarn and cloth and to

v. find out the contribution of the Southern Region to the textile industry in terms of number of mills, employment productivity and production.

The analysis relates to the book values as given in the published reports of SIMA and SITRA. The prediction analysis may be the base in planning for the future, however the accuracy of prediction depends largely on certain assumptions that the same economic forces will continue to behave in a similar pattern in the future. It is hoped that this analysis will be useful to mill managements, economists and administrators in understanding the future of the industry and plan accordingly.

Review of Literature



II REVIEW OF LITERATURE

The literature relating to the "Performance of cotton Textile Industry and Fluctuations in the production of cotton yarn and cloth in India and Southern Region - A Time Series Analysis" is reviewed under the following heads:

1. Production of cotton/yield per hectare;
2. Availability of cotton cloth;
3. Export of cotton cloth;
4. Credit assistance to the textile sector;
5. Five Year Plans and textile sector;
6. Textile Policy in India and
7. Related studies

The origin of the cotton textile industry dates back to 1818 when the first cotton mill was established at Fort Golstar near Calcutta. The grant of protection and the Swadeshi Movement enabled the industry to make rapid strides. The number of mills increased to 389 in 1937 with 2,02,464 looms. At the end of July 1984, there were 875 mills with an installed capacity of 231.6 lakh spindles, the highest in the world, and 2.1 lakh looms. In 1982-83 the production of cotton yarn was 122 crore kg and that of cotton cloth 2394.4 crore metres in the mill sector and 556 crore metres in the decentralised sector.

The textile industry touches the national economy at many points and has a chain and multiplier effects on it.

It has a sizeable weight in the country's index of industrial production, contributes significantly to its GNP and by direct and indirect taxes it pays Rs.6000 million to the national exchequer. Thus the textile industry contributes to about 20% to the total national income of the country. Hence, when the textile industry is prosperous it generates buoyancy in the national economy as a whole. The production of cotton yarn and cloth stood at 1076 million kg and 2613 million metres respectively in 1983*.

1. Production of cotton/yield per hectare:

The details of area under cotton, production and yield per hectare are given in Table 2.1.

TABLE 2.1

AREA UNDER COTTON, PRODUCTION AND YIELD PER HECTARE

Year	Total area under cotton cultivation (In million hectares)	Cotton production (In lakh bales of 170kg each)	Cotton yield per hectare (kg)
1969-70	7.73	55.64	122
1970-71	7.60	47.63	106
1971-72	7.80	69.50	151
1972-73	7.68	57.35	127
1973-74	7.57	63.09	142
1974-75	7.66	71.56	161
1975-76	7.35	59.30	138
1976-77	6.39	58.39	144
1977-78	7.87	72.43	157
1978-79	8.12	79.58	167
1979-80	8.13	76.48	160
1980-81	7.82	70.10	152
1981-82	8.06	78.84	166
1982-83	8.07	77.17	163

Source: Annual Report-SIMA 1983

It is evident from the table that variations in acreage are less but there are wide fluctuations in the productivity. The yield per hectare in India which stands at present at 160kg, is lowest in the world. One of the reasons for this low yield is that, large areas under cotton production is rainfed.

2. Availability of cotton cloth:

The details of per capita availability of cotton cloth are given in Table 2.2.

TABLE 2.2

PER CAPITA AVAILABILITY OF COTTON CLOTH

Year	Availability for home consumption (Million metres)	Per capita availability (Metres)
1975	7523	12.49
1976	6923	11.22
1977	5992	9.49
1978	6517	10.09
1979	6655	10.08
1980	7463	11.05
1981	7266	10.53
1982	7096	10.05
1983	7818	10.83

Source: Handbook of Statistics on Cotton Textile Industry-1985

The table shows that the per capita availability of cotton had been fluctuating from year to year. In 1975 India had the highest per capita availability of cotton cloth. But due to the sickness of the mills there had been a decline in the per capita availability of cotton cloth in subsequent years.

3. Export of cotton cloth¹

The details of export of cotton cloth are given in the Table 2.3 and Table 2.4.

TABLE 2.3
EXPORTS OF COTTON CLOTH

Year	Export (Lakh bales of 170 kg)
1970-71	2.00
1971-72	2.49
1972-73	1.84
1973-74	3.66
1974-75	0.97
1975-76	4.27
1976-77	0.39
1977-78	0.10
1978-79	1.77
1979-80	5.52
1980-81	6.98
1981-82	3.78
1982-83	6.81

Source: A Handbook of Statistics on
Cotton Textile Industry (1985)

TABLE 2.4
EXPORTS OF COTTON CLOTH

Year	Millmade cotton cloth		Cotton yarn		Cotton apparel value	Cotton Hoisery value	Other cotton Mfrs including made up items	Powerloom cotton cloth		Total foreign exchange earned (in crores)	
	Quantity	Value in Rs. (Crores)	Quantity (In kg)	Value Rs. (crores)				Quantity	Powerloom cotton mfrs value		Value
1970-71	419.10	68.13	22.94	20.59	8.61	0.23	17.86	0.68	0.65	0.68	130.08
1971-72	387.14	67.47	14.80	15.78	13.97	0.50	17.43	0.85	0.65	0.85	133.19
1972-73	453.26	85.12	21.40	22.83	29.81	0.93	19.66	1.42	0.64	1.42	183.43
1973-74	649.68	161.15	10.30	11.24	63.65	3.01	33.43	4.24	1.38	4.24	319.71
1974-75	373.11	130.61	9.87	18.28	94.96	5.37	46.71	3.59	1.34	3.59	343.19
1975-76	417.90	121.21	4.69	6.38	144.92	9.65	41.96	2.85	2.50	2.85	380.74
1976-77	555.31	201.18	18.52	31.00	257.10	14.11	52.69	8.94	6.39	8.94	646.80
1977-78	266.32	107.52	10.42	22.53	240.86	21.67	56.14	9.58	3.52	9.58	575.95
1978-79	310.99	134.20	6.25	15.19	351.45	13.92	57.96	21.63	1.95	21.63	688.01
1979-80	393.72	187.38	5.80	15.05	365.14	23.41	64.38	23.94	3.45	23.94	786.04
1980-81	311.75	161.62	8.96	24.06	389.32	37.44	84.98	19.34	4.71	19.34	634.7
1981-82	225.42	156.67	4.70	15.24	401.42	56.20	67.03	24.82	20.33	24.82	944.95
1982-83	225.12	151.63	6.68	29.25	439.71	52.70	83.09	23.60	26.66	23.69	936.03
1983-84	304.04	190.52	7.06	23.50	561.26	72.21	50.44	33.39	21.00	33.39	1078.21

Source: A Handbook of Statistics on Cotton Textile Industry - 1985

The trend in the export of cotton textile reveals that since 1977, there had been a consistent increase. This may be due to the nationalisation of the textile mills in 1970. As the exports are increasing, there is an increase in the foreign exchange earnings too. According to the recent data available, Rs.1098.21 crores is the total foreign exchange earnings fetched by the cotton textile exports.

4. Credit assistance to the textile sector:

The details of credit assistance given by Industrial Development Bank of India are given in Table 2.5.

TABLE 2.5

TYPE-WISE ASSISTANCE OF IDBI TO THE TEXTILE INDUSTRY

Type of assistance	1980-81		1981-82		1982-83	
	Sanctio- ned	Disbur- sed	Sanctio- ned	Disbur- sed	Sanctio- ned	Disbur- sed
1. Project loans	45.90	18.49	54.76	27.78	53.56	52.24
2. Underwriting and direct subscription	5.12	0.54	4.95	0.62	1.60	1.58
3. Soft loans	37.65	64.48	59.39	50.33	25.70	35.87
4. Technical development fund	8.70	5.85	6.71	9.22	4.12	5.69
5. Refinance of industrial loans	55.11	34.39	63.10	44.00	74.51	48.63
6. Rediscounting of bills	73.03	54.35	89.41	65.45	97.67	71.69
	225.51	178.10	280.41	199.40	256.95	215.70

Source: A Handbook of Statistics on Cotton Textile Industry, 1985

The table reveals that the amount of credit given by IDBI had increased from year to year.

5. Five Year Plans and Textile Sector:

The details of the targets and the achievements of the textile sector under the plans are given in Table 2.6 and 2.7

TABLE 2.6

TARGETS AND ACHIEVEMENTS OF TEXTILE SECTOR DURING PLANS				
Items (produced)	Unit	Plan	Plan target	Plan Achievement
Yarn	Million kg	I plan
Cloth	Crore metres	I plan	5006	466.5
Yarn	Million kg	II plan	..	801.0
Cloth	Crore metres	II plan
Yarn	Million kg	III plan	1021	913
Cloth	Crore metres	III plan	850.4	756.5
Yarn	Million kg	IV Plan	1100	1100
Cloth	Crore metres	IV Plan	510	450
Yarn	Million kg	V Plan	1300	1150
Cloth	Crore metres	V Plan	1040	950

Source: A Handbook of Statistics on
Cotton Textile Industry 1985

TABLE 2.7

TARGETS OF SIXTH PLAN

(in Million metres)

Sector	Targets as per Sixty Plan				Targets as per midterm appraisal
	Cotton	Non- cotton	Blends	Total	
Mill	3500	400	1000	4900	4460
Powerloom	2600	1200	500	4300	4300
Handloom	3150	200	750	4100	3830
Total	9250	1800	2250	13300	12590

Source: A Handbook of Statistics on Cotton
Textile Industry - 1985

First Plan: By the time the first plan was launched, India had spinning and weaving mills with 10.9 million spindles and 1,94,411 looms. The programme of development during the first plan was modest. The main objective was fuller utilisation of the existing capacity both in the mill and handloom sector. Production of cloth during this period increased from 340 crore metres to 466.50 crore metres.

Second Plan: During the second plan period, the industry had to face foreign competition from China, Japan and Pakistan. High cost of production and diminished demand due to the low purchasing power of the people added to the deterioration of the conditions in the industry. Consequently, total production of cotton yarn increased to only 801 million

kgs from 744 million kgs and increase in the production of cloth was very negligible.

Third plan: In the third plan, due to the measures taken by the government, the yarn production increased from 801 million kgs to 913 million kgs and of cotton cloth from 500 crore metres to 756.5 crore metres.

Fourth Plan: In the fourth plan, the industries as a whole were not given importance and there was only a little increase in the production of yarn and cloth i.e. from 913 million kgs to 1100 million kgs and increase in cloth production was not substantial.

Fifth Plan: The Fifth Plan achievement was less than the targeted level. This was due to frequent strikes and lock-outs in the textile industry as such.

Sixth Plan: The planning commission, in the sixth plan document has spotlighted the need for subsidies to the textile industry in order to release more resources for investment.

5. The New Textile Policy:*

The present crisis in the textile industry is neither cyclical nor temporary. There appears to be a deeper structural weakness. Therefore the government has formulated a new policy for restructuring the textile industry.

*Unpublished Reports - SITRA - 1986

The main objective of the new textile policy is to increase production of cloth of acceptable quality at reasonable prices. The industry must meet the clothing requirements of our growing population. The textile industry was viewed in terms of various sectors' organised mills, power looms, handlooms or in terms of fibre used as cotton textiles, woollen textiles, man-made textiles and silk textiles.

It is proposed to restructure the textile industry on three main dimensions.

1. The industry should be viewed in terms of three stages, namely spinning, weaving and processing.
2. The industry will have fuller flexibility in the use of various fibres.
3. Creation and contraction of capacities to textile units will be done to increase competition and promote healthy growth.

Capacity expansion of existing units and capacity creation of new units will be promoted to encourage competition, reduce cost and improve quality. The responsibility for the entire production of controlled cloth shall be transferred to the handloom sector by the end of the seventh plan. The public distribution of controlled cloth would be strengthened and streamlined.

In the case of sick mills, change of management will be essential in cases, where restructuring of capital and liabilities is contemplated. While tackling the sick textile units, the interest of labour shall be protected. A rehabilitation fund would be created to provide relief to textile workers who might be displaced by permanent closure of units. Such a fund shall be financed by a suitable cess on the textile industry.

Necessary modernisation shall be taken up in the spinning, weaving and processing sectors. Adequate funds would be provided for modernisation under the soft loan scheme of the IDBI. A Textile Modernisation Fund shall also be created. While taking up the modernisation process, the interests of workers will be protected. The Textile Research Associations would be actively involved with modernisation.

In the domestic sphere all steps will be taken to make out textile exports more competitive, in the world market both in quality and price. The government hopes that the new policy would facilitate the necessary restructuring of the textile industry so that it can more effectively satisfy the clothing needs of the people. Besides, the textile industry equipped properly can provide more employment as well as bring more foreign exchange earnings through higher exports.

7. Related Studies:

The studies conducted by different organisations and by different persons have been classified and discussed under the following heads:

- a. Studies on the performance of textile industry;
- b. Studies on fluctuations;
- c. Studies on the problems of textile industry and
- d. Studies on the impact of modernisation on textile industry.

a. Studies on the performance of Textile Industry:

1. A study on "The Trends on wages, prices and gains" had been conducted by Sahoo in 1973. The major findings of the study were:

- i. Labour enjoyed a positive gain in years when productivity increments were negative.
- ii. Capital had to face a greater loss than measured by total productivity increment. However capital got a larger share in period of positive productivity gains.
- iii. The real earnings of the workers in 1970 were less than the 1960 level.
- iv. The gross profit percentage of capital employed was very low i.e. below 8%. The profits after tax as percentage of net worth was below 8%.

v. The industry was making progress in terms of profit since 1969.

Performance of Textile Industry:

A study on the "Performance of Textile Industry" had been conducted by the Federation of Indian Chamber of Commerce in 1976-77. The major findings of the study were:

- i. The textile industry is losing 184 million kgs of yarn every year due to the economically inefficient and technically obsolete machinery.
- ii. Over the last 15 years, the industry has not been able to utilise its installed capacity more than 73% in the case of spindles and 68% in the case of looms.
- iii. Due to the use of inefficient and outdated machineries, the profitability of the industries has been cut down which in turn has affected the reinvestible surpluses.
- iv. The study has pointed out that other problems such as inefficient management of financial resources, flight of capital from the industry etc. as the reasons for the ill-health of the industry.

3. Filament yarn usage

A study on "Filament Yarn usage" had been conducted by Ahmedabad Textiles Research Association (AITRA) in 1982.

The following were the findings of the study:

- i. The textured yarns accounted for more than 80% of the filament yarn consumed as weft.
- ii. There was a relationship between the structure of polyester fibre and the various properties of fibre.
- iii. The profit of the textile industry had increased to a great extent.
- iv. The production of yarn and cloth had simultaneously gone up in 1982.

4. Labour and Machine Productivity

A study on "Labour and Machine Productivity in Textile Industry had been conducted by SITRA in 1983. The study covered the period from 1966 to 1982. The major findings of the study were:

- i. The differences in productivity between mills continued to be high, the first ranking mills had 3.8 times higher labour productivity, only 1/3rd of the operatives per 100 spindles and almost double the production per spindle per shift as compared with the last ranking mills.
- ii. The labour productivity was 33% lower than the standard level of productivity.

iii. The spindle utilisation was found to be very high at 738 hours per year. About 98% of the mills worked on all seven days of the week and 33% of the mills worked for 24 hours a day.

iv. Over the past 16 years, the average labour productivity had increased by 74% in common mills and 112% in all mills, the rate of increase however shown a decrease in the past 2 years.

v. The spindle utilisation had shown a striking increase of 38% during the past 9 years, as a result the machine productivity had increased by 46%.

5. Spinning costs

A study on "Spinning costs" had been conducted by SITRA in 1981-82. The study revealed the following facts:

i. The spindle productivity had increased.

ii. The costs had sizeably increased during the last two years in the context of boom coupled with the rise in wages by 33% in the case of labour and 50% in the case of machine productivity.

iii. It had been estimated that one per cent increase in production per spindle would result in a saving of about Rs.6 per spindle per year and 1% increase in utilisation would result in about Rs.5.5 per spindle per year.

b. Study on Fluctuations:

6. "Fluctuations in the Price and Demand for Yarn":

A study on "Fluctuations in the Price and Demand for yarn" had been conducted by SITRA in 1979-82. The major findings of the study were:

- a) Deliveries of yarn had been influenced by
 - i. Consumers price index
 - ii. different counts of yarn
 - iii. seasonal factors and
 - iv. excise ratio factor.

b. Studies on the Problems of Textile Industry:

7. The Problems of cotton Textile industry:

A study on the Problems of Cotton Textile Industry" conducted by Shah in 1983 identified the following problems:

Credit squeeze, high manufacturing costs, modernisation and rehabilitation, delay in activities of imported inputs, shortage of power, disposal of controlled cloth, shortage of coal, increase in the sales tax, competition in the international market and obsolete machinery.

8. Sectoral Imbalances in the Textile Industry:

A study on "Sectoral Imbalances in the Textile Industry" had been conducted by Radhakrishnan in 1983. The findings were as follows:

- i. The textile industry as a whole was at the cross roads. With demand recession confronting it on the one hand, and the futility of competing with powerloom products on the other hand the mill sector found itself in an unenviable position.
- ii. The industry was faced with a situation in which cloth stocks were getting accumulated for want of demand.
- iii. During the first ten months of the year, the number of mills closed went upto 10 million spindles and over 12,000 looms were lying idle due to closure of mills.

9. The Problems of Automation in the Spinning Industry:

A study on the problems of automation in the spinning industry had been conducted by Srinivasan in 1982-83. The main findings of the study were:

- i. In a country like India, adoption of automation posed a number of socio-economic problems apart from those created by the technology itself.

ii. Shortage of capital resources, lack of indigenous equipment, problems of maintenance and training of operatives, fear of resulting unemployment and attitude of the managements hindered the introduction of sophisticated technology.

iii. As a result of introducing automation in other countries, the labour productivity had gone up from 5 to 7%. But in India the labour productivity had actually declined from 4% to 2%.

10. Strikes and Lockouts in Textile Industry:

A study on "Strikes and Lockouts in Textile Industry" had been conducted by SITRA in 1974. The main findings of the study were:

i. The incidence of strikes during the period did not increase or decrease according to any ascertainable laws.

ii. Periods of intense industrial strike seemed to alternate with periods of comparative lull, the peak periods coinciding with the general elections.

iii. Inter-union rivalry coupled with a general deterioration in economic situation and the prevailing political atmosphere in the country seemed to exert a significant influence on the incidence of strikes.

- iv. All unions regardless of their political complexion achieved better results on wage strikes compared to strikes touching other major or minor issues.
 - v. Textile and plantation workers appeared to be more prone to strikes rather than other workers.
 - vi. A substantial portion of the strikes in textile industry was accounted for by a few mills.
 - vii. In textile industry, wage strikes progressively declined over the period.
 - viii. The price of technological change, economic prosperity of the worker as measured by wage levels, existing wage differentials between industries in the locality, etc. seemed to have definite influence on industrial unrest.
- d. Studies on impact of modernisation in textile industry:
- ii. The Inter-relationship between Modernisation, profits, and viability of new mills:

A study on Modernisation had been conducted by SITRA in 1981-82. The main findings of the study were:

- i. The investment in modernisation, by the mills was found to be constant in the long run.
- ii. The amount spent on modernisation showed a very wide inter variation being largely dependent on the profitability. Short-term fluctuations in profits (or) even a high

profit for just one year did not have any significant influence on the investment.

iii. Mills investing more on modernisation increased their profits by a larger amount by over 25% of the additional amount spent on modernisation.

iv. Working a machine beyond 10 years does not make any significant reduction in the annual capital changes.

v. On an average a mill spent about 35% of the profits before depreciation and interest on modernisation. Mills with high fixed assets spent about the same amount on modernisation as mills with low fixed assets.

12. The crucial Role played by Electronics; in Textile Industry:

A study on "The Role played by Electronics⁴ in Textile Industry" had been conducted by Mr. A.R.Kalyana Raman in 1982. The following were the findings:

i. Electronics coupled with its advanced technology helped in tremendous cost reduction in the textile mills.

ii. The process of monitoring was done easily with the help of electronic machines than with the help of human beings.

iii. With the help of automation it was possible to have quality uniform within the prescribed limits.

iv. Certain aspects of supervision was very effectively done by using computerisation.

v. Accounting was one of the easiest tasks achievable through electronic technology.

Methodology



III METHODOLOGY

The methodology adopted in the study on "Performance of Cotton Textile Industry and Fluctuations in the Production of Cotton Yarn and Cloth in India and Southern Region - A Time Series Analysis", is discussed under the following headings:

- a. Selection of the problem;
- b. Sources of data
- c. Tools of analysis and
- d. Definition of the terms

a. Selection of the Problem:

In spite of the considerable industrialisation that has taken place, textile industry still occupies a key position in the economy. It gives direct employment to about 20 per cent of all industrial labour and accounts for nearly 10 per cent of the foreign exchange earnings. It also constitutes 20 per cent of the industrial production. In the Southern Region, mills have attached great importance to technological efficiency. 70 per cent of the yarn mills and 20 per cent of the weaving mills are located in this region contributing nearly 37 per cent to the total yarn and cloth production". During the seventies textiles had been prone to sickness. A large number of committees, study groups and working groups have studied one aspect or other of the

industry from time to time. But no attempt has been made to study the extent of fluctuations. Hence, the problem of fluctuations in textile industry is selected for indepth analysis.

b. Sources of data:

Information on the production of cotton yarn, cloth, labour employed, foreign exchange, capacity utilisation, number of mills were collected from official and non-official sources.

a. Official sources:

- i. Indian Textile Industry - Published by SITRA 1984,
- ii. Indian Cotton Textile Industry - Annual Statistical Bulletin - SIMA Publication - 1983,
- iii. India - A Reference Manual- compiled by Ministry of Information and Broadcasting - Government of India, 1984
- iv. Surveys and study reports published by SITRA

b. Non-official sources:

- i. The Hindu: The Survey of Indian Industry - 1984
- ii. Periodicals and Journals like Economic and political Weekly, Southern Economist, Commerce etc.

c. Tools of Analysis:

The percentage of capacity utilization, the percentage contribution of Southern Region to total production, employment and percentage of excise duty on cotton textile to total excise duty were worked out. The time series model for estimating the trend and cyclical fluctuations in the production of cotton yarn and cloth was adopted from Barish Kaplan (1975).

1) Time Series Analysis:

The Time series Analysis used in the relevant variables is given by a multiplicative model as:

Actual value $A = TCSR$, Where

T - The long trend representing the consistent pattern of the changes in the variable over a period of time.

C - Cyclical variation representing the wave like fluctuations in the variable around the trend line.

S - Seasonal variation representing changes which occur during changes in seasons and

R - Irregular fluctuations representing variations which are unexplained by the trend, cyclical and seasonal factors. This model can be used to forecast the future performance of the industry.

ii) Estimation of Long trend:

The long trend is estimated by using the least square polynomial. The degree of the polynomial is determined/ based on the value of coefficient of determination R^2 . This method minimises the Random component 'R'.

iii) Estimation of cyclical variations:

The cyclical fluctuations are determined in terms of the cyclical residual index as defined by:

$$\text{Cyclical Residual index} = \frac{\text{Actual value}}{\text{Trend value}}$$

This method explains the size, length and pattern of oscillations in the variables due to economic and non-economic factors.

iv) Seasonal variations:

To estimate monthly and periodical variations in the variables, the following values are used:

1. From the trend line, the monthly values are determined.
2. By using 12 months and 24 months moving totals, moving average values are determined for each month.
3. From the moving averages and actual values, the monthly index values are calculated.

4. From the monthly index values the seasonal indices are determined.

The indices thus calculated assist in forecasting the future seasonal indices also.

The results of the analysis are discussed in the subsequent chapter on "Results and Discussion".

Finding out the growth rates:

$$r = (x_n - n_0) / t \quad \text{where}$$

$$t = n-1$$

$$x_n = \text{value in } n^{\text{th}} \text{ year}$$

$$n_0 = \text{Value in the initial year}$$

d) Definitions of the terms:

$$\text{Spindle productivity} = \frac{\text{Production of yarn}}{\text{Number of spindles used}}$$

$$\text{Loom productivity} = \frac{\text{Production of cloth}}{\text{Number of looms used}}$$

$$\text{Labour productivity of cloth} = \frac{\text{Production of cloth}}{\text{Total number of labourers employed in spinning and preparatory}}$$

$$\text{Labour productivity of yarn} = \frac{\text{Production of yarn}}{\text{Total number of Labourers employed in weaving and preparatory}}$$

Results and Discussion



IV RESULTS AND DISCUSSION

The results of the analysis are presented and discussed as follows:

I. Performance of Cotton Textile Industry;

- a. The Growth in the number of mills;
- b. Capacity utilisation;
- c. Consumption of cotton;
- d. Production of yarn and cloth;
- e. Deliveries of yarn and cloth;
- f. Employment;
- g. Profitability;
- h. Excise duty and
- i. Productivity

II. Fluctuations¹

- a. Long trend;
- b. Cyclical fluctuations;
- c. Seasonal fluctuations and
- d. Forecasting

I. Performance of Cotton Textile Industry:

- (a) The growth in the number of mills²

The growth in the number of mills is one of the indicators of the development of the industry. The number of spinning and composite mills in India and Southern Region are given in Table 4.1. The Southern Region includes Andhra Pradesh, Kerala, Karnataka, Tamil Nadu and Pondicherry.

TABLE 4.1

GROWTH OF COTTON TEXTILE INDUSTRY UNITS--INDIA AND SOUTHERN REGION

Year	India			Southern Region		
	Spinning Mills	Composite Mills	Total	Spinning Mills	Composite Mills	Total
1975	403 (58)	288 (42)	691	263 (85)	46 (15)	309
1976	409 (59)	289 (41)	698	268 (85)	46 (15)	314
1977	413 (59)	290 (41)	703	271 (85)	46 (15)	317
1978	347 (55)	290 (45)	637	225 (83)	47 (17)	272
1979	357 (55)	291 (45)	648	225 (83)	48 (17)	273
1980	370 (56)	291 (44)	661	234 (83)	48 (17)	282
1981	400 (58)	291 (42)	691	262 (85)	49 (15)	310
1982	442 (61)	281 (39)	723	289 (87)	45 (13)	334
1983	595 (68)	280 (32)	875	420 (90)	45 (10)	465
Growth rate			1.9%			1.87%

Figures in the parentheses indicate percentage to totals

It is clear from the table that the percentage of spinning mills to the total mills are high above 55% per cent in all the years in India. These percentages are higher in Southern Region (65 per cent) indicating the concentration of spinning mills in this region. On an average the number of mills have grown at a rate of 1.9 per cent in the case of India and this growth rate is 1.87 per cent in the case of Southern Region. The reduction in the number of composite mills during 1977-80 is due to reclassification of 10 composite mills into spinning mills.

b. Capacity utilisation:

The degree of capacity utilisation is used to assess the performance of an industry. The production and productivity depends to a great extent on the capacity utilisation. The details of the installed spindles and looms in India and Southern Region are given in Table 4.2 and Table 4.3.

TABLE 4.2

SPINDLES INSTALLED IN INDIA AND SOUTHERN REGION

Spindles - in lakhs			Looms - in thousands			
Year	India			Southern Region		
	Spinning Mills	Composite Mills	Total	Spinning Mills	Composite Mills	Total
1975	65.4 (35)	123.2 (65)	188.6	43.98 (70)	18.97 (30)	62.95
1976	71.1 (36)	124.3 (64)	195.4	47.59 (71)	19.25 (29)	66.84
1977	73.6 (37)	124.8 (63)	198.4	49.09 (72)	19.24 (28)	68.33
1978	74 (37)	123.0 (63)	197.0	48.30 (71)	19.63 (29)	67.93
1979	76.8 (38)	124.0 (62)	200.8	48.92 (70)	20.58 (30)	69.50
1980	81.6 (39)	125.2 (61)	206.8	51.94 (71)	20.79 (29)	72.73
1981	84.7 (40)	126.1 (60)	210.8	54.58 (72)	20.80 (28)	75.38
1982	93.5 (43)	124.3 (57)	217.8	59.92 (75)	19.85 (25)	79.77
1983	113.8 (48)	125.1 (52)	238.9	73.85 (78)	19.12 (21)	92.97

Figures in the parantheses indicates the percentages to totals

The table reveals that the installed spindleage is higher in composite mills (65 per cent) than the spinning mills in India showing that the yarn requirements of weaving mills are met by the composite mills, whereas in the Southern Region the spindleage installation is higher in the spinning mills (70 per cent) as the spinning mills in this region are supplying yarn demanded by the weaving mills. One of the important features of the spinning mills in India is that they are the suppliers of yarn to the decentralised sector also.

TABLE 4.3
LOOMS INSTALLED IN INDIA AND SOUTHERN REGION

Year	In Thousands		
	India	Southern India	Percentage share of Southern Region to India
1975	206.9	20.5	9.9
1976	209.7	20.9	10.6
1977	207.4	20.6	9.93
1978	207.1	20.7	9.95
1979	206.5	20.7	10.12
1980	206.4	20.7	10.02
1981	207.6	21.3	10.26
1982	209.7	21.9	10.44
1983	210.7	22.0	10.44

The table reveals that the percentage of looms installed in Southern Region is low (10 per cent). This low percentage in Southern Region is due to the low percentage of composite mills in this region.

The degree of spindleage utilisation is the percentage of used spindles to installed spindles. The details of spindleage utilisation for India and Southern Region are given in Table 4.4.

TABLE 4.4
SPINDLE UTILISATION IN INDIA AND SOUTHERN REGION

Year	In lakhs			
	India		Southern Region	
	Installed	Used	Installed	Used
1975	188.6	133.5 (70.71)	62.95	45.6 (72.4)
1976	195.4	148.3 (75.8)	66.84	50.19 (75.08)
1977	198.4	148.6 (76.5)	68.33	50.25 (73.54)
1978	197	158.5 (80.4)	67.93	54.98 (80.9)
1979	220.8	160.2 (79.7)	69.5	55.58 (79.4)
1980	206.8	163.6 (79.1)	72.73	55.99 (76.9)
1981	210.8	165.3 (78.4)	75.38	63.09 (83.07)
1982	217.8	145 (67)	79.77	63.07 (79.01)
1983	238	158.3 (66.3)	92.97	61.69 (66.33)

 Figures in brackets are percentages to totals

It is evident from the table that the technical potential capacity is not utilised fully in all the years. The average degree of utilization is 74.8 per cent in India and 76.4 per cent in Southern Region. The under utilisation of capacity may be due to the economically inefficient and

technically obsolete machinery, rise in price of cotton etc. The drop in the capacity utilisation during 1981-83 is due to the accumulation of stock of yarn during this period.

The degree of loom utilisation is the percentage of used looms to installed looms. The details of loom utilisation for India and Southern Region are given in Table 4.5.

TABLE 4.5

LOOMS UTILISATION IN INDIA AND SOUTHERN REGION

Year	(In thousands)			
	India		Southern Region	
	Looms installed	Looms used	Looms installed	Looms used
1975	206.9	144 (69.5)	20.5	12.95 (62.1)
1976	207.7	158 (76.0)	20.9	14.64 (70.0)
1977	207.4	158 (76.2)	20.6	14.09 (68.4)
1978	207.1	162 (78.2)	20.7	15.04 (72.6)
1979	206.5	163 (78.9)	20.7	15.22 (73.5)
1980	206.4	160 (77.5)	20.7	14.95 (72.2)
1981	207.6	162 (78.0)	21.3	14.68 (68.9)
1982	209.7	122 (58.2)	21.9	15.64 (72.5)
1983	209.7	137 (65.3)	22.0	12.45 (56.6)

Figures in parentheses indicate the percentages to totals

There is under utilisation of looms in both India and the Southern Region in all the years. The average degree of utilisation is 73% per cent in India and 68.5 per cent in Southern Region. The drop in the loom utilisation during 1981-83 may be due to the change in the pattern of demand for cloth.

C. Consumption of cotton:

Table 4.6 gives the details of cloth consumption in India and Southern Region.

TABLE 4.6
CONSUMPTION OF COTTON IN INDIA AND SOUTHERN REGION

Year	(Thousands of 170kg per bale)	
	India	Southern Region
1975	7161	1974 (28)
1976	7313	1223 (16)
1977	6600	1932 (29)
1978	6878	2155 (31)
1979	7038	2448 (32)
1980	7635	2653 (36)
1981	7414	2799 (40)
1982	7072	2819 (36)
1983	7887	
Growth rate	2.3%	2.3%

Figures in parentheses are the percentages to totals

It is clear from the Table that the consumption of cotton has declined consistently in all these years except during 1981. This may be due to the rise in the price of cotton. In the Southern Region the percentage of cotton consumption has been 8 per cent of the total cotton consumption. In general there is an increase in the consumption of cotton by 2.3 per cent in both India and Southern Region.

d. Production of cotton yarn and cloth:

The cotton textile industry was able to increase production substantially in spite of many handicaps like non availability of sophisticated machinery, increase in the price of cotton etc. The analysis is concentrated only on the production of cotton yarn and cloth.

TABLE 4.7
PRODUCTION OF COTTON YARN IN INDIA AND SOUTHERN REGION

Year	In million kgs	
	India	Southern Region
1975	989	293 (30)
1976	1006	311 (31)
1977	846	278 (33)
1978	912	298 (33)
1979	952	289 (30)
1980	1058	333 (31)
1981	1015	342 (31)
1982	958	387 (40)
1983	1017	395 (39)
Growth rate	1.52%	1.78%

The analysis of the table reveals the following facts:

1. The cotton yarn production has grown at a rate of 1.52 per cent in India and 1.98 per cent in Southern Region. The growth rate in Southern India is higher than in India as the number of spinning mills predominates in this region. Another factor with regard to this growth is the spread of textile industry to many areas, many of them in the composite sector.
2. There is a drop in the production of yarn in both India and Southern Region during 1977-79, as the industry had to face severe recession during this period and many sick mills had been taken over by the National Textile Corporation in 1974.
3. The percentage share of Southern Region to India's yarn production is continuously increasing over the years and it is more than one third of the total yarn production. This is mainly due to the fact that 70 per cent of the spinning mills are located in this region.

The details of production of cotton cloth in India and Southern Region are given in Table 4.8.

TABLE 4.8

PRODUCTION OF COTTON CLOTH IN INDIA AND SOUTHERN REGION

Year	India	Southern Region	Percentage share in million metres of Southern Region to India
1975	4032	355	9
1976	3881	377	10.3
1977	3223	319	10.1
1978	3257	328	9.91
1979	3206	334	9.6
1980	3476	356	10.2
1981	3147	353	11.2
1982	2258	373	16.5
1983	2613	324	12.4
Growth rate	2.47%	1.54%	

The production of cotton cloth includes the production from mill sector alone. There is a gradual reduction in the production of cotton cloth till the end of 1978. The production of cloth had declined by 2.47 per cent in India and 1.54 per cent in Southern Region. This is because of the change in the public taste towards finer non cotton fabrics. The decline in the rate of production of cloth is less in the Southern Region, as the Southern Region was told by the Central Government to concentrate on spinning mills. So the percentage share of this region to the total cloth production is also low (only 10 per cent).

The details of countwise production of yarn in India and Southern Region are given in Tables 4.9 and 4.10.

TABLE 4.9
COUNTWISE PRODUCTION OF YARN IN INDIA

(Thousand kgs)							
Year	15-105	115-205	215-405	415-605	615-805	Above 80	Total
1975	1,06,819 (10.80)	2,95,529 (29.87)	9,92,624 (19.47)	76,414 (7.72)	33,485 (3.38)	13,820 (1.40)	9,89,316 (100)
1976	1,13,446 (11.8)	3,21,896 (32.00)	1,93,608 (19.25)	69,134 (6.87)	34,210 (3.40)	16,594 (1.65)	40,05,925 (100)
1977	91,121 (10.77)	2,46,689 (29.16)	1,90,239 (22.49)	39,718 (7.06)	25,341 (2.99)	14,157 (1.66)	8,46,073 (100)
1978	1,02,669 (11.76)	2,71,795 (29.82)	2,05,890 (22.58)	65,133 (7.15)	27,538 (3.02)	14,984 (1.64)	9,11,624 (100)
1979	1,05,664 (11.10)	2,82,415 (29.66)	2,03,206 (21.35)	59,526 (6.25)	27,430 (2.88)	14,419 (1.51)	9,52,192 (100)
1980	1,17,305 (11.09)	2,97,797 (28.15)	2,39,315 (22.62)	66,595 (6.29)	31,786 (3.01)	16,510 (1.56)	10,57,825 (100)
1981	1,09,212 (10.76)	2,64,948 (26.11)	2,49,190 (24.55)	65,138 (6.42)	38,931 (3.83)	19,181 (1.89)	10,14,891 (100)
1982	1,09,232 (11.40)	2,46,616 (25.95)	2,39,922 (25.05)	71,650 (7.48)	39,877 (4.16)	14,760 (1.54)	9,59,921 (100)
1983	1,17,593 (10.93)	2,80,983 (26.11)	2,52,116 (23.43)	2,80,264 (26.04)	82,201 (7.64)	43,779 (4.06)	10,76,237 (100)

Figures in parantheses are percentages to totals - source, ICNF

TABLE 4.10

COUNT GROUPWISE PRODUCTION OF YARN - SOUTHERN REGION

(.00000 kgs)

Year	15-105	115-205	215-305	315-405	415-605	615-805	Above 805	Southern India
1975	222 (8)	1133 (38.6)	298 (10.1)	558 (19)	444 (15.1)	216 (7)	61 (22)	2932 (100)
1976	242 (9.7)	1211 (38.9)	313 (10)	625 (20)	442 (14.2)	203 (6.5)	75 (2.4)	3110 (100)
1977	180 (6.4)	973 (34)	374 (11)	584 (24)	409 (14)	153 (5.4)	62 (2.2)	2982 (100)
1978	202 (6.7)	1064 (35)	311 (10)	692 (23)	453 (15)	179 (6)	78 (2.6)	2979 (100)
1979	213 (9.3)	1015 (33)	323 (11)	568 (23)	409 (14)	193 (6.6)	72 (2.4)	2893 (100)
1980	243 (7.2)	1102 (33)	351 (10)	839 (25)	474 (14)	233 (6.9)	89 (2.6)	3331 (100)
1981	239 (6.9)	1018 (29)	342 (1)	900 (26)	601 (15)	315 (9.2)	115 (33)	3420 (100)
1982	281 (7.2)	1092 (28)	363 (9.3)	1055 (27)	601 (15)	361 (9.3)	129 (3.9)	3866 (100)
1983	269 (6.8)	1062 (26)	356 (8.8)	1137 (28)	620 (15)	379 (9.6)	128 (3.6)	3945 (100)

Figures in parentheses are percentages to totals

It is evident from the tables that the percentages of yarn production with fine quality 80 counts and above is less (1 and 4 per cent) in both India and Southern Region showing the yarn requirements of weaving mills. The percentage is on the higher side in the case of yarn counts with 10-20 indicating the demand for low quality cloth. The cooperative spinning mills and nationalised mills are producing controlled cloth to meet the demand for cloth by the poorer sections of the society. This is another factor for the production of low quality yarn by the spinning mills in both in India and Southern Region.

e. Deliveries of yarn and cloth:

The details of deliveries of yarn in India and Southern Region are given in Table 4.11.

TABLE 4.11
DELIVERIES OF YARN IN INDIA AND SOUTHERN REGION
(1000 kgs)

Year	Civil Deliveries		Export Deliveries	
	Southern Region	India	Southern Region	India
1975	2,23,796 (51.13)	4,37,710	3380	2975 (82.10)
1976	2,21,801 (49.38)	4,49,179	14729	9453 (64.18)
1977	2,01,735 (49.76)	4,05,414	12,359	7997 (64.72)
1978	2,18,446 (48.69)	4,48,621	4531	3042 (61.14)
1979	2,10,544 (43.39)	4,85,292	5988	3653 (63.11)
1980	2,50,414 (45.11)	5,55,130	6852	4390 (64.09)
1981	2,60,189 (46.04)	5,65,113	5974	3295 (55.16)
1982	3,09,242 (48.91)	6,32,309	5959	3170 (53.20)
1983	2,95,493 (42.25)	6,99,387	6878	4548 (66.12)

Figures in the parantheses are percentages to totals

The civil deliveries of yarn will explain the demand for yarn within the country and the export deliveries will indicate the demand for Indian yarn outside the country.

The analysis of Table 4.11 reveals the following facts:

1. There is an increase in the demand for yarn within the country in all the years (4 to 4.7 per cent).
2. The percentage of civil deliveries of yarn by the Southern Region has declined from 82 per cent to 51 per cent and a greater percentage is released for export. Another reason for the drop in the civil deliveries of yarn is the growing demand for cotton yarn by the weaving mills.
3. Export deliveries of yarn had the highest figures during 1976-77. During this period the industry had been hit by recession, with unfavourable terms of trade with other countries. In general there is a drop in the export deliveries of yarn in all these years showing that the world demand for cloth is dominated by synthetic fibres.

The details of deliveries of cotton cloth are given in Table 4.12.

TABLE 4.12
DELIVERIES OF COTTON CLOTH BY MILLS IN INDIA AND SOUTHERN REGION

Year	Civil Deliveries		Export deliveries	
	India	Southern Region	India	Southern Region
1975	36,61,462	2,187,344 (7.84)	3,19,381	49,639 (15.54)
1976	34,40,504	2,62,022 (7.62)	5,33,860	1,02,062 (19.12)
1977	30,50,191	2,47,649 (8.12)	4,30,106	67,428 (15.68)
1978	30,25,819	2,56,984 (8.29)	3,10,826	61,494 (19.78)
1979	28,57,482	2,33,167 (8.16)	3,75,048	76,499 (20.40)
1980	30,71,183	2,78,915 (9.08)	3,62,414	49,067 (13.54)
1981	27,13,006	2,68,888 (9.91)	3,28,014	49,639 (15.)
1982	21,46,602	3,06,099 (14.26)	1,81,523	45,243 (24.92)
1983	21,57,882	2,48,776 (11.53)	2,60,136	39,298 (15.11)

Figures in the parentheses are percentages to totals.

It is clear from above table that there is a decline in the total deliveries of cloth in India and Southern Region. In meeting the internal demand and export demand the percentages of Southern Region are lower (7 to 15 per cent) as the Southern Region is concentrating more on spinning mills. The public taste is moving towards better finished fabrics and blended fabrics and this may also be one of the reasons for the decline in the deliveries of cotton cloth both inside the country and in the export front.

f. Employment:

Cotton textiles were at one time considered a labour intensive industry. But the industry is fast becoming highly capital intensive. The employment position has remained more or less constant. The details of department-wise employment of textile labour are given in Table 4.13.

TABLE 4.13

DEPARTMENTWISE EMPLOYMENT OF TEXTILE LABOUR IN INDIA AND SOUTHERN REGION

Year	India - Total workers in				Southern Region- Total Number of workers in					
	Spinning and preparatory	Weaving & preparatory	Other Department-ments	Miscellaneous staff	Spinning and preparatory	Weaving and pre-ary	Other Department-ments	Miscellaneous staff		
1979	328 (38)	269 (31)	100 (12)	167 (19)	862	101 (56)	27 (16)	17 (9)	35 (19)	184
1980	336 (38)	270 (31)	97 (11)	172 (20)	675	106 (58)	29 (16)	16 (8)	35 (19)	166
1981	341 (39)	266 (30)	274 (31)		881	108 (59)	26 (14)	50 (27)		184
1982	303 (41)	201 (27)	227 (32)		931 (56)	111 (14)	27 (28)	52	190	
1983	322 (41)	205 (28)	246 (31)		793	108 (59)	24 (13)	51 (28)		184

Figures in parentheses are percentages to totals - Source: Office of Textile Commissioner, Bombay

It is evident from the table that the percentage of workers employed in spinning and preparatory mills is more (56 per cent) in Southern Region than in India as the Southern Region is concentrating on the development of spinning Mills. In India and Southern Region, these percentages are continuously increasing over the years. In all the other departments there is not much variation in the employment of workers. In the administrative departments, the percentage of staff employed are more during 1981-83, indicating the concentration of mills in improving the efficiency of management.

g. Profitability:

Profitability is an indicator of the performance of any industry. There is a feeling in the public mind that textiles is a very profitable industry. The mills are concentrated in certain cities like Bombay, Ahmedabad and Coimbatore, and their prosperity has been more visible. Profitability ratio may be high in mills which are operating under labour intensive technology. But with modernized techniques the industry has become capital intensive and the profitability is low. Table 4.14 gives profitability ratios of cotton textile industry in India.

TABLE 4.14

COTTON TEXTILE INDUSTRY - PROFITABILITY RATIOS

Year	Gross profits as percentage of sales		Profit after tax as percentage of networth	
	Cotton textile industry	All industries	Cotton Textile industry	All industries
1975	7.7	11.4	12.3	13.7
1976	2.7	9.1	-ve	8.2
1977	3.2	9.0	-ve	7.9
1978	5.3	9.0	-ve	8.8
1979	7.9	9.5	20.0	11.5
1980	8.9	10.1	22.7	14.5
1981	7.8	9.6	16.9	14.9
1982	8.3	10.3	18.7	15.5
1983	8.7	10.1	19.5	16.7

Source: Handbook of Statistics on Cotton Textile Industry - 1985

In general the profitability ratios are significantly lower in the textile industry than in all other industries. The factors responsible for this condition are--

1. Government often intervenes in the price policy of textiles, price control and even distribution controls have been imposed by the government.
2. There are wide fluctuations in the price of cotton.

3. Lack of modernisation in the industry.
4. Textile consumption is sensitive to price levels. If price rises due to excise duties the profitability also will be reduced.

h. Excise duty:

As the largest industry in India, the textile industry, substantially contributes to the exchequer by way of excise duty on cloth and yarn sold by mills. The details of revenue realised by the government from excise duty on cloth and yarn are given in Table 4.15.

TABLE 4.15

REVENUE REALISED BY GOVERNMENT FROM EXCISE DUTY

(In crores of rupees)

Period	Duty on cloth	Duty on yarn	Grand total
1975	109.15 (66.1)	55.94 (33.9)	165.09
1976	110.07 (60.2)	73.34 (39.8)	182.81
1977	109.37 (61.6)	68.16 (38.4)	197.53
1978	135.3 (65.9)	69.95 (34.1)	205.25
1979	136.44 (60.8)	87.88 (39.2)	224.32
1980	141.80 (59.2)	97.53 (40.8)	239.34
1981	161.1 (59.7)	108.59 (40.3)	269.75
1982	168.28 (61.9)	103.41 (38.1)	271.69
1983	161.93 (61.4)	100.00 (37.7)	261.73
Growth rate	1.64%	1.6%	1.76%

Figures in parentheses indicate percentages to totals.

It is clear from the table that the revenue from excise duty on cloth and yarn has increased at a rate of 1.76 per cent. The percentages of duty on cloth are on the higher side (more than 60 per cent) than the duty on yarn.

1. Productivity indices:

Productivity of factors are helpful in ensuring their optimum utilisation. Many studies conducted by SITRA show that the productivity in general is low in cotton textile industry when compared to other countries and there are differences between the best and worst mills. The tables (4-15a and 4-15b) give details of machines and men productivity in India and Southern Region.

TABLE 4-15a

PRODUCTIVITY INDICES - INDIA

Year	Spindle productivity in 100 kgs	Loom productivity in 000 metres	Labour production of cloth in 000 metres	Labour productivity of yarn in 000kgs
1975	74.08	28		
1976	67.84	24.5		
1977	56.93	20.4		
1978	57.54	20.1		
1979	59.43	19.6	12.00	2.91
1980	64.67	21.7	12.87	3.12
1981	61.40	19.4	11.83	2.93
1982	65.61	18.5	11.23	3.24
1983	68.00	19.1	12.44	3.35
Average productivity	(63.9)	(21.1)	(12.2)	(3.1)

TABLE 4.15b

PRODUCTIVITY INDICES - SOUTHERN REGION

Years	Spindle productivity in 1000 kgs	Loom productivity in million metres	Labour productivity of cloth in million metres	Labour productivity of yarn in 1000 kgs
1975	64.25	27.8		
1976	62.00	25.8		
1977	55.26	22.6		
1978	54.28	21.8		
1979	51.97	21.5	12.37	2.82
1980	59.57	22.3	12.28	3.14
1981	54.19	23.2	13.57	3.16
1982	61.33	23.8	13.81	3.55
1983	64.01	26.0	13.50	3.62
Average productivity	(58.4)	(24)	(13.2)	(3.4)

The analysis of Tables reveals the following facts:

1. Spindle productivity in India is greater than in Southern Region. The average productivity is 63.4 in India and 58.4 in Southern Region.
2. There is a drop in productivity during 1977-80 in both the regions. During this period the industry was hit by

depression. In all these years the spindle activity is less than the installed capacity. This is another reason for the low productivity.

3. In the case of loom activity the rate of decline is less when compared to spindle activity. This is due to the higher capacity installation in the case of looms. The average loom productivity is 21 in India and 24 in Southern Region.

4. In both India and Southern Region the labour productivity registers an increase inspite of many labour problems like strikes, wage settlements, lock outs etc. The average labour productivity of yarn in India is 12.2 and 13.2 in Southern Region and that of cloth in general is low. The low productivity may be attributed to lack of standardisation, modernisation, inefficient management and inefficient use of financial resources by the mills.

II Fluctuations:

a) Trend Analysis:

The Cotton Textile Industry faced both crisis and boom during the last three decades. To find out the exact extent of fluctuations, a long term trend analysis using 24 years data in production of yarn and cloth for the Indian Union and the Southern Region has been done. The non-linear

trend analysis is carried out using different degree of polynomial. The following are the estimated trend lines:

$$1. y_1 = 943.7917 + 6.0854 x \text{ (yarn - India)}$$

$$2. y_2 = 4153.139 - 46.721 x - 4.1023x^2 - 0.3429x^3$$

(cloth - India)

$$3. y_3 = 281.1155 + 2.2435 x - 0.4397x^2$$

$$+ 0.0405 x^3 + 0.0043 x^4 \text{ (yarn - southern Region)}$$

$$4. y_4 = 343.6536 + 0.6329 x - 0.1882 x^2 + 0.01407x^3$$

(Cloth - Southern Region)

These trend lines are of the form:

$$Y = B_0 + B_1x + B_2x^2 + B_3x^3 + B_4x^4$$

The co-efficients B_s are determined such that the particular trend line is the most exact one i.e. the trend line which, has the highest possible R^2 value (coefficient of determination) (Vide Appendices I, II, III and IV).

1) y_1 - Yarn - India

The estimated equation for the production of yarn shows that the average rate of growth is 6 per cent over the years. Out of 875 mills more than 500 mills are to meet the demand for yarn by the mill sector and decentralised sector. So, there is consistent growth in the production of yarn in India.

ii) y_2 - Cloth - India:

Cloth production in India shows a different trend. It had declined at an average rate of 46 per cent over these years. This decline may be due to a decline in the demand for cotton cloth and change in the public taste towards non cotton fabrics and blended fabrics.

iii) y_3 - Yarn - Southern Regions

In Southern Region the yarn production shows an increase of 2.2 per cent. As the spinning mills are concentrated in this region, more than one third of the growth of yarn production in India is from this region alone.

iv) y_4 - Cloth - Southern Region

The growth rate of cloth in Southern Region is very low (.6 per cent). When compared to the Indian condition, however the weaving industries' performance is good in this region. It also indicates that there is adequate demand for cotton cloth in this region. Another reason for this growth is that the ENTYCE controlled mills are producing controlled cloth at a cheaper price for the weaker sections of the population.

The long trend equations for cloth and yarn in India and southern Region are given in Table 4.16 and the trend lines are graphically shown in Figures I, II, III and IV.

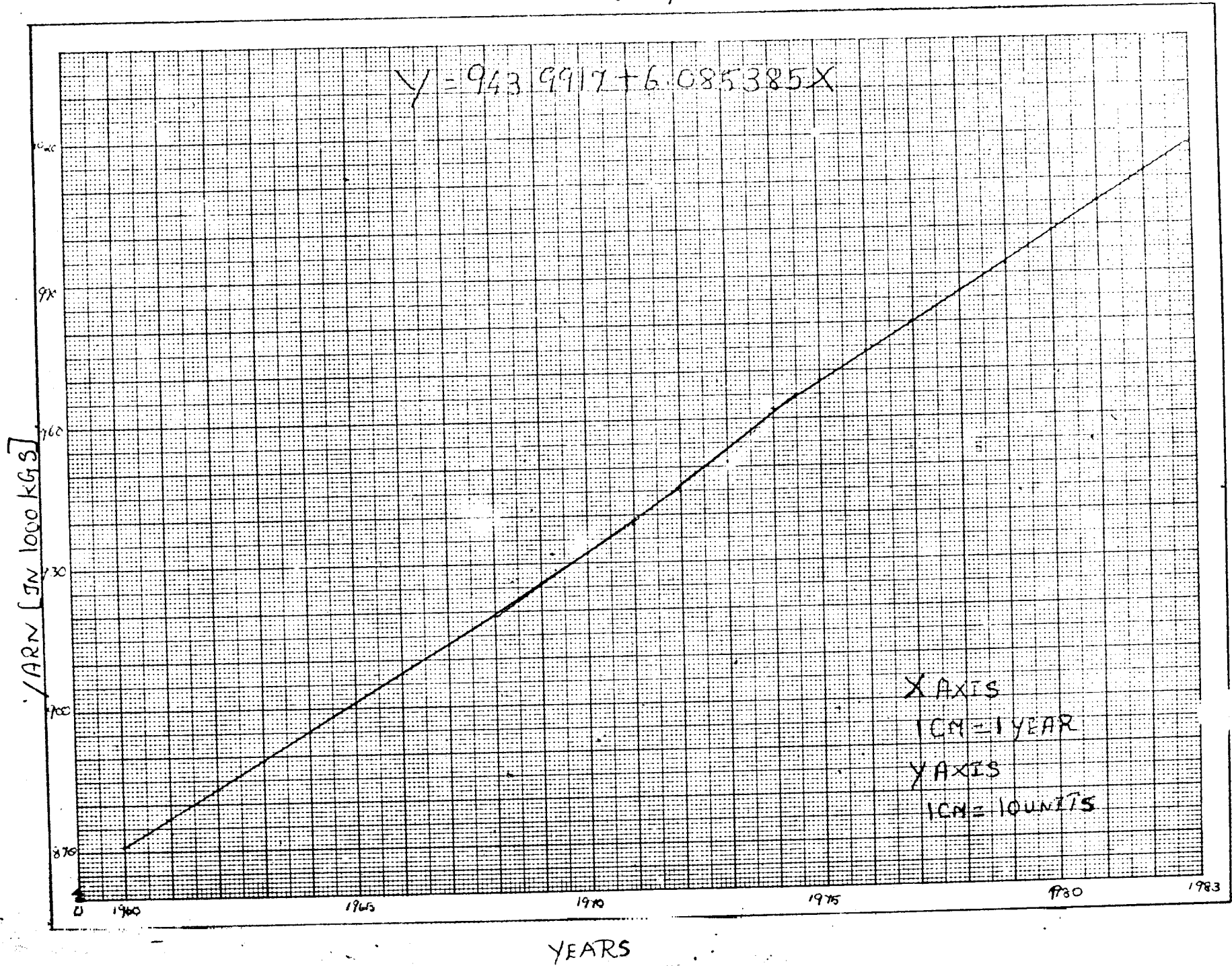
TABLE 4.16

ESTIMATED LONG TERM EQUATIONS

Item	B ₀	B ₁	B ₂	B ₃	B ₄	R ²	S.E. of B	t'
India								
Yarn	943.7917	6.095395	-	-	-	.4377	1.4075	4.3232*
Cloth	4153.139	46.7210	4.102256	.341926	-	.6939	5.89732	7.922*
Southern Region								
Yarn	281.1155	2.242542	.439653	.040565	.004330	.9467	0.31623	7.2336*
Cloth	343.6536	.632933	.18822	.014077	-	.5194	0.46	1.3718**

* - Highly significant
 ** - Significant at 20 per cent level

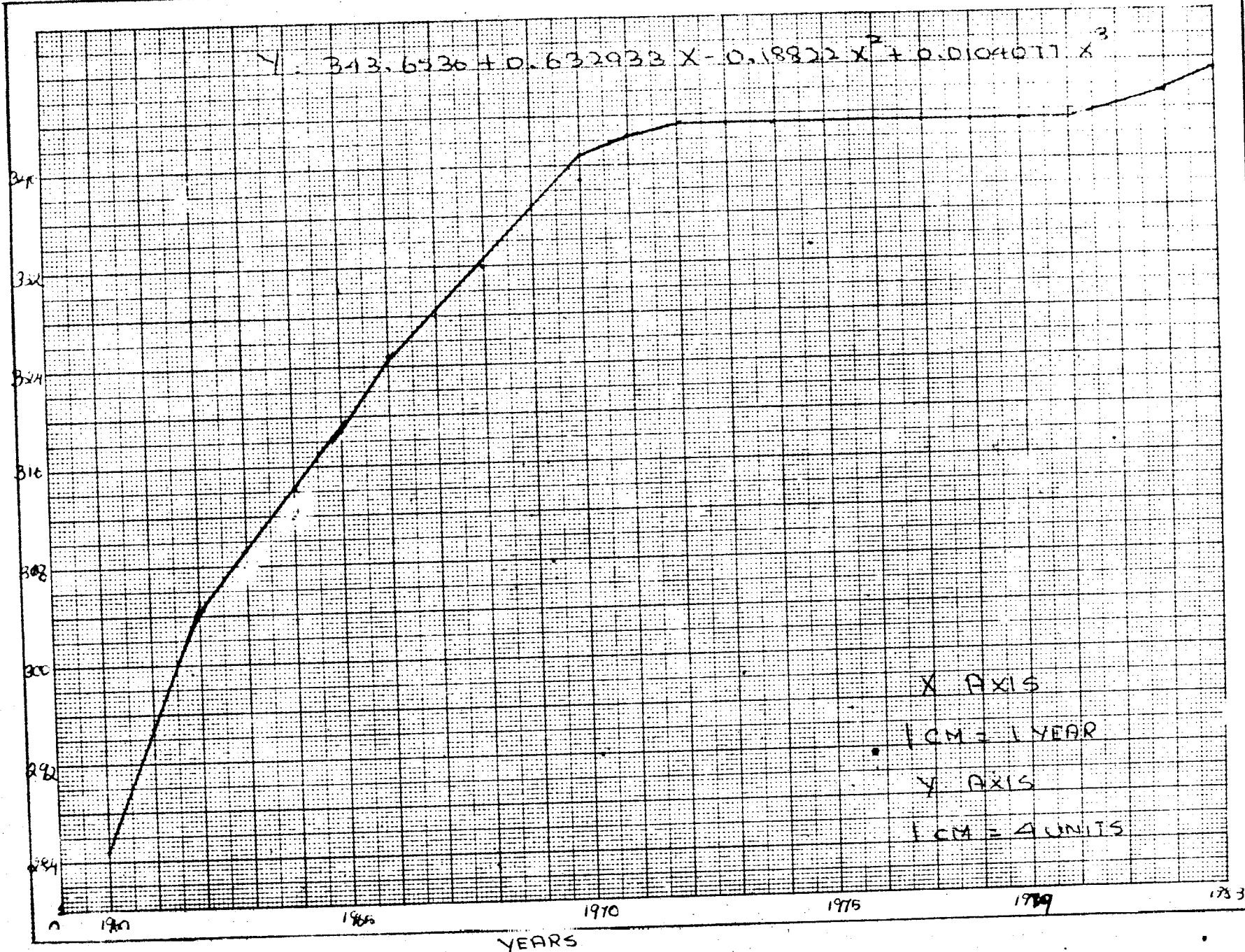
FIGURE - 1
ESTIMATED PRODUCTION OF YARN - INDIA



630

ESTIMATED PRODUCTION OF CLOTH - SOUTH INDIA

CLOTH (IN MILLION METRES)



b. Cyclical fluctuations:

Cotton Textile Industry is perhaps the only industry in India where the three sectors namely public, private and cooperative, exist side by side and compete in the same market. The increasing variety, the diverse characteristics, fluctuating prices of raw materials, the policy of the Government to ensure adequate supplies of cloth at reasonable prices, protection to the handloom sector, mismanagements and different levels of technology are some of the problems faced by the industry. So it had to face ups and downs during the last 3 decades, while the production of yarn and cloth in India and Southern Region fluctuates the long term trend uniformly varies. To take into account the actual fluctuations around the trend lines, the cyclical residual indices are determined and shown in the Tables 4.17, 4.18, 4.19 and 4.20. The cyclical residual pattern of production of yarn and cloth are graphically shown in Figures V, VI, VII and VIII.

TABLE 4.17
CYCLICAL AND RESIDUAL INDEX VALUES
YARN - INDIA

Year	y actual	y fitted	cr value
1960	788.000000	870.767200	.904949
1961	862.000000	876.852600	.983062
1962	860.000100	882.938000	.974021
1963	893.000100	889.023300	1.004473
1964	965.000000	895.108600	1.078081
1965	939.0001000	901.194000	1.041951
1966	901.000100	907.279400	.993079
1967	896.000000	913.364800	.980988
1968	961.000000	919.450100	1.045190
1969	951.000100	925.535500	1.027513
1970	965.000000	931.620900	1.035829
1971	881.000100	937.706300	.939527
1972	972.000100	949.877100	1.023290
1973	998.000000	955.962500	1.043974
1974	1007.000000	962.047900	1.046725
1975	989.000100	968.133300	1.021554
1976	1006.000000	974.218700	1.032622
1977	846.000000	980.304100	..862998
1978	912.000000	986.389500	.924584
1979	952.000100	992.474800	.959218
1980	1058.000000	998.560200	1.059525
1981	1015.000000	1004.645000	1.010307
1982	958.000000	1010.731000	.947829
1983	1076.000000	1016.816000	1.058205

TABLE 4.18
CYCLICAL AND RESIDUAL INDEX VALUES
CLOTH - INDIA

Year	y actual	y fitted	cr value
1960	4616.000000	4713.871000	.979238
1961	4701.000000	4625.765000	1.016264
1962	4560.000000	4552.020000	1.0011753
1963	4423.000000	4490.585000	.984950
1964	4654.000000	4439.409000	1.048338
1965	4587.000000	4396.441000	1.043344
1966	4239.000000	4359.629000	.972330
1967	4097.000000	4326.920000	.946863
1968	4366.000000	4296.265000	1.016232
1969	4168.000000	4265.611000	.977117
1970	4157.000000	4232.906000	.982068
1971	3957.000000	4196.099000	.943019
1972	4245.000000	4101.973000	1.034868
1973	4169.000000	4040.551000	1.031790
1974	4316.000000	3966.821000	1.088025
1975	4032.000000	3878.731000	1.039515
1976	3881.000000	3774.229000	1.028289
1977	3223.000000	3651.265000	.882708
1978	3251.000000	3507.786000	.926796
1979	3206.000000	3341.741000	.959380
1980	3476.000000	3151.078000	1.103114
1981	3147.000000	2933.747000	1.072690
1982	2258.000000	2687.694000	.840125
1983	2613.000000	2410.870000	1.083841

TABLE 4.19
CYCLICAL AND RESIDUAL INDEX VALUES
YARN - SOUTH INDIA

Year	y actual	y fitted	cr value
1960	205.000000	210.578500	.973509
1961	220.000000	212.645600	1.034585
1962	215.000000	217.452200	.988723
1963	224.000000	224.150600	.999328
1964	240.000000	231.996800	1.034497
1965	252.000000	240.350800	1.048467
1966	230.000000	248.676700	.924896
1967	244.000000	256.542200	.951110
1968	261.000000	263.619300	.990064
1969	277.000000	269.683500	1.027130
1970	292.000000	274.614600	1.063308
1971	271.000000	278.396100	1.063308
1972	282.000000	282.964300	.996592
1973	273.000000	284.237800	.960463
1974	289.000000	285.335300	1.012844
1975	293.000000	286.759900	1.021761
1976	311.000000	289.118900	1.075682
1977	278.000000	293.123300	.948406
1978	298.000000	299.588000	.994699
1979	289.000000	309.431900	.933969
1980	333.000000	323.678000	1.028800
1981	342.000000	343.452900	.995770
1982	387.000000	369.987400	1.045982
1983	395.000000	404.616000	.976234

TABLE 4.20
CYCLICAL AND RESIDUAL INDEX VALUES
CLOTH - SOUTH INDIA

Year	y actual	y fitted	cr value
1960	283.000000	284.630300	.994272
1961	304.000000	295.180700	1.029878
1962	296.000000	304.425600	.972323
1963	292.000000	312.449500	.934551
1964	335.000000	319.336800	1.049049
1965	351.000000	325.1720000	1.079429
1966	313.000000	330.039500	.948371
1967	319.000000	334.023800	.955022
1968	351.000000	337.209400	1.040896
1969	348.000000	339.680800	1.024491
1970	358.000000	341.522200	1.036536
1971	325.000000	342.818400	.948024
1972	329.000000	344.112400	.956083
1973	342.000000	344.279200	.993380
1974	342.000000	344.238500	.993497
1975	355.000000	344.074700	1.031753
1976	377.000000	343.872400	1.096337
1977	319.000000	343.715800	.928092
1978	328.000000	343.689600	.954349
1979	334.000000	343.878200	.971274
1980	356.000000	344.360000	1.033784
1981	353.000000	345.237600	1.022484
1982	373.000000	346.577300	1.076239
1983	324.000000	348.469600	.929780

FIGURE - V
CYCLICAL AND RESIDUAL INDEX VALUES - YARN INDIA

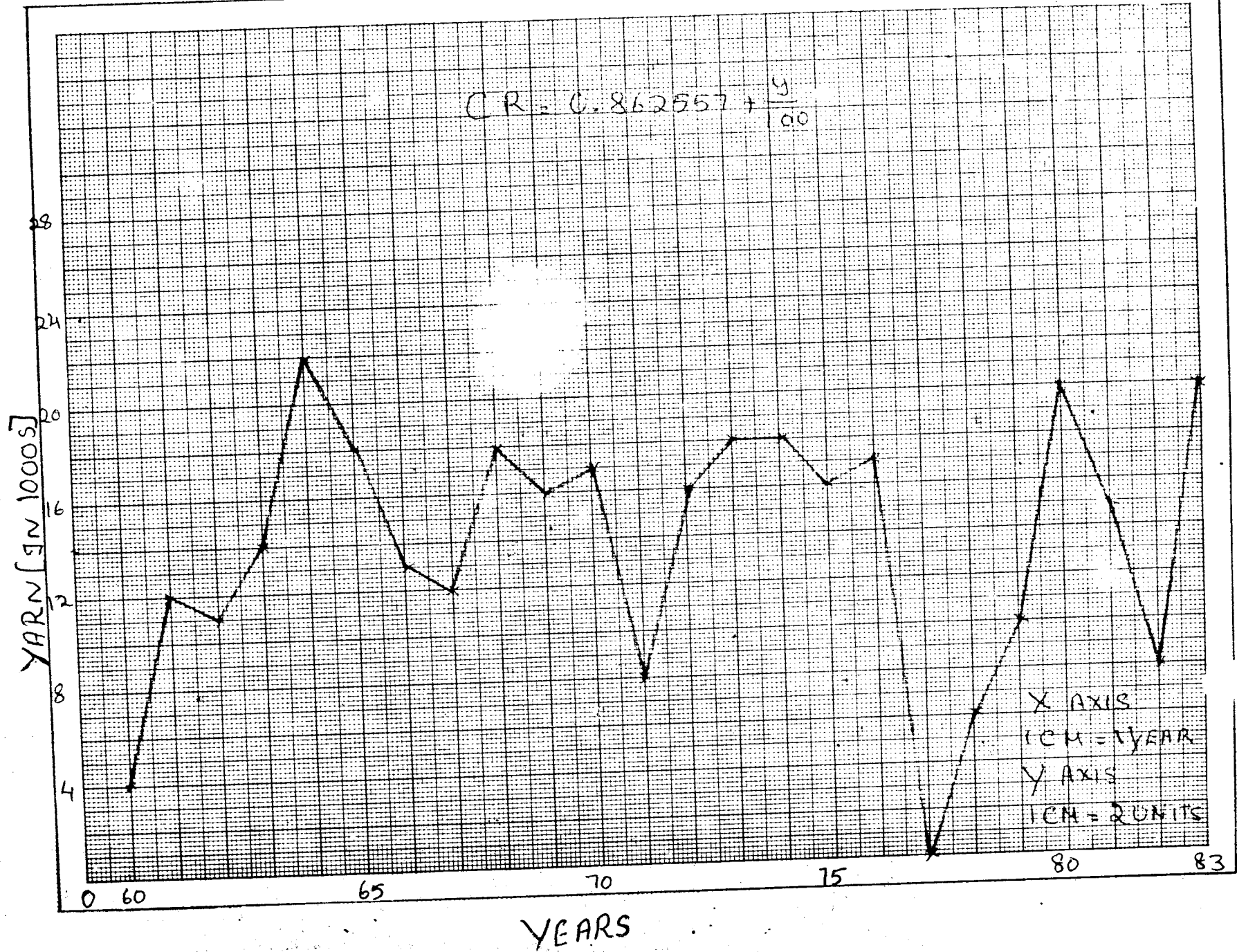


FIGURE - VI
CYCLICAL AND RESIDUAL INDEX VALUES - CLOTH INDIA

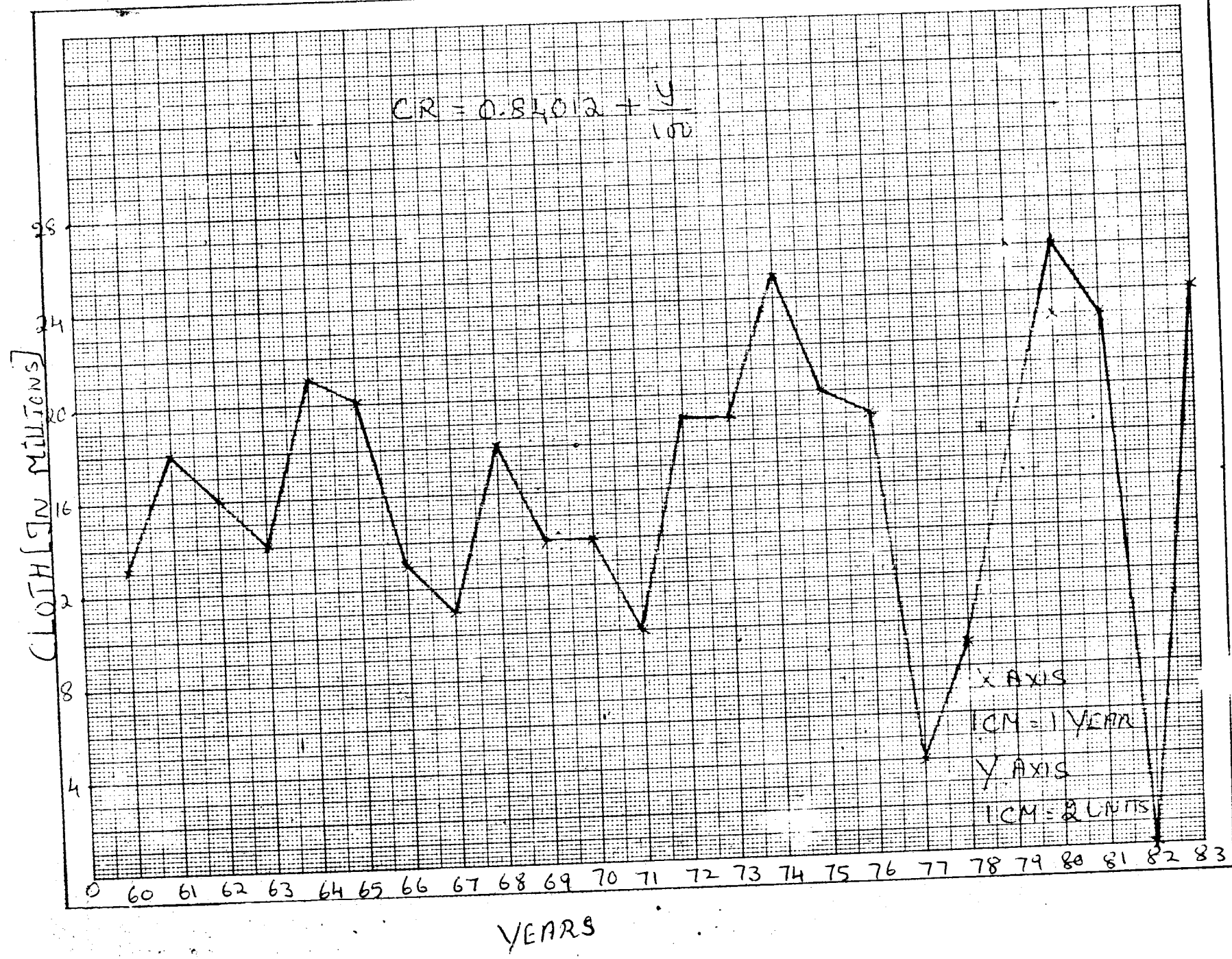
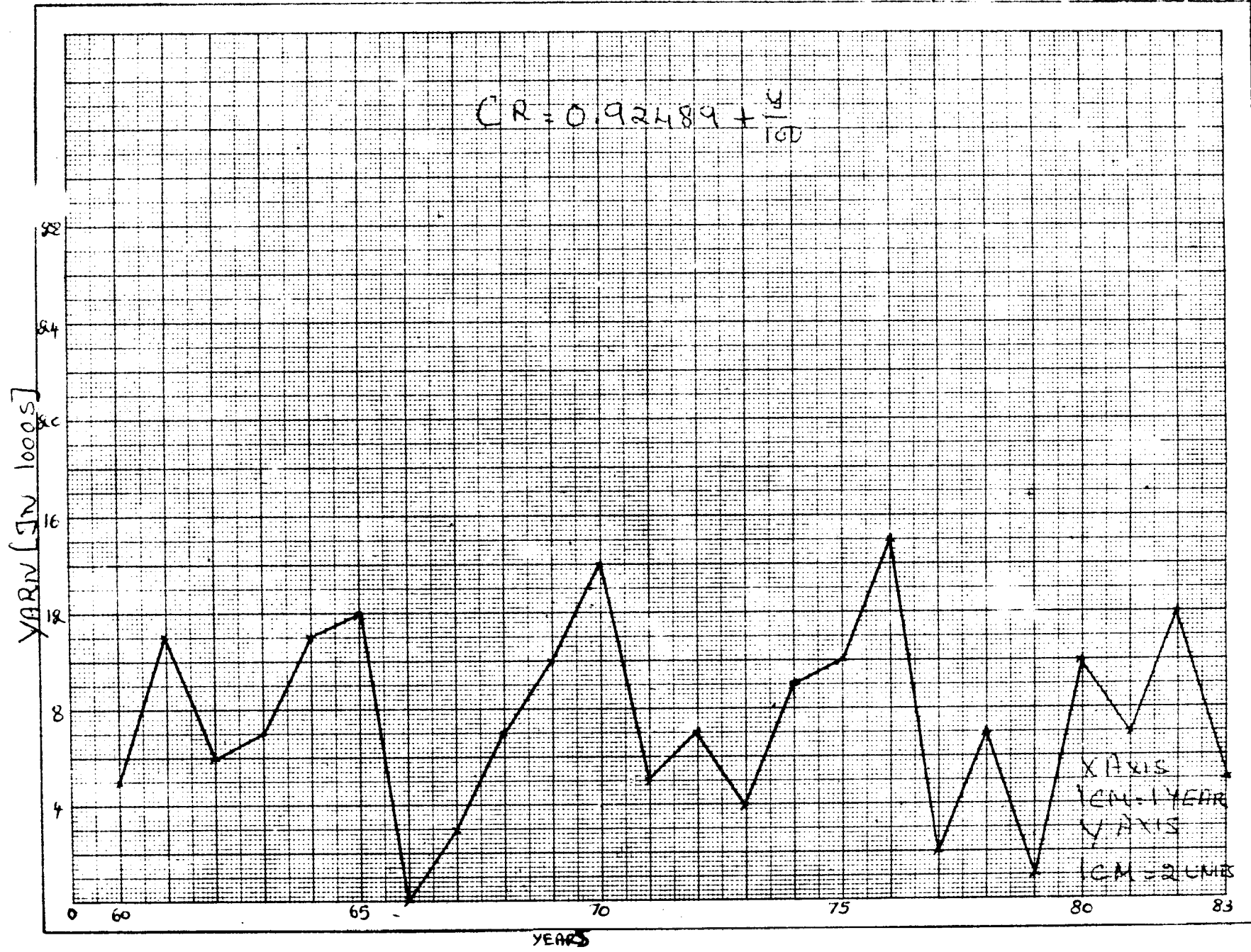
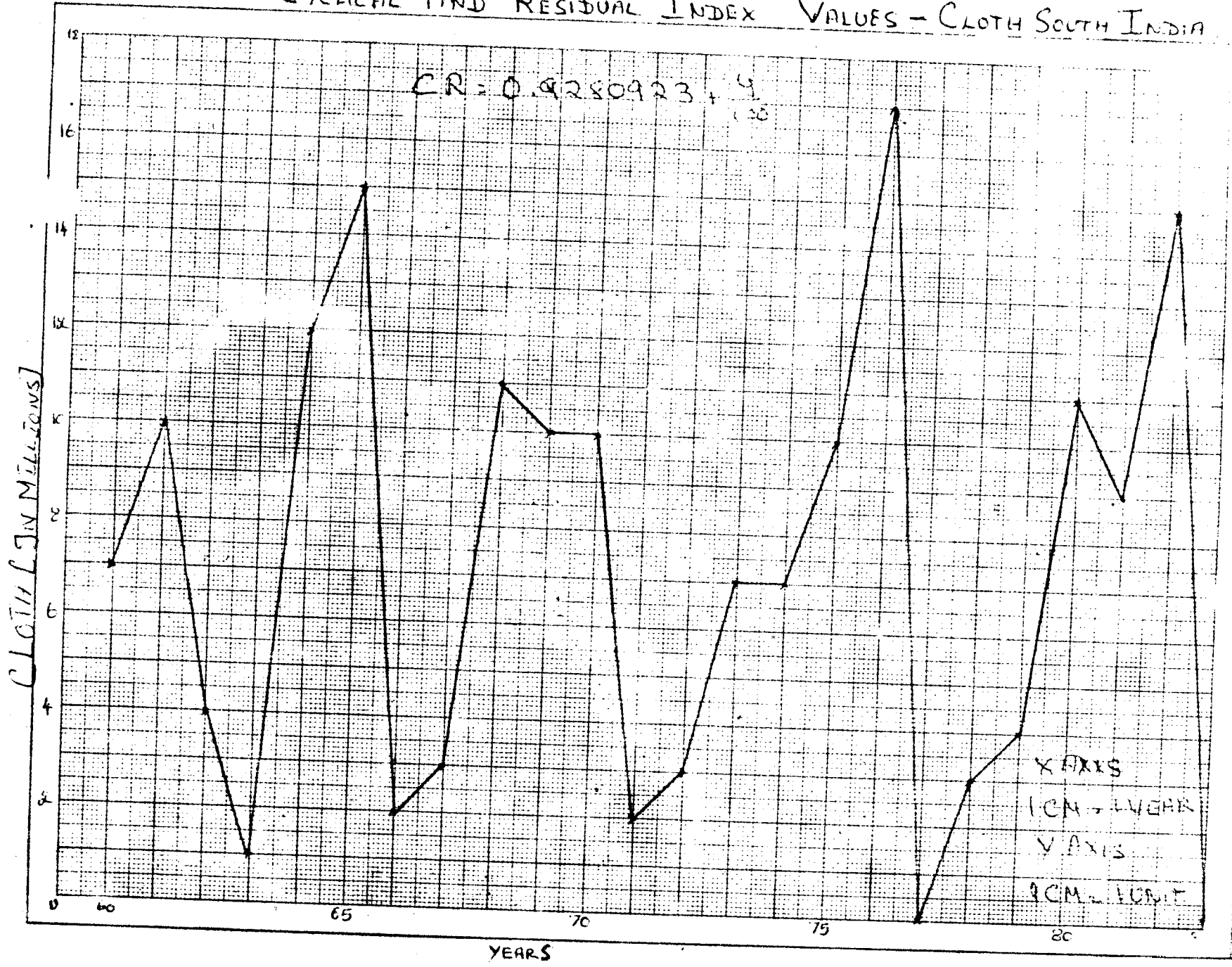


FIGURE - VII
 CYCLICAL AND RESIDUAL INDEX VALUES - YARN SOUTH INDIA



LYCICAL AND RESIDUAL INDEX VALUES - CLOTH SOUTH INDIA



The spinning mills faced its crisis during 1971, 1977 and 1982. One of the major economic causes for this ~~condition~~ was the steep increase in the food prices. The pattern of production was also not in ~~consonance~~ with the public demand and taste. During the same period cloth ~~production~~ was also sluggish and stocks began to accumulate and many mills had to close down. They were taken over by NTC.

In 1964, 1974 and 1980 the industry had peak level production in yarn and cloth. During this period it had been more or less a "Sellers Market" and most of the mills were making reasonable profits. The boom and depression in this industry did not have a long period, because of Government's intervention. Modernisation programmes and credit policy of the Government have helped the industry to revive from the depression.

In the Southern Region, the production of yarn and cloth experienced sharp rise in the years 1961, 1965, 1976 and 1982 with a high production level in 1976. The industry was hit by depression in the years 1966, 1971, 1977 and 1981. The fluctuations are more or less with some degree in both India and Southern Region.

c. Seasonal Fluctuations:

In order to find out the seasonal effect on the production of yarn and cloth. "The average seasonal indices"

for the twelve months (January to December) for the 24 years are determined by a method described in the "Methodology". The average seasonal indices are based on the actual monthly values of production of yarn and cloth. The calculated values are given in Table 4.21, 4.22, 4.23 and 4.24.

The values in the tables shows that seasonal indices have constant values for all the months indicating the seasonal independence of the production of yarn and cloth.

TABLE 4.21
MONTHLY SEASONAL AVERAGE INDEX
YARN - INDIA

month	total monthly indx.	seasonal indx
1	2197.6340	100.1020
2	2198.5040	100.0667
3	2199.1800	100.0386
4	2199.9200	100.0177
5	2199.9180	100.0046
6	2200.0000	100.0000
7	2199.9220	99.9965
8	2199.6660	99.9848
9	2199.2100	99.9641
10	2198.5420	99.9337
11	2197.6650	99.8939
12	2196.5940	100.1446

TABLE 4.22
MONTHLY SEASONAL AVERAGE INDEX
CLOTH - INDIA

month	total monthly indx.	seasonal indx
1	2199.1910	100.0350
2	2199.4970	100.0230
3	2199.7310	100.0134
4	2199.8890	100.0063
5	2199.9750	100.0017
6	2200.0000	100.0000
7	2199.9740	99.9988
8	2199.8870	99.9949
9	2199.7280	99.9876
10	2199.4940	99.9770
11	2199.1880	99.9631
12	2198.8220	100.0502

TABLE 4.22
MONTHLY SEASONAL AVERAGE INDEX
CLOTH - INDIA

month	total monthly indx.	seasonal indx
1	2199.1910	100.0350
2	2199.4970	100.0230
3	2199.7310	100.0134
4	2199.8890	100.0063
5	2199.9750	100.0017
6	2200.0000	100.0000
7	2199.9740	99.9988
8	2199.8870	99.9949
9	2199.7280	99.9876
10	2199.4940	99.9770
11	2199.1880	99.9631
12	2198.8220	100.0502

TABLE 4.23
MONTHLY SEASONAL AVERAGE INDEX
YARN - SOUTHERN INDIA

month	total monthly indx	seasonal indx
1	2201.2100	99.9790
2	2200.7920	99.9871
3	2200.4610	99.9933
4	2200.2150	99.9974
5	2200.0570	99.9995
6	2200.0000	100.0000
7	2200.0550	100.0025
8	2200.2090	100.0095
9	2200.4530	100.0206
10	2200.7820	100.0355
11	2201.2020	100.0547
12	2201.7250	99.9694

TABLE 4.24
MONTHLY SEASONAL AVERAGE INDEX
CLOTH - SOUTHERN INDIA

month	total monthly indx.	seasonal indx
1	2199.7980	99.9506
2	2199.8850	99.9692
3	2199.9490	99.9833
4	2199.9850	99.9930
5	2199.9990	99.9984
6	2200.0000	100.0000
7	2199.9990	99.9999
8	2199.9840	99.9993
9	2199.9460	99.9976
10	2199.8820	99.9947
11	2199.7960	99.9907
12	2199.6970	99.9280

d. Forecasting using Time Series Analysis:

The projected production of yarn and cloth based on the above analysis are presented in Table 4.25.

TABLE 4.25

**PROJECTED PRODUCTION OF YARN AND CLOTH
INDIA AND SOUTHERN REGION**

years	India		Southern Region	
	Yarn CR = .94	Cloth CR = 0.94	Yarn CR = .97	Cloth CR = .96
1984	961.5	1975-1939	435.30	341.8
1985	967.247	1651.3524	490.719	343.7259
1986	972.968	1292.79	554.79984	347.6379
1987	978.688	954.896	634.75	352.50
1988	984.40	493.44	730.5377	354.576

The spinning mills in India and Southern Region are in a better position than the weaving mills. According to a study made by RBI in 1985, 132 mills are in the sick list. The projected production figures of cloth in both India and Southern Region also show that the cotton textile Industry particularly the weaving mills will again be hit by a big depression. Recently 22 mills in Tamil Nadu and 78 mills in India have been closed. Modernisation liberal loans, mill purchase of machinery, fibre availability are some of the

measures taken by the Government to protect the heterogeneous mill sector. But in view of urbanisation there is going to be a long term shift away from coarse to medium and fine fabrics. Therefore, it is essential that finishing facilities should be provided for the mill sector. The demand for cloth will increase with 1.25 per cent growth rate in population. So, homogeneity should be brought between the different sectors of the textile industry so as to meet the growing demand for cloth in future.

The Projected Production Figures are calculated by taking into account the average depression cyclical residual index values.

Summary and Conclusion



V SUMMARY AND CONCLUSION

The data collected for the study on "Performance of Cotton Textile Industry and Fluctuations in the production of cotton yarn and cloth in India and Southern Region - A Time Series Analysis" were analysed with ratios, percentages and time series analysis. The summary of findings are as follows:

I. Growth in number of mills:

1. Fifty five per cent of the mills are spinning mills in India and this percentage is high in Southern Region (85 per cent).
2. The number of mills had grown at a rate of 1.9 per cent in India and 1.87 per cent in Southern Region.

II. Capacity Utilisations:

3. The installed spindleage was higher in India (65 per cent) in composite mills and this percentage was 70 per cent in spinning mills in Southern Region.
4. The percentage of looms installed in Southern Region to India was low by 10 per cent.
5. The spindleage utilisation was 74.8 per cent in India and 76.4 per cent in Southern Region.

6. The loom utilisation was 73 per cent in India and 68.5 per cent in Southern Region.

III. Consumption of cotton:

7. There was a decline in the consumption of cotton and the percentage of cotton consumption of Southern Region to India was 31 per cent.

IV. Production of yarn and cloth:

8. The cotton yarn production had grown at a rate of 1.52 per cent in India and 1.98 per cent in Southern Region.
9. The percentage share of Southern Region to total yarn production of India was 33 per cent.
10. Production of cloth had recorded a growth rate of 2.47 per cent in India and 1.54 per cent in Southern Region.
11. The percentage share of Southern Region to total cloth production of India was only 10 per cent.
12. The percentage of fine quality yarn varied between 1 to 4 in both in India and Southern Region and low quality (10-20 counts) yarn had shown higher percentages (between 25 and 40).

V. Deliveries of yarn and cloth:

13. The internal demand for yarn had increased at a rate of 1.6 per cent in India and this growth rate was 1.67 per cent in Southern Region.
14. There was a decline in the civil deliveries of yarn in Southern Region from 82 to 51 per cent.
15. The percentage share of Southern Region to total deliveries of cloth was low at 7 per cent.

VI. Employment:

16. The percentage of labour employed in the spinning mills had increased from 5 per cent to 59 in the Southern Region.
17. In the administrative department the percentage of staff had increased from 12 to 31 per cent in India and from 9 to 28 per cent in the Southern Region.

VII. Profitability:

18. The profitability ratio was low (7 per cent) in cotton textile industry.
19. The industry had incurred loss during 1977-79.

VIII. Excise duty:

20. The revenue realised by the government from excise duty on cloth and yarn had recorded a growth rate of 1.76 per cent.
21. Excise duty from cloth (65 per cent) had been more than the excise duty from yarn (35 per cent).

IX. Productivity:

22. The average spindle productivity was 63.4 thousands kgs. in India and it was 58.3 thousand kgs in the Southern Region.
23. The average loom productivity in India was 21 thousand metres and 24 thousand metres in the Southern Region.
24. The average labour productivity of yarn in India was 12.2 thousand kgs, and it was 13.2 thousand kgs in the Southern Region.
25. The average labour productivity of cloth in India was 8.1 thousand metres and it was 3.4 thousand metres in Southern Region.

X Fluctuations

26. The yarn production in India had shown a positive trend with 6 per cent growth rate.

27. The cloth production had shown a negative trend with 46 per cent rate of decline.
28. The yarn production in Southern Region had registered 2.2 per cent growth rate.
29. There had been a very low rate of growth in cloth production in Southern Region (1.6 per cent).
30. The spinning mills had faced the depression in 1971, 1977 and 1982.
31. Same degree of fluctuations have occurred in the case of cloth production.
32. There had been a sharp rise in the production of yarn and cloth in 1961, 1965, 1976 and 1982 in Southern Region and the industry was hit by depression in the years 1976, 1977 and 1981.
33. Season had not influenced the industry in all the years for yarn and cloth.
34. The projected production of yarn in India in 1988 will be 984 million kgs. and cloth will be 493 million metres.
35. In Southern Region the yarn production will be 730 million kgs and 354 million metres will be the cloth production.

Suggestions for future research:

1. Fluctuations in the demand for man made fibres can be studied.
2. The causes for fluctuations may be another area of research.
3. Variations in productivity and causes for variations in productivity may also be studied.

Conclusion:

During the past twenty years the textile industry had been passing through periods of unprecedented crisis so there are short term and long term problems existing. For the growth and development of the industry these problems are to be solved. The announcement of the New Textile Policy is expected to bring some positive changes both qualitative and quantitative.

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Appendix



APPENDIX I

ESTIMATED PRODUCTION OF YARN - INDIA

RESULT - YARN - INDIAN UNION

THE COEFFICIENT ARE 1

BETA (0) 943.791700 943.791700

BETA (1) 6.085385 6.085385

CMSSQ = 2810.386000

THE POLYNOMIAL OF DEGREE 1

X	Y	YHAT	(Y-YHAT)
-12.000000	788.000000	870.767200	-82.767090
-11.000000	862.000000	876.852600	-14.852480
-10.000000	860.000100	882.938000	-22.937870
-9.000000	893.000100	889.023300	3.976746
-8.000000	965.000000	895.108600	69.891420
-7.000000	939.000100	901.194000	37.806030
-6.000000	901.000100	907.279400	-6.279358
-5.000000	896.000000	913.364800	-17.364750
-4.000000	961.000000	919.450100	41.549860
-3.000000	951.000100	925.535500	25.464480
-2.000000	965.000000	931.620900	33.379090
-1.000000	881.000100	937.706300	-56.706300
1.000000	972.000100	949.877100	22.122920
2.000000	998.000000	955.962500	42.037530
3.000000	1007.000000	962.047900	44.952150
4.000000	989.000100	968.133300	20.866760
5.000000	1006.000000	974.218700	31.781370
6.000000	846.000000	980.304100	-134.304000
7.000000	912.000000	986.389500	-74.389410
8.000000	952.000100	992.474800	-40.474790
9.000000	1058.000000	998.560200	59.439820
10.000000	1015.000000	1004.645000	10.354490
11.000000	958.000000	1010.731000	-52.730890
12.000000	1076.000000	1016.816000	59.183720

APPENDIX III
ESTIMATED PRODUCTION OF YARN - SOUTH INDIA

RESULT - YARN - SOUTH INDIA

THE COEFFICIENT ARE 1

BETA (0) 279.208300 279.208300

BETA (1) 6.032308 6.032308

CMSO = 410.936400

THE COEFFICIENTS ARE 2

BETA (0) 271.314200 271.314200

BETA (1) 6.032308 6.032308

BETA (2) .145739 .145739

CMSO = 378.919000

THE COEFFICIENTS ARE 3

BETA (0) 271.314200 271.314200

BETA (1) 2.243540 2.243540

BETA (2) .145739 .145739

BETA (3) .040565 .040565

CMSO = 222.512000

THE COEFFICIENT ARE 4

BETA (0) 281.115500 281.115500

BETA (1) 2.243542 2.243542

BETA (2) -.439653 -.439653

BETA (3) .040565 .040565

BETA (4) .004330 .004330

CMSO = 157.497200

THE POLYNOMIAL OF DEGREE 4

X	Y	YHAT	(Y-YHAT)
-12.000000	205.000000	210.000000	-5.578522
-11.000000	220.000000	212.645600	7.354416
-10.000000	215.000000	217.452200	-2.452194
-9.000000	224.000000	224.150600	-.150558
-8.000000	240.000000	231.996800	8.003235
-7.000000	252.000000	240.350800	11.649170
-6.000000	230.000000	248.676700	-18.676700
-5.000000	244.000000	256.542200	-12.542240
-4.000000	261.000000	263.619300	-2.619263
-3.000000	277.000000	269.683500	7.316498
-2.000000	292.000000	274.614600	17.385440
-1.000000	271.000000	278.396100	-7.396088
1.000000	282.000000	282.964300	-.964294
2.000000	273.000000	284.237800	-11.237790
3.000000	289.000000	285.335300	3.664734
4.000000	293.000000	286.759900	6.240082
5.000000	311.000000	289.118900	21.881100
6.000000	278.000000	293.123300	-15.123260
7.000000	298.000000	299.588000	-1.587982
8.000000	289.000000	309.431900	-20.431950
9.000000	333.000000	323.678000	9.321991
10.000000	342.000000	343.452900	-1.452942
11.000000	387.000000	369.987400	17.012570
12.000000	395.000000	404.616000	-9.615998

APPENDIX II

ESTIMATED PRODUCTION OF CLOTH - INDIA

RESULT - CLOTH - INDIAN UNION

THE COEFFICIENTS ARE 1

BETA (0) 3930.917000 3930.917000

BETA (1) -78.656920 -78.656920

CMSSQ=99666.580000

THE COEFFICIENTS ARE 2

BETA (0) 4153.139000 4153.139000

BETA (1) -78.656920 -78.656920

BETA (2) -4.102556 -4.102556

CMSSQ=63534.880000

THE COEFFICIENTS ARE 3

BETA (0) 4153.139000 4153.139000

BETA (1) -46.721010 -46.721010

BETA (2) -4.102556 -4.102556

BETA (3) -.341926 -.341926

CMSSQ=54253.080000

THE POLYNOMIAL OF DEGREE 3

X	Y	YHAT	(Y-YHAT)
-12.000000	4616.000000	4713.871000	-97.871100
-11.000000	4701.000000	4625.765000	75.235350
-10.000000	4560.000000	4552.020000	7.980469
-9.000000	4423.000000	4490.585000	-67.584960
-8.000000	4654.000000	4439.409000	214.590800
-7.000000	4587.000000	4396.441000	190.558600
-6.000000	4239.000000	4359.629000	-120.628900
-5.000000	4097.000000	4326.920000	-229.920400
-4.000000	4366.000000	4296.2650000	69.734860
-3.000000	4168.000000	4265.611000	-97.610840
-2.000000	4157.000000	4232.906000	-75.905760
-1.000000	3957.000000	4196.099000	-239.099100
1.000000	4245.000000	4101.973000	243.026900
2.000000	4169.000000	4040.551000	128.449000
3.000000	4316.000000	3966.821000	349.179400
4.000000	4032.000000	3878.731000	153.269500
5.000000	3881.000000	3774.229000	106.771000
6.000000	3223.000000	3651.265000	-428.264700
7.000000	3251.000000	3507.786000	-256.785700
8.000000	3206.000000	3341.741000	-135.740700
9.000000	3476.000000	3151.078000	324.921600
10.000000	3147.000000	2933.747000	213.253400
11.000000	2258.000000	2687.694000	-429.694300
12.000000	2613.000000	2410.870000	202.130100

APPENDIX IV

ESTIMATED PRODUCTION OF CLOTH - SOUTH INDIA

RESULT - CLOTH - SOUTH INDIA

THE COEFFICIENTS ARE 1

BETA (0) 333.458300 333.458300

BETA (1) 1.947692 1.947692

CM550 = 402.836500

THE COEFFICIENTS ARE 2

BETA (0) 343.653600 343.653600

BETA (1) 1.947692 1.947692

BETA (2) -.188220 -.188220

CM550 = 335.977200

THE COEFFICIENTS ARE 3

BETA (0) 343.653600 343.653600

BETA (1) .632933 .632933

BETA (2) -.188220 -.188220

BETA (3) .014077 .014077

CM550 = 331.660200

THE POLYNOMIAL OF DEGREE 3

X	Y	YHAT	(Y-YHAT)
-12.000000	283.000000	284.630300	-1.630280
-11.000000	304.000000	295.180700	8.891306
-10.000000	296.000000	304.425600	-8.425629
-9.000000	292.000000	312.449500	-20.449490
-8.000000	335.000000	319.336800	25.663180
-7.000000	351.000000	325.172000	25.828000
-6.000000	313.000000	330.039500	-17.039520
-5.000000	319.000000	334.023800	-15.023830
-4.000000	351.000000	337.209400	13.790560
-3.000000	348.000000	339.680800	8.319245
-2.000000	354.000000	341.522200	12.477750
-1.000000	325.000000	342.618400	-17.618360
1.000000	329.000000	344.112000	-15.112400
2.000000	342.000000	344.279200	-2.279205
3.000000	342.000000	344.238500	-2.238495
4.000000	355.000000	344.074700	10.925290
5.000000	377.000000	343.872400	33.127660
6.000000	319.000000	343.715800	-24.715820
7.000000	328.000000	343.689600	-15.689640
8.000000	334.000000	343.878200	-9.878235
9.000000	356.000000	344.466000	11.533940
10.000000	353.000000	345.237600	7.762421
11.000000	373.000000	346.577300	26.422730
12.000000	324.000000	348.469600	-24.469570