FORECAST AND TRENDS IN EXPORTS OF SELECT INDUSTRIES FROM PUNJAB SINCE 1990

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Abstract: Punjab is the richest Indian state. In specific Punjab is one of the most vibrant and dynamic states in the whole of India. This state has also high level of manufacturing industries. Punjab is one of the most industrialized states in India. The main industrial districts in Punjab are Ludhiana, Jalandhar and Amritsar and account for 90 per cent of exports from Punjab. Ludhiana is known for yarn and textile/Readymade garments/hosiery/Bicycle and bicycle parts industry, Jalandhar is known for Leather, sports and hand tool industry and Amritsar is also known for its Yarn and Textile /Ready Made Garments/ Hosiery industry. Punjab has highly developed small scale industries and has surplus of various small scale and other industrial and manufactured products such as bicycles, sewing machines, hosiery goods, leather goods, tools etc. This study aims at, analyzing the trends of exports in Punjab since 1990. For this purpose, five major industries have been selected, whose exports are substantial such as Yarn and Textile Industry/Ready Made Garments/ Hosiery from Ludhiana and Amritsar, Leather Industry, Sports Industry, and Hand and Tools Industry from Jalandhar, Bicycle and Bicycle Parts from Ludhiana.

Keywords: Exports, Trend Lines, Projections, WTO.

INTRODUCTION

The recent liberalization of the Indian economy has pitch forked Punjab in to the global business mainstream. Heralding this change are more and more entrepreneurs, industrialists and investors with vision, from across the globe. Punjab was determined to achieve a high annual industrial rate of growth during the 1990s. Going by the availability of raw materials and the thrust areas identified by the government for investment opportunities are available for areas such as processing of major and minor crops, industries based on agricultural waste/ residue (wheat/ paddy straw, paddy husk), processing of fruits and vegetables, dairy or poultry based units, leather and sports goods, meat processing, textiles,

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electronics & telecommunications, information technology, infrastructure modernization and development, automobiles and farm machinery, engineering industries related to agriculture & food processing, including ancillary units, chemical industries, including drugs and pharmaceuticals etc. (Source: Department of Industries & Commerce, Punjab)

TREND LINES FOR SIX SELECTED INDUSTRIES EXPORTS FROM PUNJAB

Trend lines showed the forecasting of exports from Punjab by using different method such as linear, logarithmic, polynomial, power, exponential and moving average. The method which has highest value of R-squared has a good value of forecast. Forecasting of six selected industries from Punjab by using trend lines are as given below:

1. **Readymade garments and hosiery:** In Punjab, Ludhiana is the leading player in readymade and hosiery industry. Ludhiana accounts for about 21 per cent of all industrial units and over 28 per cent of the industrial output of the state. The hosiery and garments sector is much more labour intensive, small scale, employing 5-40 workers per unit. Most of the units of this industry are small scale and are located in and operate from residential areas and some large units are based in government promoted industrial estate. The R-squared in case of exponential was 0.9278.

Table 1.1
Trends and Forecast of Exports of Readymade Garments and Hosiery

Year	Export of Readymade garments and Hosiery from Punjab (Rs Crore)	Trends and forecasting in Exports of Readymade garments and Hosiery from Punjab (Rs Crore)
1990-91	291	196
1991-92	268	224
1992-93	185	256
1993-94	330	293
1994-95	348	335
1995-96	422	383
1996-97	487	438
1997-98	508	501
1998-99	445	573
1999-2000	518	655
2000-01	525	749

contd. table 1.1

Year	Export of Readymade garments and Hosiery from Punjab (Rs Crore)	Trends and forecasting in Exports of Readymade garments and Hosiery from Punjab (Rs Crore)
2001-02	816	857
2002-03	1261	980
2003-04	1312	1120
2004-05	970	1281
2005-06	985	1465
2006-07	1306	1675
2007-08	2190	1916
2008-09	1977	2191
2009-10	2584	2505
2010-11	5408	2865
2011-12	3143	3276
2012-13	4275	3746
2013-14		4284
2014-15		4898
2015-16		5601
2016-17		6405
2017-18		7324
2018-19		8376
2019-20		9578
2020-21		10952
2021-22		12524
2022-23		14321
2023-24		16377
2024-25		18727
2025-26		21415
2026-27		24488
2027-28		28003

Source: Statistical Abstract of Punjab (Various Issues)

Table no.1.1 depicts the trends and forecast of Punjab readymade garments and hosiery industry. After 2010-11 the actual exports of readymade garments and hosiery declined. The reason for decline was that the exporters from Punjab have to pay far more to export, due to this there is increase in the cost of production i.e. transportation charges as there is no port in Punjab. So the products from Punjab are not in good position to face price competitiveness in the international market.
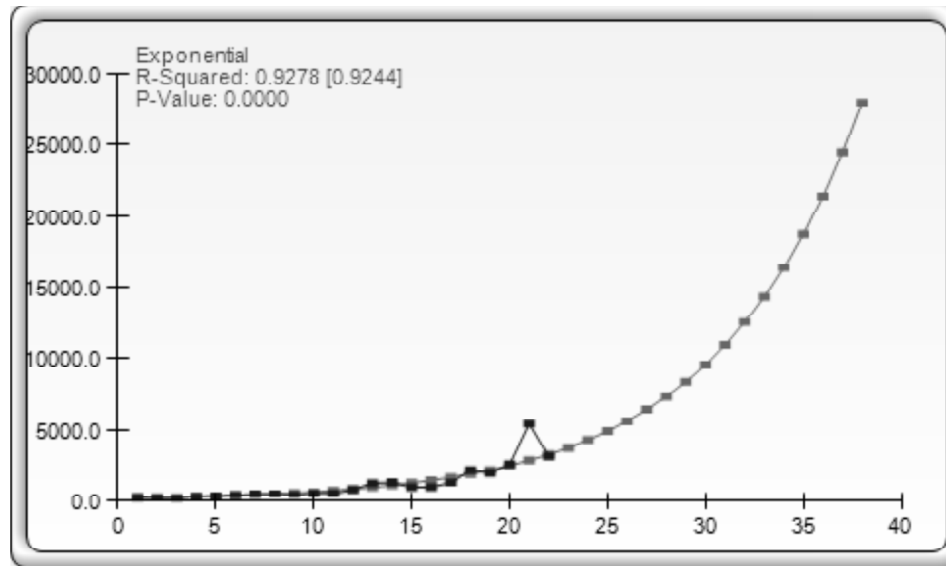
Figure 1.1 : Trends and Forecast of Exports of Readymade Garments and Hosiery

The R-squared of readymade garments was 0.9278 in case of exponential.

Projections had been made for the readymade garments exports from Punjab at current prices on the basis of their actual performance during 1991-92 to 2009-10. Punjab can export readymade garments worth Rs. 28002.5650 crore in 2027-28. Thus, based on Punjab's actual exports of readymade garments, there exists a scope for her exports in future. Therefore, efforts at the international level are required to be made to increase the exports to earn a fair name for Punjab in the world trade.

2.   Cycle and cycle parts

India is second largest manufacturer of world in cycle and cycle part industry after China. And Ludhiana is cluster for this industry. The Ludhiana cluster produces about 60 per cent of the total cycles manufactured in the country in the large and small scale sector and more than 80 per cent of the parts and components in the small and tiny sector. The first indigenously owned cycle manufacturing unit in Punjab was Atlas Cycles, established at Sonepat in 1951 in the SSI sector. Hero Cycle Ltd. commenced production of complete cycles in 1956 as an SSI unit in Ludhiana and became the world's largest producer of bicycles in 1989, with a record production of 29,36,076 units and entered the Guinness Book of World Records (Source: Planning Commission, Punjab). The R-squared in case of power was 0.7144.

Table 1.2
Trends and Forecast of Cycle and Cycle parts

Year	Export of Cycle and Cycle Parts from Punjab (Rs Crore)	Trends and forecasting in Exports of Cycle and cycle parts from Punjab (Rs Crore)
1990-91	66	110
1991-92	171	185
1992-93	296	251
1993-94	518	312
1994-95	401	369
1995-96	436	424
1996-97	706	476
1997-98	890	527
1998-99	462	576
1999-2000	516	623
2000-01	520	670
2001-02	466	716
2002-03	763	760
2003-04	858	804
2004-05	950	847
		Contd. …
2005-06	1184	889
2006-07	1434	931
2007-08	1044	972
2008-09	993	1012
2009-10	951	1052
2010-11	296	1092
2011-12	1283	1131
2012-13	1579	1169
2013-14		1208
2014-15		1245
2015-16		1283
2016-17		1320
2017-18		1357
2018-19		1393
2019-20		1429
2020-21		1465
2021-22		1501
2022-23		1536
2023-24		1571
2024-25		1606
2025-26		1640
2026-27		1674
2027-28		1708

Source: Statistical Abstract of Punjab (Various Issues)

Table 1.2 depicts the trends and forecast of cycle and cycle parts industry of Punjab. From the year 2008-09 to 2010-11 the exports of cycle and cycle parts industry declined because Punjab imports the cycle parts from China. Every month Punjab dry port receives at least 100 containers of Chinese cycle parts. It badly affects the exports of cycle and cycle parts from Punjab. And another problem faced by cycle industry is continuous rise in price of steel.
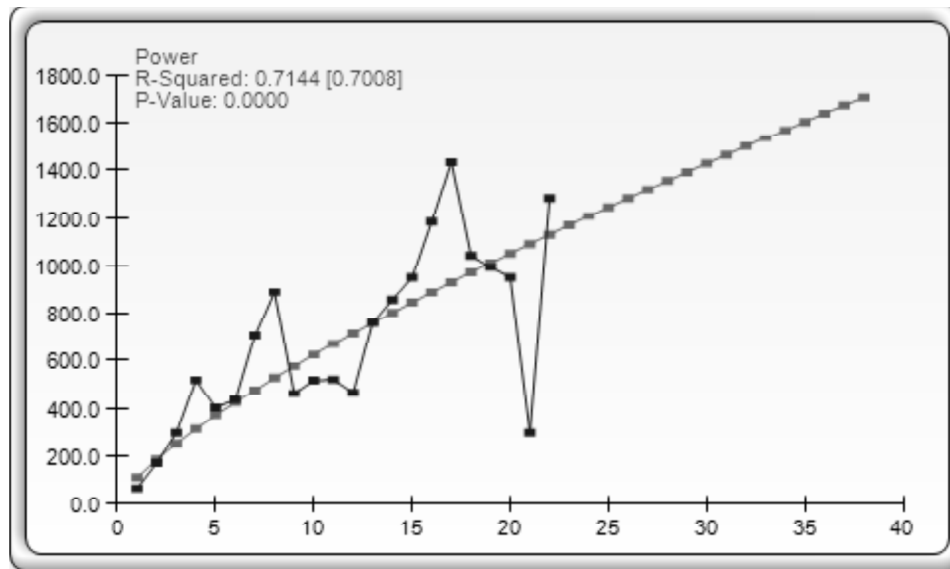

Figure 1.2 : Trends and Forecast of Exports of cycle and cycle parts industry

Projections have been made for the cycle and cycle parts exports from Punjab at current prices on the basis of their actual performance during 1991-92 to 2009-10. Punjab can export cycle and cycle parts worth Rs. 1708.4582 crore in 2027-28. Thus, based on Punjab's actual exports of cycle and cycle parts, there exists a scope for her exports in future. Therefore, efforts at the international level are required to be made to increase the exports to earn a fair name for Punjab in the world trade.

3. Sports goods

Jalandhar is main cluster for the sports good industry in Punjab. Jalandhar contributes 55-60 per cent of the total sports good exports from India. The sports goods industry in Punjab provides direct employment to about 10,000 workers and indirect employment to 40,000 workers. The products manufactured include traditional products like footballs, cricket bats, hockey and cricket balls, hockey sticks, tennis, badminton and squash rackets, balls, soft leather goods and shuttlecocks. The R-squared in case of sports good industry exports was highest in case of power that was 0.8774.

Table 1.3
Trends and Forecast of Exports of Sports good industry

Year	Export of Sports Goods from Punjab (Rs Crore)	Trends and forecasting in Exports of Sports Goods from Punjab (Rs Crore)
1990-91	26	13
1991-92	34	31
1992-93	41	53
1993-94	32	77
1994-95	100	102
1995-96	118	130
1996-97	225	159
1997-98	246	189
1998-99	161	220
1999-2000	193	252
2000-01	204	285
2001-02	274	319
2002-03	285	354
2003-04	396	390
2004-05	366	426
2005-06	471	464
2006-07	563	502
		Contd ….
2007-08	552	540
2008-09	457	579
2009-10	1196	619
2010-11	393	660
2011-12	1656	701
2012-13	1024	742
2013-14		785
2014-15		827
2015-16		871
2016-17		914
2017-18		958
2018-19		1003
2019-20		1048
2020-21		1094
2021-22		1140
2022-23		1186
2023-24		1233
2024-25		1280
2025-26		1328
2026-27		1376
2027-28		1425

Source: Statistical Abstract of Punjab (Various Issues)

Table 1.3 depicts the trends and forecast of sports good industry of Punjab. Due to the tax burden or unseasonal taxation, lack of raw material, and Chinese good onslaught the exports of sports good from Punjab have declined. And majority of the manufacturers in Jalandhar cater to global players; the slowdown in their countries has affected local manufacturers of sports good industry. In the year 2009-10 the exports of sports good was Rs. 1196 crore and there was a sharp declined noticed in next financial year where the exports were only worth Rs. 393 crore.
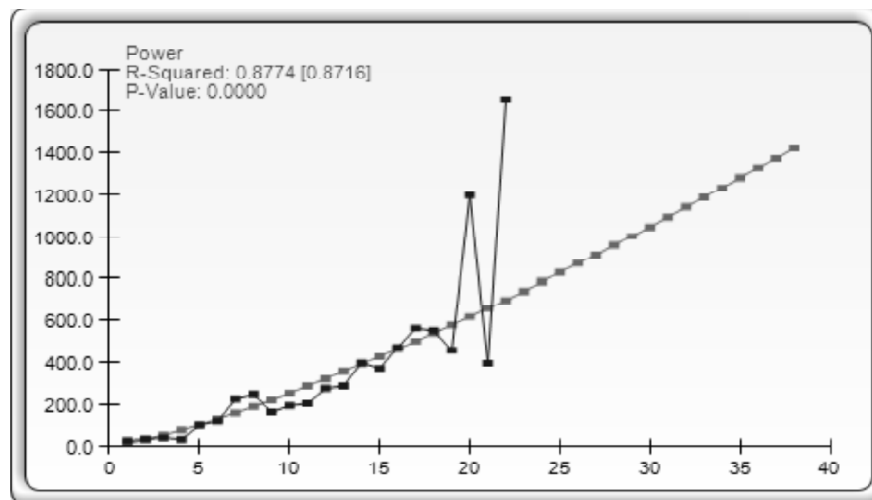

Figure 1.3 : Trends and Forecast of Exports of Sports good industry

Projections have been made for the sports good exports from Punjab at current prices on the basis of their actual performance during 1991-92 to 2009-10. Punjab can export sport goods worth Rs. 1424.7187 crore in 2027-28. Thus, based on Punjab's actual exports of sport goods, there exists a scope for her exports in future. Therefore, efforts at the international level are required to be made to increase the exports to earn a fair name for Punjab in the world trade.

4. Yarn and Textile

In Punjab Ludhiana district is worldwide famous for yarn and textile industry. In recent years this industry progressed gradually. Till recent years main trading partner for the export of textile and yarn was the USSR. However, after its disintegration, exports have diversified to other markets, viz., Europe, USA and other advanced countries. Production in the textile and yarn industry achieved an impressive average annual growth rate. Abundance of raw material, trained labour, enabling infrastructure, cluster development and an established industrial ecosystem ensure an ideal environment for the booming textile and yarn industry in Punjab. The R-squared was 0.8315 in case of power for exports of yarn and textile.

Table 1.4
Trends and Forecast of Exports yarn and textile industry

Year	Export of Yarn and Textile from Punjab (Rs Crore)	Trends and forecasting in Exports of Yarn and Textile from Punjab (Rs Crore)
1990-91	29	7
1991-92	19	27
1992-93	19	62
1993-94	36	112
1994-95	72	175
1995-96	165	254
1996-97	656	347
1997-98	831	454
1998-99	862	577
1999-2000	918	714
2000-01	934	866
2001-02	987	1033
2002-03	1572	1214
2003-04	1733	1411
2004-05	2418	1623
2005-06	3362	1850
2006-07	2676	2091
2007-08	2223	2348
2008-09	3673	2620
2009-10	3545	2907
2010-11	400	3209
2011-12	6520	3526
2012-13	3460	3858
2013-14		4205
2014-15		4568
2015-16		4946
2016-17		5339
2017-18		5747
2018-19		6171
2019-20		6609
2020-21		7063
2021-22		7532
2022-23		8017
2023-24		8517
2024-25		9032
2025-26		9562
2026-27		9866
2027-28		10257

Source: Statistical Abstract of Punjab (Various Issues)

Table 1.4 depicts the trends and forecast of yarn and textile industry of Punjab. The textile industry in Punjab is passing through the most tough and difficult phase in recent times. The Textile industry in Punjab suffered from US economic recession, due to this the cotton price increased by 40 per cent, high interest rates is facing closure. In 2010-11 the exports of yarn and textile from Punjab was only Rs. 400 crore, which badly affected the overall exports of Punjab. The taxes and levies in the state are much higher than other states. With induction of entry tax on cotton, the Punjab Textiles Industry became more incompetitive. Because Punjab is far from sea ports the logistic costs add burden to the Industry. To overcome this problem Punjab government introduce subsidy on freight. The government has also withdrawn interest subsidy on exports and with input cost like fuel, power, and transportation. With the introduction of high taxes on textile industry in Punjab, textiles industry becomes more uncompetitive. The Punjab industry is also facing power shortage Projections have been made for the yarn and textile exports from Punjab at current prices on the basis of their actual performance during 1991-92 to 2009-10. Punjab can export yarn and textile worth Rs. 10256.8712 crore in 2027-28. Thus, based on Punjab's actual exports of yarn and textile, there exists a scope for her exports in future. Therefore, efforts at the international level are required to be made to increase the exports to earn a fair name for Punjab in the world trade.

5. Leather goods

Jalandhar is the main cluster of leather industry in Punjab. Items produced by this sector include, bags, handbags, hand gloves and industrial gloves, wallets, ruck sacks, folios, brief cases, travelware, belts, sports goods, upholstery and saddlery goods. The main importers of leather goods are USA, European Union, Africa,
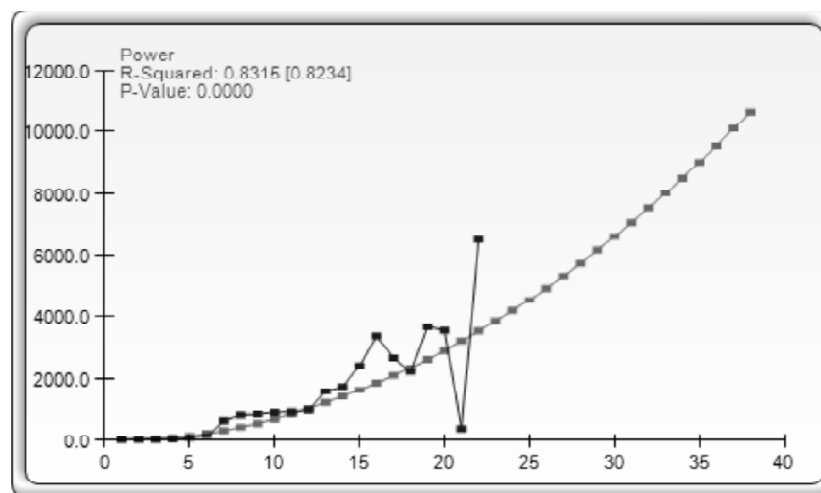

Figure 1.4 : Trends and Forecast of Exports of yarn and textile industry

Hong Kong, Australia. In case of leather goods polynomial R-Squared was highest, that was 0.5928.

Table 1.5
Trends and Forecast of Exports of leather goods industry

Year	Export of Leather Goods from Punjab (Rs Crore)	Trends and forecasting in Exports of Leather Goods from Punjab (Rs Crore)
1990-91	30	32
1991-92	30	37
1992-93	40	43
1993-94	47	49
1994-95	59	55
1995-96	53	62
1996-97	79	69
1997-98	104	77
1998-99	83	85
1999-2000	114	94
2000-01	18	103
2001-02	206	112
2002-03	130	122
2003-04	66	133
2004-05	191	144
2005-06	133	155
2006-07	198	167
2007-08	108	180
2008-09	218	192
2009-10	234	206
2010-11	85	220
2011-12	367	234
2012-13	226	248
2013-14		264
2014-15		279
2015-16		295
2016-17		312
2017-18		329
2018-19		346
2019-20		364
2020-21		383
2021-22		402
2022-23		421
2023-24		441
2024-25		461
2025-26		482
2026-27		503
2027-28		524

Source: Statistical Abstract of Punjab (Various Issues)

Table 1.5 depicts the trends and forecast of leather goods from Punjab. With global economic slowdown, leather industry Punjab faces a problem. Punjab leather industry is facing a major downturn. There was sharp decline in the export and domestic consumption. Due to this in 2000-01 the exports of leather goods was Rs. 18 crore only and Rs. 85 crore in 2010-11. To promote the leather industry in Punjab, Punjab government reduced import duty on leather industry. Lack of quality raw material and two-and-a-half-day power cuts are also a problem for leather industry in Punjab. Another problem faced by leather industry is prices of finished goods are not moving up in sync with the raw material prices. Cost of raw leather sheet has increased by Rs.5 per square feet and prices of chemicals have gone up by about 10 percent and further 10 percent rise is expected in near future.
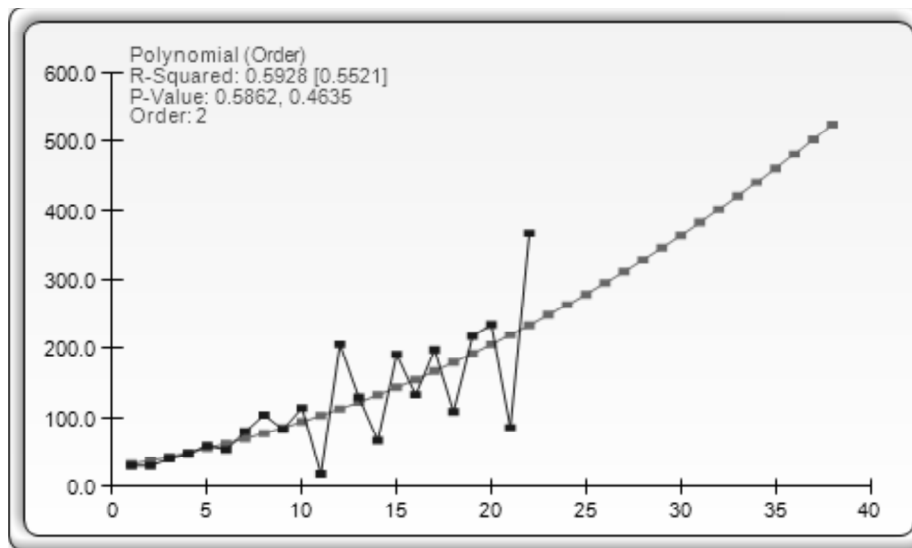

Figure 1.5 : Trends and Forecast of Exports of leather goods industry

Projections have been made for the leather goods exports from Punjab at current prices on the basis of their actual performance during 1991-92 to 2009-10. Punjab can export leather goods worth Rs. 524.4899 crore in 2027-28. Thus, based on Punjab's actual exports of leather goods, there exists a scope for her exports in future. Therefore, efforts at the international level are required to be made to increase the exports to earn a fair name for Punjab in the world trade.

6.   Hand tools/machine tools

The hand tools industry is concentrated in Jalandhar and Ludhiana. The use of hand tools covers almost all types of industries, viz., engineering, electrical and electronics, construction, plumbing, etc. Absence of these tools would in fact

paralyse every type of industrial activity. Hand tools most commonly used in industries are wrenches, hand drills, pullers, vices, hammers, screwdrivers, pliers, spanners, clamps, cramps, etc. Such hand tools, as flaring tools, pullers, ring expanders and compressors, screw and stud extractors, tyre valve pull-out tools, flanging tools, valve lifters and reseating tools etc., are extensively used in automobile repair workshops and garages. They also have important applications in the household sector in day to day life. (Source: Planning Commission, Punjab) The R-squared is highest in case of power was 0.7374 in case hand tools/machines.

Table 1.6
Trends and Forecast of Exports of Hand tools/ machines industry

Year	Export of Leather Goods from Punjab (Rs Crore)	Trends and forecasting in Exports of Leather Goods from Punjab (Rs Crore)
1990-91	20	7
1991-92	18	21
1992-93	19	39
1993-94	28	61
1994-95	53	85
1995-96	58	113
1996-97	44	143
1997-98	352	176
1998-99	300	211
1999-2000	350	248
2000-01	321	288
2001-02	437	329
2002-03	417	372
		Contd. …
2003-04	872	417
2004-05	710	464
2005-06	968	512
2006-07	1715	562
2007-08	1126	614
2008-09	1102	668
2009-10	1292	722
2010-11	279	779
2011-12	231	837
2012-13	255	896
2013-14		957
2014-15		1019
2015-16		1082
2016-17		1147
2017-18		1213

contd. table 1.6

Year	Export of Leather Goods from Punjab (Rs Crore)	Trends and forecasting in Exports of Leather Goods from Punjab (Rs Crore)
2018-19		1280
2019-20		1349
2020-21		1419
2021-22		1490
2022-23		1562
2023-24		1636
2024-25		1711
2025-26		1787
2026-27		1864
2027-28		1942

Source: Statistical Abstract of Punjab (Various Issues)

Table 1.6 depicts the trends and forecast of hand tool/machines industry of Punjab. The problem generally faced by the exporters of hand tool items is sometime absence of buyers. Form 2010-11 onward the exports of hand tools/ machines declined due to lack of technology. Industrialist should adopt R&D benefits and adopt new technology, which save input costs drastically and importing state-of-the-art machinery and the latest technology from Taiwan, especially Cold Forging Technology and Blue Moulding Technology.

Projections have been made for the hand tools/machines exports from Punjab at current prices on the basis of their actual performance during 1991-92 to 2009-
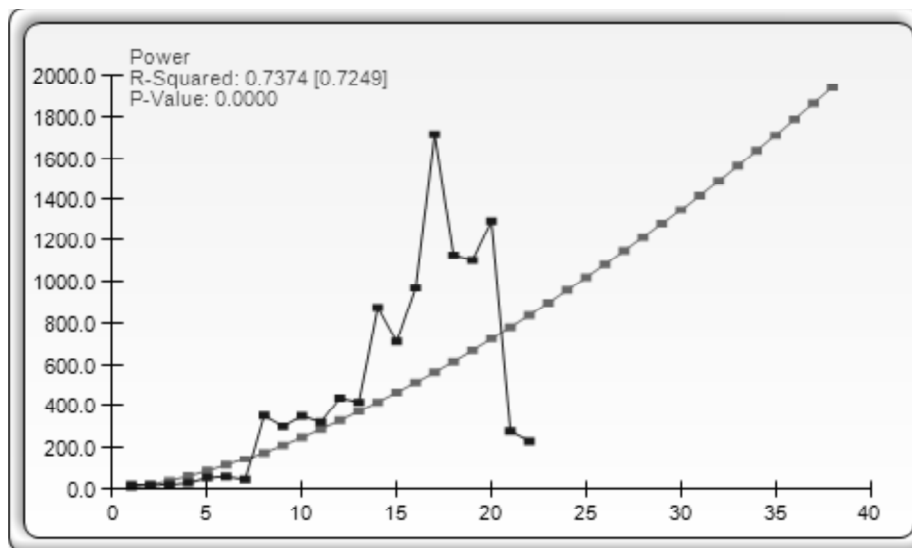

Figure 1.6: Trends and Forecast of Exports of hand tool/machine industry

10. Punjab can export hand tools/machines worth Rs. 1941.7155 crore in 2027-28. Thus, based on Punjab's actual exports of hand tools/machines, there exists a scope for her exports in future. Therefore, efforts at the international level are required to be made to increase the exports to earn a fair name for Punjab in the world trade.

1.2. CAUSES OF TRENDS

Punjab has not been able to achieve faster growth of industries in the state. This slow pace of industrial exports. There are certain reasons that why the exporters of Punjab/India is not in a good position in the world trade which are as follows:

1. Main problem faced by an exporter from Punjab is of the infrastructure. Roads and railways are main sources of transportation. A container takes 10 to 15 days to reach Mumbai, which consumes more time, which may cause in delays of deliveries, again the exporters may lose their confidences in the international markets.

2. Small scale industries do not have better technology. They are not capable of mass production, which is also a loophole.

3. One major problem is related to electricity. One industrialist cannot run industry for more than 6 hours a day.

4. Role of state government is nil, there is inadequate or no support for the industry.

5. Child labour is another major cause. Sports goods industry uses child labour directly or indirectly. Sports goods industry has received ultimatum previously by the foreign countries because of the involvement of child labour in the industry. Child labour is strictly restricted in WTO.

6. According to WTO rules if there is no work there is no labour. But this rule is not applicable here because of labour unions.

7. Products exported from Punjab are no longer competitive.

8. In terms of transportation one can provide subsidy to its exporters, but no imitative is being taken by the Punjab Government to get this export subsidy on transportation due to some political reasons.

9. The state of Punjab is poor in case of natural resources. The soil and climate suits agriculture. There is a need of minerals for the production process. But these are not available in Punjab. Several minerals are imported from other states and countries. This takes a long time for industrial processing. There is a withdrawal of the freight equalization scheme of the central government that has put extra burden on exporters of Punjab and discourages the exporters.

10. Another major reason is the political instability and militancy in Punjab. Several exporters and industries migrated during militancy period from Punjab to other states.

There are many reasons for the slow growth of Punjab's exports. Majority of the export firms from Punjab are one man shows, their capital bases are poor and they do not have access to economies of scale. The international organizations are likely to create some far reaching implications of these exporters in Punjab, specifically with regard to their competitive ability and integration with global markets.

These industries continue to be the main foreign exchange earner for the country and have played a pivotal role in balancing India's balance of trade. However for the last 4 to 5 years, these industries have been passing through a very difficult period. The general economic slowdown in the US and other economies of the world continued in the year 2002, 2009 and thus affected the performance of these industries. The global competition and stagnation has pushed the product prices to such an extent that maintaining a reasonable performance has become a great challenge. The serve squeezes on the margins are affecting efforts as well as profitability of these industries. The entry of China into WTO, has the major impact on these industries. China is a great challenge for the domestic producers. These industries are basically labour intensive industries. Due to the competition in the global market and for the survival in the international market, these industries require zero MFN tariffs in the developed countries on labour intensive goods. But developed countries continue to maintain high tariffs on labour intensive goods to protect their domestic industries. The high domestic support, export subsidies and denial of market access through various tariff and non tariff barriers in the developed countries, have resulted a fall in global industrial commodity prices in the post globalization period. International quality standards are very difficult to be maintained by exporters from Punjab in the globalization regime. In more recent years there has been a decline in garment exports from the country and from the region. Such exports have been constrained by extensive protection of domestic textile and clothing industries by industrialized countries through import quotas imposed under the Multifiber Arrangement (MFA). The large number of people employed in the textile and clothing sector in these countries has meant that quotas could continue for many decades despite recognition of the inefficiency of such protection. The threats of WTO on industry are cost competitiveness, competition from China, Indonesia etc., import licensing procedure, environmental threats etc.

Like a coin has two sides in the same way, WTO has two aspects one is good and other is bad. We have analyzed the bad impact of the WTO above. There are certain ample opportunities through WTO for the ambitious young exporters,

entrepreneurs, industrialist etc. The aim is to pave the way for greater market access for all member countries by slashing the import duties on thousands of industrial goods. The agreement on textile and clothing was given a full structure. The USA has reluctantly agreed to phase out the import quotas on the Third World textiles and clothing over 10 years from 1995 in place of quota system. Agreement on Anti dumping have been subjected to Measures Disciplines. Agreement on Trade Related Investment Measures (TRIMS) has also been incorporated. The idea is to open up foreign and international investment across national barriers among nations.

Most Favored Nation Treatment (MFN) provides equal treatment to all member countries. Any trade concession offered to one member country must be offered to all their member countries. Imported goods share should not be discriminated against in favor of the domestic goods. Some treatment must be accorded to goods imported from outside the country. This would reduce barriers to trade

1.3. METHODOLOGY FOR TOTAL EXPORTS OF SELECTED INDUSTRIES FROM PUNJAB BY USING ARIMA

Export performance of six selected industries from Punjab Moving Average structure as explained by ARIMA models. Punjab's export of industrial goods will be modeled as ARIMA process. Identification of the values of parameters p,d and q is done on basis of ACF and PACF analysis. Data analyzed in the study is yearly exports from Punjab in Crore Rupees from 1990-91 till 2012-13. Data from 1990-91 till 2012-13 is used to train the structural models while next 15 years data is used to

Table 1.7
AUTO-ARIMA (Autoregressive Integrated Moving Average)

Models	Adjusted R-Squared	Akaike Information Criterion (AIC)	Schwarz Criterion (SC)	Durbin-Watson Statistic (DW)	Number of Iterations	Model Rank
P=2, D=0, Q=0	0.8786	16.1387	16.5736	2.4238	0	1
P=2, D=2, Q=0	0.8588	16.0043	16.4692	2.0095	0	2
P=1, D=0, Q=0	0.7744	17.6488	17.9298	3.0016	0	3
P=2, D=1, Q=1	0.5490	16.7960	17.3951	1.6970	13	4
P=0, D=0, Q=2	0.5445	17.5281	17.9371	1.3456	36	5
P=2, D=1, Q=0	0.5260	16.9062	17.3555	1.6734	0	6
P=1, D=1, Q=1	0.4717	16.1667	16.6016	2.0021	25	7
P=1, D=1, Q=0	0.4622	16.2351	16.5251	2.2399	0	8
P=0, D=1, Q=1	0.4127	17.0936	17.3746	2.4532	23	9
P=0, D=2, Q=0	0.0000	17.9711	18.1160	2.9144	0	10
P=0, D=1, Q=0	0.0000	17.6746	17.8151	3.1582	0	11

test the accuracy of the model forecast. Table (1) describes the data used in the analysis. First and foremost step before fitting the model is making the time series stationary. If time series is not stationary then it has to be transformed to make it stationary. Generally time series is differenced to make it stationary. Plots of ACF and LBQ test statistics will be used to check the stationarity of the model.

Table 1.8
Regression Statistics

R-Squared (Coefficient of Determination)	0.8908	Akaike Information Criterion (AIC)	16.1387
Adjusted R-Squared	0.8786	Schwarz Criterion (SC)	16.5736
Multiple R (Multiple Correlation Coefficient)	0.9438	Log Likelihood	-169.46
Standard Error of the Estimates (SEy)	3588.51	Durbin-Watson (DW) Statistic	2.4238
Number of Observations	21	Number of Iterations	0

Table 1.9
Regression Results

	Intercept	*AR(1)*	*AR(2)*
Coefficients	435.1838	0.2311	0.9003
Standard Error	470.6370	0.1728	0.2026
t-Statistic	0.9247	1.3372	4.4433
p-Value	0.3674	**0.1978**	**0.0003**
Lower 5%	1251.2983	0.5308	1.2516
Upper 95%	-380.9306	-0.0686	0.5489

Table 1.10
Analysis of Variance

	Sums of Squares	*Mean of Squares*	*F-Statistic*	*p-Value*	*Hypothesis Test*	
Regression	229419320.1	114709660	73.41	**0.0000**	Critical F-statistic (99% confidence with df of 2 and 18)	6.0129
Residual	28128375.02	1562687.5			Critical F-statistic (95% confidence with df of 2 and 18)	3.5546
Total	257547695.1				Critical F-statistic (90% confidence with df of 2 and18)	2.6239

Table 1.11
Autocorrelation

| Time Lag	AC	PAC	Lower Bound	Upper Bound	Q-Stat	Prob
1	0.7944	0.7944	(0.4170)	0.4170	15.2406	0.0001
2	0.6531	0.0598	(0.4170)	0.4170	26.0846	0.0000
3	0.5976	0.1693	(0.4170)	0.4170	35.6661	0.0000
4	0.4463	(0.2378)	(0.4170)	0.4170	41.3256	0.0000
5	0.3415	0.0234	(0.4170)	0.4170	44.8455	0.0000
6	0.2500	(0.1045)	(0.4170)	0.4170	46.8586	0.0000
7	0.1217	(0.0971)	(0.4170)	0.4170	47.3699	0.0000
8	0.0219	(0.0790)	(0.4170)	0.4170	47.3877	0.0000
9	(0.0646)	(0.0652)	(0.4170)	0.4170	47.5557	0.0000
10	(0.1638)	(0.0934)	(0.4170)	0.4170	48.7336	0.0000
11	(0.2549)	(0.1116)	(0.4170)	0.4170	51.8718	0.0000
12	(0.3003)	0.0057	(0.4170)	0.4170	56.7114	0.0000
13	(0.3365)	(0.0320)	(0.4170)	0.4170	63.5474	0.0000
14	(0.3467)	0.0391	(0.4170)	0.4170	71.8435	0.0000
15	(0.3578)	(0.0830)	(0.4170)	0.4170	82.1479	0.0000
16	(0.3744)	(0.0534)	(0.4170)	0.4170	95.6863	0.0000
17	(0.3630)	(0.0358)	(0.4170)	0.4170	111.6007	0.0000
18	(0.3371)	(0.0052)	(0.4170)	0.4170	129.8930	0.0000
19	(0.2976)	0.0201	(0.4170)	0.4170	151.2847	-
20	(0.2350)	0.0388	(0.4170)	0.4170	177.9657	-
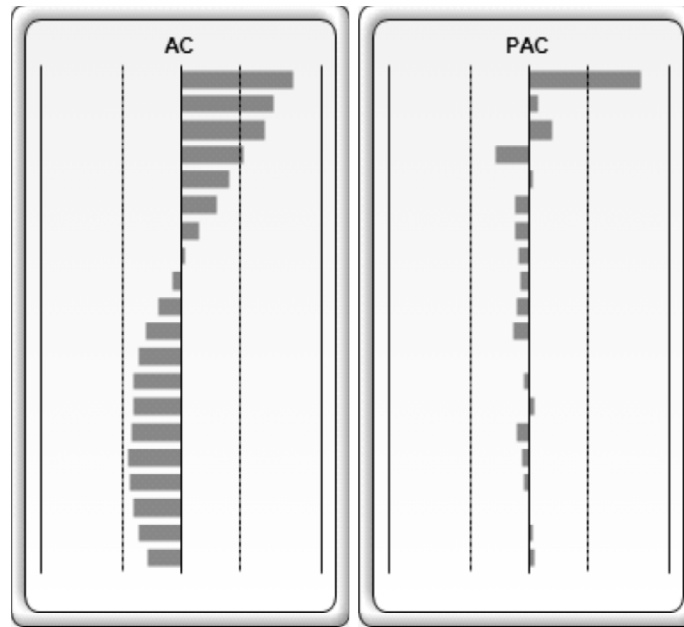
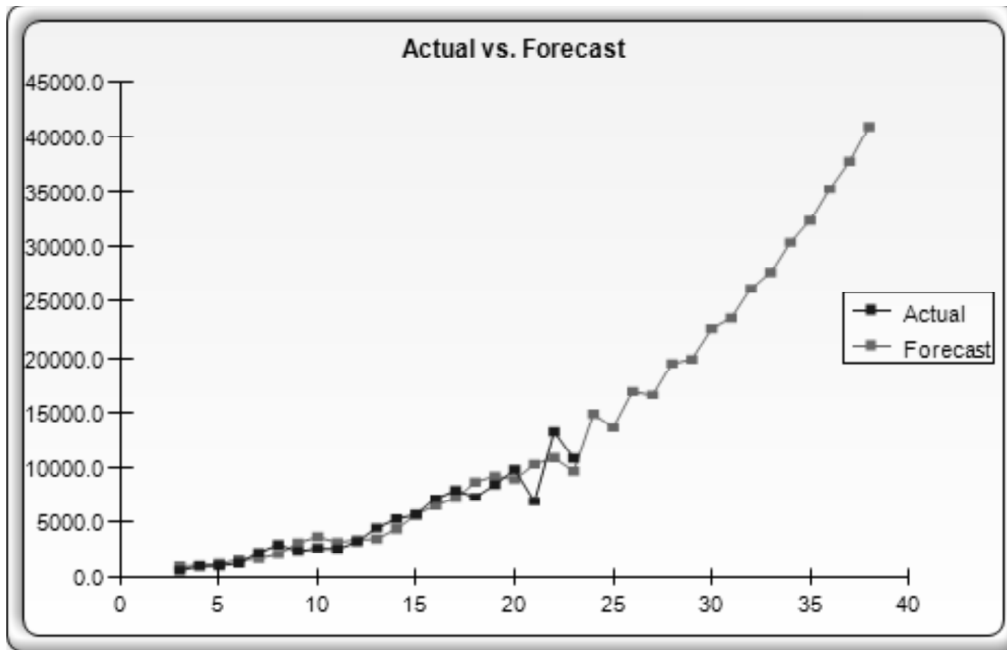**Figure 1.7 : Auto correlation and partial auto correlation**

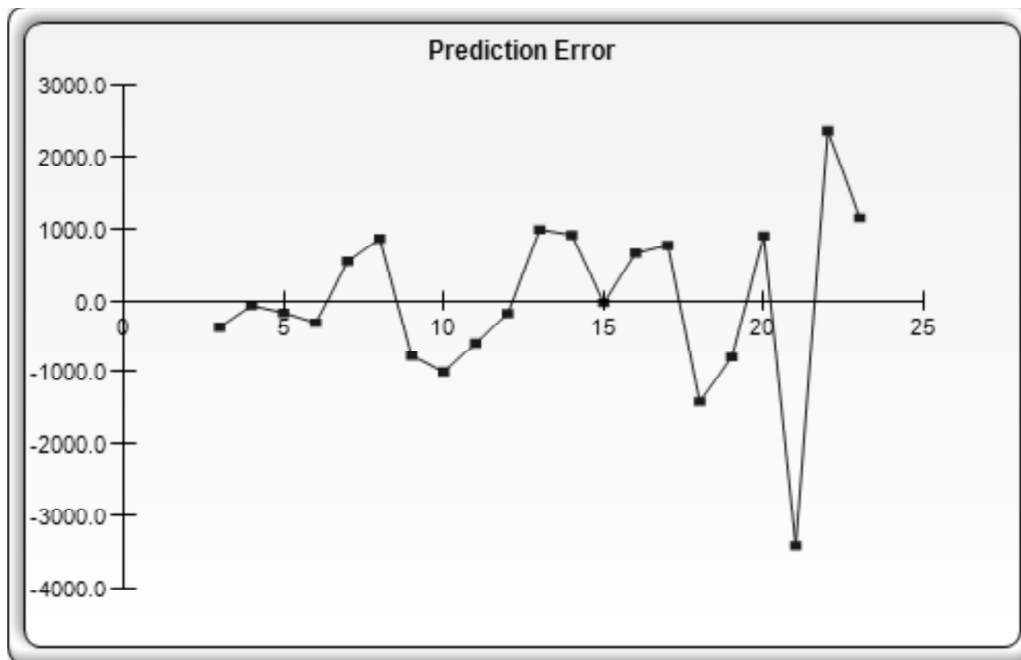**Figure 1.8 : Comparison of actual and forecasted Exports**

Figure 1.9 : Predictor error

Table 1.12
Projections and trends of six selected industries exports of Punjab at current prices on the basis of their actual performance during 1990-91 to 2012-13

Year	Actual (Y)	Forecast (F)
1992-93	600	976
1993-94	991	1060
1994-95	1033	1204
1995-96	1252	1566
1996-97	2197	1655
1997-98	2930	2070
1998-99	2314	3090
1999-2000	2610	3608
2000-01	2522	3122
2001-02	3185	3368
2002-03	4427	3442
2003-04	5238	4326
2004-05	5606	5631
2005-06	7104	6446
2006-07	7892	7123
2007-08	7244	8654
2008-09	8421	9214
2009-10	9801	8902
2010-11	6862	10281
2011-12	13201	10845
2012-13	10819	9664
2013-14		14820
2014-15		13600
2015-16		16920
2016-17		16589
2017-18		19502
2018-19		19877
2019-20		22586
2020-21		23550
2021-22		26212
2022-23		27694
2023-24		30433
2024-25		32401
2025-26		35322
2026-27		37768
2027-28		40963

Projections have been made for the six selected industries exports of Punjab at current prices on the basis of their actual performance during 1990-91 to 2012-13. Table 5.12 shows these projections. Punjab can export goods worth Rs. 40963 crore in 2027-28. Thus, based on Punjab's actual exports, there exists a scope for her

exports in future. Therefore, efforts at the international level are required to be made to increase the exports to earn a fair name for Punjab in the world trade.

Forecasting and Trends in total exports of Punjab

Moving Average structure as explained by ARIMA models. Punjab's export of industrial goods will be modeled as ARIMA process. Identification of the values of parameters p,d and q is done on basis of ACF and PACF analysis. Data analyzed in the study is yearly exports from Punjab in Crore Rupees from 1991-1992 till 2009-2010. Data from 1990-91 till 2009-10 is used to train the structural models while next 10 years data is used to test the accuracy of the model forecast. Table (5.18) describes the data used in the analysis. First and foremost step before fitting the model is making the time series stationary. If time series is not stationary then it has to be transformed to make it stationary. Generally time series is differenced to make it stationary. Plots of ACF and LBQ test statistics will be used to check the stationarity of the model.

Table 1.13
AUTO-ARIMA (Autoregressive Integrated Moving Average)

Models	Adjusted R-Squared	Akaike Information Criterion (AIC)	Schwarz Criterion (SC)	Durbin-Watson Statistic (DW)	Number of Iterations	Model Rank
P=1, D=0, Q=0	0.9457	15.7671	16.0771	2.4824	0	1
P=2, D=0, Q=0	0.9408	16.6282	17.1100	2.2465	0	2
P=0, D=0, Q=2	0.8423	17.6791	18.1285	0.3550	32	3
P=2, D=2, Q=0	0.6337	16.4837	17.0035	1.6495	0	4
P=0, D=0, Q=1	0.5715	18.7356	19.0351	0.5412	29	5
P=0, D=2, Q=0	0.0000	17.5143	17.6748	2.8611	0	6
P=0, D=1, Q=0	0.0000	15.8895	16.0445	1.9995	0	7
P=2, D=1, Q=0	-0.0155	15.7450	16.2450	1.5883	0	8
P=0, D=1, Q=1	-0.0532	15.8845	16.1944	1.8398	12	9
P=1, D=1, Q=0	-0.0599	16.8016	17.1228	1.9645	0	10

Table 1.14
Regression Statistics

R-Squared (Coefficient of Determination)	0.9487	Akaike Information Criterion (AIC)	15.7671
Adjusted R-Squared	0.9457	Schwarz Criterion (SC)	16.0771
Multiple R (Multiple Correlation Coefficient)	0.9740	Log Likelihood	-149.79
Standard Error of the Estimates (SEy)	4512.76	Durbin-Watson (DW) Statistic	2.4824
Number of Observations	19	Number of Iterations	0

Table 1.15
Regression Results

	Intercept	*AR(1)*
Coefficients	283.9372	1.0945
Standard Error	414.6082	0.0617
t-Statistic	0.6848	17.7309
p-Value	0.5027	**0.0000**
Lower 5%	1005.1924	1.2019
Upper 95%	-437.3180	0.9871

Table 1.16
Analysis of Variance

	Sums of Squares	*Mean of Squares*	*F-Statistic*	*p-Value*	*Hypothesis Test*	
Regression	347764392.9	347764392.9	314.38	**0.0000**	Critical F-statistic (99% confidence with df of 1 and 17)	8.3997
Residual	18805041.67	1106178.92			Critical F-statistic (95% confidence with df of 1 and 17)	4.4513
Total	366569434.5				Critical F-statistic (90% confidence with df of 1 and 17)	3.0262

Table 1.17
Autocorrelation

| Time Lag	AC	PAC	Lower Bound	Upper Bound	Q-Stat	Prob
1	0.7970	0.7970	(0.4472)	0.4472	14.0796	0.0002
2	0.6231	(0.0332)	(0.4472)	0.4472	23.1910	0.0000
3	0.5105	0.0656	(0.4472)	0.4472	29.6905	0.0000
4	0.3424	(0.2122)	(0.4472)	0.4472	32.8098	0.0000
5	0.2154	0.0028	(0.4472)	0.4472	34.1325	0.0000
6	0.1320	(0.0122)	(0.4472)	0.4472	34.6671	0.0000
7	(0.0037)	(0.1815)	(0.4472)	0.4472	34.6676	0.0000
8	(0.1069)	(0.0433)	(0.4472)	0.4472	35.0824	0.0000
9	(0.1545)	0.0012	(0.4472)	0.4472	36.0354	0.0000
10	(0.2020)	(0.0186)	(0.4472)	0.4472	37.8442	0.0000
11	(0.2614)	(0.1220)	(0.4472)	0.4472	41.2517	0.0000
12	(0.3085)	(0.1032)	(0.4472)	0.4472	46.6772	0.0000
13	(0.3492)	(0.0656)	(0.4472)	0.4472	54.7855	0.0000
14	(0.3631)	(0.0112)	(0.4472)	0.4472	65.3050	0.0000
15	(0.3690)	(0.0877)	(0.4472)	0.4472	78.8895	0.0000
16	(0.3455)	0.0067	(0.4472)	0.4472	94.7629	0.0000
17	(0.2919)	0.0397	(0.4472)	0.4472	111.7670	0.0000
18	(0.2328)	0.0176	(0.4472)	0.4472	133.3930	0.0000
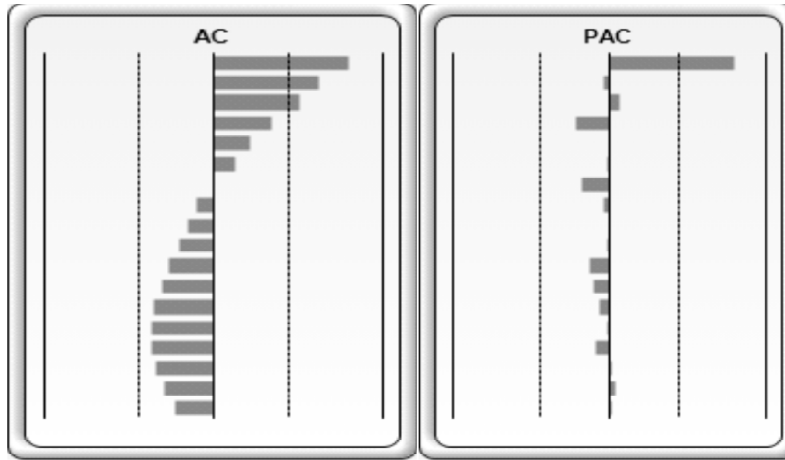
Figure 1.10 : Auto correlation and partial auto correlation.

Table 5.18
Projections of Total Exports from Punjab

S.No	Year	Exports (Rs. Crore)	Forecasted Value of Exports (Rs Crore)
1	1991-92	901	1126
2	1992-93	1215	1270
3	1993-94	1815	1614
4	1994-95	2082	2270
5	1995-96	2565	2563
6	1996-97	3641	3091
7	1997-98	4205	4269
8	1998-99	3629	4886
9	1999-2000	4063	4256
10	2000-01	4015	4731
11	2001-02	4408	4678
12	2002-03	7014	5109
13	2003-04	8933	7961
14	2004-05	7914	10061
15	2005-06	9656	8946
16	2006-07	11798	10853
17	2007-08	11267	13197
18	2008-09	13888	12616
19	2009-10	15972	15485
20	2011-12		17765
21	2012-13		19728
22	2013-14		21877
23	2014-15		24229

S.No	Year	Exports (Rs. Crore)	Forecasted Value of Exports (Rs Crore)
24	2015-16		26802
25	2016-17		29619
26	2017-18		32703
27	2018-19		36077
28	2019-20		39771
29	2020-21		43814

Source: Govt. of Punjab, Statistical Abstract of Punjab, (various issues)
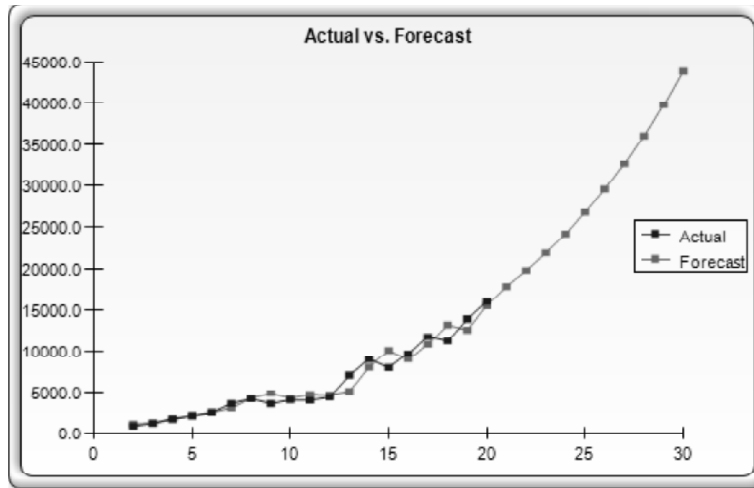
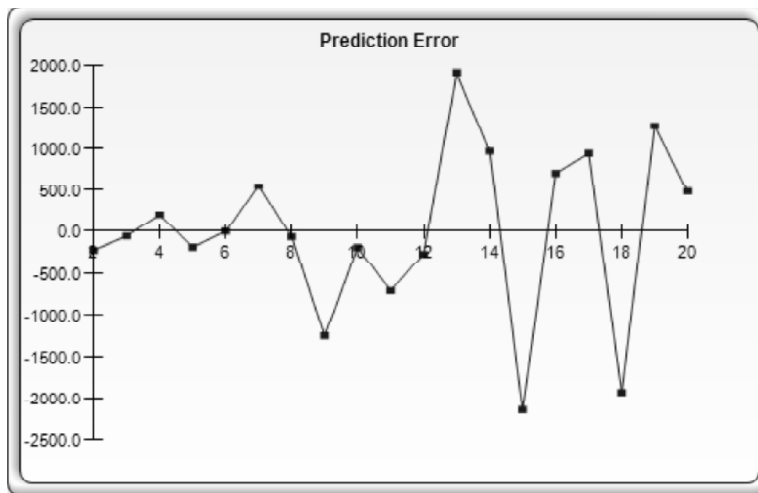**Figure 1.11 : Comparison of actual and forecasted Exports**

Figure 1.12 : Predictor error

　　　Projections have been made for the industrial exports of Punjab at current prices on the basis of their actual performance during 1991-92 to 2009-10. Table 5.18 shows these projections. Punjab can export goods worth Rupees 43814 crore in 2020-21. Thus, based on Punjab's actual exports, there exists a scope for her exports in future. Therefore, efforts at the international level are required to be made to increase the exports to earn a fair name for Punjab in the world trade.

SUMMARY

Punjab is on its way to rapid industrialization through coordinated development of small, medium and large scale industries. Industrial sector of Punjab plays a significant role in the development of state. Ludhiana leads in industrialization, accounting for more than 35 per cent of the industrial output, 23 per cent of industrial units and 33 per cent of industrial workforce of Punjab Ludhiana is leading player in readymade and hosiery industry. Ludhiana accounts for about 21 per cent of all industrial units and over 28 per cent of the industrial output of the State. The hosiery and garments sector is much more labour intensive, small scale, employing 5-40 workers per unit. The Ludhiana cluster produces about 60 per cent of the total cycles manufactured in the country in the large and small scale sector and more than 80 per cent of the parts and components in the small and tiny sector. Hero Cycle Ltd. commenced production of complete cycles in 1956 as an SSI unit in Ludhiana and became the world's largest producer of bicycles in 1989, with a record production of 29,36,076 units and entered the Guinness Book of World Records. Jalandhar was main cluster for the sports good industry in Punjab. Jalandhar contributes 55-60 per cent of the total sports good exports from India. The sports goods industry in Punjab provides direct employment to about 10,000 workers and indirect employment to 40,000 workers. Ludhiana district was worldwide famous for yarn and textile industry. In recent years this industry progressed gradually. Till recent years main trading partner for the export of textile and yarn was the USSR. However, after its disintegration, exports have diversified to other markets, viz., Europe, USA and other advanced countries. Production in the textile and yarn industry achieved an impressive average annual growth rate. Abundance of raw material, trained labour, enabling infrastructure, cluster development and an established industrial ecosystem ensure an ideal environment for the booming textile and yarn industry in Punjab. Jalandhar was the main cluster of leather industry in Punjab. Items produced by this sector include, bags, handbags, hand gloves and industrial gloves, wallets, ruck sacks, folios, brief cases, travelware, belts, sports goods, upholstery and saddlery goods. The main importers of leather goods are USA, European Union, Africa, Hong Kong, Australia. The hand tools industry was concentrated in Jalandhar and Ludhiana. The use of hand tools covers almost all types of industries, viz., engineering, electrical and electronics,

construction, plumbing, etc. Absence of these tools would in fact paralyse every type of industrial activity. Unavailability of major raw material such as iron or coal, was a definite hindrance for the establishment of large and medium scale units in Punjab. Punjab Government stepped in to help make large & medium scale production profitable in Punjab. Punjab has not been able to achieve faster growth of industries in the state because of Unavailability of major raw material. Projections have been made for the industrial exports of Punjab at current prices on the basis of their actual performance during 1991-92 to 2009-10. Punjab can export goods worth Rs. 43814 crore in 2020-21. Thus, based on Punjab's actual exports, there exists a scope for her exports in future. Therefore, efforts at the international level are required to be made to increase the exports to earn a fair name for Punjab in the world trade.

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