INFLATION AND ECONOMIC GROWTH IN THE INDIAN ECONOMY

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ABSTRACT:

To have an idea about the trend of wholesale price index number and the rate of inflation during the period from 1981-82 to 2011-12, this research work uses the various price index numbers which are deflated to the base year 2004-05 and their growth in various decades is analysed. For this purpose, wholesale price index number of all commodities, price index number of primary articles, food articles, Non-food articles, fuel and power and manufactured products have been taken. Further, to know about the annual growth rate of inflation in these groups of price index numbers, growth rates have also been worked out for the three periods, namely, 1981-81 to 1990-91, 1991-92 to 2000-01 and 2001-02 to 2011-12. To know the annual average increase in these price index numbers, simple linear trend line is fitted for all the price index numbers in these three periods. Finally to analyse the relationship between GDP (national income) and wholesale price index numbers (inflation), simple linear regression is used and the results are interpreted.



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I.INTRODUCTION:

When economic activities are increasing, general price level also tends to increase. A moderate rate of inflation is in fact advocated to activise the process of economic growth. Generally economists advocate to have a single digit inflation to achieve a reasonable growth rate. Developed countries try to limit the inflation rate around 2 to 3 per cent. A higher rate of inflation affects the economy adversely and creates several disturbances to the internal and external sectors of the economy. Hence the government has to control the inflation to safeguard the welfare of the low income group people since inflation reduces the real income and purchasing power of the people.

It is commonly felt that most of the developing countries have a high rate of inflation and hence it is transferring the income from low income group to business people. Governments generally watch how the inflation is changing from time to time. How the inflation is affecting the economic growth is a research question to be investigated periodically. This work mainly analyses how the inflation is changing over a period of past three decades and how inflation is affecting the economic growth during the period from 1981-82 to 2011-12.

II. REVIEW OF LITERATURE:

Most of the research works available on inflation investigate various aspects of inflation. Some of the works undertaken on inflation and economic growth of Indian Economy are: Inflation and Economic Growth: Deepak Mohanty, A.B.Chakraborty, Abhiman Das and Joice John (2012), KanhaiyaSingh and Kaliappa Kallirajan (2003), Seema Narayan and Paresh Kumar Narayan (2013), Girijiasankar Mallik and Anis Chowdhury (2001), S.L.Shetty (2013) and so on. A few works investigating Price Indices and Inflation are: Prachi Mishra and Deresh Roy (2011), Juthathis Jongwanich and Donghyun Park (2009), A.K.Nag and G.P.Samanta (1994), R.K.Patnaik and Amaresh Samantaraya (2006), Sthanu R Nair and Leema Mary Eapen (2012), T.N.Srinivasan (2008), C.Rangarajan (2012), Neeraj Matekar, Ashutosh Sharma and Savita Kalkarni (2011) and so on. Some works on the Measurment of Inflation are: Sujata Kar (2009), Abhiman Das, Joice and Sansay Singh (2009) and so on. Studies on Inflation Targeting are: Sukanya Bose (2012), Rohit Azad and Anupam Das (2013) and so on. However, the present work investigates the trend of inflation over a period of three decades and how inflation is associated with economic growth by taking price index number to a common base.

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III. METHODOLOGY OF APPROACH:

Generally inflation is measured through wholesale price index. However in various sources of data on index numbers, the base year is changed in each decade. This makes it difficult to compare the rates of inflation. Therefore to have an idea about the rate of inflation for more than a decade, all the wholesale price index numbers are converted into a particular base year period. For analysis, the data on wholesale price index number of all commodities, primary articles, food products, non-food articles, fuel and power and manufactures products price index numbers have been used. To maintain uniformity and to facilitate comparison, all the index numbers are converted into the base year 2004-05. The annual growth rates are calculated based on these index numbers. To assess the annual average increase in index numbers, simple linear regression model is used.

To analyze the relationship between inflation and economic growth, simple linear regression model is used by taking the GDP (National Income) as the dependent variable and wholesale price index number as the independent variable. GDP is measured in constant prices (2004-05 prices) to assess the growth rate of national income. The estimated regression coefficients are tested for the null hypothesis that their value is zero. GDP is measured in billions of Indian Rupees. The regression coefficient in this case will measure the increase in national income, when the wholesale price index increases by one point.

IV. INCREASE IN VARIOUS PRICE INDICES:

The various price index numbers for the periods of 1981-81 to 1990-91, 1991-92 to 2000-01 and 2001-02 to 2011-12 are given Tables 1, 2 and 3. The wholesale price index number for all the commodities has increased from 22.94 in 1981-82 to 41.92 in 1990-91. The other price index number is relatively lower in this period.

During the first period 1981-82 to 1990-91, the wholesale price index number for all commodities has increased by 18.98 points. The lowest increase by 11.40 points has been registered by the index number of fuel and power. The highest increase by 21.76 points has been registered by the index number of manufactured products. The index number of primary articles has increased by 18.64 points and the index number of food articles has increased by 19.49 points. Index number of non-food articles has increased by 20.30 points.

During the second period, that is, from 1991-92 to 2000-01, the wholesale price index number of all commodities has increased by 35.46 points. However, the index number of food



articles has increased by the highest level of 44.81 points. Fuel and power comes in the next place with 44.47 points. The lowest increase by 28.70 points is in the non-food articles. The price index number of manufactured products has increased by 31.77 points.

In the third period, that is, from 2001-02 to 2011-12, the wholesale price index number of all commodities has increased by 69.98 points. However, the price index number of primary articles has increased by the highest level of 110.77 points. Price index number of non-food articles comes in the second place with 101.20 points. The lowest increase by 52.73 points is in the index number of manufactured products. The price index number of fuel and power has increased by 88.09 points

V. ANNUAL GROWTH RATES OF VARIOUS PRICE INDEX NUMBERS:

The annual growth rates of wholesale price index numbers of various groups of commodities are given in Table 4, 5 and 6.

The annual growth rates of wholesale price index numbers vary between a minimum of 4.39 per cent and a maximum of 10.25 per cent. The annual growth rate of wholesale price index numbers exceeded 10 per cent only in the year 1990-91. In various other years, the annual growth rate remains less than 10 per cent.

The annual growth rate of price index numbers of primary articles has crossed 10 per cent three times during 1981-82 to 1990-91. For food articles, it has crossed 10 per cent 4 times. In the case of non-food articles, the annual growth rate has touched the highest level of 21.60 per cent in the year 1987-88. It has exceeded 10 per cent in five years. Therefore, inflation is higher in the case of Non-food articles during this period. For the fuel and power, the annual growth rate has exceeded 10 per cent only two times. In the case of manufactured products, the annual growth rate has exceeded 10 per cent only in the year 1989-90. Hence during this period, inflation is relatively less only for the fuel and power.

During the period 1991-92 to 2000-01, the annual growth rate of wholesale price index numbers has exceeded 10 per cent in three times. The highest annual growth rate in this period is 13.72 per cent in the year 1991-92. The minimum annual growth rate is 1.75 per cent in the year 1993-94.

For the primary articles, the annual growth rate has touched the highest value of 18.08 per cent in the year 1991-92. It has exceeded 10 per cent in three years. The minimum annual growth rate is 1.16 per cent in the year 1999-2000.

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In the case of food articles, the highest annual growth rate is 20.20 per cent. It has crossed 10 per cent in 5 times during this period. The minimum growth rate was 2.25 per cent in the year 1993-94. For the non-food articles, the annual growth rate has touched 24.20 per cent in the year 1994-95. Four times it has crossed 10 per cent and the minimum growth rate is -0.87 per cent in the year 1996-97. The highest rate of inflation during the period 1991-92 to 2000-01 is in the fuel and power group and the highest rate of 28.45 per cent is registered in the year 2000-01. In this group, the annual growth rate has exceeded 10 per cent in five times. Inflation is relatively less in the case of manufactured products. The annual growth rate has touched the highest level of 12.31 per cent in the year 1994-95 only. Three times it has crossed 10 per cent. The minimum rate is 1.45 per cent in the year 1993-94.

During the period 2001-02 to 2011-12, the annual growth rate of wholesale price index numbers has remained less than 10 per cent. The highest rate touched is 9.56 per cent in the year 2010-11. The minimum rate was 3.40 per cent in the year 2002-03.

In the case of primary article, the annual growth has exceeded 10 per cent three times. It has touched the highest level of 17.75 per cent in the year 2010-11. The minimum rate was 3.32 per cent in the year 2002-03. For the food articles, the annual growth rate has crossed 15 per cent two times. A minimum of 1.23 per cent was recorded in the year 2003-04. For Non-food articles, the highest rate touched is 22.32 per cent in the year 2010-11. In this period, it has crossed 10 per cent four times. The minimum rate of -3.30 per cent was recorded in the year 2005-06. However, inflation is higher only in this group, during this period. For the fuel and power group, the annual growth rate has crossed 10 per cent five times. The minimum rate registered is -2.15 per cent in the year 2009-10. For the manufactured products group, the annual rate has remained less than 10 per cent through out this period. The highest rate recorded is 7.23 per cent and the lowest rate recorded is 1.83 per cent in the year 2001-02. Compared to all other groups, inflation is less only in this group, during this period.

VI. TREND ANALYSIS:

For the index numbers of various groups of commodities worked out for the base year 2004-05, trend line is fitted by taking the time period as the independent variable and index number as the dependent variable for the three periods 1981-81 to 1990-91, 1991-92 to 2000-01 and 2001-02 to 2011-2012. The regression coefficient of the simple linear trend line measures the average annual increase in the index number (average rate of inflation in percentage with

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2004-05 as the base year). The estimated value of the regression coefficient, its standard error, coefficient of determination and other important results are given in Tables 7, 8 and 9.

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During 1981-81 to 1990-91, the wholesale price index number has increased by 2.023 points per year. The index number of primary products has increased by 1.949 points per year. The price index of food articles has increased by 2.040 points per year. Index number of Nonfood articles has increased by 2.184 points. Fuel and power has increased by 1.195 points. The price index of manufactured products has increased by 2.353 points per year. Thus, in this period, the highest increase is in the price index of manufactured products.

During the period 1991-92 to 2000-01, the wholesale price index number of all commodities has increased by 3.372 points. The price index of primary products has increased by 4.643 points. The price index of food articles has increased by 5.277 points per year. For Non-food articles, it has increased by 3.671 points per year. In the case of fuel and power, it has increased by 4.216 points per year. For the manufactured products, the increase is by 3.509 points. Therefore, in this period, the highest increase is in the prices of food articles and the lowest increase is in the prices of manufactured products.

During the period 2001-02 to 2011-12, the wholesale price index numbers of all commodities increases by 6.742 points. For primary products, it has increased by 10.757 points. The increase is by 9.875 points for the food articles. For Non-food articles, it has increased by 9.15 points. The price index of fuel and power increases by 8.122 points and for the manufactured products, the increase is 5.151 points. Hence, in this period, the highest inflation is in the primary products and the lowest inflation is in the manufactured products.

Comparing the three periods, the wholesale price index numbers has increased by 2.023 points in 1981-82 to 1990-91, by 3.872 points in 1991-92 to 2000-01 and by 6.742 points in 2001-02 to 2011-12. Hence, analysed in terms of price index numbers for the base year 2004-05, the rate of inflation is increasing decade by decade and during 2001-02 to 2011-12, the average rate of inflation is 6.742 per cent. Compared to earlier decades, this rate of inflation is very much higher. Therefore, the government of India should take appropriate steps to reduce the rate of inflation in future.

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VII. RELATIONSHIP BETWEEN NATIONAL INCOME AND INFLATION:

To analyze to what extent national income and inflation is going together, simple linear regression model is fitted by taking the wholesale price index number as the independent variable and GDP (in billions of Indian Rupees) as the dependent variable. GDP is taken in 2004-05 prices. The results of the regression analysis are given in Table 10. During 1981-82 to 1990-91, GDP has increased by 343 billions of Rupees when wholesale price index increases by one point. There exists a strong relationship between GDP and wholesale price index number. The value of adjusted R² suggests that 99 per cent of variations in GDP is explained by the variations in wholesale price index numbers

During 1991-92 to 2000-01, the results of the regression analysis reveal that GDP increases by 619 billions of Rupees when wholesale price index number increases by one point. However, the regression coefficient is significant only at 10 per cent level. The variations in wholesale price index number now can explain only 30 per cent of variations in GDP. Therefore, it clearly indicates that there are many other variables which influence the growth of GDP (national income).

During 2001-02 too 2011-12, national income increases by 474 billions of Rupees when wholesale price index increases by one point. The regression coefficient is significant at one per cent level. The value of adjusted R^2 suggests that 98.2 per cent of variations in GDP is explained by the variations in wholesale price index number.

The relationship between GDP and wholesale price index number should be interpreted with a note of caution here. It reflects merely the association between the two variables. It should not be taken to mean that increase in wholesale price index number alone causes increase in GDP. In fact there are many variables which stimulate national income. A detailed and more complicated analysis is required to identify the important determinants of economic growth. A moderate inflation to some extent can promote economic growth. Mere inflation can not stimulate growth under any circumstances. The increase in GDP influenced by the wholesale price index number (as a proxy for inflation) may be due to the potential existing in the Indian Economy to achieve a higher rate of economic growth.

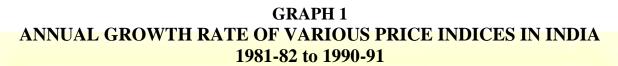
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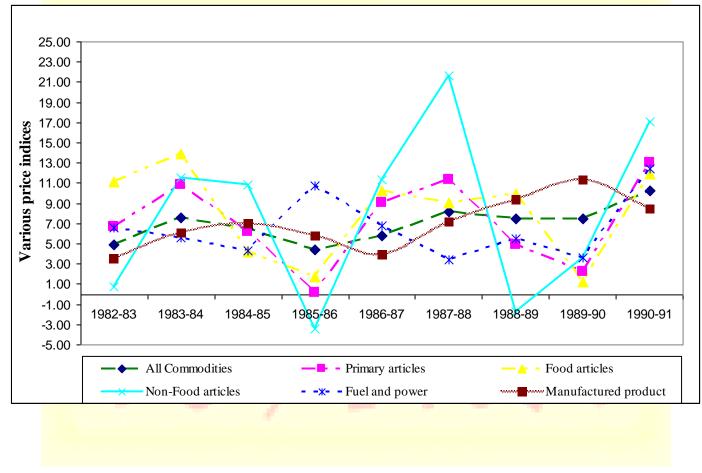












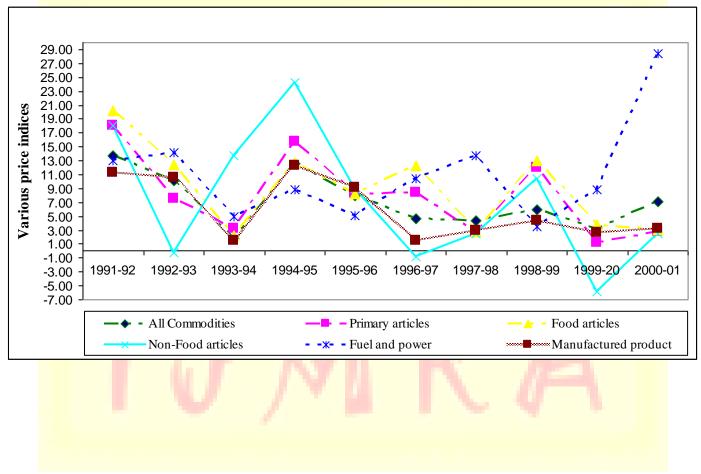




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GRAPH 2 ANNUAL GROWTH RATE OF VARIOUS PRICE INDICES IN INDIA 1991-92 to 2000-01



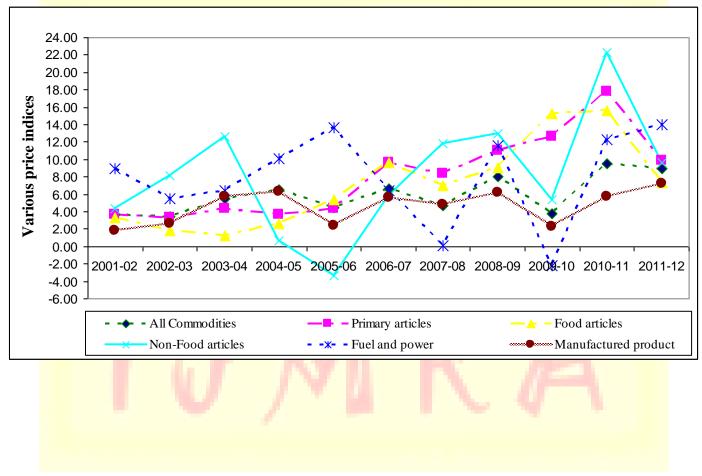




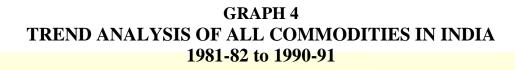
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GRAPH 3 ANNUAL GROWTH RATE OF VARIOUS PRICE INDICES IN INDIA 2001-02 to 2011-12



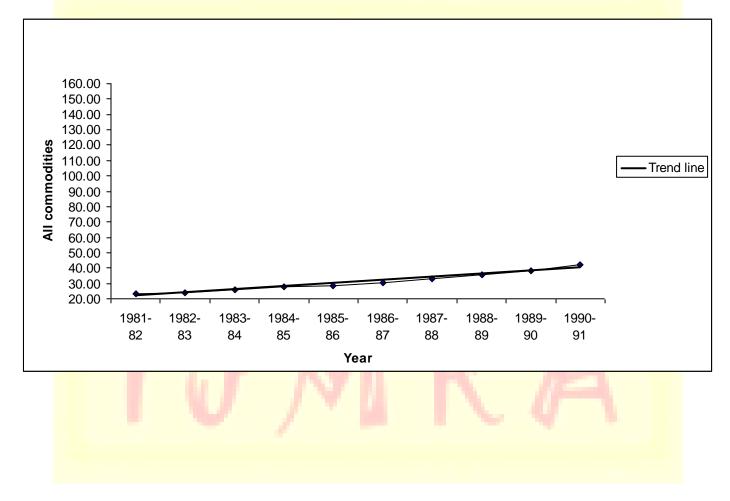




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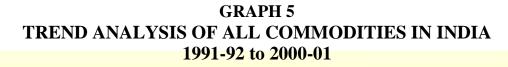
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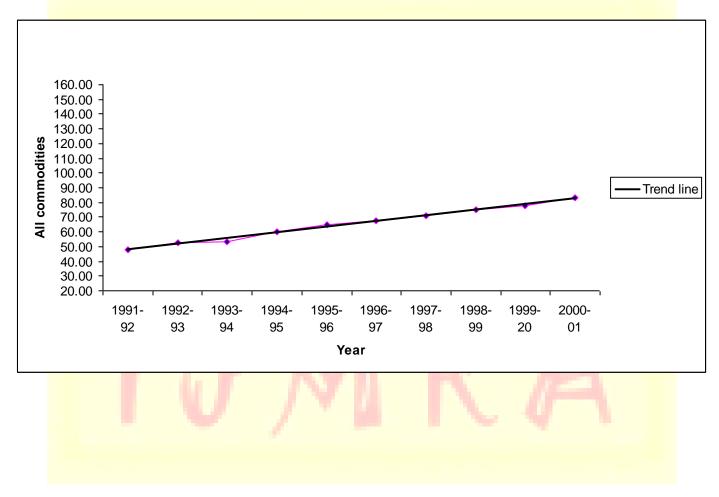


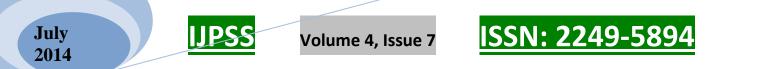
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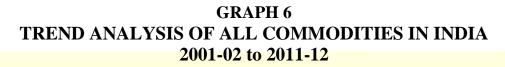
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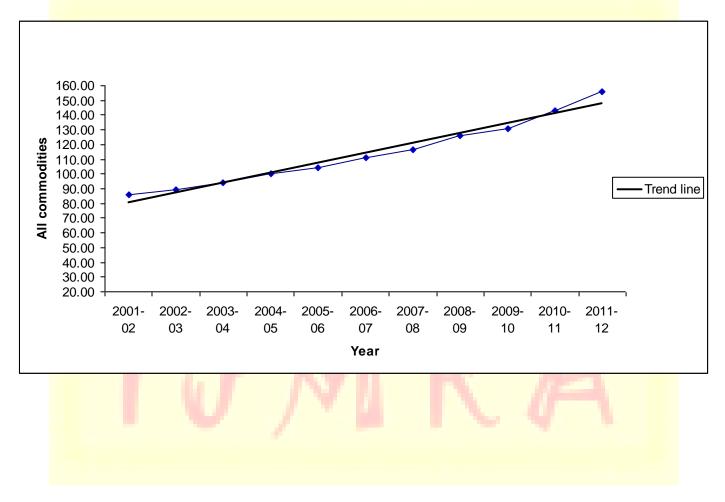












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TABLE 1PRICE INDEX NUMBERS OF VARIOUS GROUPS OF COMMODITIES1981-82 to 1990-91

year	All Commodities	Primary Articles	Food Articles	Non-Food Articles	Fuel and Power	Manufactured Product
1981-82	22.94	21.96	19.37	21.55	14.97	26.27
1982-83	24.06	23.43	21.52	21.72	15.95	27.19
1983-84	25.88	25.96	24.51	24.22	16.84	28.85
1984-85	27.56	27.56	25.53	26.85	17.56	30.87
1985-86	28.77	27.60	25.98	25.94	19.44	32.67
1 <mark>986</mark> -87	30.44	30.10	28.63	28.89	20.75	33.95
1 <mark>987</mark> -88	32.92	33.51	31.21	35.13	21.46	36.39
1 <mark>988</mark> -89	<mark>35.3</mark> 8	35.16	34.31	34.52	22.64	39.80
1 <mark>989</mark> -90	38.02	35.93	34.73	35.77	23.45	44.30
<mark>1990-</mark> 91	41.92	40.60	38.86	41.85	26.37	48.03
Average	30.79	30.18	28.47	29.64	19.94	34.83

Source: Worked Out from the Data Published in Various issues of Handbook of Statistics on the Indian Economy 2011-12.

TABLE 2 PRICE INDEX NUMBERS OF VARIOUS GROUPS OF COMMODITIES 1991-92 to 2000-01

	All	Primary	Food	Non-Food	Fuel and	Manufactured
year 🛛	Commodities	Articles	Articles	Art <mark>icles</mark>	Power	Product
1991-92	47.67	47.94	46.71	49.39	29.80	53.44
1992-93	52.47	51.52	52.50	49.28	34.01	59.27
<u>1993-94</u>	53.39	53.16	53.68	53.30	35.69	60.13
<u>1994-95</u>	60.12	61.56	60.55	66 <mark>.2</mark> 0	38.86	67.53
1995-96	64.92	66.61	65.59	72.17	40.86	73.70
1996-97	67.91	72.20	73.70	71.54	45.11	74.80
1997-98	70.90	74.11	75.74	73.29	51.32	76.97
1998-99	75.12	83.04	85.56	80.92	53.11	80.34
1999-20	77.58	84.00	88.84	76.23	57.82	82.50
2000-01	83.13	86.39	91.52	78.09	74.27	85.21
Average	65.32	68.05	69.44	67.04	46.09	71.39

Source: Worked Out from the Data Published in Various issues of Handbook of Statistics on the Indian Economy 2011-12.

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TABLE 3PRICE INDEX NUMBERS OF VARIOUS GROUPS OF COMMODITIES
2001-02 to 2011-12

vear	All Commodities	Primary Articles	Food Articles	Non-Food Articles	Fuel and Power	Manufactured Product
2001-02	86.12	89.53	94.52	81.50	80.91	86.77
2002-03	89.05	92.50	96.19	88.17	85.37	89.06
2003-04	93.91	96.49	97.42	99.31	90.83	94.11
2004-05	100.00	100.00	100.00	100.00	100.00	100.00
2005-06	104.50	104.30	105.40	96.70	113.60	102.40
2 <mark>006</mark> -07	111.40	114.30	115.50	102.30	120.90	108.20
2 <mark>007</mark> -08	116.60	123.90	123.60	114.40	121.00	113.40
2 <mark>008-</mark> 09	126.00	137.50	134.80	129.20	135.00	120.40
2 <mark>009</mark> -10	130.80	154.90	155.40	136.20	132.10	123.10
2010-11	143.30	182.40	179.60	166.60	148.30	130.10
2011-12	156.10	200.30	192.70	182.70	169.00	13 <mark>9.50</mark>
Average	114.34	126.92	126.83	117.92	117.91	109. <mark>73</mark>

Source: Worked Out from the Data Published in Various issues of Handbook of Statistics on the Indian Economy 2011-12.

TABLE 4 ANNUAL GROWTH RATES OF VARIOUS PRICE INDICES

(in Percentage							
	All	All Primary Food Non-Food		Non-Food	Fuel and	Manufactured	
year 🛛	Commodities	Articles	Articles	Articles	Power	Product	
1981-82	-	-	-		-	-	
1 <mark>98</mark> 2-83	4.88	6.69	11.10	0.79	6.55	3.50	
<mark>198</mark> 3-84	7.56	10.80	13.89	11.51	5.58	6.11	
<mark>198</mark> 4-85	6.49	6.16	4.16	10.86	4.28	7.00	
1 <mark>985-86</mark>	4.39	0.15	1.76	-3.39	10.71	5.83	
1986-87	5.80	9.06	10.20	11.37	6.74	3.92	
1987-88	8.15	11.33	9.01	21.60	3.42	7.19	
1988-89	7.47	4.92	9.93	-1.74	5.51	9.37	
1989-90	7.46	2.19	1.22	3.62	3.58	11.31	
1990-91	10.25	13.00	11.89	17.10	12.45	8.42	
Average	3.80	4.16	5.22	4.17	3.69	3.62	

Source: Worked Out from the Data Published in Various issues of Handbook of Statistics on the Indian Economy 2011-12.

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TABLE 5ANNUAL GROWTH RATES OF VARIOUS PRICE INDICES

						(in Percentages)
year	All Commodities	Primary Articles	Food Articles	Non-Food Articles	Fuel and Power	Manufactured Product
1991-92	13.72	18.08	20.20	18.02	13.01	11.26
1992-93	10.07	7.47	12.40	-0.27	14.13	10.51
1993-94	1.75	3.18	2.25	13.73	4.94	1.45
19 <mark>94-95</mark>	12.61	15.80	12.79	24.20	8.88	12.31
1 <mark>995</mark> -96	7.98	8.20	8.32	9.02	5.15	9.14
1 <mark>996</mark> -97	4.61	8.39	12.36	-0.87	10.40	1.49
1 <mark>997</mark> -98	4.40	2.65	2.77	2.45	13.77	2.90
1 <mark>998</mark> -99	5.95	12.05	12.97	10.41	3.49	4.38
1 <mark>999</mark> -20	3.27	1.16	3.83	-5.80	8.87	2.68
2000-01	7.15	2.85	3.02	2.44	28.45	3. <mark>28</mark>
Average	8.27	8.91	10.66	6.46	16.58	6.6 1

Source: Worked Out from the Data Published in Various issues of Handbook of Statistics on the Indian Economy 2011-12.

TABLE 6

ANNUAL GROWTH RATES OF VARIOUS PRICE INDICES

(in Percentages)

	All	Primary	Food	Non-Food	Fuel and	Manufactured
year	Commodities	Articles	Articles	Articles	Power	Product
2001-02	3.60	3.63	3.28	4.37	8.94	1.83
2002-03	3.40	3.32	1.77	8.18	5.51	2.64
2003-04	5.46	4.31	1.28	12.63	6.41	5.67
2004-05	6.48	3.64	2.65	0.69	10.09	6.26
2005-06	4.50	4.30	5.40	-3.30	13.60	2.40
2006-07	6.60	9.59	9.58	5.79	6.43	5.66
2007-08	4.67	8.40	7.01	11.83	0.08	4.81
2008-09	8.06	10.98	9.06	12.94	11.57	6.17
2009-10	3.81	12.65	15.28	5.42	-2.15	2.24
2010-11	9.56	17.75	15.57	22.32	12.26	5.69
2011-12	8.93	9.81	7.29	9.66	13.96	7.23
Average	20.58	12.37	10.39	12.42	10.89	6.08

Source: Worked Out from the Data Published in Various issues of Handbook of Statistics on the Indian Economy 2011-12.

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TABLE 7 RESULTS OF TREND ANALYSIS FOR VARIOUS PRICE INDICES IN

INDIA DURING THE PERIOD FROM (1981-82 to 1990-91)

a	b	SE of b	Adjusted R ²
19.663	2.023**	0.122	0.968
19.461	1.949**	0.114	0.970
17.246	2.040**	0.104	0.977
17.633	2.184**	0.201	0.928
13.373	1.195**	0.059	0.978
21.892	2.353**	0.186	0.946
	19.663 19.461 17.246 17.633 13.373	19.663 2.023** 19.461 1.949** 17.246 2.040** 17.633 2.184** 13.373 1.195**	19.6632.023**0.12219.4611.949**0.11417.2462.040**0.10417.6332.184**0.20113.3731.195**0.059

** Significant at 1% level

TABLE 8 RESULTS OF TREND ANALYSIS FOR VARIOUS PRICE INDICES IN

INDIA DURING THE PERIOD FROM (1991-92 to 2000-01)

Index No	a	b	SE of b	Adjusted R ²
All Commodities	44.025	3.872**	0.127	0.990
Primary product	42.518	4.643**	0.229	0.978
Food Articles	40.414	5.277**	0.213	0.986
Non-Food Articles	46.851	3.671**	0.536	0.836
Fuel and Power	22.897	4.216**	0.464	0.901
Manufactured product	52.089	3.509**	0.238	0.960

** Significant at 1% level

TABLE 9

RESULTS OF TREND ANALYSIS FOR VARIOUS PRICE INDICES IN

INDIA DURING THE PERIOD FROM (2001-02 to 2011-12)

Index No	a	b	SE of b	Adjusted R ²
All Commodities	73.889	6.742**	0.400	0.966
Primary product	62.377	10.757**	1.248	0.880
Food Articles	67.578	9.875**	1.207	0.868
Non-Food Articles	63.017	9.150**	1.191	0.853
Fuel and Power	69.180	80122**	0.542	0.957
Manufactured product	78.827	5.151**	0.196	0.986

** Significant at 1% level

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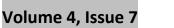


TABLE 10 RESULTS OF THE REGRESSION ANALYSIS FOR THE RELATIONSHIP

BETWEEN GDP AND WHOLE SALE PRICE INDEX

Period	Α	b	SE of b	t	\mathbf{R}^2	Adjusted R ²
1981-82 to 1990-91	-3.785	342.558**	11.702	29.272	0.991	0.990
1991-92 to	-18384.054	619.030***	280.821	2.204	0.378	0.300
2000-01						
2001-02 to	-14733.297	473.982**	20.457	23.169	0.984	0.982
2011-12						

** Significant at 1% level

* Significant at 10% level



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