Recent Divergence between Wholesale and Consumer Prices in India -A Statistical Exploration

G.P. Samanta & Sharmishtha Mitra*

During the recent period, inflation rates based on the CPIIW have been much higher compared to those based on the WPI. On conceptual plane, though a certain degree of mismatch is unavoidable in the movements of two series, at the same time they are also expected to be linked by some stable relationship to ensure inter-linkages between two markets - the wholesale market and the retail market. Empirical results show that since May 1995, divergence between the CPIIW and WPI (after adjusting for increasing level/trend) is widening - indicating a possible distortion in their relationship. For a formal verification, we applied co-integration test (for long-term relationship) and Granger's causality test (for short-run relationship) for two different periods, viz., (i) April 1991 to April 1995 and (ii) May 1995 onwards. It is seen that while data support the existence of a stable long-run relationship (co-integration) between the CPIIW and WPI during April 1991 to April 1995, the relationship is distorted thereafter. Even the short-run relationship is disturbed since May 1995.

Introduction

The widening gap between inflation rates based on the Wholesale Price Index (WPI : base 1981-82=100) and Consumer Price Index for Industrial Workers (CPIIW : base 1982=100) in India in recent periods has raised several issues on the measurement of inflation. For instance, the CPIIW at 429 for the month of December 1998 recorded an annual rise of 15.32 per cent. In contrast, the annual growth in the WPI (356.4) for the same month was only 6.55 per cent.

On a conceptual plane, CPIIW and WPI series differ on many counts, *viz.*, purpose and use, coverage of commodity/service, weighting diagram, the stage at which price quotations are collected, associated market (i.e., wholesale market, retail market), base-year, etc. In India, the importance of both these series for policy formulation is well recognised. While the WPI is used for measuring inflation (general price level) and assessing its future prospect, the CPIIW has wide acceptance for wage indexation of a majority of salaried people and wage earners. From the coverage point of view, the dis-similarity in the baskets for CPIIW and WPI is also very prominent. The basket for WPI includes wide-spectrum of raw materials, intermediate and final products, which are traded in wholesale markets even though services are excluded from its scope. On the other hand, CPIIW covers only final products and services consumed by industrial workers in retail market. Obviously, while price quotations for WPI relate to the wholesale level, those for CPIIW pertain to retail prices. If we accede to all these differences - conceptual as well as compilation - it is not surprising that they differ by some extent. However, as we know, consumption being the end use of all economic activities, price changes in wholesale markets represented by WPI are expected to be reflected in price changes in retail markets (CPIIW). Changes in CPIIW may also have some cost-push impact on WPI due to changes in wages through dearness allowances. Thus despite having several differences, conceptually one can expect some cause-and-effect type relationship between these two series.

Therefore, the much faster rise in CPIIW as compared to WPI, particularly in a time when the WPI growth rates have started declining (since December 1998) - not only casts several doubts on the trends in domestic price level but is also a matter of concern to the people, in general, and policy-makers, in particular. In this context, it is important to see how the recent divergence has affected the short-run and long-run relationship between the two series. This constitutes the main theme of the present paper. Accordingly, in Section I, we briefly discuss trends in prices and identify the starting point of recent divergence. The nature of long-term relationship between CPIIW and WPI is dealt with in Section II, while Section III is devoted to study of short-run relationship between these two variables. The possible sources of distortion in the relationship between CPIIW and WPI are identified in Section IV. Section V presents concluding remarks.

* Shri G.P. Samanta is Assistant Adviser and Dr. (Smt.) Sharmishtha Mitra is Research Officer in the Department of Statistical Analysis and Computer Services of the Bank.

Section I

Trends in CPIIW and WPI - The Recent Divergence

In India, Consumer Price Index for Industrial Workers (CPIIW) is compiled and released by the Labour Bureau, Ministry of Labour. The data on the present series (base 1982 = 100) are available at monthly frequency for various centres. The figures for all India level are derived taking the weighted average of these centre specific indices. The weighting diagram is constructed based on the value of consumption of industrial workers. Though these indices are not released for each and every commodity/service included in the basket, they are available for a few broad groups/sub-groups.

The responsibility for compilation and release of data on Wholesale Price Index (WPI) in India is rested on the Ministry of Industry (MI), Government of India. The present series (base 1981-82=100) covering 447 commodities are classified into several groups/sub-groups. Data on WPI for each of these commodities/groups are available at weekly interval. The MI initially calculates the WPI for all these commodities at all India level. These commodity level indices are then converted into weighted averages to arrive at the WPI for various commodity groups/ sub-groups/all commodities. The fixed weighting diagram is derived on the basis of value added concept of the end products/commodities. Unlike CPIIW, the centre-wise figures for WPI are not available. Moreover, though WPI data are available at weekly frequency, information on CPIIW is compiled only at monthly frequency. Thus for comparing the behaviour of WPI and CPIIW, one is compelled to consider the monthly data for different commodity group/sub-group at all India level. Monthly data for WPI are calculated by taking the simple average of weekly indices in the corresponding month. In this section we, therefore, identify the starting point of recent divergence based on monthly data on CPIIW and WPI at the aggregate level.

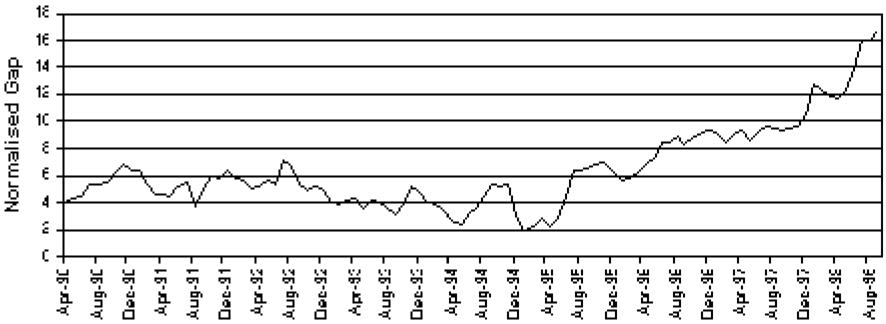
Starting Point of Recent Divergence

For studying the divergence between CPIIW and WPI, the simplest way is to analyse the behaviour of the gap (say, CPIIW - WPI) between two variables. At this stage it is worth noting that some degree of difference between CPIIW and WPI may be unavoidable mainly due to difference in their base years. Therefore, the main concern in this context is that whether the gap is widening significantly or not. This point also deserves some further discussion. When the trends in both WPI and CPIIW are increasing over time, we are not sure whether the widening gap may be considered as a real divergence (i.e., significant). For better understanding we require to normalise the gap after making suitable adjustment for the rising trends in both the series. To clarify the point, let us consider the hypothetical values of WPI and CPIIW to be 100 and 105, respectively, at any particular time point, indicating a gap (i.e., CPIIW - WPI) of 5 points. In a subsequent period let us assume the hypothetical figures for WPI and CPIIW to be 200 and 210, respectively, with a gap of 10 points. To eliminate the level-effect in both situations, we may express the gaps in percentage of WPI (CPIIW) and in such case the normalised gaps are identical at 5 per cent of WPI (CPIIW) in both situations. Similar comparison can also be made by expressing the gap in percentage of trends in CPIIW and/or WPI. Though the estimation of trend component is difficult, such a task has been made somewhat easy by the Hodrick-Prescott (HP) Filter. We derive the normalised gap as follows:

$$\textit{Normalised Gap (in \%)} = \frac{CPIIW - WPI}{(HCPIIW + HWPI)/2} \times 100,$$

where, HCPIIW and HWPI are estimated trend components (by using HP-Filter) of CPIIW and WPI, respectively. Plot of this normalised gap, NGAP, for the period[1] April 1990 to September 1998, is presented in Figure 1. From this figure it is clear that till April 1995 or so, NGAP was moving around some constant value (or possibly around some mild-declining trend). Thereafter, NGAP exhibits clear increasing trend. Thus, since May 1995 or so, the divergence is widening over time. More particularly, the extent of this divergence is very high in recent periods. We, therefore, fix May 1995 as the starting point of recent divergence.

Figure1:Plot of Normalised Gap (NGAP) in percentage



Section II

Long-term Relationship between CPIIW and WPI

As pointed out earlier, despite having several dis-similarities in terms of coverage, weighting diagram, etc., CPIIW and WPI are expected to share a stable long-term relationship between them. Some preliminary statistical investigation through HP-filter however, not only indicates widening divergence between the two series since May 1995 but also seems to have raised some questions on the stability of long-term relationship between them. In this context, two propositions need to be investigated. Is the evidence of instability a recurring phenomenon starting from May 1995 or whether it existed even prior to that? Accordingly, we divide the entire sample period into two sub-periods, the first one ending in April 1995 and the second in September 1998.

In the literature, the theory of stable long-term relationship among a number of variables is associated with the technique of co-integration (Engle & Granger 1987, 1991, Johansen 1988, Barman & Samanta 1998, etc.). The preconditions for testing for co-integration is that all underlying variables must be I(1)[2]. A number of I(1) series are said to be co-integrated if at least a linear combination of those variables is stationary. As we know, any shock in any I(1) series persists for long and the series has no tendency to come back to the normal path without intervention (either through some policy or other related variables). The existence of co-integration relationship among a number of such series has a great economic implication, in that, shocks to any one or more variables will be absorbed by the system as a whole so that the entire system moves from one equilibrium point to another.

Table 1: Unit-Root Tests for WPI& CPIIW

Variable	Unit Root Test Method					
	Augmented Dickey-Fuller			Phillips-Perron		
	Optimal Lags	Test Statistics (t)	t (trend)	Optimal Lags	Test Statistic (z)	t (trend)
Sub-Period : April 1990 to April 1995						
log (WPI)	1 to 3	--2.2251	2.1526	1 to 3	--8.7426	1.8681
log (CPIIW)	1 to 3	--2.4770	2.3578	1 to 3	--8.8019	1.8616
Sub-Period II : May 1995 to September 1998						
log (WPI)	1 to 5	--2.6364	2.7382	1 to 5	--6.9303	1.4100
log (CPIIW)	1 to 3	--1.6390	1.8690	1 to 3	--5.7802	0.9923

Note: (i) t and z are Test Statistics for testing Null Hypothesis of presence of Unit Root.

(ii) t-trend is the Test Statistic for testing whether the series has any deterministic (trend) component or not.

(iii) None of the test statistics - t , z and t (trend) are significant at 5% level of significance.

We carried out co-integration tests between CPIIW and WPI separately for both the sub-periods, by making use of the methodology suggested by Johansen (1988). For testing of unit root, we applied the widely used Augmented Dickey-Fuller (ADF) test and Phillips-Perron's (PP) test (Dickey & Fuller, 1979, 1981, Phillips & Perron 1988, Pantula, Gonzalez-Farias & Fuller, 1994, Said & Dickey, 1984, etc.). The results for unit root tests and co-integration tests are given in Table 1 and Table 2, respectively. From Table 1, it may be seen that in both the sub-periods, log(CPIIW) and log(WPI) do not have any deterministic trend component but have unit root in their levels. Thus both the variables are identified to be I(1) processes, indicating that a shock in any one of these variables will persist for a long time period and the series does not have the tendency to come back to its normal path without intervention. The Johansen (1988) test strongly rejects the null hypothesis of absence of any co-integrating relationship in the first sub-period indicating that WPI and CPIIW had stable long-term relationship during April 1990 to April 1995. In contrast, the null hypothesis of no cointegration is accepted in the second sub-period. Hence, it appears that instability has originated in the more recent period.

Table 2: Johansen (Trace) Co-Integration Test for WPI & CPIIW

Eigen Value	Corresponding Eign Vector (Row Vector)		Null Hypothesis on no. of Cointegrating Vector (r)		
			Null Hypothesis (H_o)	Test Statistic	p-value
Sub-Period I : April 1990 to April 1995					
Variables: log (WPI) & log (CPIIW); Optimal Lag = 1					
0.3225	1.0000	-0.7877	$H_o: r = 0$	28.7670	0.0023
0.1252	1.0000	0.4562	$H_o: r \leq 1$	7.3550	0.0057
Sub-Sample II : May 1995 to September 1998					
Variables: log (WPI) & log (CPIIW); Optimal Lags = 1 to 8					
0.5519	1.0000	-0.5600	$H_o: r = 0$	11.6787	0.3287
0.0310	1.0000	-2.0913	$H_o: r \leq 1$	0.4404	0.5029

Note : *Any test statistics is rejected at a per cent level of significance if the corresponding p-value exceeds a /100. In normal practice a is assumed to be either 1 or 5.*

Section III

Short-Run Relationship between CPIIW and WPI

The observed disturbances in long-run relationship between CPIIW and WPI since May 1995, lead us to similar inferences for short-run. We performed Granger's causality test separately for both the sub-periods. It is well known that the reliability of results of the Granger's causality test depends on whether the system variables are stable or otherwise. In the earlier section we found that log (CPIIW) and log (WPI) belong to I(1) process during both the sub-periods. Thus though log (CPIIW) and log (WPI) are non-stationary, the following first differenced series are stationary :

Δlog (CPIIW) = log (CPIIW) - log $(CPIIW)_{(-1)}$ and
Δlog (WPI) = log (WPI) - log $(WPI)_{(-1)}$

TABLE 3: Granger's Causality Test for WPI & CPIIW

Dependent Variable	Explanatory Variables		Null Hypothesis & Test Statistics			Remarks
	Regressor	Lags	Null Hypothesis	F-statistic	P-value	
Sub Sample (I) : April 1990 to April 1995						
Δlog (CPIIW)	Constant	-	H_o : WPI	F (3,42)	0.0005	Bi-directional
	Δlog(WPI)	1,10,11	does not	= 7.3297		causality
			Cause CPIIW			exists
	Δlog(CPIIW)	5,12				between
						CPIIW
Δlog(WPI)	Constant	-	H_o : CPIIW	F (4, 39)	0.0004	and WPI
	Δlog(WPI)	1,3,4,7, 8,9	does not cause WPI	= 6.4908		
	Δlog(CPIIW)	2,6,7,10				
Sub Sample (II) : May 1995 to September 1998						
Δlog(CPIIW)	Constant	-	H_o : WPI	F (3, 35)	0.0050	WPI causes
	Δlog(WPI)	1,10,12	does not	= 5.0784		CPIIW but
			cause CPI			not the other
	Δlog(CPIIW)	9,12				way.
Δlog(WPI)	Constant	-	H_o : CPI	F (2, 26)	0.0945	
	Δlog(WPI)	1 to 12	does not	= 2.5864		
			cause WPI			
	Δlog(CPIIW)	5,7				

Note: Any test statistics is rejected at a per cent level of significance if the corresponding p-value exceeds a/100. In normal practice a is assumed to be either 1 or 5.

We therefore, applied Granger's causality test on the first difference of the log transformed (Δlog (CPIIW) and Δlog (WPI)) series. The relevant results are presented in Table 3. It may be observed that the data for the first period do not support the null hypothesis of no causality between log (CPIIW) and log (WPI) in either direction. In case of the second period, however, there is evidence of declining causal connection between the two series. The causal effect is detected only from CPIIW to WPI. Thus the short-run causal relationship between CPIIW and WPI has been disturbed during the second period.

Section IV

Sources of Divergence

Against the backdrop of evidences of considerable instability in WPI and CPIIW relationship, the present section aims at identifying possible reasons of this outcome in the recent periods. As the baskets for WPI and CPIIW differ in terms of commodity coverage, weighting diagram, etc., it may be interesting to analyse the nature of relationship between the adjusted WPI and CPIIW series, constructed on the basis of common commodity characteristics. In Table 4 we present common commodity groups[3] in both the baskets with their respective weights.

Above constructions indicate that WPI1 and CPIIW1 are similar in terms of both commodity coverage and weighting diagram (weights being taken from WPI basket). Similarly, WPI2 and CPIIW2 are also similar in terms of both these aspects. In contrast, WPI1 and CPIIW2 are similar only in terms of commodity coverage (they differ with respect to weighting diagrams).

Table 4: Weights of Common Groups in WPI & CPIIW Baskets

WPI		CPIIW	
Group Name	Weight (%)	Group Name	Weight (%)
1. Food Articles & Products (excluding Betelnuts, Tea & Coffee Processing)	27.021	1. Food Items	56.995
2. Beverages, Tobacco & Tobacco Products, Tea & Coffee Processing, Betelnuts	2.536	2. Pan, Supari, Tobacco & Intoxicants	3.155
3. Fuel, Power, Light & Lubricants	10.663	3. Fuel & Light	6.281
4. Textiles, Leather & Leather Products, Rubber & Canvas Footwear	12.671	4. Clothing, Bedding & Footwear	8.540
Total	52.891	Total	74.971

In order to investigate the impact of differences in coverage and weighting diagram on the recent disturbances in the relationship between CPIIW and WPI, we constructed the following adjusted CPIIW and WPI series.

WPI1 = Adjusted WPI based on common items with weights taken from WPI basket
WPI2 = Adjusted WPI based on common items but weights taken from CPI basket
CPIIW1 = Adjusted CPIIW based on common items with weights taken from WPI basket
CPIIW2 = Adjusted CPIIW based on common items but weights taken from CPI basket

Hence, we shift our focus to examine whether adjusted series belong to the class of I(1) processes or not. Results of unit-root tests (Table 5) identify log transformed series of WPI1, WPI2, CPIIW1 and CPIIW2 to be I(1) processes in both the periods under study.

Table 5: Unit-Root Tests for Adjusted WPI & CPIIW

Variable	Unit Root Test Methods					
	Augmented Dickey-Fuller			Phillips-Perron		
	Optimal Lags	Test Statistics (t)	t (Trend)	Optimal Lags	Test Statistic (z)	t (Trend)
Sub-Period I : April 1990 to April 1995						
log (WPI1)	1 to 3	-2.1565	2.0314	1 to 3	-8.6170	1.8459
log (CPIIW1)	1 to 3	-2.4993	2.3688	1 to 3	-9.0442	2.0298

log (WPI2)	1 to 3	-2.0916	1.9178	1 to 3	-8.6465	1.6522
log (CPIIW2)	1 to 3	-2.5579	2.4222	1 to 3	-9.7048	1.9776
Sub-Period II : May 1995 to September 1998						
log (WPI1)	1 to 6	-3.0259	3.0908	1 to 6	-8.2567	1.8215
log (CPIIW1)	1 to 3	-1.6869	1.8754	1 to 3	-7.9594	1.3376
log (WPI2)	1 to 3	-2.2938	2.5144	1 to 3	-6.0198	1.3645
log (CPIIW2)	1 to 3	-1.3292	1.6197	1 to 3	-5.6206	1.0148

Note: (i) t and z are Test Statistics for testing null hypothesis of presence of Unit Root.

(ii) t-trend is the test statistic for testing the null hypothesis of no deterministic trend.

(iii) None of the test statistics - t , z and t (trend) are significant at 5% level of significance.

The Johansen's test for cointegration on different pairs of these variables gives some peculiar results (Table 6). During the first period, CPIIW1 and WPI1 are strongly co-integrated with two possible co-integration vectors. However, the co-integration relationship between (i) CPIIW2 and WPI1 and (ii) CPIIW2 and WPI2 is not so strongly detected. Though the null hypothesis of no co-integration vector is accepted, the null of at most one co-integration vector is rejected at 5-7 per cent level of significance. These results indicate probable existence of co-integration relationship among various pairs of variables during the first period. On the other hand, during the second period, none of the pairs of variables are co-integrated (as at the same level of significance, the null hypothesis of no cointegration as well as at most one co-integration vector are accepted). In this context a comparison of results presented in Table 2 and Table 6 reveals certain interesting facts. It is clear that during the second period, the acceptance of no co-integration relationship between actual CPIIW and WPI is relatively stronger than the case when the series are adjusted. Therefore, it appears that while correcting for differences in coverage and weighting pattern improves the long-term relationship between CPIIW and WPI, the relationship is still weak. These results point to certain other factors than commodity basket and weighting pattern alone, which may have contributed to growing divergence the between the wholesale and consumer prices in India.

Table 6: Results of Johansen (Trace) Co-Integration

Eigen Value	Corresponding Eign Vector (Row Vector)		Null Hypothesis on no. of Cointegrating Vector (r)		
			Null Hypothesis (H_o)	Test Statistic	p-value
Sub-Period I : April 1990 to April 1995					
Variables: log (WPI1) & log (CPIIW2) Optimal Lag = 8					
0.1525	1.0000	-0.4293	$H_o: r = 0$	8.9122	0.5682

0.0921	1.0000	-0.9821	$H_o: r \leq 1$	3.2864	0.0657
Variables: log (WPI1) & log (CPIIW1); Optimal Lag = 1					
0.2698	1.0000	-1.0168	$H_o: r = 0$	24.0586	0.0085
0.1158	1.0000	2.4838	$H_o: r \leq 1$	6.7667	0.0080
Variables: log (WPI2) & log (CPIIW2); Optimal Lag = 8					
0.2287	1.0000	-1.0706	$H_o: r = 0$	12.7838	0.2481
0.1097	1.0000	-2.8571	$H_o: r \leq 1$	3.9524	0.0438
Sub-Sample II : May 1995 to September 1998					
Variables: log (WPI1) & log (CPIIW2); Optimal Lags = 8					
0.6326	1.0000	-0.5451	$H_o: r = 0$	15.6165	0.1105
0.1143	1.0000	0.7328	$H_o: r \leq 1$	1.6997	0.1882
Variables: log (WPI1) & log (CPIIW1); Optimal Lag = 8					
0.5579	1.0000	-0.7611	$H_o: r = 0$	12.7314	0.2516
0.0888	1.0000	5.7422	$H_o: r \leq 1$	1.3027	0.2652
Variables: log (WPI2) & log (CPIIW2); Optimal Lag = 7					
0.5881	1.0000	-0.5554	$H_o: r = 0$	16.3517	0.0911
0.0721	1.0000	1.2565	$H_o: r \leq 1$	1.2716	0.2725

Note : *Any test statistics is rejected at α per cent level of significance if the corresponding p-value exceeds α/100. In normal practice α is assumed to be either 1 or 5.*

The lack of evidences on long-term relationship between CPIIW and WPI, based both on actual and adjusted data, lead to the inference that the recent divergence between wholesale and consumer prices could have been due to certain shocks which affect the short-run behaviour of the series. To be sure, we conducted Granger's causality tests on stationary transformed series (i.e., first differences of logged transformed series) for different pairs of adjusted CPIIW and WPI. The relevant results are presented in Table 7. It is seen that in both the periods bi-directional causality is detected between (i) CPIIW2 & WPI1, (ii) CPIIW1 & WPI1 and (iii) CPIIW2 & WPI2. Thus it appears that the short-term relationship between CPIIW and WPI based on common commodities is not disturbed. Therefore, the recent disturbance in short-run relationship between actual CPIIW and WPI is mostly attributable to some peculiar price behaviour of uncommon items, weighting diagrams, etc.

Table 7: Granger's Causality Test for Adjusted

Dependent Variable	Explanatory Variables		Null Hypothesis & Test Statistics			Remarks
	Regressor	Lags	Null Hypothesis	F-statistic	P-value	
Sub-Period I : April 1990 to April 1995						
Causality Test for WPI1 & CPIIW2						
Δlog (CPIIW2)	Constant Δlog(WPI) Δlog(CPIIW2)	- 1,2,5 3,6,11	H_o : WPI does not Cause CPIIW2	F (3,42) = 6.8606	0.0007	Bi-directional causality exists between WPI1 and

Δlog (WPI1)	Constant Δlog(WPI1) Δlog(CPIIW2)	- 1,3 2,4,7,12	H_o : CPIIW does not cause WPI	F (4, 41) = 5.9101	0.0008	CPIIW2
Causality Test for WPI1 & CPIIW1						
Δlog (CPIIW1)	Constant Δlog(WPI) Δlog(CPIIW2)	- 1,6,11 6,12	H_o : WPI does not Cause CPIIW1	F (3,42) = 6.1923	0.0014	Bi-directional causality exists between WPI1 and
Δlog (WPI1)	Constant Δlog(WPI1) Δlog(CPIIW2)	- 1,3 2,4,7,12	H_o : CPIIW does not cause WPI	F (4, 41) = 5.3054	0.0015	CPIIW1
Causality Test for WPI2 & CPIIW2						
Δlog (CPIIW2)	Constant Δlog(WP2) Δlog(CPIIW2)	- 1,12 1,3,6,9, 12	H_o : WPI does not Cause CPIIW1	F (2,40) = 3.4333	0.0420	Bi-directional causality exists between CPIIW2 and
Δlog (WPI2)	Constant Δlog(WPI2) Δlog(CPIIW2)	- 1,7 4,7,8,12	H_o : CPIIW does not cause WPI	F (4, 41) = 7.4749	0.0001	WPI2.
Sub-Period II : May 1995 to September 1998						
Causality Test for WPI1 & CPIIW2						
Δlog (CPIIW2)	Constant Δlog(WPI) Δlog(CPIIW2)	- 1,8,10 9,12	H_o : WPI1 does not Cause CPIIW2	F (3,35) = 5.3456	0.0039	Bi-directional causality exists between WPI1 and
Δlog (WPI1)	Constant Δlog(WPI1) Δlog(CPIIW2)	- 6 7	H_o : CPIIW2 does not cause WPI1	F (1, 38) = 8.3388	0.0064	CPIIW2
Causality Test for WPI1 & CPIIW1						
Δlog (CPIIW1)	Constant Δlog(WPI) Δlog(CPIIW1)	- 1,5,8 7,8	H_o : WPI1 does not Cause CPIIW1	F (3,42) = 5.4484	0.0035	Bi-directional causality exists between WPI1 and
Δlog (WPI1)	Constant Δlog(WPI1) Δlog(CPIIW2)	- 1,3 2,4,7,12	H_o : CPIIW1 does not cause WPI1	F (1, 37) = 5.3341	0.0266	CPIIW1
Causality Test for WPI2 & CPIIW2						
Δlog (CPIIW2)	Constant Δlog(WP2) Δlog(CPIIW2)	- 1,8,10 9,12	H_o : WPI2 does not Cause CPIIW2	F (3,35) = 8.4579	0.0002	Bi-directional causality exists between WPI2 and
Δlog (WPI2)	Constant Δlog(WPI2) Δlog(CPIIW2)	- 1 2,3,7,9	H_o : CPIIW2 does not cause WPI2	F (4, 35) = 3.2764	0.0221	CPIIW2.

Note : Any test statistics is rejected at α per cent level of significance if the corresponding p-value exceeds α /100. In normal practice α is assumed to be either 1 or 5.

Section V

Concluding Observations

The results of this study indicate that there has been some strong evidence of growing divergence between the wholesale and consumer prices in India since May 1995. While a part of this divergence is explained by the differences in commodity basket and weighting pattern inherent in two price indices, there are also other factors which are at work in giving rise to this outcome. Empirical results indicate that while removal of these sources of divergence improves the short-run relationship between CPIIW and WPI, the improvement is not so impressive for the long-term relationship. This points to other factors, such as price quotations, differences in market behaviours, etc., which may have been playing a significant role in the recent divergence in the relationship between CPIIW and WPI. Quantification of those impacts is, however, difficult in absence of appropriate dis-aggregated data. While the price setting process in both the markets is undoubtedly different and is subject to dynamic shocks, the recent growing divergence between the wholesale and consumer prices calls for a detailed survey of the behaviour of individual commodity prices in both the market segments and how far this behaviour has undergone a change to merit a revision of base period, commodity baskets and their relative weights in the respective price indices.

Notes

1. At the time of doing the econometric exercises included in this study, we had detailed data till September 1998. Though by this time, data are available for about another couple of months, the nature of divergence between CPIIW and WPI has broadly remained unchanged. Therefore, we believe that the inclusion of those extra data points will not change the qualitative nature of the relevant results.

2. A non-stationary variable with no deterministic component is said to be integrated of order d, denoted by I(d), if d-th order differencing on the original series produces a stationary series.

3. The task of identifying common commodity groups is really very difficult mainly due to the fact that detail commodity coverage in CPIIW basket is not readily available. In this study taking the major groups of CPIIW as the standard, relevant items from WPI basket have been chosen to construct a comparable WPI series. Obviously, a bit of arbitrariness is involved in this type of heuristic approach. However, we hope that the results based on the present groupings would not have deviated much from a rigorous and full-proof classification.

References

Apel, Mike (1995): "Output Gap and Inflation in a Historical Perspective", *Quarterly Review,* Vol.2, Sveriges Riksbank - The Swedish Central Bank.

Barman, R.B. and G.P.Samanta (1998): "Efficiency of Indian Stock Market: A Statistical Re-evaluation", *The 34th Annual Conference of The Indian Econometric Society,* Mangalore University, Mangalore, March 20-23.

Dickey, D.A. and W.A. Fuller (1979): "Distribution for the Autoregressive Time Series with Unit Root", *Journal of American Statistical Association,* Vol.74, pp. 427-31.

Dickey, D.A. and W.A. Fuller (1981): "Likelihood Ratio Statistics For Autoregressive Time Series with a Unit Root", *Econometrica,* Vol.49, No.4, pp. 1057-72.

Engle, R.F. and C.W.J. Granger (1987): "Co-Integration and Error Correction: Representation, Estimation and Testing", *Econometrica,* Vol.55, No.2, pp. 251-76.

Engle, R.F. and C.W.J. Granger (1991) (Eds): *Long-Run Economic Relationship,* Oxford University Press Inc., New York.

Giorno, Claude, Pete Richardson, Deborah Roseveare and Paul Van den Noord (1995): "Estimating Potential Output, Output Gaps and Structural Budget Balances", Economics Department, Working Paper No. 152, *The Organisation for Economic Co-Operation & Development (OECD),* Paris.

Johansen, Soren (1988): "Statistical Analysis of Co-Integration Vectors", *Journal of Economic Dynamic and Control*, Vol.12, pp.231-54.

Nelson, C.R. and Charles I. Plosser (1982): "Trends and Random Walks in Macroeconomic Time Series", *Journal of Monetary Economics,* North Holland Publishing Society, Vol. 10, pp. 139-62.

Pantula Sastry G., Graciela Gonzalez-Farias and Wayne A. Fuller (1994): "A Comparison of Unit-Root Test Criteria", *Journal of Business & Economic Statistics, American Statistical Association,* Vol.12, No.4, pp. 449-59.

Phillips, P.C.B. and P. Perron (1988): "Testing for Unit Root in Time Series Regression", *Biometrika,* Vol.75, pp. 335-46.

Said, S.E. and Dickey, D.A. (1984): "Testing for Unit Roots in Auto-Regressive Moving Average Model with Unknown Order", *Biometrika,* Vol.71, pp. 599-607.

Sengupta, Suchitra and Tanuka Endom (1998): "Inflation and its Measures - Some Recent Issues", *Economic and Political Weekly,* Vol. XXXIII, No.11, March 14-20.

Srimany, A.K and G.P.Samanta (1998): "Identification of Monetary Policy Shock and Its Effects on Output and Price: A Structural VAR Approach", *Reserve Bank of India Occasional Papers,* Vol. 19, No. 2, June.