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Spatial price integration and price transition in major markets of onion in India

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Abstract
This paper has investigated the spatial price integration among the major onion markets for the price efficiency and determined the long run and short run equilibrium relationship of wholesale prices of onion in different markets using co integration, Granger-causality test and Error correction Model. The study is based on the wholesale monthly price data of twelve major regulated markets from seven major onion producing states of India. After checking for the presence of seasonal and non-seasonal unit roots, suitable co integration, Granger causality test model has been applied for modeling the spatial price integration in domestic markets of onion. The application of Johansen method of co integration has revealed that prices in eight markets share stable long-run relationship and the other four markets operates independently in the country. The Granger causality test has shown that Ahmadabad, Hubli, Bangalore, Jaipur and Kolkata markets have influence on price movement in other market to some extent. The Vector Error Correction analysis reveals that, the short run price adjustment is at low level in these markets and the speed of the adjustment of the short run prices to reach general equilibrium level is varied among the markets, it ranged between 14-90%. The reasons attributed for poor short run adjustment in prices may be due to the paucity of information and its dissemination, and poor transportation facilities. By strengthening the market information system enables all the stakeholders of markets to make proper production and marketing decisions.

Keywords: Onion wholesale prices, spatial price integration, long run equilibrium, short run equilibrium, major markets

Introduction
India is the world's second largest producer of onion with the area and production of 1.2 million ha and 19.77 million tonnes respectively during 2013-15. In India, onion is mainly cultivated in Maharashtra with lion's share of 37.28% in total onion acreage, followed by Karnataka (14.73%), Madhya Pradesh (9.81%), and Gujarat (4.73%), Rajasthan (4.97%), Bihar (4.48%) and Andhra Pradesh (3.84%). In the case of production, Maharashtra holds the top position by contributing around 29.9% of total onion production in India followed by, Karnataka with (14.87%), Madhya Pradesh (14.36%), Gujarat (7.31%), Bihar (6.4%), Andhra Pradesh (4.14%) and Rajasthan (3.88%). At all India level the average productivity of the onion is around 16.45 quintals/ha. (Table-1).

At all India level area, production and productivity have registered a positive growth rate of 4.89%, 6.42% and 1.46% respectively during 1980-2015. All the major onion cultivating states also registered a positive growth rate in APY. Despite of increase in area and production of onion, in the recent time, the wholesale prices have substantially increased to touch historical highs of Rs. 5000- 6000 /quintal and witnessed a high instability in price movement in all the major markets across India. Significant price variation is noticed in producer markets to consumer markets in the case of onion. These indiscriminate increases in price levels of onion have significant impact on trade, exports and household budget allocation. The conspicuous volatility in the price of onion is noticed in the year 1998, 2010, 2013, 2015 and 2017, and the frequency of the price rise scenario is noticed in alternate years in the recent times. The price fluctuations were pretty high in consumer markets despite increase in area and production of onion in India. Thus, there is a need to analyze, along with the supply demand dynamics of the crop, arrivals and prices relation, role of market integration in attaining price efficiency in onion across the markets.

Table 1: Triennial (TE) of Area, production and yield of Onion in major cultivating states in India (2013-15)

States	Area(m.ha)	Production(m.t)	Yield t/ha	Percentage share in total area	Percentage share in total production
Maharashtra	0.45	5.91	13.22	37.28	29.90
Karnataka	0.18	2.94	16.47	14.73	14.87
Madhya Pradesh	0.12	2.84	24.10	9.81	14.36
Gujarat	0.06	1.44	25.44	4.73	7.31
Rajasthan	0.06	0.77	12.83	4.97	3.88
Bihar	0.05	1.27	23.35	4.48	6.40
Andhra Pradesh	0.05	0.82	17.62	3.84	4.14
Others	0.24	3.78	13.50	19.98	19.12
All India	1.20	19.77	16.45	100.00	100.00

Integration of the agricultural markets is one of the foremost important aspect for efficient functioning of markets (Dercon, 1995) [3]. On integration of agricultural markets, both the producers and consumers will realize the potential gains from liberalized markets (Reddy et al., 2012) [8]. Spatial price behavior in regional markets is an important indicator of overall market performance and price efficiency of agriculture commodity. Here, spatial market integration refers to a situation in which prices of a commodity in spatially separated markets move together due to arbitrage and the price signals and information are transmitted smoothly across the markets. With the free flow of information in a competitive market, the difference in prices of a product in the two markets would be equal to or less than the transportation cost between them (Vasciaveo *et al*., 2013) [9]. More the markets are integrated the greater is the likelihood that price system will efficiently allocate resources and products across regions and time. This will allow the benefits of technical change and productivity improvements to alleviate poverty and help achieve food security (Wilson, 2000). An integrated market can mitigate the effect of price shocks because it induces trade between surplus and deficit areas (Ojo *et al.*, 2013) [7].
Against this back drop, the present study attempts to analyze the extent and degree of market integration in major onion markets of India. As market integration depicts a smooth transmission of prices from one market to the other, integration of market has been used as an excellent marker of an efficient marketing system. Hence, this study may throw a light on understanding the short and long run price integration among the major markets of onion in India. The study will also help in addressing the level of integration among the markets and their impact on the price movement and volatility in prices of onion in domestic markets.

Objectives

- To study the short run and long run price behavior of the onion wholesale prices in selected markets
- To find strength in spatial market integration and stability of price linkages in major onion markets in India.
- To study the existence and direction of long-run causal price relationship between the markets.

Methodology

In this study, twelve major regulated markets from seven major onion producing states of India, namely Ahmedabad from Gujarat, Bangalore and Hubli from Karnataka, Pimpalgaon, Pune, Mumbai and Lasalgaon from Maharashtra, Mahua from Bihar, Kolkata from West Bengal, Jaipur from Rajasthan, Chennai from Tamil Nadu and Delhi were selected for analyzing the monthly prices and their integration among the various major markets to study the price efficiency of onion during 2002 to 2017.

Sources of data

In order to fulfill the designed objectives for the present study, the secondary data were collected on monthly prices of onion from National Horticultural Research and Development Foundation (NHRDF) in order to analyze the price integration among the major markets operating in India and the price efficiency attained in domestic market.

Data analysis

Finally to know the degree of market integration and price efficiency of onion in major markets of India, the time series analytical tool Johansen co- integration test was used. Before analyzing the extent of Integration of markets for price efficiency, there is a need to check the stationarity of the price for a study period. A detailed methodology is presented in following sections for better understating of the selected model for studying the co integration of markets of onion in domestic market.

Procedure to check the stationarity of the series

A stationary series is a type of series whose statistical properties such as mean, variance and autocorrelation are all constant over time and non-stationary time series has time dependent statistical properties (Gopal, Raveendaran, & Rajan, 2009) [4]. In analyzing any time series data, testing for stationarity is a precondition, since, econometric relation between the time series has the presence of trend components (Davidson & Mackinnon, 1993) [1]. This involves testing for stationarity using tests such as, Augmented Dicky-Fuller (ADF) test. If one identifies the series to be non-stationary, the first difference of the series is tested for stationarity to determine the order of integration. The number of times (d) a series is differenced to make it stationary is termed as the order of integration, I (d). In this study, the ADF test was used to determine the data properties due to its common application in the time series literature. The ADF test as mentioned, considers the null hypothesis that a given series is non stationary. In this test a sequential testing has been used, which involves step-by-step testing procedure, by considering different equations.

$\Delta Yt = a_0 + \delta T + Yt\text{-}1 + a_1 + \epsilon$ --------- (i)
$\Delta Yt = T + Yt\text{-}1 + a_1 + \epsilon$ --------- (ii)
$\Delta Yt = Yt\text{-}1 + a_1 + \epsilon$ --------- (iii)

After running through the above series of equations, from the observations, the best fit equation was the (iii) with no trend and no constant. Hence, the test (III) is applied by running a regression of the following form:

$$\Delta Yt = Yt\text{-}1 + a_1 + \epsilon$$

Where,

Yt = Price of commodity in a given market at time t

ΔYt = Yt - Yt-1

ϵ = Pure white noise error term
m = optimal lag value which is selected on the basis of Schwartz Information Criterion (SIC)
The regressions provide at-statistic of the estimated ịֽ. The t-statistics was then compared to the critical value t-statistic (The test statistic from the testing regression is known as the statistic critical values (Dickey & Fuller, 1979). If the value of the ADF statistic is less, (ADF values are always negative) than the critical value at the conventional significant level (usually at five percent level of significance) then the series (Yt) is said to be stationary and vice versa. Once it was confirmed that the given price-series were stationary or of the same order of integration, the co-integration of markets was tested by Johansen Maximum-Likelihood Estimation techniques (MLE).

Co-integration test
The Co-integration test explains the extent of deviation from the long run equilibrium relationship by the non-stationary series. It is concerned with the existence of as table relations hip among prices indifferent localities. The ADF test which is a test for stationarity is supplemented by Johansen-Julius Maximum Likelihood Estimation (MLE) method. Johansen (1988) and Johansen and Juselius (1990), developed a multivariate co-integration method which was a robust procedure for testing long run relationship between stationary prices variables and also allow tests for multiple co-integrating vectors. The number of co integrating vectors indicated by the tests is an important indicator of the extent of co-movement of prices. An increase in the number of co-integrating vectors implies an increase in the strength and stability of price linkages.

Test for Granger-causality
After undertaking co-integration analysis of the long run linkages of the various variables, and having identified that they are linked, an analysis of statistical causation was conducted. The Granger causality test conducted within the framework of a Vector Auto Regressive (VAR) model is used to test the existence and direction of long-run causal price relationship between the markets. The causality test uses an error correction model (ECM) of the following form:

$$Pt^1 = \alpha + \beta_0 +j\ P^1t\text{-}j + k\ P^2t\text{-}k + \epsilon t$$

Where, T is the time period,
ϵt is the error term,
P^1 and P^2 are the prices in the 2 markets at time t. j and k are the number of lags of both the variables in the system respectively.

Error Correction Method (ECM)
An Error Correction Model (ECM) is an efficient way of combining the long run co integrating relationship between the levels variables and the short run relationship between the first differences of the variables. It has the merit that all the variables in the estimated equation are stationary; thus there is no problem of spurious correlation. The procedure of differencing results in the loss of valuable long run information in the data and so an error correction term is introduced in the theory of co integration to integrate the short run dynamics of the series with its long run value. The residuals obtained from the equation are introduced as explanatory variables in to the system of variables in levels. The error correction term thus captures the adjustment towards long run equilibrium.
If the price series are I (1), then a linear combination will result in co integration and if there is the existence of co integration between the variables, it is not sufficient to estimate relationship between the two variables using the standard regression model. But it is important to incorporate the long run equilibrium relationship between them in their regression relationship, subsequently; an error correction model is specified to relate the changes in the dependent variable to the independent variable as well as the error correction term where the error correction term measures the deviation from the long run equilibrium. A negative and significant coefficient of the ECM (i.e. t-l) indicates that any short term fluctuation between variables will give rise to as table long run relationship between the variables. A generalized ECM formulation to understand both short-run and long-run behavior of prices can be considered by first taking the autoregressive distributed lag equation as follows

$$\Delta Yt = a_{00} + \sum_{i=0}^{k-1} ai_1 \Delta Xt - i + \sum_{i=0}^{k-1} ai_2 \Delta Yt - i + m_0 [m_1 Xt\text{-}k - Yt\text{-}k] + \epsilon t$$

Where, $m_0 = (1 - \sum_{i=0}^{k} ai_2)$, $m_1 = \sum_{i=0}^{k} ai_1 / m_0$

The parameters m_0 measures the rate of adjustment of the short-run deviations towards the long run equilibrium. Theoretically, this parameter lies between 0 and 1. The value 0 denotes no adjustment and 1 indicates an instantaneous adjustment. A value between 0 and 1 indicates that any deviations will have gradual adjustment to the long-run equilibrium values.
In the present study, we have used Johansen's Vector Error Correction Model (VECM). This approach permits the testing of co-integration as a system of equations in one step. In addition, it does not require the prior assumption of endogeneity or erogeneity of the variable.

Results and Discussion

Unit Root Test for stationarity of the price time series
As a first step to determine the price transmission mechanism in onion, an Augmented Dickey Fuller (Dickey and Fuller 1979) unit root test was applied to ascertain the stationarity of the monthly price series obtained from various markets across the states. The results of this exercise are presented in the Table-2. The test was applied to each variable (market) over the period of2002–2017.

Table 2: The estimated test statistics from ADF test for wholesale prices of onion

Markets	ADF test statistics at level
Ahmadabad	-5.13*
Bangalore	-5.53*
Chennai	-4.53*
Delhi	-6.05*
Hubli	-4.98*
Jaipur	-6.14*
Kolkata	-4.17*
Lasalgaon	-5.95*
Mahua	-4.49*
Mumbai	-5.9*
Pimpalgaon	-5.85*
Pune	-5.58*

Note: critical values for rejection of hypothesis of a unit root are -2.597, -1.945 and -1.613at1%, 5% and 10% respectively. * indicates significant at 5% level of significance. ADF analysis was carried out in Eviews.

The test results infers that, H_0 of unit root (non-stationary) for all the time series were rejected for the wholesale prices at 1% level of significance, since the ADF test statistic was lower than the critical valuesat1%levelofsignificance. The variables were all stationary at their level (0 order) at1%levelof significance. So we can use the wholesale prices of onion directly in the model estimation due to their stationarity in time series.

With the conformity of the stationarity of the selected time series in unit root test, now the next analysis is Johansen Co-Integration test to address the existence of long-run relationship among the selected markets (variables). The results of the multivariate co-integration tests are reported in the Table 3. The results based on trace test likelihood ratio and Max-Eigen test statistics shows that eight markets out of twelve markets are co integrated to long run equilibrium at 5% level of significance where the farmers/traders transfer their produce from one market to the other according to the price changes. Meanwhile, arbitrage through trade ties their prices together. According to the trace test, there are about four markets operating independently in the country. This implies that absence of pair-wise co-integration of prices, suggesting that even though the markets are co- integrated, the Law of One Price (LOP) does not hold good.

Table 3: The Result of Johansen Co-Integration Test of Onion markets in India

Markets	Null hypothesis	Eigen value	Trace test			Null hypothesis	Max-Eigen test		
			Trace statistics	Critical Value(0.05)	Prob. (0.05)		Max-Eigen Statistic	Critical Value	Prob. (0.05)
Ahmadabad	r = 0	0.895	1502.39*	334.98	0.0000	r=0	405.012*	76.57*	0.0063
Bangalore	r ≤ 1	0.804	1097.37*	285.14	0.0000	r=1	291.72*	70.53*	0.2685
Chennai	r ≤ 2	0.749	805.64*	239.23	0.0000	r=2	247.76*	64.5*	0.1296
Delhi	r ≤ 3	0.578	557.88*	197.37	0.0000	r=3	154.61*	58.43	0.2093
Hubli	r ≤ 4	0.525	403.26*	159.52	0.0005	r=4	133.61*	52.36	0.2252
Jaipur	r ≤ 5	0.414	269.65*	125.61	0.0047	r=5	95.824*	46.23	0.4005
Kolkata	r ≤ 6	0.376	173.82*	95.75	0.0333	r=6	84.444*	40.07	0.7287
Lasalgaon	r ≤ 7	0.235	89.38*	69.81	0.0678	r=7	47.953*	33.87	0.7613
Mahua	r ≤ 8	0.111	41.43	47.85	0.0702	r=8	21.088	27.58	0.4899
Mumbai	r ≤ 9	0.067	20.34	29.79	0.1367	r=9	12.461	21.13	0.5899
Pimpalgaon	r ≤ 10	0.042	7.88	15.49	0.2684	r=10	7.795	14.26	0.8458
Pune	r ≤ 11	0.000	0.08	3.84	0.0370	r =11	0.085	3.84	0.073

Note: Trace test indicates 8 co integrating eqn(s) at the 0.05 level; Max-eigenvalue test indicate 8 co integrating eqn(s) at the 0.05 level; *Denotes the rejection of the hypothesis at the 0.05 level

Granger causality test

In order to know the direction of causation between the markets granger causality test was employed. When a co integration relationship is present for two variables, a granger causality test can be used to analyze the direction of this co-movement relationship. Theoretically a variable is said to Granger- cause another variable, if the current value is conditional on the past value.

Table -4 gives us the results of Granger causality tests which indicate the strength of causality in each market with reference to every other market, based on the significance level of F statistics. The results show that the null hypothesis of onion market of Ahmadabad does not granger cause the markets of Chennai, Delhi, Jaipur, Kolkata, Lasalgaon, Mahua, Mumbai and Pimpalgaon is rejected, signifying that Ahmadabad market influences the prices in Chennai, Jaipur, Mahua and Pimpalgaon markets at 1% significance level (i.e., Ahmadabad markets are highly integrated with above mentioned markets) and in Delhi, Kolkata, Lasalgaon and Mumbai at 5% of significance level. Likewise, price movement in Bangalore influenced the prices in Ahmadabad, Chennai, Delhi, Jaipur, Kolkata, Lasalgaon, Mahua, Mumbai and Pimpalgaon at 1% significance level and at 5% significance level in Pune market. The onion markets in Mahua, Mumbai and pune are influence by the price change in Chennai at 1% significance levels, whereas, in other markets such as in Hubli, Lasalgaon, and Jaipur at 5% significance level and in Delhi at 10% significance level.

The change in price movement in onion in Delhi market have effect on the price movement of onion in Ahmadabad, Chennai, Jaipur, Kolkata, Lasalgaon and Mahua markets. The Hubli and Jaipur market prices of onion influences the onion prices in all other selected markets in the study .Whereas, Kolkata market prices influence all the selected markets except the Hubli and the Bangalore markets which are located in the state of Karnataka. The Lasalgaon market prices have influence only in Ahmadabad, Chennai, and Delhi, Jaipur, Kolkata, Mahua and Pimpalgaon markets. While the Delhi and Lasalgaon market prices are influenced by Mahua market onion prices. Individually Mumbai, Pimpalgaon and Pune market prices of onion have great influence on Ahmadabad, Chennai, Delhi, Jaipur, Kolkata and in Mahua markets at 1% significance level. From this test finally we can conclude that, major markets of the country like Ahmadabad, Hubli, Bangalore, Jaipur and Kolkata are the important sources of price information according to Granger causality approach in case of onion.

From the results of Johansen's Multiple Co-integration test it is understood that few of the selected onion markets have long run equilibrium relationship and there exists co-integration between them. For testing short run integration, the same price series can be incorporated in the vector Error Correction model (VECM) only when the long run integration is observed. Hence the Vector Error Correction Model (VECM) is employed to know the speed of adjustments among the onion markets for short run and long run equilibrium. The short run dynamics of wholesale prices of onion is presented in below Table-5.

A principal feature of co integrated variables is that, their time paths are influenced by the extent of any deviation from long run equilibrium (Walter Enders, 1995) [6]. If the system is to return to the long run equilibrium, the movement of at least some of the variable must respond to the magnitude of the disequilibrium. The larger the coefficient of the co-integrating relation in the regression, the stronger the reaction of the markets in the short run. i.e., the deviation from the long run equilibrium is corrected gradually through partial short run adjustments. It is seen from the Table 5that Delhi was the strongest follower of the co integration equation one with a speed of adjustment of about 15%. While Pune market was the strongest follower of co integration equation 2 with the speed of adjustment of 29%. Kolkata market is the strongest follower of the co integration equation 3 and 5 with the speed adjustment of 30.4% and 14% respectively. Ahmadabad and Bangalore markets were strongest followers of co integration equation 3 and 4 respectively with speed adjustment of 75% and 90% respectively. In general, it can be said that, Delhi, Pune, Kolkata, Ahmadabad and Bangalore markets are special markets as they reacted to all the co integrating equations. The co-integration equation 7 was strongly followed by Jaipur market at the speed of adjustment of 35%. From the above co integration analysis it is clearly understood that, there exist a long urn relationship between majority of the wholesale markets but the results of vector error correction model explains that, the significant short run association was missing in most of the cases. Thus it may be concluded from the above analysis that while prices are tied together in the long run, they drift apart in the short run because of paucity of availability of information and in efficient information dissemination mechanism.

Conclusion

Market integration is very essential linkage to understand the level of integration between the markets and to know the price efficiency attained in markets. The analysis of the spatial price integration among the major onion markets by using the monthly wholesale prices of onion reveals that, eight markets (Ahmadabad, Bangalore, Chennai, Delhi, Jaipur , Kolkata and Lasalgaon)out of twelve selected markets are co integrated in the long run, when the farmers/traders transfer their produce from one market to the other according to the price changes and there are about four markets operating independently in the country, implies that, there is an absence of pair-wise co-integration of prices, and in these markets the law of one price does not hold. Based on the Granger causality analysis, it is clear that, major markets of the country like Ahmadabad, Hubli, Bangalore, Jaipur and Kolkata are the important sources of price information of onion and have influence on price movement in other market to some extent. Further analysis of Vector Error Correction Analysis reveals that, despite the existence of the long run relationship between the selected markets, the short run association is missing in majority of the markets. In turn the response in price change is low in these markets in short run. Due to weak association between the markets in the short run, there is a scope for the traders to influence the market. However, the speed of the adjustment of the short run prices to reach general equilibrium level is present in few markets, but it varied from market to market and it range between 14-90%. The reasons attributed for this may be the paucity of information, lack of dissemination of available information, and transportation facilities. To make onion markets more efficient in short and long run, there is a need for strengthening the market information system for dissemination of the information on prices , production and demand estimates to enable, traders, producers and consumers respectively to make proper production and marketing decisions. This can help farmers and traders understand well the trends of production and marketing. In turn, they will be able to make better decisions as well as realize higher returns in the process and thus help consumer's to get the product at a reliable price. The government is also required to intervene and monitor in controlling the volatility in prices by stipulating the stock holding limits by traders and setting the Minimum Export Price (MEP) to curb the sky rocketing prices of onion for welfare of the producers and consumers. Appropriate policy mechanism is the need of the hour to have an efficient marketing system which will benefit both produces and trader and in turn, consumers are benefited by getting produce at a reasonable price.

Table 4: Granger casualty test results of onion prices

Independent variable		Dependent variable											
		Ahmadabad	**Bangalore**	**Chennai**	**Delhi**	**Hubli**	**Jaipur**	**Kolkata**	**Lasalgaon**	**Mahua**	**Mumbai**	**Pimpalgaon**	**Pune**
Ahmadabad	f-stat		0.496	2.525	1.919	1.095	3.324	2.045	2.014	4.418	1.899	2.552	1.156
	Prob.		0.923	0.0038***	0.031**	0.366	0.0002***	0.020**	0.023**	3.E-06***	0.034**	0.003***	0.317
Bangalore	f-stat	4.683		5.966	3.554	1.48	4.49	3.3	2.718	5.779	2.267	2.821	2.204
	Prob.	9.E-07***		7.E-09***	7.E-05***	0.13	2.E-06***	0.0002***	0.0018***	1.E-08***	0.009***	0.0012***	0.011**
Chennai	f-stat	0.83	0.883		1.693	2.112	1.833	0.7	1.863	3.987	2.65	1.244	2.725
	Prob.	0.626	0.571		0.067*	0.016**	0.042**	0.761	0.038**	1E.05***	0.002***	0.253	0.0017***
Delhi	f-stat	1.96	1.226	4.016		1.046	4.024	2.538	1.655	5	1.47	1.364	1.404
	Prob.	0.027**	0.265	1.E-05***		0.41	1.E-05***	0.003***	0.076*	3.E-07***	0.134	0.182	0.162
Hubli	f-stat	5.374	2.921	5.039	6.772		10.35	3.708	4.049	7.522	3.479	4.341	1.641
	Prob.	7.E-08***	0.0008***	2.E-07***	4.E-10***		2.E-15***	4.E-05***	1.E-05***	3.E-11***	0.0001***	3.E-06***	0.079*
Jaipur	f-stat	1.885	1.602	2.021	2.481	1.902		2.055	2.1	4.858	1.59	1.981	1.841
	Prob.	0.035**	0.089*	0.0026***	0.0043***	0.033**		0.019**	0.017**	5.E-07***	0.093*	0.025**	0.041**
Kolkata	f-stat	2.173	0.717	2.611	2.222	1.564	3.731		2.439	7.072	3.448	2.577	1.85
	Prob.	0.013***	0.743	0.002***	0.011***	0.101	4.E-05***		0.005***	1.E-10***	0.0001***	0.003***	0.040**
Lasalgaon	f-stat	2.273	1.032	4.291	2.596	1.121	4.481	4.364		5.465	0.707	2.36	1.044
	Prob.	0.009***	0.423	4.E-06***	0.0028***	0.345	2.E-06***	3.E-06***		5.E-08***	0.754	0.006***	0.412
Mahua	f-stat	0.561	0.697	1.434	1.827	1.055	0.852	1.094	1.917		0.921	1.327	1.07
	Prob.	0.881	0.764	0.149	0.043**	0.403	0.6	0.367	0.032**		0.531	0.202	0.388
Mumbai	f-stat	2.816	1.025	6.885	2.491	0.928	4.093	5.449	0.653	4.532		1.048	1.202
	Prob.	0.0012***	0.429	2.E-10***	0.004***	0.525	9E-06***	5E-08***	0.804	2.E-06***		0.408	0.282
Pimpalgaon	f-stat	2.373	1.008	2.729	1.874	1.199	4.112	3.514	1.76	4.113	0.978		1.077
	Prob.	0.006***	0.44	0.0017***	0.037**	0.284	8.E-06***	8.E-05***	0.054*	8.E-06***	0.475		0.382
Pune	f-stat	2.771	1.051	6.418	2.03	0.809	3.01	3.615	1.155	5.909	0.996	1.184	
	Prob.	0.001***	0.406	1.E-09***	0.0217**	0.65	0.0006***	6.E-05***	1.044	9.E-09***	0.457	0.295	

Note: ***, ** & * denotes significance at 1%. 5% and 10% level

Table 5: The Result of Vector Error Correction Model showing the Short Run Effects

	D (Ahmadabad)	**D (Bangalore)**	**D (Chennai)**	**D (Delhi)**	**D (Hubli)**	**D (Jaipur)**	**D (Kolkata)**	**D (Lasalgaon)**	**D (Mahua)**	**D (Mumbai)**	**D (Pimpalgaon)**	**D (Pune)**
CointEq 1	-0.30 (0.21) [-1.43]	-0.276 (0.191) [-1.439]	-0.043 (0.245) [-0.176]	1.150 (0.173) [0.867]	-0.3014 (0.1306 [-2.307]	0.057 (0.175) [0.324]	-0.476 (0.239) [-1.991]	-0.04 (0.209) [-0.22]	-0.376 (0.21) [-1.745]	-0.130 (0.226) [-0.578]	0.05 (0.214) [0.244]	-0.211 (0.233) [-0.908]
CointEq 2	0.03 (0.23) [0.16]	-0.442 (0.206) [-2.142]	-0.2182 (0.2650) [-8235]	-0.0613 (0.1872) [-0.3277]	0.1745 (0.1407) [1.2400]	-0.0760 (0.1892) [-0.4021]	0.0040 (0.2578) [0.0155]	-0.0097 (0.2260) [-0.0432]	-0.37227 (0.2321) [-1.6039]	0.155 (0.243) [0.637]	0.015 (0.231) [-0.065]	0.291 (0.251) [1.160]
CointEq 3	0.1812 (0.124) [1.458]	0.206 (0.111) [1.85]	-0.0258 (0.14278) [-0.1808]	0.11595 (0.10089) [1.14941]	0.181 (0.075) [2.38]	0.052 (0.101) [0.51]	0.30499 (0.1389) [2.1957]	0.22047 (0.12177) [1.8106]	0.12596 (0.1250) [1.00742]	0.173 (0.131) [1.321]	0.100 (0.124) [0.8077]	0.150 (0.135) [1.114]
CointEq 4	0.758 (0.332) [2.281]	0.5201 (0.2978) [1.7465]	0.6401 (0.3819) [1.6759]	-0.380 (0.2698) [-1.408]	0.252 (0.202) [1.243]	0.0600 (0.272) [0.220]	0.16076 (0.37160) [0.4326]	0.167906 (0.32576) [0.51544]	0.3835 (0.334) [1.14]	0.5119 (0.351) [1.4576	0.265 (0.333) [0.795]	0.417 (0.362) [1.15]
CointEq 5	0.658 (0.234) [2.801]	0.90 (0.21) [4.29]	0.851 (0.269) [3.1533]	0.60586 (0.19075) [3.1762]	0.152(0.14 3) [1.060]	0.59349 (0.192) [3.079]	0.765 (0.262) [2.915]	0.669 (0.230) [2.907	0.740 (0.236) [3.132]	0.692 (0.248) [2.791]	0.8072 (0.235) [3.425]	0.579 (0.256) [2.262]
CointEq 6	-0.645 (0.26) [-2.44]	-0.21 (0.236) [-0.88]	-0.205 (0.303) [-0.67]	-0.299 (0.214) [-1.395]	-0.304 (0.161) [-1.8177]	-0.85262 (0.2168) [-3.9321]	0.146 (0.295) [0.494]	-0.331 (0.259) [-1.278]	-0.2517 (0.265) [-0.946]	-0.448 (0.279) [-1.604]	-0.282 (0.265) [-1.067]	-0.901 (0.288) [-3.130]
CointEq 7	0.068 (0.17) [0.38]	-0.0565 (0.15) [-0.35]	-0.064 (0.203) [-0.319]	0.048 (0.143) [0.33]	-0.063 (0.108) [-0.590]	0.3569 (0.1453) [2.45650]	-0.570 (0.197) [-2.880]	0.055129 (0.173) [0.317]	-0.04630 (0.1782) [-0.2598]	-0.066 (0.187) [-0.354]	0.004 (0.177) [0.026]	0.116 (0.193) [0.605]

Note: All the figures in parentheses (….) are standard error and figures in [….] are t-values.

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