

Price volatility in major chilli markets of India

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Abstract

Background/Objectives: Chilli arrivals from all over the country reach the market from mid October to end of May. The arrival pattern influences the price behaviour. The study aims at examining the price volatility of chill in major markets of India.

Methods/Statistical analysis: Based on the quantum of arrivals in various markets in the country, from markets viz., Guntur, khammam, virudnagar and Nagpur were purposively chosen. The secondary data on monthly modal prices (Rs/Qtl) were emanated from the records maintained by the respective market committees.

Findings: chilli prices in Guntur market for the period from 1997 to 2011 has indicated wide variations with prices ranging from Rs 1000 in 1997 to Rs 8800 February, 2011. The coefficient of variation of the prices was 32.4 per cent in virudnagar market. The price behaviour of selected crop in Nagpur compared to Guntur and virudnagar presented on altogether new dimension till 2000 commencing from 1997. Chilli prices in all the markets indicated persistent fluctuations over a period of time and these were maximum in Nagpur market.

Application/Improvements: Chilli prices in all the markets had persistent fluctuations over a period of time and it was maximum in Nagpur market.

Keywords: ARCH, Chilli, GARCH, Price movement, Volatility

1. Introduction

Chilli known as “Universal Spice” is grown in almost all states in India. In India, chilli is the major crop cultivated in 30 per cent of the area under spices. Andhra Pradesh occupied about 1/4th of the total area (26.44 per cent) contributing 52 per cent of production. India is also leading country in chilli exports.

The origin of volatility differs for different groups of commodities. In agricultural commodities, volatility originates mainly from supply disturbances. A price series can be highly volatile yet change over longer periods of time or show little volatility but a considerably large change over time through discrete adjustments. Primary agricultural commodities generally fall into the former group while industrial products often confirm to the latter.

The variations in the prices are influenced by arrivals in the market, demand, climatic conditions, export demand and also varietal differences among the markets [1]. The flow of commodities in agricultural markets is a seasonal phenomenon dominated by the private traders to a larger extent [2].

The volatility of prices were more influenced by acreage adjustments driven by the lagged prices, production variation in the country, distribution of rainfall, prices of the competing crops, export demand, prices of the competing crops when all or some of these factors operated chilli prices exhibited volatility under these conditions, if the farmers are given right market advisory they can take advantage of the same for additional net returns. Against this background an attempt has been made to study the extent of price volatility in major chilli markets of India.

2. Materials and Methods

The secondary data on monthly modal prices (Rs/qrtl) were collected for the period from January, 1997 to March, 2011 from the records maintained by the market committees of Guntur, Khammam, Virudhunagar and Nagpur markets, the major chilli markets in the country.

2.1. ARCH

Autoregressive Conditional Heteroscedasticity models are specially designed to model and forecast conditional variances. The variance of the dependent variable is modeled as a function of past values of the dependent variable and independent or exogenous variables. ARCH and GARCH (Generalized ARCH) models are widely used in various branches of econometrics, especially in financial time series analysis.

2.2. GARCH Model

Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model was originally proposed by Bollerslev. The simplest GARCH model is the GARCH (1, 1) model, which can be written as:

$$\sigma_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2 + \alpha_2 \sigma_{t-1}^2$$

Which says that the conditional variance of 'u' at time 't' depends not only on the squared error term in the previous time period but also on its conditional variance in the previous time period. This model can be generalized to a GARCH (p,q) model in which there are 'p' lagged terms of the squared error term and 'q' terms of the lagged conditional variances.

3. Results and Discussion

To assess the presence of price fluctuations in the domestic markets for chillies, ARCH-GARCH analysis was carried out for the price series viz., Guntur, Khammam, Virudhunagar and Nagpur markets. The sum of Alpha and Beta indicated ARCH and GARCH affect for the given markets (Table-1). The value close to 1 indicates persistence of shocks or volatility in the market. Therefore it could be inferred that, chilli prices in all the markets had persistent fluctuation over a period of time and it was maximum in Nagpur market.

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Table 1. Results of ARCH- GARCH analysis

Particulars	GNT	KMM	VRD	NGP
Alpha(A)	0.969906	0.520431	0.981990	0.996378
Beta(B)	-0.081774	0.457260	-0.014601	0.070065
Sum of A & B	0.8881	0.9777	0.9674	1.0664

(N B: GNT – Guntur chilli prices; KMM–Khammam chilli prices; VRD – Virudhunagar chilli prices NGP – Nagpur chilli prices)

3.1. Variations in Prices of chillies over time

Price movements of red chilli in important domestic markets are presented in Table-2

3.1.1. Guntur market

Chilli prices in Guntur market for the period from 1997 to 2011 has indicated wide variations with the prices ranging from Rs.1000 in 1997 to Rs.8, 800 in February, 2011. The price per quintal which was in the range of Rs. 1000 to Rs. 2300 in 1997 reached a high of Rs. 5500 in January, 2007. There was a dip in the following months of 2007, before a new peak of Rs .5800 reached in November, 2009. An all time high price of Rs. 8800 is reached in February, 2011.

3.1.2. Virudhunagar market

Chilli prices in Virudhnagar market has witnessed peak and troughs during the period commencing from 1997 to 2010. The coefficient of variation of the prices was 32.4 per cent. The price which was below Rs. 2000 during 1997 reached a high of Rs. 5813 per quintal in the very next year i.e., during November, 1998 and after a gap of eight years the price has mounted the peak with a new high of Rs.7150 during September, 2006. Again after a gap of four years in 2010, an all time high price of Rs.8500 was reached in November 2010.

3.1.3. Nagpur market

The price behaviour of chilli in Nagpur compared to Guntur and Virudhunagar presented an altogether new dimension till 2000 commencing from 1997. The prices during the four year period almost remained stationary around Rs.2000. Minimum price of Rs.1298 was found in July, 2005 which was almost in line with Virudhunagar market. First time since 1997, the chilli prices peaked to Rs.4932 in December, 2006. But immediately after a gap of two years i.e., 2008, the prices slipped to a very low of Rs.2950 in January, 2008. At the end of 2010, an all-time new high of Rs.5621 was set in. The estimated coefficient of variation was 27.91 per cent.

3.1.4. Khammam

In this market the lowest price of Rs. 1,100 was found in July, 1997 and the maximum price Rs.8, 400 was noticed in February, 2011.

3.2. Price movements across International chilli markets

As can be seen from Table -3 that price per kg of red chilli was less than an American dollar throughout 2005-06 and greater part of 2006-07 and thereafter there was a rise in the prices. But in 2011-12 the price ranged between \$ 1.45 to 1.65.

Table 2. Price Movement of Red Chilli in Domestic Markets (1997-2011)

Place	Year Month	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Guntur	Jan	2300	1300	3550	2400	2100	2200	3100	4000	2600	2600	5500	3300	4000	5400	5000
	Feb	1600	1600	3300	2000	1700	2300	3400	3000	2300	2900	4000	3500	4800	4800	8800
	Mar	1500	2700	2400	2250	2400	2300	3400	2500	2200	3500	4000	3500	5000	4700	7900
	Apr	1300	2900	2200	1900	2200	2400	3000	1900	1800	4300	4800	3800	4700	4700	4900
	May	1200	2600	2300	1700	2200	2500	3000	2200	1800	4500	3800	3000	4000	4000	8400
	Jun	1200	3000	2200	1900	3300	2600	4000	2700	2000	4600	3500	3000	3500	5200	6500
	Jul	1100	3050	2300	2000	3400	2800	3900	2700	1900	4800	3500	3000	3800	4700	6500
	Aug	1300	3300	3200	2200	3500	2900	3800	2800	1900	5300	3500	3000	4200	4500	6500
	Sep	1500	3200	2440	2200	3500	3500	3600	2800	1800	4000	3400	4000	4500	3900	6500
	Oct	1400	3200	2900	1900	3400	3500	3600	2900	2600	4200	3400	4000	4500	4900	6800
	Nov	1200	4600	2800	1950	2900	3000	3900	2800	3000	4000	3500	4000	5800	4400	6000
	Dec	1000	3000	2850	2200	2200	3400	3900	2700	2900	4300	3000	4000	5500	6000	5800
Khammam	Jan	2800	2711	3966	2550	2450	2210	2800	3300	2400	2500	4500	4500	5100	4800	3500
	Feb	2050	2600	3000	2400	2190	2000	3250	3000	2200	2700	3700	4400	4900	4800	8400
	Mar	2000	3366	2850	2500	2000	2200	3500	2500	2250	3800	5600	4200	5500	5200	8200
	Apr	1650	3500	2800	2500	2500	2270	3450	2575	1700	3600	5200	4600	4900	5200	
	May	1700	3000	2800	2400	2400	2270	3300	2300	1360	4000	4100	4350	4900	4600	
	Jun	1500	3400	2900	1880	1880	2270	3100	2600	1200	3500	4000	3950	4300	4000	
	Jul	1100	3400	2800	1925	1925	2200	3200	2000	1300	3400	3800	4200	4350	4000	
	Aug	1500	3600	2350	1800	1800	2150	3000	1600	1200	3800	3800	4500	4500	3800	
	Sep	1450	3200	3200	1788	1788	2300	3225	1800	1200	4500	3500	4400	4500	3600	
	Oct	1200	3950	3410	1600	1600	2500	3200	1300	1200	4700	3350	3400	4700	3000	
	Nov	1150	4656	4650	1525	1525	2800	3000	1200	1200	5400	3600	3300	5500	3200	
	Dec	1250	4611	4611	1700	1700	2600	3850	2800	1200	7200	4900	2900	5800	3100	
Virudhnagar	Jan	2525	2138	5420	2900	2700	2875	4050	4675	1714	1750	6733	2900	5175	4394	10000
	Feb	2863	3450	4663	3150	2300	2638	3983	3708	2514	2288	5550	3500	5000	5200	9000
	Mar	2367	3300	3300	2750	2440	2513	3775	2980	2200	3686	4638	4106	5040	5158	8500
	Apr	2000	3350	2900	2840	2350	2663	3663	2562	1785	3883	4310	4100	4510	3290	
	May	1780	3500	3838	2575	2225	2575	3525	2042	1717	4360	3900	4950	6067	4245	
	Jun	1788	4025	3038	2406	2880	2640	3750	2420	1571	4515	3700	5100	5133	4218	
	Jul	1717	4075	3390	2290	2938	2750	3900	2100	1258	4825	4200	4800	5150	4097	
	Aug	1550	4490	3438	2250	3088	2790	3808	2050	1375	4916	3400	4750	5425	5260	
	Sep	1483	4438	3750	2340	3050	3313	4100	2088	1567	7150	3090	4788	5350	6270	
	Oct	2463	4850	3850	2500	3525	3850	4013	1957	2375	6875	3000	4983	4308	8000	
	Nov	1620	5813	3525	2525	3463	3900	4310	1942	2392	6617	2550	6250	4425	8500	
	Dec	1538	5000	3138	2790	2680	4017	4433	1911	1750	7091	2950	5550	4473	8500	
Nagpur	Jan	2092	1997	2048	2067	2181	1924	2824	3708	2148	2106	4374	2950	2165	3575	6750
	Feb	1981	2042	2182	2263	1913	1913	2931	3003	2077	2305	3530	3107	3707	3575	7929
	Mar	2048	2182	2278	2108	2090	2087	3392	2569	1990	2939	3742	3127	3819	3623	8089
	Apr	2081	2032	2228	2270	2018	2225	3187	2223	2068	3000	3933	3157	3692	3536	
	May	2232	2093	2023	2423	2023	2346	3418	1986	1355	3536	3503	3426	3524	3219	
	Jun	2281	2134	2072	2223	2340	2462	3729	2085	1451	3536	3548	3663	3600	4440	
	Jul	2359	2023	2082	2023	2513	2390	3584	2002	1298	3406	3166	3552	3716	4750	
	Aug	2093	2052	2118	2072	2851	2572	3554	1977	1432	3635	3189	3400	3971	4194	
	Sep	2138	2118	2074	2052	2693	2737	3405	2189	1500	4505	3277	3630	4000	4000	
	Oct	2042	2073	2134	2113	2624	3025	3336	2118	1931	4606	3087	3277	4216	4000	
	Nov	2023	2134	2163	2073	2435	2888	3548	2035	2277	4880	3200	3527	4528	4767	
	Dec	2143	2108	2107	2134	2219	3051	3698	2092	1998	4932	2963	3826	4689	5621	

Table 3. International Prices of Chilli (Indian S4) in New York market (\$/ Lb)

Year/ month	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
January		0.67	1.24	1.00	1.05	1.15	1.45
February		0.67	1.25	1.00	1.05	1.15	1.60
March		0.75	1.37	1.00	-	1.15	1.65
April	0.57	0.76	1.50	1.04	1.05	1.15	1.65
May	0.55	0.82	1.38	1.05	1.05	1.15	1.65
June	0.55	0.84	1.09	1.08	1.05	1.15	1.65
July	0.55	0.88	1.00	1.10	1.05	1.11	1.65
August	0.55	0.92	1.00	1.10	1.05	1.10	1.65
September	0.55	0.97	1.00	1.10	1.05	1.11	1.65
October	0.58	1.04	1.00	1.10	1.09	1.15	
November	0.62	1.16	1.00	1.10	1.10	1.15	
December	0.64	1.20	1.00	1.05	1.15	1.22	

Source: Spices Board of India

4. Conclusions

The sum of Alpha and Beta indicated ARCH and GARCH affect for the given markets. The value close to 1 indicates the persistence of shocks or volatility in the market. Therefore it could be inferred that, chilli prices in all the markets had persistent fluctuations over a period of time and it was maximum in Nagpur market.

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