INTERNATIONAL PRICE VOLATILITY OF INDIAN SPICES EXPORTS - AN EMPIRICAL ANALYSIS

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Abstract

India is a land of spices which has to play an important role in global market. The volume of export has mainly influenced by the factors like production of commodity, domestic consumption, international demand, domestic and international prices and their fluctuations. Among above factors the fluctuation in (both the short and long-run behavour) of international price has important implications on trade, domestic production and export revenue. An understanding of the pattern of volatility of major spices exports could provide some guidelines to policymakers, commodity producers and traders. This paper is made an attempt to empirically examine persistence and asymmetry in volatility of international prices of spices through GARCH I model and its effect on exports by using time series data for the period between 2001-02 and 2007-08. The empirical results reveal that volatility of international prices of selected spices generally tends to fluctuate over time and there is an evidence of long-term persistence and volatility clustering in prices.

Introduction

India is considered as the land of spices which are popular in domestic and international communities. Indian spices command a formidable place in the world spice trade with 48 per cent share in volume and 44 per cent in value. Major exports spices such as cardamoms, chilies, pepper, coriander, tamarind, etc. Indian production of spices is around 2.48 million tones, from which its exports Rs 11800 millions. However, export potentiality is mainly determined by international demand, international price of the commodity and exchange rate. Fluctuations in these factors in both short and long-run have important implications on the volume of trade, domestic production and export revenue. A fluctuation in prices, often leads to inefficiency and adversely effect the efficient allocation of resources for farmers. Further, if price volatility is higher and more unpredictable, greater the risk of incurring losses or realising gains on future sales. Moreover, the other consequences of uncertainty in price are fluctuation in incomes, poor agricultural labourers and labour engaged in unorganised sector because their wages are not index- linked. Majority farmers who are producing these spices belong to marginal and small categories in India, with low propensity to save and poor access to efficient saving instruments

can not cope with the revenue variability resulting from fluctuations in output prices. They do not possess the requisite know-how for crop diversification and also lack of access to appropriate technology (Sekhar C.S.C, 2004)

As a result of price volatility in international market poses problems to government in respect of export earning. Hence an understanding of the pattern of volatility of international prices and spices exports are necessary for future policymakers, producers can make their own strategies with stand such circumstances.

Due to WTO commitments the domestic production cannot be protected from international price shocks by imposing Quantitative Restrictions (QRs). If such shocks were transmitted to farm level it would destabilize crop pattern and supply. Since vast majority of Indian farmers is either small or marginal, they do not have resources and potentiality to frequently shift from one kind of crop pattern to another kind, in a short period as necessitated by changes in international prices.

Further, traditionally, volatility in agricultural prices has been attributed to a) low price and income elasticities of agricultural products b) intrinsically irregular supply of agriculture commodities as results of unpredictable and unavoidable shocks like weather.c) The very different nature of agricultural planning process where production decisions for most farm products are made much in advance of the time the product is marketed (Starleaf, 1982)

Therefore, there is a need to develop mechanism to cope up with price volatility, which required understanding of the nature and degree of international price volatility. This can only be done by an empirical investigation of spices price volatility in international market. In this study an attempt is made to determine the effects of international price volatility on Indian spices export and to examine the relevance of price volatility risk in spice trade flows.

Data And Methodology

The source of volatility is differs for different group of commodities. In agricultural products, volatility arises mainly from supply disturbances; where as for industrial raw materials (both agricultural and metallic), it originates from demand disturbances. These disturbances together with short-run demand and supply elasticites give rise to acute price fluctuations (Raymand B.Swaray, 2002). A price series can be highly volatile yet change over longer periods of time or show little volatility but a significantly large change over time through discrete adjustment. Primary agricultural goods usually fall into the former group whereas industrial goods often confirm to latter. It is common to assume market information and hedging as attributes that only apply to financial markets and physical availability to be akin to primary commodity markets (Raymand B.Swaray, 2002).

However, a look at the primary commodity markets it reveals that the arrival of the information, hedging and speculation, and physical availability of commodities are all crucial factors that influence the volatility of primary commodity prices (Gilbert,1994). Increased fluctuation in the prices of agricultural export commodities has made speculation as a common phenomenon in

commodity markets. This aspect can justify the use of informational-based process to modeling the pattern of volatility of the prices of these commodities. The financial asset prices are generally believed to be leptokurtic (i.e. they exhibit 'fat tails'). In many ways, commodity prices behave alike to asset prices. This may not be surprising because a casual examination of agricultural commodity price series reveal volatility clustering. Large changes tend to follow large changes, and small changes tend to be followed by small changes and the process tends to die away with time (Sekhar C.S.C, 2003).

This pattern indicates that the variance of the process underling these price series may be varying overtime. This pattern can capture by the models of the Generalised Auto Regressive Conditional Heteroscedasticity (GARCH) class family. Time varying conditional variances has been estimated by using a GARCH model (Bollerslev, 1986). The GARCH(1,1) model is used in this model described as follows:

$$P_{it} = Ø_0 + Ø_1 P_{i,t-1} + Ø_2 P_{i,t-2} + \varepsilon_{it} \quad t = 1,2, \ldots\ldots, T$$

$$\sigma_{it}^2 = \delta + \alpha_i \varepsilon_{it}^2 + \beta_i \sigma_{it-1}^2$$

Where P_{it} is the price in time t of commodity i. σ_{it}^2 denotes the variance of ε_{it} conditional upon information upto period t-1. The fitted values of σ_{it}^2 give the measure of uncertainty of P_{it}. The sum of $(\alpha_i + \beta_i)$ gives the degree of persistence of volatility in the series. If the sum of $(\alpha_i + \beta_i)$ closer to one, greater is the propensity of volatility to persist for longer period. On the other hand, if sum of $(\alpha_i + \beta_i)$ is greater than one, it signals an explosive series with a tendency to wander away from mean value. The GARCH estimates have been used to identify periods of high volatility and volatility clustering.

One of the distinctive importances of ARCH family of models lies in their capability to allow the conditional variance of understanding processes to over time, which is not possible in standard time series models. Further, the method of prediction of conditional expectation is similar to that employed to forecast the conditional mean, namely, variables observed in the previous period. Hence the GARCH model maintains the desirable forecasting properties of the traditional time series model but extends to them to the conditional variance (Holt and Aradhuya, 1990).

Empirical Results

Monthly average spot prices of five selected spices in international market (Newyork) were obtained from International Trade Center (ITC), WTO, Geneva for the period 2001-02 to 2007-08. The commodities selected for analysis are pepper, ginger, cardamom, turmeric and chillies.

This section discusses empirical results of GARCH (1,1) model under consideration. Table -1 shows descriptive statistics for prices of selected commodities.
The results indicate that there is a significant skewness and excess kurtosis in the distribution of the price series of selected commodities and absolute values of normality test of all selected commodities substantiate divergence from normal distribution.

Further, the study tested unit root for non-statonarity of prices. Philip - Perron (here after PP) test is used to evaluate statistical significance of ρ in the following regression equation

$$\Delta \log p_t = w + \Phi \log p_{t-1} + b_t + e_t$$

Where $\Phi = \rho-1$ and $\Delta \log p_t$ is the logarithm of the first difference of monthly price series of the commodities under = ρ-1 and $\Delta \log p_t$ is the logarithm of the first difference of monthly prices of the selected commodities under examination. An alternative test to PP is Augmented Dickey Fuller Test (ADF). However, the PP can be more appropriate in this, because of evidence of heteroscedasticity assumed in the error process of the price series evaluated (Raymand B. Swaray, 2002). All PP test use the fifth degree of Bartlett Kernel's truncation lag.* The results of the PP unit root test show that level data of all commodities were non-stationary but their first difference were stationary, implying the presence of unit root in the series. The occurrence of unit root in the price data generation process of these commodities a preliminary indication of shocks having permanent or long lasting effect, thus making it very difficult for traditional price stabilisation polices followed in India to survive.

Table: 1 Descriptive Statistics

Chillies	Cardamom	Ginger	Pepper	Turmeric	
Mean	0.7421	1.0754	1.0429	0.8107	10.792
Std. Dev.	0.2293	0.4912	0.3828	0.1409	2.7339
Skewness	1.4155	1.1560	1.2523	-0.2686	1.3710
Kurtosis	4.1480	3.3827	3.0523	1.9469	5.1571
Normality Test-	32.667	19.222	21.9673	4.8920	42.6027
(0.0000)	(0.0000)	(0.0000)	(0.0866)	(0.0000)	
Philips - Perron Test					
Level	-1.635	-2.654	-2.315	-2.546	-1.954
First Diff	-13.634**	-14.128*	-14.356*	-13.964**	-12.364**

Note: * and ** denotes the test statistics is significance at 1% and 5 % level respectively. Figures in the parenthesis below the normality test are probability values.

Autoregressive part of the mean equation for all five commodities were set to various lag lengths until a robust model, as directed by the Schwarz model selection criterion, was obtained. Table-2 contains the empirical results of univariate GARCH (1,1) parameters for the mean and variance equations of all selected commodities under analysis.

* **Econometrics View version 5.0 (Eviews) was used to estimate the models in this paper**

Table -2: Empirical Results Of The GARCH (1,1) Model

Parameters	Chillies	Cardamom	Ginger	Pepper	Turmeric
$Ø_0$	-0.0086 (0.0010)	0.2062 (0.0055)	0.1042 (0.0017)	-0.0151 (0.0094)	0.0306 (0.0011)
$Ø_1$	1.2560 (0.0006)	0.1174 (0.0094)	0.5027 (0.0047)	(1.6133) (0.0020)	0.8460 (0.0011)
$Ø_2$	-0.2316 (0.0036)	0.8388 (0.0154)	0.3297 (0.0234)	-0.5892 (0.0315)	0.1187 (0.0158)
δ	0.0008 (0.0004)	1.2028 (0.0097)	0.0002 (0.0001)	8.1320 (0.0000)	0.0052 (0.0034)
α	0.0387 (0.0315)	0.1700 (0.0149)	0.1627 (0.0158)	0.5989 (0.0033)	0.4099 (0.0090)
β	0.5528 (0.0024)	0.8996 (0.0097)	1.8399 (0.0014)	0.8343 (0.0434)	0.2626 (0.0417)
$\alpha + \beta$	0.5915	1.0696	1.0026	1.4332	0.6725
Schwarz	-5.7226	-1.1948	-2.7020	-4.4821	-5.0518

Note: Numbers in parenthesis are Boosersleve and Woodridge (1992) robust standard errors.

The results reveal that three of the commodities i.e., cardamom, ginger and pepper, with significantly large GARCH coefficients and two are insignificant coefficients - one relatively small (chillies) and the other very small (Turmeric). The measure of persistence in volatility ($\alpha + \beta$) is large in three of the five commodities in the sample and relatively small in two. This implies that there was a high volatility in international prices along with volatility clustering in three commodities, namely, cardamom, ginger and pepper. If the persistence value equal to one indicates the Integrated GARCH (IGARCH) process. An IGARCH in these commodities implies persistence changes in volatility of their prices, which might indicate that 'current information remains important for the forecasts of the conditional variances for all horizons' (Engel and Bollerslev, 1986).

Conclusion And Policy Implications

The study results indicate that the international price vitality is found for three important spices whereas other two spices price fluctuations are so much effected to farmers. Since the pattern is skewed which indicates that international prices prediction is very difficult which make the farmers are vulnerable to price fluctuations.

Our analysis of volatility of international prices of selected spices commodities reveals generally tends to change over time. The result also reveals that there is an indication of long-term persistence and volatility clustering in the prices but significant only for three commodities. The most popular spice products are extracts which are widely in food, pharmaceutical and toiletry industries. Indian has to play an important role in global market because Indian spices are

available nearly 134 countries. Since India has enjoys a near monopoly in the field of spice extract, it has not yet capture world market even though it has comparative advtanges. This study, made an attempt to analyse the impact of international prices on few commodities, shows that international price of spices are causing concern to production and exports of spices in the world market.

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