Futures Markets and Price Stabilization
- Evidence from Indian Hessian Market

Jatinder Bir Singh

Abstract: This paper investigates the hessian cash price variability before and after the introduction of futures trading to ascertain whether the futures market help in reducing the intra-seasonal and/or inter-seasonal price fluctuations. A multiplicative dummy-variable model is applied to examine the price variation difference in the two periods. The evidence suggests that futures market has reduced the price volatility in the hessian cash market.

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Abstract

Futures markets play important role in determining the inventory decisions in the cash market. The futures market is the nerve centre for collection and dissemination of information about the agent's expectations of future cash market. It performs the price insurance and price discovery functions. The latter function enables the traders to make rational choices about inventory management. This results in reduction in volatility of cash prices.

This paper investigates the hessian cash (spot) price variability before and after (over 1988-1997 period) the introduction of futures trading to ascertain whether the futures market help in reducing the intra-seasonal and/or inter-seasonal price fluctuations. This paper is seeking to show how the influence of hessian futures market has led to reduced cash market volatility in the hessian market.

To know about the pattern of volatility over the season, Figlewisky (1981) measure of volatility has been adopted. To take account of inter-seasonal price variability, this volatility measure has been normalized to make it akin to coefficient of variation. The relationship between hessian price variability and jute prices has been investigated using regression of logarithm of volatility on logarithm of prices and monthly dummy variables. To take account of possible price variation differences between the two sub-periods, multiplicative dummy variable model was applied.

The evidence in this paper suggests that cash market volatility was less pronounced after 1992 when hessian futures market was established. The major role for futures market appears to be in reducing inter-seasonal volatility as opposed to intra-seasonal volatility.

The results suggest that futures market may be indeed viable policy alternative for policy-makers to reduce uncertainty in agricultural markets. The liberalization of state support policy which was designed to stabilize farmers' income will increase risk and uncertainty to market participants. The futures markets through its information role may vastly improve the storage across the seasons, thereby stabilizing cash prices.

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Introduction:

The question of whether futures market activity affects the cash prices has long been disturbing the minds of economists. Many hold the viewpoint that the introduction and existence of futures trading causes destabilization of spot prices. This belief at times had also been shared by government agencies, which had abolished the futures trading in a number of commodities attributing the much-maligned volatility of physical markets to speculation in futures counterpart. They believe that speculation is inherently unstable because of the herd tendency, selling at falling prices and buying at rising prices thereby increasing the amplitude of volatility of spot prices. Hart (1977) showed that a sophisticated speculator could destabilize the futures prices by exploiting the naïve forecasting technique of less sophisticated speculator. Newberry (1987) held the view that if a dominant producer has a market power, then even if market agents have rational expectations, then it pays the dominant player to destabilize the cash market and indulge in destabilizing speculation. Futures trade may increase the price volatility if investors in the futures market do not have as good information as participants in the cash market. Their actions can disturb the prices in the cash market away from appropriate level.

However the critic of above arguments have demonstrated that the institution of futures trading has brought the stability to cash prices after its introduction. Power (1970), Taylor and Leuthold (1974), Turnovsky (1979), Brorsen et al (1989), Gilbert (1989) and Netz (1995) have all found that the variance of cash prices decreased substantially after futures market began. Available evidence suggests that in case of seasonally produced and storable commodities, futures market has helped to stabilize production, thereby reducing the variability of seasonal price fluctuations. The trader/speculator buy the crop during the harvest season, raising the prices and storing them until the new crop year, offloading it in small doses thereby not allowing prices to become prohibitive. Thus theoretically the speculation tends to even out the oscillations in seasonal cash prices.

The ability of futures markets to reduce risks associated with price variability and stock holding through hedging is probably their most important role. The argument of risk reduction through hedging primarily rests on the observation that the spot and futures markets move together, so losses in one market can be made good through gains in other market. Also the variability of basis is less than the variability of either underlying cash market or futures market. Even in well functioning markets the movement of spot and futures prices is not perfectly parallel, so the trader can only reduce risks through placing opposite positions in two markets.

As a pre-requisite to performing the price insurance (risk reduction) role, the futures market must be able to predict the subsequent cash prices at maturity. At maturity the futures price become equivalent to cash prices except for some transaction costs (transportation costs) and quality premia /discount. This is known as the price discovery function of futures market. Futures markets are able to perform the price discovery function for two reasons. Firstly, futures prices are what collective expectations of market agents are about prospective demand and supply of commodities at maturity of futures contract. Traders make decisions to buy or sell futures contracts on the basis of differences in expectations about future demand and supply conditions at maturity. Secondly, most of futures trading is paper trading, so prices tend to be very sensitive to new information. The transaction costs of futures trading is pretty low and if futures price is true indicator of information reaching the shores of the market then the market is the right processor of information. If the futures prices are a reflection of futures demand and supply conditions of the market then they are considered to exert some influence on inventory holding. If futures prices are falling then it reveals that either future demand would fall or future supply would ease. This would induce traders to reduce inventory stock and this results in decrease in spot prices. In this way futures market is an efficient disseminator of information. The introduction of futures market is considered to improve the price discovery process. Hence the price efficiency of cash market might be expected to increase.

1. Data Sources and Indian Hessian Market

The price data required for the study has been obtained mainly from "Forward Market Bulletin" published by Forward Market Commission, Mumbai. The

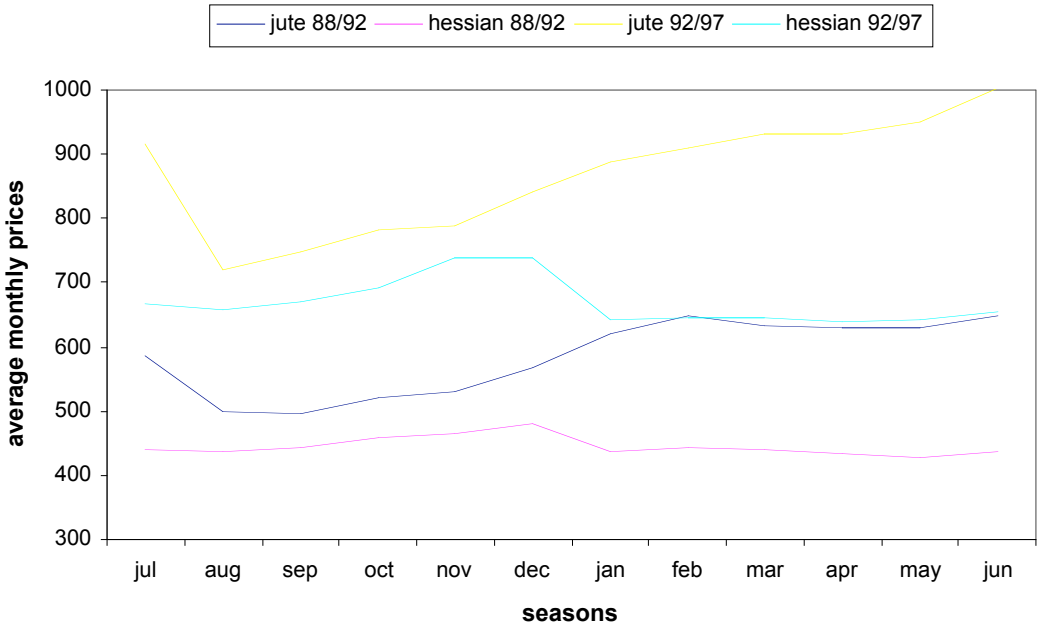
records compiled by Forward Commission are on the basis of the periodical returns received by it from the recognized associations and their members. They may well be accepted as correct, though the possibilities of some errors in the quotations are not ruled out. There is, however, no other source of information for this kind of data and hence there is no alternative choice. The prices of agricultural and derived commodities are supposed to witness the seasonal peaks and troughs because of their periodicity of production, supply and distribution. We have taken hessian as the commodity to find out the impact of futures market. The demand for hessian is somewhat elastic because of foreign competition and availability of substitute goods. Since jute enters as raw material to the production of hessian, the seasonal variations in prices present in jute may affect the hessian prices as well. It is against this background that the effect of futures trading on the seasonal variations in prices of hessian is being studied. The reason for choosing hessian is also due the fact that the futures market in this commodity was introduced in 1992, enabling us to compare hessian market via 'before-after' analysis. The period considered here is from September 1988 to September 1997. The futures market in hessian was introduced in September 1992. In this entire period of study, there was no existence of futures market. However from September 1992 onwards till September 1997, futures trading in hessian was taking place.

The summary results of the seasonal variation in the prices of hessian are provided in table 1. It is evident from table given below that the average coefficient of variation around the annual mean price of hessian has gone down from 6.269 in period 1988-92 to 5.819 in period 1992-97. Since raw jute prices constitute majority of the cost of production of hessian, so it is plausible that price variations of jute might have caused the corresponding changes in hessian prices also. The Coefficient of correlation between the changes in the prices of jute and hessian is 0.85.

Table 1 Average Coefficient of Variation around the Annual Mean Price of Jute and Hessian

Period	Coefficient Of Variation	
	Hessian	Jute
1988-92	6.269	13.172
1992-97	5.819	18.113

Figure 1 Average monthly prices of Jute (per 100kg.) and Hessian(pe 100mts.)



In the absence of any substantial shift in demand, seasonal variations in prices of hessian must be small. In the figure 1, average monthly prices of jute and hessian show that hessian follows more or less stable pattern for both the sub-periods except for some minor aberration in the months of November and December. The variations are particularly more pronounced in November/December. This aberration may be because of firm trend in prices of both jute and hessian. The jute prices trebled from Rs.615/- per 100kg. to Rs.1714/- per 100kg. between September'94 to June/July'1996 (fig.8.2). Similar tendency was also visible in hessian prices. After a particular bad year in production i.e. 1992-93, exports of hessian went down in 1993-94. However things looked bright from 1994-95 when exports started picking up and witnessed an excellent growth in 1995-96 resulting in higher prices. On the domestic front also demand remained firm. If these extraordinary years are excluded, then a smooth trend in average monthly prices results. The behavior of average monthly indices of seasonal prices of jute exhibit typical pattern of agricultural crop, witnessing a fall after harvest (harvesting starts in July) and a rise afterwards.

2. Methodology and Empirical Estimation

The previous analysis is however too aggregative and tends to hide the movement of prices across the months. The true utility of futures market is to reduce intra-seasonal fluctuations in commodity prices. In order to examine seasonal price volatility, we adopt a measure of volatility as follows:

$$M_{it} = \left(\sum_{j=1}^{n_{it}} (p_{itj} - p_{itj-1})^2 / n_{it} \right)^{1/2} \qquad \ldots\ldots\ldots(A)$$

where M_{it} is the volatility of month i in year t (monthly volatility of weekly changes), n_{it} are number of the weeks in month i in year t and p_{itj} is the price in week j in month i in year t.

This measure of volatility however, is not appropriate for measuring intra-seasonal volatility, so it is divided by average monthly price to normalize the measure. The resultant volatility measure is akin to coefficient of variation V_{it}:

$$V_{it} = M_{it} / p_{it}$$

The mean and standard deviation of normalized volatility of prices V_{it} by month for the period 1988-92 before the existence of futures market and the period 1992-97 after the introduction of futures market are given in table 2. The first observation to note is that the average monthly volatility in the period 1992-97 is lower and less volatile than for the period 1988-92. Within the season price volatility is higher in months between September and December and May/June reflecting delays in government procurement orders and end of season supply fluctuations.

Table 2 Mean and Standard Deviation of Volatility (V_{it}) of Hessian

	1988-92	1988-92	1992-97	1992-97
	mean	stdev	mean	stdev
JUL	0.0083	0.0036	0.0071	0.0036
AUG	0.0071	0.0012	0.0081	0.0042
SEP	0.0090	0.0049	0.0085	0.0099
OCT	0.0155	0.0095	0.0141	0.0076
NOV	0.0088	0.0038	0.0137	0.0059
DEC	0.0134	0.0086	0.0183	0.0149
JAN	0.0110	0.0034	0.0067	0.0018
FEB	0.0281	0.0374	0.0084	0.0038
MAR	0.0158	0.0141	0.0072	0.0010
APR	0.0100	0.0084	0.0057	0.0012
MAY	0.0168	0.0016	0.0107	0.0070
JUN	0.0169	0.0027	0.0140	0.0121
Average	0.0134	0.0083	0.0102	0.0061

The results above are only preliminary evidence of reduced cash price volatility in post-1992 period, the reason being that no account has been taken of the seasonal jute prices. The relationship between the price volatility and level of jute prices need to be empirically examined in the analysis of cash price variability. In order to do that the logarithm of volatility has been regressed on logarithm of jute price (In P_t) and monthly dummy variables (d_j). To take account of the possible differences in the relationship between the price volatility and Jute price level in the two sub periods, each of the variables on the right hand side has been multiplied by an additional dummy variable (D*) for 1992-97. To be specific let

$$\text{In } V_t = a + b \text{ In } P_t + \sum_{j=1}^{11} c_j d_{jt} + a^*D^* + b^* (D^* \text{ In } P_t) + \sum_{j=1}^{11} c_j^*(D^* d_{jt}) + \varepsilon \quad \ldots (B)$$

where j=1,2,3,……11 denote the eleven dummies for 12 months of the season from July to June. D* stand for the dummy for the period 1992-97.

Using SHAZAM, the method adopted entails starting from general to specific framework wherein the variables on the right hand side of above test equation have been successively dropped and resulting equation estimated using OLS. The Model Selection Criteria bases its judgement about the "best" model on the basis of minimum values of Schwarz Bayesian Criterion (SBC) and Akaike Information Criterion (AIC). The results of this exercise are given in table 3:

Table 3 Estimation and Model Selection

Model	Variables Dropped	Estimated Parameters	SBC	AIC
1	none	a, b, c, a* , b* , c*	0.19702	0.10368
2	D*	a , b , c , b* , c*	0.19233	0.10374
3	D*ln P_t	a ,b , c , a* , c*	0.19167	0.10339
4	D*d_{jt}	a , b , c , a* , b*	0.13396	0.92495E-01
5	D* , D*ln P_t	a , b , c , c*	0.18630	0.10301
6	D* , D*d_{jt}	a , b , c , b*	0.12860	0.91018E-01
7	D*ln P_t ,D*d_{jt}	a , b , c , a*	0.12847	0.90926E-01
8	D* , D*ln Pt ,D*d_{jt}	a , b , c	0.13757	0.96173E-01

Notes: 1.D represents the dummy variable for the period 1992-97*
2. AIC and SBC stand for Akaike Information Criterion and Schwarz Bayesian Criterion for model selection

The simplified version of estimated equation (B) that gives the best results is given by line (7) in above table 3. The estimated coefficients of this simplified specification are given in table 4.

Table 4: Parameter Estimates of regression equation

Variable name	Estimated coefficient	T-ratio	p-value
Log P(price)	0.35385***	1.666	0.099
d2(October)	0.28683**	2.195	0.031
d3(November)	0.20281****	1.551	0.124
d4(December)	0.27289**	2.082	0.040
d5(January)	0.059339E-01	0.4504	0.653
d6(February)	0.19048	1.438	0.154
d7(March)	0.11071	0.8349	0.406
d8(April)	-0.22845E-01	-0.1723	0.864
d9(May)	0.20856****	1.571	0.119
d10(June)	0.26558**	1.987	0.050
d11(July)	-0.29715E-01	-0.2247	0.823
d12(August)	0.32504E-01	0.2487	0.804
D*	-0.17948*	-2.710	0.008
Constant	-3.0728*	-5.368	0.000

*Note:1. *represents significance at 1% level*
*2.** represents significance at 5% level*
*3.*** represents significance at 10% level*
*4.**** represents significance at 12% level*
5.D signifies dummy for period with futures trading (1992-1997)*

3. Findings

Many interesting results can be derived from the estimation process and simplified presentation. First of all, the dummy for the second period (post futures market i.e. 1992-97) is significant and negative suggesting that the volatility of cash prices in the two periods (1988-92 & 1992-97) is significantly different. This confirms our earlier finding that the volatility in second period (1992-97) is lesser than that of first period (1988-92). The volatility in the second period is 15.11% lower than 1st period. Second, the change in the level of jute price is both positive and significant in determining volatility. This confirms our earlier belief that higher prices tend to signify higher volatile market, which is often the case with those years when availability (carry-over stock + production + import) of jute crop is less (i.e. 1993-94, 1994-95 & 1995-96). The jute price elasticity of volatility is 0.35. However, the hypothesis that the impact of jute price level is different in two different sub-periods (1988-92 & 1992-97) is not substantiated by this estimation procedure.

The third observation is most interesting. The dummies for some months of the season namely October- December and May-June are significant suggesting some seasonal pattern of volatility. October to December period witnesses uncertainty perhaps due to fructification of impending purchases from Tobacco, Textiles and Cement industry as well as fluctuations in export orders. Volatility in the months of May and June are manifestations of end of storage season supply fluctuations. However, the hypothesis that the monthly volatility in the second sub-period (1992-97) is different from that of first sub- period (1988-92) is not validated by this estimation which suggests that futures market is not playing any significant role in reducing intra-seasonal price volatility. This may be due to manufactured nature of hessian commodity.

4. Conclusions:

The above-mentioned results show that futures market has reduced the price volatility in the hessian market. The hypothesis here is that futures market facilitates storage of jute to produce hessian to have its impact on spot market of hessian. For this to happen it is important that hessian futures market is efficient. Efficiency entails price discovery and price insurance. This depends among other things on liquidity (volume of contracts) of market. In hessian futures exchange, though, volumes have consistently gone down but are still equal to production.

To sum up, the results suggest that the cash price volatility is less pronounced after 1992, when futures trading was allowed. The significant contribution of futures market is to reduce inter-year price volatility than intra-seasonal variability of prices of hessian. This potential of stabilizing cash market prices would be beneficial to those traders/ growers who have lost the stabilizing influence of support policies.

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