



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Vol XXVII
No. 2

ISSN 0019-5014

APRIL-
JUNE
1972

INDIAN JOURNAL OF AGRICULTURAL ECONOMICS



INDIAN SOCIETY OF
AGRICULTURAL ECONOMICS,
BOMBAY

SEASONAL PRICE MOVEMENTS, MARKET ARRIVALS AND RETURNS TO STORAGE IN WHEAT MARKETS†

L. S. Venkataramanan

and

M. A. Muralidharan*

Introduction

The economic behaviour of farmers in India with regard to their output decisions has been investigated in several empirical studies in recent years. The studies have generally shown that the output response to price changes is positive. There have been very few empirical studies based on time series data on the market supply behaviour of farmers producing food crops because data on aggregated market sales out of total production and the prices at which they are sold are not available. Indirect methods of estimating the marketed surplus price elasticity for food crops have been suggested by Krishna¹ and Behrman.² The price elasticity of marketed supply could be negative or positive for food crops for which output response is positive. Economic analyses of the seasonal pattern of prices and market arrivals are also very meagre,³ and studies on the demand for and supply of storage are non-existent, mainly on account of the paucity of appropriate data on the holding of stocks.

Wheat Markets, Period of Study and Data Sources

In this paper, we present a detailed analysis of seasonal price movements⁴ in nine primary and three secondary wheat markets for the period May, 1961 to April, 1970. The primary markets examined are Khagaria (Bihar), Dhanduka and Rajkot (Gujarat), Rewa (Madhya Pradesh), Abohar and Moga (Punjab), Kotah (Rajasthan), Hapur and Bahraich (Uttar Pradesh).

† This paper was submitted to the Seminar on "Emerging Problems of Marketing of Agricultural Commodities" organized by the Indian Society of Agricultural Economics in collaboration with the Directorate of Marketing and Inspection, Government of India at Nagpur during 18-20th February, 1971.

* Division of Agricultural Economics, Indian Agricultural Research Institute, New Delhi. The authors gratefully acknowledge the very valuable assistance rendered by Sarvashri B. M. Sharma and G. M. Punjabi in the preparation of this paper.

1. Raj Krishna, "Agricultural Price Policy and Economic Development," in *Agricultural Development and Economic Growth* edited by H. M. Southworth and B. F. Johnston, Cornell University Press, New York, 1967, Chapter XIII.

2. J. R. Behrman, "Price Elasticity of the Marketed Surplus of a Subsistence Crop," *Journal of Farm Economics*, Vol. 48, No. 4, November, 1966, pp. 875-892; also Behrman, *Supply Response in Underdeveloped Agriculture: Contributions to Economic Analysis*, North Holland Publishing Company, Amsterdam, 1968, Chapter VI.

3. Government of India: Report of an Enquiry into the Pace and Pattern of Market Arrivals of Foodgrains (Season 1958-59), Directorate of Economics and Statistics, Ministry of Food and Agriculture, New Delhi, 1959. T. N. Krishnan, "The Marketed Surplus of Foodgrains," *The Economic Weekly*, Vol. XVII, Nos. 5-7, Annual Number, February, 1965.

Uma Lele: Working of Grain Markets in Selected States, India, 1956-56 to 1964-65, Occasional Paper No. 12, Department of Agricultural Economics, Cornell University, Ithaca, New York, U.S.A., 1968.

4. The price data are based on weekly wholesale price quotations reported in the *Bulletin of Agricultural Prices* published by the Directorate of Economics and Statistics, Ministry of Food and Agriculture. Bi-weekly and monthly market prices derived from an unweighted averaging of weekly prices have been used for the analysis of seasonal price variations.

The secondary markets are Sagar and Bhopal (Madhya Pradesh) and Chandauli (Uttar Pradesh). The six States, where these twelve markets are located, together account for more than 85 per cent of wheat production in the country. For the period of the study, the present States of Punjab and Haryana have been grouped together.

The effect of seasonal movements of prices⁵ on the pattern of market arrivals has been examined by considering aggregated State-wise data on quarterly market arrivals⁶ for the period April, 1962 to May, 1970.

Wheat Allocation between Consumption and Storage

The supply of wheat arrivals during any day or month of the season in any primary or secondary market is matched by the demand for wheat arrivals in the same market. The demand for wheat market arrivals at any point of time represents the sum total of the joint demand for current consumption and storage (carrying over of stocks for future consumption). The allocation between present consumption and storage in commodity markets is based on the relation between expected prices relevant to the period of storage, current prices and storage costs (see Diagram 1). If the total

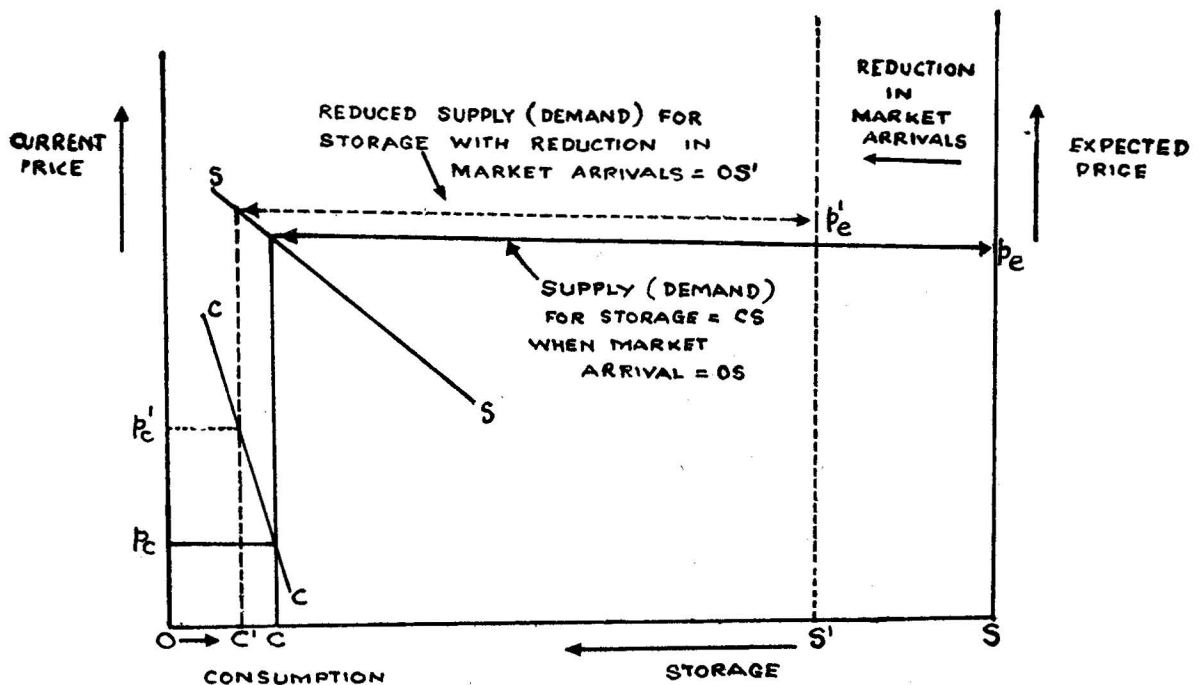


Diagram 1

5. The quarterly prices used for this purpose are the unweighted average market prices within each State.

6. The source for the market arrivals data is *Agricultural Situation in India*, published by the Directorate of Economics and Statistics.

amount of the commodity available for allocation is OS, current price is p_c and expected price is p_e , the amount demanded for current consumption is OC and the demand for storage is CS.⁷

Under competitive conditions of trading and carrying over of wheat stocks, the returns to inventory firms per quintal of wheat held for a given period must equal the marginal storage cost in holding wheat for the same period. An upward price seasonal implies that inventory firms realise a positive gross return; under competitive conditions, this must equal the marginal cost in storing wheat.

Empirical Evidence on Seasonal Price Movements

We now examine the empirical evidence on the seasonal movement of wheat prices in all the above mentioned twelve primary and secondary wheat markets.

Let

- p_{jt} = wholesale price in a market in period j in year t ,
- \bar{p}_t = the average wholesale price in a market in year t ,
- m_{jt} = market arrivals in period j in year t ,
- \bar{m}_t = the average market arrival in year t ,

where j = the number of observations within each year.

A non-linear seasonal regression of the form specified below was used to study the seasonal pattern in each market both within each year and over the period 1961-70. For the study of inter-year seasonality two separate regression estimates were made one using monthly and the other bi-weekly price observations within each year. In the study of intra year seasonality, bi-weekly price observations were used.

$$p_{jt} - \bar{p}_t = a_0 + a_1 j + a_2 j^2 + \text{residual}$$

In the absence of year to year variability of the seasonal, the inter-year seasonal regression estimates must correspond to any intra-year seasonal estimates. The results of the inter-year and intra-year seasonal regressions are presented in Tables I, II and III respectively. Tables I and II indicate an upward inter-year seasonal regression in all the twelve markets, showing that an owner of inventory would have received a positive gross return over the period 1961-70. The intra-year seasonal regressions presented in Table III establish the year to year variability in the seasonal pattern but confirm the upward seasonal character of price movements in all markets over most years. The yearly gross returns per quintal of wheat (1961-62 to 1969-70) in all the markets are shown in Table IV. The table shows that there has been consi-

7. The diagram shows the allocation between consumption and demand (supply) for storage out of a given total market arrival.

derable variability in the gross returns from storage from year to year, the gross returns were relatively high in 1963-64, 1964-65, 1966-67 and 1969-70 compared to other years. The returns and storage cost for storing one quintal of wheat in the Moga market are shown in Table V. A comparison of the average gross returns (which included the marginal risk premium for risk bearing shown as net profit in Table V), and storage costs broadly indicates that inventory firms were competitive.

TABLE I—INTER-YEAR SEASONAL REGRESSION OF MONTHLY WHOLESALE PRICES: 1961-62 (MAY-APRIL)

$$P_{jt} - \bar{P}_t = a_0 + a_1j + a_2j^2$$

Sample size 108

Market	a_0	t-ratio	a_1	t-ratio	a_2	t-ratio	R ²	S.E. of estimate value in rupees per quintal
1	2	3	4	5	6	7	8	9
Abohar	- 8.68	6.11	2.20	4.37	-0.10	2.74	0.37	4.13
Moga	- 9.80	4.57	1.74	2.29	-0.03	0.49	0.38	6.23
Hapur	-15.43	4.01	3.86	2.84	-0.18	1.75	0.21	11.20
Bharaich	- 9.38	2.38	2.15	1.55	-0.19	0.86	0.09	11.40
Chandausi	-13.56	3.58	3.61	2.70	-0.18	1.83	0.16	11.00
Sagar	- 9.62	3.47	3.70	3.76	-0.27	3.62	0.12	8.06
Rewa	-13.48	4.47	4.38	4.10	-0.28	3.46	0.18	8.75
Bhopal	- 9.69	3.70	3.84	4.14	-0.28	4.07	0.14	7.61
Khagaria	-13.00	3.56	3.65	2.83	-0.20	2.06	0.14	10.60
Kotah	- 7.35	3.42	2.00	2.63	-0.10	1.82	0.14	6.24
Rajkot	- 8.86	4.28	2.87	3.92	-0.18	3.30	0.16	6.01
Dhanduka	- 8.64	3.42	2.35	2.63	-0.12	1.83	0.14	7.34

TABLE II—INTER-YEAR SEASONAL REGRESSION OF BI-WEEKLY WHOLESALE PRICES: 1961-70 (MAY-APRIL)

$$P_{jt} - \bar{P}_t = a_0 + a_1j + a_2j^2$$

Sample size 234

Market	a_0	t-ratio	a_1	t-ratio	a_2	t-ratio	R ²	S.E. of estimate value in rupees per quintal
1	2	3	4	5	6	7	8	9
Abohar	- 7.12	7.71	0.74	4.71	-0.01	2.21	0.34	4.35
Moga	- 8.35	5.98	0.53	2.21	0.00	0.51	0.35	6.58
Hapur	-14.30	5.95	1.49	3.62	-0.03	1.72	0.23	11.33
Bharaich	- 9.11	3.97	0.92	2.33	-0.01	1.06	0.12	10.90
Chandausi	-13.20	5.61	1.56	3.90	-0.03	2.37	0.18	11.05
Sagar	- 9.87	5.03	1.68	5.01	-0.05	4.56	0.10	9.24
Rewa	-10.90	5.82	1.62	5.05	-0.05	4.07	0.14	8.85
Bhopal	-10.20	5.79	1.89	6.29	-0.06	5.96	0.15	8.27
Khagaria	-12.30	5.72	1.63	4.43	-0.04	3.19	0.15	10.16
Rajkot	- 8.26	6.30	1.24	5.54	-0.04	4.47	0.16	6.18
Dhanduka	- 2.16	1.85	0.28	2.71	0.02	12.04	0.58	7.75

TABLE III—INTRA-YEAR SEASONAL REGRESSION OF BI-WEEKLY WHOLESALE PRICES: 1961-69 (MAY-APRIL)

$$p_j - \bar{p} = a_0 + a_1j + a_2j^2$$

Sample size 26

Year	Market				Abohar				Moga				Hapur			
					a ₀	a ₁	a ₂	R ²	a ₀	a ₁	a ₂	R ²	a ₀	a ₁	a ₂	R ²
1961-62	-4.11 (1.68)	0.17 (0.29)	0.01 (0.01)	0.55	-3.54 (0.97)	0.08 (0.17)	0.01 (0.01)	0.77	-4.65 (1.14)	0.38 (0.03)	-0.01 (0.00)	0.54
1962-63	-0.46 (0.46)	0.29 (0.08)	-0.01 (0.00)	0.01	2.52 (0.99)	-0.36 (0.17)	0.01 (0.01)	0.27	-0.99 (0.64)	0.25 (0.11)	0.01 (0.00)	0.24
1963-64	-10.00 (2.09)	-0.00 (0.36)	0.04 (0.01)	0.88	-8.43 (2.17)	-0.02 (0.37)	0.03 (0.01)	0.83	-8.77 (1.51)	0.09 (0.26)	0.03 (0.01)	0.90
1964-65	-16.20 (2.68)	1.55 (0.46)	-0.02 (0.02)	0.80	-13.40 (2.01)	0.96 (0.34)	0.00 (0.01)	0.86	-44.98 (3.30)	6.29 (0.56)	-0.17 (0.02)	0.91
1965-66	-4.76 (2.29)	0.65 (0.39)	-0.02 (0.01)	0.16	-2.03 (1.90)	0.42 (0.32)	-0.02 (0.01)	0.07	-13.80 (2.11)	2.50 (0.36)	-0.09 (0.01)	0.68
1966-67	-10.50 (0.76)	1.66 (0.13)	-0.05 (0.01)	0.90	-25.70 (4.23)	0.97 (0.72)	0.05 (0.03)	0.89	-32.98 (6.40)	0.71 (1.09)	0.10 (0.04)	0.86
1967-68	1.03 (0.84)	-0.13 (0.14)	0.00 (0.01)	0.07	1.19 (0.46)	-0.16 (0.08)	0.00 (0.00)	0.30	5.99 (3.76)	1.32 (0.64)	-0.10 (0.02)	0.80
1968-69	-14.64 (2.88)	1.73 (0.49)	-0.04 (0.02)	0.65	-19.40 (2.99)	2.58 (0.51)	-0.07 (0.02)	0.71	-9.83 (2.15)	1.02 (0.37)	-0.02 (0.01)	0.65
1969-70	-4.44 (1.07)	0.76 (0.18)	-0.02 (0.01)	0.45	-6.46 (2.23)	0.27 (0.38)	0.01 (0.01)	0.62	-18.85 (5.60)	0.83 (0.96)	0.03 (0.03)	0.70

Note: Figures in parentheses indicate standard errors.

(Contd.)

RETURNS TO STORAGE IN WHEAT MARKETS

TABLE III—(Contd.)

Market Year	Bharaich				Chandausi				Sagar			
	a ₀	a ₁	a ₂	R ²	a ₀	a ₁	a ₂	R ²	a ₀	a ₁	a ₂	R ²
1961-62	.. -3.24 (1.14)	0.33 (0.20)	-0.01 (0.01)	0.35	-6.07 (1.67)	0.67 (0.29)	-0.02 (0.01)	0.43	-5.88 (0.65)	0.65 (0.11)	-0.01 (0.00)	0.87
1962-63	.. -1.00 (0.56)	0.23 (0.10)	-0.01 (0.00)	0.22	-1.53 (0.71)	0.18 (0.12)	-0.00 (0.00)	0.23	2.14 (1.12)	-0.11 (0.19)	-0.00 (0.01)	0.30
1963-64	.. -10.30 (1.74)	-0.04 (0.30)	0.04 (0.01)	0.91	-12.80 (2.50)	0.96 (0.43)	-0.00 (0.15)	0.75	-6.80 (1.90)	0.24 (0.32)	0.01 (0.01)	0.01
1964-65	.. -34.70 (2.87)	4.91 (0.49)	-0.14 (0.02)	0.88	-38.20 (4.24)	5.53 (0.72)	-0.16 (0.03)	0.80	-18.30 (1.62)	3.10 (0.28)	-0.10 (0.01)	0.85
1965-66	.. -11.20 (2.72)	2.43 (0.46)	-0.09 (0.02)	0.51	-13.50 (2.72)	2.65 (0.46)	-0.09 (0.02)	0.59	-2.12 (0.81)	0.29 (0.14)	0.01 (0.01)	0.20
1966-67	.. -25.10 (4.34)	-0.33 (0.74)	0.12 (0.03)	0.92	-30.50 (7.01)	0.64 (1.20)	0.09 (0.04)	0.84	0.89 (0.31)	0.02 (0.05)	-0.01 (0.00)	0.78
1967-68	.. 14.20 (4.35)	0.66 (0.74)	-0.09 (0.03)	0.84	6.27 (3.54)	1.75 (0.60)	-0.12 (0.07)	0.86	-48.80 (10.90)	9.98 (1.87)	-0.36 (0.07)	0.56
1968-69	.. -0.92 (2.38)	-0.15 (0.41)	0.01 (3.02)	0.15	-7.37 (2.54)	0.59 (0.43)	-0.01 (0.02)	0.46	1.64 (2.77)	0.46 (0.47)	-0.03 (0.02)	0.45
1969-70	.. -9.77 (3.38)	0.20 (0.58)	0.03 (0.02)	0.67	-14.70 (4.40)	1.09 (0.75)	-0.00 (0.03)	0.57	-11.60 (6.34)	0.46 (1.08)	0.02 (0.04)	0.36

(Contd.)

TABLE III—(Contd.)

Market Year	Rewa				Bhopal				Khagaria			
	a ₀	a ₁	a ₂	R ²	a ₀	a ₁	a ₂	R ²	a ₀	a ₁	a ₂	R ²
1961-62	.. —	—	—	—	-6.89 (1.57)	0.83 (0.27)	-0.02 (0.01)	0.58	-2.44 (1.31)	0.32 (0.22)	-0.01 (0.01)	0.20
1962-63	.. -0.43 (0.59)	-0.12 (0.10)	-0.01 (0.00)	0.18	-0.58 (0.75)	0.34 (0.13)	-0.01 (0.01)	0.36	-3.08 (1.21)	0.33 (0.21)	-0.01 (0.01)	0.37
1963-64	.. -8.40 (1.65)	-0.07 (0.28)	0.04 (0.01)	0.89	-7.84 (1.69)	0.84 (0.29)	-0.02 (0.01)	0.62	-8.36 (0.69)	0.24 (0.12)	0.02 (0.00)	0.97
1964-65	.. -8.31 (1.49)	-1.08 (0.25)	-0.03 (0.01)	0.57	-9.89 (2.22)	1.80 (0.38)	-0.06 (0.01)	0.50	-17.80 (2.73)	1.93 (0.47)	-0.04 (0.02)	0.76
1965-66	.. —	—	—	—	-2.91 (1.38)	0.46 (0.24)	-0.01 (0.01)	0.20	-20.80 (3.20)	3.36 (0.55)	-0.10 (0.02)	0.67
1966-67	.. 1.40 (0.45)	0.02 (0.08)	-0.01 (0.00)	0.78	0.89 (0.31)	0.02 (0.05)	-0.01 (0.00)	0.78	-27.80 (4.70)	2.79 (0.80)	-0.04 (0.03)	0.76
1967-68	.. -69.90 (7.57)	11.90 (1.29)	-0.39 (0.05)	0.80	-43.30 (10.80)	9.51 (1.84)	-0.36 (0.07)	0.56	3.36 (8.49)	3.03 (1.45)	-0.19 (0.05)	0.66
1968-69	.. -10.70 (5.89)	1.31 (1.01)	-0.03 (0.04)	0.21	-4.72 (0.52)	1.20 (0.31)	-0.05 (0.00)	0.21	-7.84 (4.97)	-0.28 (0.85)	0.04 (0.03)	0.49
1969-70	.. -2.06 (2.71)	0.14 (0.46)	0.00 (0.02)	0.10	-16.42 (2.67)	2.01 (0.46)	-0.05 (0.02)	0.70	-26.40 (3.25)	2.97 (0.55)	-0.06 (0.02)	0.82

(Contd.)

RETURNS TO STORAGE IN WHEAT MARKETS

TABLE III (Concl'd.)

Year	Market			Rajkot				Dhanduka			
				a ₀	a ₁	a ₂	R ²	a ₀	a ₁	a ₂	R ²
1961-62	-1.77 (0.39)	0.27 (0.07)	-0.01 (0.00)	0.50	-5.75 (1.92)	0.52 (0.33)	-0.01 (0.01)	0.40
1962-63	-1.57 (0.91)	0.27 (0.16)	-0.01 (0.01)	0.12	-1.94 (1.44)	1.04 (0.25)	-0.05 (0.01)	0.73
1963-64	0.83 (0.69)	-0.41 (0.12)	0.03 (0.00)	0.85	-2.27 (1.09)	-0.77 (0.19)	0.05 (0.01)	0.91
1964-65	-9.89 (2.38)	1.34 (0.41)	-0.04 (0.02)	0.49	-12.60 (3.41)	1.60 (0.58)	-0.04 (0.02)	0.46
1965-66	1.15 (1.34)	0.26 (0.23)	-0.02 (0.01)	0.53	2.45 (1.02)	0.28 (0.17)	-0.03 (0.01)	0.84
1966-67	5.62 (4.24)	2.38 (0.72)	-0.03 (0.03)	0.78	-9.33 (1.08)	0.16 (0.18)	0.03 (0.01)	0.95
1967-68	-10.40 (3.45)	3.32 (0.56)	-0.14 (0.02)	0.73	-16.20 (2.39)	4.58 (0.41)	-0.19 (0.02)	0.82
1968-69	-15.90 (2.78)	2.41 (0.48)	-0.07 (0.02)	0.62	-15.82 (3.99)	2.16 (0.68)	-0.06 (0.02)	0.48
1969-70	-9.55 (3.54)	1.85 (0.60)	-0.04 (0.02)	0.31	-16.41 (4.36)	0.98 (0.37)	0.01 (0.01)	0.90

TABLE IV—AVERAGE GROSS PROFITS FROM STORAGE OF WHEAT FROM MAY TO FOLLOWING APRIL IN DIFFERENT MARKETS
MAY, 1961—APRIL, 1970

(in Rs. per quintal)

Markets	Estimates of gross profits from storage based on intra-year seasonal regressions ¹										Estimates of gross profits from storage based on inter-year seasonal regression ³	
	1961-62	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	1969-70	Average ²		
1	2	3	4	5	6	7	8	9	10	11	12	
Abohar	8.60	-1.50	24.90	27.00	5.08	10.20	-0.85	20.20	3.95	10.80	9.39	
Moga	8.35	-2.68	20.90	24.50	0.50	56.10	-1.50	24.00	12.90	13.90	15.20	
Hapur	5.73	12.60	20.30	51.60	9.40	77.20	-28.20	14.90	40.10	22.60	17.00	
Bharaich	4.65	0.20	25.20	38.50	4.60	66.90	-42.30	3.73	21.90	13.70	10.80	
Chandausi	7.43	2.03	21.50	41.40	9.23	74.10	-32.50	11.60	25.30	17.80	13.50	
Sagar	8.23	-3.40	13.50	14.90	12.10	-2.58	22.70	-9.08	0.85	6.36	2.64	
Rewa	—	-8.30	20.90	-45.70	—	-3.83	55.40	15.90	2.88	5.32	8.63	
Bhopal	9.50	-0.25	11.10	6.80	3.43	-2.58	15.40	0.00	20.90	7.30	1.87	
Khagaria	3.65	4.58	17.20	25.10	20.10	42.80	39.80	20.60	36.10	23.30	11.80	
Rajkot	1.63	1.08	6.03	11.60	-5.42	40.70	-6.95	16.40	11.80	8.54	5.70	
Dhanduka	8.05	-5.30	12.60	15.70	-9.18	20.90	-4.93	19.10	17.00	9.87	8.34	

RETURNS TO STORAGE IN WHEAT MARKETS

1. The estimates of yearly gross profits from storage are based on the intra-year seasonal regressions of bi-weekly wholesale prices (Table II).
2. The average gross profits estimates for the period 1961-70 derived from averaging of yearly estimates are comparable to the estimates of gross profits from storage based on inter-year seasonal regression. Compare the last two columns of this table.
3. The estimates of gross profits are based on inter-year seasonal regressions of monthly wholesale prices (1961-70, May-April).

TABLE V—AVERAGE GROSS AND NET PROFITS FOR CARRYING ONE QUINTAL OF WHEAT FOR DIFFERENT PERIODS IN MOGA MARKET: 1961-70 (MAY-APRIL)

Period	Gross profit	Storage cost*	Net profit
May-June	1.66	1.48	0.18
May-July	3.26	2.07	1.19
May-August	4.80	2.66	2.14
May-September	6.29	3.25	3.04
May-October	7.73	4.83	2.90
May-November	9.11	6.22	2.89
May-December	10.43	7.91	2.52
May-January	11.70	9.40	2.30
May-February	12.91	12.17	0.74
May-March	14.07	14.25(a)	-0.18
May-April	15.17	16.40(a)	-1.23

* Storage cost has been taken from A. S. Kahlon: Cost of Storage and Replacement of Buffer Stock in Foodgrains, Seminar on Foodgrains Buffer Stocks in India, Seminar Series—VIII, Indian Society of Agricultural Economics, Bombay, 1969, pp. 155.

(a) Calculated on the same basis as previous periods.

Behavioural Hypothesis

The data on market arrivals of wheat, we have indicated, refers to the amount of wheat supplied and demanded for current consumption and storage. As the data on current consumption and data on the size of inventory holdings at different periods of the season are not separately available, it is difficult to test rigorously any hypothesis relating to behavioural response of traders who demand market arrivals for allocation between present consumption and storage. The demand for current consumption may be regarded as being nearly even during the year. Larger fractions of market arrivals in the early part of the marketing season, when arrivals are heavy, go into storage. During the lean season, when market arrivals fall, the demand for current consumption must be met from depletion of stocks under storage.

The demand for stocks for supply of storage by inventory firms is large at the beginning of the crop year when current prices are low and the traders have normal expectations of prices being higher later in the season. Inventory firms expect under such conditions to realise a return which will cover the costs of storage for the period the inventory is held. Investments in the holding of stocks, for any given level of holding, are smaller when prices are low, and become larger as the off-season price rise takes place. As the financial commitment in the holding of stocks increase, total risks for the inventory

firm correspondingly increase. When price expectations are higher relative to current prices, the firms are willing to carry larger stocks but this willingness decreases as current prices rise relative to expected prices at a future date. Demand for current consumption and current demand for storage, *ceteris paribus*, must be inversely related to current price levels. The demand for storage would be also directly related to the expected net returns from storage and inversely to the price variance or risk associated with the expected return. For given level of expectations, total storage demand as the season advances, would decrease with an upward seasonal movement of prices. The behavioural hypothesis relating to traders demanding market arrivals outlined above was tested with reference to aggregated quarterly data on market arrivals in four States, Punjab, Uttar Pradesh, Madhya Pradesh and Bihar for the period 1962-70. The results are presented in Tables VI, VII, VIII and IX.

TABLE VI—INTER-YEAR QUARTERLY SEASONAL REGRESSIONS OF MARKET ARRIVALS ON WHOLESALE PRICES : 1962-70 (APRIL TO MAY)

$$m_{jt} - \bar{m}_t = a_0 + a_1 (P_{jt} - \bar{P}_t)$$

Sample size 32

State				a_0	a_1	t-ratio	R ² value	S.E.
Punjab	..	..	..	2.056	-69.25	2.741	0.20	1105
Uttar Pradesh	..	..	..	0.233	-16.78	2.160	0.13	525.9
Madhya Pradesh	..	..	..	0.305	-9.116	2.034	0.13	178.2
Bihar	..	..	..	0.005	-1.208	2.938	0.22	24.12

Note : All the regressions in Table VI to IX are run with market arrivals measured in thousand quintals and the prices in rupees per quintal. Each regression coefficient must therefore be interpreted bearing in mind the units used to express these variables.

TABLE VII—INTER-YEAR SEASONAL REGRESSIONS OF CHANGE IN MARKET ARRIVALS ON CHANGE IN WHOLESALE PRICES: 1962-70 (APRIL-MAY)

$$m_{jt} - m_{(j-1)t} = a_0 + a_1 (P_{jt} - P_{(j-1)t})$$

Sample size 31

State				a_0	a_1	t-ratio	R ² value	S.E.
Punjab	..	..		47.26	-57.09	1.482	0.07	1886
Uttar Pradesh	..	..		10.72	-38.92	3.233	0.26	778.0
Madhya Pradesh	..	..		13.65	-4.794	1.031	0.03	458.2
Bihar	..	..		4.233	-1.952	3.137	0.25	35.72

TABLE VIII—INTER-YEAR QUARTERLY SEASONAL REGRESSIONS OF MARKET ARRIVALS ON CURRENT AND EXPECTED CHANGE IN WHOLESALE PRICES: 1962-70 (APRIL-MAY)

$$m_{jt} - \bar{m}_{jt} = a_0 + a_1 (P_{jt} - \bar{P}_{jt}) + a_2 P_{jt} - P_{(j-1)t}$$

Sample size 32

State	a_0	a_1	t-ratio	a_2	t-ratio	R ² value	S.E.
Punjab	57.40	-55.91	2.046	-29.24	1.226	0.24	1096
Uttar Pradesh	23.09	-3.337	0.355	-22.16	2.265	0.26	493.1
Madhya Pradesh	1.311	-8.818	1.884	-0.756	0.263	0.12	181.1
Bihar	2.539	-0.025	1.066	-0.819	1.383	0.27	23.74

TABLE IX—INTER-YEAR QUARTERLY SEASONAL REGRESSION OF MARKET ARRIVALS ON WHOLESALE PRICE EXPECTATIONS

$$m_{jt} - \bar{m}_{jt} = a_0 + a_1 (P_{jt} - \bar{P}_{jt}) + a_2 (m_j - l_t - \bar{m}_j - l_t)$$

Sample size 28

State	a_0	a_1	t-ratio	a_2	t-ratio	R ² value	S.E.
Punjab	16.89	-78.62	2.976	-0.274	1.525	0.28	1127
Uttar Pradesh	3.511	-16.28	2.095	-0.240	1.308	0.20	575.6
Madhya Pradesh	0.320	-7.865	2.222	0.437	2.715	0.36	138.2
Bihar	0.077	-1.151	2.719	-0.164	0.919	0.26	24.74

Empirical Tests for the Hypothesis

Table VI contains results of inter-year quarterly seasonal regressions of market arrivals on wholesale prices. The results show that the demand for market arrivals is inversely and significantly related to current prices. Production has not been included as an explanatory variable because we are taking into account the mean level of market arrivals from year to year in this inter-seasonal regression.

Table VII presents results of inter-year seasonal regressions of quarterly changes in market arrivals to corresponding quarterly changes in current market prices. The results are similar to those presented in Table VI.

Table VIII presents results on the demand for market arrivals in relation to current and expected change in wholesale prices. Similarly, Table IX

contains results of inter-year quarterly seasonal regression of market arrivals on wholesale price expectations. This is the estimating equation of the distributed lag demand model⁸ based on the hypothesis that demand for market arrivals is influenced by price expectations, and that these price expectations are revised from period to period based on past price experience. The value of the coefficient of price expectation is greater than one in all cases, which indicates that if the level of seasonal price in any period turns out to be greater than what the traders expected, then they make an upward revision in their expectation by an amount greater than the error they made in framing price expectation in the preceding period. The traders, the model suggests, reduce their demand for market arrivals when they expect the price to move up.

The results of Tables VIII and IX confirm our hypothesis relating to normal trading behaviour of inventory owners who demand market arrivals. The demand for market arrivals, the results in Table VIII and IX show, are inversely related to current prices, changes in quarterly prices, and to price expectations. The results uniformly suggest that demand for market arrivals decreases as inter-quarterly prices increase. Considering that the demand for market arrivals in each period is the total demand for current consumption and for storage, and allowing for a fairly uniform rate of demand for current consumption throughout the year, the results in Table VIII and IX indicate that traders demand for storage, to add to their existing inventory holdings, declines as prices rise over the season.⁹

Conclusion

The results presented in Tables VIII and IX discount the view traditionally held that traders abnormally add to their inventories over periods of rising prices and then unload their stocks over periods of falling prices. The results of our regressions presented in Tables VI, VII, VIII and IX indicate that wheat traders perform the very useful functions of carrying over of stocks over the season and of balancing the supply with the relatively uniform consumption demand for wheat over the season.

8. The demand for market arrivals model can be specified as follows :

$$m_{jt} - \bar{m}_{jt} = \alpha_0 + \alpha_1 (p_{j+1t} - \bar{p}_{j+1t})^*$$

$$\text{where } (p_{j+1t} - \bar{p}_{j+1t})^* = (p_{jt} - \bar{p}_{jt})^*$$

$$= \beta [(p_{jt} - \bar{p}_{jt}) - (p_{jt} - \bar{p}_{jt})^*]$$

giving the estimating equation of Table IX

$$m_{jt} - \bar{m}_t = a_0 + a_1 (p_{jt} - \bar{p}_{jt}) + a_2 (m_{j-1t} - \bar{m}_{j-1t}).$$

9. Traders do carry a larger level of total inventories when price expectations are favourable and prices are expected to move further up, but the demand for storage to add to the existing level of inventory declines with an upward expectation of movement in prices.