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AN ANALYSIS OF THE STRUCTURE AND PERFORMANCE OF AGRICULTURAL MARKETS IN PAKISTAN

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AN ANALYSIS OF THE STRUCTURE AND PERFORMANCE OF AGRICULTURAL MARKETS IN PAKISTAN

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ABSTRACT

This study focuses on (a) the nature of price formation in agricultural markets in Pakistan, (b) structure of markets and conduct of traders, and (c) performance of markets. Major imperfections in the existing system are pointed out and policy prescriptions to remove them are suggested.

Using monthly data on wholesale and retail prices of wheat, rice (Basmati) and gram from January 1955 to June 1979, five major hypotheses are tested.

1. The existing agricultural marketing structure in Pakistan is not oligopolistic as is often suggested;
2. There exists a high degree of integration between price structures of different regions and between harvest and post-harvest prices, which is a characteristic of a perfectly competitive marketing system;
3. The market margins earned by traders at different stages of marketing are consistent with their costs;
4. Fluctuations in off-season prices, which are a major source of risk in storage activity, have decreased over time, probably due to improved performance of agricultural markets;
5. The Green Revolution of the late sixties, when the yield levels of wheat and rice increased significantly, has allowed farmers to get relatively better prices for their produce than before.

The study employs methods of logical analysis of facts related to different aspects of markets, and statistical techniques like regression, correlation, calculation of Theil's Inequality Coefficient and Coefficients of Variation.

The results generally support the hypotheses stated above. However, they are not conclusive on market integration, when based on rice (Basmati) prices. Similarly, significant increases in prices received by farmers are observed only in the case of wheat during the Green Revolution period.

The study concludes that the prevailing view of agricultural markets in Pakistan as exploitative and oligopolistic is not necessarily true. Exodus of the traditional trading class in 1947 and its replacement with traders from diverse socio-economic backgrounds, coupled with government efforts in the areas of transportation, communications, credit and agricultural development, have brought about mainly favourable changes in the nature of agricultural markets in Pakistan.

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Any errors remaining in the transcript are the sole responsibility of the author.

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CHAPTER I

Introduction

A close relation usually exists between the level of economic development and the structure, conduct, and performance of agricultural markets.[1] In general, a marketing system is supposed to function as a price signalling device for consumers and producers to facilitate efficient allocation of resources. In Pakistan, as in many other developing countries, one of the popular views is that markets for agricultural commodities do not perform these functions efficiently, and that there are great differences between the prices paid by consumers and received by farmers. [74, 81, 84] Some of the other major problems from which the existing marketing system is believed to suffer are:

1. inefficiencies caused by the monopolistic power of a few traders;
2. existence of a long chain of intermediaries resulting in high per unit marketing costs;
3. unnecessary year-to-year fluctuations in prices, harmful to the long-run economic development and political stability of the country;
4. inadequate physical capacity to handle the rapid growth of

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[1] See for example Holton [31], Jones [39], Mehren [50], Mellor [51, 52], and Mueller [54].

agricultural surplus as was experienced in the late sixties in the provinces of Punjab and Sind. [3, 44, 81]

Such criticisms of the existing marketing system in Pakistan have led to a number of suggestions for alternative arrangements.[2] Some of these recommendations, if implemented, could radically alter the organisation of the present system and impose large demands on the country's financial and administrative resources.

The central theme of this study is that to formulate an effective policy on agricultural markets we need to investigate carefully the costs and benefits of alternative arrangements. It is essential that we first have a proper knowledge of the existing marketing system, i.e. its level of performance and the nature of its imperfections.

Studies on Agricultural Marketing in Pakistan

The existing literature on agricultural markets in Pakistan is an inadequate guide to public policy. [12, 20, 43, 78, 79, 80] For one thing, few studies have been conducted since Pakistan became an independent state in 1947. These studies are limited in their scope and analysis. Most of them deal with only the description of some aspects of the institutional

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[2] Establishment of the Pakistan Agricultural Storage and Supplies Corporation (PASSCO) is one result of the recommendations for alternative arrangements. This organization was established by the government to replace private traders in the agricultural markets of Pakistan. [58]

arrangements, without analysing such important issues as the regional and intertemporal nature of prices or how the development process may have been influenced by them.

A report on the efficiency of markets in Sind financed by U.S. A.I.D. estimated gross margins only by taking the difference between prices paid by consumers and the prices paid to farmers by the primary traders [74]. Such estimates tells nothing about net margins. Secondly, it does not shed any light on factors which might be responsible for the apparently high gross margins. Is the village trader or town market trader responsible for "excessive" margins? This and many other related questions have not been answered by these reports.

Another study for the Punjab province tried to reach at certain similar conclusions, which are not supported even by its own findings [81]. For example, the authors maintain that there are generally four categories of intermediaries between the grower and the consumer. They are (1) village dealers (beoparies), (2) commission agents, (3) wholesalers/millers, and (4) retailers, each of which is supposedly making undue profits and is responsible for manipulating prices [81, p. 9]. Again they say "... our survey has brought out the disconcerting fact that the grower gets half or even less than half of the price which the ultimate consumer has to pay. This large difference goes to the long chain of middlemen who often resort to unethical practices which have the effect of robbing the grower of his legitimate share and also creating conditions by which the consumer has to pay unduly high prices" [81, p. ii].

In the above two statements, the words underlined indicate a very specific nature of these markets. These statements try to create the impression that traders have the ability to set or manipulate prices in order to make "excessive profits." As it is well known in economic theory, this is possible only if the traders have some monopoly power. One finds no explanation of such power in the cited report. Similarly, the study uses a term, 'undue profits rate', which has no meaning unless we know what is a 'due profit rate'.

It appears that these studies are part of the rhetoric which considers the existing marketing system inherently bad and exploitative. Market traders are usually blamed for poor market performance. For instance, the Punjab Agricultural Product Act 1939 states that "the objective of this act is to give protection to the growers from unscrupulous businessmen and to afford facilities to them so that they may obtain a fair price for their products."[3] However it will be argued in the next chapter that the present situation in Pakistani is quite different because (a) almost all members of the traditional trading class which allegedly used oligopsonistic practices moved to India after 1947 and (b) transportation and credit facilities have expanded impressively.

There are studies which have shown that agricultural trade

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[3] Reported in Ali, [3].

has indeed improved remarkably since 1947.[4] For example, S.K. Qureshi did a detailed analysis of village level markets and found that they were highly competitive. [75] He also pointed out that migration of the traditional trading class from the village has contributed significantly to the improved performance of village markets. However, Qureshi's work, and others similar to his, is not without serious shortcomings.

First, Qureshi uses one-year cross-sectional data which are certainly not sufficient to get a full view of the market performance. Secondly, he limits his study to village markets, which are only one of many markets in Pakistan. There are town and city markets, which influence the functioning of lower-level markets and must therefore be studied to get a complete picture of the marketing system.[5] Similarly, he provides no information on the size-distribution of traders or their conduct in arriving at a price and dealing with their competitors. All of these are important factors which determine the level of performance of any market.

In view of the deficiencies in the existing literature on agricultural markets in Pakistan, we believe that further investigation of this subject is in order.

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[4] See, Javid [35] and Qureshi [75].
[5] See Chapter II below for classification of different markets.

Objectives of This Study

The purpose of this study is to conduct a detailed investigation of the existing marketing system for major (non-perishable) agricultural goods in Pakistan. The commodities are: wheat, rice (Basmati) and gram, which account for about 60 percent of the value of total agricultural crops.[6] An attempt is also made to evaluate the performance of these markets as revealed by their pricing behaviour. Some policy measures to improve their performance are then explored.

Research Methods

Conceptual Framework

Research on the organisation of agricultural markets gained prominence in the 1930s with studies investigating the nature of competition. Attempts to improve the quality of agricultural marketing investigations led to empirical observations about the agricultural industry.[7] The resulting analytical framework became known as "market structure research". J.S. Bain later provided researchers with an analytical framework which has been termed "market research analysis". [6] More recently, N.T.

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[6] In 1979-80 the share of these three commodities in the value of major agricultural crops was 64%. See [62, 63]. Also see Table 1.1 of this study.
[7] See B.G. Bressler (Jr.) [11, p. 1], R.L. Clodious and W.F. Mueller [14, p. 515].

Pritchard has identified four elements necessary to formulate a research framework for the analysis of agricultural marketing systems in developing countries. [72] The first of these is market structure analysis. It provides a model which may be used to assess the performance of an agricultural marketing system. The key elements of this model are those of market structure, conduct and performance.

"Market structure refers to those characteristics of organisation of a market which influence strategically the nature of competition and pricing within the market". [6, p. 7] The characteristics most emphasised are the degree of buyer and seller concentration, the degree of product differentiation and the conditions of entry and exit. Market conduct refers to "the pattern of behaviour which firms follow in adapting or adjusting to the markets in which they buy or sell" [6, p. 10]. Important dimensions of conduct include methods employed by firms in determing the price of an output and sales promotion policy, including the presence or absence of coercive tactics directed against either established rivals or potential entrants. "Market performance refers to the economic results that flow from the industry and how well it performs in terms of efficiency and progressiveness, given its technical environment" [6, p. 12].

The second element pertains to micro-economic theories relevant to agricultural marketing. These are related to consumer demand, production and resource use, and pricing behaviour of the firm. The economics of agricultural marketing to which these theories apply are the consumer's demand for farm products, the price system that reflects this demand back to distributors, and producers, and the methods or practices used in exchanging titles and getting the physical product from cultivators to consumers in the form and at the time and place desired.

The third element concerns the theory of effective competition, which is a result of modification of the theory of the firm, representing contributions of Robinson, Chamberlain and Schumpeter as found in Bateman [7], Fellner [22], Kohls [45], Nelson [55] and Sosnick [89]. The basic attributes of the competitive market model may be used as a standard to evaluate market performance as modified. The concept of a perfect market implies that all buyers and sellers have perfect knowledge of demand, supply and prices, and act rationally upon this knowledge. The implications are that if all the buying and selling is carried out at a particular point in space and at a single instant of time a uniform price will prevail. To be more realistic, however, one must expand this concept to consider the fact that marketing is carried out over a geographical area and over a period of time. The expansion of the concept of a market to include space requires an analysis of transportation and handling costs between buyers and sellers at different locations. Time can be included by considering storage costs of carrying products from one period to another.

The fourth element concerns with the general theory of economic growth and its relevance to agricultural marketing. An effective agricultural marketing system facilitates optimum allocation of resources in agricultural production and provides a direct contribution to total product as it increases place, time and form utility of agricultural products. Therefore, a progressive and technologically adaptive marketing system can promote economic growth. This ability to modernise and expand is acquired as favourable changes take place in technology, economic and social institutions, and structures of production and demand.

Pritchard's framework, however, has been criticised on the grounds that it emphasizes the structure, conduct, and performance of markets and ignores the specific requirements of the development processes in these countries.[8] Agricultural markets should not be studied in isolation from other sectors of the economy. Interactions among the sectors should be a matter of primary concern for economic development. This means that we must design criteria to judge the performance of agricultural markets in creating, both within their structure and among those sectors which are related to them, conditions which accelerate the process of development.

Smith [86] suggests that we should evaluate the performance of markets in terms of their ability to (a) create and rapidly diffuse new technologies and managerial innovations resulting in

[8] See for example E.D. Smith [86], M. Solomon [88] and G.R. Spink [93].

increased productivity and reduced costs, (b) minimise market risk to producers and marketing firms, (c) increase reliability of export product quality and develop functional export grades which could be rigorously enforced, and (d) minimise opportunities for corruption of government officials supervising marketing activities and grade enforcement.

Hypotheses to be Tested in this Study

In this study we will test five main hypotheses[9]

1. That the existing agricultural marketing structure is not "oligopolistic" in nature;
2. That there exists a high degree of integration between price structures of different regions and between harvest and post-harvest prices: a characteristic of a perfectly competitive marketing system;
3. That the margins earned by traders at different stages of marketing are consistent with marketing costs;
4. That fluctuations in off-season prices, which are the major source of risk in storage activity, have decreased over time due to improved performance of agricultural markets;
5. That the Green Revolution in the late sixties, which

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[9] Some of the hypotheses stated here have also been tested for other underdeveloped countries during the past decade. In the case of Pakistan this is the first time it is being done. As the following chapters will show we have tried to avoid some of the conceptual problems in the methodology of the earlier work in this field. For a critical evaluation of the earlier work see Barbara Harris [24] and Peter Timmer [100]. For similar studies see Farruk [21], Hays [28], Jones [40] and Lele [48].

resulted in substantial increases in yield levels of wheat and rice, has enabled farmers to receive relatively better prices for their produce.

The first hypothesis is tested by using facts based on direct observation and study of the functioning of markets in Pakistan. Estimates relating to the number of traders in various markets, their size distribution, and their access to financial and input markets are examined. Information on business practices, price formation processes, and traders' attitude towards their rivals allows us to assess market conduct.

Using the perfectly competitive market model as a standard, Hypotheses 2 to 4 are evaluated by analysing interregional and intertemporal relationships between prices. In most cases, regression estimates are used. In other cases, Theil's Partial Inequality Coefficients and market margins are used to test these hypotheses. Regression methods are also employed to evaluate the response of markets and prices to the Green Revolution.

Data Collection: Problems and Prospects

Selection of Commodities and Markets

This study focuses on three major non-perishable agricultural commodities, wheat (average quality), rice

(Basmati) and gram (brown).[10] The main reasons for selecting these three commodities are: (1) they constitute about 60% of the value of major agricultural crops and cover about 50% of the cropped area of Pakistan, and (2) the availability of consistent price data over a long period.[11] These commodities are handled by all agricultural markets in Pakistan. However, the conclusions reached from studying these commodities may not apply to other commodities, although they would certainly indicate the overall nature of agricultural markets.

The three commodities under study are grown mainly in three of the four provinces of Pakistan (see Figure 1-1 and Table 1-1). However, the largest share of the marketable surplus is produced in Punjab and Sind. It moves through their markets to markets in the deficit areas of North-west Frontier Province (NWFP) and Baluchistan. We have, therefore, selected a sample of markets mostly located in the two surplus-producing provinces. These markets are Faisalabad, Gujranwala, Hyderabad, Lahore, Multan, Okara, Sahiwal, Sargodha, Sialkot, and Sukkur. From NWFP we have selected Peshawar, which produces relatively large amounts of wheat, gram, and rice, and for which time-series price data were also available. We have also selected the Karachi and Rawalpindi markets from those regions which do not have significant agricultural production of their own, but are among the largest consumption centres in the country. They are

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[10] Hereafter the term 'rice' refers to the 'Basmati' variety only.
[11] See Pakistan (1975) [62, p. 140] and Pakistan (1975) [64, pp. 2-50 and 154-165].

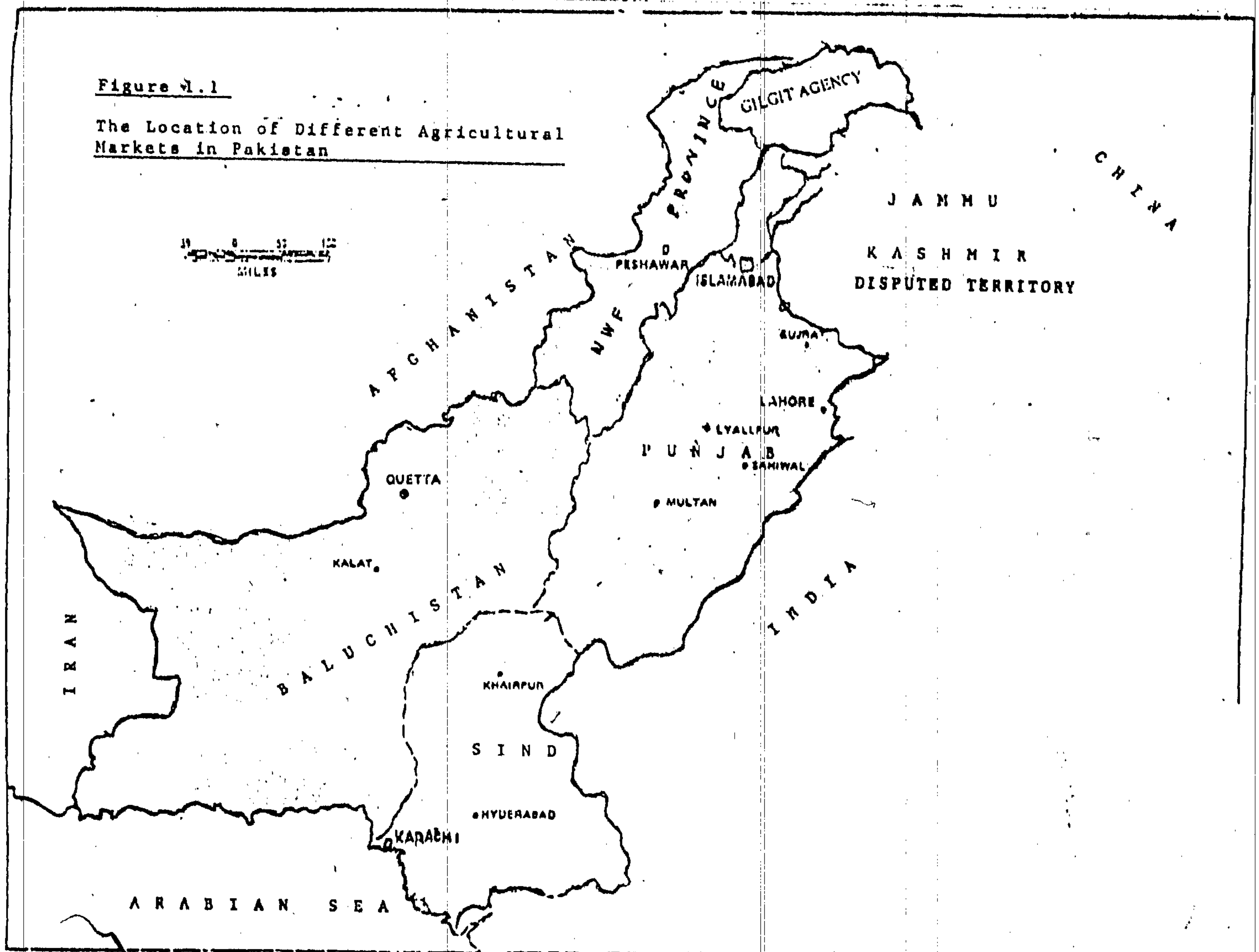

Figure 1.1

The Location of Different Agricultural Markets in Pakistan

Table 1-1

Area and Value of Wheat, Rice (Basmati) and Gram in Selected Districts of Pakistan, 1974-75*

Districts	AREA ('000 Acres)					VALUE (In Millions Rupees)				
	Wheat	Rice (Basmati)	Gram	Total (2)+(3)+(4)	Percentage of Total Cropped Area in a District	Wheat	Rice (Basmati)	Gram	Total in mill. of Rupees (7)+(8)+(9)	Percentage of Total Value of Agriculture Products
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1. Faisalabad	852.0	31.0	18.4	901.4	42.02	742.09	47.43	9.30	798.82	2.38
2. Gujranwala	543.0	350.0	30.4	923.4	63.48	356.92	523.26	11.77	891.95	2.66
3. Hyderabad	277.6	-	3.7	281.3	NA	206.88	-	1.45	208.33	0.62
4. Karachi	0.4	-	-	0.4	NA	0.23	-	-	0.23	NSG
5. Lahore	472.0	116.0	21.8	609.8	47.25	304.24	169.52	9.88	483.64	1.44
6. Multan	1092.0	15.0	11.9	1118.9	34.52	915.74	26.52	5.23	947.45	2.83
7. Peshawar	234.4	-	2.5	236.9	NA	119.48		0.58	120.06	0.36
8. Rawalpindi	32.30	-	11.3	334.3	44.85	83.96	-	3.20	87.16	0.26
9. Sahiwal	895.0	45.0	22.0	962.0	37.20	790.01	85.99	10.02	886.02	2.64
10. Sargodha	633.0	30.0	551.90	1214.9	53.45	441.20	45.59	166.14	652.93	1.95
11. Sialkot	594.0	257.0	16.00	867.0	62.46	302.28	346.70	5.52	654.50	1.95
12. Sukkar	163.1	-	206.2	369.3	NA	116.93	-	82.56	199.45	0.59
13. TOTAL	6079.5	844.0	895.2	7818.7	46.07	4380.0	1245.08	305.62	5930.70	17.69

NSG = Less than 0.1%
Basmati Rice is not grown in Sind. In Peshawar district its area is less than 500 acres.

Source: Computations based on data from (62, 63)

* To calculate value we use average prices of Rs.45.40, Rs.120.00, and Rs.57.00 respectively for Wheat, Rice (Basmati) and Gram.

considered terminal markets.[12]

Since the distance between markets is an important factor affecting intermarket mobility of products, approximate distances by road between the selected markets are shown in Table 1-2.

Sources and Procedures of Data Collection

Perhaps the single most difficult problem in doing a study on a developing country like Pakistan is access to data. In the area of agricultural marketing the problem is even greater, as neither the government nor any other agency concerned with such activities has collected the information necessary to do a comprehensive analysis. Fortunately, however, a long series of weekly and monthly average prices is available in "Market and Prices," a publication of the Agricultural Marketing Advisor, Government of Pakistan [53]. Although the prices reported in this publication are averages, a recent study of the quality of these data found that they provided reasonably accurate information on prices.[13]

For price data we have relied completely on this source. For other data, we have used the published and unpublished

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[12] See Chapter II below for classification of agricultural markets in Pakistan.

[13] This study was conducted by S.K. Qureshi [76] who compared the published data with those he collected through a simple random sample. The correlation between the two prices was close to one and their differences were insignificant.

TABLE 1.2

APPROXIMATE DISTANCES BETWEEN AGRICULTURAL MARKETS IN PAKISTAN (BY ROADS, IN MILES)

Karachi													
150	Hyderabad												
630	490	Multan											
750	600	120	Sahiwal										
780	630	150	30	Okara									
810	660	180	60	30	Jaranwala								
840	690	210	90	60	30	Faisalabad							
850	700	220	150	70	80	85	Lahore						
875	725	245	125	95	50	60	25	Sheikhupura					
880	730	250	130	100	70	40	125	100	Sargodha				
890	740	260	140	110	85	95	40	35	135	Gujranwala			
920	770	290	170	140	115	125	70	65	165	30	Sialkot		
1025	875	395	275	245	215	225	175	165	265	135	130	Rawalpindi	
1135	975	495	375	345	315	325	275	265	365	235	230	100	Peshawar

SOURCE: [54]

records of the Market Committees which the government created to supervise markets in each region.[14] Data regarding the size distribution of traders and their number in each market were obtained from Market Committee's records.

A sample survey of farmers and traders and other market functionaries was conducted to gather information on sales practices, marketing costs, sources of finance and other inputs, and other related aspects of marketing activities. Details of the survey are presented in Chapter II, Appendix A. This survey included direct observations of price formation processes and activities such as weighing, packing, loading and unloading of commodities.

The plan of the study is as follows. Chapter II presents an historical review of existing marketing institutions and examine critically marketing channels, sales practices of traders and farmers, marketing intelligence, transportation facilities, and the number and size-distribution of traders. Chapter III discusses some of the main criteria which we have used to evaluate the performance of the selected markets. Empirical results relating to those criteria and their analysis are presented in Chapter IV. Chapter V examines the performance of markets by observing the impact of the Green Revolution on prices received by farmers. Finally, in Chapter VI, the findings

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[14] Market committees are composed of government officials, farmers and traders, and they maintain records of weekly sales by individual firms and keep information on the number of traders in a market. Licensing of the traders is also done by them. See A. Ali [3].

of this study are summarised and some policy implications are drawn.

CHAPTER II

Some Features of the Agricultural Marketing System in Pakistan: A Critical Evaluation

One of the main objectives of this study is to present an outline of the existing agricultural marketing system in Pakistan. This will allow us to evaluate its performance and the role played by various market functionaries in the price formation process. In other words, we examine the conditions which farmers and consumers face in arriving at a market price. We first look at the historical background.

Historical Background

A prominent feature of the socio-economic structure of the Indian sub-continent has been the class/caste system, which is generally believed to have been established by the Aryans, who invaded India in the 6th Century B.C. In this system the society was divided into four caste groups (classes) to perform various functions. At the top was a religious class, called Brahmin. Next in order was the fighting class, called Kshatriya. The trading and working classes, were third and fourth in the hierarchy, and known as Vaisya and Sudra respectively.[1] In theory farmers were part of Vaisya, the same caste group to which traders belonged, but in reality they were a separate

[1] D.D. Kosambi [46].

sub-caste group, and, generally, regarded as less than equal to the trading class.[2] Such class boundaries were so strong at times that one could not cross them without facing severe social and economic reprisals or in some cases losing one's life. [5] It was due to the strength, and also to some extent the sanctity, which this system gained over time, that the working classes in particular remained attached to their professions and to their castes even after the introduction of a new order, such as Islam which opposed the caste system and preached social equality. It appears that this may have been because of insufficient access to alternative economic opportunities.

One of the major outcomes of the caste system was that peasants saw no role other than working on the land. They had very little contact with the outside world and had practically no knowledge of reading and writing common among the people belonging to trading profession. Lack of transportation and communication facilities was yet another barrier to possible change. Consequently, whether agriculture was merely a subsistance sector or started generating some surplus to meet cash revenue requirements of the rulers, farmers remained in the "production line" whereas the marketing of produce was carried out by the trading class. The major characteristics of this trading class were:

1. it consisted mainly of Hindus (and Sikhs after the 16th century), whereas the cultivaters were mainly Muslims in

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[2] Baden-Powell [5].

areas which are now Pakistan;

2. it had social and business contacts both at the village and city levels, or it was easy for them to establish such contacts;
3. it had ready cash which they also used for lending;
4. its members sold produce to various markets and provided nonfarm merchandise to farmers; they were knowledgeable about the handling of accounts and scales, about which the masses were ignorant.[3]

In the village, the cultivators were largely illiterate, often ignorant about prices prevailing in towns outside their own very limited circle, constrained by lack of transportation and communication facilities and pressured by their cash needs.

The result was poor marketing conditions in which a farmer had to sell his produce. Such marketing conditions along with low agricultural productivity led to the worst kind of indebtness of cultivators.[4] Private traders were to be partly responsible for this situation as they interacted with farmers through their triple functions of merchandizing, moneylending and middlemanship.

To improve the working of agricultural markets the British government introduced various laws regarding weights and measures, and created urban "regulated markets", which were to be regulated by marketing committees composed of farmers,

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[3] See India [33].
[4] According to Michael Darling peasants were born in debt, lived in debt and died in debt [17].

traders and government officials. However, the marketing systems in areas now in Pakistan remained unregulated, hence poor in nature. For one thing, the road, rail, and other transportation facilities were still very unsatisfactory. Secondly, government credit extension facilities continued to be less than sufficient due to which farmers were still dependent on traditional money lenders.

Partition of British India and Agricultural Markets in Pakistan

The partition of British India in 1947 and subsequent developments in Pakistan brought major changes in the agricultural marketing system.[5]

Due to the communal nature of Partition, the traditional moneylending class migrated to India. The emigration of Hindu and Sikh moneylenders had at least four major effects on the markets. First, all debts owed to moneylenders by the peasantry were wiped out. The previously indebted peasants became free agents and could choose market outlets for their surplus produce based on private profitability. Second, the departure of the entire trading class led to a disequilibrium in agricultural trade. Profits were high, which attracted new people to the trading profession. The response was quick and massive. Third, the new entrants came from diverse backgrounds. Wealthy landowners started assembling produce for sale in the wholesale

[5] Impressions based on personal communications with traders. Also see Qureshi [75] for some of the points discussed here.

primary markets. Muslim immigrants were compensated for properties left in India in the form of titles to Hindu and Sikh shops, thus entering into agricultural trade. Former employees of the Hindu traders also started business on their own account. Fourth, the functions of moneylending, buying of produce, and merchandizing were not combined in one person in the new setup. The main reason for the separation of functions lies in the attitude of the new entrants. Merchandizing was considered a low profession by wealthy landowners. Moneylending, prohibited by Islam, was looked down upon in the society. Produce buying was the least objectionable outlet for investable funds. All of these forces interacted in radically altering the role of traders in agricultural markets after the partition of British India.

Government Policies on Transportation and Credit

The separation of moneylending, produce buying and merchandizing was an important element in the improvement of marketing activities in Pakistan as traders ability to manipulate price due to their triple roles if existed before, was less likely to be present now. However, another important factor was governmental policy to expand transportation and credit in rural areas.

Transportation

The role of transportation in determining market structure is important, as the cost of transportion between two markets usually determines how large the price spread can be without attracting shipments between them. Availability of cheap and easy transportation removes an important barrier in breaking up oligoposony in any particular region.

Table 2.1 presents some data on the growth of transportation facilities in rural Pakistan since 1947. During this period, rail freight more than tripled, mileage of better quality roads increased and the number of trucks rose from 823 in 1947-48 to 57,219 in 1975-76. The rapid spread of tractors in the late 1960s had also been an important factor in fostering competition in rural markets. It has increased selling alternatives to farmers, as many tractor owners started bringing produce from the farm to urban markets.

Credit

Table 2.2 gives a comparative picture of the sources of rural credit in Pakistan and India after 1947. The decline in the share of moneylenders in Pakistan is quite obvious while the moneylending class in India is still the major source of credit. The three combined categories of shopkeepers, marketing intermediaries and moneylenders account for only 6.2 percent of

Table 2.1

Some Indicators of Transportation Facilities Available in Pakistan for Selected Years since 1947-48.

Years	Rail Freight Carried Million Ton Miles	Road Mileage High[1]	Road Mileage Low[2]	Sub-Total	Trucks	Total Tractors (Imported)
1	2	3	4	5	6	7
1947-48	1408	5053	8768	13821	823	NA
1950-51	2223	6150	10176	16326	3020	NA
1955-56	2892	8038	11386	19424	14004	NA
1960-61	4129	8827	11554	20381	20472	191
1965-66	4743	10934	11902	22036	31203	1665
1967-68	5237	10704	8974	19678	34532[a]	21466
1975-76	5611	12867	8520	21387	57219	60395
1979-80	5192*	15619*	9428*	25047*	58000*	121952*

Source [75] up to 1965-66.

Pakistan [62] for the remaining years.

[1] Roads having cement concrete surface.

[2] Roads generally of stones, bricks, gravel or ordinary earth roads with drainage structure provided.

* Provisional estimates

[a] Average of 1967 and 1968.

Table 2.2

Sources of Rural Credit in the Punjab (Pakistan) and Comparison with India after Partition (1947)

Serial #	Sources	Board of Economic Inquiry Punjab (Percentage) (1951)	Socio-Economic Research Project Punjab University (Percentage) (1957)	All India Rural Credit Survey (Percentage) (1954)
1.	Relatives & Friends	63.2	62.8	14.2
2.	Well-to-do Rural People/Landlords	16.9	0.2	1.5
3.	Cooperatives	13.2	14.3	3.1
4.	Government	2.9	13.4	3.3
5.	Shopkeepers	2.5	0.4	5.5
6.	Marketing Intermediaries	-	4.7	-
7.	Money-lenders	1.3	1.1	69.7
8.	Other Sources	-	3.1	2.7

Source: Table adapted from [75].

the credit supplied in Pakistan as compared to 75.2 percent in India.

The vacuum created by the departure of moneylenders was not filled by institutional sources of credit. Cooperative societies and the government have supplied only a small fraction of total credit. Credit societies were deprived of the services of skilled managers who migrated to India. The government was slow to recognize the role played by credit in agricultural development. The gap left by the moneylenders was filled by relatives, friends and landlords. This source of credit did not have the same implications for agricultural markets as the moneylender's credit had, since farmers now did not have to make concessions in price as would probably be the case if they were to borrow from a trader who was also a moneylender.

In the 1950s government came to recognize the critical role of agricultural credit in financing investment in agriculture. Various specialized banks and institutions were designed to extend loans to farmers directly or indirectly through increased funding for credit societies. The Agricultural Development Finance Corporation was set up by the federal government in 1952. The Agricultural Bank of Pakistan was established in 1956. The two banks were merged in 1961 into the Agricultural Development Bank of Pakistan (ADBP). The increasing importance of the government in the credit field is reflected in Table 2.2, where the share of government in the supply of credit rises from 2.9% in 1951 to 13.4% in 1957. Table 2.3 shows the total credit supplied by institutional sources to the agricultural sector during 1947-78. The spectacular rise in lending by the specialized banks in the 1960s as compared to earlier periods is clearly brought out in the table.

Organization of the Marketing System

We now turn to examine the existing marketing structure in Pakistan. The information contained in this section is based on our field investigations and has been cross checked with some of the literature available on the subject.[6] Appendix A discusses the nature of the sample and the questionnaire used for this purpose.

The agricultural marketing system in Pakistan is composed of various types of exchange points where assembly, storage, and transportation are performed. The marketing process ranges from simple exchange between households at the village level to the movement of grain to rural and urban markets and to final consumers. We examine different channels of marketing of agricultural commodities, the nature of the traders involved and the process of price formation at various points.

[6] See [19, 35, 42, 44, 81] for the description of various aspects of the market structure in Pakistan.

Table 2.3

Flow of Credit to the Agricultural Sector in Pakistan from Institutional Sources for Selective Years.

(In Million Rupees at Current Prices)

Year	Agricultural Development Bank of Pakistan	State Credit Known as Taccavi Loans	Cooperative Societies	Total Credit	% of VAP(a)
1	2	3	4	5	6
1947-48	Nil	4.7	55	59.7	1.01
1950-51	Nil	7.2	70	77.2	1.30
1955-56	1.0	5.5	58	65.6	12.4
1960-61	30.9	13.7	124.5	169.1	2.06
1965-66	68.0	12.7	98.2	178.9	1.69
1967-68	106.2	13.0	129.6	242.8	1.74
1975-76	532.2	25.7*	92	649.7	1.695
1979-80	709.8	9.22	677.19	1396.2	2.12

Source: [63] for columns 2 to 5 and [62] for calculating column 6

(a) Value of agricultural product.

Marketing Channels

A substantial portion of agricultural commodities, particularly food crops, never leaves the farm; it is retained for domestic consumption, feed, seed, and payment to agricultural labour.[7] The proportion of marketed surplus in total production of various crops is difficult to estimate accurately as the quantity retained for use on each farm depends on factors such as the size of farm and family, the proportion of foodgrain in total farm production, and the proportion of hired labour. The absolute quantity retained for home use also varies from one year to another. In a year of poor crops, with consequent high price, the absolute amount brought to the market may fall, but it may go up when the harvest is bumper and prices tend to fall. The response of farmers, however, seems to vary also according to their farm sizes and storage capacities.

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[7] We will concentrate here on marketing channels involving only private traders. In the recent years, however, the government has assumed a major role in agricultural marketing. Public corporations such as The Pakistan Agricultural Storage and Supplies Corporation (PASSCO) and Rice Export Corporation buy large quantities of marketable surplus of major food commodities for local distribution and export [61]. Government procurement of agricultural commodities is done through different channels including private traders [64]. In the case of rice, however, the government intervention in marketing activities is different from other commodities such as wheat and gram. To help meet its procurement target the government maintains restrictions on movement of rice from one district to another and sometimes within a district throughout the year [106]. Such restrictions on other commodities are minimal. Again the government applies restrictions on processing of rice, which is not the case of other commodities. All these measures could influence price structure of rice, relative to other commodities, differently in different markets.

Generally, large farmers market little when prices are low and hold stocks in anticipation of future higher prices.[8]

Table 2.4 shows that on average about 56% of the wheat produced in the major wheat producing regions is sold. The proportion is as low as 27.2% for small farmers (less than 6.25 acres) and as high as 71.3% for large farmers (over 25 acres). For rice, about 70% of output is sold in the market. An important feature of the rice surplus is that, except for those districts where rice is used as a major food item a relatively greater share of output is sold even by small cultivators. The average portion held by small cultivators is 45.5%, which is approximately double the share of wheat marketed. The marketable surplus of gram, seems highly unpredictable, as it depends very much on the production of other lentil crops. In our survey, farmers were selling on average about 50% in the market.[9]

The marketed surplus moves through various channels, the simplest one involving only the farmer and the consumer, and others involving a multiplicity of intermediaries. Wheat is usually moved in unprocessed form to the consumer, whereas gram and rice are marketed both in processed and unprocessed forms.

A complete picture of marketing channels of the commodities is given in Figures 2.1 (wheat), 2.2 (rice) and 2.3 (gram). Three kinds of markets can be distinguished on the basis of

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[8] For evidence of this in the literature. See for example [66, 77].
[9] For some other studies on the proportion and nature of marketed surplus see [66].

Table 2.4

The Marketable Surplus in Pakistan: By Commodities and Farm Categories in 1980-81.*

Serial #	Farm Size in Acres (# of Respondents)	Wheat: Total Output (Maunds) (1)	Wheat: Marketable Surplus (2)	Wheat: % (2)/(1) X100 (3)	Rice: Total Output (Maunds) (1)	Rice: Marketable Surplus (Maunds) (2)	Rice: % (2)/(1) X100 (3)	Gram: Total Output (Maunds) (1)	Gram: Marketable Surplus (Maunds) (2)	Gram: % (2)/(1) X100 (3)
1.	up to 6.25 acres	5292	1440	27.22	4224	1922.0	45.50	803	207	25.77
	(Respondents)	(98)			(96)			(82)		
2.	6.25-12.5	8736	(3366)	38.53	7560	4410	58.33	1034	415	40.11
	(Respondents)	(90)			(90)			(76)		
3.	12.5-25.0	15096	7483	49.57	12358	8846	71.58	1302	678	52.05
	(Respondents)	(74)			(74)			(60)		
4.	25.0 +	14105	10061	71.33	9805	8149	83.11	1541	9.33	60.55
	(Respondents)	(40)			(40)			(35)		
Total		43229	22350	-	33947	23327	-	4680	2230	-
(Respondents)		(302)			(300)			(253)		
(Average Percentage)				36.24			74.94			50.94

Source: Field Survey Conducted by the author from December 1980 to January 1981.

*Not every farmer produced all three commodities every year.
302 produced wheat, 300 rice and 253 gram.

place of marketing and the nature of traders involved, namely:

1. Village markets;[10]
2. Primary wholesale markets (hereafter referred as either primary markets or wholesale markets); and
3. terminal markets.

We will now discuss the features of these markets in some detail.

Village Markets

Village markets are often situated close to farmgate, generally in a small town, where the major portion of the marketable surplus is brought by farmers. A village shopkeeper or an itinerent dealer acts as a buyer in these markets. Most of the transactions involve small quantities of agricultural produce. A part of the product is purchased by small retailers who in turn sell it to the nonfarm population or back to cultivators in the off-season. Traders in village markets are not approved by any government agency, although in some cases town committees created by the local self-government system have started charging an entry fee from traders. Usually, no systematic record of transactions is maintained by traders. The price formation process is very simple. Direct negotiation between the village trader and the cultivator settles the price.

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[10] The term 'market' (and markets) in this study refers to a particular location where buying and selling of any commodity takes place, unless otherwise specified.

Figure 2.1

Marketing Channels for Wheat in Pakistan
1980-81

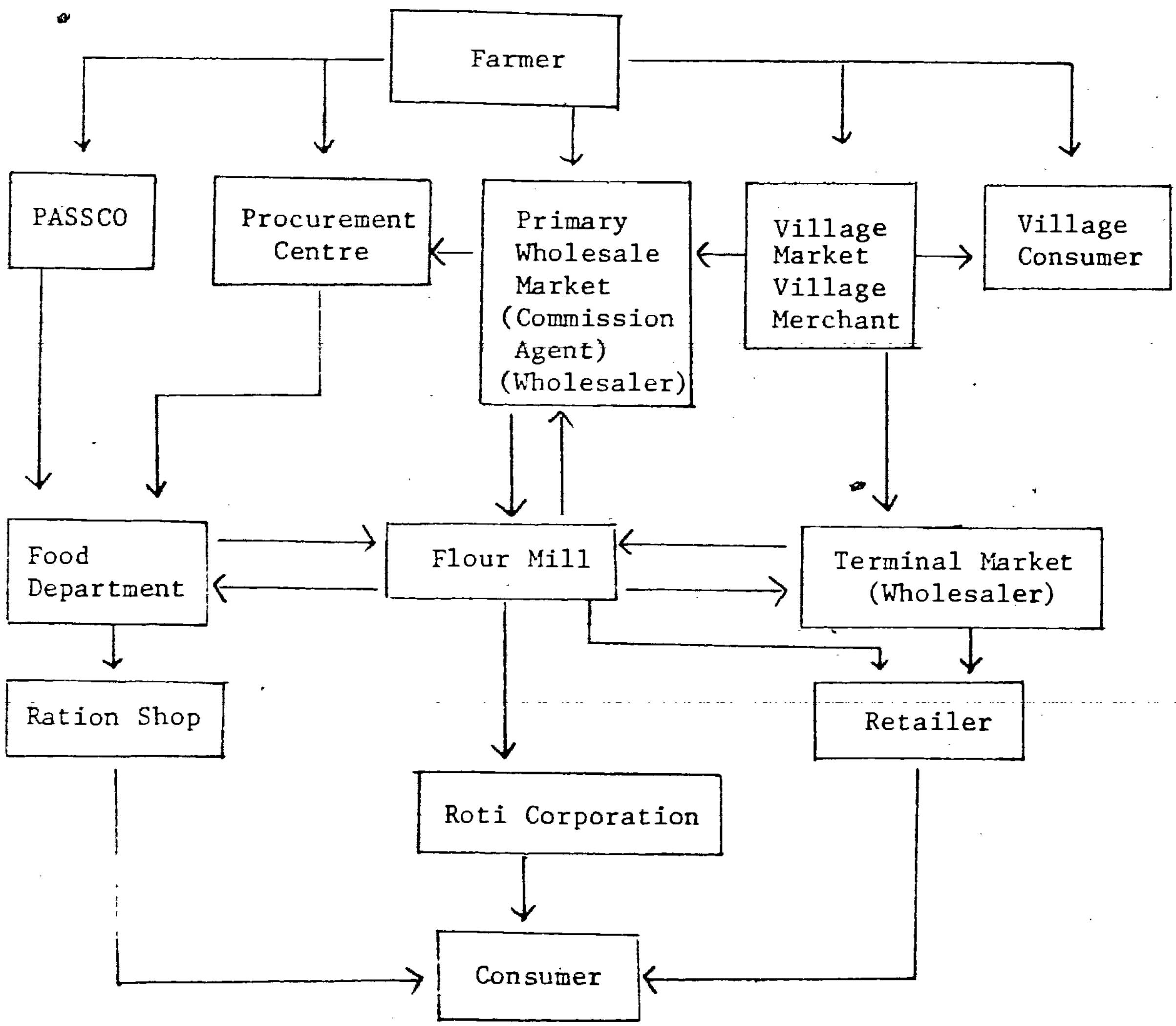


Figure 2.2

Marketing Channels for Rice in Pakistan
1980 - 81

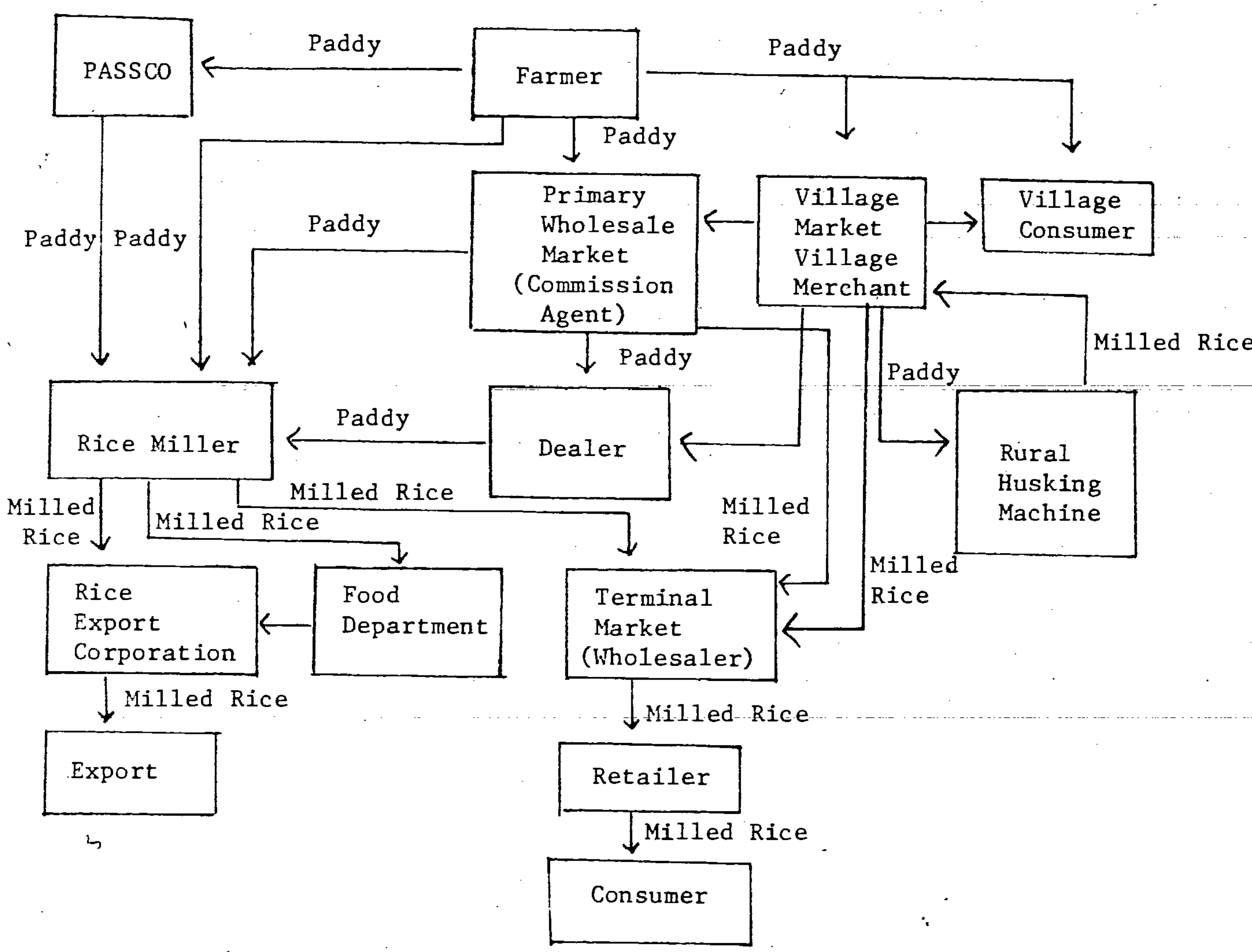
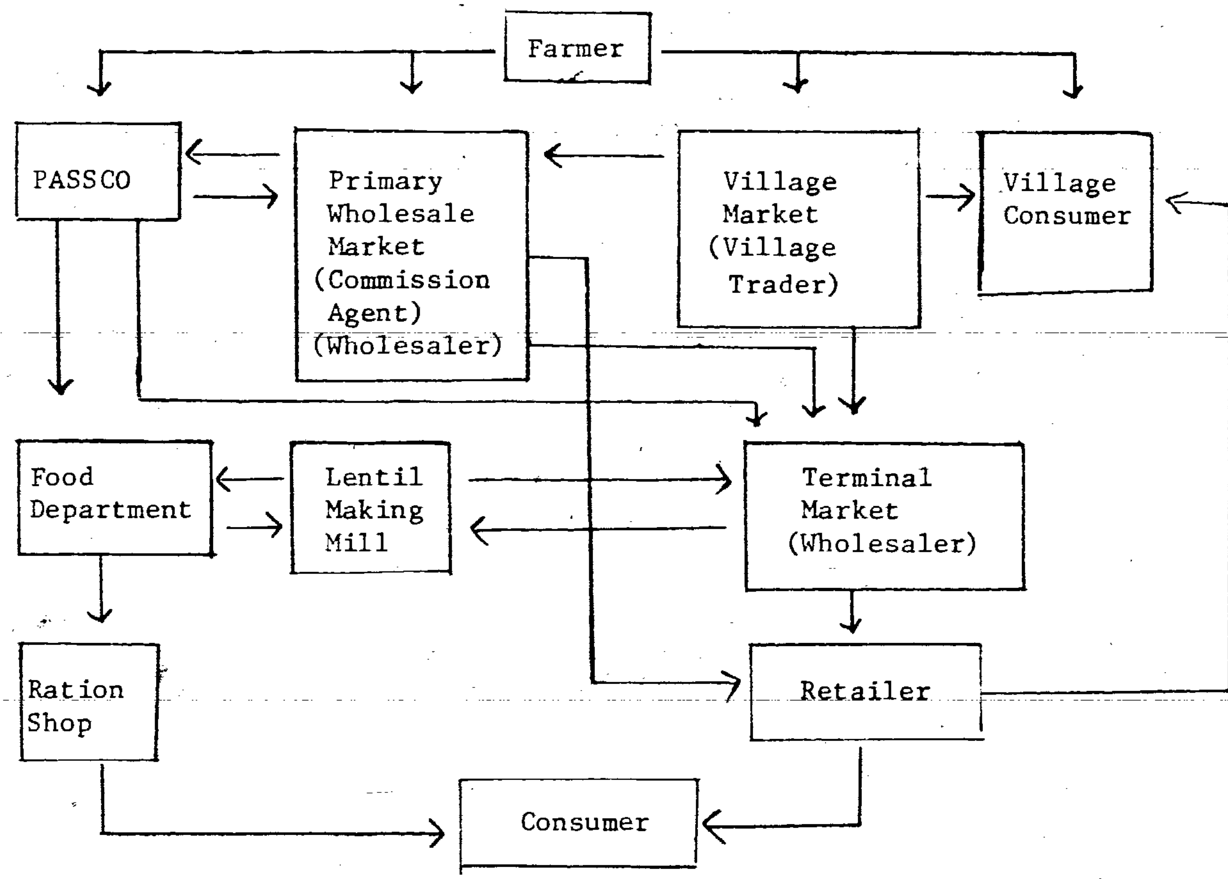


Figure 2.3

Marketing Channels for Gram in Pakistan
1980-1981



Since the quantities involved are small, a farmer may not mind small price differentials (compared to wholesale market) if he can buy his requirements by selling a part of his produce in these markets.[11] However, for larger quantities farmers prefer to go to wholesale markets, or at least try to compare prices with those markets before striking a deal.

Village markets were important in the first few years after Independence. More recently, due to better transport facilities and availability of larger quantities of marketable surplus, it has become feasible to take produce to wholesale markets. A large portion of the commodities under study are sold in the primary wholesale markets. Our survey results summarized in Tables 2.5 to 2.7, reveal that farmers with larger quantities of marketable surplus generally sell in the primary markets or to the mills. This is true for all three commodities under study. However, rice is more often sold in primary or terminal markets or mills. Farmers with small holdings, who have a relatively smaller proportion of output to sell, prefer to do so at village level. On average, about 60% of the farmers sold their wheat outside village markets, whereas about 65% of them did so for rice. The corresponding figures for gram was only 45%. From the same table, we can see that usually small and medium size farmers sell in a village market or to itinerant dealers. In Table 2.3, we saw that such farmers have a relatively smaller proportion of their output to sell in the market. We may,

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[11] See Chapter IV of this study for analysis of the market margins earned by the traders in these markets.

Table 2.5

Sale of Marketable Surplus of Wheat in Pakistan, 1980-81.[1]

The Number and Percentage of Farmers selling to:

Farm Size (Acres)	Village Traders or Consumers (Only)		Traders in the Primary Market (Occasionally but usually in the Village Market)		Traders in the Primary Market (Only)		Terminal Markets (Occasionally)		Terminal Markets (Usually)		Government Agencies or Mills (Occasionally)		Government Agencies or Mills (Usually)	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
To 6.25	23	(23.5)	41	(41.8)	29	(29.6)		-(0)		-(0)	5	(5.1)		
6.25 - 12.5	10	(11.0)	29	(32.92)	39	(42.85)	2	(2.20)		-	10	(11.0)		
12.5 - 25.0	3	(4.05)	13	(17.57)	31	(41.89)	3	(4.05)	5	(6.75)	10	(13.51)	9	(12.16)
25.0 +	0	(0)	5	(12.5)	11	(27.5)	4	(10.0)	6	(15.0)	5	(12.5)	9	(22.5)
Total Farmers = 302 (100%)	36	(11.92)	89	(29.14)	110	(36.42)	9	(2.98)	11	(3.64)	30	(9.93)	18	(5.96)

[1] We may mention that since farmers did not remember exactly how much they sold to various categories of markets they were asked to state 'either', 'only', 'usually' or 'occasionally' they sold to a particular category.

Table 2.6

Sale of Marketable Surplus of Rice (Basmati) in Pakistan, 1980-81.*

Commodity	Farm Size (Acres)	The Number and Percentage of Farmers selling to: Village Traders or Consumers (Only)		Traders in the Primary Market (Occasionally but usually in the Village Market)		Traders in the Primary Market (Usually)		Terminal Markets (Occasionally)		Terminal Markets (Usually)		Government Agencies or Mills (Occasionally)		Government Agencies or Mills (Usually)	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%
Rice	up to 6.25	17	(17.71)	32	(33.33)	34	(35.42)	0		0	0	7	(7.29)	6	(6.25)
	6.25 - 12.5	5	(5.55)	29	(32.22)	32	(35.55)	4	(4.44)	3	(3.33)	5	(5.55)	12	(13.33)
	12.5 - 25.0	2	(2.70)	20	(27.03)	29	(31.19)	3	(4.05)	4	(5.40)	3	(4.05)	13	(17.57)
	25.0 +	0	(0)	6	(15.0)	13	(32.5)	3	(7.50)	2	(5.0)	4	(10.0)	12	(30.0)
	Total Farmers = 300 (100%)	24	(8.00)	87	(29.00)	108	(36.00)	10	(3.33)	9	(3.00)	19	(6.33)	43	(14.33)

*We may mention that since farmers did not remember exactly how much they sold to various categories of markets, they were asked to state 'either', 'only', 'uusually' or 'occasionally' they sold to a particular category.

Table 2.7

Sale of Marketable Surplus of Gram in Pakistan, 1980-81.*

Farm Size (Acres)	The Number and Percentage of Farmers selling to; Village Traders or Consumers (Only)		Traders in the Primary Market (Occasionally) but usually in the Village Market		Traders in the Primary Market (Usually)		Terminal Markets (Occasionally)		Terminal Markets (Usually)		Government Agencies or Mills (Occasionally)		Government Agencies or Mills (Usually)	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%
up to 6.25	27	(32.93)	36	(43.90)	19	(23.17)	0	0	0	0	0	0	0	0
6.25 - 12.5	15	(19.74)	31	(40.79)	30	(39.47)	0	0	0	0	0	0	0	0
12.5 - 25.0	6	(10.0)	21	(35.00)	26	(43.33)	3	(5.0)	1	(1.66)	2	(3.33)	1	(1.66)
25.0 +	1	(2.86)	9	(25.71)	13	(37.14)	2	(5.0)	3	(7.5)	2	(5.0)	5	(8.33)
Total Farmers = 253 (100%)	49	(19.36)	97	(38.34)	88	(34.78)	5	(1.97)	4	(1.58)	4	(1.58)	6	(2.37)

* We may mention that since farmers did not remember exactly how much they sold to various categories of markets, they were asked to state 'either', 'only', 'usually' or 'occasionally' they sold to a particular category.

therefore, conclude that, contrary to the assumption in some of the earlier studies, a major portion of the marketable surplus is sold in the primary market and not in the village market.[12]

Furthermore, a village market of today has very little resemblance to the rural market in pre-Partition days, when the moneylender/ merchant was the principal dealer. At that time, farmers were in many cases forced to sell at the village level as they were fettered in debt. Now a farmer chooses to deal with village traders in three main circumstances: when he has a small amount of marketable surplus; when in the early stages of a harvesting season, he has to sell a limited quantity to fulfill his immediate cash needs; and with relevant price information in his hands, he may still sell in a village market out of sheer convenience or favour to a trader belonging to his own village. In all other circumstances, given easier access to transport facilities, primary markets or other lternatives (like selling directly to the mills) are used.

In Table 2.8 and 2.9, we have presented the reasons given by farmers for selling at the village level. On average, 49.17% of the farmers sold to village traders because of small quantities of surplus. About 38% of them did so because they found practically no difference in the prices offered by village traders and others. Traditional reasons such as 'credit ties'

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[12] According to some of the earlier studies village markets handle relatively lesser share of marketable surplus. See for example Ahmad [1] and Qureshi [75]. A recent study by Agricultural Ministry of Pakistan however found proportion of marketable surplus and the agencies to which it was sold similar to our findings. See [65, 66].

Table 2.8

Summary of Reasons for Farmers to sell their Marketable Surplus to a Village Trader in Pakistan.

The number and percentage of farmers who gave these reasons:

	Reasons	Farm size up to 6.25	6.25 - 12.5	12.5 - 25.0	25.0 +	Over all (%)
		# %	# %	# %	# %	# %
1.	Small marketable surplus.	51 (52.04)	38 (41.76)	37 (50.0)	23 (57.5)	(49.17)
2.	Small price differences at the village markets compared to city markets.	39 (39.8)	34 (37.36)	23 (31.08)	19 (47.5)	(37.95)
3.	High market charges.	18 (18.37)	14 (15.38)	8 (10.81)	3 (7.5)	(14.19)
4.	Credit ties.	26 (26.53)	20 (21.97)	14 (18.91)	7 (17.5)	(22.11)
5.	Social ties.	18 (18.37)	25 (27.47)	37 (50.0)	29 (72.5)	(39.93)
6.	Lack of time.	20 (20.41)	22 (24.18)	17 (22.97)	17 (42.5)	(25.08)
7.	Clash between sale and sowing time of other crops.	11 (11.22)	7 (7.69)	5 (6.76)	3 (7.5)	(8.58)
8.	To avoid transportation problems.	36 (36.73)	22 (24.17)	18 (24.32)	8 (20.0)	(27.72)

Source: Survey conducted by the author in 1980-81.

Table 2.9

Summary of Reasons for Farmers to sell their Marketable Surplus in a primary wholesale market in Pakistan.

The number and percentage of farmers who gave these reasons:

Reasons	Farm Size up to 6.25	6.25 – 12.5	12.5 – 25.0	25.0 +	Over all (%)
1. Have to buy inputs from the Arhatyas.	5 (5.10)	8 (8.79)	7 (9.45)	7 (17.5)	(8.91)
2. Better price expectation.	63 (64.29)	57 (62.64)	48 (64.86)	29 (72.5)	(65.02)
3. Better transportation facilities.	41 (41.83)	54 (59.34)	41 (55.41)	34 (85.0)	(56.11)
4. Credit ties (Arhatyas)	18 (18.37)	29 (31.86)	34 (45.95)	25 (62.5)	(34.98)
5. Social Ties (Arhatyas)	12 (12.25)	17 (18.68)	27 (36.48)	22 (55.0)	(26.73)
6. Easy availability of cash from the markets.	17 (17.35)	12 (13.18)	18 (24.32)	13 (32.5)	(19.80)
7. Non-availability of any village trader.	8 (8.16)	5 (5.49)	4 (5.41)	2 (5.0)	(6.27)

Continued on the next page.

Table 2.9 (cont'd)

Summary of Reasons for Farmers to sell their Marketable Surplus in a Primary Wholesale Market in Pakistan

Number and percentage of farmers who gave these reasons.

Reasons	Farm Size up to 6.25	6.25 - 12.5	12.5 - 25.5	25.0 +	Average Total %
8. Village Traders cheat in weighing and pricing.	3 (3.06)	2 (2.20)	1 (1.35)	1 (2.50)	7 (2.31)

Source: Survey conducted by the author in 1980-81.

seem to have very little impact on their selling options, which goes against the long-held view that farmers usually sell to the village and other dealers because of their indebtedness.[13] Only 22.11% gave this reason for selling to village traders.

In Table 2.9, we have also summarised the reasons offered by farmers for selling in primary markets and not in village markets. A majority did so on the basis of better price expectations in primary markets relative to the village market. Availability of relatively better transport facilities was the next most important reason given by about 56% of the farmers. Both these reasons should dispel a commonly held view that traders in these markets cheat farmers by offering them a low price [44]. Also, a majority of farmers find it easier to go to primary markets as they believe they can arrange transportation more easily. A likely reason is the availability of tractors as a means of transportation. In the past farmers had to either contract out to professional movers or depend on their ox-driven carts, which were very slow and expensive. It is interesting to note that there were only a few (2.3%) who thought that village traders would cheat them either in weighing or pricing their produce.

The results of the survey indicate that primary wholesale markets are more important than village markets.

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13 This is the view expressed in studies like India [33], and Qureshi [74]. However contrary to this view we were told by several farmers of traders borrowing from wealthy landowners on regular basis.

Primary Wholesale Markets

Primary wholesale markets are usually located in district towns or in major sub-divisional towns such as Jaranwala in the Faisalabad district. As noted in Chapter I, most of the markets selected are located in areas which produce large quantities of marketable surplus. They are the main assembly points for the marketable surplus of surrounding areas.

Primary wholesale markets have better storage, transportation, communication and working conditions for both buyers and sellers than those at the village level. Since many of these markets are located in specially zones areas permanent offices and auction floors have been built by traders who hold official permits for their activities. Almost every trader (commission agent) has facilities to store produce for a few days (free of cost) or for longer periods for a nominal charge. Some Commission agents also provide lodging and dining facilities to farmers and village traders. In these markets, arrangements also exist to settle disputes over pricing and weighing of produce, over market charges and other market practices. A Market Committee oversees the activities of traders in each market.[14] Traders are required to keep records of their transactions and report them to Market Committees. Market

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[14] Such market committees were originally created by a statute known as the Agricultural Product Market Act enacted in 1939 in the undivided Punjab. In 1964, the Government of Pakistan extended it to the whole country after certain amendments. For details of this Act see [3, 44].

functionaries such as weighing men, who play a major role in the orderly completion of a transaction are also registered with the Market Committees. This policy has reduced the possibility of over or under-weighing, which was one of the problems of the pre-Partition marketing system. [3] Furthermore, the weighing system in most markets has been revolutionized in recent years. Until recently, manual scales were used, i.e. they required one person taking the scale in his hand to weigh the produce, which usually led to disputes. Now semi-automatic scales are used, which make it much easier for the parties involved to observe weights without outside assistance. Consequently, the role of weighing-man is now no more than putting bags of produce on the weighing machine and dictating total weight to recording clerks. Finally, these markets usually have transport companies located either inside or adjacent to the premises, which makes it easier for farmers and traders to move their produce to other markets where the price may be higher.

Market Intermediaries

Primary markets transact a large volume of business every day, brought here by the farmers, village traders and traders from other primary markets. There are three types of traders who operate, apart from local consumers and retailers who can also buy from farmers and village traders. They are known as Selling Agents (Kacha Arhatyas) and Buying Agents (Pacca Arhatyas). A generic term, "Commission Agents", is also used for all of them. However, a significant difference exists in the nature of the activities of each type of commission agent. A *Kacha Arhatya* usually provides selling services to village traders and farmers who bring their produce on his shop, and gets a certain percentage of total sales as his commission or *arhat*. This commission is fixed by Market Committees, and is allowed for providing the auction floor to display a seller's produce and helping the agent to find the highest bidder. The selling agent also provides weighing, bag-filling, loading, and unloading facilities, for which separate charges are collected from the sellers.

Buying Agents, on the other hand, play more than one role. They are usually well established traders and buy a major part of the produce either for themselves or for others. They act as agents for the mills and traders in other (usually terminal) markets. In this way, they get a commission from those for whom they work. They also act as wholesalers for local retailers. Moreover, they keep major stocks of foodgrain, both for intermarket and intertemporal arbitrage. Stock taking is done by all kinds of traders in these markets, however in view of more quantitites of marketable surplus purchased by Buying Agents than Selling Agents, the former is expected to hold relatively more stocks. The exact volumes of stock held at different levels of marketing in Pakistan is difficult to determine because of traders reluctance to release such information and lack of data on stocks held by farmers.

All these traders, agents of the flour mills, and outside traders along with local consumers and retailers, indicate demand for any agricultural commodity on a particular day. They move around different shops, where the produce is kept in bags or in open spaces in front of each shop and buy their desired quantity. In most of these markets, open bidding methods are used to settle the price. However, in some places bidding through a piece of a paper is also observed. In any case, the transaction takes place only if the highest bid is acceptable to the seller. This has decreased the use of old practices, like the sign language and undercover pricing methods.[15]

Terminal Markets

Terminal markets are generally situated in large urban centres. Karachi and Rawalpindi are the best examples of this kind of market. Most of the marketable surplus of agricultural commodities, is ultimately routed to these markets. Foreign trade is another reason for the flow of the marketable surplus to Karachi. Traders in terminal markets are usually wholesalers who supply grain to mills for processing and to retailers. The

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[15] In the past the traders used to settle the price by putting their hands under a cover and using some sign language which was not known to the farmers. This method is prohibited now by market committees. However A. Ali [3] in his survey of markets in the early sixties found that in about 20% of the cases prices are still settled by sign language.

majority of traders are Buying Agents, who buy from other markets through their agents or directly when produce is brought there from other regions. These markets are the best well-equipped in the country. Since traders here are well established and depend on supplies from other markets, they have access to all the modern facilities for approaching their agents in lower level markets. Many traders have their own trucking companies. Telegraph and telephone services are easily available.

Other Marketing Channels

We have so far dealt with three channels of marketing which are traditionally considered to be the most important links in the agricultural marketing system of the country. Also, these are the only three channels for which data and information are generally available. One of the least explored marketing channels in Pakistan, however, is the exchange between a cultivator (or village trader) and the urban consumer. During the course of our survey a large number of village traders (particularly those dealing in rice) revealed that they sold a significant portion of their produce directly to city consumers or retailers. This practice has several implications. First, it identifies the people who keep stocks of foodgrains other than the traditionally perceived traders like wholesalers. Many consumers who buy in bulk also sell to other consumers in urban areas when profitable opportunities arise. Second, such marketing outlets enable cultivators and village traders to overcome official restrictions on selling commodities like rice in the open market. Third a major portion of marketed surplus may not pass through a large chain of middlemen. It is quite possible that a significant portion involves just one or two intermediaries. For our purpose, however, the "visible" channels of marketing are more important.[16]

Intermarket Arbitrage and Flow of Information

So far we have examined various channels of marketing agricultural commodities and the role played by different functionaries within a particular market. Before closing our discussion on this aspect, it is important that we look at the nature of intermarket flows of these commodities, the role played by traders in such flows, and the way information about market conditions is disseminated.

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[16] Recently, government agencies such as the Provincial Food Departments, Pakistan Agricultural Storage and Supplies Corporation (PASSCO), and ration shops have become important channels through which a significant amount of "essential" foodgrain items reach consumers. However, for most of the period covered by this study (1955-1979), all the major agricultural commodities, except rice (Basmati), were handled by private marketing systems, and government agencies bought their desired stock from the markets. For further comments on this point see Chapter 7 of this study.

Role of Intermediaries in Intermarket Flows

The village trader's primary job is to assemble produce from rural areas and take it to primary or terminal markets. Because his scale of operation is small he plays a relaively small role in inter-market flows.

Flows between primary and terminal markets are significant in influencing prices at every level. Some primary markets are relatively more important because they are assembly points for smaller primary markets. We may distinguish them by calling them 'assembly markets'. In the Punjab, for example, Lahore, Faisalabad, and Multan and in Sind, Hyderabad, Nawabshah and Sukkar, are prominent "assembly markets." They attract customers from terminal markets who make their purchases in three different ways:

1. Traders from terminal markets visit these markets in harvest season because of their reputation as assembling centres. These visits usually cause a bullish tendency in the market.
2. The assembly markets receive orders from terminal markets for large-scale purchases. Traders in the "importing" markets (terminal markets) make a careful survey of price quotations received from assembly markets. There is usually keen competition among assembly markets for orders from terminal markets. This keeps prices in assembly markets at par with one another. If a price quotation from the next assembly market is slightly lower, an "importer" usually

shifts to that market. The price level in small markets is determined mainly by the prices prevailing in the nearby assembly markets. Both cultivators and village traders would take their produce to the assembly market if the price in that market offers a profitable opportunity.

3. Traders in terminal markets advise their agents in assembly markets to purchase produce on their own account to be shipped to them later in the season. This requires mutual trust between a trader and his agent. For this reason, traders in the assembly and primary markets are induced to ~~work on a competitive basis.~~

Flow of Market Information

Practices adopted by traders to get information about other markets have an important bearing on the intermarket mobility of products and on prices. In Pakistan, personal contact is the most important source of such information. Although crop production and prices are reported in newspapers and are broadcast on radio, heavy reliance is placed on information gathered through personal contact. Traders in primary markets get information about crop conditions by talking to cultivators.

In order to establish trading contacts, traders in primary and terminal markets send their agents to various major markets. They collect first hand information on crop outlook and demand conditions in important centres. This is one of the old practices which is still very widely used. Once such contacts are established, there is mutual understanding about the free exchange of market intelligence. Traders in some markets also use postcards, telegrams and telephone to maintain their contacts with traders in other markets.

Movement of fellow traders is another source of information. Every trader in a primary market is on the look-out for any order that his fellow traders may receive from other markets. If he notices a heavy order from a particular terminal market, he would usually contact his own counterpart in that market to get similar orders.

However, the overall condition of market intelligence in Pakistan is not very encouraging. Use of personal contact remains the dominant source of information. Other sources such as newspapers, radio and T.V. are either not very reliable or under-utilised. Very little responsibility is shown in collecting prices for reporting purposes. As a result, neither traders nor cultivators put much reliance on media information. Similarly, the communication system, particularly telephone service, is not very efficient. In primary markets, there are many traders who do not have their own telephone and those who have this facility face numerous difficulties in approaching traders in distant centres due to lack of direct lines to such places.[17] Poor communication facilities explain to some extent why many underdeveloped countries lack futures markets and quick

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[17] We were told that it took two to three years to get a phone connection in some cases.

intermarket arbitrage, which is commonly observed in developed countries.

3. Findings Related to the Structure of Markets in Pakistan

Whether existing market practices lead to an efficient marketing system will depend to a great extent on factors such as the number of traders operating in various markets, conditions of entry to the trade, and the ability of some traders to influence prices through their share in total sales. All these factors are usually cited among the major determinants of performance of any marketing system [6]. However, we examine these factors here as preliminary information to evaluate the competitiveness of market structure. Statistical tests will be used in Chapters III, IV and V.

Number of Traders

Although the number of traders is not considered to be one of the central characteristics of a particular market structure, traders in general behave more independently of one another when their members are large. Alternatively, a policy of collusive behaviour becomes relatively difficult to achieve as the number of traders increases.

Table 2.10 shows the number of traders (both selling and buying agents) in various markets for selected periods. It is

Table 2.10

Number of Trades (Commission Agents) in Major Primary Markets of Pakistan for Selected Years

Years	Faisal-abad (FD)	Gujran-wala (GA)	Hyder-abad (HD)	Lahore (LR)	Multan (MN)	Okara (OK)	Pesha-war (PR)	Sahi-wal (SL)	Sargo-dha (SG)	Sial-kot (ST)	Average
1950-51	50	36	40	95	61	35	40	51	39	51	48
1955-56	66	47	54	113	79	50	51	66	55	68	65
1960-61	93	68	68	148	105	62	60	85	72	92	85
1964-65	143	112	86	174	141	77	75	117	97	112	112
1965-66	128	97	71	148	126	67	70	98	85	90	98
1966-67	145	110	83	173	140	79	77	118	93	115	113
1967-68	169	128	104	194	159	98	94	138	112	135	133
1968-69	190	151	121	215	175	118	113	158	129	153	154
1969-70	248	170	132	232	191	130	125	176	143	171	169
1970-71	206	164	123	210	178	118	99	159	128	158	155
1971-72	185	142	105	201	166	107	89	145	119	147	141
1975-76	224	171	140	248	198	128	107	168	137	171	169
1979-80	256	191	201	282	224	147	125	189	158	195	192

Source: Survey conducted by the author in 1980-81 evident from this table that the number of traders (i.e. potential competitors) is large. This number has increased over time with the exception of recession years such as 1965-66 and 1971-72. An important item to note is the relatively greater increase in the number of traders after 1967-68 compared with the earlier period. This may be due to a dramatic increase in production of two main agricultural commodities, wheat and rice, since 1967-68, providing profitable opportunities. This, of course, was made possible by "easy" entry conditions which prevailed in these markets.

Entry Into Trade

In general, there are three kinds of factors which may restrict entry: social, governmental and financial.

In agricultural markets in Pakistan, social factors were thought to be relatively more important before 1947, due to caste barriers or hostile business tactics of the existing traders. However, no such picture emerges when we look at Table 2.11 showing the distribution of traders by communities in different markets in Pakistan in 1981.[18] An important aspect of

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[18] It may be mentioned here that even today in most parts of the Punjab and Sind people are known by their castes which are based on the professions with which their families were associated in the past. A person belonging to a shoemaker's family will be called by his family profession even if he has moved to some other trade. Such a classification is contrary to Islam, the dominant faith of the people of Pakistan, and is a remnant of the Hindu social structure, of which Pakistan was part only 35 years ago.

Table 2.11

Breakdown of Traders by Caste or Communities[1] in Selected Agricultural Markets in Pakistan, 1980.

Caste or Community	FBD	GA	HD	LR	MN	SL	ST	Markets	Percent
	Markets								
1. Sheikh or Khoja	3	2	2	3	2	2	3	17	15.60
2. Jat	2	2	0	1	2	2	1	12	11.01
3. Pattan	0	0	2	2	1	1	1	7	6.42
4. Aranyin	3	0	0	3	1	4	1	12	11.01
5. Teili	2	2	0	[illegible]	1	0	2	8	7.34
6. Kumhar	1	1	0	1	0	1	2	6	5.50
7. Lohar or Burhaie Burhaie	1	1	0	0	0	0	2	4	3.67
8. Mochi	0	1	0	1	0	1	1	4	3.67
9. Machoe	0	1	0	1	1	1	1	5	4.58
10. Hindi	0	0	2	0	0	0	0	2	1.83
11. Kashmiri	1	2	1	2	1	0	2	9	8.26
12. Awan	1	0	0	1	1	1	1	5	4.59
13. Others	2	1	5	3	3	2	2	18	11.01
Total	16	13	12	19	13	15	21	109	100.00

Source: Personal Interview with traders in different markets.

[1]Out of these communities, Sheikh (Khoja) and Hindu (Banyia) are traditionally regarded as business communities; whereas Jat, Awan, Aranyin and Pattan are among the farming caste. Lohr (Barhaie), Mochi, Teili and Macheg belong to the rural farm workers' community.

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this distribution is that the majority of traders come from those communities which are generally considered to have no association with the 'trading profession'. Of the 109 traders interviewed the family profession of ten were shoemaking or carpentry, 10 were pottery-makers, and part-time grain movers in their village, 13 came from families who are called 'teli' (edible oil sellers), which is a job done by some part-time farm workers to supplement their income. There were 40 who used to be farmers themselves, and 25 who still have their families operating their farms. There were only 30 commission agents who came from families traditionally associated with retail or wholesale trades.

A comparison of the distribution of traders in Pakistan with that in Maharashtra State of India is presented in Table 2.12. It reveals that in India one or two major communities still control this trade. Very few of the traders come from farming communities, or professions which are traditionally not related to the business class.

The composition of traders in Pakistan, therefore, reveals a relatively greater social freedom of entry and, the existence of both vertical and horizontal mobility in the agricultural marketing system. People from all backgrounds were able to enter agricultural trade.

Governmental restrictions in Pakistan come through the issuance of licences to traders, which are available to everyone who applies. Thus, in practice it is not a restriction.

Table 2.12

Breakdown of Traders by Caste or Communities in Primary Markets of Maharashtra (India), 1969.

		Markets						
Caste or Community	Latur	Parli	Parbhani	Nanded	Sailu	Jalna	Total	%
1. Marwari	79	35	18	43	30	121	326	39.90
2. Gujrathi	12	4	6	6	10	38	76	9.30
3. Vani	60	18	6	0	4	4	92	12.6
4. Jain	2	0	16	0	4	0	22	2.69
5. Komti	3	0	0	20	0	0	23	2.82
6. Musleman	5	3	0	0	0	5	13	1.59
7. Elam Reddi	14	0	0	0	0	0	14	1.71
8. Maratha	77	22	15	10	16	19	159	19.47
9. Rajput	5	0	0	7	0	0	12	1.47
10. Brahmin	5	5	4	2	3	0	19	2.33
11. Dhaugar	1	0	2	0	0	0	3	0.36
12. Mali	3	0	0	0	0	0	3	0.36
13. Teli	1	0	0	0	0	0	1	0.12
14. Tamilian	1	0	0	0	0	0	1	0.12
15. Cooperative Societies	15	2	0	2	0	0	19	2.32
16. Other	0	4	4	22	4	0	34	4.16
Total	283	93	71	112	71	187	817	100%

Source: Lele [48]

Financial requirements are often the most stringent limits on entry to any industry. In the case of agricultural markets in Pakistan, this restriction is not operative. According to some traders, whom we interviewed, practically no capital was required to be a selling agent about twenty years ago. The goodwill of an individual trader or his family was enough to attract customers from rural areas, who not only would sell through their favorite trader but also let him use their cash revenue for a limited period. This happened because for a farmer the trader was a very important social link in the city, which he could utilize for lodging and dining needs and for emergency loans.

More recently, however, the social link is on the decline because of other alternatives such as hotels for lodging and banks for loaning which are now more easily available to farmers and also because of the rapid transformation of agriculture from basically a subsistence-oriented to surplus-creating activity. Capital requirements, however, have increased significantly over time. Due to changes in technology, fixed capital requirements have particularly increased in recent years.[19] Fixed assets such as automatic weighing machines, steel-made safety lockers, telephone sets, and some modern furniture have all become necessary items. In some cases, one might have to pay a large sum to buy the goodwill of a particular firm. Generally, the price of goodwill of an average firm may not exceed a few

[19] See Table 2.13 below.

Table 2.13

The Nature of Fixed Costs in Operating a Commission Agency in a Primary Agricultural Markets in Pakistan 1980-81.

Components of Fixed Costs	Amount in Rupees	%
1. Furniture[1]	1000.00	6.02
2. Safety-locker	1200.00	7.23
3. Scale	300.00	1.81
4. Jute-bag[2]	1000.00	6.02
5. Telephone	600.00	3.61
6. Permanent[3] Worker	6000.00	36.14
7. Shop Rent	500.00	3.01
8. Cash in Hand	5000.00	30.12
9. Miscellaneous	1000.00	6.02
Total	16600.00	100.00

[1] Furniture usually includes a few chairs, a table and some carts (for the occasional use of traders).

[2] About 200 on average.

[3] Permanent labour force includes only one 'Palledar' (loader/helper). Other labour services can be hired as and when needed.

Source: Personal interview with traders in selected markets in 1980-81.

hundred rupees.

Table 2.13 provides a breakdown of the fixed costs to open a commission agency in a primary market in 1981. These are average estimates based on our survey. Total fixed cost of Rs. 16,600 (approximately U.S. $1400) required to enter this trade is not a very large amount, compared to other alternatives such as manufacturing or foreign trade.

Financial constraints, however, tend to be more severe for the new entrants when judged from the point of view of their ability to raise capital from external sources (i.e. financial market). In this case, the new entrants are put into a relatively less competitive position and may be forced out of business. However it is ironical to note that very little opportunities exist for most traders to borrow from the financial market. They usually borrow from their own sources, such as friends, relatives and in many cases wealthly farmers, who allow them to defer their payments of sale proceeds for a limited period, either free of interest or for such benefits as occasional lodging and dining facilities.

Traders who can borrow from the financial market, however, are very likely to reap economies of scale more than their competitors, and thus can gain a larger share of the market. In our survey results, presented in Table 2.14, we found that most of the traders relied on their own funds, and borrowed capital was less than 25% of the total capital used. There were only 16.9% of traders whose share of borrowed capital was between 25

Table 2.14

The Proportion of Borrowed Funds in the Total Capital Use of Traders in Selected Primary Agricultural Markets of Pakistan, 1980-81.

Proportion of Borrowed Capital	FBD	GA	HD	LR	MN	SL	ST	All Markets	Percentage
0 - 10%	7	7	5	7	5	7	8	46	42.20
10 - 25	5	4	2	9	5	4	7	36	33.03
25 - 40	2	3	2	3	2	3	3	18	16.51
40 - 50	1	1	1	3	1	0	2	9	8.26
50 +	0	0	0	0	0	0	0	0	
Total # of Traders	15	15	10	22	13	14	20	109	100.00

Source: Personal interviews with traders in 1980-81.

to 40% and 8.12% of them used 40-50% borrowed funds. Not a single trader was found to have borrowed more than 50% of his total outlay.

Two main factors can explain this situation. One of them obviously is the relatively limited availability of such funds from commerical banks at rates acceptable to traders, as the banks usually hesitate to lend outside the relatively advanced sectors of industry and foreign trade. Secondly, most of the traders do not like to expose their trading activities such as keeping of stocks to others, for fear of government inspections and checks.[20] Dealing with the state-owned banks, and particularly borrowing from them, could result in such an exposure.

As far as village traders are concerned, their major costs are on a few jute bags, scales and weights and some means of transportation to move around in rural areas. The most important factor determining entry into trade at the village level, therefore, is entrepreneurial ability which depends on several factors in a village setting. Educational level, family background and composition, and the nature of land-holding are some of these factors. Since these barriers are apparently not the creation of agricultural markets, we do not consider them "barriers to entry".

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[20] Governmental inspection is disliked since most traders try to avoid taxes.

Distribution of Sales Among Traders

One of the important criteria applied very widely in identifying market structure is the distribution of sales among traders in an industry [8]. A competitive market structure is characterized by the existence of traders enjoying only a small share of the total business such that any change in price by the individual trader should have an insignificant effect on the price-quantity decisions of other traders. A certain degree of monopolistic power will be enjoyed if, other things being equal, only a few traders control a major share of total sales. Concentration ratios or the ratio of individual firm's sales to total sales of an industry is one of the widely-used measures to estimate degree of monopoly power.

Table 2.15 presents the percentage of wheat, rice and gram purchased by different categories of traders in various primary markets of Pakistan during 1973-1976. Data on sales were collected from the weekly reports of Market Committees.

In Table 2.15 are presented the shares in total sales of three main commodities enjoyed by the top five and top twenty firms in ten major markets of Pakistan. It is apparent from these sales ratios that the distribution of sales is not symmetrical. In some cases the top five firms control as much as 25% of total sales of a commodity like gram. Similarly, the top twenty firms are found to control a minimum of 35% of total sales of wheat. In the case of gram, the sales ratio of the top

Table 2.15

Distribution of Sales of Various Commodities in Major Agricultural Markets of Pakistan (1973-74 to 1975-76).*

Markets	Top 5 Traders as % of Total # of Traders	% of Sales of Wheat Handled by (1)	% of Sales of Rice (Paddy) Handled by (1)	% of Sales of Gram Handled by (1)	Top 20 Traders as % of Total # of Traders	% of Sales of Wheat Handled by (5)	% of Sales of Rice (Paddy) Handled by (5)	% of Sales of Gram Handled by (5)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. Faisalabad	2.41	15.67	19.17	22.69	9.65	35.41	44.45	45.83
2. Gujranwala	3.56	16.53	18.09	23.80	14.24	39.88	40.70	48.35
3. Hyderabad	4.52	18.04	19.49	25.56	18.04	39.52	41.36	51.69
4. Karachi	NA	NA	NA	NA	NA	NA	NA	NA
5. Lahore	2.22	16.26	18.29	22.04	8.74	35.00	39.84	46.51
6. Multan	2.77	16.22	19.85	23.77	11.07	36.53	41.56	47.87
7. Okara	NA	NA	NA	NA	NA	NA	NA	NA
8. Peshawar	5.47	18.29	24.77	25.58	21.43	49.75	52.58	52.50
9. Rawalpindi	NA	NA	NA	NA	NA	NA	NA	NA
10. Sahiwal	3.46	14.97	19.11	21.48	13.65	39.00	41.29	44.82
11. Sargodha	4.23	17.12	20.38	22.71	16.92	40.33	43.23	45.35
12. Sialkot	3.16	15.50	18.91	23.90	12.35	36.25	41.78	47.64
13. Sukkar	NA	NA	NA	NA	NA	NA	NA	NA
Total	3.53	16.51	19.78	23.50	14.01	39.07	42.98	47.84

Source: Survey conducted by the author in 1980-81.

* Data for this table were collected from the weekly reports of different market committees. Since it involved a lot of computational work, we took only four months' data from every year to bring it to a manageable limit. These four months included two months from the harvest season (May and June for wheat and gram, and December and January for rice) and two months from the off-season periods (December and January for wheat and gram and May and June for rice). Sales in such months represent roughly 50 to 60% of total sales in various markets. [1, 4]

twenty firms is as high as 52% in one of the markets. However, this cannot be interpreted as a proof of monopoly power. We must look at these ratios in conjunction with other factors which may or may not allow the top firms to influence price or act in a collusive manner. Such factors are:

1. the nature of entry into trade;
2. the nature of cooperation among traders; and
3. the availability of funds from financial institutions.

In an earlier section, we have shown that entry into grain trade is relatively easy almost at every level of marketing. The chances of such entry are very real because neither governmental nor financial restrictions are very stringent. The second important factor which indicates why traders may not act in a collusive manner, despite some of them holding disproportionately large shares of total sales, is the lack of cooperation among traders even for mutual rewards, which may be evident from (a) the nature of partnership and (b) absence of trading organisations.

Nature and Extent of Partnership

In the agricultural markets of Pakistan the single family firm is still the dominant entity. Most of the firms are partnerships between immediate members of a family (between brothers or between a father and his son(s)), and very few of them involve members of different families.[21] Of the 109 traders we surveyed, only 15 were partnerships between different families, and even these were due to the fact that the traders belonged either to the same village or ethnic group. Traders in these markets are so distrustful of each other that no one is willing to show his records to anyone other than his partner. So much so that the accountants employed are usually from the immediate family. Such an arrangement both helps and hinders the efficiency of the present system. It helps to the extent that it does not encourage collusive behavior which could weaken competitiveness. On the other hand, this reflects a very inward-looking attitude of traders as a consequence of which they may not be able to make the best use of available resources. Since business operations are kept undisclosed to others, any weakness in management may go unchecked, resulting in business failures.

Absence of Trading Organizations

Lack of active cooperation among traders is also evident from the absence of any major or strong trade organization. The few traders' associations which do exist are simply spokesmen of traders' interests at the government level and thus act as a political pressure group. Even this kind of objective is not

[21] We may point out, however, that in the Hyderabad market of Sind partnership between individuals of distant families is relatively more common than in the Punjab markets.

served effectively, as the majority of traders remain indifferent to the activities of such organizations. Except for two or three markets, most of these organizations do not have their own office premises.

Finally, we must also note that compared to other activities agricultural marketing in Pakistan has always remained a less sophisticated and not so-well-respected economic activity.[22] For one thing, the people who function as traders here are not well educated. Many of them were farmers who lived in a village area where the educational level was very low. Other participants in this trade may sometime be categorized as part of the so-called "informal sector" of a developing economy, a sector which usually grows as a periphery of the advanced sector. There were many traders in the markets we visited who had struggled for many years as loaders or as weighing men before trying their luck as independent commission agents. They used their own labour along with the human capital they acquired to further their careers. However, due to their lack of awareness of business methods used in other sectors, their approach to business is based on "adhoc principles." Consequently, we see few advanced methods of accounting or cost-benefit analysis applied by many of the firms operating in these markets.

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[22] This is reflected in numerous warnings and sometimes threats issued by government officials to grain traders to behave (i.e. to follow official pricing directions and not "hoard"). For example see Dawn, [18].

Secondly, the fact that prices of foodgrains play a very significant political role, in an underdeveloped country, has made the agricultural trade a target of more government inspections and checks than other activities. Treatment given to "hoarders" of foodgrain may sometimes be harsher than that given to common criminals. Traders with relatively large business operation are kept under greater vigilance, which in many ways limits the extent to which such traders would like to expand their business even within legal limits. As a result, we do not see significant flows of investment from any advanced sector to this trade. Rather many traders, fearing that further expansion in grain trade could be dangerous would prefer to move out to other trades, like manufacturing industries, where government restrictions are less onerous. Consequently, most of the firms in this trade are of relatively moderate size compared to the leading firms in other industries. Monopsonistic power, either created by price leadership or by collusive behaviour, is, therefore, very unlikely to persist under these circumstances, even though some firms hold relatively large shares of total sales.

CHAPTER III

Some Criteria To Test The Performance Of Agricultural Markets In Pakistan

The preceeding chapter has examined those aspects of agricultural markets in Pakistan which significantly influence the price formation process. In this chapter, we discuss some of the criteria we have used to evaluate the performance of these markets as revealed by their price structures.

Competitive Market as a Standard to Evaluate Performance

In a private enterprise economy the model of perfect competition is often used as a standard to evaluate the performance of any industry.[1] It assumes an industry with a large number of firms, selling perfectly homogeneous products and having complete information of supply and demand conditions. Since each firm is assumed to be a profit maximizer and a price taker, and if the buying and selling are carried out at a particular point in space and at a single instant of time, a uniform price will prevail in the market [15]. This behaviour allows the most efficient use of factors of production and the

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[1] See Paul [68].

highest level of welfare to the society.[2]

We will use this competitive market model as a standard to evaluate the performance of agricultural markets in Pakistan. However, actual markets are much more complex in nature. They are situated in different geographical locations and in this way are more like parts of a marketing system than points in a single market. Buying and selling of farm products continues throughout the year adding another complexity into their pricing structure. While studying prices in these markets, we must take into account the effects of both location and time. To do this, we first examine the price-equilibrating process in markets located in different regions and then deduce some criteria which can be used to evaluate their performance. This is followed by tests on the behaviour of prices in markets separated by 'time' such as 'harvest' versus 'post-harvest' and by the 'nature of transactions' such as 'wholesale' and 'retail'.

Determinants of Price in a Regional Market

For analytical convenience, let us assume that there are only two markets, A and B, located in two different regions, and each handling more than one non-perishable farm product. Intermarket arbitrage is free and there are no restrictions on product mobility or on flow of information between the markets. As a result, producers and traders, who supply commodities to

[2] For details of how this is achieved see Bilas (8, pp. 304-325).

these markets, and consumers or traders who buy, respond to changes in supply and demand not only of their own market but also the second market. Under these conditions, the supply and demand functions in markets A and B would be:

$$\text{(Supply in Market A)} \quad QASt = f(PAt, ZAt, ZBt) \qquad (3.1)$$

$$\text{(Demand in Market A)} \quad QADt = g(PAt, Z'At, Z'Bt) \qquad (3.2)$$

$$\text{(Supply in Market B)} \quad QBSt = f'(PBt, ZBt, ZAt) \qquad (3.3)$$

$$\text{(Demand in Market B)} \quad QBDt = g'(PBt, Z'Bt, Z'At) \qquad (3.4)$$

Where: QASt and QBSt are the quantities supplied and QADt and QBDt are the quantities demanded respectively in market A and B, of a commodity at time t. Similarly PAt and PBt are prices in markets A and B at time t.

ZAt refers to all factors other than own price of a commodity influencing supply in market A. Such factos can be price of other commodities, total cropped area, cropping pattern and inventory levels of different commodities in region A, all of which influence the supply in market A. ZBt refers to similar factors in region B. At this stage, no assumption is being made about the degree of ZBt's influence on QAt (or ZAt's influence on QBt). However, we believe that ZBt affects supply not only in market B but also in market A. This applies equally to ZAt.

Z'At refers to all factors other than own price of a commodity which may influence demand in market A at time t. These factors are per capita income, prices of 'other goods,' population and taste in region A. Z'Bt stands for similar factors in region B. We believe that demand in trading markets is also influenced by factors other than own price of both regions A and B. Hence we include $\acute{Z}At$ and $\acute{Z}Bt$ in the demand functions of both markets.

Setting individual supply equal to demand in each market we get:[3]

$$PAt = \phi\ (\bar{Z}At,\ \bar{Z}Bt) \qquad (3.5)$$

and

$$PBt = \psi\ (\bar{Z}At,\ \bar{Z}Bt) \qquad (3.6)$$

where

$$\bar{Z}At = ZAt \text{ and } \acute{Z}At \qquad (3.7)$$

and

$$\bar{Z}Bt = ZBt \text{ and } \acute{Z}Bt \qquad (3.8)$$

Equations 3.5 and 3.6 state that equilibrium prices of a commodity in markets A and B depend on a number of exogenous factors associated either with supply or demand of both markets. Figures 3.1 and 3.2 display the equilibrium positions of both markets at any time. Initially prices in A and B are PAt and PBt respectively. When, for example, demand shifts to the right in A

[3] Here we have implicitly assumed that demand in each market includes purchases for shipments to other markets. However that may not necessarily be the case. Traders in most of these markets also make purchases for future trade. As a result changes in inventory levels become an important factor in determining the nature of price adjustments in different markets. Therefore, in a situation where one is interested in studying intermarket price responses to exogenous factors ($\bar{Z}At$ and $\bar{Z}Bt$), one may observe some differences in price movements even though exogenous changes have occured by the same amount in two marktes. However to study the effect of inventories on prices one may have to use a relatively complex model working out the dynamic behaviour of inventories at different levels of marketing. We have avoided such a venture due to lack of data for quantities in argicultural markets in Pakistan. Some bias therefore may be present in the estimates obtained on the basis of our model here. However the direction of bias is unknown.

(due to exogenous forces) price in A moves to P'At. This will have a spillover effect on market B as traders from both markets A and B tend to buy more from market B and sell in market A. Finally P'Bt is established in market B.*

Figure 3.1

Interaction of Supply and Demand in Market A

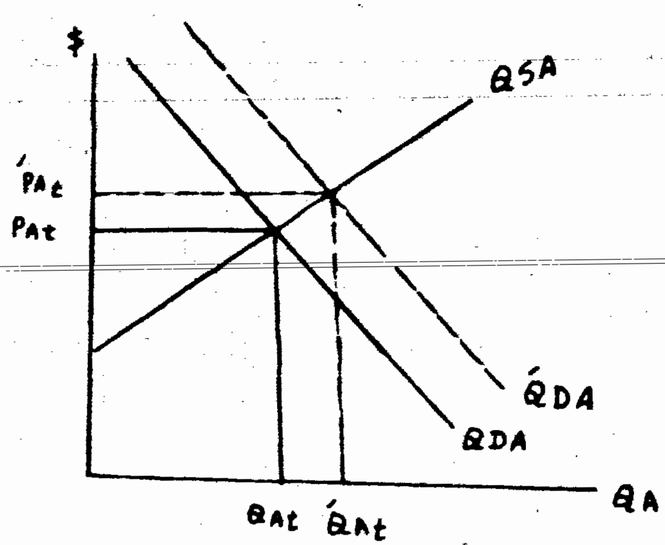
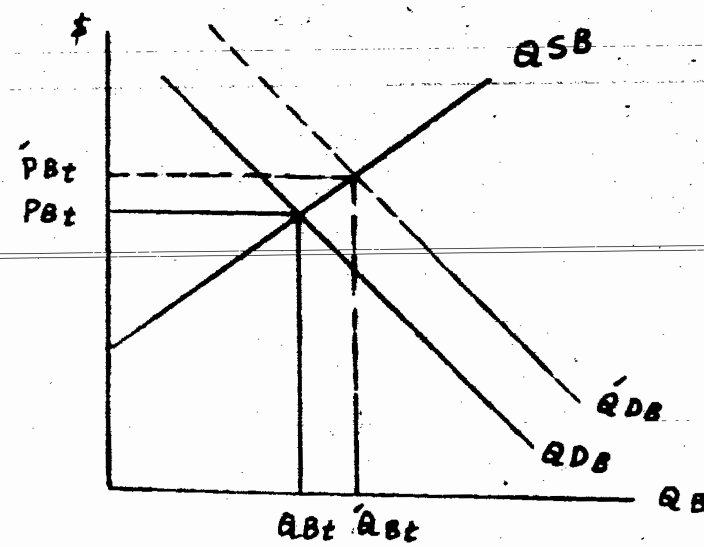


Figure 3.2

Interaction of Supply and Demand in Market B



A similar process of price change would take place if supply were to shift in either of the markets.

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* In Figures 3.1 and 3.2 we have not shown the actual dynamic path which the equilibrium process may take. It is however quite probable that a series of shifts take place in both markets before a final equilibrium is reached. Our objective here is simply to show that a shift in demand in any of the markets, holding other things constant, would shift demand in other markets in the same direction if not by the same magnitude. Also see footnote 3.

Intermarket Price Relationship as a Measure of Market Integration and as an Indicator of Competitiveness of Markets

One of the main implications of the foregoing model is that as long as there is arbitrage among different markets one can observe some degree of integration between these markets. From equations (3.5) and (3.6) this implies:

$$\frac{\partial PAt}{\partial \bar{Z}Bt} \neq 0 \qquad (3.9)$$

and

$$\frac{\partial PBt}{\partial \bar{Z}At} \neq 0 \qquad (3.10)$$

Equations (3.9) and (3.10) define what we call 'market integration'. The degree of integration between two markets may be strong or weak. The extent to which two markets are integrated depends on the speed and accuracy with which prices of any commodity react and adjust to various stimuli in other markets (i.e. ZAt and ZBt). The speed and accuracy of adjustment in prices in turn depends on the degree of product mobility, availability of transportation and communication facilities, transportation costs, degree of homogeneity of a product, and the relative degree of monopoly power enjoyed by traders in the markets. As the speed and accuracy of adjustment in prices increases, $\partial PBt/\partial \bar{Z}At$ approaches $\partial PAt/\partial \bar{Z}At$ and similarly $\partial PAt/\partial \bar{Z}Bt$

approaches to $\partial PAt/\partial \bar{Z}Bt$.[5] In a situation where

$$\frac{\partial PBt}{\partial \bar{Z}At} = \frac{\partial PAt}{\partial \bar{Z}At} \qquad (3.11)$$

and

$$\frac{\partial PAt}{\partial \bar{Z}Bt} = \frac{\partial PBt}{\partial \bar{Z}Bt} \qquad (3.12)$$

markets A and B can be regarded as "perfectly integrated".[6]

Market integration is, therefore, a desirable property of any marketing system. It measures closeness in the price structures of different regions and the extent to which market margins may be driven down by arbitrage between markets. Perfect integration between markets may indicate that the markets are perfectly competitive: an ideal state of a marketing system. However, perfect market integration may be a necessary but not a sufficient condition for the markets to be perfectly competitive.[7]

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[5] This is possible only when $QSAt=QDAt$ and $QSBt=QDBt$ which may be true only under extreme conditions of zero inventory level in each market or alternatively under rational expectations about inventories and other aspects of markets. See footnote 3 for effects of inventories on market prices.

[6] We assume throughout this study that trading does not take place at some pre-determined price and the forces of supply and demand are allowed to interact freely.

[7] Barbara Harris [24] has rightly pointed out that most of the earlier studies on this subject confused "perfect integration" with "perfect competition." It is important to note that if perfect market integration is observed then it becomes difficult for anyone to reject the hypothesis that markets are perfectly competitive.

Estimating Market Integration

Market integration, can be measured by using the reduced form of equations (3.5) and (3.6) or by measuring the degree of association between prices in any two markets. We have adopted the second course to avoid data problems involved in the first course. Three kinds of estimates are obtained for this purpose.

First, rewriting equations (3.5) and (3.6) in a linear form and adding a random term in each equation, we get:

$$PAt = ao + a1\bar{Z}At + a2\bar{Z}Bt + et \qquad (3.5')$$

and

$$PBt = bo + b1\bar{Z}At + b2\bar{Z}Bt + e't \qquad (3.6')$$

If there exists 'perfect integration' between markets A and B then:

$$\partial PAt/\partial \bar{Z}At = a1 = \frac{\partial PBt}{\partial \bar{Z}At} = b1 \qquad (3.11')$$

and similarly $a2 = b2$ (3.12')

Substituting (3.11') and (3.12') into (3.5'), PAt can be shown to be related to PBt as:

$$PAt = (a0-b0) + PBt + (et-e't) \qquad (3.13)$$

Equation 3.13 can be restated to cover both 'perfect' and 'less than perfect' market integration cases as:

$$PAt = \gamma 0 + \gamma 1 \; PBt + e^{*}t \qquad (3.14)$$

Where $\gamma 0=(a0-b0)$ and $e^{*}t=(et-e't)$; $\gamma 1$ is greater than zero but not equal to one if there exists some integration between markets A and B. If the adjustment in prices is perfect in the sense described by equations (3.11) and (3.12) $\gamma'1$ will be equal to one. The intercept term, ($\gamma 0$) for the former case differs significantly from zero as prices in two markets could differ either because of transportation costs or because of imperfect adjustments of markets in response to exogenous changes. In the case of perfect market integration $\gamma 0$ is assumed to be equal to transportation costs. Equation (3.14) is estimated by using 'absolute price levels' in different markets taking two markets at a time.

Second, we use the 'first difference in prices' and estimate equation:*

$$\Delta PAt = \gamma'0 + \gamma'1 \Delta PBt + Vt \qquad (3.15)$$

Where ΔPAt and ΔPBt are the 'first differences' in PAt and PBt respectively, and $\gamma'0$ and $\gamma'1$ are regression coefficients to be estimated. Once again, $\gamma'1$ is assumed to be positive for the case of integration between markets A and B and equal to one if they are perfectly integrated. γ_0 is introduced to allow for possible changes in transportation costs. If transportation costs do not change over a short period of time, $\gamma 0$ will be equal to zero in the case of perfect market integration. Vt is random error term.

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* Writing (3.14) for two periods (t and t-1) and subtracting PAt-1 from PAt we get:
$\Delta PAt = \gamma'1\ PBt + vt$
where $vt = \acute{e}t - \acute{e}t\text{-}1$.

One of the advantages of equation (3.15) is that it frees our estimates, at least partially, from the effect of size of absolute prices prevalent in equation (3.14). Secondly, it has a different error structure which influences the significance level of a coefficient. It is possible that the degree of integration changes significantly when 'first differences' rather than 'absolute price levels' are used in estimation.

Finally, the third, or a relatively more effective, method of removing the effect of size on our estimates is to use the 'rate of change' in prices, rather than 'absolute difference' in estimating the coefficients. This is a standardized measure of changes in price variables and provides another basis for comparing them. We do this by estimating:

$$\hat{PA}t = \gamma''_0 + \gamma''_1 \hat{PB}t + v't \qquad (3.16)$$

where

$\hat{PA} = \dfrac{\Delta PAt}{PAt-1}$; and $\hat{PB}t = \dfrac{\Delta PBt}{PBt-1}$

and as in the earlier cases $\gamma''_1 > 0$ for a simple integration situation and $=1$ for a perfect integration case. $\gamma'' \neq 0$ if transportation costs also change with prices. $V't$ is the random error term.

The ordinary Least Squares (OLS) estimation method was found suitable to obtain the estimates of the parameters specified in equations (3.14) to (3.16).[9] Using average monthly wholesale (real) prices from January 1955 to June 1979, these equations are estimated for three major commodities and for 13 primary and terminal markets in Pakistan. Real prices are used to remove the effect of inflation.

Criteria to Evaluate Market Performance

To evaluate the performance of the selected markets, we first test the hypothesis that $\gamma_1=1$, as this is one of our standards.[10] Student's t and F tests are used for this purpose. Then we explore the main causes of divergence between the observed and the hypothesized values of γ_1, focussing especially on the comparative positions of markets in different regions. By relating deviations of γ_1 from one with factors which could cause them, we try to draw some inferences about the policy steps needed to improve the performance of these markets.

Secondly, we compare our estimates of the degree of market integration obtained from equations 3.13 to 3.15 with those obtained by others for some other countries (UDCs) in Asia and Africa.

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[9] There might be some problem of auto correlation in our estimates based on 'absolute prices' (i.e. in the case of equation (3.14) as the Durbin-Watson statistics were in 'inconclusive range'. However only marginal differences were noticed in the values of the coefficients when alternative estimation techniques such as Cochrane-Orcutt method was used for a few selected cases. We therefore thought it feasible, both on time and cost grounds to use only OLS.

[10] Hereafter we call γ_0, γ_0 and γ_0 as γ_0 ; and γ_1 , γ_1 and γ_1 as γ_1 .

Thirdly, we compare intermarket price differences with transhipment costs between markets. This is to test the hypothesis that, under perfect market integration, prices between markets differ only by transhipment costs. One simple method could be to compare transhipment costs between the markets under study with their respective 0. However, such a comparison is too simplistic to be correct for comparing the level of prices in different markets. First of all, 0 as an average figure can only be a suitable measure of the differences in prices between markets A and B if A's prices are always expected to be higher than B's. This is certainly not the case with most of our markets which buy from and sell to other markets and hence their prices could be sometimes higher or lower than the others. Similarly, a simple comparison of transhipment costs with 0 may ignore the fact that prices in markets could differ either because of differences in their mean values, their variances or their covariances as shown by equation (3.17) below. A significant difference in the variance of their prices does not indicate perfect market integration even though the mean prices of two markets differ by a margin equal to transhipment costs. Similarly, a major difference in two price series may be observed even though their means and variances are very close, simply because of a less than perfect degree of correlation. Therefore, when testing the hypothesis on price differentials vis-a-vis the transhipment costs, an attempt is made to go into details of such differentials by decomposing them into mean, variance and covariance components. This gives us better insight into the levels of prices in different markets.

To decompose intermarket price differences, we follow a method used by Henri Theil in the context of a forecasting model.[11] According to Theil the mean squared difference between any two series such as PA_t and PB_t can be expressed as:

$$\sum_{t=1}^{n} (PAt - PBt)^2/n = (PA-PB)^2 + (SA-SB)^2 + (1-r)\ SA.SB \qquad (3.17)$$

$$1 = \underset{\text{(Bias Proportion)}}{\frac{(\overline{P}A-\overline{P}B)^2}{\sum_{t=1}^{n} (PAt-PBt)^2/n}} + \underset{\text{(Variance Proportion)}}{\frac{(SA-SB)^2}{\sum_{t=1}^{n} (PAt-PBt)^2/n}} + \underset{\text{(Covariance Proportion)}}{\frac{(1-r)\ SA.SB}{\sum_{t=1}^{n} (PAt-PBt)^2/n}} \qquad (3.18)$$

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[11] Theil used a measure called Theil's Inequality Coefficient (U) to test the accuracy of forecasts from any econometric model. He suggested the use of actual (A) and predicted (P) series to obtain:

$$U = \sqrt{\frac{\sum_{t=1}^{n} (At-Pt)^2/n}{\sum^{n} A^2t/n}}$$

where if U = 0 the forecast is perfect. The further 'U' is from zero the poorer is the forecast ability of a model. According to him, the numerator of 'U' can be expressed as (3.17) to see the sources of difference between At and Pt. Although we are not dealing here with a forecasting problem as such, his formula is general enough to be used where the decomposition of differences in two series is involved. See Theil [95] and Koutsoyiannin [47, pp. 482-485].

where PA and PB are the means, SA and SB are the standard deviations of PAt and PBt and r is a partial correlation coefficient between the two price series. The term on the left hand side is what Theil calls "Mean Square Error" (MSE). Taking a square root of this gives us a Root Mean Square Error (RMSE). The first term on the right hand side of (3.17) is "Bias Component", the second is the "Variance Component", and the third is the "Covariance Component". In equation (3.18), they are called Bias, Variance and Covariance proportions, the sum of which is equal to one. The bias Proportion (Um) represents the discrepancy between PAt and PBt due to a difference in their mean values; the Variance Proportion (Us) shows the discrepancy between the two prices due to the difference in their variances; the Covariance Proportion (Uc) represents the difference in them due to imperfect covariance. According to Theil, the third source of difference is the most serious in the sense that not much can be done about it. Since r is generally less than one, the covariance component may never be equal to zero. Even a slight variation of r from one can result in a large value of the covariance component as long as SA and SB are more than one. [12]

We then test the following hypotheses about the nature of intermarket price differentials as expressed by (3.17) and (3.18).

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[12] This happens because any value of SA and SB exceeding one, after multiplying with each other and then with (1-r), can be very different from zero.

1. If markets are perfectly integrated, then the RMSE between PAt and PBt is just equal to the average transhipment costs between markets A and B. This is one of the ways of checking whether on average the price differentials have stayed in line with transhipment costs.
2. The Bias component is close to zero for all those markets which both receive and send shipments of commodities to other markets. If primary markets are perfectly integrated no one market should have consistently higher or lower prices than the other over a long period of time even though differences were within the range of transhipment costs. However, in terminal markets (which in general only receive supplies from other markets), prices could always stay higher than others by a margin of transhipment costs. The bias component in these cases, therefore is assumed to be equal to or less than the squared value of the transhipment costs.[13]
3. The Variance component, however, should be equal to zero for all those markets which are perfectly integrated with one another, except for terminal markets which generally receive shipment from other markets.
4. The Bias and Variance proportions (not components) are also close to zero for the primary markets and relatively small compared to the Covariance proportion for all cases. This implies that the proportionate differences in prices due to

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[13] This is so because the Bias Component = $(\overline{PA} - \overline{PB})^2$.

difference in their means and variances are smaller relative to differences because of imperfect covariance between them.[14] In the case of terminal markets, the Bias and Variance proportions, however, may not be zero because of hypothesis 2 and 3.

Performance of Markets: Intertemporal Dimensions

The seasonal behaviour of prices constitutes the second important indicator of the performance of a marketing system. The ideal performance is set once again by a competitive market structure. If all conditions stated earlier of this system prevail, traders and farmers are expected to allocate their supplies over time in such a manner that the off-season rise in prices (compared with harvest prices) is just equal to storage costs, plus some risk premium to stock keeping. Any opportunity of earning 'abnormal' profit will attract more traders and eliminate "undue" differences between two kinds of prices. A test on the intertemporal performance of markets, therefore,

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[14] It really does not matter how much smaller the Bias and the Variance proportions should be compared to the Covariance proportion as long as they are significantly less than the latter. If our hypotheses 1 to 3 in this section are true, then there is no real need to test 4. If not, then it becomes important to see what is the relative strength of each component. Mean and variance components if higher in relative strength indicate systematic effect of factors such as markup or differences in the structure of markets. On the other hand, if the covariance component is relatively higher, that could be due to imperfections in markets caused mainly by problems in transportation, communication and similar other facilities. The implications for the performance of a market are different if one or the other phenomenon is more significant.

should involve comparison between the off-season variations in prices with relevant storage costs to see if the above requirement of an efficient market is fulfilled. However, agricultural markets in Pakistan, seasonal price movements raise more than one issue which cannot be handled simply by comparing intertemporal price differentials with storage costs. In the following, we first discuss those issues briefly and then present the hypotheses to be tested in this respect.

In Pakistan the traditional view of storage activity is that farmers are compelled to sell their produce during the harvest season as they have limited "holding capacity" due to their loan needs and nonavailability of storage facilities. Accordingly, prices in the harvest season are "unduly" depressed and stock-keepers earn "abnormal" profits, by selling produce in the off-season. [74, 81, 84] As a result of this impression, a question commonly asked is what proportion of total production of farm commodities is sold in the harvest vis-a-vis the off-season.[15] A fall in this proportion is taken to imply an increase in the holding capacity of farmers and an improvement in their borrowing position. Some studies, like Qureshi's [75], have also tried to deal with the question of whether harvest prices were unduly depressed compared to off-season prices.

The traditionally-held view of 'holding capacity' may not be relevent in a farmer's decision to sell in the harvest period. If a farmer is viewed as an entrepreneur, it is the net

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[15] See Farruk [21], Lele [48], Qureshi [75], and Ahmad [2].

expected return from off-season sales and the degree of risk associated with them which determine the optimum amount to be sold in the harvest relative to the off-season period.

To evaluate intertemporal price relationships we need to address ourselves to three main questions:

First are prices in the harvest month significantly different from off-season prices? This may be a redundant exercise, as one would expect on a priori basis that off-season prices would be higher by the margin of storage costs. We do this by using time-series data to check Qureshi's conclusion based on cross-section data that there are no significant differences in these prices. [75]

The following equation will be used to estimate the difference:

$$Pt = d0 + d1T + d2H + et \qquad (3.19)$$

where Pt is the average wholesale price of a commodity in a market at time t; T = 1, 2, ..., 252 (time in months) H = 1 for the harvest months and zero otherwise, 'd1' is expected to be positive as nominal prices usually rise over time; and 'd2' should be negative if the hypothesis that prices are depressed during the harvest month is true.

The second question is by how much do off-season prices differ from prices in the harvest month? To deal with this question, we hypothesize that under perfect intertemporal market integration:

$$E\,(NORPt) = 0 \tag{3.20}$$

$$\text{where } (NORPt) = (Pt - E(Pt)) \tag{3.21}$$

$$\text{and } E(Pt) = Ph + t(R + I + L + D) \tag{3.22}$$

NORPt = Net seasonal rise in the average wholesale price of a commodity in any market in the off-season months (t);

Pt = Average Wholesale price of a commodity in any market in the off-season months (t);

Ph = Average wholesale price of a commodity in any market in the harvesting months (h);

t = Time in months (August to April for wheat and gram; and from February to October for rice.);

h = May to July for wheat and gram and November, December and January for rice;

R = Rent per month per unit of storage;

I = Interest on capital needed for storing a unit of good for one month;

L = monthly losses in storage. (Calculated as one percent of the value of the stored commodity); and

D = Depreciation on bags and other material used in storage.

The hypothesis that the expected net off-season rise in average wholesale price of a commodity in a market [i.e. E(NORPt)] is equal to zero was tested for all markets and commodities in our sample using the student's t-test.

It may be noted that in our calculation of storage costs we have left out the 'risk premium' portion of such costs, because an exact quantification of this factor requires knowledge of the attitude of traders toward risk, which is beyond the scope of this study. The net seasonal rise in prices (NORP) may, therefore, overstate the profit margins earned by traders in this operation. While using the criterion stated in equation 3.15, we must bear this factor in mind and look at the magnitude of deviation of (NORP) from zero.

The third question deals with the magnitude of risk in storage activity. One of the commonly used estimates of risk is the standard deviation of the variable under study. The Coefficient of Variation (CV) in many ways is a still better way of expressing this parameter as it gives a unit free measure of the spread of data around its mean. This measure may not be an accurate indicator of risk, but it is usually employed because it is an easily quantifiable measure of a qualitative factor like risk.[16] Since the phenomenon of risk is due to the variability in prices in the off-season, we compute the coefficient of variation in off-season prices. Formally we calculate:

$$CV = \sqrt{\frac{\sum_{t=1}^{n=8} (Pt-\overline{P})^2}{n}} \Bigg/ \frac{\sum_{t=1}^{n=8} Pt}{n} \qquad (3.23)$$

where Pt = monthly wholesale price of a commodity in any market in the off-season month (t); t=August to April for wheat and gram, and February to October for rice;

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[16] See Seo and Winger [82, pp. 22-25].

$\bar{P}$ = Mean of Pt commodity in jth market for the off-seasonal periods

CV = Coefficient of Variation in Pte

Equation 3.23 is computed for each year separately for the period 1955-56 to 1978-79 for all markets and commodities. Markets are then compared and contrasted with one another.

The fourth question is how the risk factor has behaved over time. Since, the risk margin is usually added to the costs of marketing a commodity in the off-season, holding other things constant, a decline in its magnitude would indicate a decrease in marketing costs and an improvement in the performance of a market. In the case of markets under study, there are several reasons for the risk factor to decline. From Chapter II, we know that these markets made a start under a new socio-economic setting in Pakistan. Most of the traders entering into trade did not have backgrounds well suited to understanding the intricacies of the interregional and intertemporal nature of arbitrage. However, over time they would learn and respond more accurately to various changes in market forces. This in turn would affect changes in prices in the off-season, as traders understand stock positions in various markets better than before. As a result, it is expected that over a certain range off-season price fluctuations would decrease over time.

Secondly, as shown in Chapter II, facilities like storage, transportation and communications have increased significantly in the last 35 years. Absence of these facilities creates barriers to the smooth allocation of supplies both over time and space, which could result in 'abnormal' fluctuations in prices. Increased availability of such facilities, other things being equal, results in reducing extreme price fluctuations. One may, however, argue that factors such as the war with India in 1965 and 1971 and the rapid increase in production of wheat and rice in the late sixties could have disrupted existing marketing facilities, resulting in greater fluctuations in prices. In our view, if markets were functioning efficiently, these factors should not have created a permanent shift in the rate of price fluctuations. It may also be pointed out that relatively smaller price fluctuations may not necessarily be due to a higher degree of intertemporal market integration. They may be due to an increase in collusive behaviour of traders. This argument, though theoretically plausable, does not concern us, as there exists no evidence that collusive behaviour indeed <u>increased</u> over time.

To see time trend in the risk factor, we therefore regress CV on time for each market and for each commodity. The best fit is given by:

$$CVi = a + bT + cT^2 + ei \qquad (3.24)$$

where

CV = as defined in (3.23

i = 1 ... 22

T = time in years i.e. 1, 2, ... 22

and for the risk factor to decrease over time $b+2CT<0$ must hold.

Evaluating the Performance of Different Levels of Marketing

The nature of differences between prices at various levels of marketing in any region is another important indicator of the performance of a market. In a perfectly integrated marketing system, prices at any two levels differ only by a minimum amount of handling costs plus a "normal" rate of return to the traders involved.[17]

We will calculate such differences between the average monthly retail and wholesale prices. Estimates of handling costs were also obtained. An attempt then is made to derive estimates of the 'net rate of return' which all traders (from wholesalers to retailers) have earned on average in various years. Some estimates are also made of the rates of return earned by village traders who buy from farmers and sell in city markets.[18]

Ideally one should check price differences at each stage of the movement of a commodity. Unfortunately, no information is available on the exact number of times a commodity changes hands. The sale and purchase prices at every stage of marketing are almost impossible to get as in many cases traders do not keep proper accounts of their transactions, and in other cases

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[17] The term "normal" rate of return as used in textbooks generally means what an entrepreneur expects on average to make from alternative opportunities in riskless undertakings. See, for example, [82, pp. 21-22].

[18] See Chapter II for details of the marketing channels of farm commodities in Pakistan.

they are reluctant to release such information to "outsiders". Government agencies which collect price data thus depend on two sources: marketing agents (arhatyas) and retailers. Information on their prices is open to all as it is in their own interest to keep their customers informed. Consequently, we are confined to those stages of marketing for which information on prices is available. The estimation method used here is as follows:

$$GM = (RP - WP) \tag{3.25}$$

$$NAM = (GM - HC) \tag{3.26}$$

$$NM = GM - (HC + N) \tag{3.27}$$

$$RG = (GM)/(WP) \tag{3.28}$$

and $$RA = (NAM)/(WP) \tag{3.29}$$

where GM = Gross margin;

RP = Average monthly Retail price;

WP = Average monthly Wholesale Price;

NAM = Net accounting margin;

NM = Net margin;

HC = Transportation and handling costs;

N = "Normal profit";

RG = Rate of gross margin;

RA = Rate of net accounting margin;

t = time in years = 1,2 ... 22.

To see if marketing at the retail level was perfectly integrated with the wholesale level, one would like to test the hypothesis that $E(NM)=0$ to test the long-run behaviour of market margins. One of the basic problems in testing this hypothesis, however, is the definition of 'normal profit'. We may say that it is the average rate of return which a trader expects to earn from riskless alternatives.[19] But usually it is not possible to find out a trader's expectations. To avoid this problem, we present only 'gross margins' and some estimates of 'handling charges'. The difference between the two determines the 'net accounting margin' (NAM) earned by any trader. Magnitudes of those margins allow us to determine, at least qualitatively, the level of performance of markets.

Similarly, a comparison of our estimates of market margins with those obtained by some of the earlier studies is done for the purpose of comparative analysis.

Secondly we observe the time trend of both the net and gross margins. If these margins (in percentage term) decline over time, then, other things being equal, market performance has improved as it implies that the cost per unit of marketing a product has decreased. On the other hand, if one observes these rates to be increasing, then, it will signify deterioration in market performance.[20]

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19 See for this definition of normal rate of return [82, pp. 21-22].
20 A similar view is expressed by Warrack [10 3].

Marketing Margins Earned by Village Traders in Pakistan

Our calculations of marketing margins above are based on wholesale price data from primary markets but not from village markets. The traders who earn such margins are those who move the produce from a commission agent's shop to the consumer. The market margins earned by village traders are not included in this amount. For this purpose we need to compare prices in a village market with those in a primary wholesale market. However, no systematic data are available for village market prices in Pakistan.

Most of the earlier attempts to deal with the subject do not give any clear picture of the market margins for village traders.[21] According to these studies, they are as high as 60% in the case of gram, but only 10% or less in the case of wheat and rice. [75, 84] Some studies have concluded that village traders should be eliminated as they earn "abnormal profits" and provide practically no service [82]. No such conclusion, however, emerges from other studies [35, 75].

We think that part of the confusion on this issue is due to the lack of exact figures about prices paid and received by village traders all the studies have used indirect methods to estimate such prices. To overcome this problem, we have taken steps to obtain information about the trading activities of a cross-section of village traders in the districts of Faisalabad

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[21] See [35, 74, 81 and 84].

and Sialkot.[22] Purchase and sale price and net margins earned by 30 traders were collected from the records of village traders. We will present the estimates of both gross and net margins calculated on the basis of this information and compare them with earlier findings.

In Chapter IV, we present our statistical results and their analysis.

[22] We used our personal contacts with some of the commission agents in these two markets to persuade 15 village traders in their areas to let us see their account books for 1980.

CHAPTER IV

Performance of Markets: Results and Interpretation

We now turn to empirical findings and analyse their main implications.

Market Integration

The results of our estimates of equations (3.14) to (3.16) for different pairs of markets are summarized in Tables 4.1 and 4.2, whereas details of these estimates are presented in Tables B.1 to B.33. From these tables we can make the following observations about the nature of integration between the selected markets. A discussion of some of the factors explaining these results follows.

1. The hypothesis that $\gamma 1=1$ can be accepted in a large number of cases: 74.24% and 58.97% respectively for prices of wheat and gram when the relationships are estimated on the basis of absolute price levels. In a few cases, about 25% for wheat, this hypothesis is rejected, indicating that even though the intermarket intergration is significant in the sense of Equations 3.9 and 3.10, its degree is not perfect for all cases.
2. The values of the $\gamma 1$ coefficient are significantly different from <u>one</u> in most of the cases, when estimated by using other

TABLE 4.1

Distribution of the Regression Coefficient 'γ_1'', for the Relationships Between Prices of Major Commodities (Wheat, Rice, Gram) in Various Markets of Pakistan, From January 1955 to June 1979.

Percentage of γ_1 Values Observed for:

The Value of 'γ_1''	WHEAT Absolute Price Levels	WHEAT Changes in Prices	WHEAT Rates of Change in Prices	RICE Absolute Price Levels	RICE Changes in Prices	RICE Rates of Change in Prices	GRAM Absolute Price Levels	GRAM Changes in Prices	GRAM Rate of Change in Prices
				(Percentages)					
< 0.60	0	0	18.18	0	0	18.18	0	0	17.95
0.60-0.70	9	13.64	23.72	9.09	27.28	32.73	1.28	0	21.79
0.70-0.80	0	25.75	30.30	27.27	16.36	23.64	7.69	17.95	30.78
0.80-0.85	10.61	28.79	13.64	21.81	9.09	1.81	7.69	11.54	16.67
0.85-0.90	53.03	19.70	8.10	5.46	7.27	0	21.79	24.36	7.69
0.90-0.95	30.30	10.60	3.03	3.64	7.27	0	33.33	20.51	2.56
0.95-1.00	4.54	1.52	0	1.82	0	0	20.52	1.28	0
1.00-1.05	1.52	0	0	0	1.82	0	7.69	3.85	0
1.05-1.10	0	0	1.52	10.91	9.09	3.64	0	3.85	0
1.10-1.20	0	0	1.52	20.0	12.73	7.27	0	10.25	2.56
1.20+	0	0	0	0	9.09	12.73	0	6.41	0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Pairs of Markets	66	66	66	55	55	55	78	78	78
Total Number of Markets	12	12	12	11	11	11	13	13	13

Source: Tables B.1 to B.27

TABLE 4.2

Distribution of F-Statistics to Test the Hypothesis that $\gamma = 1$*.

Percentage of F Value Observed for:

The Value of 'F'	WHEAT Absolute Price Level	WHEAT Changes in Prices	WHEAT Rate of Change in Price	RICE Absolute Price Level	RICE Changes in Prices	RICE Rate of Changes in Prices	GRAM Absolute Price Level	GRAM Changes in Prices	GRAM Rate of Changes in Prices
	(Percentages)								
< 3.84	74.24	10.61	3.03	14.54	10.91	0	58.97	26.92	2.56
> 3.84	25.75	89.39	96.97	85.46	89.09	100.00	41.03	73.08	97.44
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Total pairs of markets	66	66	66	55	55	55	78	78	78
Total Number of Markets	12	12	12	11	11	11	13	13	13

Source: Tables B. 28 to B. 36.

*Critical Value of F at $V_1 = 1$ and $V_2 = 250 = 3.84$

See Appendix B for definition of F-statistics used here.

forms of the price variable, e.g. changes in prices or rate of change in prices for both of these commodities.

3. In the case of <u>rice</u>, the values of γ_1 are less than those for <u>wheat</u> and <u>gram</u> everywhere, and much different from <u>one</u>, even when the estimates are based on absolute price levels.

4. The degree of market integration, though not perfect for every case, is relatively higher between primary markets than between primary and terminal markets.

5. Integration is greater among markets in the Punjab than between markets in the Punjab and other provinces.

6. Karachi as a terminal market has a higher degree of market integration than Rawalpindi with the markets in the Punjab, particularly in wheat.

7. The Peshawar market is very weakly related with most of the other markets, whereas Faisalabad, Lahore, Multan and Sahiwal are the best integrated markets both with one another and with the rest of the markets.

8. Among the markets of the Punjab, Sailkot and Sargodha are relatively weakly integrated with other markets.

9. In Sind, the Hyderabad market is relatively more strongly integrated with Karachi and with the markets of the Punjab. This is not the case for the Sukkur market.

10. The intercept terms (γ_0) based on absolute price levels for wheat and gram are generally less than the transportation costs presented in Tables B.37 and B.38. This, however, is

not true for rice prices.[1]

11. The estimates of γ_0 based on 'first differences' and rates of change in prices are statistically insiginificant for wheat and gram indicating no differences between 'changes' and 'rates of change' in prices of these two commodities in different markets. For rice prices, however, intercepts are significantly different from zero indicating relatively lower degree of integration between markets for rice.

One of the most important aspects of these estimates is that they all show a highly significant relationship between prices in various markets, supporting our hypothesis that these markets are "integrated". The degree of market integration is, however, obviously not perfect. But it is not reasonable to conclude from these results that lack of perfect market integration, as indicated by the value of γ_1, is caused by a single factor like manipulation of prices by traders. In fact, if we look at the structure of Equations (3.5) and (3.6), we find that the value of γ_1 depends on the relative magnitudes of a1, b1, a2, and b2, which in turn depend on a number of factors.[2] Some of these factors are:[3]

1. transportation costs;
2. differences in the quality of a product;

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[1] For more on Comparison of intermarket price differences with transportation costs see a section below on Root Mean Square Error (RMSE) versus transportation costs.

[2] See Chapter III equations (3.5) and 3.6) for definitions of a1, a2, b1 and b2.

[3] See U.J. Lele [48], H.M. Hays [27] and M.O. Farruk [21] for some of these factors.

3. product mobility;

4. nature of production in different regions; and

5. differences in the monopoly power enjoyed by traders in various markets.

All of these factors influence the nature of arbitrage between markets in such a manner that contrary to conditions (3.11) and (3.12), a1 and a2 are likely to differ from b1 and b2. $\gamma 1$ will not be equal to <u>one</u> under these circumstances. We discuss the relevance of these factors to our empirical findings above.

<u>Transportation costs</u>

Transportation Costs are a function of factors such as physical distance, quality of rail and roads, frequency of service, and so on. The magnitude of such costs between any two markets usually sets the range within which prices may change without causing any movement of commodities from one market to the other. The higher the absolute transport costs the smaller is intermarket arbitrage. As a result, $\gamma 1$ will be less than one. In our view, transportation costs is one of the most important factors influencing the degree of integration between markets in Pakistan. A reason why markets in the Punjab, for example, have a higher degree of integration with one another compared to markets like Hyderabad is their closeness in distance.

The same factor should also explain a high degree of market integration between the markets of Sialkot and Gujranwala which are only 30 miles apart. However, as the Sialkot market is located on a relatively less convenient transportation route, it has a much lower degree of integration with other markets, even in the Punjab.

The perfect degree of market integration between the Sahiwal and Okara markets that we observed for wheat and gram is another example of the significant influence of transportation costs and distance on intermarket price relationship.[4] Since both of these markets are located on the same national highway, and only 20 miles apart, we observe almost no difference in their price movements.

Differences in Quality of Produce

This is another major reason which may result in a low degree of integration between markets. Since no scientific grading system exists in the selected markets, the quality of a crop is determined by its colour, percentage of foreign elements, degree of brokenness (as in rice), or according to its place of its origin. For wheat and gram, the seeds are usually categorised as 'superior', 'average' or 'inferior' quality. The price data used in this study refer only to average quality produce, e.g. <u>dara</u> wheat.

However, the main problem is that so-called 'average quality' differs from region to region. Wheat grown on soft non-rice growing lands is likely to be of different quality than

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[4] The intermarket distances are presented in Table 1.2.

what is grown in rice-growing fields. Gram from Sargodha and Mianwali are considerd to be of better quality compared to Sialkot or Gujranwala. Such qualitative differences become further complicated in the case of rice (Basmati). Rice sometime differs in its quality from farm to farm because of the amount of water, rainfall, fertilizer and other inputs. During the husking process, its quality can change according to the wetness of paddy, and the kind of machine used in husking. Some husking machines break more than others, others clean and shine better. Similarly, rice (Basmati) can differ in its taste because of differences in aging. If stored properly, one to two-year old rice usually tastes better than freshly husked. These are just a few of the numerous factors which determine the quality and price of rice in each region. The prices used in our study refer to (Basmati) rice but this may have different implications for prices in each region due to qualitative differences. Consequently, we observe an evidently low market integration when prices of (Basmati) rice are used.[5]

Restrictions on Product Mobility

Varietal differences alone cannot explain the very low degree of integration observed in the case of (Basmati) rice prices. Why should rice prices particularly exhibit such a markedly different pattern? This can be explained more by the

[5] Other main varieties of rice grown in Pakistan are Kangni, Sugdasi and Irri-Pak [63, 65].

existence of control by government on the interdistrict and even intradistrict movement of rice. [70]

Rice has been a major source of foreign exchange earnings from Middle Eastern and Eastern European countries. [62] To increase exports the government buys its desired stocks from the rice-producing areas first, before allowing any movement to other markets. The Government also intervenes with respect to wheat, but not to that extent as it does in the case of rice. Rice is transacted both in the processed and unprocessed (paddy) forms. Therefore it takes more time before the surplus stocks of rice with farmers and village traders are exhausted. Government therefore, imposes restrictions on rice movement for a longer period to be able to buy its desired quantities. Restrictions usually remain in effect throughout the year for rice, whereas for wheat this happens only occasionally during the harvesting months. [70]

The result of mobility restrictions obviously is that the arbitrage among markets is restricted. Prices in some areas may continue to rise without causing any movement of goods from other markets. As a result, prices in different markets may become completely unrelated. This is what has happened to the marketing of rice. Although the government has been allowing private traders to buy and sell whatever stocks they might have had from within a market area or bought from government agencies, it has generally discouraged and even prohibited movement of rice between markets.

The Nature of Production in Different Regions

Due to differences in the quality of land, cropping patterns and weather conditions, crops are neither sown nor harvested at the same time in every region. As a result, the flow of marketable surplus to markets differs from region to region. Wheat and gram, for example, start arriving in the markets of non-rice growing areas earlier than in the markets of rice-growing areas.[6] Similarly, the rice crop is usually ready earlier in those regions where irrigation facilities are relatively better. The flow of marketable surplus to different markets is, therefore, quite unpredictable. This may affect the degree of integration between markets.

Differences in Monopoly Power of Traders in Different Markets

This is onother important reason why responsiveness of prices may differ between any two markets. Factors associated with non-price competition make traders and farmers prefer one market over the other, even though price changes are the same everywhere. Traders in some markets may therefore enjoy a degree of monopoly power not available to traders in other markets. However, it is important to find out whether such a monopoly power is due to manipulation of market forces by a few traders

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[6] Wheat harvesting is usually late in the rice-growing area as the fields in which rice is grown take some time before they are ready for recultivation.

or due to imperfections caused by some of the factors mentioned earlier. A closer look at differences in the degree of integration of different markets will allow us to identify the main factors.

Factors explaining comparative differences in the degree of market integration of different markets

In the light of the foregoing considerations, differences in the degree of integration among markets can be explained as follows.

1. Most of the primary markets of the Punjab are located within a radius of 300 miles, whereas their average distances from the Karachi terminal market is more than 1000 miles in some cases (see Table 1.2). Since transport costs usually increase with distance, the degree of integration between the primary markets of the Punjab would likely be more than that between the primary markets of the Punjab and the Karachi market.

   However the relationship of the Punjab markets is relatively stronger with Karachi than with the Rawalpindi market which is closer. This can be explained by the following factors. First, to most of the traders in the Punjab, Rawalpindi is not as well-established a terminal market as Karachi. Being relatively smaller in population, it absorbs only a small share of the total surplus available for terminal markets. Also, Rawalpindi does not offer in exchange any significant commodities to other places in the country. On the other hand, Karachi offers in exchange most of the imported and locally produced industrial goods to the country.[7] Due to this pattern of exchange of goods, transporters and traders have developed a preference for trips to Karachi rather than to places like Rawalpindi. Transporters usually expect to get attractive shipment contracts on their return trips from Karachi but not necessarily from Rawalpindi. They are, therefore, willing to charge less per mile for a trip to Karachi from the Punjab markets compared to what they would ask for a similar trip to Rawalpindi.

2. Government restrictions may have been responsible for a lower degree of market integration between Peshawar and the other markets. Because Peshawar is located near the border of Afghanistan, strict checking is done of vehicles carrying goods to and from this city. This discourages traders from moving goods to the Peshawar market. Differences in languages may also be a barrier to smooth trading contacts between markets of the two regions.[8]

3. Another interesting aspect of our results is the case of the Sialkot and Sargodha markets. Compared to markets like

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[7] Although no data are available about the actual flow of manufactured goods from Karachi vis-a-vis Rawalpindi to other parts of the country, one can easily get some idea by looking at the data on total industrial production of different cities given in [62]. Karachi's share in total industrial production of Pakistan is many times more than any other city.

[8] In Peshawar markets the traders ususally speak Pushto, whereas the language spoken by traders in Punjab is Punjabi.

Lahore, Faisalabad, Sahiwal, and Multan, these two markets have shown weaker integration with other markets. [See Table 4.3]. Relatively poor transport facilities appear to be the main factor responsible. Both Sialkot and Sargodha are located on "branch lines" of the railways and are also away from the Grand Trunk Road (the national highway linking various cities in Pakistan). Railway service to these cities is less frequent and slow. Poor transportation tends to increase costs. Truck companies charged a higher rate if they had to pass through a low quality or branch road.

4. The main reason why the Sukkur market has relatively poor integration with Punjab markets is the difference in the timing of arrival of marketable surplus in the markets in two regions. In most areas of Sind, wheat arrives late compared to the markets in the Punjab. The Hyderabad market (which is also in the Sind) has better transportation and communication links with other cities, and is more closely related with other markets.

Comparison with estimates for other countries

Table 4.4 summarizes estimates of the Correlation Coefficient (r) obtained by Farruk [21], Hays [27], Jones [40], Lele [48], Southworth [92] and Thaker [94] respectively for East Pakistan (now Bangladesh), Nigeria, India, Ghana, and the Gujrat province of India. We have also summarized in the same table our

Table 4.3

Classification of Markets Showing 'High', 'Medium' or 'Low' Degree of Market Integration for Different Commodities.

	Wheat			Gram			Rice		
Degree of Market Integration	Number of Markets	% of Markets	Names of the Markets	Number of Markets	% of Markets	Names of the Markets	Number of Markets	% of Markets	Names of Markets
1	2	3	4	5	6	7	8	9	10
1. High (γ_1 = .95 - 1.05) (Usually)	6	50.00	Faisalabad, Lahore, Multan, Sahiwal, Okara, Gujranwala	4	30.77	Faisalabad, Lahore, Multan, Sahiwal	2	20.00	Gujranwala & Sialkot (Only with each other)
2. Medium ($.90 \leq \gamma_1 \leq .95$) or ($1.05 \leq \gamma_1 \leq 1.10$) (Usually)	5	4.67	Hyderabad, Karachi, Rawalpindi, Sargodha, Sialkot.	8	61.54	Gujranwala, Hyderabad Karachi Rawalpindi, Sargdha, Sialkot, Sukkar	0	0	
3. Low ($\gamma_1 < 0.90$) (Usually)	1	8.33	Peshawar	1	7.69	Peshawar	8	80.00	All but mentioned above.

Source = Table B.1 to B.27.

Table 4.4

Comparative Distribution of Correlation Coefficient (r) as observed by various studies on Agricultural Markets in Different Underdeveloped countries.

Range of Correlation Coefficient "r"	Farruk for East Pakistan (Bangladesh) Rice	Hays for Nigeria (1958-65) Millet	PERCENTAGE OF "r" OBSERVED BY: Jones for Nigeria Rice	Lele for India Various Commodities	Lele for Indian Punjab Wheat only	Southworth et al for Ghana Rice	Thakur for Gujrat (India) Diff. Commodities	Present study for Absolute Prices of: Wheat	Gram	Rice	Jones for Nigeria Gari	Southworth for Ghana Yam
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Below 0.50	0	33.3	63.8	0	0	21.00	51.92	0	0	0	2.6	30.00
0.50 / 0.60	0	20.9	20.5	0	0	10.00	9.61	0	0	0	7.6	18.00
0.60 / 0.70	1.31	34.3	12.2	1.0	0	22.00	3.85	0	0	0	18.7	24.00
0.70 / 0.80	10.94	0.5	3.2	12.0	0	30.00	13.46	0	0	0	35.7	18.00
0.80 / 0.90	32.04	1.0	0.3	30.00	6.67	11.00	14.42	4.84	5.13	63.64	30.4	8.00
0.90 / 0.95	42.48	0	0	29.00	40.00	3.00	4.81	33.14	30.33	34.54	4.7	0.00
0.95+	13.07	0	0	28.00	53.33	4.00	1.92	62.02	64.54	1.82	0.3	2.00
Total	100	100	100	100	100	100	100	100	100	100	100	100
Number of Markets	23	15	57	31	6	16	10	12	13	10	25	16
Number of Pairs	153	105	1596	117	15	120	104	66	78	55	300	120

Source: Farruk [21] , Hays [27] , Jones [40] , Lele [49] , Sourthworth et al [92]
Thakur [94]

estimates of 'r'.[9]

As we can see from Table 4.4, none of the correlations is above 0.90 and in more than 50% of the cases it is less than 0.50 for Nigerian Markets studied by Hays. Jones's estimates based on prices of several commodities present more or less a similar picture of the Nigerian markets. Values of 'r' for markets in one district of Ghana are slightly higher than those for Nigerian markets but still mostly in the range of .5 to .80. In the case of the Gujrat markets of India, more than 50% of the values of 'r' are less than 0.50 denoting poor market integration. In the case of Farruk's study of East Pakistan, (now Bangladesh), more than 40% of the values are below 0.90. In the case of Lele's study of Indian markets, the value of 'r' is less than 0.90 for 43% of the cases. However, her values for the Punjab markets in India were generally close to 0.90. In our markets, more than 90% of the values based on "absolute prices" are above 0.90 and none are 0.80 or less. Even when the rate of change in price is used to estimate this coefficient, our values generally remained above 0.80 and only in 25% of the cases went below 0.80. (Not shown in Table 4.4).

One of the main reasons for higher 'r' values in our study compared to others is the kind of data base used. We used monthly average prices, which tends to make prices in different markets relatively closer to one another compared to weekly prices used by Farruk, Lele and Thakur. Secondly, our sample

[9] We did this by taking the square root of the values of 'R^2' presented in Appendix B, Tables B1-B27.

size (=264) was larger than Farruk's (=52), Hays' (=96), Jones' (=144), and Southworth's (=96), which by adding more information into our estimations resulted in high values of 'r' [47].

Nevertheless, our high estimates show that in relative terms Pakistan's markets are more strongly integrated with one another than in other underdeveloped countries. This may be attributed partly to the lack of any traditional trading community (compared to places like Gujrat in India) and partly to relatively better transportation facilities (compared to the markets studied by Hays and Jones in Nigeria). Hays included mostly rural markets which did not have good transportation links with major cities. The system of regulated markets which exists in Pakistan and not in Nigeria, and which allows quicker and better dissemination of information as the markets are located in specially marked premises, may also be responsible for a relatively higher degree of market integration among Pakistani markets.

An interesting case is that of the Indian markets in Punjab as compared to the markets in some other provinces of India. Since that part of India experienced a higher rate of growth in its agricultural productivity and had relatively better road and railway facilities, the markets were found to be more integrated than in the provinces of Tamil Nadu and West Bengal [48, pp. 89-90]. The effect of increased agricultural productivity on the performance of agricultural markets, in fact, needs separate treatment. We, therefore, study it for Pakistan in the next chapter.

Decomposing the Intermarket price Differentials into Mean, Variance and Covariance Components

In Chapter III, we pointed out that to explore the nature of relationships between markets we should also examine means, standard deviations and correlation coefficients between prices in these markets. We now present the statistical results.

Tables 4.5 shows the frequency distribution of Root Mean Square Error (RMSE), values based on absolute levels of prices respectively of wheat, gram and rice in selected markets of Pakistan. A detailed picture of these estimates is given in Tables B37 to B39. The essence of RMSE estimates is to find absolute differences between prices in different markets over a given period of time, which then can be compared with per unit transhipment costs over the same period, a distribution of which is given in Table 4.6.

The results in Table 4.5 show that in the case of wheat prices the RMSE is between 1.0 to 3.0 for most of the primary markets of the Punjab. For the markets of Hyderabad and Karachi, which are more than 500 miles away from the Punjab markets, the RMSE value is between 3.0 to 5.0. Comparing these values with transhipment costs, we find that except for the Peshawar market the RMSE values are always less than the transhipment costs.

The pattern of the RMSE values is very much in line with our regression estimates discussed in the preceding section.

TABLE 4.5

DISTRIBUTION OF ROOT MEAN SQUARE ERROR (RMSE) IN AVERAGE WHOLESALE PRICES OF SELECTED AGRICULTURAL COMMODITIES IN AGRICULTURAL MARKETS OF PAKISTAN ROM JANUARY 1955 TO JUNE 1979

RANGE OF RMSE VALUES	WHEAT		GRAIN		RICE	
	FREQUENCY	PERCENTAGE	FREQUENCY	PERCENTAGE	FREQUENCY	PERCENTAC
1.00 / 2.00	12	18.18	9	11.54	0	0
2.00 / 3.00	26	39.39	14	17.95	0	0
3.00 / 4.00	22	33.33	21	26.92	0	0
4.00 / 5.00	3	4.55	17	21.79	0	0
5.00 / 6.00	3	4.55	16	20.51	1	1.82
6.00 / 7.00	0	0	0	0	0	0
7.00 / 8.00	0	0	1	1.28	1	1.82
8.00 / 9.00	0	0	0	0	3	5.45
9.00 / 10.00	0	0	0	9	3	5.45
10.00 +	0	0	0	0	47	85.45
TOTAL	66	100	78	100	55	100

SOURCE: TABLES B.34 to B.36

Table 4.6

Distribution of Minimum Average Transport and Handling Costs on Transfer of one Maund (82½ lbs) of Different Commodities from One Agricultural Market to Another 1955-56 to 1978-79.

Costs in Rupees (Maund)	WHEAT		RICE	
	Frequency	Percentage	Frequency	Percentage
1.00 / 2.00	1	1.28	0	
2.00 / 3.00	5	6.41	1	1.28
3.00 / 4.00	35	44.87	4	5.13
4.00 / 5.00	24	30.77	17	21.79
5.00 / 6.00	12	15.38	33	42.31
6.00 / 7.00	1	1.28	17	21.79
7.00 / 8.00	0	0	6	7.69
Total	78	100	78	100

Source: Tables B.37 and B.38

Once again the markets of Lahore, Faisalabad, Multan, Sahiwal, and Gujranwala showed relatively better integration in their prices than the markets of Sialkot, Sargodha, Sukkar, and Rawalpindi. It is also interesting to note that the RMSE values seem not to depend only on one particular factor. They have generally increased with the distance between markets, but there are several cases where some other factors appear to have exercised greater influence. Karachi, for example, is further from Gujranwala compared to Okara, but still the RMSE for Gujranwala-Karachi is smaller (in the case of wheat prices) relative to Karachi-Okara. Similarly, while Peshawar is half as far away from Punjab markets as Karachi, the RMSE values for Peshawar versus the Punjab markets are higher than for the Karachi versus Punjab markets. On the other hand, in the case of gram prices, the RMSE values are generally higher than those observed for wheat prices, although still not more than the transhipment costs. The values of RMSE for rice prices are still higher than those for wheat and gram. They are also higher than the relevant transhipment costs by a significant proportion.

These are just a few examples which support our hypothesis in the above section, that differences in price relationships among markets have been influenced by more than one factor. Whereas the effect of transportation costs, or distance, is more obvious in the case of all prices studied here, the effects of other factors is however less clear.[10] The exception, however, is rice prices in which case the government restrictions on mobility appear to be a major factor influencing price trends. This is the only factor which can explain very high values of RMSE for rice observed here. Otherwise it seems highly improbable that other factors which were more or less equally operative for all commodities could result in huge intermarket differences in rice alone.

Bias, Variance and Covariance Components[11]

The values of Bias, Variance and Covariance components, in proportion form, for wheat, gram and rice are summarised in Table 4.7.

Our hypothesis that the Bias component is close to zero in the case of primary markets is true for wheat and gram prices as its values are less than 5% of RMSE in 71.21% and 79.49% cases for the two products respectively. The same is true of the Variance Component for these markets: in 86.36% of the cases, it is less than 5% of the RMSE estimates for wheat. As a result, the Covariance Components are around 90% of the RMSE figures in all of these cases, which supports our earlier hypothesis that the intermarket price differences have been mainly due to less-than-perfect covariance in prices for our markets.

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[10] Other factors which we have discussed above are differences in the cropping pattern, quality of product, product mobility, and monopoly power of traders in different regions.
[11] For definitions of Bias, Variance and Covariance Components see Chapter III, equation 3.18.

Table 4.7

Distribution of Bias, Variance and Covariance Proportions of RMSE of Average Wholesale Prices of Selected Agricultural Commodities in Major Agricultural Markets in Pakistan from January 1955 to June 1979.

Proportion	WHEAT			GRAM			RICE		
	(1) Um	(2) Us	(3) Uc	(1) Um	(2) Us	(3) Uc	(1) Um	(2) Us	(3) Uc
Below 0.05	47 (71.21)	57 (86.36)	0	62 (79.49)	56 (71.79)	0	4 (7.27)	21 (38.18)	0
0.05 ∠ 0.10	5 (7.58)	9 (13.64)	0	10 (12.82)	6 (7.69)	0	3 (5.45)	10 (18.18)	0
0.10 ∠ 0.15	10 (15.15)	0	0	6 (7.69)	4 (5.13)	0	6 (0.0190)	7 (12.73)	7 (12.73)
0.15 ∠ 0.20	3 (4.54)	0	0	0	1 (1.28)	0	10 (18.18)	9 (16.36)	10 (18.18)
0.20 ∠ 0.30	0	0	0	0	3 (3.85)	0	19 (34.55)	5 (0.09)	12 (21.82)
0.30 ∠ 0.40	0	0	0	0	7 (8.97)	0	5 (9.09)	2 (36.36)	6 (10.96)
0.40 ∠ 0.60	0	0	0	0	1 (1.28)	2 (2.56)	3 (5.45)	1 (1.82)	9 (16.36)
0.60 ∠ 0.80	0	0	6 (9.09)	0	0	9 (11.54)	2 (3.63)	0	6 (10.90)
0.80 ∠ 0.90	0	0	11 (16.67)	0	0	12 (15.38)	3 (5.45)	0	3 (5.45)
0.90 +	0	0	49 (74.24)	0	0	55 (70.51)	0 (0)	0	2 (3.64)
Total (%)	66 (100)	66 (100)	66 (100)	78 (100)	78 (100)	78 (100)	55 (100)	55 (100)	55 (100)

Source: Tables B.41 to B.43

In the case of Karachi and Hyderabad markets, however, the Bias Component is generally more than 10% of RMSE, when their wheat and gram prices are compared with other markets. But once again it is consistent with our hypotheses stated in Chapter III. Since Karachi is one of the main terminal markets, located far from major producing areas, its prices may always remain higher relative to other markets due to transportation costs and the one-way flow of agricultural goods to this market. The Hyderabad market, being the closest to Karachi, appears to have followed it closely in its pricing behaviour, and hence the higher values of Bias and Variance Components compared to other primary markets.

Somewhat unique is the case of the Peshawar market. Its Bias Component figures for wheat do not show any consistent pattern. In some cases, they are far less than 5%, but for others they are close to 10%. Looking at gram prices, the relative pricing behaviour of this market becomes further complicated. In most cases, the Bias Component is very small, but the variance component is sometimes as high as 40.70% (e.g. the Peshawar-Sialkot case). Whatever may be the reason for this phenomenon, one thing seems clear: the risk of dealing with this market due to the greater variability in its prices has been larger than in other markets. Thus it is not surprising that we observed a relatively larger value of RMSE for the Peshawar market compared to transhipment costs, indicating a possibility of higher risk premium applied by traders.

Not so surprising, however, are the results for rice prices. For almost all markets, the Bias Component is very large, implying that the rice prices in various markets have stayed systematically different from one another.

The above results have important implications for our analysis. For most markets, smaller values of the Bias and Variance Components in the case of wheat and gram indicate that traders were not able to keep prices of these commodities consistently different in one market from another. Whatever intermarket price differences we have observed were because of imperfect covariances in their prices, which depend primarily on factors like transportation costs and cropping patterns. These results also explain why, for example, Peshawar markets showed relatively lower values of γ_1 in the case of wheat and gram prices. It is because the correlation coefficients between Peshawar and other market prices were generally lower than those among other markets, indicating a relatively slower response of supply and demand in other regions to changes in Peshawar prices. This means, in light of our Equation (3.11) and (3.12), low values of γ_1. From these results, we also learn that even though movements in prices between Sukkur and other markets have not been very close, because we obtained relatively smaller values of γ_1 for this market, the average trend in its prices was close to the other primary markets. Both the Bias and Variance Components are less than 5% of the RMSE values for Sukkur market.

Similarly, the structure of rice prices becomes clearer after we decompose price differences into various components. Large values of the Bias Component indicate that the relative degree of market integration between rice prices is much lower than signified by the regression estimates shown in Table 4.20. There the γ_1 values for rice prices were only marginally different from those obtained for wheat and gram. However, the estimates of RMSE and the Bias and Variance Components show that rice prices in various markets were significantly different from one another.[12]

Intertemporal Performance of Markets: Empirical Findings

Off-season Rise in Prices Versus Storage Costs

In Chapter III, we pointed out that there were four major questions about the intertemporal aspect of market performance:

1. whether prices in the harvest season were significantly lower than the off-season prices?;
2. if yes, then what was the nature of "profit margins" earned by traders who bought at harvest and sold in the off-season?
3. what was the nature of risk associated with the storage operation as measured by the coefficient of variation (CV) in prices of off-season periods?;
4. how did risk in storage activity behave over time in

[12] Comparison of RMSE with the transhipment costs showed that RMSE values for rice prices were many times more than transhipment costs.

response to factors like better marketing facilities and improvement in traders' skills through "learning-by-doing"?

In Table 4.8, we have summarized our results of the regression of average wholesale monthly prices of three main commodities on the time variable (T) and a dummy variable (H), which is equal to one for the harvesting months (May, June and July for wheat and gram; November, December and January for rice), and zero otherwise, in selected markets of Pakistan for the period January 1955 to June 1979. These estimates show that there is some evidence of significant underpricing in the case of wheat. The coefficient b2 of variable H is significant at the 5 level or less for most of the cases and at 1% for Faisalabad, Okara, Sargodha and Sialkot. For gram and rice prices, the evidence is very weak. All values of the coefficient b2 are insignificant at the conventional levels of significance. However, the sign of these coefficients is negative, supporting the hypothesis that prices do go down during the harvest months compared with the off-season. This was not unexpected as prices in the off-season would be somewhat higher than the harvest prices due to storage costs. However it is not sufficient to conclude that farmers are paid "unduly" low prices during the harvest periods. To be able to draw some definite conclusions on this aspect, we compare the off-season rise in prices with storage costs.

The estimates of the rates of off-season rise in the average wholesale monthly prices, computed according to the

Table 4.8

Regression of Average Wholesale Monthly Prices of Different Agricultural Commodities on Time (t) and a Dummy Variable (H) Which = 1 for the Harvesting Months and Zero Otherwise. For Various Markets of Pakistan.

n = 252

Markets \ Commodities	Wheat				Gram				Rice			
	a	b_1	b_2	R^2	a	b_1	b_2	R^2	a	b_1	b_2	R^2
1. Faisalbad	5.87	0.138 (23.67)	-1.97 (-1.94)	0.695	5.11	0.285 (17.84)	-2.74 (-.92)	0.562	7.38	0.402 (20.39)	3.03 (0.91)	0.626
2. Gujranwala	6.36	0.133 (22.84)	-1.856 (-1.81)	0.678	3.97	0.281 (17.81)	-2.59 (-0.94)	0.561	5.41	0.390 (21.69)	1.42 (0.46)	0.654
3. Hyderabad	5.81	0.137 (24.54)	-1.62 (-1.57)	0.716	3.99	0.267 (20.07)	-1.82 (-0.74)	0.604	9.41	0.445 (19.02)	3.39 (0.85)	0.593
4. Karachi	5.88	0.145 (25.22)	-1.28 (-1.08)	0.718	4.87	0.295 (17.24)	01.79 (-0.51)	0.532	43.55	0.439 (15.52)	0.544 (0.11)	0.538
5. Lahore	6.30	0.135 (24.22)	-1.85 (-1.72)	0.701	5.03	0.286 (18.03)	-2.52 (-0.92)	0.572	4.81	0.454 (22.10)	3.37 (0.77)	0.636
6. Multan	5.98	0.130 (23.64)	-1.76 (-1.79)	0.694	5.07	0.279 (17.89)	-2.32 (-0.88)	0.563	7.47	0.402 (19.71)	3.80 (1.03)	0.611
7. Okara	5.96	0.129 (24.49)	-1.89 (-1.96)	0.709	4.96	0.278 (19.01)	-2.18 (-0.84)	0.584	NA	NA	NA	NA
8. Peshawar	6.98	0.122 (48.90)	-1.42 (-1.51)	0.603	2.80	0.249 (24.03)	-0.154 (-0.09)	0.671	4.91	0.515 (21.74)	4.24 (1.05)	0.655
9. Rawalpindi	5.95	0.146 (22.75)	-1.65 (-1.67)	0.694	4.69	0.278 (17.72)	-2.05 (-0.69)	0.568	15.61	0.452 (16.76)	1.92 (0.52)	0.565
10. Sahiwal	5.87	0.129 (24.66)	-1.83 (-1.89)	0.712	5.02	0.281 (18.21)	-2.43 (-0.91)	0.572	10.60	0.390 (19.05)	2.09 (0.59)	0.594
11. Sargodha	5.81	0.132 (22.85)	-1.87 (-1.73)	0.684	5.12	0.279 (18.14)	-2.39 (-0.92)	0.569	NA	NA	NA	NA
12. Sialkot	6.88	0.128 (22.29)	-1.89 (-1.95)	0.659	4.92	0.284 (17.87)	-2.46 (-0.94)	0.560	4.51	0.378 (19.94)	2.49 (0.81)	0.624
13. Sukkar	NA	NA	NA	NA	3.83	0.259 (19.05)	-1.81 (-0.73)	0.596	3.67	0.428 (19.93)	3.19 (0.86)	0.638

Source: Computations based on data from [57]

NA : Data not available

method already explained in Chapter III, are summarised in Tables 4.9.

Several interesting features of the off-season price variations can be observed from these estimates. First, the rate of off-season rise remained generally low: below 10% for about 50% of the cases and below 15% in about 65% of the cases for wheat. Only 7.19% of the times were they above 30%. The nature of off-season price variations in the case of gram was similar to wheat. However, in the case of rice prices there was either a sharp decline or sharp increase in off-seasons, indicating a relatively greater degree of randomness in off-season behaviour of its rice prices. Substantial government intervention in trade may be responsible for this behaviour of rice prices. In its attempt to meet the demand of deficit regions, the government keeps changing its zoning and interdistrict restrictions policy, creating uncertainty about the behaviour of prices in different markets. Private traders who may store to sell in the off-season could face heavy losses or high rates of return if in the meantime government changes the level of its supply to a particular market. In fact, the creation of PASSCO recently may have also led to a similar situation for other commodities.[13] Since PASSCO is one of the biggest marketing and storage organisations in the country, it can change the nature of prices in any market by its trading activities.

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[13] This opinion is based on the views expressed by several traders. However, to reach a proper conclusion further research is needed to study the effect of PASSCO on the stability of prices in primary markets.

Table 4.9

Distribution of Gross and Net Off-Seasonal Rise in Prices of Different Commodities in Pakistan. 1955-56 - 1978-79.

Range of off seasonal increase (%)	Wheat		Gram		Rice (Basmati)	
	Gross	Net	Gross	Net	Gross	Net
Below zero percent	10 (3.79)	131 (49.62)	6 (2.09)	110 (38.46)	10 (4.13)	106 (43.80)
0 - 5.00	15 (5.68)	53 (20.08)	40 (13.96)	57 (19.94)	13 (5.37)	36 (14.88)
5.0 - 10.0	93 (35.23)	40 (15.15)	52 (18.18)	40 (13.99)	41 (16.94)	35 (14.46)
10.0 - 15.0	49 (18.56)	22 (8.33)	44 (15.38)	10 (3.50)	18 (7.43)	19 (7.85)
15.0 - 20.0	35 (13.26)	7 (2.65)	41 (14.33)	12 (4.20)	42 (17.36)	12 (4.96)
20.0 - 25.0	28 (10.61)	0	40 (13.99)	14 (4.90)	26 (10.72)	8 (3.31)
25.0 - 30.0	15 (5.68)	2 (0.76)	32 (11.18)	25 (8.74)	41 (16.94)	9 (3.72)
30.0 - 35.0	7 (2.65)	0	8 (2.79)	5 (1.75)	35 (14.46)	12 (4.95)
35.0 +	12 (4.54)	9 (3.41)	23 (8.04)	13 (4.54)	16 (6.61)	5 (2.07)
Total # of Observations	264 (100)	264 (100)	286 (100)	286 (100)	242 (100)	242 (100)

Source: Tables B.44 to B.46 and B.48 to B.50

The second important feature of our results is that they indicate a great deal of fluctuation in off-season prices from one period to the other. A year of large off-season price rise was usually followed by two or three periods of very small rise. This to some extent looks natural as the 'high' margin in any one year would induce more traders into the storage operation and eliminate the premium. However, compared to a few years in the mid-fifties, the off-season rise was generally low between 1961-62 to 1970-71, with the exception of 1966-67 when the off-season rise was phenomenal. In fact, 1966-67 was an abnormal year in the marketing history of Pakistan. There was exceptionally low production in that year and the year preceeding it, because of the war with India and the drought following it. This led to uncertainty about supply conditions in the country, creating a spectacular rise in prices in the off-season as people were trying to hoard foodgrains for fear of shortages. Shortages created by crop damage due to a flood in 1973-74 also seem to have been responsible for a high off-season rise in 1974-75, when the effect of these shortages was felt in the marketplace. The price rise in 1977-78 seems partly due to the political crisis in the early months of 1977, culminating in the imposition of Martial Law in July 1977. Once again, the uncertainty created by a 'transitory' government in terms of its attitude toward the private sector affected the smooth functioning of every economic activity, including agricultural marketing, in the country.

The net off-season rise in prices remained close to zero for the three commodities, except for years like 1966-67. The average rates of net off-season rise in price, are close to zero for wheat. For gram and rice, the rates are slightly higher than those for wheat, indicating perhaps the riskier nature of storage operation. Traders must expect a higher risk premium to be able to allocate their supplies to the off-season months. While calculating the net off-season rise, we did not add the risk premium and the return to traders' services to storage costs. Any positive value assigned to these factors would have made the average net off-season rise in price virtually zero. Despite of the fact that we did not net out some components of storage costs, the hypothesis that E(NORP) =0 can be accepted at the 5% level of significance for a majority of the cases but at the 1% level only for a few markets.

Risk in Storage Activity

We now examine the nature of risk involved in storing a commodity for off-season sales. We have used the coefficient of variation (CV) of average wholesale monthly prices in off-season months as a measure of this risk.[14] In Tables 4.10 we present a summary of the annual estimates of the CV respectively for wheat, gram and rice. A look at these estimates reveals that, except for a few years, the magnitude of the coefficient of variation for all three commodities has been quite low. This

[14] See Chapter III equation 3.23 for the method used to calculate CV.

Table 4.10

Frequency Distribution of Coefficient of Variation (CV) in Average Wholesale Prices of Selected Commodities in Off-Season Period for Various Agricultural Markets in Pakistan. 1955-56 to 1978-79.

Estimate of CV	WHEAT		(BASMATI) RICE		GRAM	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Below 0.05	68	25.76	104	42.97	22	7.69
0.05 / 0.10	156	59.09	99	40.91	180	62.93
0.10 / 0.15	20	7.58	23	9.50	49	17.13
0.15 / 0.20	9	3.41	13	5.37	29	10.13
0.20 / 0.25	6	2.27	3	1.24	5	1.74
0.25 +	5	1.89	0	0	2	0.69
Total	264	100	242	100	286	100

Source: Tables B.51 to B.53.

indicates that the overall amount of risk faced by any stock-keeper was not very high and as a result the cost imposed by the risk factor on consumers was low.

The second important feature of our estimates is that the coefficient of variation shows fluctuations from one period to another. Such fluctuations could result in a higher degree of risk, as this would mean that a trader faced an unpredictable range of wholesale prices in the off-season months. Although true for all three commodities, gram prices in particular showed large off-season fluctuations. Rice has the lowest values of the coefficient of variation, but the fluctuations are more severe than similar estimates for wheat and gram prices. Relatively smaller off-season fluctuations for rice once again may be due to a greater degree of government regulation of its trade, whereas the swings in its prices are likely due to abrupt changes in zoning by the government.

An important question to be explored is the nature of the trend and magnitude of swings from year to year in the coefficients of variation of off-season prices. For this purpose, we have plotted in estimates for selected markets. Regression estimates were obtained to observe the trend lines, whereas the graphic analysis was used to see the magnitude of swings in their values.

The ordinary least square estimates of Equation 3.24 are summarised in Table 4.11. Our hypothesis that the coefficients of variation have not increased over time can be accepted in the

Table 4.11

Regression of Coefficients of Variation (CV) in Off-seasonal Wholesale Prices of Various Commodities in Different Agricultural Markets of Pakistan. 1955-56 - 1978-79.

Commodities / Markets	WHEAT a	WHEAT b (t)	WHEAT c (t)	WHEAT R^2 (F)	GRAM a	GRAM b (t)	GRAM c (t)	GRAM R^2 (F)	RICE a	RICE b (t)	RICE c (t)	RICE R^2 (F)
1. FD	0.1542	-0.155	0.0054	0.398	0.0984	-0.052	0.0051	0.102	0.050	0.041	-0.002	0.091
		(2.65)	(2.00)	(5.63)		(0.65)	(0.89)	(0.99)		(0.91)	(1.08)	(0.95)
2. GA	0.1781	-0.17	0.0055	0.468	0.0856	-0.081	0.0021	0.053	0.053	-0.042	0.003	0.203
		(3.25)	(2.55)	(8.63)		(-0.36)	(0.28)	(0.59)		(0.98)	(1.26)	(2.23)
3. HD	0.1376	-0.139	0.0052	0.413	0.0906	-0.078	0.0074	0.083	0.0455	0.082	-0.004	0.093
		(2.97)	(2.31)	(6.15)		(0.81)	(1.35)	(0.79)		(1.115)	(1.05)	(0.96)
4. KCI	0.1058	-0.106	0.0052	0.317	0.0953	-0.089	0.007	0.267	0.0239	0.124	-0.005	0.115
		(2.34)	(1.95)	(4.12)		(-1.63)	(2.114)	(2.94)		(1.448)	(1.395)	(1.49)
5. LR	0.1473	-0.151	0.0048	0.438	0.0874	-0.084	0.006	0.189	0.0320	0.054	-0.0021	0.083
		(2.97)	(2.29)	(7.68)		(-1.27)	(1.55)	(2.10)		(0.855)	(-0.532)	(0.816)
6. MN	0.1483	-0.163	0.0056	0.457	0.0961	-0.081	0.0072	0.153	0.0367	0.047	-0.0023	0.091
		(3.11)	(2.43)	(8.12)		(1.06)	(1.69)	(1.95)		(1.07)	(0.89)	(0.94)
7. OK	0.1601	-0.139	0.0051	0.471	0.1109	-0.1025	0.0069	0.142	NA	NA	NA	NA
		(3.07)	(2.49)	(8.65)		(1.06)	(1.235)	(1.61)	"	"	"	"
8. PR	0.1785	-0.09	0.0063	0.257	0.1063	-0.033	0.0007	0.031	0.0650	0.038	-0.0013	0.041
		(1.95)	(1.316)	(3.10)		(-0.35)	(0.15)	(0.27)		(0.47)	(-0.330)	(0.19)
9. RPI	0.1160	-0.125	0.0052	0.335	0.1035	-0.092	0.0068	0.096	0.0516	0.048	-0.0035	0.085
		(2.63)	(2.01)	(5.15)		(1.02)	(0.83)	(0.92)		(0.859)	(0.94)	(0.81)
10. SL	0.1479	-0.127	0.0045	0.502	0.0987	-0.085	-0.0074	0.126	0.0401	0.036	-0.003	0.089
		(3.15)	(2.32)	(9.71)		(0.63)	(1.21)	(1.39)		(0.87)	(1.02)	(0.90)
11. SG	0.1443	-0.142	0.0051	0.406	0.969	-0.065	0.0063	0.106	NA	NA	NA	NA
		(2.95)	(2.09)	(5.73)		(0.78)	(1.03)	(1.02)	"	"	"	"
12. ST	0.1187	-0.178	0.0049	0.393	0.1247	-0.1120	0.0078	0.187	0.0488	0.037	-0.0013	0.043
		(2.33)	(2.03)	(5.46)		(-1.65)	(1.86)	(2.06)		(0.58)	(0.43)	(0.342)
13. SKR	NA	NA	NA	NA	0.1126	-0.094	0.0081	0.105	0.0391	0.065	-0.003	0.956
						(1.02)	(0.95)	(0.96)		(1.21)	(0.92)	(0.931)

N.A.: Data not available
Source: Data from [57]

case of wheat only, where the values of 'b' are generally negative and significant at 5% level. However, since the 'c' values are positive (though not large enough to make the trend line positively sloped) the overall time trend in the coefficients of variation for all our markets is represented by a gradually declining curvature similar to Figure 4.37. Our hypothesis, however, cannot be accepted in the case of gram and rice. No systematic trend could be observed in the CV of rice prices. The estimates of the coefficients 'b' and 'c' are such that they show a positive trend in the CV of gram prices. However, this trend is statistically insignificant.

A positive trend in off-season price fluctuations for gram is not surprising if we look at the specific nature of this commodity. Gram is one of the supplementary food items. It is a good substitute not only for other lentils but also for vegetables and meat. Changes in supply and demand conditions for all of its substitutes affect its equilibrium price. The number of substitutes for wheat and rice are far more limited. Secondly, as most of the cropped area is devoted to crops like wheat and rice, gram is grown mostly on lands without access to good irrigation facilities. This makes the output of gram more vulnerable to changes in weather and rainfall, and hence the fluctuations.

The results related to rice prices are consistent with our earlier findings. There is not much similarity in off-season fluctuations of its prices in various markets except for the absence of a systematic trend. For some markets, the sign of the trend coefficient is negative; it is positive for others. This could be either because of poor fit which the data on rice prices have been giving us so far or because of the relatively stronger degree of control of the government on its prices as discussed earlier.

Figures 4.2 to 4.9 reveal that there was not only a downward trend in the values of the coefficient of variations for wheat but also the swings became smaller over time. This to some extent can be taken to indicate a decline in the degree of risk in storage activity as smaller swings mean a relatively lower degree of unpredictability about off-season prices. In the case of gram and rice, however, the situation was quite the opposite. The trend in the off-season fluctuations for gram was generally positive which indicated the possibility of growing riskiness in storing gram. For rice, even though there is no clear cut trend, fluctuations have been changing in magnitude more abruptly from time to time, indicating once again a higher degree of unpredictability in its prices. The added risk due to this factor is reflected in our estimates of profit margins shown earlier. A part of the positive off-season net profit margin could be due to a higher risk premium needed in storing this commodity.

In general, the results about the nature and behaviour of the risk characteristic of markets support our hypothesis that they have responded favourably to those factors which reduce the amount of risk in storage activity. We have seen that in the case of wheat, which is one of the most important commodities traded in these markets, the trend in off-season price variations was negative in almost all cases. The sign of the coefficients for gram prices was postive but insignificant, which does not necessarily mean an increase in the risk associated with storing gram.

Marketing Margins Earned by Traders at Different Stages of Marketing

In this section, we examine the nature of net margins earned by traders at different stages of marketing. Our estimates here are hypothetical, for they were based on secondary data which government agencies collected for different markets and could be different from margins actually paid by consumers and received by farmers. The exact estimates of margins can only be obtained if we know at what prices traders bought and sold any commodity. This information is usually difficult to obtain through normal channels in Pakistan. We have, therefore, used the average wholesale and retail prices in primary wholesale markets to calculate the net margin which all traders between the commission agent and retailer would have earned. A distribution of such margins is presented in Table 4.12 along with gross differences between the average wholesale and retail prices in various markets. Estimates of transportation and handling costs from farm to primary wholesale

Table 4.12

Gross and Net Marketing Margins Earned by all the Intermediaries between a Commission Agent and a Retailer in Wheat and Gram in Pakistan[1]. 1955-56 - 1978-79*

Range of the Margin	Wheat		Gram		All Commodities	
	Gross	Net	Gross	Net	Gross	Net
Below Zero	0	52 (27.52)	0	30	0	82 (21.69)
0 - 5.0	17 (8.99)	69 (36.50)	5 (2.65)	42 (22.22)	22 (5.82)	111 (29.37)
5.0-10.0	71 (37.56)	42 (22.22)	11 (5.82)	78 (41.26)	82 (21.69)	120 (31.75)
10.0-15.0	54 (29.57)	19 (10.05)	14 (7.40)	23 (12.17)	68 (17.99)	42 (11.11)
15.0-20.0	30 (15.87)	7 (3.70)	22 (11.64)	13 (6.87)	52 (13.76)	20 (5.29)
20.0-25.0	10 (5.25)	0	28 (14.81)	3 (1.59)	38 (10.05)	3 (0.79)
25.0-30.0	7 (3.70)	0	38 (20.11)	0	45 (11.90)	0
30.0-35.0	0	0	24 (12.69)	0	24 (6.35)	0
35.0-40.0	0	0	19 (10.05)	0	19 (5.03)	0
40.0-45.0	0	0	17 (8.90)	0	17 (4.50)	0
45.0 +	0	0	11 (5.82)	0	11 (2.91)	0
Total (%)	189 (100)	189 (100)	189 (100)	189 (100)	378 (100)	378 (100)

N.A.: Retail price data were not available

Source: Computations based on data from [59] and Appendix D.

*Figures in brackets are percentage of total observation market and from primary wholesale market to retail shop are shown in Appendix D.

The margin earned by village traders, is estimated on the basis of 500 observations on sale and purchase prices for wheat and rice from the 1980 account books of 15 village traders each in the districts of Faisalabad and Sialkot. From these traders, we also gathered information on their actual profit/loss and costs of selling to a primary wholesale market. A summary of these data is presented in Table 4.13.

Our estimates of the net margins tend to reject the claims that they were "excessive". Even the gross differences between wholesale and retail prices are less than 10% in 37.51% of the cases and less than 20% in about 70% of the cases. Only in 18.75% of the cases were such differences more than 30%, which could be attributed to abnormal conditions faced by Pakistan in certain years due to war, drought and other natural calamities. If we exclude handling and other charges from these margins then the net accounting margins -- margins from which the return to traders for undertaking a risky venture are not excluded -- are very close to zero. Except for 17.19% of the cases, net margins did not exceed 10% of average wholesale prices for all commodities. In about 50% of the cases such margins were below 5%.

However, even if we do not use the figures for handling costs, on the ground that most of the traders in a city do not get their supplies after they pass through more than one hand,

Table 4.13

Distribution of Gross and Net Margins Earned by Village Traders in Wheat and Rice Trade in the Districts of Sialkot and Faisalabad, Pakistan, 1980 - 81.[1]

Range of Margin in %	WHEAT Gross	WHEAT Net	RICE (Basmati) Gross	RICE (Basmati) Net	BOTH COMMODITIES Gross	BOTH COMMODITIES Net
	Number and (percentage) of cases					
Below zero	12 (6.09)	25 (12.69)	8 (4.06)	17 (8.63)	20 (5.08)	42 (10.66)
0 - 5.0	24 (12.18)	60 (30.46)	14 (7.11)	32 (16.24)	38 (9.64)	92 (23.35)
5.0-10.0	31 (15.74)	42 (21.32)	37 (18.78)	67 (34.01)	68 (17.26)	109 (27.66)
10.0-15.0	40 (20.30)	41 (20.81)	48 (24.37)	50 (25.38)	88 (22.34)	91 (23.09)
15.0-20.0	39 (18.80)	29 (14.70)	40 (20.30)	31 (15.34)	79 (20.05)	60 (15.23)
20.0-25.0	31 (15.74)	-	25 (12.69)	-	56 (14.21)	-
25.0-30.0	20 (10.15)	-	18 (9.14)	-	38 (9.64)	-
30.0 +	-	-	7 (3.55)	-	7 (1.78)	-
Total %	197 (100)	197 (100)	197 (100)	197 (100)	394 (100)	394 (100)

1. Net margins here refer to net accounting margin because the traders deducted only the transportation and handling charges from their profit and not all kinds of costs.

Figures in brackets are percentages of total observations.

N.A. Data not available.

Source: Interviews with village traders

the gross differences between wholesale and retail prices are not as high as some of the earlier studies have tried to project.[15] These differences varied between 5 to 20%, except for a few cases where they exceeded 30%. On the other hand, according to the estimates of some of the earlier studies shown in Table 4.14, the "gross margins" earned by traders in the primary market were generally close to 30%. But the problem with these estimates is that they were based on one or two year data. The chances are that those were abnormal years as even in our estimates the margins for 1966-67 and 1973-74 were much higher than those for other years. The important question is whether the phenomenon of high margin was persistent or short-lived. On this, we find that the high rates never stayed for more than two years in a row. Usually a high margin period was followed by a period with very small margin. In years like 1967-68 and 1968-69, the net margins must have been negative, as the gross differences between wholesale and retail prices were very close to zero. Even 1969-70 was not a good year for traders, when the average gross differences were below 10% for all markets.

A similar picture emerges when we look at the margins earned by village traders. From the data presented in Table 4.14, we find that the "net accounting margins" were not more than 20% for any case.[16] In fact, these margins were below 10% in sixty percent of the cases and between 10 to 15% in about 25%

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[15] See Qureshi [74] Sattar [82] and Siddiqui [84].
[16] For definition of net accounting margin see Chapter III, Equation 3.26.

Table 4.14

Gross Marketing Margins Earned by the Wholesalers, Mills and Retailers, all taken together, as reported by some of the earlier studies on Pakistan.

	Name of the Study	Wheat %	Gram %	Rice (Basmati) %
1.	Jamid, M.A. 1968-69 Punjab (Chuhrian)	18.15	NA	31.79
2.	Sattar, S.A. 1974-75	NA	50.53	NA
3.	Qureshi Toaha 1969-70-1972-73	NA		
	i. Flour mills	NA	6.00	30.00
	ii. Traders	NA	12.00	12.90
	Total (i + ii) =	NA	18.00	42.90
4.	Siddiqi, S.A. 1977-78 (Sind)	NA	40.34	NA

NA : No estimates available

Sources: (1) [35] (2) [81] (3) [74] (4) [84]

of the cases. They were above 25% only in 15% of the cases. If we exclude from these estimates costs like expenditure on food and the like, which the traders usually do not exclude from profits shown in their books, the net accounting profit margin would on average be less than 10%.

Figure 4.1

A General Picture of the Trend in Coefficients of Variation in Off-Seasonal Average Wholesale Prices of Wheat in Different Agricultural Markets in Pakistan. 1955-56 to 1978-79.

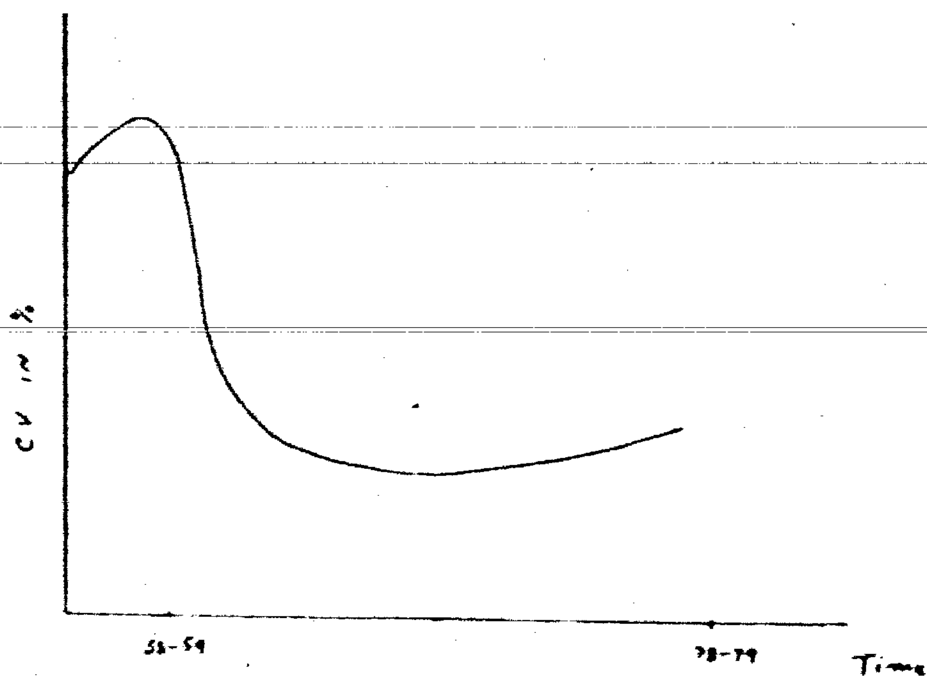

Figure 4.2

The Behaviour of the Coefficients of Variation in Off-Season Wholesale Prices of Wheat in Faisalabad Market 1955-56 to 1978-79.

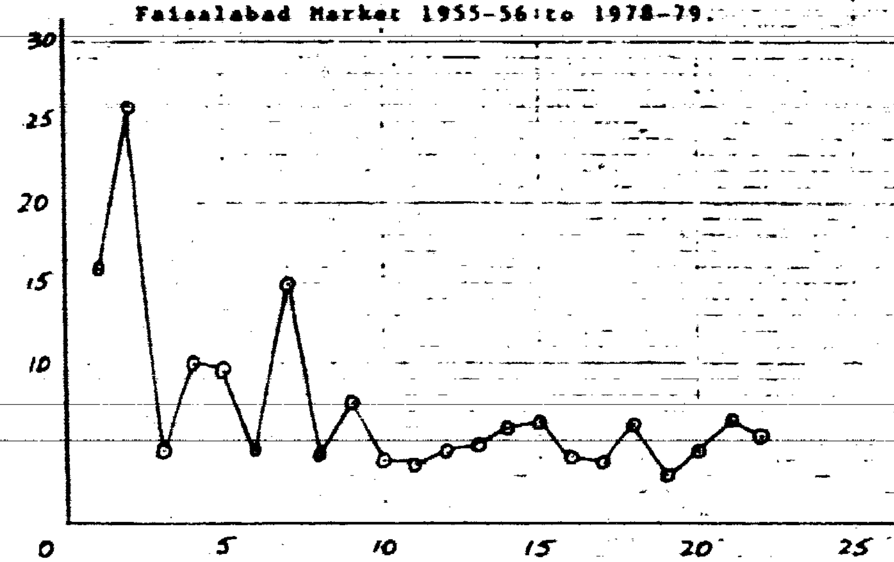

Figure 4.3

The Behaviour of the Coefficients of Variation in Off-Season Wholesale Prices of Wheat in Gujranwala Market 1955-56 to 1978-79.

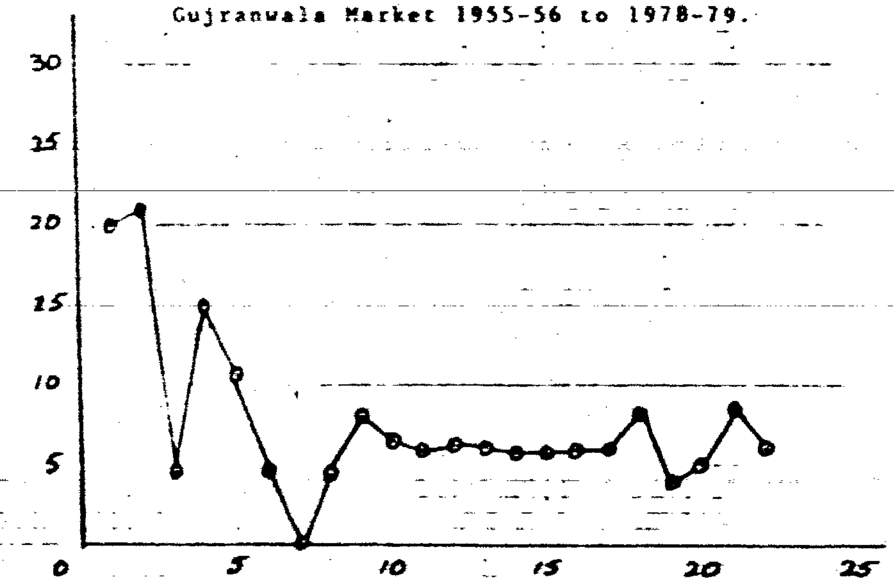

Figure 4.4

The Behaviour of the Coefficients of Variation in Off-Season Wholesale Prices of Wheat in Hyderabad Market 1955-56 to 1978-79.

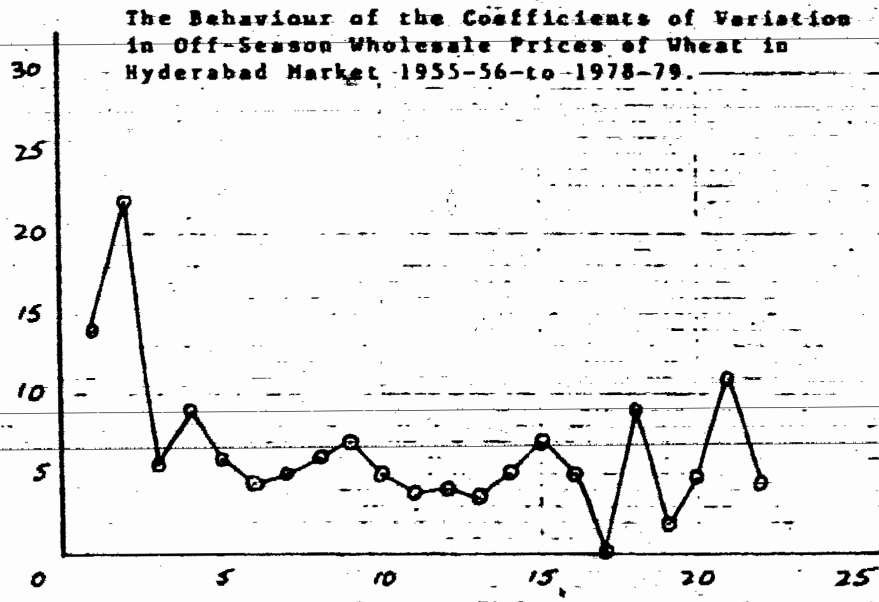

Figure 4.5

The Behaviour of the Coefficients of Variation in Off-Season Wholesale Prices of Wheat in Karachi Market 1955-56 to 1978-79.

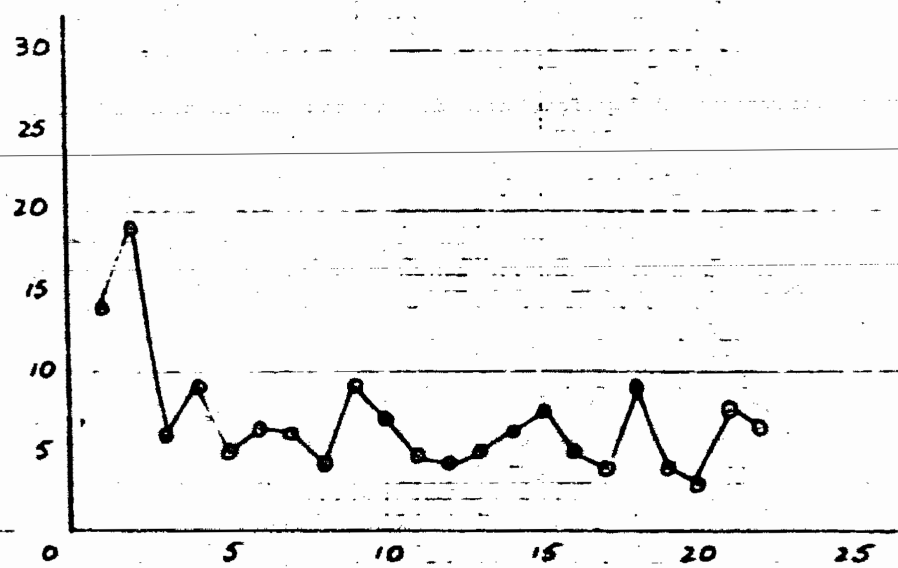

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Figure 4.6

The Behaviour of the Coefficients of Variation in Off-Season Wholesale Prices of Wheat in Lahore Market 1955-56 to 1978-79.

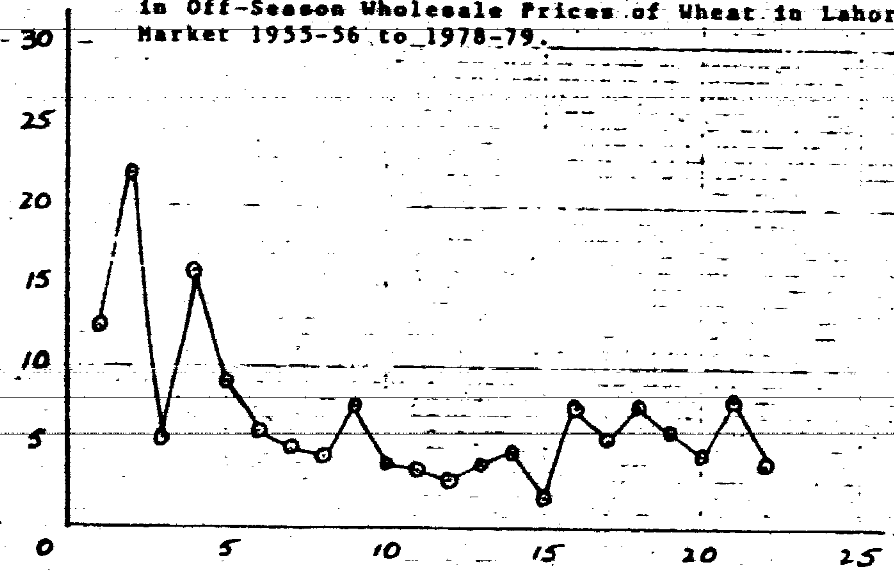

Figure 4.7

The Behaviour of the Coefficients of Variation in Off-Season Wholesale Prices of Wheat in Peshawar Market 1955-56 to 1978-79.

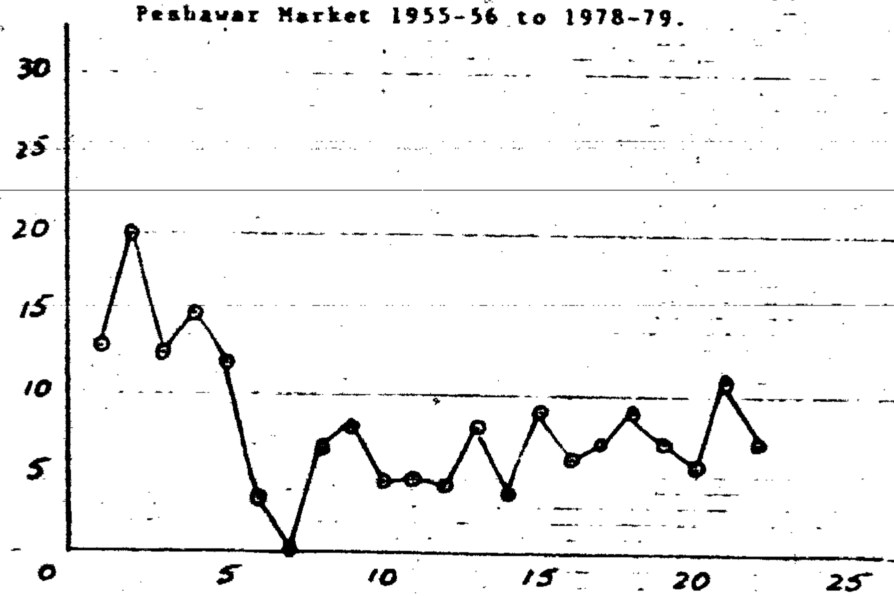

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Figure 4.8

The Behaviour of the Coefficients of Variation in off-season Wholesale Prices of Wheat in Okara Market 1955-56 to 1978-79.

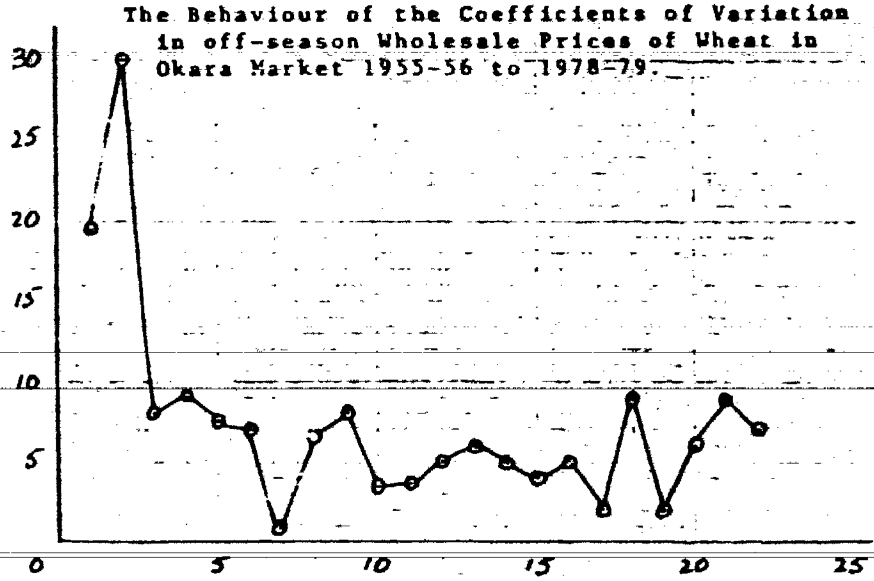

Figure 4.9

The Behaviour of the Coefficients of Variation in Off-season Wholesale Prices of Wheat in Sialkot Market 1955-56 to 1978-79.

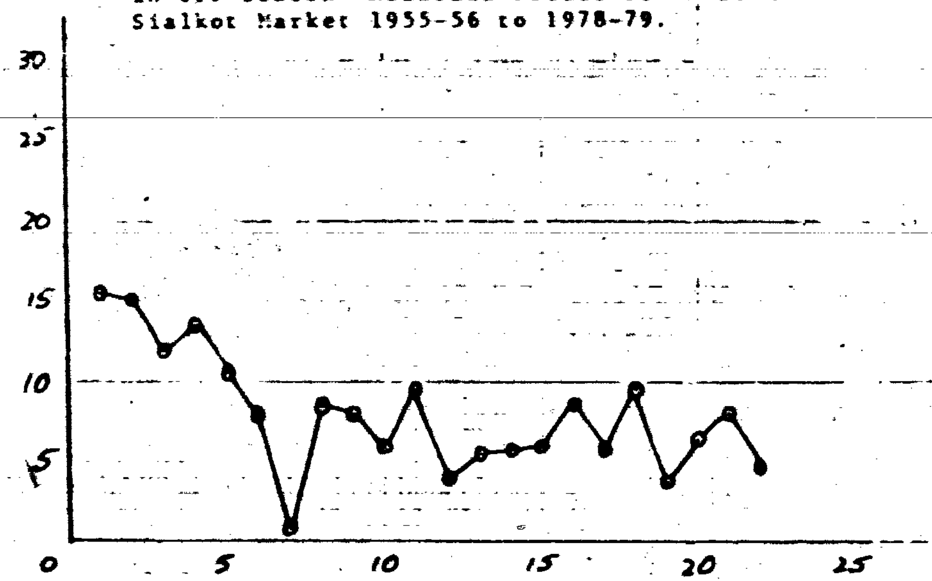

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Figure 4.10

The Behaviour of the Coefficients of Variation in Off-Season Wholesale Prices of Rice (Basmati) in Gujranwala Market, 1955-56 to 1978-79.

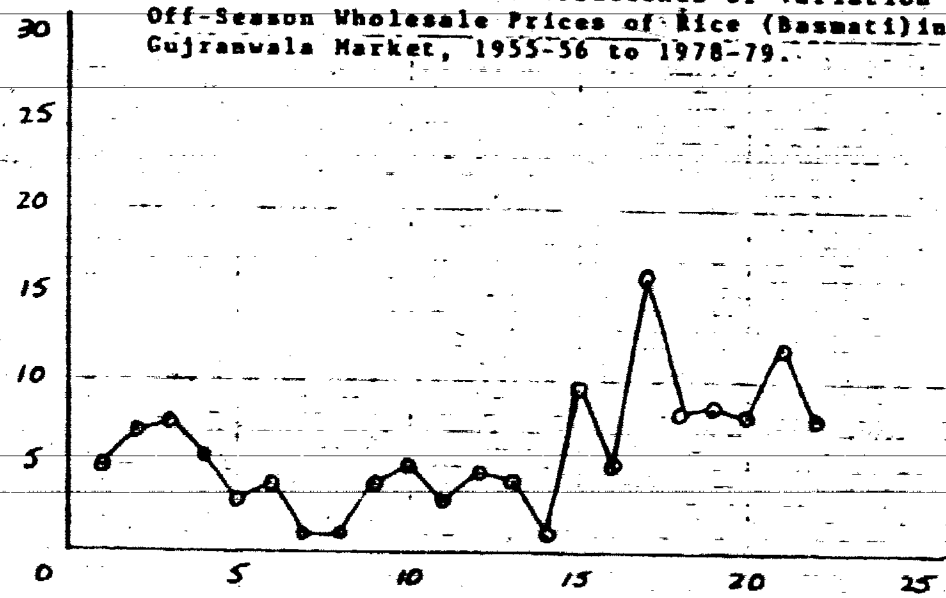

Figure 4.11

The Behaviour of the Coefficients of Variation in Off-Season Wholesale Prices of Rice (Basmati) in Karachi Market, 1955-56 to 1978-79.

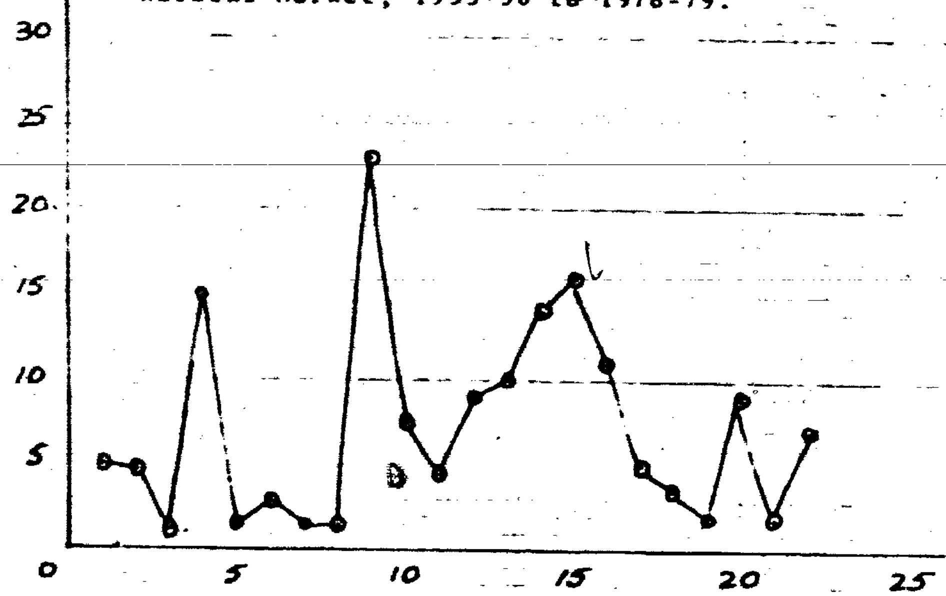

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Figure 4.12

The Behaviour of the Coefficients of Variation in Off-Season Wholesale Prices of Rice (Basmati) in Lahore Market, 1955-56 to 1978-79.

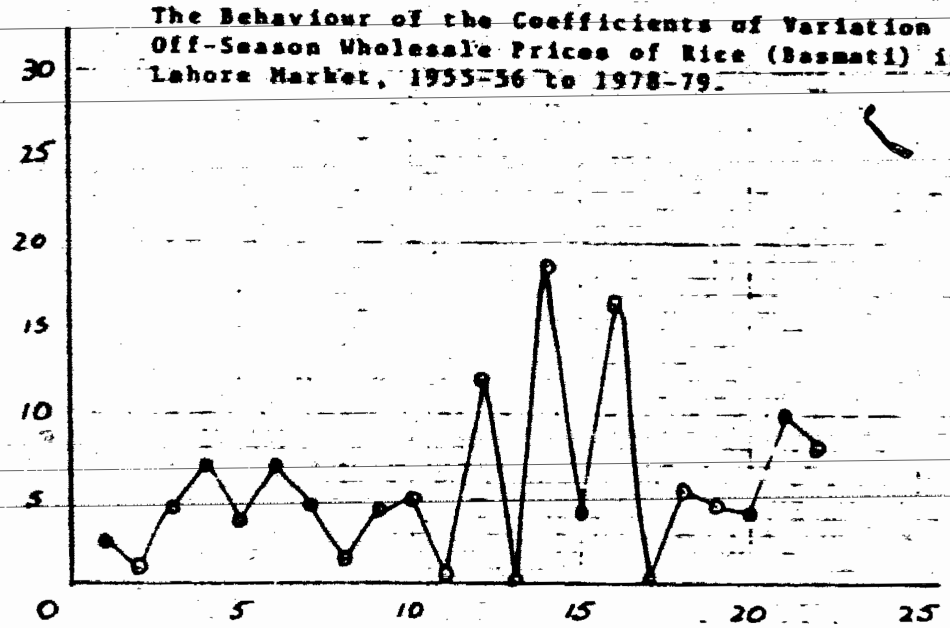


Figure 4.13

The Behaviour of the Coefficients of Variation in Off-Season Wholesale Prices of Rice (Basmati) in Peshawar Market, 1955-56 to 1978-79.

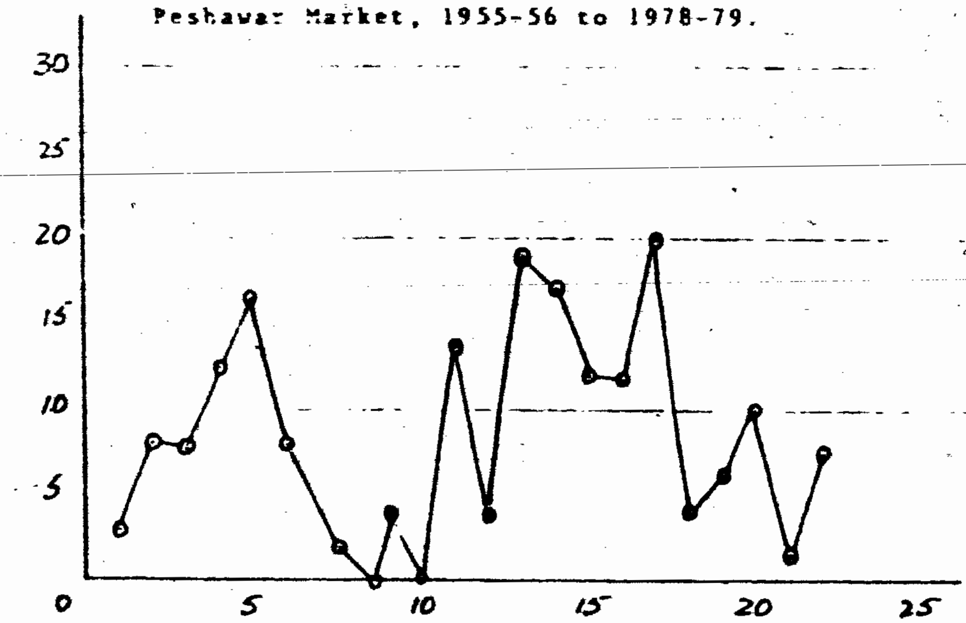


Figure 4.14

The Behaviour of the Coefficients of Variation in Off-Season Wholesale Prices of Gram in Lahore Market, 1955-56 to 1978-79.

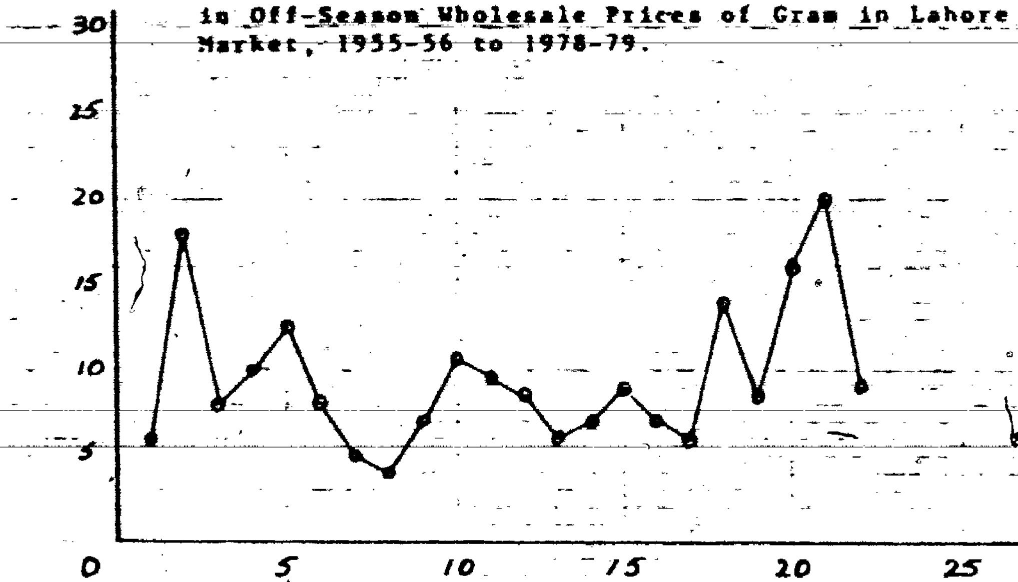


Figure 4.15

The Behaviour of the Coefficients of Variation in Off-Season Wholesale Prices of Gram in Peshawar Market, 1955-56 to 1978-79.

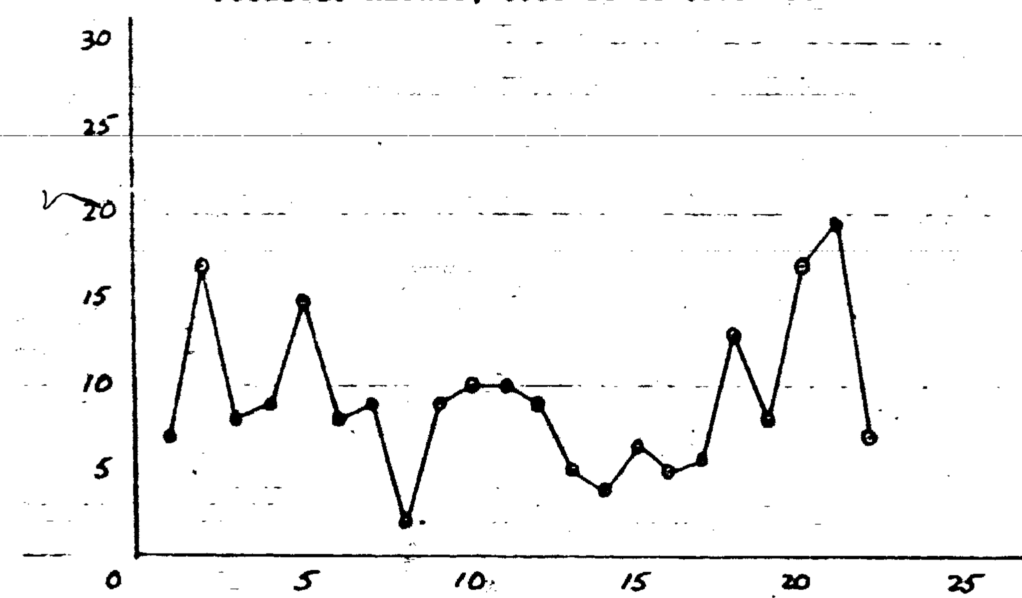


Figure 4.16

The Behaviour of the Coefficients of Variation in Off-Season Wholesale Prices of Gram in Sargodha Market, 1955-56 10 1978-79.

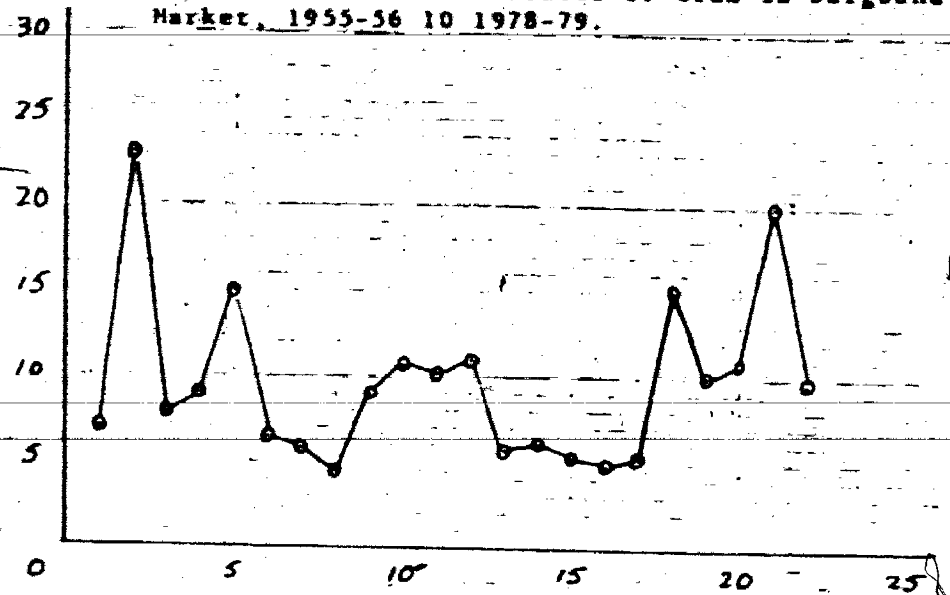
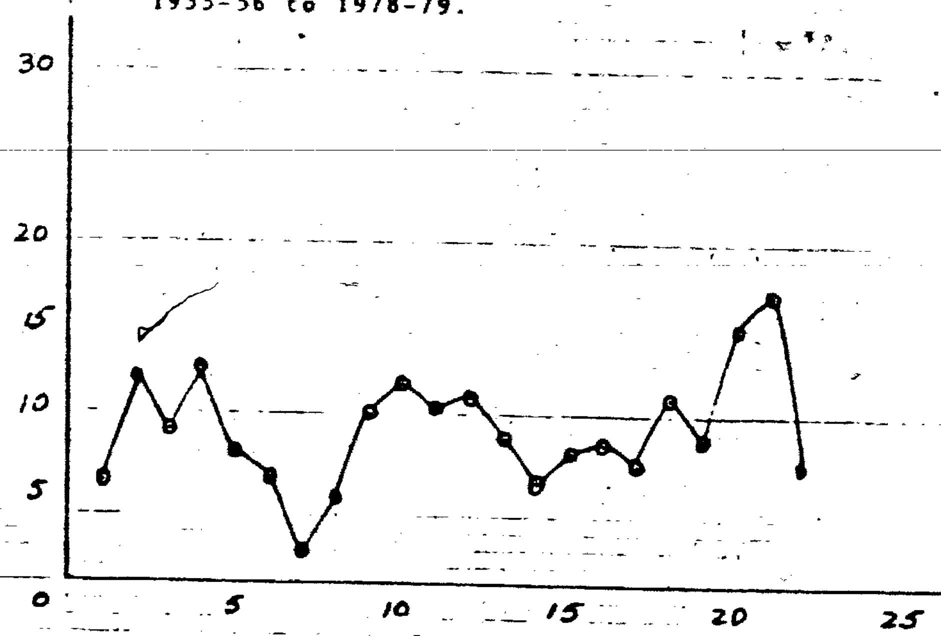


Figure 4.17

The Behaviour of the Coefficients of Variation in Off-Season Wholesale Prices of Gram in Sukkur Market, 1955-56 to 1978-79.



CHAPTER V

The Impact of Green Revolution on the Performance of Agricultural Markets in Pakistan

No observer of rural life in Pakistan today can disregard the fact that farmers are no longer as "ignorant" about marketing their produce as they once were when they faced a powerful trading community like the Banias (Hindu traders) before the creation of Pakistan in 1947. Their awareness of the market has increased significantly in the last 15 to 20 years, particularly following the introduction of high-yield varieties of Mexi-Pak wheat and IRRI rice in the mid-sixties, a phenomenon commonly termed as the Green Revolution. We see a much larger number of farmers selling directly to primary wholesale markets or to mills than was the case even a decade ago. We see rapidly increasing numbers of tractors used to move the produce from the farm to city markets. We also observe a larger number of farmers taking the role of commission agents (Arhatyas) in primary wholesale markets, establishing a direct contact of farmers with markets and the "secrets" which these markets may contain.

It has been pointed out that an increase in intersectoral "links" plays an important role in the economic development of a country.[1] It is, therefore, important that we study the nature and impact of these interactions, when evaluating the performance of agricultural markets. As a preliminary effort, we will study the response of markets to the Green Revolution in the mid-sixties. The main hypothesis to be tested is that during the Green Revolution farmers were able to get relatively better prices, even though an increase in marketable surplus would normally have resulted in falling prices.[2]

We will first present some facts related to the Green Revolution and develop a framework to study the impact on prices. After this, we will empirically test the hypothesis that farmers were able to receive higher prices in the Green Revolution period than before.

The Green Revolution and Agricultural Markets in Pakistan

Table 5.1 shows that in Pakistan total output of wheat and rice increased significantly between 1967-68 and 1970-71. Complete information on marketable surplus are not available in Pakistan. Table 5.1 presents data on arrival of marketable surplus of wheat in Punjab markets only. With increase in output marketable surplus also increased during the Green Revolution period. The introduction of high-yielding varieties of wheat and

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[1] See E.D. Smith [86].

[2] It is important to note that if elasticity of demand is greater than one, a decrease in price would result in an increase in total revenue for farmers and vice versa. However, our concern here is with the proportion of Consumer Price received by farmers. A farmer is always relatively better if his share of Consumer Price increases.

Table 5.1

Production, Arrival of Marketable Surplus and Yield Per Acre of Wheat and Rice.[1]

Year	Production (000 tons)		Arrival of Surplus in Markets (000 tons)		Yield per Acre (Maunds)	
	Wheat	Rice	Wheat	Rice	Wheat	Rice
1955-56	3317	828	NA	NA	8.0	9.4
56-57	3581	831	"	"	8.4	9.4
57-58	3508	862	"	"	8.4	8.8
58-59	3845	976	"	"	8.8	9.37
59-60	3847	979	"	"	8.7	10.30
60-61	3754	1014	"	"	8.9	9.5
61-62	3963	1119	"	"	8.8	10.1
62-63	4104	1078	"	"	9.0	10.0
63-64	4096	1173	"	"	9.0	10.1
64-65	4518	1329	201	"	9.4	10.6
65-66	3854	1296	258	"	8.2	10.2
66-67	4266	1343	245	"	8.8	10.5
67-68	6317	1478	429	"	11.60	11.7
68-69	6513	2000	869	"	11.62	14.2
69-70	7179	2363	655	"	12.62	16.00
70-71	6476	2200	657	"	11.83	15.98
71-72	6890	2262	670	"	12.97	16.88
72-73	7442	2330	NA	"	13.60	17.19
73-74	7629	2455	"	"	13.62	17.69
74-75	7673	2314	"	"	14.40	15.69
75-76	8690	2618	"	"	15.50	16.69
76-77	9144	2737	"	"	15.60	17.06
77-78	8367	2950	"	"	14.34	16.93
78-79	NA	NA	"	"	NA	NA

N.A. : Data not available

Source: [63] and [73]

[1] Arrival data are for Punjab only
Data for other provinces not available.

rice during this period increased the average yield of wheat from 8.8 maunds in 1966-67 to 11.60 maunds per acre in 1967-68 and to 12.62 maunds in 1969-70. The yield for rice increased from 10.5 maunds in 1966-67 to 11.7 maunds in 1967-68 and to 14.2 maunds in 1968-69.[3] As a result, total output of wheat increased from an annual average of 4.08 million tons during 1960-67 to 6.32 million tons in 1967-68. Rice output went from an average of 1.19 million tons in 1960-67 to 1.47 million tons in 1967-68. The marketable surplus during this period also increased significantly, as shown by the figures on Arrival of surplus in markets for wheat in Punjab in the same table.

Figures 5.1 to 5.3 show the equilibrium between supply and demand for marketable surplus of a commodity in (a) the village market (Channel A), (b) the primary wholesale market (Channel B), and (c) all other markets, say terminal markets, city consumers, mills, or government agencies (Channel C). As shown in Chapter II, the supply of marketable surplus is brought by (a) farmers in a village market, (b) by farmers and village traders in the primary wholesale market, and (c) by village or city traders into other markets. In all cases, the supply curve represents various amounts of marketable surplus of a commodity which sellers are willing to offer at different prices in the market. Like the usual supply curve, if the price offered by buyers goes up, the sellers are willing to supply higher

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[3] We may point out that the figures for rice include all varieties of rice. The Green Revolution, however, was relatively more pronounced in the case of coarse rice, and less in the case of rice. One maund equals 82 1/2 lbs.

Figure 5.1

Interaction of Supply and Demand in a Village Market (Channel A)

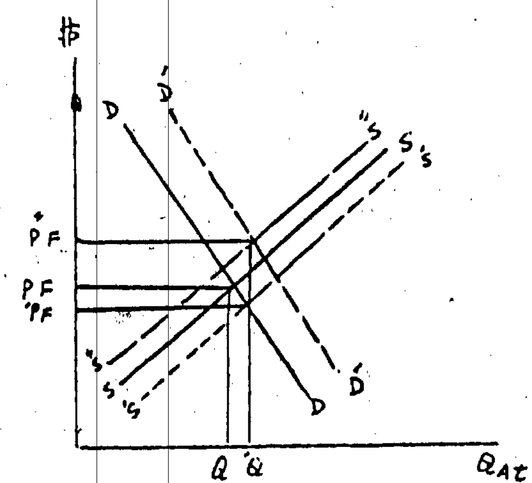


Figure 5.2

Interaction of Supply and Demand in a Primary Wholesale Market (Channel B)

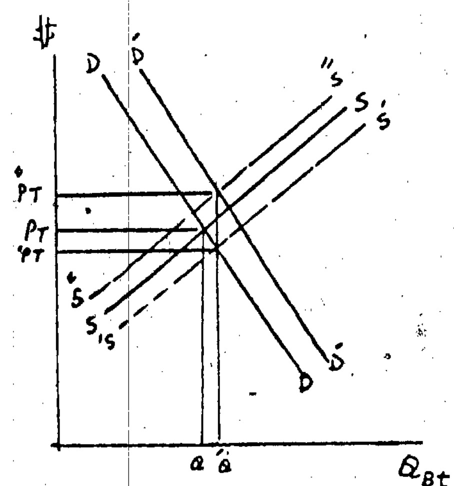
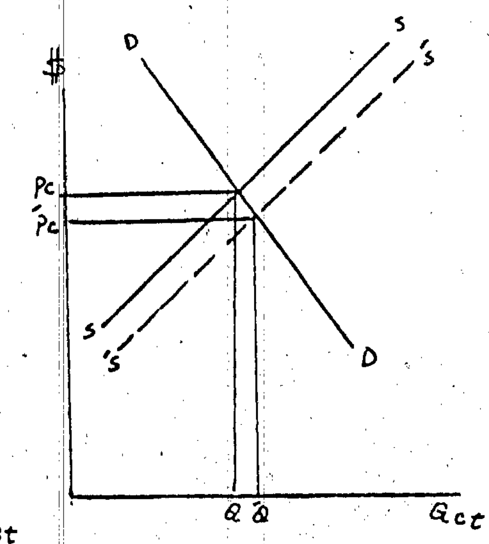


Figure 5.3

Interaction of Supply and Demand in "Other Markets" (Channel C)



quantities of their surplus and vice versa. The demand curve (DD), on the other hand, reflects quantities of the marketable surplus of a commodity which traders in a given market are willing to purchase at various prices. Since a lower price enables the village traders to get a higher profit when such surplus is sold to the next link in the marketing channel, they buy more of the marketable surplus if price is lowered and vice versa. Both of these curves have the usual properties of the ordinary supply and demand relations, except that they relate to a semi-final product for which the demand is not from the final consumer but from market intermediaries who purchase it for resale purposes.

In drawing these figures, we have assumed that as the agricultural product moves from a village market to a primary wholesale market, and from there to other marketing channels, some margin is added by traders to cover the cost of services and other handling charges like transportation and loading/unloading. As a result, Pc (the price received by a trader who sells to the highest link in the marketing channel) is higher than PT, the price received by a trader or a farmer who sells in a primary wholesale market, which in turn is higher than PF, the price received by a farmer by selling his produce in the village market.[4] Formally:

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[4] In the cases where produce is sold to the C from A (the village market) PT may be > Pc depending on the amount of marketing costs in 'C' vis-a-vis 'B'. However, to keep our analysis simple, we assume that commodities moved from A to B to C before the advent of the increase in agricultural productivity.

$$PF < (PT = PF + MT + HCT) < (PC = PT + MC + HCC) \qquad (5.1)$$

where MT is the profit margin earned by a trader by selling in a primary wholesale market and HCT are the handling costs for selling to this market. Similarly, MC is the profit margin earned by a trader who sells to the marketing channel 'C' and HCC are the costs of bringing supplies to this market.

Under these simplifying conditions, one may expect that an increase in marketable surplus would shift the supply (SS) curve to the right to (S'S',) in each market and depress the equilibrium prices, PF, Pt, and Pc to P'F, P't, and P'c. This fall in prices may result because traders in the village and city markets have limited storage facilities and cannot buy the additional amount without discounting the price down to meet extra storage costs. It may be that there are few traders who usually buy from farmers and they cannot handle a dramatic increase in the marketable surplus within their scale of operation, unless price is scaled down to compensate for the rising marginal costs of handling additional quantities beyond an optimum point.

As it is shown below it is, however, not necessary that a shift in the supply curve for the country as a whole should have resulted in a fall in price in every kind of market in Pakistan. Under the changed situation, the demand curve could have shifted upward (to D'D') and the shift in supply curve, particularly in the village market, could be to S''S'' rather than to S'S', as farmers may have found it feasible now to take their marketable surplus to higher level markets rather than selling in a low-price village market. Consequently, the prices received by farmers could go up rather than fall. This conclusion is based on the following considerations.

For one, agricultural markets have exhibited a considerable degree of flexibility in transferring trading activity in Pakistan from one long established trading community to a more heterogeneous and broad-based trading group after 1947. We have also seen that relatively easy entry exists in this trade. It was, therefore, expected that in response to short-term profits in this trade, generated by higher quantities of marketable surplus, a larger number of traders would join primary wholesale markets during this period. This is confirmed by our statistics in Chapter II, as the number of traders increased significantly after 1967-68 in almost every market.

Secondly, an important implication of the Green Revolution was to release some family labour which could be gainfully employed, (at least part time) in professions other than farming, trading in farm products and cattle being the more important among them. This may have happened because not all the family labour was required to produce a given amount of foodstuff.[5] The surplus family labour could be used either to get more land which may or may not be available, in other professions. And since not all farmers may like to work for others, some kind of

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[5] Holding other things constant an increase in the productivity of land will result in relatively greater use of land and relatively lesser use of labour (L) at a given level of output. This happens because at equilibrium (MPN/PN) = (MPL/PL) and any increase in MPN must tend to increase use of N (land) if the equality is to be maintained [8].

business activity is considered a better alternative. Such a transition was facilited by the availability of capital generated by the higher amount of marketable surplus available. In village markets we see not only traditional non-farm families who used to deal in farm products but also a large number of farming families dealing in farm produce. In our survey, we found that in almost every village more than 50% of the village convenience shops were owned and operated by farm families, a phenomenon of recent origin in Pakistan. This shows that, although larger quantities of marketable surplus were available, creating perhaps a problem for farmers to dispose of at the "desired" price, the Green Revolution also increased the number of traders by a significant margin. This means that a farmer had a relatively better chance of getting a better price offer as there were now more people to bid for his produce. In terms of Figures 5.1 to 5.3, this implies that the demand curve for the marketable surplus in a village market shifts to the right as there are more traders.

The third reason why market conditions may have been favourable to farmers was the change in technology in related areas, particularly the increased availability of tractors in rural areas. From about the mid-sixties, the government started selling tractors to farmers on a subsidised basis. Excess capacity in tractors, usually resulting from limited use on farms, has been used for transport, haulage, etc. This facility has created opportunity for farmers to sell in city markets rather than accept 'inferior' offers from village traders.

Finally, the most important reason why farmers may now be getting a relatively better price is the higher degree of enterpreneurship and "selectiveness" shown by them in disposing of their produce. It is usually observed that farmers with smaller quantities do not search for a better price as much as farmers with relatively larger quantities of marketable surplus do. This observation can be confirmed by our evidence in Table 2.2, where we found that farmers with smaller land holdings, who are likely to have smaller marketable surplus, generally sold to village traders rather than to consumers in the cities or to urban markets where they could receive a relatively higher net price. On price-theoretic grounds, it would be correct to argue that the return (or cost) to search for a better price is higher (lower) per unit for a farmer with a larger marketable surplus than for the one with a relatively smaller quantity. We can, therefore, say that the amount of search for a better price is an increasing function of marketable surplus. The larger (smaller) the quantity of surplus the greater (smaller) is the search for a better price.

Search in this context may take two forms. One is to simply waiting until a better offer is made by traders. Another is cross-checking with various market functionaries, not only about the price but also about other aspects of the transaction, such as weights and scales involved, transportation and storage conditions, possibility of loans from various agencies, and expectations about future price changes. All these factors help to enhance the ability of a farmer to get a better price when he has relatively larger quantities to sell.

Search costs in this process are the costs of obtaining information such as travelling to cities and the opportunity costs of holding produce or the return foregone on cash which a farmer could have received by selling his produce rather than holding it. The former costs are fixed, whereas the latter increase with the quantity of marketable surplus. The overall costs, therefore, should be lower if a relatively larger quantity is sold, as the fixed costs are spread more thinly over a larger quantity.

The impact of higher marketable surplus, therefore, was not necessarily to shift the supply curve in a village or city market to (S′S′). The farmers in search of a better price can sell their commodities to markets other than those where they have been selling traditionally. Farmers who used to sell in the village market may take their supplies to city markets, or those who used to sell in the city market may sell directly to the mills or government agencies, and in this way avoid paying for the marketing services they used to get from others.

Consequently we may observe the supply curve in the lower level markets (Channels A and B) shifting to the left rather to the right, even though for the economy as a whole the supply curve has shifted to the right. Whether this shift in the supply curve is real or potential, traders in lower level markets are likely to bid up their price offers to farmers (and reduce their profit margins) to retain their market shares and to compete with those alternative channels which farmers have found to be more attractive. They can do so as long as they can cover their variable costs. This along with the increased number of traders in lower level markets will shift the demand curve to $D'D'$. This gives us a new set of relationships among prices in various markets.

$$PF < P''F < [P''T = (P''F + M''T + H''T)] \qquad (5.2)$$

$$P''T < P'C = [P''T + M''C + H''CC] < PC \qquad (5.3)$$

$$M'C < MC \qquad (5.4)$$

$$M''T < MT \qquad (5.5)$$

This improvement in farmer's share of price would be stronger and much more unambiguous if we assume that an increase in the marketable surplus also helped remove some market imperfections, like lack of information on market prices, credit, transportaion and storage facilities. As shown in Chapter II, these imperfections have indeed decreased to some extent in Pakistan. The net price received by farmers, therefore, may have increased during the Green Revolution. In our opinion, this could have happened as markets showed flexibility in accommodating the added amount of marketable surplus without increasing the marketing margins of traders. Free entry into trade and the lack of price-setting ability of the existing ~~traders~~ allowed new entrants to operate in the markets.

Testing the Effect of the Green Revolution on Prices Received by Farmers in Different Regions of Pakistan

Prices of any commodity depend basically on the supply of and demand for that commodity, which in turn may depend on a number of factors like costs and technology in the case of supply, income, tastes or future price expectation in the case of demand. Time is a proxy variable which embodies all factors which either directly or indirectly influence price of any commodity. From the preceding discussion, it should be clear that we are interested in observing the interaction of supply and demand curves during a particular time period, i.e. during the Green Revolution. This can be achieved by using a simple method of estimating the relationship between prices and the time variable in general and treating the Green Revolution period as a separate variable.

To test out hypothesis, we have regressed the monthly prices of wheat and rice (Basmati) (both in nominal and in real terms) in each market on time (t) and a dummy variable (D), which takes the value of <u>one</u> for months in those years in which the new varieties were introduced /or when higher marketable surplus was available and <u>zero</u> for months of other years. The period for which D=1 was June 1967 to June 1971. If the markets have helped farmers to get a better price during this period, then the coefficient of 'D' should be positive and significant.

We did not use the period after 1971 because the Pakistani Rupee was devalued in 1972, changing the price structure of domestic and imported goods. To further ensure that the coefficient of the dummy variable 'D' does not take our hypothesized value erroneously, we also estimated two more equations, one with D=1 for the period January 1955 to December 1960 and the other where D=1 for January 1961 to December 1965. If it turns out that the coefficient of 'D' in these two equations is also positive and significant, then our hypothesis about the Green Revolution period (1967 to 71) loses much of its value, as this implies that there could be some other factors which influenced prices relatively more strongly in one period. Our hypothesis, however, is that the coefficient of the dummy variable 'D' in periods other than the Green Revolution are either statistically insignificant or much less significant than value of this coefficient for the Green Revolution period. Formally:

$$NPt = bo + b1t + b2D + \varepsilon \quad (5.6)$$

$$RPt = c0 + c1t + C2D + U \quad (5.7)$$

where NPt = Nominal price of a commodity in any market at time t minus transportation and handling costs;

RPt = Real price of ith commodity in a market at time t minus transportation and handling costs;

$t = 1 \ldots\ldots \text{to} \ldots\ldots 192$

D = 1 for June 1967 to June 1971

= 0 otherwise

In two other formulations of Equations (5.7) and (5.8)

D = 1 for January 1955 to Dec. 1960

= 0 otherwise

and

D = 1 for January 1961 to Dec. 1965

= 0 otherwise.

This method is only an indirect way of testing the effect of higher marketable surplus on prices received by farmers. There are other methods, more direct and conceptually more accurate. For example, we could have compared the prices received by farmers before and after the Green Revolution period of say 4 to 5 years. Unfortunately, no such farm-level data exist in Pakistan, and it is impossible to find them retroactively. Another method could have been to properly count the number of village traders before and after the Green Revolution period and also estimate the net market margins earned by them in both periods. This could tell us how far the farmers relied on village traders relative to other channels of marketing. If their numbers have increased proportionate to total output, and if their net margins decreased over time, this would indicate that farmers were able to get the marketing services at relatively lower cost, and the net price received by them would be higher than before. Again very little information of this nature exists in Pakistan. Our estimates of the market margins of village traders in Chapter IV may be compared with some earlier periods, but this comparison could not be made due to the absence of historical data on margins received by village traders.

We have, however, examined the marketing margins of traders in the primary wholesale markets, as we had some estimates of their historical trend for the periods of the Green Revolution and before from Chapter IV. Similarly, to avoid the influence of other factors on our conclusions from Equations 5.7 and 5.8, we have also looked at all those factors which might have increased prices in this period without the interplay of market forces. Some of the major factors of this nature could be (a) the government fixing a significantly higher 'floor price' in this period and buying most of the marketable surplus at that price and (b) price jumps due to unexpected changes in demand for food during this period because of internal or external shocks. We would, however, argue that as long as these factors increased productivity, our hypothesis is valid. We want to show that to all those factors, which increased yield per acre during this time, our agricultural market responded "positively."

Empirical Results and their Analysis

The ordinary least squares estimates of Equation 5.7 and 5.8 are presented in Tables 5.2 to 5.7 for wheat and rice, respectively. The results based on nominal prices (Tables 5.2 to 5.5) support our hypothesis that prices moved significantly upward from their trend values during the Green Revolution period (1967-1971) compared to the earlier periods (1955-1960 or 1960-1965). This is evident from the coefficient (b2) for the dummy variable 'D' for different time periods shown in these tables. This coefficient is significant at the 5% level for most of the markets both for wheat and rice. In the case of wheat prices in Faisalabad, Gujranwala, Hyderabad, Okara, Sahiwal, and Sialkot, it is significant at the 1% level. This is an important result, because this shows that increased productivity brought about relatively more improvement in smaller markets (like Okara and Sialkot) than in the relatively larger markets (like Karachi and Lahore). Our results imply that due to the impact of the Green Revolution on farmers' ability to get a better price, average wholesale nominal prices, particularly of wheat and rice, went up by the value of the coefficient 'b2' in different markets from their trend values.

The estimates based on real prices (Tables 5.6 to 5.7) provide relatively weaker evidence in favour of our hypothesis. The coefficient of the dummy variable 'D' is significant at the 5% level for wheat in the case of the Faisalabad, Gujranwala, Okara and Sahiwal markets. In some other cases, it is

Table 5.2

The Relationship Between Average Monthly Wholesale Prices (Nominal) of Wheat Received by the Farmers in Pakistan, and the Time Variable (T), and a Dummy Variable 'D'*

	MARKETS	a Intercept Term, Equation where D = 1 for: Jan. 1955 to Dec. 1959 (1)	Jan. 1960 to Dec. 1964 (2)	Jan. 1967 to Dec. 1971 (3)	b_1 Coefficient for Time Variable (1)	(2)	(3)	b_2 Coefficient for Dummy Variable 'D' (1)	(2)	(3)
1.	Faisal-abad	16.93 (44.39)	16.57 (54.24)	15.33 (41.11)	.044 (8.77)	.051 (11.43)	.035 (7.68)	-.879 (-1.41)	-.759 (-1.58)	2.83 (3.61)
2.	Gujran-wala	16.97 (48.51)	17.02 (61.11)	15.92 (46.60)	.045 (6.95)	.045 (8.38)	.032 (6.25)	-.778 (-.919)	.860 (-1.23)	2.66 (3.25)
3.	Hyder-abad	16.58 (64.80)	16.36 (69.64)	15.37 (61.91)	.045 (8.90)	.055 (14.05)	.038 (7.72)	-.421 (-1.50)	-.707 (-1.72)	2.84 (4.20)
4.	Kara-chi	17.53 (73.52)	17.37 (80.87)	16.55 (71.60)	.059 (20.74)	.059 (20.74)	.043 (10.38)	-1.04 (-1.78)	-.559 (-1.24)	1.76 (2.27)
5.	Lahore	16.85 (50.25)	16.93 (63.95)	15.59 (48.49)	.046 (7.85)	.053 (12.41)	.038 (7.37)	-.98 (-1.18)	-1.02 (-1.57)	3.68 (4.84)
6.	Multan	16.73 (45.61)	16.81 (56.75)	15.05 (42.99)	.042 (6.95)	.051 (11.14)	.039 (6.61)	-1.21 (-1.28)	-.901 (-1.47)	2.81 (3.40)
7.	Okara	16.15 (52.50)	15.93 (51.23)	14.97 (45.64)	.042 (6.82)	.055 (12.59)	.039 (6.98)	-1.25 (-1.59)	-.85 (-.772)	2.51 (3.20)
8.	Pesh-awar	16.91 (54.2)	17.04 (69.53)	15.92 (52.38)	.035 (5.40	.041 (9.81)	.028 (4.74)	-.786 (-1.05)	-1.09 (-1.73)	-2.42 (3.32)
9.	Rawal-pindi	16.75 (48.25)	16.97 (52.55)	15.65 (45.52)	.042 (6.01)	.041 (8.79)	.032 (5.64)	-1.22 -1.38	-1.01 (-1.59)	2.11 (2.79)
10.	Saliwal	16.40 (52.02)	15.89 (51.31)	15.17 (47.69)	.043 (16.82)	.053 (14.01)	.044 (7.26)	-1.211 (-1.82)	-.659 -0.96	2.04 (2.59)

*Values in brackets are t-values.
-Computations based on data from [57]

Table 5.2 Continued

The Regressions of Average Monthly Wholesale Prices (Nominal) of Wheat Received by the Farmers in Pakistan, on a Time Variable (T), and a Dummy Variable 'D'.*

MARKETS	a Intercept Term — Equation where D = 1 for: Jan. 1955 to Dec. 1959 (1)	Jan. 1960 to Dec. 1964 (2)	Jan. 1967 to Dec. 1971 (3)	b_1 Coefficient for Time Variable (1)	(2)	(3)	b_2 Coefficient for Summary Variable 'D' (1)	(2)	(3)
11. Sialkot	16.76 (47.15)	16.28 (52.13)	15.39 (43.59)	.039 (6.09)	.043 (9.28)	.037 (6.15)	-1.01 (-1.58)	-.909 (-1.379)	2.16 (2.57)
12. Sargodha	16.24 (45.09)	16.00 (51.57)	14.39 (42.02)	.040 (6.19)	(.050) (10.71)	.034 (5.88)	-1.06 (-1.33)	-915 (-1.48)	3.17 (3.81)
13. Sukkar	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Values in brackets are t-values.
-Source: Computations based on data from [57]

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Table 5.3

R^2, F-values and Durbin Watson statistics for the Regression Relationship of Monthly Average Wholesale Prices of Wheat Received by Farmers on time (T) and a Dummy Variable 'D'.

MARKETS	Equation where D= 1 for: R^2			F-Statistics			Durbin-Watson Statistics		
	Jan. 1955 to Dec. 1959 (1)	Jan. 1960 to Dec. 1964 (2)	Jan. 1967 to Dec. 1971 (3)	(1)	(2)	(3)	(1)	(2)	(3)
1. Faisal-abad	0.462	.471	.498	98.42	108.47	147.34	1.325	1.361	1.335
2. Gujranwala	.465	.473	.501	93.36	102.19	151.49	1.329	1.340	1.355
3. Hyderabad	.526	.538	.565	115.18	123.05	181.65	1.380	1.378	1.413
4. Karachi	.630	.648	.661	186.61	205.11	240.39	1.431	1.427	1.458
5. Lahore	.578	.585	.632	166.51	179.34	217.30	1.372	1.399	1.403
6. Multan	.487	.509	.551	93.38	114.13	164.43	1.370	1.374	1.392
7. Okara	.503	.519	.543	99.89	105.28	137.99	1.314	1.358	1.445
8. Peshawar	.381	.394	.410	65.34	73.41	83.17	1.266	1.275	1.317
9. Rawalpindi	.412	.420	.439	78.55	85.57	103.25	1.295	1.304	1.323
10. Sahiwal	.511	.520	.552	112.63	116.59	138.99	1.344	1.353	1.413
11. Sialkot	.453	.461	.489	83.99	93.39	121.59	1.367	1.372	1.401
12. Sargodha	.429	.432	.481	79.47	88.16	101.77	1.302	1.368	1.413
13. Sukkar	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 5.4

The Regression of Average Monthly Wholesale Prices (Nominal) of Rice (Basmati) Received by the Farmers in Pakistan on Time Variable (T) and a Dummy Variable 'D'.*

MARKETS	a Equation where D = 1 for:			b_1 Coefficient for Time Variable			b_2 Coefficient for Dummy Variable 'D'		
	Jan. 1955 to Dec. 1959 (1)	Jan. 1960 to Dec. 1964 (2)	Jan. 1967 to Dec. 1971 (3)	(1)	(2)	(3)	(1)	(2)	(3)
1. Faisal-abad	45.41 (58.58)	39.18 (52.28)	38.86 (41.40)	.055 (1.82)	.113 (10.05)	.099 (5.93)	-17.74 (-9.55)	2.19 (1.03)	3.17 (1.99)
2. Gujran-wala	37.76 (71.69)	36.04 (71.78)	36.30 (70.38)	.104 (8.91)	.121 (9.66)	.131 (12.39)	-2.17 (-2.18)	1.33 (1.06)	2.90 (2.77)
3. Hyder-abad	47.55 (43.50)	44.72 (49.30)	43.54 (38.44)	.035 (1.83)	.093 (5.87)	.088 (5.29)	-10.11 (-3.87)	-1.10 (-1.54)	2.77 (2.18)
4. Karachi	69.55 (33.63)	105.83 (38.13)	106.62 (38.77)	.071 (5.85)	.195 (8.58)	.044 (1.59)	-5.31 (-1.59)	-21.07 (-5.77)	4.17 (1.73)
5. Lahore	44.98 (44.84)	41.08 (48.08)	38.96 (37.22)	.069 (3.45)	.119 (10.70)	.101 (5.04)	-11.15 (-5.15)	-.32 (-0.22)	6.12 (3.83)
6. Multan	44.94 (47.88)	39.83 (47.57)	39.47 (37.72)	.047 (1.89)	.095 (1.89)	.100 (5.16)	-14.39 (-5.84)	-0.96 (-.64)	2.43 (1.995)
7. Okara	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A
8. Peshawar	53.64 (35.47)	48.57 (38.01)	37.72 (29.03)	.078 (2.45)	.175 (10.04)	.155 (5.38)	-12.59 (-3.84)	-2.00 (-.89)	5.53 (2.45)
9. Rawal-pindi	51.36 (41.53)	46.85 (42.11)	38.77 (33.95)	.034 (2.11)	.099 (8.36)	.091 (4.86)	-7.23 (-4.15)	-1.92 (-.83)	3.77 (2.11)
10. Sahiwal	48.51 (59.73)	40.93 (52.11)	42.63 (42.27)	.046 (1.82)	.081 (8.64)	.112 (6.36)	-9.73 (-8.14)	2.52 (1.12)	2.92 (1.83)

*Values in brackets are t-values.
-Source: Computations based on data from [59] 7 ✱

Table 5.4 Continued

The Regression of Average Monthly Wholesale Prices (Nominal) of Rice (Basmati) Received by the Farmers in Pakistan on Time Variable (T) and a Dummy Variable 'D'.*

MARKETS	a Equation where D= 1 for:			b_1 Coefficient for Time Variable			b_2 Coefficient for Dummy Variable 'D'		
	Jan. 1955 to Dec. 1959 (1)	Jan. 1960 to Dec. 1964 (2)	Jan. 1967 to Dec. 1971 (3)	(1)	(2)	(3)	(1)	(2)	(3)
11. Sialkot	38.78 (73.09)	36.95 (74.43)	33.95 (59.21)	.048 (2.85	.087 (12.33)	.093 (8.17)	-7.18 (-5.60)	2.05 (1.55)	2.41 (2.29)
12. Sargodha	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A	N/A N/A
13. Sukkar	41.35 (65.18)	38.15 (67.17)	36.79 (52.57)	.041 (3.32)	.112 (12.14)	.087 (7.01)	-10.11 (5.73)	-.81 (-.79)	4.06 (2.73)

Source: Price data from [57]

Table 5.5

R^2, F-Values and Durbin-Watson Statistics for the Regression Relationship of Monthly Average Wholesale Prices of Rice (Basmati), received by Farmers on time (T) and a Dummy Variable "D".

MARKETS For which the Equation are Estimated	Equation where D = 1 for R^2			F-Statistics			Durbin-Watson Statistics		
	Jan. 1956 to Dec. 1959 (1)	Jan. 1960 to Dec. 1964 (2)	Jan. 1967 to Dec. 1971 (3)	(1)	(2)	(3)	(1)	(2)	(3)
1. Faisal-abad	0.563	0.540	.581	121.55	83.27	138.75	1.253	1.240	1.261
2. Gujranwala	.679	.669	.698	193.53	188.09	206.48	1.293	1.285	1.320
3. Hyderabad	.388	.396	.430	62.74	69.65	85.97	1.309	1.281	1.285
4. Karachi	.444	.429	.458	89.39	81.01	101.75	1.216	1.211	1.225
5. Lahore	.514	.503	.521	112.42	95.02	103.19	1.233	1.232	1.234
6. Multan	.450	.419	.435	91.04	74.93	85.16	1.283	1.220	1.274
7. Okara	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8. Peshawar	.442	.415	.471	88.84	81.39	99.89	1.385	1.349	1.366
9. Rawal-pindi	.439	.437	.454	84.77	83.21	97.14	1.246	1.212	1.239
10. Sahiwal	.566	.596	.561	125.61	95.28	107.55	1.270	1.215	1.290
11. Sialkot	.600	.546	.597	142.73	110.58	126.44	1.351	1.295	1.279
12. Sargodha	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
13. Sukkar	.548	.529	.549	132.41	106.49	121.03	1.336	1.317	1.329

Table 5.6

The regression of average wholesale (real) prices of wheat received by the farmers on time variable (t) and a dummy variable (D) in different agricultural markets of Pakistan.

Markets	1955 - 1960				1961 - 1965				1967 - 1971			
	CO	C1	C2	R^2	CO	C1	C2	R^2	CO	C1	C2	R^2
Faisal-abad	13.81	0.021	0.041	0.185	13.53	0.025	0.029	0.196	13.29	0.018	0.605	0.237
	(49.77)	(2.65)	(0.27)		(51.12)	(2.92)	(0.13)	(7.95)	(48.25)	(2.71)	(2.05)	
Gujran-wala	13.94	0.019	0.036	0.173	13.89	0.020	0.062	0.180	13.78	0.017	0.638	0.223
	(49.55)	(2.28)	(0.24)		(52.13)	(2.32)	(0.45)		(51.70)	(2.25)	(1.985)	
Hydar-abad	13.76	0.0184	0.092	0.164	13.43	0.023	0.076	0.181	13.17	0.019	0.546	0.213
	(58.12)	(2.37)	(0.29)		(61.78)	(2.83)	(0.45)		(63.16)	(2.11)	(1.875)	
Karachi	14.73	0.0176	0.049	0.159	14.47	0.0185	0.068	0.188	14.02	0.0205	-0.296	0.201
	(70.22)	(1.88)	(0.23)		(72.63)	(1.94)	(0.41)		(71.80)	(1.984)	(0.863)	
Lahore	13.92	0.0294	0.052	0.194	13.58	0.0287	0.115	0.196	13.83	0.031	-0.372	0.205
	(56.12)	(3.25)	(0.35)		(54.76)	(3.11)	(0.93)		(56.88)	(3.37)	(1.39)	
Multan	13.55	0.0252	0.094	0.190	13.21	0.0275	0.083	0.202	13.07	0.0246	0.596	0.234
	(49.81)	(2.83)	(0.40)		(50.13)	(2.915)	(0.483)		(48.98)	(2.743)	(1.894)	
Okara	13.48	0.0232	-0.105	0.182	13.11	0.0206	-0.075	0.190	12.81	0.0227	0.937	0.265
	(50.37)	(2.675)	(0.53)		(51.81)	(2.533)	(0.196)		(48.98)	(2.734)	(2.57)	
Peshawar	14.23	0.0166	0.115	0.114	13.95	0.0185	-0.22	0.136	13.77	0.0181	0.565	0.172
	(59.31)	(1.765)	(0.227)		(58.04)	(1.895)	(0.53)		(53.75)	(1.912)	(1.735)	
Rawal-pindi	14.07	0.0176	0.089	0.176	13.77	0.0182	-0.16	0.182	14.06	0.0167	-0.215	0.178
	(55.02)	(2.01)	(0.286)		(53.31)	(1.946)	(0.34)		(54.11)	(1.54)	(0.524)	
Sahiwal	13.51	0.0211	-0.084	0.194	13.29	0.0223	-0.115	0.193	12.95	0.0262	0.896	0.268
	(62.67)	(2.92)	(0.34)		(58.24)	(2.385)	(0.36)		(60.17)	(2.854)	(2.321)	
Sargodha	13.77	0.0188	0.112	0.173	13.45	0.0178	-0.27	0.184	13.03	0.0212	0.783	0.252
	(59.80)	(2.25)	(0.334)		(51.44)	(1.985)	(0.85)		(49.51)	(2.395)	(1.946)	
Sialkot	13.92	0.0182	0.165	0.165	13.45	0.0180	-0.06	0.162	13.08	0.022	0.695	0.214
	(54.28)	(1.933)	(0.396)		(51.44)	(1.785)	(0.14)		(49.28)	(2.05)	(1.919)	
Sukkar	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Source: Price data from [57]. Other data [62].

Table 5.7

Regression of average wholesale (real) prices of rice (fine quality) on time variable (t) and a dummy variable D for different agricultural markets in Pakistan.
1955-56 - 1978-79

Markets	1955 - 1960				1961 - 1965				1967 - 1971			
	C0	C1	C2	R^2	C0	C1	C2	R^2	C0	C1	C2	R^2
Faisal-	36.54	0.026	0.319	0.159	35.77	0.031	-0.423	0.93	34.96	0.028	0.565	0.215
		(1.675)	(0.62)			(2.35)	(0.89)			(2.75)	(1.25)	
Gujran-wala	30.16	0.021	0.456	0.173	29.87	0.025	0.82	0.181	31.07	0.0189	-0.42	0.175
		(1.935)	(0.941)			(1.910)	(1.83)			(1.876)	(1.105)	
Hyder-abad	39.75	0.0325	0.583	0.184	38.48	0.0331	-0.46	0.205	37.11	0.0341	0.835	0.255
		(2.17)	(1.12)			(2.55)	(0.838)			(3.35)	(1.962)	
Karachi	58.43	0.021	0.53	0.164	75.58	0.043	0.85		77.83	0.033	-0.633	
		(1.85)	(1.12)			(2.75)	(1.96)			(1.965)	(1.39)	
Lahore	39.61	0.025	0.38		38.10	0.0215	-0.71		37.78	0.0222	0.63	
		(1.966)	(0.83)			(1.8723(	(1.35)			(1.789)	(1.21)	
Multan	38.98	0.016	0.21		37.76	0.0165	0.39		38.88	0.0152	0.08	
		(1.571)	(0.39)			(1.635)	(0.61)			(1.39)	(0.14)	
Okara	NA	NA	NA		NA	NA	NA		NA	NA	NA	
	"	"	"		"	"	"		"	"	"	
Peshawar	42.36	0.0204	0.365		43.85	0.0215	0.52		46.61	0.0195	0.253	
		(1.754)	(0.81)			(1.938)	(0.867)			(1.814)	(0.418)	
Rawal-pindi	43.14	0.0217	-0.11		41.65	0.0196	-0.225		39.87	0.0216	0.007	
		(1.853)	(0.185)			(1.765)	(0.409)			(1.819)	(0.083)	
Sahiwal	39.40	0.0239	-0.25		38.25	0.0241	-0.178		37.78	0.0253	0.796	
		(2.05)	(0.62)			(1.891)	(0.391)			(2.21)	(1.784)	
Sargodha	NA	NA	NA		NA	NA	NA		NA	NA	NA	
Sialkot	31.75	0.0196	-0.41		30.25	0.0211	-0.385		29.51	0.0216	0.787	
		(3.15)	(0.95)			(2.975)	(0.821)			(3.07)	(1.915)	
Sukkur	33.18	0.0215	-0.36		32.28	0.0230	-0.43		31.90	0.0225	0.657	
		(2.11)	(0.83)			(2.385)	(0.94)			(2.226)	(1.784)	

Source: Computations based on data from [57].

significant at the 10% level or less. For Karachi and Lahore markets, the sign of this coefficient is negative, indicating that real prices of wheat declined in these markets during the Green Revolution. For the real prices of rice, our coefficient was significant at the 10% level only in Sialkot and Hyderabad. In other cases, it was either insignificant or negative, implying that in some of these markets real prices of rice decreased during the Green Revolution.

However, a close look at all of these results reveals that in many ways they support our hypothesis, though not very strongly. First of all, the sign of the dummy coefficient is positive for wheat prices in all the smaller markets. These were the markets where, the phenomenon of price improvement was hypothesised to be stronger.

Secondly, it is not surprising if the real prices in markets like Karachi and Lahore decreased in this period compared to other markets. Additional supplies of the marketable surplus should have moved to these markets more than to other markets due to factors mentioned earlier.

Thirdly, at least for wheat prices, when we compare them with the other periods (1955-60, and 1960-65), the dummy variable is positively associated with real prices only during the Green Revolution period (1967-71). In other periods, compared to the Green Revolution period, the coefficient for dummy variable was either negative or insignificant. For rice prices, it appears that government restrictions on its movement from surplus districts did not let the farmers and traders move their produce to other markets. Instead productivity of rice led to a stronger hold of government on its trade due to greater opportunities of exporting. Also, since we studied here only Basmati rice which did not experience a very significant increase in its yield as compared to other varieties markets may not have responded as favourably as it did to wheat.

Marketing Margins During the Green Revolution Period

Our hypothesis that the Green Revolution enabled the farmers to get a better price than before can also be tested by comparing the profit margins earned by traders who buy from framers and sell in primary or secondary markets. Unfortunately, as we pointed out earlier, we did not have any historical data on profit margins for all kinds of traders. The only historical figures one could get were those we obtained in Chapter IV on the "gross margins" of wholesalers and retailers.

These margins, presented in Table 5.8, evidently went down significantly in all markets during 1967-1971 compared to 1955-60 and 1961-65. The average rate of "gross margin" in wheat for all markets during 1967-71 was 7.02%, whereas the figures for 1955-60 and 1960-65 were 8.95% and 11.46%. The differences among these average rates are significant at the 5% level in most cases.

Table 5.[illegible]

Correlation coefficient between "floor prices" and private market prices of wheat and rice in different agricultural markets in Pakistan

Markets	Correlation Coefficient for: Wheat	Rice
1. Faisalabad	0.132	0.106
2. Gujranwala	0.121	0.135
3. Hyderabad	0.136	0.128
4. Karachi	0.142	0.097
5. Lahore	0.139	0.103
6. Multan	0.127	0.098
7. Okara	0.125	NA
8. Peshawar	0.108	0.106
9. Rawalpindi	0.143	0.129
10. Sahiwal	0.129	0.094
11. Sargodha	0.123	NA
12. Sialkot	0.122	0.132
13. Sukkur	NA	0.125

Source: Floor price data from [63]
Other data [57]

Checking For Other Confounding Factors

Our results in the preceding Sections on nominal and real prices of wheat and rice may be confounded by other factors. One of these factors could be the increase in 'floor prices' by the government. It can be argued that prices of these commodities increased during 1967-71 not because the markets encouraged this to happen, but because government raised 'floor prices' and bought most of the marketable surplus at this price. We will argue here that nothing unusual like this latter happened during this period.

First of all, there is a very weak relationship between the private market and government procurement prices, as the correlation coefficients, shown in Table 5.9, are very close to zero. Secondly, government procurement prices, presented in Table 5.10 have generally been lower than private market prices, presented in Table 5.11 and 5.12. This implies that there was very little incentive for farmers to sell to government procurement agencies, except under some 'threat' by officials or under conditions of debt. The impact of lower procurement prices is reflected clearly in the proportion of marketable surplus of wheat which the government was able to buy in different years, given in Table 5.10 for the province of the Punjab only.[6] The proportion was very small up to 1969-70. From then on, the government bought a relatively larger share of the total

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[6] Unfortunately, data for other provinces are not available. However, as Table 1.1 (in Chapter I) shows, more than 75% of wheat in Pakistan is produced in the Punjab, so procurement of this commodity is done mainly from this province.

Table 5.[illegible]

'Government floor prices' of wheat and rice, and the proportion of wheat procured by government

Year	Quantity and % Procured of:				Av. Floor Prices	
	Wheat		Rice			
	Quantity Tons (1)	% of Total Output (2)	Quantity Tons (3)	% of Total Output (4)	Wheat (5)	Rice (6)
1955-56	NA	NA	NA	NA	9.75	NA
56-57	"	"	"	"	10.00	"
57-58	"	"	"	"	11.50	"
58-59	"	"	"	"	12.50	25.00
59-60	"	"	"	"	12.50	23.00
60-61	"	"	"	"	13.50	24.00
61-62	"	"	"	"	13.50	25.00
62-63	"	"	"	"	13.50	26.00
63-64	"	"	"	"	13.50	28.00
64-65	430	0.0095	"	"	13.50	28.00
65-66	480	0.0125	"	"	13.50	28.00
66-67	19053	0.446	"	"	14.50	28.00
67-68	4554	0.072	"	"	15.50	31.00
68-69	64294	0.987	"	"	17.00	37.00
69-70	684480	9.530	"	"	16.00	35.00
70-71	813946	12.57	"	"	17.00	32.00
71-72	632053	9.17	"	"	17.00	38.00
72-73	NA	NA	"	"	18.50	46.00
73-74	"	"	"	"	24.00	62.00
74-75	"	"	"	"	37.00	90.00
75-76	"	"	"	"	37.00	90.00
76-77	"	"	"	"	37.00	-
77-78	"	"	"	"	45.00	95.00
78-79	"	"	"	"	46.65	110.00

Source: For (1) and (3) [73]

For (5) and (6) [63]

Table 5.10

Intertemporal comparison of the gross retail and wholesale margin earned by the traders in different agricultural markets in Pakistan.

	Markets	WHEAT			GRAM			RICE
		Gross Market Margins						
		1955-56 to 1949-60	1960-61 to 1965-66	1967-68 to 1970-71	1955-56 to 1959-60	1960-61 to 1965-66	1967-68 to 1970-71	All Periods
1.	Faisalabad	13.18*	9.16*	5.48	39.60*	32.53**	27.90	N.A.
2.	Gujranwala	10.75*	6.93**	5.05	30.83*	28.58*	21.72	"
3.	Hyderabad	15.75*	10.23*	6.88	24.62**	28.00*	24.19	"
4.	Karachi	10.08***	21.52*	9.82	27.15***	22.12	25.13	"
5.	Lahore	7.88	12.62*	9.81	26.54*	23.96	22.10	"
6.	Multan	12.94**	12.84**	11.62	37.98*	35.44*	31.76	"
7.	Okara	NA	NA	NA	NA	NA	NA	"
8.	Peshawar	6.27	7.08	7.29	26.69**	45.97*	32.98	"
9.	Rawalpindi	17.09*	7.19	9.07	25.50	31.47*	24.55	"
10.	Sahiwal	NA	NA	NA	NA	NA	NA	"
11.	Sargodha	NA	NA	NA	NA	NA	NA	"
12.	Sialkot	9.18**	3.86***	7.99	31.72**	28.42	28.03	"
13.	Sukkar	NA	NA	NA	NA	NA	NA	"
	AVE	11.46	8.95	7.02	31.18	30.72	23.69	

*** The difference between 1967-71 average and this average is significant at 10% level of significance.

** The difference between 1967-71 average and this average is significant at 5%.

* The difference between 1967-71 average and this average is significant at 1%.

N.A.: Data not available.

Source: Computations based on price data from (57), and other data from Appendices C and D.

marketable surplus, perhaps due to greater economic and political uncertainties created by the events around the 1971 Bangladesh crisis, and the accession of a relatively more interventionist government in 1972.

Since the proportion of total output which the government purchased was small, and the private market prices were very weakly related to official 'floor prices', no clear evidence exists that the government's procurement prices were responsible for bringing a significant shift in prices received by farmers during this period. We can, therefore, conclude that the private market response to increased agricultural productivity, allowed the farmer a better price than before.

CHAPTER VI

Summary, Conclusions and Policy Implications

The main objective of this study was to exaimine rice formation processes in some primary and terminal markets of Pakistan since its creation in 1947. Popular opinion among economic historians is that the traditional marketing system in British India was characteristically oligopsonistic and that farmers were offered unfavourable prices for their products. The prevailing view of agricultural trade as an "exploitative" and "anti-social" activity is probably due to this historical notion. In fact, this view of the trading profession in Pakistan is taken for granted and public policies to curb so-called anti-social activities of traders are often suggested. [74, 81] It is, therefore, important to evaluate the performance of private markets in agricultural trade.

Our investigation of the background of the existing marketing structure reveals that poor marketing conditions in British India resulted from (a) inadequate and expensive transportation systems, and (b) dominance by a homogeneous class/caste of non-Muslim middlemen, who performed the triple functions of merchandising, produce buying and providing credit facilities. The almost total exodus of this class in 1947 and the inability of new trading classes to combine these three functions led to the disintegration of the oligopsonistic market structure. Government policies on agricultural credit, transportation and agricultural growth completed this process. The response of traders and cultivators to trading opportunities reinforced this result. The performance of the agricultural marketing system is a function primarily of inputs supplied by other sectors. These inputs comprise transportation and communication, credit facilities, and more importantly technological growth and changes in agrarian relations. Most of the marketing changes in Pakistan since 1947 have been straightforward adjustments to improvements in the supply of inputs which accompanied the process of development.

Agricultural Marketing System

To evaluate the agricultural marketing system in Pakistan, we first descibed the marketing channels for wheat, gram and rice. Information was gathered on how much marketable surplus farmers usually sell and why they sell to one or the other marketing agency. Methods of settling price, getting information on market forces and dealing with competitors were noted to determine the conduct of traders in a market. Information on the number of traders, their size distribution and conditions of entry into trade was collected to evaluate the structure of markets. We can make the following conclusions from our analysis of the structure and conduct of markets:

1. Contrary to the view held in some earlier studies, a relatively greater share of wheat and rice (paddy) is sold

in primary than in village markets. For example, of the 302 farmers we surveyed, 36.30% sold their wheat exclusively in primary markets and only 11.88% in village markets. About 29.37% sold in both the village and primary markets. Small farmers depended more on the village market as compared to medium and large farmers. Once again, contrary to the popular view, few farmers sold to a particular market because of credit ties with a trader. A great majority (49.2%) sold in a village market only when they had small quantities to sell or because they (37.95%) thought that the price differential between the village and higher level market was "very small". It is no longer true that a significant portion of marketable surplus passes through every link in the market chain. Farmers select a marketing channel on the basis of its profitability and a village trader is not a dominant element in marketing activities.

2. The number of traders in both primary and terminal markets is apparently too large to permit monopolistic practices. Unequal distribution of sales among traders does not indicate any clear evidence of control by a few traders of grain marketing. Prices in general are settled in an open auction in the presence of a large number of traders and local buyers. Intermarket information, perfect, flows quite rapidly as traders from terminal and primary markets visit different markets frequently to determine trends in prices and stock positions in every region. This enhances

intermarket and intramarket competition among the intermediaries, which greatly limits the profits that can be earned despite the relatively strong bargaining positions enjoyed by some traders vis-a-vis producers and fellow traders. Due to their diverse socio-economic backgrounds and limited access to financial markets, we observed no tacit or overt collusion among traders, or price leadership in these markets. Some traders enjoy a relatively larger share of the market simply because of their greater command of owned capital, a scarce resource in Pakistan's trade. The high profits of a few traders can be explained by their skill in correctly judging market trends and by their ability to speculate in short-term inventories.

3. One of the important features of the marketing system is that a large number of traders, both at the village and city levels, either belong to small landowning families or were landless before moving to agricultural marketing. This signifies, a positive change in social mobility and points to the necessity for government to evaluate the distributional aspect of its policy towards agricultural markets. It is often not a situation where the "poor" farmers need protection from "unscrupulous" traders.

Regional Market Integration

To determine whether prices in different markets moved in a competitive manner, we regressed average monthly prices of wheat, gram, and rice in one market on prices in other markets from January 1955 to June 1979. The regression coefficient was then taken as an indicator of market integration. It was assumed that if makets behaved in a perfectly integrated manner the regression coefficients would be equal to unity, a characteristic of a perfectly competitive marketing system. Estimates for the degree of intermarket relationship were obtained by using 'absolute price', 'first differences in prices', and 'rates of change in prices'.

To gain additional insight into interregional price relationships, we computed Root Mean Square Errors (RMSE) and compared them with transhipment costs. An attempt was also made to decompose these estimates of RMSE based on absolute price differentials into mean differences (Bias Component), variance differences (Variance Component) and covariance difference (Covariance Component). The decomposition of RMSE helped in identifying the factors which may have influenced price trends in different regions. Larger values of Bias and Variance components relative to Covariance components were taken to indicate the influence of monopolistic elements, caused either by governmental restriction on product mobility or monopolistic hold of a few traders on supply and demand or related factors. On the other hand, a relatively large covariance component was taken to indicate poor transportation and communication facilities or differences in cropping patterns which would influence price movements differently in different regions.

An examination of our estimates of the regression relationships between prices suggests that markets for wheat and gram were closely related to each other, when such estimates were based on 'absolute prices'. In about 75% of the cases, our hypothesis of perfect market integration was accepted and our estimates were much higher than estimates obtained in countries like India, Nigeria, Bangladesh, and Ghana. The results based on 'first differences' and 'the rates of change in prices' did not, however, reflect as high degree of market integration. In most cases, the hypothesis of perfect integration could not be accepted. This indicates that our markets were not perfectly competitive as described generally in the economics textbooks. However, our regression results coupled with the estimates of RMSE and its components could not be construed to mean that there was oligopolistic hold of traders on markets. The RMSE values were generally lower than transhipment costs and the Bias and Variance components were small compared to the covariance components, which indicate that traders have responded to price differences in a way in which prices in one region did not stay higher than in others for a long period, implying competitive behavior.

The case of rice, which is traded under government supervision, is however different from wheat and gram. The regression coefficients between rice prices in most cases showed large deviation from a one-to-one relationship between markets. Intermarket price differences for this commodity were also many times greater than transhipment costs, indicating a strong possibility of traders dealing in black markets and making huge profit when they were able to sell to a "high price" market.

Seasonal Price Variations

We have treated the following major issues about seasonal variations in prices.

1. Whether prices during the harvesting season are "unduly" depressed compared to the post-harvest periods, as is sometimes believed in Pakistan.
2. What is the nature of profits in storage activity when intertemporal price differentials are compared with storage costs?
3. Since the risk attached to sales in future is an important factor influencing an individual's decisions to sell in harvest vis-a-vis post-harvest periods, what is the magnitude of such risk in storage activity?
4. Since the risk of offseason fluctuations in prices affects the total cost of allocating supplies to the future, what is the nature of this cost over time? The performance of a marketing system should improve if, the average cost of intertemporal supplies declines over time.

In answering these questions, we used the average wholesale monthly prices of wheat, gram and rice (Basmati), from January 1955 to June 1979.

It was found that prices in havest periods were lower than in post-harvest periods. However, when storage costs were subtracted from intertemporal price differences, the net difference between harvest and post-harvest prices of wheat and gram were generally very low. Differences in the case of gram were slightly more than for wheat, indicating riskier nature of storing gram due to greater instability in its supply and demand conditions. For rice prices, the gross intertemporal price differences were very low for some years and very high for others. Also, there was no uniformity across markets. The net margins, though not very large on average, also showed major fluctuations from year to year. A major reason for this could be government intervention in the rice trade. In its attempt to meet demand in different regions, the government keeps changing its policy of zoning and restrictions on interdistrict movement of rice which alters prices in an unpredictable manner in different markets.

We have measured risk by the value of the coefficient of variation of average wholesale monthly prices in post-harvest months. This measure was obtained for each market and for every year from 1955 to 1979. It was assumed that a higher (lower) value of this coefficient for the post-harvest prices, would reflect greater (smaller) risk in storing a commodity. Farmers who are expected to take into account the nature of prices in the offseason will be encouraged to sell in the harvest periods if prices in the post-harvest periods fluctuated "too much." This would depress prices further in the harvest relative to the post-harvest period.

The annual estimates of the coefficient of variation in offseason prices were quite high in the early years for most of markets. Their values generally declined since 1960. However, there has been a rising trend since 1977. For the twenty-five year period (1955-1979), we observed a significantly negative trend in the values of CV for wheat, indicating that fluctuations in the offseason prices of this commodity decreased over time. In the case of gram, the coefficient of variation seems to have gone up over the period, though not significantly. For rice, we could not observe any clear trend: the trend was negative in some markets and positive in others, but insignificant in all cases.

An important conclusion here is that traders appear to have improved their understanding of the storage operation over time. This is evident from the declining trend in the values of coefficients of variation in the offseason prices of wheat. Also lack of any trend in off-season variations in prices of gram and rice Inspite of several destablising factors, such as the 1965 war with India and the drought following it, fluctuations in prices did not increase. This is a sign of the ability of the agricultural markets to cope with internal and external shocks without imposing higher costs on the economy.

Price Relationships Between Different Levels of Marketing

To analyse profit margins earned by traders in different markets, we compared average wholesale monthly prices with the average monthly retail prices of wheat and gram from 1955 to 1979.[1] By subtracting handling charges from gross differences between prices at different levels we obtained the net marketing margins. Our estimates show that the net market margins earned by traders, were only slightly above zero. Even the gross difference between these prices, except for a few years when there was either a political or economic crisis in the country, was usually less than 15%. More importantly, high margins never lasted for more than a year or so.

A similar picture emerges when we look at estimates of profit margins computed from the account books of village traders. Nowhere did we find that their "gross margins" were more than 25%, and on average were close to 15%. If handling charges were excluded from these figures, the net accounting margin would be close to 5%. We cannot consider these profit margins as unduly high, particularly when we look at the amount of time and effort which these traders have to put in marketing commodities. During the course of our investigation, we found that a village trader worked as hard as anybody in the village setting. He must travel long distances in search of marketable

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[1] Retail prices for rice were not available.

surplus. It takes him days or even weeks before a sufficient quantity is collected to be taken to primary markets. Even this the trader can do only if his womenfolk and children help him sewing bags, loading and unloading. Arranging transportation and taking the product to markets are not easy jobs either. There is always a danger of losses if transportation is not readily available, and when the product is carried by donkeys or mules a trader sometimes walks 10 to 15 miles with the animals so that he can prevent losses on the way. Finally, he may be harassed by the Octroi (municipal tax) and police officials, who tend to take advantage of their officialdom for extracting illegal donations and bribes. These are just a few examples of the nature of his task for which a 5 to 10% is not "unjustified" by any standard.

Agricultural Markets and the Green Revolution

To investigate the response of agricultural markets to technological change in agriculture, we examined the behaviour of prices in the periods before and during the Green Revolution. Our main argument was that these markets allowed entry to new traders and showed flexibility and dynamism, absorbed the additional marketable surplus without the share of consumer price received by farmers declining. In response to the Green Revolution, competition among traders increased as new traders entered the grain trade and pushed marketing margins down. The net price received by farmers (particularly in village markets) increased even though the total supply of agricultural surplus went up. Our observation of the changes in net prices received by farmers during the Green Revolution period largely confirms our hypothesis. Nominal wheat prices went up significantly during 1966-67 to 1970-71 compared to earlier years of our study. Real prices also went up in some markets such as Sahiwal, Okara, Sargodha and Sialkot. In the case of (Basmati) rice, our hypothesis was not confirmed as strongly. It was perhaps because (a) the Green Revolution affected coarse rice more than Basmati rice, and (b) the control exercised by the government on rice trade.

The Nature of Imperfections in the Marketing System

Despite the general competitiveness of the markets, they are obviously deficient in several areas and need improvement. Among the most important weaknesses is the present system is market intelligence. We found that traders and farmers rely on personal contacts for market information as other means are either not readily available or not reliable. There is no system of displaying current daily prices on the premises of a market. Farmers, therefore, usually visit different commission agencies and learn about prices through their personal links. This is a poor arrangement, as farmers may either get incomplete or wrong information. Prices reported on radio and published in the newspapers are only averages of daily quotations, which may not be very helpful. One of the reasons why average prices are reported is the lack of standardization of agricultural commodities in Pakistan. The quality of a product is determined on the basis of its colour, dryness, proportion of foreign elements and so on, and is not uniform among markets. This arbitrariness in standardization sometimes results in unnecessary disputes.

The lack of telephone and telegraph links is one of the major problems which traders dealing in more than one market face. Several traders in primary markets visited did not have any telephone service. Those who had such facilities found it difficult to get free lines when they were most needed. As a result, it is not easy or possible for traders to respond to changes in prices in other markets. Short-run profit opportunities are therefore created in some markets at the expense of traders and farmers in other regions because of an inefficient information system. This also happens due to poor transportation particularly during the harvest season. Since harvesting brings relatively large quantities of surplus to the market, transportation facilities are usually the least adequate in those periods. Of course, supply of transportation facilities depends mainly on government policy, as it controls railway routes and determines the number of trucks, tractors and other vehicles through its import policy.

Another problem in trading relates to making payments to farmers. Most of the traders and farmers we interviewed complained about the lack of sufficient funds during the harvesting months. According to majority of the traders we interviewed, banks do not provide enough cash on demand during this period which results in delays in payments to farmers. This means that some farmers may sell to a trader who can arrange ready cash. Once again this is a problem which the government largely controls as it now owns the banking system. Inadequate access of agricultural trade to the capital markets in the country may have hindered progress. Banks and other financial institutions usually do not encourage investment by private traders. They would rather provide credit to industry and foreign trade, which are the advanced sectors in the economy. We do not therefore see modern techniques used in domestic agricultural markets on the same scale which one observes in the industrial sector.

Finally, the generally low level of education of traders, particularly in the village and primary markets, also seems to be a major drawback of the existing marketing system. Most of the traders we interviewed were highschool dropouts. Not all of them knew about the exact role of the market committees which the government has established to regulate marketing activities. Consequently, they do not show much care in reporting prices and quantities to these committees. Nor do they fully understand their rights and duties in relation to various laws enacted by the government. This may allow the market committee officials, and officials of food departments and police, to misuse their authority.

Policy Implications

The findings of this study should be of interest to policy makers in Pakistan. It demonstrates that, although agricultural markets in Pakistan do not function like textbook perfect markets, they have shown a high degree of integration and appear to have contributed significantly to positive changes which took place in the agricultural sector during the past two decades. Agricultural traders are generally from the middle or lower middle income groups of the society. The rural traders (beoparies), who are sometimes considered "anti-social" due to historical reasons, in fact belong to that segment of the rural society whom the government should be helping the most as they are either landless labourers or very small landowners and supplement their income by trading.

From this study it also appears that private markets have responded favourably to changes in other sectors of the economy. Socio-economic changes in rural areas may also have been encouraged by these markets, as people with diverse social and economic backgrounds were able to enter the grain trade with relative ease. The case of rice marketing, on the contrary, shows that direct control of trade by the government has not always produced the desired results: it may in fact have distributed income in favour of influential groups without resulting in higher efficiency. No evidence could be found for "excessive" profits by private traders in agricultural markets for wheat and gram.

Based on the above findings it would not be advisable for the government to replace the existing marketing system by public sector arrangements.[2] This step is not warranted by either efficiency or equity arguments. It would be desirable instead that the government concentrates on providing facilities which, contribute to the overall development of the agricultural sector and, improve the performance of markets. Some specific areas in this respect are:

1. Improvement in telephone and telegraph services between markets. Agricultural markets seem to have not received equal priority vis-a-vis the industrial sector in getting these facilities.
2. Expansion in transportation facilities need immediate attention. In the short-run, government can provide more railway wagons to surplus-producing areas during the harvest season. In the long run, both railways and road links should be improved to all important primary markets, particularly to Sargodha, Mianwali, Sialkot, Sukkur and Peshawar, as at present these markets are located on branch lines or have poor road links.
3. Market committees should be required to make it obligatory for traders in the primary and terminal markets to display prominently the daily prices of all commodities on market

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[2] Pakistan Agricultural Storage and Supplies Corporation (PASSCO) is one example of how the public sector is trying to replace private markets.

premises. To improve market intelligence, government should undertake studies to gather accurate information on the stock position of each commodity every year. This should be done for each region and should be available to traders, farmers and consumers alike, so that they may all adjust their expectations accordingly. A regular news bulletin on market conditions containing information on each variety of commodities should be broadcast on radio, as this is the only medium easily available to farmers and traders alike.

4. Standardization of major commodities should be done as a matter of priority.

5. The role of government credit should be extended. At present, loans are provided to farmers for various inputs, and they usually go first or mostly to influential farmers. Small farmers and village traders, who generally serve small farmers, get few loans for their needs. A scheme can be devised whereby loans are extended to small farmers and linked with storage facilities. Providing farmers with adequate storage facilities, so that they do not have to sell in the harvest season under compulsion of repaying the loan, is a stated government goal. But in reality this is possible only if the basic need (which is cash) for which the surplus is sold by a farmer is also fulfilled. It is essential for the government to expand storage facilities to rural areas. Better results can be achieved by providing credit along with these facilities. A side benefit of this

scheme will be that the government can learn about the stock positions of important commodities through its storage links with farmers.

6. The role of private traders should be recognized as basically positive and necessary. They should be treated like entrepreneurs in other sectors and have equal access to credit facilities.

7. It should be recognised that the problems of marketing cannot be isolated from overall development of the agricultural sector. Our study of the effects of the Green Revolution on agricultural markets shows that the performance of agricultural marketing is a function of factors which bring about changes in farm output. These factors could be technological, as the Green Revolution, or institutional, as agrarian reform. Therefore, if the objective is to develop agriculture, and thereby the economy as a whole, government should allocate its scarce resources to the activities mentioned above and not to taking over the functions of relatively skilled but not so-well-off individuals in the private marketing sector.

Appendix A

Sample Survey of Agricultural Markets in Pakistan 1980-81

A survey of selected farmers and traders was conducted during December 1980 to January 1981 to collect information on agricultural markets in Pakistan. We describe here the sample and questionnaire used in the survey.

The thirteen selected primary and terminal markets are located in six of the twelve administrative divisions in Pakistan. We picked one district from each division, except from Karachi, and then two villages from each district randomly. From each of the 20 villages so selected, we picked a random sample of 20 farmers. The sample size of farmers was 400, but this was not a simple random sample of all farmers. Given the large number of farmers, our resources did not permit us to have a better sample. Out of the 400 farmers selected, only 302 could be interviewed. The rest were either not available for interviews or refused to grant one.

We also selected 120 traders from our markets, except Peshawar, Sargodha and Sukkur. The selection of markets was done more on the basis of convenience in travel. The number of traders selected differed from market to market. 10 to 15 were picked from each market for interviews. 109 traders responded to our questionnaire.

The questionnaire used to interview farmers and traders are given below.

Questionnaire for Farmers Regarding

Agricultural Markets in Pakistan: 1980-81

1. Name (Voluntary)
2. Village:
3. Land ownership:
4. Total output in 1980-81 of:
   a) wheat b) paddy/rice
   c) gram d) maize
   e) cotton f) sugar cane
   g) others

5. Marketable Surplus of:
   a) wheat
   b) paddy/rice
   c) gram
   d) maize
   e) cotton
   f) sugar cane
   g) others

7. Time of disposal of marketable surplus of various commodities:
   a) How much in the first month of harvest?
   b) In the first three months?
   c) In the first six months?
   d) After six months

8. Agency to which various commodities are sold:[1]

a) wheat	(1), (2), (3), (4), (5), (6) or (7)
b) paddy/rice	(1), (2), (3), (4), (5), (6) or (7)
c) gram	(1), (2), (3), (4), (5), (6) or (7)
d) maize	(1), (2), (3), (4), (5), (6) or (7)
e) others	(1), (2), (3), (4), (5), (6) or (7)

9. Reasons for selling to various agencies:[2]
   (1), (2), (3), (4), (5), (6), (7) and/or (8)?

10. Sources of information on prices and market information?

11. How often prices are checked from other places before selling to a village trader or primary market

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[1] See Table 2.5 for description of the numbers mentioned here.

[2] See Table 2.6 for description of the numbers mentioned here.

12. Number of price offers received before selling a commodity?

13. Kind of storage facilities available/used?

14. Amount of credit needed per year?

15. Time of credit needs?

16. Sources of credit?

Bank Landlords
Village traders Relatives
Friends Others

17. Interest paid on loan?

18. Sources of obtaining fertilizers: a) Arhatyas;
b) Fertilizer agency:
c) others

19. Sources of obtaining seeds: a) Home
b) Government Agency
c) others

20. Means of transportation used in taking goods to a primary market

21. What are the usual problems you face in arranging transportation?

Questionnaire for Traders in various agricultural markets in Pakistan 1980-81

1. Name (Voluntary)
2. Place
3. If <u>Kacha</u> or <u>Pucca</u> <u>Arhatya</u>?
4. Are you a sole owner or have a partner in this business?
5. How many total <u>arhatyas</u> are in this market in your opinion?
6. How many of them buy major shares of various goods in your opinion?
7. In what commodities do you generally deal?
8. How much initial investment did you put in this business?
9. How much initial capital is required if one is to start business today?
10. Can you please give us the break-down of fixed capital required to open a Kacha Arhat (Commission Agency) today?[3]

1.	2.	3.
4.	5.	6.
7.	8.	9.
10.	11.	12.

11. What proportion of your total business capital is borrowed?
12. What are the major sources of loan:
    a) banks b) government agencies
    c) friends and relatives d) others
13. Do you have any farm land of your own?
14. What was your family profession before joining farm trade?
15. Do you sell fertilizers or other inputs to farmers:
    a) regularly b) occasionally
    c) rarely d) never
16. Do you extend loans to farmers:
    a) regularly b) occasionally
    c) rarely d) never
17. What kinds of benefits do you expect from a farmer if you extend a loan?
18. Have you ever bought land from farmers who are your clients?
19. How many of your clients are farmers?
20. How many of your clients are non-farmers? Who are they? Any idea?

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[3] See Table 2.13 for description of the numbers mentioned here.

21. Do you have contacts in other markets?
Which markets and of which nature?
22. How do you get information about other markets?
23. Do you have your own telephone system? Teleprinter?
24. How often do you call on a telephone your contacts in other markets to check about price and stock changes?
25. Do you get any business newspaper or magazine to learn about other markets conditions?
26. Do you keep stocks of any commodity?
a) regularly b) occasionally
c) rarely d) never
27. How much? a) wheat b) rice/paddy
c) gram d) others
28. For how long?
29. What are the charges for a farmer or a village 'Beopary' to sell his produce through your agency?
a) Commission... b) Loading-Unloading...
c) Weighing costs... d) other charges...
30. Is there any difference between the amount you charge a farmer and a 'Beopary'?
31. Do you take market charges in kind or cash?
32. Are markets charges fixed or do they vary from time to time?
33. Is there any organisation of traders in this market?
34. Are you active in any traders' organisation?
35. What kind of benefits do you get from your organisation?
36. How many total employees are working for you at present?
a) permenent b) part-time
38. How many of your employees are your
a) relatives b) others ?
39. Do you report daily prices and sales volume to your market committee?
40. How often do you report prices and sales to the market committee?
41. Is there any penalty for not reporting to the market committee?

APPENDIX B

Details of the Estimates Related to Chapter IV

Tables B.1 to B.27 show the ordinary least square estimates of the coefficients specified in Equations 3.14 to 3.16 for different pairs of markets. The first nine of these tables (Tables B.1 to B.9) contain estimates based on 'absolute' wholesale (Real) prices of three commodities in various markets. Tables B.10 to B18 show the relationships between 'changes' in such prices. The next nine tables (Tables B.19 to B.27) provide estimates of these relationships for 'rates of change' in prices of the selected commodities. For economy of space, we have presented different components of the equations, like the intercept term $\gamma 0$ or the slope $\gamma 1$, etc. separately in different tables.[1]

To locate a particular equation, showing relationships between prices in any two markets, therefore, we have to use three different tables at a time. For example, such a relationship between average wholesale (real) prices of wheat in Faislabad and Gujranwala would be determined by taking the intercept ($\gamma 0$) term from Table B.1, the value of the slope ($\gamma 1$) from Table B.2, and the Durbin Watson Statistics from Table B.3. We have encircled such values in these tables to read as PAt = 1.05 + 0.97 PBt

(3.01) (28.26)

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[1] We also estimated a detrended version of equation 3.14 (i.e. by adding time as an additional independent variable along with the respective price variable). However, since no significant change in the values of our coefficients ($\gamma 1$) was observed in this version compared with the simple regressions equations, we do not report the detrended estimates here.

$R^2 = 0.952$

D.W=1.78

Where the figures in brackets are t-values of the respective coefficients. A similar euqation for Karachi and Lahore will be:

$$PA_t = 2.27 + 0.937\ PB_t$$
$$(3.27)\quad (18.20)$$

$R^2 = 0.945$

D.W=1.98

Equations showing relationships among other categories of prices can be formulated in the same manner from Tables B.1 to B.27.

Now to test the hypothesis of $\gamma_1 = 1$, as specified in Equations 3.14 to 3.16 we computed an F-statistics:[2]

$$F = \frac{(SSEr - SSEu)/V1}{SSEu/V2}$$

where SSE,r = the sum of squared residuals obtained as

$$SSEr = \sum_{t=1}^{n} (PAt - PBt)^2$$

SSEu = the sum of squared residuals obtained from our estimates of equation (3.8).

V1 = number of restrictions imposed on the values of the coefficients, which is equal to γ_1 here.

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[2] See Koutsoyiannis [47].

V2 = [(number of observations) - (number of independent variables) - (1)]; which is equal to (252-1-1) = 250.

Estimates of F-statistic for regression results presented in Tables B.1 to B.27 are given in Tables B.28 to B.33 along with its critical value at the 5% level of significance. Thus, in Tables B.28 to B.33, wherever the value of F is smaller or equal to 3.84, we accept the hypothesis that γ_1 for those markets is equal to one, i.e. there is perfect market integration between prices of a good in those markets, and wherever this value is larger than our critical value we reject the null hypothesis that $\gamma_1=1$.

The following Tables contain the details of the estimates related to Chapter IV.

EXPLANATION OF SOME OF THE TERMS USED IN

TABLES B.1 TO B.53

1. FD = Faisalabad
2. GA = Gujranwala
3. HD = Hyderabad
4. KCI = Karachi
5. LR = Lahore
6. MN = Multan
7. OK = Okara
8. PR = Peshawar
9. RPI = Rawalpindi
10. SL = Sahiwal
11. SG = Sargodha
12. ST = Sialkot
13. SKR = Sukkur

Table B.1

Regression Estimates of the Intercept Term γ_0 for the Relationship Among Monthly Average Wholesale (Real) Prices of Wheat in Various Primary Agricultural Markets in Pakistan From January 1955 to June 1979.*

	1	2	3	4	5	6	7	8	9	10	11	12	13
	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	ST	SG	SKR
FD		1.05 (3.01)	-0.91 (-1.57)	-2.5 (-4.24)	-0.23 (-0.59)	0.72 (1.31)	0.666 (2.28)	2.21 (3.45)	-0.30 (-0.04)	1.30 (3.66)	1.87 (4.17)	0.435 (1.659)	NA NA
GA			0.63 (0.945)	-1.81 (-1.49)	0.123 (0.33)	1.37 (4.23)	1.14 (5.0)	1.84 (3.19)	0.93 (1.29)	1.70 (5.80)	1.29 (3.99)	1.62 (4.28)	NA NA
HD				-2.16 (-1.05)	-0.33 (1.88)	1.44 (2.24)	1.28 (2.37)	2.51 (3.63)	1.83 (2.77)	1.46 (2.64)	1.83 (2.24)	1.64 (2.05)	NA NA
KCI					2.27 (3.27)	2.23 (2.73)	2.17 (2.85)	3.38 (4.48)	2.36 (2.21)	1.74 (2.84)	1.98 (3.11)	2.37 (2.85)	NA NA
LR						1.05 (7.75)	1.34 (7.37)	1.83 (5.54)	1.02 (1.72)	1.84 (3.88)	1.69 (3.42)	1.92 (5.15)	NA NA
MN							0.79 (2.73)	1.90 (3.23)	2.19 (1.54)	1.04 (2.14)	0.98 (2.70)	0.66 (2.38)	NA NA
OK								0.84 (1.81)	0.72 (0.33)	0.77 (2.01)	1.17 (2.32)	0.76 (2.65)	NA NA
PR									1.61 (3.20)	2.08 (4.47)	2.34 (4.67)	2.69 (3.21)	NA NA
RPI										2.56 (3.03)	2.94 (2.84)	2.35 (2.49)	NA NA
SL											1.53 (2.91)	1.09 (3.05)	NA NA
ST												1.40 (3.92)	NA NA
SG													
SKR													

*Figures in brackets are t-values.

Computations based on data from [57].

N.A. Data not available.

Table B.2

Regression Estimates of the Slope 'γ_i' for the Relationships Among Monthly Average Wholesale (Real) Prices of Wheat in Various Agricultural Markets of Pakistan from January 1955 to June 1979.*

	1	2	3	4	5	6	7	8	9	10	11	12	13
	FD	GA	HD	KCI	LR	MN	UK	PR	RPI	SL	ST	SG	SKR
FD		0.97 (28.26)	1.052 (23.83)	0.97 (19.76)	1.006 (34.49)	0.983 (42.88)	0.992 (16.90)	0.904 (18.99)	0.999 (18.99)	0.984 (32.47)	0.949 (24.89)	0.998 (48.19)	NA NA
GA			0.98 (18.76)	1.025 (25.50)	1.003 (35.74)	0.965 (36.92)	0.948 (20.18)	0.915 (19.87)	0.948 (22.00)	0.952 (22.88)	0.981 (37.54)	0.939 (31.05)	NA NA
HD				0.975 (28.05)	0.928 (25.57)	0.918 (23.72)	0.921 (24.88)	0.887 (15.65)	0.916 (23.05)	0.927 (25.09)	0.845 (17.36)	0.926 (22.80)	NA NA
KCI					0.937 (18.2)	0.933 (19.05)	0.953 (20.22)	0.827 (14.05)	0.904 (15.49)	0.944 (18.47)	0.908 (16.83)	0.901 (17.94)	NA NA
LR						0.978 (41.90)	0.966 (34.02)	0.947 (18.07)	0.929 (20.38)	0.948 (28.62)	0.949 (28.88)	0.936 (35.79)	NA NA
MN							0.964 (40.54)	0.908 (17.94)	0.939 (17.91)	0.948 (29.62)	0.936 (29.70)	0.968 (42.00)	NA NA
OK								0.918 (17.75)	0.935 (18.51)	0.968 (47.69)	0.913 (26.06)	0.947 (40.86)	NA NA
PR									0.924 (25.83)	0.863 (15.41)	0.887 (18.06)	0.889 (14.85)	NA NA
RPI										0.916 (19.29)	0.896 (16.25)	0.904 (19.17)	NA NA
SL											0.929 (22.84)	0.955 (31.81)	NA NA
ST												0.951 (30.75)	NA NA
SG													
SKR													

* Figures in brackets are t-values;
Computation based on data from [57].
N.A. data not available

Table B.3

R^2 and Durban-Watson Statistics for the Relationships Among Monthly Average Wholesale (Real) Prices of Wheat in Various Agricultural Markets in Pakistan from January 1955 to June 1979.*

	1	2	3	4	5	6	7	8	9	10	11	12	13
	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	ST	SG	SKR
FD		0.952 (1.78)	0.911 (1.807)	0.908 (1.74)	0.946 (1.933)	0.972 (2.08)	0.98 (1.928)	0.783 (1.51)	0.906 (1.88)	0.968 (2.17)	0.918 (1.629)	0.928 (1.816)	NA "
GA			0.885 (1.419)	0.921 (1.92)	0.986 (1.683)	0.945 (1.887)	0.938 (1.624)	0.815 (1.526)	0.881 (1.54)	0.925 (1.657)	0.949 (1.86)	0.944 (1.619)	" "
HD				0.960 (1.767)	0.905 (1.626)	0.891 (1.69)	0.887 (1.85)	0.762 (1.52)	0.816 (1.83)	0.901 (1.81)	0.884 (1.497)	0.885 (1.645)	" "
KCI					0.945 (1.98)	0.942 (1.75)	0.935 (1.749)	0.782 (1.62)	0.845 (1.726)	0.967 (2.024)	0.904 (1.65)	0.906 (1.84)	" "
LR						0.945 (1.78)	0.927 (1.865)	0.866 (1.535)	0.905 (1.815)	0.966 (1.908)	0.919 (1.646)	0.907 (1.784)	" "
MN							0.937 (1.933)	0.863 (1.593)	0.902 (1.684)	0.987 (2.06)	0.919 (1.765)	0.917 (1.99)	" "
OK								0.823 (1.649)	0.8905 (1.837)	0.990 (1.96)	0.908 (1.653)	0.937 (1.972)	" "
PR									0.905 (1.855)	0.878 (1.579)	0.896 (1.651)	0.877 (1.693)	" "
RPI										0.919 (1.883)	0.910 (1.81)	0.962 (1.819)	" "
SL											0.918 (1.82)	0.904 (1.883)	" "
ST												0.920 (1.804)	" "
SG													
SKR													

*Figures in brackets are Durbin-Watson Statistics.
Computation based on data from [57]

N.A. - Data not available.

Table B.4

Regression Estimates of the Intercept Term (γ) for the Relationships Among Average Monthly Wholesale Prices of Gram in Various Agricultural Markets of Pakistan From January 1955 to June 1979*.

	1 FD	2 GA	3 HD	4 KCI	5 LR	6 MN	7 OK	8 PR	9 RPI	10 SL	11 ST	12 SG	13 SKR
FD		0.71 (5.955)	3.10 (3.965)	2.70 (3.239)	-0.50 (-3.366)	-0.20 (-1.262)	-0.50 (-1.851)	4.09 (4.775)	-0.66 (-2.202)	0.009 (0.041)	0.09 (0.428)	0.04 (0.258)	2.95 (3.51)
GA			2.11 (7.841)	2.13 (9.496)	0.84 (7.579)	2.18 (7.455)	2.92 (9.463)	8.15 (10.132)	3.88 (7.168)	2.98 (5.921)	1.88 (3.091)	2.69 (4.132)	4.26 (4.79)
HD				1.00 (3.391)	3.287 (5.632)	3.588 (6.284)	4.098 (6.282)	8.104 (10.008)	6.81 (7.33)	3.583 (5.42)	3.74 (6.05)	3.43 (8.97)	1.75 (2.11)
KCI					3.653 (2.676)	2.58 (2.86)	2.991 (4.49)	5.922 (4.46)	3.559 (2.82)	2.602 (3.15)	3.663 (3.11)	3.066 (3.20)	2.63 (2.81)
LR						1.05 (2.883)	0.07 (0.27)	5.99 (8.34)	-0.012 (-0.056)	0.70 (3.11)	0.70 (3.79)	0.74 (4.256)	3.05 (4.77)
MN							6.30 (0.994)	3.10 (8.312)	-0.17 (-0.615)	0.60 (2.298)	0.61 (2.8)	0.50 (2.795)	3.12 (4.14)
OK								3.90 (3.71)	0.88 (1.761)	1.00 (4.542)	1.12 (4.849	1.60 (5.454)	2.13 (4.95)
PR									1.77 (4.37)	3.66 (6.822)	3.07 (7.50)	2.96 (6.727)	3.75 (4.15)
RPI										1.80 (5.136)	1.06 (5.99)	1.60 (6.279)	2.17 (2.48)
SL											1.25 (1.73)	0.80 (2.837)	2.02 (2.79)
ST												0.05 (0.59)	3.75 (4.77)
SG													3.06 (5.11)
SKR													

*Figures in parenthesis are t-values.
- Source: Computations based on data from [57]

Table B .5

Estimates of the Coefficient 'γ' for the Relationships Among Average Monthly Wholesale (Real) Prices of Gram in Various Agricultural Markets of Pakistan From January 1955 to June 1979.*

1	2	3	4	5	6	7	8	9	10	11	12	13
FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	ST	SG	SKR
FA	0.996 (72.32)	0.86 (28.119)	0.909 (37.776)	1.018 (106.685)	1.029 (95.187)	1.048 (58.671)	0.762 (23.560)	1.046 (35.932)	0.991 (68.22)	0.971 (74.978)	1.013 (95.973)	0.889 (24.54)
GA		0.792 (24.881)	0.895 (33.522)	0.986 (88.895)	0.915 (69.291)	0.931 (64.205)	0.637 (22.749)	0.904 (3 .04)	0.952 (48.27)	0.967 (88.926)	0.929 (68.286)	0.865 (23.55)
HD			0.949 (110.093)	0.906 (48.097)	0.851 (41.061)	0.888 (46.667)	0.776 (20.04)	0.735 (29.95)	0.843 (33.73)	0.863 (30.31)	0.849 (32.05)	0.953 (71.55)
KCI				0.935 (80.139)	0.922 (70.99)	0.931 (75.99)	0.780 (26.84)	0.889 (37.81)	0.934 (67.87)	0.903 (38.05)	0.894 (47.61)	.911 (46.62)
LR					1.0 (90.139)	1.03 (64.02)	0.768 (27.86)	0.909 (37.05)	0.961 (67.96)	0.946 (80.35)	0.981 (85.873)	.905 (42.55)
MN						0.977 (47.18)	0.827 (26.85)	0.947 (55.577)	0.94 (59.294	0.944 (70.47)	0.965 (78.72)	0.899 (33.15)
OK							.835 (22.15)	0.918 (40.432)	0.98 (62.944)	0.931 (59.14)	0.913 (58.31)	.887 (28.58)
PR								0.915 (41.2)	0.88 (26.16)	0.832 (22.525)	0.871 (20.731)	0.885 (21.75)
RPI									0.962 (51.52)	0.94 (54.28)	0.935 (56.367)	0.876 (22.15)
SL										0.948 (55.67)	0.973 (56.05)	0.908 (37.25)
ST											1.015 (65.79)	0.859 (31.15)
SG												0.893 (29.37)
SKR												

*Figures in parenthesis are t-values.

- Source: Computations based on data from [57]

Table B.6

Estimates of R^2 and Durbin-Watson Statistics for the Relationship Among Average Monthly Wholesale (Real) Prices of Gram in Various Agricultural Markets of Pakistan from January 1955 to June 1979.*

	1 FD	2 GA	3 HD	4 KCI	5 LR	6 MN	7 OK	8 PR	9 RPI	10 SL	11 ST	12 SG	13 SKR
FD		0.927 (1.724)	0.914 (1.558)	0.906 (1.610)	0.979 (1.792)	0.981 (1.807)	0.936 (1.801)	0.895 (1.581)	0.902 (1.894)	0.972 (1.927)	0.973 (1.874)	0.976 (1.611)	0.905 (1.745)
GA			0.887 (1.56)	0.88 (1.57)	0.906 (1.862)	0.908 (1.784)	0.886 (1.638)	0.876 (1.573)	0.907 (1.673)	0.903 (1.721)	0.906 (1.767)	0.903 (1.677)	0.895 (1.81)
HD				0.970 (1.736)	0.911 (1.7531)	0.894 (1.790)	0.882 (1.634)	0.8518 (1.554)	0.875 (2.315)	0.8839 (1.71)	0.8858 (1.636)	0.8992 (1.764)	0.943 (1.854)
KCI					0.898 (1.818)	0.8952 (1.802)	0.8849 (1.652)	0.8894 (1.563)	0.8943 (1.639)	0.8944 (1.892)	0.8956 (1.6220)	0.8932 (1.663)	0.885 (1.805)
LR						0.976 (1.924)	0.9402 (1.875)	0.9011 (1.5229)	0.9711 (1.698)	0.9667 (1.703)	0.9736 (1.815)	0.9732 1.663	0.917 1810.50
MN							0.9418 (1.669)	0.8990 (1.554)	0.976 (1.797)	0.9722 (1.851)	0.9810 (1.851)	0.9765 (1.823)	0.903 (1098.92)
OK								0.841 (1.515)	0.9226 (1.813)	0.9506 (1.917)	0.9422 (1.806)	0.9345 (1.602)	0.905 (1.590)
PR									0.921 (1.683)	0.796 (1.617)	0.787 (1.588)	0.803 (1.631)	0.779 (1.582)
RPI										0.963 (1.713)	0.975 (1.697)	0.9675 1.780	0.905 (1.727)
SL											0.975 (1.703)	0.9630 (1.654)	0.9035 (1.615)
ST												0.973 (1.784)	0.887 (1.635)
SG													0.885 (1.671)
SKR													

*Figures in Parenthesis are Durbin-Watson Statistics.
-Computations based on data from [57]

Table B.7

Regression Estimates of the Intercept term γ_o for the Relationships Among Average Monthly Wholesale (Real) Prices of Rice (Basmati) in Various Agricultural Markets of Pakistan from January 1955 to June 1979.*

	1 FD	2 GA	3 HD	4 KCI	5 LR	6 MN	7 OK	8 PR	9 RPI	10 SL	11 ST	12 SG	13 SKR
FD		3.15 (2.92)	2.31 (2.3)	-3.35 0.92	1.72 (2.54)	1.09 (1.52)	NA NA	2.20 (2.51)	1.80 (1.95)	1.09 (-1.08)	3.80 (3.01)	NA NA	4.11 (5.20)
GA			1.11 (1.65)	-3.59 (0.91)	1.71 (2.02)	1.51 (1.74)	NA NA	2.90 (2.27)	2.75 (1.99)	1.59 (1.42)	2.04 (2.11)	NA NA	2.76 (3.58)
HD				-1.82 (0.99)	2.10 (2.14)	1.25 (1.75)	NA NA	2.56 (2.12)	2.92 (3.01)	1.86 (1.95)	2.89 (2.91)	NA NA	2.59 (3.93)
KCI					38.12 (6.54)	25.45 (6.90)	NA NA	33.09 (7.59)	34.11 (7.44)	35.01 (6.99)	19.69 (8.22)	NA NA	40.63 (8.96)
LR						1.15 (2.12)	NA NA	2.18 (2.38)	1.95 (2.10)	1.02 (-1.88)	1.84 (2.33)	NA NA	3.14 (4.19)
MN							NA	2.42 (2.89)	2.06 (1.97)	1.25 (1.78)	2.73 (3.81)	NA NA	3.05 (4.37)
OK								NA	NA NA	NA NA	NA NA	NA NA	NA NA
PR									2.81 (3.11)	(3.60) (3.32)	2.98 (3.14)	NA NA	5.25 (5.93)
RPI										1.81 (2.47)	2.92 (3.17)	NA NA	4.95 (4.47)
SL											3.11 (3.70)	NA NA	4.50 (4.75)
ST												NA	2.58 (2.51)
SG													NA NA
SKR													

*Figures in brackets are t-values.
- Computation based on data taken from [57]

Table B.8

Estimates of the Regression Coefficient 'γ_i' for the Relationship Among Average Monthly Wholesale (Real) Prices of Rice (Basmati) for Various Agricultural Markets of Pakistan, for January 1955 to June 1979.*

	1	2	3	4	5	6	7	8	9	10	11	12	13
	FD	CA	HD	KCI	LR	MN	OK	PR	RPI	SL	ST	SG	SKR
FD		1.095 (25.97)	0.815 (29.11)	0.665 (12.12)	0.841 (33.12)	0.877 (46.15)	NA NA	0.729 (21.02)	0.741 (26.41)	0.839 (35.14)	1.150 (39.62)	NA NA	1.112 (36.63)
CA			0.736 (19.42)	0.640 (12.79)	0.815 (28.28)	0.841 (27.22)	NA NA	0.704 (20.22)	0.711 (23.41)	0.806 (25.90)	0.981 (50.66)	NA NA	0.778 (21.22)
HD				0.829 (13.88)	0.811 (29.26)	1.116 (29.16)	NA NA	0.804 (23.94)	0.807 (22.75)	1.18 (22.78)	1.190 (35.51)	NA NA	0. (33.62)
KCI					0.717 (12.92)	0.717 (11.34)	NA NA	0.629 (12.97)	0.725 (13.28)	0.698 (10.73)	0.720 (10.73)	NA NA	0.625 (10.79)
LR						1.084 (103.66)	NA NA	0.733 (46.12)	0.822 (48.13)	1.078 (46.50)	1.117 (54.09)	NA NA	0.78 (34.39)
MN							NA NA	0.774 (45.41)	.782 (42.37)	0.927 73.75	1.085 (59.04)	NA NA	1.077 (89.78)
OK								NA NA	NA NA	NA NA	NA NA	NA NA	NA NA
PR									0. (49.15)	1.162 (45.17)	1.181 (47.56)	NA NA	1.152 (45.81)
RPI										1.115 (39.25)	1.139 (44.49)	NA NA	1.122 (47.19)
SL											1.081 (64.92)	NA NA	0.880 (44.93)
ST												NA NA	0.831 (41.30)
SG													NA NA
SKR													

* Figures in brackets are t-values.
- Computation based on data from [57]
- N.A.: Data not available.

Table B.9

Estimates of R^2 and Durbin-Watson Statistics for Rice (Basmati) Real Monthly Average Wholesale Prices in Various Agricultural Markets of Pakistan from January 1955 to June 1979.*

	1 FD	2 GA	3 HD	4 KCI	5 LR	6 MN	7 OK	8 PR	9 RPI	10 SL	11 ST	12 SG	13 SKR
FD		0.908 (1.489)	0.914 (1.345)	0.894 (1.419)	0.915 (1.398)	0.938 (1.780)	NA NA	0.914 (1.582)	0.907 (1.477)	0.926 (1.71)	0.926 (1.600)	NA NA	0.914 (1.512)
GA			0.907 (1.337)	0.890 (1.365)	0.908 (1.462)	0.899 (1.394)	NA NA	0.866 (1.397)	0.894 (1.381)	0.894 (1.449)	0.952 (1.556)	NA NA	0.903 (1.437)
HD				0.921 (1.44)	0.913 (1.381)	0.903 (1.319)	NA NA	0.902 (1.432)	0.910 (1.423)	0.908 (1.336)	0.913 (1.361)	NA NA	0.942 (1.485)
KCI					0.901 (1.387)	0.837 (1.379)	NA NA	0.804 (1.397)	0.835 (1.385)	0.815 (1.373)	0.806 (1.381)	NA NA	0.866 (1.418)
LR						0.931 (1.458)	NA NA	0.901 (1.483)	0.906 (1.459)	0.899 (1.374)	0.912 (1.355)	NA NA	0.877 (1.342)
MN							NA NA	0.902 (1.432)	0.904 (1.413)	0.946 (1.746)	0.923 (1.470)	NA NA	0.910 (1.443)
OK								NA NA	NA NA	NA NA	NA NA	NA NA	NA NA
PR									0.902 (1.487)	0.891 (1.449)	0.901 (1.445)	NA NA	0.891 (1.368)
RPI										0.904 (1.411)	0.894 (1.375)	NA NA	0.891 (1.372)
SL											0.924 (1.618)	NA NA	0.888 (1.379)
ST													0.866 (1.335)
SG													NA NA
SKR													

*Figures in brackets are Durbin-Watson statistics.
- Computation based on data from [57]
- N.A.: Data not available.

Table B.10

Regression Estimates of the Intercept Term for the Relationship Among Changes in Average Monthly Wholesale (Real) Prices of Wheat in Various Agricultural Markets of Pakistan From January 1955 to June 1979.*

	1	2	3	4	5	6	7	8	9	10	11	12	13
	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	ST	SG	SKR
FD		.016 (.14)	.043 (.27)	.018 (.119)	.012 (.105)	.03 (.26)	.029 (.26)	.036 (.305)	.028 (.21)	.024 (.29)	.026 (.28)	.027 (.31)	N/A "
GA			.031 (.36)	.022 (.179)	.008 (.13)	.012 (.18)	.019 (.22)	.025 (.148)	.017 (.22)	.017 (.25)	.013 (.21)	.012 (.21)	" "
HD				.014 (.19)	.018 (.21)	.015 (.25)	.018 (.27)	.015 (.22)	.022 (.31)	.024 (.31)	.018 (.28)	.016 (.27)	" "
KCI					.021 (.38)	.028 (.43)	.03 (.45)	.025 (.37)	.028 (.40)	.035 (.46)	.033 (.40)	.032 (.45)	" "
LR						.016 (.26)	.020 (.29)	.020 (.25)	.036 (.30)	.028 (.31)	.026 (.29)	.031 (.37)	" "
MN							.021 (.28)	.031 (.38)	.037 (.46)	.023 (.29)	.024 (.31)	.031 (.34)	" "
OK								.039 (.44)	.038 (.41)	.011 (.15)	.024 (.29)	.023 (.25)	" "
PR									.019 (.24)	.045 (.58)	.065 (.71)	.041 (.63)	" "
RPI										.039 (.47)	.046 (.49)	.046 (.51)	" "
SL											.024 (.29)	.027 (.34)	" "
ST												.023 (.19)	" "
SG													
SKR													

*Figures in brackets are t-values.
- Source of the data used: [57]
- N.A. Data on wheat prices for this market were not available for the period used here.

Table B.11

Regression Estimates of the Coefficient 'γ_i' for the Relationships Between Changes in Average Monthly Wholesale (Real) Prices of Wheat in Various Primary Markets of Pakistan from January 1955 to June 1979.*

	1 FD	2 GA	3 HD	4 KCI	5 LR	6 MN	7 OK	8 PR	9 RPI	10 SL	11 ST	12 SG	13 SKR
FD		0.904 (28.18)	0.784 (17.97)	0.834 (19.26)	0.941 (29.06)	0.863 (22.84)	0.851 (26.60)	0.676 (15.25)	0.793 (18.74)	0.888 (27.37)	0.819 (24.81)	0.811 (26.81)	N/A "
GA			0.774 (16.59)	0.805 (16.41)	0.905 (29.96)	0.850 (18.91)	0.766 (15.40)	0.684 (12.93)	0.799 (18.47)	0.836 (24.47)	0.889 (18.46)	0.846 (18.72)	" "
HD				0.894 (26.91)	0.805 (17.13)	0.809 (18.53)	0.814 (22.08)	0.661 (13.05)	0.789 (15.75)	0.787 (14.63)	0.801 (19.12)	0.797 (20.85)	" "
KCI					0.860 (20.94)	0.82 (18.61)	0.808 (19.12)	0.702 (12.87)	0.796 (16.24)	0.765 (16.01)	0.794 (18.26)	0.801 (16.34)	" "
LR						0.905 (28.12)	0.882 (24.42)	0.671 (13.69)	0.799 (19.51)	0.875 (22.27)	0.873 (24.58)	0.795 (19.90)	" "
MN							0.916 (26.69)	0.644 (12.71)	0.778 (16.34)	0.901 (24.67)	0.854 (20.24)	0.796 (18.44)	" "
OK								0.670 (14.41)	0.755 (18.48)	0.962 (33.11)	0.884 (24.57)	0.869 (27.93)	" "
PR									0.801 (19.71)	0.662 (12.31)	0.623 (11.76)	0.664 (14.19)	" "
RPI										0.841 (19.48)	0.839 (19.52)	0.804 (18.68)	" "
SL											0.840 (26.01)	0.809 (22.29)	" "
SG												0.908 (27.75)	" "
SKR													

*Figures in brackets are t-values.

- Data source: Computations based on data from [57]

- N.A. Data on wheat prices for this market not available for the period used here.

Table B.12

Regression Estimates of R^2 and Durbin-Watson Statistics for the Relationship Changes in Average Monthly Wholesale (Real) Prices of Wheat in Various Primary Agricultural Markets of Pakistan From January 1955 to June 1979.*

	1 FD	2 GA	3 HD	4 KCI	5 LR	6 MN	7 OK	8 PR	9 RPI	10 SL	11 ST	12 SG	13 SKR
FD		0.756 (2.45)	0.669 (2.06)	0.709 2.18	0.790 (2.38)	0.729 (2.42)	0.813 2.33	0.615 (2.05)	0.685 (2.28)	0.722 (2.41)	0.708 (2.39)	0.713 (2.43)	N/A "
GA			0.647 (1.99)	0.698 (2.19)	0.878 (2.19)	0.705 (2.20)	0.715 (2.11)	0.601 (2.02)	0.688 (2.10)	0.715 (2.21)	0.729 (2.37)	0.722 (2.42)	" "
HD				0.728 (2.38)	0.678 (2.18)	0.655 (2.09	0.637 (2.16)	0.585 (2.24)	0.648 (2.31)	0.673 (2.21)	0.682 (2.04)	0.649 (2.11)	" "
KCI					0.719 (2.33)	0.711 (2.28)	0.695 (2.19)	0.581 (2.02)	0.618 (2.11)	0.692 (2.23)	0.680 (2.27)	0.681 (2.04)	" "
LR						0.820 (2.37)	0.721 (2.26)	0.589 (2.11	0.702 (2.20)	0.754 (2.21)	0.805 (2.28)	0.733 (2.36)	" "
MN							0.709 (2.17)	0.575 (2.28)	0.668 (2.33)	0.715 (2.26)	0.711 (2.41)	0.695 (2.14)	" "
OK								0.583 (2.11)	0.652 (2.25)	0.918 (2.14)	0.708 (2.20)	0.761 (2.32)	" "
PR									0.688 (2.19)	0.592 (2.12)	0.549 (2.15)	0.631 (2.12)	" "
RPI										0.652 (2.19)	0.602 (2.12)	0.616 (2.18)	" "
SL											0.718 (2.27)	0.730 (2.34)	" "
ST												0.738 (2.25)	" "
SG													
SKR													

*Figures in brackets are Durbin-Watson Statistics.
- N.A. : Data not available.

Table B.13

Estimates of the Intercept Term for the Relationship Among Changes in Average Monthly Wholesale (Real) Prices of Gram in Various Agricultural Markets of Pakistan from January 1955 to June 1979.*

	1 FD	2 GA	3 HD	4 KCI	5 LR	6 MN	7 OK	8 PR	9 RPI	10 SL	11 ST	12 SG	13 SKR
FD		0.281 (0.189)	-0.315 (-0.149)	0.142 (0.935)	-0.230 (-0.279)	-0.278 (-0.353)	0.269 (0.385)	0.129 (0.323)	-0.131 (-0.176)	0.379 (0.588)	0.383 (0.493)	0.403 (-0.923)	0.535 (0.783)
GA			0.425 (0.160)	0.170 (0.529)	0.240 (0.169)	0.239 (0.176)	0.174 (0.563)	0.179 (0.951)	0.335 (0.308)	0.246 (0.362)	0.601 (0.390)	0.600 (0.376)	0.693 (1.82)
HD				0.174 (0.824)	0.211 (0.882)	0.130 (0.859)	0.168 (1.004)	0.183 (0.811)	0.173 (0.759)	0.153 (0.959)	0.143 (0.991)	0.134 (0.975)	0.38 (0.347)
KCI					0.128 (0.305)	0.297 (0.670)	0.219 (0.71)	0.395 (1.005)	0.273 (0.81)	0.221 (0.65)	0.29 (0.711)	0.377 (0.711)	0.218 (0.711)
LR						0.128 (0.141)	0.170 (0.592)	0.168 (0.563)	0.391 (0.333)	0.375 (0.379)	0.554 (0.451)	0.492 (0.491)	0.210 (0.715)
MN							0.136 (0.515)	0.489 (0.601)	0.491 (0.373)	0.310 (0.427)	0.542 (0.530)	0.597 (0.472)	0.495 (0.81)
OK								0.651 (0.9)	0.464 (0.428)	0.184 (0.201)	0.315 (0.684)	0.285 (0.721)	0.416 (0.883)
PR									0.225 (0.619)	0.317 (0.812)	0.304 (0.667)	0.395 (0.551)	0.497 (.795)
RPI										0.277 (0.233)	0.215 (0.377)	0.307 (0.391)	0.395 (0.675)
SL											0.271 (0.312)	0.209 (0.173)	0.315 (0.462)
ST												0.150 10.209	0.413 (0.721)
SG													0.387 (0.622)
SKR													

*Figures in brackets are t-values.

- Source: Computations based on data from [57]

Table B.14

Estimates of the Coefficient 'γ' for the Relationships Among Changes in Average Monthly Wholesale (Real) Prices of Gram in Various Agricultural Markets of Pakistan from January 1955 to June 1979.*

	1 FD	2 GA	3 HD	4 KCI	5 LR	6 MN	7 OK	8 PR	9 RPI	10 SL	11 ST	12 SG	13 SKR
FD		0.913 (27.487)	1.031 (15.953)	0.908 (29.310)	1.015 (30.692)	1.011 (55.087)	0.914 (31.58)	1.283 (16.706)	0.987 (58.370)	0.936 (37.126)	0.915 (43.660)	1.042 (53.021)	0.743 (23.17)
GA			0.829 (22.450)	0.888 (29.205)	0.908 (31.039)	0.915 (28.924)	0.909 (36.188)	1.236 (15.786)	0.886 (29.278)	0.867 (25.062)	0.892 (29.780)	0.889 (26.227)	0.729 (21.75)
HD				0.895 (34.696)	0.837 (26.713)	0.353 (24.437)	0.776 (19.694)	1.294 (16.468)	0.735 (21.49)	0.724 (22.294)	0.753 (24.193)	0.735 (26.552)	0.904 (38.57)
KCI					1.906 (30.834)	1.099 (29.272)	1.105 (31.67)	1.223 (15.37)	1.147 (24.79)	1.103 (32.16)	1.135 (23.47)	1.34 (16.25)	1.114 (23.41)
LR						0.930 (43.745)	0.898 (28.653)	1.195 (17.026)	0.909 (41.271)	0.874 (26.441)	0.874 (31.981)	0.886 (35.247)	0.807 (22.12)
MN							0.885 (24.599)	1.256 (16.302)	0.897 (37.498)	0.892 (41.951)	0.884 (41.243)	0.904 (32.636)	0.817 (30.26)
OK								(19.15)	0.850 (32.892)	0.915 (41.50)	0.839 (25.39)	0.857 (27.23)	0.733 (18.25)
PR									0.811 (23.27)	0.761 (17.95)	0.725 (15.39)	0.773 (20.27)	0.765 (15.25)
RPI										0.912 (35.991)	0.903 (32.31)	0.901 (31.55)	0.782 (18.25)
SL											0.895 (27.15)	0.961 (39.097)	0.807 (21.77)
ST												0.863 (53.650)	0.799 (18.11)
SG													0.802 (18.37)
SKR													

*Figures in brackets are t-values.
- Source: Computations based on data from [57]

Table B.15

Estimates of R^2 and Durbin-Watson Statistics for the Relationship Among Changes in Average Monthly Wholesale (Real) Prices of Gram in Various Primary Agricultural Markets of Pakistan From January 1955 to June 1979.*

	1	2	3	4	5	6	7	8	9	10	11	12	13
	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	ST	SG	SKR
FD		0.769 (2.095)	0.639 (1.990)	0.780 (1.992)	0.864 (2.401)	0.892 (2.051)	0.790 (2.033)	0.683 (1.980)	0.802 (2.383)	0.805 (2.279)	0.891 (2.286)	0.874 (2.220)	0.741 (2.419)
GA			0.738 (1.997)	0.764 (2.006)	0.784 (2.026)	0.717 (2.006)	0.831 (1.999)	0.632 (1.999)	0.748 (1.984)	0.747 (2.063)	0.790 (2.007)	0.717 (2.00)	0.729 (1.98)
HD				0.855 (2.009)	0.727 (2.057)	0.716 (2.035)	0.653 (2.080)	0.641 (1.996)	0.671 (2.11)	0.801 (2.093)	0.704 (2.041)	0.777 (2.061)	0.811 (2.195)
KCI					0.815 (1.993)	0.805 (1.991)	0.819 (2.11)	0.641 (1.935)	0.775 (2.084)	0.822 (1.97)	0.771 (2.293)	0.723 (1.945)	0.804 (1.985)
LR						0.830 (2.212)	0.830 (2.129)	0.664 (1.6031)	0.872 (2.844)	0.835 (2.6570)	0.803 (2.6564)	0.8325 (2.5264)	0.715 (2.10)
MN							0.816 (1.990)	0.697 (1.639)	0.849 (2.6049)	0.875 (2.297)	0.871 (2.310)	0.8099 (2.346)	0.775 (2.45)
OK								0.695 (2.341)	0.802 (2.245)	0.856 (2.089)	0.801 (2.395)	0.820 (2.275)	0.716 (0.883)
PR									0.725 (2.295)	0.682 (2.372)	0.656 (2.312)	0.702 (2.195)	0.629 (1.825)
RPI										0.812 (2.243)	0.804 (2.288)	0.795 (2.198)	0.695 (2.375)
SL											0.803 (2.241)	0.868 (2.246)	0.721 (2.31)
ST												0.890 (2.112)	0.716 (2.21)
SG													0.733 (2.39)
SKR													

*Figures in brackets are Durbin-Watson statistics.

Source: Computations based on data from [57]

Table B.16

Intercept term for the Relationship Among Changes in Monthly Average Wholesale (Real) Monthly Prices of Rice (Basmati) in Various Agricultural Markets of Pakistan from January 1955 to June 1979.*

	1 FD	2 GA	3 HD	4 KCI	5 LR	6 MN	7 OK	8 PR	9 RPI	10 SL	11 ST	12 SG	13 SKR
FD		0.91 (1.49)	1.08 (1.95)	1.33 (2.11)	0.71 (0.891)	0.83 (1.21)	NA NA	1.01 (1.79)	0.95 (1.67)	0.79 (1.021)	1.02 (1.732)	NA NA	1.31 (1.995)
GA			0.93 (1.51)	1.28 (1.99)	0.65 (1.21)	0.73 (1.73)	NA NA	1.27 (1.85)	1.21 (1.693)	1.10 (1.667)	0.71 (0.87)	NA NA	1.43 (2.241)
HD				0.83 (1.65)	1.28 (1.899)	1.22 (1.725)	NA NA	1.322 (1.951)	1.24 (1.795)	1.17 (1.813)	1.26 (1.955)	NA NA	0.94 (1.438)
KCI					2.30 (2.85)	2.04 (2.657)	NA NA	2.33 (2.427)	2.04 (2.715)	2.14 (2.415)	2.37 (2.338)	NA NA	2.25 (2.179)
LR						0.79 (1.41)	NA NA	1.05 (1.685)	1.016 (1.471)	0.83 (1.38)	1.005 (1.394)	NA NA	1.22 (1.695)
MN							NA NA	1.13 (1.67)	1.05 (1.533)	0.72 (1.075)	0.98 (1.511)	NA NA	1.21 (1.724)
OK								NA NA	NA NA	NA NA	NA NA	NA NA	NA NA
PR									0.94 (1.325)	1.21 (1.914)	1.44 (2.135)	NA NA	1.397 (1.995)
RPI										1.17 (1.879)	1.31 (2.27)	NA NA	1.412 (2.245)
SL											1.06 (1.73)	NA NA	1.14 (1.775)
ST												NA NA	1.08 (2.113)
SG													NA NA
SLR													

*Figures in brackets are t-values.
- Computation based on data from [57]
- N.A. Data not available.

Table B.17

Estimate of the slope 'γ$_i$' for the Relationships Among Changes in Monthly Average Wholesale Prices of Rice (Basmati) in Various Primary Agricultural of Pakistan from January 1955 to June 1979.*

	1 FD	2 GA	3 HD	4 KCI	5 LR	6 MN	7 OK	8 PR	9 RPI	10 SL	11 ST	12 SG	13 SKR
FD		0.812 (11.25)	0.656 (7.55)	0.632 (6.37)	0.915 (22.13)	0.875 (20.77)	NA NA	0.614 (6.03)	0.715 (10.211)	0.905 (27.35)	0.804 (16.21)	NA NA	0.685 (10.37)
GA			0.621 (8.352)	0.631 (9.18)	0.885 (19.28)	0.795 (16.11)	NA NA	0.621 (7.65)	0.653 (8.95)	0.717 (11.27)	0.905 (21.54)	NA NA	0.672 (10.27)
HD				0.755 (11.75)	0.713 (8.95)	0.651 (7.52)	NA NA	0.611 (5.37)	0.627 (7.291)	0.654 (8.325)	0.713 (9.295)	NA NA	0.813 (10.75)
KCI					1.182 (9.25)	1.235 (8.17)	NA NA	1.054 (6.251)	0.871 (7.24)	1.185 (8.175)	1.315 (7.284)	NA NA	1.151 (9.177)
LR						0.835 (14.59)	NA NA	0.679 (8.75)	0.722 (10.33)	0.913 (19.79)	1.035 (12.275)	NA NA	1.088 (8.89)
MN							NA NA	0.642 (7.51)	0.707 (8.55)	0.859 (14.25)	1.079 (11.25)	NA NA	1.079 (8.23)
OK								NA NA	NA NA	NA NA	NA NA	NA NA	NA NA
PR									0.895 (10.27)	1.115 (7.78)	1.325 (7.29)	NA NA	1.275 (7.35)
RPI										1.085 (11.35)	1.274 (8.95)	NA NA	1.193 (8.81)
SL											1.153 (10.79)	NA NA	1.142 (8.74)
ST												NA NA	0.794 (9.227)
SG													NA NA
SKR													

*Figures in brackets are t-values.
- Computations based on data from [57]
- N.A. data not available.

Table B.16

'R^2' and Durbin-Watson (DW) Statistics for Regression Relationships Among Changes in Average Monthly Wholesale Prices of Rice (Basmati) in Various Primary Agricultural Markets of Pakistan from January 1955 to June 1979.*

	1	2	3	4	5	6	7	8	9	10	11	12	13
	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	ST	SG	SKR
FD		0.603 (2.19)	0.585 (2.41)	0.522 (2.54)	0.653 (2.17)	0.604 (2.33)	NA NA	0.495 (2.66)	0.524 (2.39)	0.601 (2.295)	0.603 (2.23)	NA NA	0.582 (2.478)
GA			0.549 (2.23)	0.527 (2.395)	0.715 (2.07)	0.627 (2.115)	NA NA	0.502 (2.375)	0.517 (2.291)	0.585 (2.23)	0.853 (2.15)	NA NA	0.525 (2.19)
HD				0.721 (2.17)	0.623 (2.21)	0.554 (2.35)	NA NA	0.509 (2.42)	0.512 (2.379)	0.603 (2.215)	0.601 (2.294)	NA NA	0. 03 (2.31)
KCI					0.699 (1.69)	0.605 (1.45)	NA NA	0.521 (1.375)	0.681 (1.45)	0.585 (1.521)	0.655 (1.437)	NA NA	0.649 (1.397)
LR						0.657 (2.19)	NA NA	0.553 (2.32)	0.634 (2.25)	0.652 (2.211)	0.715 (2.185)	NA NA	0.605 (2.355)
MN							NA NA	0.524 (2.41)	0.611 (2.335)	0.685 (2.192)	0.621 (2.275)	NA NA	0.595 (2.385)
OK								NA NA	NA NA	NA NA	NA NA	NA NA	NA NA
PR									0.715 (2.21)	0.595 (2.315)	0.577 (2.277)	NA NA	0.535 (2.413)
RPI										0.617 (2.291)	0.635 (2.295)	NA NA	0.573 (2.435)
SL											0.629 (2.273)	NA NA	0.603 (2.355)
ST												NA	0.584 (2.372)
SG													NA
SKR													

* Figures in brackets are Durbin-Watson statistics.
- Computation based on data taken from [57]

TABLE B.19

REGRESSION ESTIMATES OF THE INTERCEPT TERM FOR THE RELATIONSHIP AMONG RATES OF CHANGE IN (REAL) MONTHLY AVERAGE WHOLESALE PRICES OF WHEAT IN VARIOUS AGRICULTURAL MARKETS IN PAKISTAN FROM JANUARY 1955 TO JUNE 1979*

	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
FD		0.071	0.134	0.102	0.064	0.085	0.083	0.096	0.104	0.094	0.101	0.114	NA
GA			0.123	0.115	0.062	0.069	0.072	0.095	0.083	0.073	0.084	0.073	NA
HD				0.065	0.072	0.073	0.079	0.085	0.094	0.096	0.074	0.075	NA
KCI					0.064	0.069	0.081	0.103	0.095	0.091	0.087	0.084	NA
LR						0.035	0.042	0.073	0.102	0.053	0.061	0.055	NA
MN							0.059	0.113	0.121	0.056	0.084	0.076	NA
OK								0.123	0.092	0.007	0.089	0.09	NA
PR									0.073	0.129	0.131	0.133	NA
RPI										0.094	0.112	0.103	NA
SL											0.079	0.083	NA
SG												0.087	NA
ST													
SKR													

* t-values for all of these Intercept Terms were much less than the critical t-value at 5% level of significance.

NA : data not available

TABLE B.20

REGRESSION ESTIMATES OF THE COEFFICIENT γ_1 FOR THE RELATIONSHIP AMONG RATES OF CHANGE IN (REAL) MONTHLY AVERAGE WHOLESALE PRICES OF WHEAT IN VARIOUS AGRICULTURAL MARKETS IN PAKISTAN FROM JANUARY 1955 TO JUNE 1979 *

	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
FD		0.846	1.136	0.801	0.901	0.884	0.832	0.585	0.685	0.891	0.821	0.785	NA
		(16.81)	(15.20)	(14.73)	(23.68)	(18.24)	(15.79)	(9.21)	(11.78)	(18.23)	(16.14)	(14.62)	NA
GA			1.099	0.785	0.892	0.782	0.767	0.592	0.692	0.772	0.783	0.864	NA
			(13.21)	(12.94)	(21.60)	(14.81)	(13.76)	(10.33)	(12.39)	(15.04)	(15.92)	(16.39)	NA
HD				0.719	0.635	0.629	0.628	0.563	0.576	0.631	0.566	0.621	NA
				(15.26)	(11.24)	(11.03)	(10.89)	(8.78)	(8.90)	(11.33)	(8.21)	(9.30)	NA
KCI					0.816	0.796	0.764	0.596	0.681	0.791	0.677	0.695	NA
					(15.29)	(14.37)	(13.76)	(9.73)	(11.21)	(14.32)	(12.38)	(12.41)	NA
LR						0.851	0.831	0.591	0.763	0.845	0.798	0.806	NA
						(16.87)	(15.90)	(10.27)	(13.33)	(16.68)	(13.83)	(14.10)	NA
MN							0.835	0.586	0.673	0.886	0.745	0.724	NA
							(15.38)	(9.25)	(12.25)	(16.34)	(13.37)	(12.89)	NA
OK								0.592	0.653	0.941	0.745	0.731	NA
								(9.81)	(11.21)	(21.55)	(14.32)	(13.54)	NA
PR									0.723	0.587	0.579	0.582	NA
									(13.01)	(9.17)	(9.00)	(8.79)	NA
RPI										0.633	0.612	0.619	NA
										(11.41)	(12.75)	(12.00)	NA
SL											0.702	0.711	NA
											(14.21)	(13.98)	NA
SG												0.781	NA
												(14.30)	NA
ST													NA
SKR													

* Values in parenthesis are t-values

NA : data not available for these markets

SOURCE: COMPUTATIONS BASED ON DATA FROM [57]

TABLE B.21

R^2 FOR THE REGRESSION RELATIONSHIPS AMONG RATES OF CHANGE IN (REAL) MONTHLY AVERAGE WHOLESALE PRICES OF WHEAT IN VARIOUS AGRICULTURAL MARKETS IN PAKISTAN FROM JANUARY 1955 TO JUNE 1979 *

	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
FD		0.657	0.605	0.629	0.708	0.709	0.705	0.525	0.605	0.696	0.685	0.682	NA
GA			0.598	0.642	0.765	0.678	0.683	0.590	0.602	0.669	0.672	0.722	NA
HD				0.688	0.629	0.618	0.615	0.582	0.609	0.622	0.610	0.613	NA
KCI					0.637	0.625	0.621	0.600	0.618	0.622	0.619	0.616	NA
LR						0.720	0.687	0.542	0.637	0.691	0.680	0.710	NA
MN							0.653	0.502	0.598	0.650	0.634	0.620	NA
OK								0.514	0.587	0.850	0.656	0.613	NA
PR									0.609	0.533	0.561	0.500	NA
RPI										0.591	0.534	0.544	NA
SL											0.652	0.649	NA
SG												0.602	NA
ST													
SKR													

* Since all the values of DW statistics were observed to be close to 2.0, we did not think it necessary to report here the specific figures.

SOURCE: COMPUTATIONS BASED ON DATA FROM [57].

TABLE B.22

ESTIMATE OF THE INTERCEPT TERM FOR THE REGRESSION RELATIONSHIP AMONG RATES OF CHANGE IN (REAL) MONTHLY AVERAGE WHOLESALE PRICES OF GRAM IN VARIOUS AGRICULTURAL MARKETS IN PAKISTAN FROM JANUARY 1955 TO JUNE 1979*

	FD	GA	HD	KCI	LR	MN	OK	PR	PRI	SL	SG	ST	SKR
FD		0.198	-0.201	0.198	-0.144	-0.187	0.158	-0.268	0.180	0.152	0.156	0.198	0.259
GA			0.167	0.205	0.141	0.195	0.205	-0.232	0.204	0.202	0.260	0.175	0.265
HD				0.185	0.214	0.179	0.192	0.232	0.253	0.205	0.185	0.205	0.218
KCI					-0.182	-0.172	-0.209	-0.288	-0.203	-0.230	-0.217	-0.225	-0.209
LR						0.108	0.140	-0.205	0.185	0.158	0.203	0.206	0.215
MN							0.105	-0.215	0.189	0.121	0.195	0.221	0.230
OK								-0.252	0.207	0.106	0.204	0.210	0.216
PR									0.186	0.251	0.209	0.207	0.221
RPI										0.189	0.197	0.174	0.219
SL											0.161	0.182	0.191
SG												0.126	0.195
ST													0.221
SKR													

* The values of t-statistics for all the Intercept Terms here were much less than the critical values of t at 5% level of significance. Hence for all the cases H_0: $f_0 = 0$ is accepted.

SOURCE: COMPUTATIONS BASED ON DATA FROM [57].

TABLE B.23

REGRESSION ESTIMATES OF THE COEFFICIENT γ_1 FOR THE RELATIONSHIP AMONG RATES OF CHANGE IN (REAL) MONTHLY AVERAGE WHOLESALE PRICES OF GRAM IN VARIOUS AGRICULTURAL MARKETS IN PAKISTAN FROM JANUARY 1955 TO JUNE 1979 *

	FD	GA	HD	CKI	LR	MN	OK	PR	PRI	SL	SG	ST	SKR
FD		0.823	0.908	0.734	1.108	1.114	0.745	1.191	0.722	0.769	1.144	0.754	0.703
		(18.75)	(13.31)	(22.15)	(33.29)	(38.57)	(19.53)	(11.67)	(22.51)	(27.61)	(38.66)	(27.35)	(14.32)
GA			0.865	0.726	0.912	0.805	0.818	1.223	0.710	0.778	0.813	0.795	0.698
			(16.27)	(21.45)	(23.25)	(21.03)	(24.24)	(12.26)	(16.21)	(17.94)	(18.31)	(18.55)	(14.27)
HD				0.756	0.633	0.614	0.595	0.735	0.567	0.613	0.639	0.561	0.788
				(24.29)	(17.68)	(16.71)	(14.43)	(10.64)	(15.52)	(16.14)	(16.00)	(14.95)	(22.25)
KCI					1.073	1.080	1.091	1.203	1.165	1.101	1.087	0.093	0.110
					(21.38)	(19.39)	(22.00)	(11.77)	(17.29)	(18.47)	(14.33)	(16.39)	(16.71)
LR						0.841	0.829	1.156	0.841	0.814	0.758	0.723	0.749
						(31.37)	(20.90)	(12.25)	(30.01)	(20.16)	(22.19)	(21.66)	(18.22)
MN							0.810	1.192	0.820	0.828	0.840	0.813	0.716
							(18.25)	(12.00)	(25.26)	(35.95)	(22.63)	(28.25)	(21.99)
OK								1.165	0.811	0.934	0.788	0.726	0.765
								(11.16)	(22.57)	(26.75)	(19.25)	(18.79)	(14.20)
PR									0.657	0.598	0.583	0.577	0.596
									(16.76)	(12.25)	(11.39)	(10.16)	(9.77)
RPI										0.785	0.792	0.795	0.720
										(25.19)	(22.15)	(22.36)	(13.81)
SL											0.897	0.755	0.705
											(25.10)	(19.06)	(15.30)
SG												0.803	0.705
												(32.15)	(13.15)
ST													0.739
													(14.00)
SKR													

* The figures in parentheses are t-values.

SOURCE: COMPUTATIONS BASED ON DATA FROM [57].

TABLE B.24

R^2 FOR REGRESSION RELATIONSHIP AMONG RATES OF CHANGE IN (REAL) MONTHLY AVERAGE WHOLESALE PRICES OF GRAIN IN VARIOUS AGRICULTURAL MARKETS IN PAKISTAN FROM JANUARY 1955 TO JUNE 1979 *

	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
FD		0.702	0.587	0.725	0.805	0.856	0.732	0.630	0.725	0.750	0.781	0.785	0.682
GA			0.649	0.701	0.713	0.663	0.753	0.592	0.649	0.701	0.654	0.720	0.630
HD				0.769	0.672	0.655	0.587	0.589	0.611	0.715	0.650	0.641	0.752
KCI					0.753	0.760	0.758	0.604	0.704	0.769	0.669	0.702	0.705
LR						0.768	0.764	0.615	0.738	0.770	0.742	0.735	0.643
MN							0.723	0.619	0.768	0.789	0.712	0.735	0.693
OK								0.594	0.706	0.623	0.735	0.729	0.635
PR									0.672	0.620	0.619	0.615	0.583
RPI										0.725	0.708	0.714	0.630
SL											0.786	0.720	0.625
SG												0.755	0.629
ST													0.607
SKR													

* Since all of the DW statistics here were close to 2.0, we did not think it necessary to report here the specific figures.

TABLE B.25

INTERCEPT TERM FOR THE REGRESSION RELATIONSHIP AMONG RATES OF CHANGE IN (REAL) MONTHLY AVERAGE WHOLESALE PRICES OF RICE IN VARIOUS AGRICULTURAL MARKETS IN PAKISTAN FROM JANUARY 1955 TO JUNE 1979 *•

	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
FD		0.216	0.273	0.250	0.150	0.123	NA	0.255	0.245	0.184	NA	0.161	0.213
		(1.62)	(2.21)	(2.32)	(1.26)	(1.45)	NA	(1.92)	(1.58)	(1.205)	NA	(1.652)	(2.20)
GA			0.176	0.188	0.135	0.153	NA	0.169	0.136	0.162	NA	0.122	0.183
			(1.68)	(2.26)	(1.43)	(1.68)	NA	(1.92)	(1.72)	(1.57)	NA	(0.92)	(2.62)
HD				0.158	0.195	0.122	NA	0.184	0.174	0.157	NA	0.191	0.157
				(1.55)	(1.91)	(1.76)	NA	(2.12)	(1.82)	(1.76)	NA	(2.05)	(1.38)
KCI					-0.232	-0.228	NA	-0.193	-0.241	-0.216	NA	-0.217	-0.238
					(2.73)	(2.33)	NA	(2.69)	(2.95)	(2.26)	NA	(2.68)	(2.28)
LR						0.150	NA	0.225	0.206	0.153	NA	-0.121	-0.171
						(1.39)	NA	(1.90)	(1.68)	(1.42)	NA	(1.16)	(1.89)
MN								0.292	0.205	0.175	NA	-0.107	-0.141
								(1.92)	(1.73)	(1.15)	NA	(1.72)	(1.94)
OK								NA	NA	NA	NA	NA	NA
PR									0.215	-0.125	NA	-0.181	-0.211
									(1.41)	(1.84)	NA	(1.96)	(2.33)
RPI										-0.108	NA	-0.112	0.213
										(1.82)	NA	(1.97)	(2.36)
SL											NA	-0.05	-0.171
											NA	(1.08)	(1.97)
SG												NA	NA
ST													0.194
													(1.97)
SKR													

*• Figures in parentheses are t-values.

NA : Data not available.

SOURCE: COMPUTATIONS BASED ON DATA FROM [57].

TABLE B.26

REGRESSION COEFFICIENT γ_1 FOR THE RELATIONSHIP AMONG RATES OF CHANGE IN (REAL) MONTHLY AVERAGE WHOLESALE PRICES OF RICE (BASMATI) IN VARIOUS AGRICULTURAL MARKETS IN PAKISTAN FROM JANUARY 1955 TO JUNE 1979 *

	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
FD		0.708 (8.12)	0.599 (7.04)	0.615 (7.60)	0.803 (18.21)	0.786 (16.26)	NA NA	0.559 (5.25)	0.595 (8.60)	0.789 (18.10)	NA NA	0.710 (13.27)	0.606 (8.16)
GA			0.601 (7.98)	0.618 (8.35)	0.815 (16.08)	0.710 (13.11)	NA NA	0.502 (6.10)	0.586 (7.60)	0.630 (8.98)	NA NA	0.894 (17.26)	0.633 (8.08)
HD				0.765 (8.73)	0.602 (7.06)	0.601 (6.53)	NA NA	0.534 (5.23)	0.584 (7.05)	0.605 (7.33)	NA NA	0.622 (8.59)	0.725 (9.51)
KCI					1.156 (8.17)	1.185 (7.56)	NA NA	1.167 (5.60)	0.751 (7.05)	1.160 (7.25)	NA NA	1.265 (7.20)	1.182 (8.04)
LR						0.760 (11.50)	NA NA	0.596 (7.26)	0.645 (8.32)	0.810 (15.76)	NA NA	1.089 (10.29)	1.125 (7.35)
MN							NA NA	0.537 (6.25)	0.624 (7.76)	0.809 (12.98)	NA NA	1.090 (9.73)	1.115 (7.05)
OK								NA NA	NA NA	NA NA	NA NA	NA NA	NA NA
PR									0.765 (9.28)	1.103 (7.00)	NA NA	1.232 (6155)	1.144 (6.15)
RPI										1.142 (10.24)	NA NA	1.213 (7.46)	1.180 (7.56)
SL											NA NA	1.105 (9.70)	1.125 (8.85)
SG												NA NA	NA NA
ST													0.685 (8.27)
SKR													

* Values in parentheses are t-values.

NA : Data not available

SOURCE: COMPUTATIONS BASED ON DATA FROM [57].

TABLE B 27

R^2 FOR THE REGRESSION RELATION AMONG RATES OF CHANGE IN (REAL) MONTHLY AVERAGE WHOLESALE PRICES OF RICE (BASMATI) IN VARIOUS AGRICULTURAL MARKETS IN PAKISTAN FROM JANUARY 1955 TO JUNE 1979 *

	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
FD		0.552	0.505	0.516	0.596	0.534	NA	0.434	0.489	0.565	NA	0.579	0.516
GA			0.502	0.496	0.635	0.576	NA	0.452	0.496	0.554	NA	0.732	0.478
HD				0.650	0.572	0.504	NA	0.472	0.475	0.536	NA	0.520	0.586
KCI					0.602	0.556	NA	0.480	0.582	0.525	NA	0.569	0.534
LR						0.605	NA	0.501	0.586	0.610	NA	0.632	0.530
MN							NA	0.467	0.525	0.622	NA	0.575	0.517
OK								NA	NA	NA	NA	NA	NA
PR									0.615	0.507	NA	0.498	0.468
RPI										0.528	NA	0.535	0.496
SL											NA	0.530	0.500
SG												NA	NA
ST													0.487
SKR													

* The values taken by the DW statistics in all the cases here were around 2.0; we therefore did not think it necessary to report them here.

NA : Data not available

Table B.28

The Estimates of F-Statistics to Test the Hypothesis that $\gamma_1 = 1$ for Average Wholesale (Real) Prices of Wheat in Major Agricultural Markets in Pakistan, from January 1955 to June 1979.*

#	Markets	FD	CA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
1.	FD		0.767	1.392	0.378	0.141	0.652	0.433	4.066	0.238	0.395	1.952	0.266	NA
2.	CA			0.162	0.375	0.123	1.126	1.352	3.01	1.435	0.932	0.445	0.407	"
3.	HD				0.653	1.985	4.513	4.621	5.256	5.667	3.91	8.106	3.360	"
4.	KCI					1.322	1.116	0.954	7.657	3.956	1.554	3.340	3.251	"
5.	LR						0.533	1.540	0.725	2.353	1.854	2.242	3.489	"
6.	MN							2.073	5.941	1.456	2.162	2.525	1.517	"
7.	OK								2.689	1.652	2.556	6.333	3.724	"
8.	PR									4.235	5.64	6.039	3.915	"
9.	RPI										3.129	3.597	4.178	"
10.	SL											3.115	3.516	"
11.	SG												1.754	"
12.	ST													"
13.	SKR													

Source: Computations based on data [57]

*** F .05 = 3.84 i.e. Accept HO: $\gamma_1 = 1$ when F < 3.84**

Table B.29

The Estimates of F-Statistics to Test The Hypothesis that $\gamma_1 = 1$ for Average Wholesale (Real) Prices of Basmati Rice in Major Agricultural Markets in Pakistan, from January 1955 to June 1979.*

#	Markets	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
1.	FD		5.07	24.81	38.56	26.17	24.82	NA	52.07	61.43	45.58	NA	21.09	12.25
2.	GA			42.25	39.51	3.45	27.29	"	71,53	59.34	45.08	"	0.96	31.36
3.	HD				10.38	38.21	9.17	"	28.90	30.73	12.75	"	35.06	3.78
4.	KCI					25.81	39.24	"	53.25	34.24	42.25	"	17.46	32.08
5.	LR						26.30	"	220.02	82.12	9.73	"	20.41	77.45
6.	MN							"	183.04	134.07	3.81	"	20.21	10.41
7.	OK								NA	NA	NA	"	NA	NA
8.	PR									24.75	56.43	"	55.21	47.95
9.	RPI										14.33	"	26.15	23.70
10.	SL											"	11.26	30.38
11.	SG												NA	NA
12.	ST													62.05
13.	SKR													

Source: Computations based on data [57]

* $F_{.05} = 3.84$ (critical value of F)
Accept HO: $\gamma_1 = 1$ when $F < 3.84$

Table B.30

The Estimates of F-Statistics to Test the Hypothesis that $\gamma_1 = 1$ For Average Wholesale (Real) Prices of <u>Gram</u> in Major Agricultural Markets in Pakistan, from January 1955 to June 1979*.

#	Markets	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
1.	FD		0.225	20.95	19.63	3.72	3.09	3.78	52.20	2.79	0.613	3.55	1.24	8.65
2.	GA			42.70	15.26	1.31	3.65	3.81	168.07	7.72	3.786	3.115	3.80	17.99
3.	HD				3.80	17.12	35.44	27.91	28.75	23.29	16.38	15.96	23.12	3.97
4.	KCI					3.82	17.29	21.30	50.06	24.93	3.26	10.17	16.52	3.78
5.	LR						0.198	3.54	43.94	3.41	3.52	3.77	2.78	15.75
6.	MN							0.817	29.12	3.69	2.84	3.79	3.76	11.25
7.	OK								19.16	13.06	1.72	3.44	3.61	13.25
8.	PR									14.27	10.08	17.98	15.76	8.11
9.	RPI										3.65	3.78	3.29	7.65
10.	SL											3.80	2.42	7.90
11.	SG												1.025	19.25
12.	ST													10.77
13.	SKR													

Source: Computations based on data [57]

* Critical value of F at 5% level of significance = 3.84.

Accept HO: $\gamma_1 = 1$ when $F < 3.84$.

Table B.31

The Estimates of F-Statistics to Test the Hypothesis that $\gamma_1 = 1$ for <u>Changes in Average Wholesale</u> (Real Prices of <u>Wheat</u> in Major Agricultural Markets in Pakistan from January 1955 to June 1979*.

#	Markets	FD	CA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
1.	FD		3.68	26.77	17.45	3.31	11.25	18.97	51.84	27.90	3.80	27.20	24.06	NA
2.	CA			34.70	18.09	3.80	11.12	22.16	39.04	18.79	16.20	12.65	3.75	"
3.	HD				8.72	17.21	19.09	24.17	51.08	18.10	15.44	26.55	25.12	"
4.	KCI					11.25	16.40	24.77	37.50	15.88	20.04	17.18	23.12	"
5.	LR						3.77	5.35	42.50	24.76	12.45	22.70	10.15	"
6.	MN							3.80	48.04	20.55	3.74	19.11	10.50	"
7.	OK								28.77	37.20	1.42	12.85	11.50	"
8.	PR									25.66	50.43	45.40	53.03	"
9.	RPI										12.60	24.76	17.51	"
10.	SL											15.57	14.33	"
11.	SG												5.59	"
12.	ST													"
13.	SKR													

Source: Computations based on data [57]

* $F_{.05} = 3.84$, i.e. accept HO: $\gamma_1 = 1$ where $F < 3.84$

Table B.32

The Estimates of F-Statistics to Test the Hypothesis that $\gamma_1 = 1$ For Changes in Average Wholesale (Real) Prices of (Basmati) Rice in Major Agricultural Markets in Pakistan, from January 1955 to June 1979.*

#	Markets	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
1.	FD		11.08	17.50	10.63	3.76	9.87	NA	16.95	18.11	5.12	NA	16.53	26.08
2.	GA			18.59	28.09	7.84	17.01	"	21.30	27.62	24.10	"	3.07	19.73
3.	HD				17.43	12.08	18.25	"	10.36	19.78	25.62	"	16.10	6.81
4.	KCI					5.51	4.53	"	7.56	5.76	7.73	"	17.17	6.32
5.	LR						8.32	"	12.72	13.58	3.30	"	3.57	5.75
6.	MN							"	16.81	15.65	6.08	"	5.80	5.69
7.	OK								NA	NA	NA	"	NA	NA
8.	PR									6.71	5.12	"	19.65	15.81
9.	RPI										5.06	"	14.55	7.29
10.	SL											"	4.47	4.34
11.	SC												NA	NA
12.	ST													6.48
13.	SKR													

Source: Computations based on data [57]

* $F_{.05} = 3.84$ i.e. Accept HO: $\gamma_1 = 1$ where $F < 3.84$

Table B. 33

The Estimates of F-Statistics to Test the Hypothesis that $\gamma_1 = 1$ for Changes in Average Wholesale (Real) Prices of Gram in Major Agricultural Markets in Pakistan, From January 1955 to June 1979.

#	Markets	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
1.	FD		3.74	2.02	10.05	0.230	0.191	10.15	11.44	0.37	3.56	3.29	3.76	24.38
2.	GA			17.51	10.48	2.85	3.79	5.71	8.41	14.59	15.66	8.67	11.00	34.05
3.	HD				3.80	14.71	8.50	27.18	10.86	50.08	51.66	64.89	60.12	3.81
4.	KCI					4.22	3.80	5.12	8.66	8.87	5.44	8.30	6.21	5.78
5.	LR						3.68	4.87	7.59	15.65	15.40	18.22	21.06	17.33
6.	MN							4.70	12.07	14.60	8.61	3.61	8.20	32.80
7.	OK								17.58	18.40	3.72	20.70	15.65	39.03
8.	PR									19.95	35.60	38.44	24.30	24.56
9.	RPI										3.04	3.81	5.14	17.64
10.	SL											1.45	10.65	23.50
11.	SG												14.54	23.50
12.	ST													24.96
13.	SKR													

Source: Computations based on Data [57]

* $F_{.05} = 3.84$, i.e. Accept HO: $\gamma_1 = 1$ where $F < 3.84$

Table B.34

Root Mean Square Error (RMSE)[1] in Average Wholesale Prices of Wheat in Major Primary Agricultural Markets of Pakistan From January 1955 to June 1979.

	1	2	3	4	5	6	7	8	9	10	11	12	13
	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	ST	SG	SKR
FD		1.85	3.45	.67	1.71	2.21	2.19	3.57	2.78	2.13	2.07	1.65	NA
GA			3.17	4.31	1.12	2.13	2.51	3.31	2.19	2.24	1.58	1.77	NA
HD				.29	2.51	3.13	3.44	3.49	2.85	3.59	3.72	3.51	NA
KCI					3.95	3.75	3.99	4.75	3.16	5.77	5.22	5.17	NA
LR						1.79	2.15	3.17	2.94	2.73	2.03	2.03	NA
MN							1.52	3.28	2.88	1.75	2.15	2.02	NA
OK								4.22	3.05	1.15	2.29	1.78	NA
PR									3.23	4.08	3.81	3.57	NA
RPI										2.72	3.02	2.69	NA
SL											2.37	2.01	NA
ST												2.07	NA
SG													NA
SKR													NA

[1] Computations based on data from [57]

Table B.35

(RMSE)[1] in Average Wholesale Prices of Gram in Major Primary Agricultural Markets of Pakistan from January 1955 to June 1979.

	1	2	3	4	5	6	7	8	9	10	11	12	13
	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	ST	SG	SKR
FD		3.88	4.25	4.37	1.83	3.35	3.25	5.56	2.25	2.12	1.75	1.63	4.52
GA			4.39	5.12	3.53	3.97	3.68	4.89	4.05	3.88	2.75	2.69	3.85
HD				3.99	5.34	4.79	4.68	5.81	4.78	5.09	5.02	4.73	3.22
KCI					5.19	5.27	5.26	7.23	5.31	5.09	5.37	5.37	4.85
LR						2.12	3.78	5.49	1.65	2.15	2.09	1.89	4.73
MN							3.12	5.87	1.77	2.23	2.25	1.80	4.58
OK								5.08	3.85	3.87	3.73	3.89	4.53
PR									3.79	3.81	4.42	3.74	4.08
RPI										2.29	1.83	1.83	3.65
SL											2.20	2.64	4.18
ST												2.45	4.95
SG													3.52
SKR													

[1] Computation based on data from [57]

TABLE B.36

Root Mean Square Error for Average Wholesale Prices of Rice (Fine Quality) in Various Primary Agricultural Markets of Pakistan from January 1955 to June 1979.

	FD	CA	HD	KCI	LR	MN	OK	PR	RPI	SL	ST	SG	SKR
FD		8.95	15.00	42.77	9.32	5.92	NA	18.28	15.30	8.18	10.10	NA	10.20
CA			16.73	46.95	13.04	10.90	"	30.14	19.92	10.39	7.14	"	13.47
HD				33.68	13.60	14.97	"	15.17	9.69	14.03	19.63	"	12.61
KCI					37.92	41.63	"	30.12	31.32	40.09	48.83	"	39.97
LR						10.20	"	15.49	12.12	10.95	14.97	"	10.91
MN							"	18.16	14.93	8.49	12.53	"	11.18
OK								NA	NA	NA	NA	"	NA
PR									9.32	18.14	24.90	"	16.82
RPI										14.24	21.40	"	13.80
SL											12.69	"	12.17
ST												"	15.43
SG													NA
SKR													

Source: Computation based on data from [57]

N.A.: Data not available

Table B.37

Minimum Average Transportation and Other Costs on Transfer Shipment of One Maund (82-1/2 lbs) of Wheat from One Market to the Other for Various Agricultural Markets in Pakistan from 1955- 1979.*

(Rupees per Maund)

Markets	FD	CA	HD	KCI	LR	MN	OK	PR	RPI	SL	SC	ST	SKR
FD		3.57	4.84	5.22	3.25	3.75	3.12	3.97	3.74	3.25	2.22	3.48	4.37
CA			5.12	5.87	2.42	4.17	3.25	3.62	3.50	3.50	3.62	2.37	4.95
HD				3.06	4.97	3.87	4.50	5.88	5.67	4.37	5.12	4.86	3.02
KCI					4.82	3.67	4.65	6.04	5.80	4.42	5.06	5.42	4.02
LR						3.45	2.87	3.75	3.62	3.40	3.62	2.87	3.97
MN							3.25	5.00	4.65	3.52	4.12	4.67	3.67
OK								4.42	4.12	1.87	3.62	3.62	3.95
PR									3.37	4.40	4.05	3.82	5.10
RPI										5.06	4.08	3.63	4.92
SL											3.50	3.75	4.06
SC												3.77	4.98
ST													4.36
SKR													

* See footnote to this table on page 250.

Table B.38

Minimum Average Transportation and Other Costs on Transfer of One Maund (82-1/2 lbs.) of Rice From one Market to Another, for Various Agricultural Markets in Pakistan, 1955-56 to 1978-79.*

(Rupees per Maund)

	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
FD		4.86	6.44	7.02	4.75	5.25	4.62	5.47	5.25	4.75	3.62	5.12	5.87
GA			6.62	7.15	3.62	5.87	4.75	5.12	5.00	5.00	5.12	3.87	6.45
HD				4.56	5.47	5.37	5.00	7.12	7.07	5.82	6.48	6.56	4.87
KCI					6.62	5.37	5.25	7.75	7.56	6.12	6.60	6.82	4.62
LR						5.15	4.37	5.25	6.12	4.60	4.82	3.97	5.47
MN							4.15	6.32	6.15	4.12	4.82	5.37	4.87
OK								5.92	5.62	2.97	4.12	5.12	5.62
PR									4.17	6.00	5.15	5.17	6.55
RPI										5.15	5.62	5.13	6.62
SL											5.00	5.25	5.69
SC												5.37	6.36
SKR													6.00

* See footnote to Tables B.37 and B. 38 on the following page.

Estimates of transportation costs and handling charges for different years are shown in Tables B.39 and B.40. The figures in Table B 37 and B. 38 were then obtained as:

$$ATOC_{ijt} = \frac{[\Sigma TC_{ijt} + \Sigma HC_{ijt}]}{n}$$

where $ATOC_{ijt}$ = average transportation and other handling costs between i^{th} and j^{th} market in year t; TC_{ij} = Transportation Cost (by road) between i^{th} and j^{th} market at year t; and HC_{ijt} = Handling Charges between i^{th} and j^{th} market at year t.

We calculated such values only for wheat and rice. For gram, the portion of handling charges (in total costs) should be higher than wheat figures by a proportion by which its average prices for the whole period is greater than the average wheat prices. This is so because marketing charges like 'Commission' and 'Brokerage' are charged accroding to the value, and average prices of gram were generally somewhat higher than wheat prices. However, since the difference between the two kinds of prices was not very large, we did not compute the transportation costs data for gram separately. The estimates in Table B.37 for wheat can be approximated for gram as well, without much difficulty.

Table B.39

Average Transportation Rates on Transfer of Agricultural Produce by Road in Pakistan as Charged by Truck Companies.*

Year \ Distance in kilometers (Km)	Rates per Tonne per Kilometer (in Rupees)					
	Up to 80Km (Flat rate per Truck containing 10 tonnes)	81 to 160	161-240	241-400	401-625	625+
1955	52.0	0.05	0.04	0.03	0.03	0.03
1956	53.0	0.06	0.05	0.04	0.03	0.03
1957	56.0	0.06	0.05	0.04	0.03	0.03
1958	58.0	0.06	0.05	0.04	0.04	0.03
1959	60.0	0.07	0.06	0.05	0.04	0.03
1960	64.0	0.07	0.06	0.05	0.04	0.04
1961	67.0	0.07	0.06	0.06	0.05	0.04
1962	68.0	0.07	0.06	0.06	0.05	0.04
1963	70.0	0.08	0.07	0.06	0.05	0.04
1964	72.0	0.08	0.08	0.07	0.06	0.05
1965	74.0	0.09	0.08	0.08	0.07	0.05
1966	76.0	0.09	0.09	0.08	0.07	0.06
1967	82.0	0.10	0.09	0.09	0.08	0.07
1958	95.0	0.10	0.10	0.09	0.09	0.07
1969	96.0	0.12	0.11	0.10	0.09	0.08
1970	100.0	0.12	0.12	0.11	0.10	0.09
1971	108.0	0.13	0.12	0.11	0.10	0.09
1972	115.0	0.14	0.13	0.12	0.11	0.10
1973	120.0	0.14	0.13	0.12	0.11	0.10
1974	134.0	0.16	0.14	0.14	0.12	0.11
1975	169.0	0.16	0.15	0.15	0.13	0.11
1976	181.0	0.18	0.16	0.15	0.13	0.12
1977	194.0	0.18	0.17	0.15	0.14	0.13
1978	215.0	0.20	0.20	0.19	0.18	0.15
1979	253.0	0.25	0.24	0.23	0.21	0.19
1980	292.0	0.31	0.29	0.27	0.25	0.22

* The rates for 1965 to 1980 were based on the data kindly made available by three trucking companies: (1) Central Goods Transport Company, Ravi Road Lahore; (2) All Pakistan Goods Forwarding Agency (Regd.) Paris Road, Sialkot; and (3) Shakargarh Lahore Goods Transport Company, Noorkot Shakargarh, District Sialkot. For the remaining years wholesale price indexes were used to calculate these rates.

Table B.40

Maximum Average Handling Costs on Transferring one[1] Maund (82½ lbs) of Different Commodities from One Market to the Other, Based on Selected Years Data.1

Components of Cost	WHEAT		(BASMATI) RICE		GRAM	
	Amount in Rupees	Percentage of Total Handling Costs	Amount in Rupees	Percentage of Total Handling Costs	Amount in Rupees	Percentage of Total Handling Costs
1. Cleaning	0.10	5.29	0.13	3.53	0.12	5.33
2. Packaging	0.25	13.23	0.31	8.42	0.25	11.11
3. Weightment	0.06	3.17	0.06	1.63	0.06	2.66
4. Loading	0.10	5.29	0.10	2.72	0.10	4.44
5. On the way Losses	0.10	5.29	0.28	7.61	0.12	5.33
6. 'Octroi' duty	0.15	7.43	0.37	10.08	0.25	11.11
7. Unloading	0.10	5.29	0.10	2.72	0.10	4.44
8. Cartage*	0.12	6.35	0.12	3.26	0.12	5.33
9. Commission* while buying	0.33	17.46	0.96	26.09	0.42	18.66
10. Commission of* a selling agent	0.33	17.46	0.96	26.09	0.42	18.66
11. Market Fee	0.05	2.74	0.05	1.35	0.05	2.22
12. Storage*	0.10	5.29	0.12	3.26	0.12	5.33
13. Miscellaneous labour costs	0.10	5.29	0.12	3.26	0.12	5.33
14. Total	1.89	100	3.68	100	2.25	100

[1]For Wheat our estimates are based on Mohammad [53] and Rashid [79], for Gram Sattar [81]and Siddiqui [84] and for Rice (Basmati), Javid [35] and Qureshi [74]. Appendix C was also used for different components.

* In some cases one or more of these costs may be avoided by a trader depending on the nature of transportation and physical location of a market. In a market where trucks can unload into its premises, cartage may not be necessary. Similarly, commission of a buying agent can be avoided if a trader buys directly and does not hire the services of an agent. Therefore the total costs shown here are the 'maximum average' over the period 1955-56 to 1978-79.

Table B.41

Decomposition of Theils Inequality Proportions into Bias Proportion (Um), Variance Proportion (Us) and Covariance Proportion (Uc) for Average Wholesale Prices of Wheat in Major Agricultural Markets in Pakistan from January 1955 to June 1979.*

Serial No.	Market Pair (1)	Um (2)	Us (3)	Uc (4)
1	FD-KCI	0.143	0.004	0.853
2	FD-SKR	0.1204	0.098	0.7816
3	GA-KCI	0.112	0.091	0.797
4	HD-KCI	0.09	0.080	0.830
5	HD-MN	0.126	0.009	0.865
6	HD-OK	0.115	0.001	0.884
7	HD-SG	0.09	0.000	0.910
8	KCI-LR	0.117	0.082	0.801
9	KCI-MN	0.158	0.084	0.758
10	KCI-OK	0.102	0.092	0.746
11	KCI-RPI	0.116	0.064	0.820
12	KCI-SL	0.175	0.075	0.75
13	KCI-SG	0.165	0.035	0.800
14	KCI-ST	0.146	0.076	0.784
15	MN-PR	0.102	0.023	0.875
16	OK-PR	0.097	0.024	0.879
17	PR-SL	0.075	0.016	0.909
18	PR-SG	0.117	0.00	0.883
19	RPI-SG	0.054	0.00	0.946

* For all other cases both (Um) and (Us) were less than 0.05 and (Uc) was > 0.90.

Source: Computations based on data from [57]

Table 3.42

Decomposition of Theils Inequality Coefficient into Bias Proportion (Um), Variance Proportion (Us) and Covariance Proportion (Uc) for Average Wholesale Price of Rice (Basmati) in Major Agricultural Markets in Pakistan, January 1955 to June 1979.*

Sl # (1)	Market Pair (2)	Um (3)	Us (4)	Uc (5)	Sl # (1)	Market Pair (2)	Um (3)	Us (4)	Uc (5)
1	FD-CA	0.180	0.043	0.777	27	KCI-LR	0.88	0.022	0.098
2	" -HD	0.572	0.116	0.312	28	" MN	0.862	0.043	0.095
3	" -KCI	0.833	0.046	0.121	29	" -PR	0.799	0.000	0.201
4	" -LR	0.138	0.150	0.712	30	" -RPI	0.818	0.006	0.176
5	" -PR	0.437	0.263	0.300	31	" -SL	0.848	0.048	0.104
6	" -RPI	0.487	0.194	0.319	32	" -ST	0.879	0.054	0.067
7	" -SA	0.068	0.001	0.931	33	" -SKR	0.883	0.012	0.105
8	" -ST	0.45	0.045	0.505	34	LR -MN	0.091	0.093	0.816
9	" -SKR	0.02	0.222	0.776	35	" -PR	0.312	0.138	0.560
10	GA-HD	0.457	0.173	0.370	36	" -RP	0.361	0.066	0.573
11	" -KCI	0.831	0.055	0.114	37	" -SL	0.012	0.092	0.896
12	" -LR	0.309	0.176	0.515	38	" -ST	0.464	0.147	0.389
13	" -MN	0.144	0.047	0.809	39	MN-PR	0.418	0.239	0.343
14	" -PR	0.388	0.139	0.473	40	" -RPI	0.477	0.176	0.347
15	" -RPI	0.529	0.186	0.285	41	" -ST	0.325	0.045	0.630
16	" -SL	0.324	0.044	0.635	42	" -SKR	0.008	0.147	0.845
17	" -ST	0.157	0.016	0.827	43	PR-SL	0.301	0.249	0.450
18	" -SKR	0.149	0.243	0.608	44	" -ST	0.573	0.215	0.212
19	HD-KCI	0.785	0.014	0.201	45	" -SKR	0.403	0.074	0.523
20	" -LR	0.091	0.014	0.895	46	RPI-SL	0.361	0.203	0.436
21	" -MN	0.227	0.094	0.679	47	" -ST	0.666	0.172	0.162
22	" -PR	0.093	0.076	0.831	48	" -SK	0.453	0.020	0.527
23	" -RPI	0.106	0.028	0.866	49	SL -ST	0.491	0.037	0.472
24	" -SL	0.147	0.116	0.737	50	" -SKR	0.002	0.135	0.863
25	" -ST	0.53	0.135	0.335	51	ST -SKR	0.282	0.202	0.516
26	HD-SKR	0.232	0.006	0.762					

* For all other case Bias, and Variance Proportions were less than 0.05 and the Covariance Proportion was 0.90 or more.

Source: Computations based on data from [57].

Table B.43

Decomposition of Theils Inequality Proportion into Bias (Um) Variance (Us) and Covariance (Uc) Proportions, for Average Wholesale Prices of Gram in Major Agricultural Markets in Pakistan from January 1955 to June 1979*

Serial No.	Market Pair (1)	Um (2)	Us (3)	Uc (4)
1	FD-KCI	0.071	0.069	0.860
2	FD-PR	0.023	0.366	0.612
3	GA-OK	0.059	0.004	0.937
4	GA-PR	0.034	0.239	0.727
5	HD-KCI	0.043	0.071	0.886
6	HD-OK	0.052	0.008	0.940
7	HD-PR	0.043	0.374	0.583
8	HD-SG	0.056	0.048	0.896
9	KCI-LR	0.037	0.089	0.871
10	KCI-MN	0.104	0.131	0.765
11	KCI-OK	0.131	0.078	0.791
12	KCI-PR	0.065	0.312	0.623
13	KCI-RPI	0.065	0.135	0.800
14	KCI-SL	0.103	0.065	0.832
15	KCI-SG	0.121	0.143	0.749
16	KCI-ST	0.065	0.051	0.884
17	KCI-SKR	0.095	0.045	0.860
18	LR-MN	0.144	0.019	0.837
19	LR-OK	0.074	0.000	0.926
20	LR-PR	0.050	0.307	0.643
21	LR-SG	0.113	0.028	0.859
22	MN-PR	0.001	0.191	0.808
23	OK-PR	0.000	0.304	0.636
24	PR-RPI	0.017	0.304	0.679
25	PR-SL	0.002	0.324	0.674
26	PR-SG	0.000	0.289	0.711
27	PR-ST	0.011	0.407	0.582
28	PR-SK	0.003	0.245	0.754
29	RPL-SKR	0.005	0.124	0.871

* For all other cases both (Um) and (Us) were less than .05 and (Uc) was more than 0.90.

Source: Computations based on data from [57]

Table B.44

Gross Off-seasonal Rise in Average Wholesale Prices of Gram as a Percentage of Harvest Price in Different Agricultural Markets in Pakistan. 1955-56 - 1978-79.

Year	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
1955-56	36.75	35.55	45.70	51.15	33.95	37.80	35.10	30.22	31.80	32.56	37.44	38.78	41.12
56-57	21.35	19.37	17.95	23.76	25.87	25.25	23.54	30.20	21.87	22.32	22.91	20.67	20.51
57-58	18.78	10.20	20.78	13.02	16.02	17.36	13.87	31.60	13.16	18.56	22.71	20.50	20.29
58-59	5.05	12.00	3.05	24.50	3.00	8.50	8.25	-2.00	4.05	0.75	7.53	4.38	2.50
59-60	15.18	14.22	17.10	15.62	17.12	16.70	15.88	17.60	15.25	15.56	12.98	12.05	13.82
60-61	15.55	16.05	10.29	14.50	14.38	14.54	13.28	13.16	13.05	16.55	17.29	15.65	15.18
61-62	17.65	19.41	19.72	16.10	17.55	18.95	18.06	25.95	19.82	16.45	19.20	18.75	18.31
62-63	3.75	8.50	5.10	4.25	8.66	5.78	1.75	6.00	2.60	2.10	1.80	4.88	1.65
63-64	6.80	17.10	1.25	5.10	2.65	0.50	22.65	21.05	18.15	4.00	9.35	10.00	4.10
64-65	18.50	20.95	14.10	14.45	17.35	16.15	18.32	15.80	16.30	16.60	16.50	17.15	14.80
65-66	21.40	11.62	9.75	13.50	13.75	15.30	10.60	12.56	14.60	14.60	13.45	20.37	13.85
66-67	21.80	28.56	11.53	11.32	20.25	13.40	15.81	16.37	22.10	12.70	9.95	14.88	16.40
67-68	7.50	12.85	11.05	9.60	7.50	8.00	9.80	3.96	3.60	8.90	8.50	7.50	-6.75
68-69	10.50	10.05	8.78	9.05	9.70	10.80	10.25	11.10	8.01	7.04	5.95	8.80	7.90
69-70	10.10	7.15	5.80	8.15	11.18	10.38	10.60	12.32	11.30	9.40	-10.50	10.45	8.10
70-71	8.20	9.60	4.80	1.60	4.05	0.90	1.35	6.00	2.80	1.95	0.80	-0.70	2.80
71-72	19.05	14.75	19.90	19.85	20.42	17.95	29.50	21.60	21.82	21.25	18.52	20.62	19.98
72-73	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
73-74	"	"	"	"	"	"	"	"	"	"	"	"	"
74-75	21.82	23.60	21.20	26.18	19.67	20.05	18.90	19.60	22.10	21.28	24.05	22.10	19.18
75-76	1.10	-2.00	3.50	-4.15	3.50	4.10	3.20	24.87	2.06	2.20	4.71	2.66	1.95
76-77	33.18	40.42	25.37	33.75	34.60	35.25	37.40	21.60	23.25	32.30	35.60	35.16	28.70
77-78	-75.90	78.60	60.20	63.70	77.67	80.50	80.90	41.60	51.40	80.75	8.192	83.99	73.90
78-79	-0.50	-3.12	3.05	1.45	1.15	1.07	2.80	2.10	1.05	2.05	-0.75	-0.18	1.92
AVE	18.72	19.70	18.11	16.95	18.02	19.11	20.15	17.05	16.80	19.85	19.68	19.01	18.67

N.A.: Data not available
AVE: Average

Source: Price data from [57]

Table B.43

Gross Off-seasonal Rise in Average Wholesale Price of Wheat as Percentage of Harvest Price in Different Primary Agricultural Markets in Pakistan, 1955-56 - 1978-79.

Year	FBD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR	AV
1955-56	34.60	35.86	18.49	10.55	25.81	33.94	34.14	22.93	25.81	34.04	32.53	34.44	NA	27.01
56-57	27.19	11.05	23.52	8.75	20.37	18.72	16.95	6.48	8.57	22.95	19.07	17.52	"	16.42
57-58	14.85	12.17	15.22	12.45	18.38	26.14	12.06	22.03	18.24	16.38	13.16	13.69	"	16.34
58-59	5.39	2.07	3.75	-4.05	-2.19	0.87	2.65	2.97	1.32	2.96	0.54	2.65	"	1.59
59-60	18.80	17.39	17.54	18.38	19.53	16.55	20.06	21.57	18.33	19.98	18.72	20.22	"	18.92
60-61	15.56	16.55	13.13	12.82	15.27	20.22	8.98	10.33	12.28	10.25	11.71	15.80	"	
61-62	7.30	8.02	6.52	13.32	8.97	7.24	9.76	7.37	17.23	10.49	7.79	6.35	"	13.58
62-63	10.75	11.10	13.95	9.45	10.67	8.02	9.64	5.92	1.44	9.71	7.28	10.42	"	10.34
63-64	19.40	14.80	14.06	13.81	18.18	19.34	21.30	13.20	15.81	21.77	16.10	13.08	"	16.74
64-65	16.52	12.47	12.04	9.17	14.39	9.62	15.23	17.50	9.71	16.95	19.00	19.19	"	14.32
65-66	12.50	13.24	10.75	10.96	12.81	8.66	9.94	11.53	12.96	8.04	10.17	8.97	"	10.88
66-67	72.58	66.67	46.53	39.77	63.91	70.33	69.59	46.73	39.91	65.54	70.14	68.17	"	59.99
67-68	8.60	7.85	6.65	5.36	6.35	5.14	5.96	5.86	5.87	6.19	7.99	5.16	"	6.12
68-69	7.06	7.42	7.27	6.76	6.60	8.89	6.98	6.09	7.76	4.99	6.80	7.34	"	7.00
69-70	9.44	11.53	12.36	12.10	8.04	11.46	8.03	9.91	10.10	9.57	10.53	11.08	"	10.34
70-71	8.31	9.36	9.57	8.97	11.29	12.28	9.14	10.57	8.29	9.37	8.80	8.15	"	8.84
71-72	12.48	15.03	8.30	7.20	9.03	9.48	6.03	2.33	7.25	10.58	8.13	9.14	"	8.81
72-73	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	"	NA
73-74	"	"	"	"	"	"	"	"	"	"	"	"	"	"
74-75	18.53	31.21	27.62	25.14	21.35	17.55	14.89	29.35	19.94	25.50	28.69	28.10	"	26.00
75-76	-2.51	-4.1	-3.31	-4.18	-3.66	-0.51	-0.67	-2.79	-1.92	-0.39	-4.91	2.89	"	-2.40
76-77	11.33	8.30	8.19	5.14	7.78	10.41	9.81	8.50	7.77	9.61	12.16	8.90	"	8.99
77-78	22.24	21.34	15.09	14.19	15.04	15.71	16.71	13.61	13.19	18.93	20.02	21.51	"	16.13
78-79	6.14	8.12	7.59	10.29	6.61	6.39	4.23	10.73	6.39	6.48	6.51	6.14	"	7.14
AV	17.82	15.10	13.40	11.98	14.62	15.29	14.33	12.93	11.62	17.51	17.01	17.35		

N.A. : Data not available
AV : Average

Source: [57]

Table B-46

Gross Off-seasonal Rise in Average Wholesale Prices of Rice (Basmati) as a Percentage of Harvest Price in Different Agricultural Markets in Pakistan. 1955-56 - 1978-79.

Year	FD	CA	HD	KCT	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
1955-56	17.57	10.25	16.60	14.68	14.02	8.60	NA	2.95	11.35	7.30	NA	10.30	12.50
56-57	20.50	21.10	21.75	16.45	18.45	25.32	"	25.30	18.30	21.98	NA	17.80	27.12
57-58	8.10	23.95	7.40	12.40	7.35	6.40	"	4.25	14.50	9.08	"	17.65	11.50
58-59	33.10	34.20	25.25	57.60	27.25	73.50	"	35.41	39.20	35.25	"	30.19	22.62
59-60	5.42	15.02	61.49	5.02	8.25	25.00	"	41.30	28.60	15.78	"	5.50	13.10
60-61	40.35	15.85	11.05	-23.85	47.12	34.65	"	39.91	19.71	38.55	"	31.10	45.12
61-62	37.49	16.90	19.88	39.47	11.50	-3.05	"	8.77	10.55	6.45	"	6.75	7.50
62-63	7.25	4.90	-0.95	2.60	9.37	6.69	"	24.97	10.05	10.60	"	10.06	0.35
63-64	22.34	13.62	22.14	32.75	14.42	23.83	"	19.59	20.46	21.05	"	15.19	17.05
64-65	8.10	6.15	1.20	6.60	11.40	12.02	"	5.05	7.50	5.08	"	-0.34	5.05
65-66	7.82	1.15	0.70	2.60	5.29	6.62	"	-3.35	1.60	6.63	"	5.13	5.76
66-67	44.55	42.95	55.90	41.88	42.05	32.60	"	25.13	29.75	29.19	"	31.12	28.32
67-68	22.42	19.05	24.10	24.15	18.62	30.98	"	26.87	21.10	24.75	"	19.10	20.10
68-69	4.50	5.60	3.60	10.20	15.10	4.40	"	-1.02	8.40	4.80	"	4.10	1.20
69-70	29.27	28.20	20.54	21.50	21.15	19.89	"	24.34	20.40	28.40	"	26.40	26.20
70-71	2.85	4.30	2.26	8.85	-0.65	0.55	"	-4.05	0.80	5.05	"	4.00	2.16
71-72	8.75	6.38	8.38	10.29	6.91	7.69	"	5.85	9.79	6.25	"	7.69	10.10
72-73	NA	NA	NA	NA	NA	NA	"	NA	NA	NA	"	NA	NA
73-74	"	"	"	"	"	"	"	"	"	"	"	"	"
74-75	18.94	28.01	19.91	16.50	17.70	16.41	"	19.25	16.60	17.56	"	17.30	17.00
75-76	16.65	18.16	17.06	17.09	19.62	17.55	"	23.25	18.75	16.31	"	16.35	18.39
76-77	21.38	13.00	17.10	27.44	13.53	12.20	"	19.75	29.67	24.30	"	21.20	20.15
77-78	24.26	19.29	19.90	20.39	23.50	19.95	"	19.30	17.80	22.94	"	20.91	18.56
78-79	10.08	6.00	7.15	11.83	19.10	15.00	"	8.63	5.90	8.00	"	6.50	9.75
AV.	18.70	18.23	17.75	16.19	16.55	16.12		19.02	16.75	17.02		16.11	18.32

N.A. : Data not available

AV. : Average

Source: Price data from [57]

Data on storage cost from Table

Table B.47

Average monthly storage costs on one maund (82¼ lb) of different commodities in Pakistan. 1955-56 to 1978-79.

Year	Wheat	Gram	Rice
1955-56	0.20	0.22	0.38
56-57	0.22	0.24	0.39
57-58	0.25	0.26	0.39
58-59	0.24	0.28	0.41
59-60	0.25	0.29	0.40
60-61	0.26	0.29	0.42
61-62	0.27	0.30	0.46
62-63	0.29	0.31	0.46
63-64	0.30	0.33	0.46
64-65	0.31	0.32	0.45
65-66	0.33	0.34	0.48
66-67	0.36	0.36	0.49
67-68	0.37	0.37	0.51
68-69	0.38	0.40	0.57
69-70	0.37	0.41	0.60
70-71	0.39	0.42	0.61
71-72	0.40	0.43	0.62
72-73	NA	NA	NA
73-74	NA	NA	NA
74-75	0.68	0.72	0.95
75-76	0.72	0.75	1.08
76-77	0.80	0.85	1.15
77-78	0.84	0.99	1.25
78-79	0.89	1.02	1.41

Source: Storage costs data are calculated by using more than one source. Major sources used are: Mohammad [53] Pakistan [65] Sattar [81] Siddiqi [84] and Appendix C.

Table B.48

Net Off-seasonal Rise in Average Wholesale Prices of Wheat as a Percentage of Harvest Price in Different Agricultural Markets in Pakistan. 1955-56 – 1978-79

Year	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
1955-56	18.11	18.62	4.21	-5.20	7.85	15.39	18.49	5.52	9.45	18.11	15.32	17.00	NA
56-57	11.25	-2.15	9.05	-5.55	5.33	3.17	1.84	-6.35	-3.20	5.23	3.70	2.44	"
57-58	-0.20	-1.55	2.11	-2.87	2.40	8.31	-1.85	6.80	4.15	1.78	1.05	0.85	"
58-59	-6.31	-8.12	-7.20	-10.08	-9.75	-9.07	-11.93	-11.61	-10.75	-12.21	-10.31	-0.01	"
59-60	5.51	3.65	3.75	2.86	5.85	2.16	5.65	5.94	3.97	4.40	3.98	4.95	"
60-61	2.82	2.85	0.71	-1.21	2.30	6.02	-3.98	-4.02	-1.58	-3.32	-1.86	2.25	"
61-62	-6.28	-4.76	-5.77	0.20	-3.86	-5.12	-3.71	-4.55	3.25	-3.78	-5.15	7.17	"
62-63	-0.75	-1.28	1.26	4.25	-2.85	-3.84	-2.42	-5.70	-12.25	-3.96	-5.86	-3.75	"
63-64	5.28	1.23	1.83	0.75	5.33	5.14	8.14	-0.28	1.35	5.90	2.65	-0.20	"
64-65	3.14	0.58	-1.06	3.90	2.42	-3.96	2.26	3.77	-4.76	2.95	4.77	5.05	"
65-66	-1.88	1.04	-3.31	-2.41	-0.61	-3.76	-2.45	-1.95	-1.04	-5.76	-2.83	-3.56	"
66-67	58.25	53.28	34.51	28.61	48.39	57.03	55.49	35.65	28.11	60.20	55.66	54.05	"
67-68	-5.24	-6.03	-5.24	-6.35	-5.98	-7.01	-7.49	-5.34	-7.85	-7.30	-6.90	-8.11	"
68-69	-6.03	-6.12	-5.11	-5.20	-6.80	-5.87	-5.95	-7.02	-4.89	-7.05	-5.94	-6.25	"
69-70	-3.27	-1.23	-1.33	-0.70	-3.75	-1.54	-4.21	-3.76	-3.21	-2.90	-1.65	-1.56	"
70-71	-4.12	-3.81	-4.26	-3.75	-1.75	-0.32	-2.90	-2.23	-4.07	-3.11	-3.90	-4.50	"
71-72	1.72	2.88	0.27	1.83	3.05	3.75	2.10	4.00	0.40	0.66	1.88	0.90	"
72-73	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	"
73-74	"	"	"	"	"	"	"	"	"	"	"	"	"
74-75	3.94	15.06	12.95	1w.24	7.13	3.64	-0.66	12.56	4.74	10.08	12.21	12.06	"
75-76	-15.07	-17.25	-15.30	-13.20	-16.35	-13.01	-14.73	-16.25	-15.86	-14.51	-12.65	-13.60	"
76-77	-2.95	-4.95	-5.25	-8.45	-5.27	-3.87	-4.56	-5.63	-7.11	-4.35	-4.30	-5.54	"
77-78	6.81	7.01	1.11	0.42	1.54	0.88	2.07	-1.27	-0.50	3.98	6.12	5.70	"
78-79	-6.76	-5.12	-6.05	-3.02	-5.56	-6.13	-8.95	-3.25	-6.06	6.12	5.36	-7.25	"
AV	2.76	1.63	0.66	-0.40	1.58	1.72	1.10	0.30	0.21	1.82	2.01	2.25	
t-values	1.12	1.06	0.89	-0.52	1.27	1.22	0.99	0.62	0.53	1.31	1.24	1.05	

N.A. : Data not available.
AV : Average
Source: Estimates based on price data from [57] and Table B.47 for the storage cost.

Table B.49

Net Off-seasonal Rise in Average Wholesale Price of Gram as a Percentage of Harvest Price in Different Agricultural Markots of Pakistan. 1955-56 - 1978-79.

Year	FD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
1955-56	20.70	19.35	29.90	35.14	18.59	22.20	19.10	14.21	15.85	16.76	21.27	32.94	25.51
56-57	6.28	4.31	2.91	8.71	10.70	10.18	8.34	15.08	6.76	7.18	7.76	5.45	5.31
57-58	3.08	-4.42	6.02	-1.81	1.06	2.56	-1.00	16.64	-1.55	3.87	7.95	5.66	5.48
58-59	-9.50	-2.50	-11.60	10.04	-11.50	-6.00	-6.25	-16.10	-10.45	-13.78	-7.03	-10.22	-12.00
59-60	1.14	0.18	2.98	1.57	3.05	2.65	1.87	3.64	1.21	1.54	-1.05	-2.05	0.22
60-61	1.64	2.08	-3.55	0.60	0.51	0.60	-0.55	-0.66	-0.85	2.62	3.41	1.85	1.22
61-62	4.19	5.81	6.09	2.56	4.05	5.50	4.04	12.39	6.23	2.92	5.66	5.21	5.25
62-63	-9.50	-5.25	-8.28	-8.75	-4.60	-7.33	-11.40	-7.20	-10.50	-11.05	-11.89	-8.22	-11.50
63-64	-6.05	4.23	-10.69	-7.85	-10.21	-12.65	9.12	6.12	5.25	-8.98	-3.50	-2.95	-8.75
64-65	5.85	8.41	1.50	1.69	4.82	3.55	5.81	3.21	3.75	3.97	3.94	4.58	2.27
65-66	9.15	5.51	-0.63	-2.50	1.06	1.25	3.05	-1.69	0.28	2.27	1.15	8.05	1.65
66-67	9.74	16.51	-0.51	-0.67	8.20	1.37	3.76	4.32	10.01	0.65	-2.77	2.85	4.25
67-68	-4.42	0.87	-1.03	-2.55	-4.66	-4.01	-2.13	-8.14	-8.51	3.14	-3.85	-4.60	-5.75
68-69	-1.62	-2.50	-3.78	-3.12	-2.63	-1.25	-1.87	-1.05	-4.21	-5.50	-6.50	-3.50	-4.50
69-70	-2.52	-5.50	-6.95	-4.50	-1.50	-2.20	-1.89	-0.29	-1.25	-3.35	-2.06	-2.10	-4.59
70-71	-4.75	-3.32	-8.32	-11.25	-8.99	-12.20	-11.66	-7.29	-10.08	-11.05	-12.28	-13.66	-10.33
71-72	6.12	1.89	6.87	6.91	7.52	4.94	16.46	8.66	8.92	8.23	5.52	7.58	6.96
72-73	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
73-74	"	"	"	"	"	"	"	"	"	"	"	"	"
74-75	7.52	9.95	7.20	12.25	5.77	6.01	4.94	5.67	8.24	7.35	10.09	8.11	5.25
75-76	-12.98	-16.12	-10.66	-18.45	-10.64	-10.65	11.20	-10.75	-12.42	-12.03	-10.05	-12.06	-12.86
76-77	18.15	25.28	10.25	18.70	19.50	20.11	22.33	6.50	8.18	17.14	20.55	20.09	13.54
77-78	60.70	62.95	54.67	58.41	62.62	65.25	65.38	25.90	46.21	65.50	66.50	68.72	58.70
78-79	-15.62	-18.51	-12.20	-13.76	-14.00	14.08	-12.37	-13.25	-14.09	-12.96	-16.04	-15.43	-13.17
AV	4.09	4.97	4.11	3.98	4.04	4.85	4.79	3.78	3.81	4.98	5.03	5.11	4.56
t-values	1.573	1.724	1.362	1.292	1.325	1.592	1.486	1.053	1.151	1.784	1.924	1.874	1.655

N.A. : Data not available

Source: Price date from [57] and Table B.47 for the storage costs.

Table B.50

Net Off-seasonal Rise in Average Wholesale Prices of Rice (Basmati) as a Percentage of Harvest Price in Different Agricultural Markets in Pakistan. 1955-56 - 1978-79.

Year	FD	CA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
1955-56	2.18	-5.22	1.16	-0.61	-1.51	-7.00	NA	-12.54	-4.90	-8.25	NA	-5.25	-2.94
56-57	5.48	6.08	6.70	1.11	3.43	10.37	"	10.20	3.22	6.98	"	2.84	12.06
57-58	-6.65	9.65	-7.53	-2.09	-7.20	-8.11	"	-10.20	0.20	-5.40	"	3.19	-2.98
58-59	19.02	20.28	11.29	43.43	13.17	59.20	"	21.34	25.11	21.18	"	16.16	8.67
59-60	-8.67	1.05	47.55	-9.07	-5.70	11.00	"	-21.20	14.65	1.77	"	-8.60	-0.80
60-61	26.50	1.95	-2.83	-37.81	33.20	20.70	"	26.09	5.81	34.60	"	17.19	31.16
61-62	23.67	3.15	6.13	25.72	-12.25	-16.80	"	-4.98	-3.21	-7.30	"	-7.00	-6.25
62-63	-6.30	-8.87	-14.30	-11.00	-4.23	-6.91	"	11.38	-3.55	-3.00	"	-3.55	-13.25
63-64	8.84	0.12	8.53	19.11	0.89	10.34	"	6.08	6.95	8.51	"	1.68	3.53
64-65	-5.25	-7.13	-12.00	-7.70	-1.78	-1.18	"	-8.05	05.66	-8.08	"	-13.44	-8.05
65-66	-5.83	-11.67	-12.05	-10.15	-7.46	-6.13	"	-15.42	-11.21	-6.12	"	-7.62	-6.99
66-67	32.04	30.45	33.40	28.87	29.12	20.12	"	12.63	17.25	26.69	"	18.62	25.81
67-68	10.17	6.75	11.73	11.78	6.52	18.89	"	14.82	8.95	12.51	"	6.80	7.89
68-69	-7.58	-6.52	-8.51	-1.90	2.99	-7.65	"	-13.02	-3.71	-7.31	"	-7.19	-10.85
69-70	16.87	25.84	18.29	9.25	8.98	7.81	"	12.14	18.21	16.25	"	14.26	13.99
70-71	-9.65	-8.03	-11.14	-3.55	-12.99	-11.87	"	-16.37	-11.50	-7.33	"	-8.41	-10.24
71-72	-3.75	-6.14	-4.12	-2.21	-5.59	-4.81	"	-6.65	-2.71	-6.25	"	-4.81	-2.41
72-73	NA	NA	NA	NA	NA	NA	"	NA	NA	NA	"	NA	NA
73-74	"	"	"	"	"	"	"	"	"	"	"	"	"
74-75	4.79	13.67	5.66	2.25	3.45	2.16	"	5.00	2.35	3.31	"	3.05	2.75
75-76	2.15	3.66	2.56	2.58	5.12	3.05	"	8.75	4.25	1.81	"	1.85	3.79
76-77	7.13	-1.44	3.85	13.29	-0.72	-2.05	"	5.50	15.42	10.05	"	6.95	5.90
77-78	10.26	5.04	5.85	6.36	9.48	5.92	"	5.26	3.71	8.91	"	6.89	4.53
78-79	-3.81	-7.98	-6.82	-2.11	5.15	1.02	"	-5.25	-8.05	-5.98	"	-7.47	-3.25
AV	4.98	3.66	4.37	3.85	4.22	4.29		3.86	3.92	4.85		4.02	4.22
t-value	1.795	1.21	1.533	1.325	1.692	1.587		1.289	1.335	1.925		1.541	1.463

N.A.: Data not available

Source: Price data from [57].

Storage costs data from Table B.47

Table B.51

Coefficient of Variation of Off-seasonal Average Wholesale Price of Wheat in Different Primary Agricultural Markets of Pakistan. 1955 - 56 to 1978-79.

Markets / Year	FDB	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	ST	SG	SKR
1955-56	0.1570	0.202	0.137	0.141	0.130	0.214	0.189	0.333	0.151	0.185	0.155	0.181	NA
56-57	0.2570	0.210	0.217	0.194	0.219	0.276	0.291	0.202	0.140	0.267	0.155	0.270	"
57-58	0.0479	0.051	0.051	0.053	0.068	0.086	0.076	0.122	0.052	0.078	0.118	0.069	"
58-59	0.1034	0.148	0.097	0.096	0.151	0.092	0.087	0.146	0.103	0.130	0.134	0.153	"
59-60	0.0980	0.109	0.061	0.0517	0.091	0.064	0.079	0.123	0.076	0.067	0.105	0.125	"
60-61	0.0475	0.053	0.048	0.067	0.064	0.074	0.074	0.031	0.081	0.057	0.073	0.067	"
61-62	0.0152	0.024	0.053	0.066	0.055	0.0154	0.024	0.020	0.057	0.033	0.017	0.013	"
62-63	0.0510	0.051	0.063	0.038	0.053	0.063	0.068	0.069	0.061	0.056	0.085	0.073	"
63-64	0.0731	0.079	0.067	0.092	0.079	0.079	0.087	0.077	0.075	0.067	0.081	0.077	"
64-65	0.0399	0.067	0.051	0.74	0.042	0.040	0.38	0.044	0.053	0.059	0.054	0.061	"
65-66	0.0392	0.061	0.037	0.50	0.39	0.042	0.39	0.050	0.049	0.040	0.098	0.068	"
66-67	0.0502	0.065	0.041	0.047	0.038	0.049	0.050	0.048	0.063	0.031	0.039	0.030	"
67-68	0.0510	0.061	0.038	0.055	0.043	0.052	0.061	0.081	0.051	0.076	0.057	0.052	"
68-69	0.0539	0.058	0.057	0.067	0.059	0.059	0.053	0.035	0.0483	0.120	0.057	0.045	"
69-70	0.0660	0.054	0.074	0.069	0.034	0.062	0.043	0.086	0.0584	0.039	0.062	0.062	"
70-71	0.0399	0.059	0.047	0.052	0.078	0.048	0.054	0.067	0.0472	0.058	0.088	0.055	"
71-72	0.0381	0.060	0.018	0.043	0.057	0.054	0.029	0.078	0.0398	0.034	0.058	0.051	"
72-73	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	"
73-74	"	"	"	"	"	"	"	"	"	"	"	"	"
74-75	0.056	0.085	0.092	0.096	0.078	0.094	0.092	0.098	0.071	0.096	0.093	0.092	"
75-76	0.0329	0.0381	0.031	0.039	0.068	0.019	0.024	0.073	0.0531	0.028	0.029	0.034	"
76-77	0.054	0.052	0.05	0.032	0.054	0.058	0.061	0.057	0.481	0.045	0.070	0.053	"
77-78	0.085	0.089	0.105	0.078	0.083	0.091	0.093	0.113	0.095	0.094	0.087	0.114	"
78-79	0.0581	0.056	0.047	0.068	0.042	0.038	0.076	0.0731	0.058	0.067	0.054	0.050	"

Source: Price data from [57]

Table B.52

Coefficient of Variation in Off-seasonal Average Wholesale Prices of Rice (Basmati) in Different Primary Agricultural Markets of Pakistan. 1955-56 - 1978-79.

Year	FBD	GA	HD	KCI	LR	MN	OK	PR	RPI	SL	SG	ST	SKR
1955-56	0.0617	0.0515	0.0583	0.0512	0.0311	0.0388	NA	0.0359	0.0307	0.0318	NA	0.0356	0.0317
56-57	0.0485	0.0712	0.0614	0.0501	0.0284	0.0[illegible]1	"	0.0865	0.02750	0.0682	"	0.0541	0.0278
57-58	0.0510	0.0704	0.1423	0.0098	0.0558	0.0604	"	0.0855	0.0468	0.1360	"	0.0701	0.1384
58-59	0.1177	0.0555	0.0714	0.1535	0.0753	0.0790	"	0.1238	0.0987	0.1059	"	0.0679	0.0715
59-60	0.0390	0.0343	0.0263	0.0104	0.0314	0.0687	"	0.1799	0,0157	0.0477	"	0.0413	0.0373
60-61	0.0506	0.0430	0.0652	0.0352	0.0739	0.0321	"	0,0801	0,0352	0.0860	"	0.0753	0.0303
61-62	0,0245	0.0050	0.0804	0.0195	0.0536	0.0215	"	0.0299	0.0312	0.0366	"	0.0361	0.0196
62-63	0.0517	0.0071	0.0788	0,0198	0.0294	0.0341	"	0.0174	0.0306	0.0291	"	0.0314	0.1539
63-64	0.0358	0.0386	0.0278	0.2208	0.0532	0.0344	"	0.0617	0.044	0.0188	"	0.0923	0.0849
64-65	0.0964	0.0567	0.0403	0.0707	0.0555	0.0791	"	0.0194	0.0795	0.0603	"	0.0329	0.034
65-66	0.0833	0.0316	0.0398	0.0461	0.0158	0.0272	"	0.0351	0.0315	0.0437	"	0.0227	0.0565
66-67	0.0871	0.0527	0.0864	0.0889	0.1202	0.0813	"	0.0[illegible]78	0.0633	0.0770	"	0.1052	0.1224
67-68	0.0987	0.0525	0.0605	0.1069	0.0153	0.1609	"	0.1959	0.0495	0.1116	"	0.0826	0.0995
68-69	0.0414	0.0139	0.1550	0.1381	0.1907	0.1739	"	0.1798	0.0525	0.0704	"	0.0174	0.0280
69-70	0.0895	0.0955	0.1155	0.1476	0.0464	0.1003	"	0.1210	0.0491	0.1306	"	0.0726	0.0871
70-71	0.0870	0,0534	0.1273	0.0904	0.1634	0.214	"	0.1177	0.0671	0.0246	"	0.0710	0.0524
71-72	0.0596	0.1545	0.0338	0.0529	0.0196	0.0404	"	0.2033	0.0301	0.0463	"	0.0429	0.1362
72-73	NA	NA	NA	NA	NA	NA	"	NA	NA	NA	"	NA	NA
73-74	"	"	"	"	"	"	"	"	"	"	"	"	"
74-75	0.0356	0.0848	0.0268	0.0383	0.0634	0.0191	"	0.0432	0.0405	0.0376	"	0.0476	0.0551
75-76	0.0112	0.0925	0.0198	0.0216	0.0554	0.0665	"	0.0658	0.0215	0.0942	"	0.0260	0.1530
76-77	0.0368	0.0827	0.0343	0.0891	0.0276	0.0215	"	0.0953	0.0715	0.0358	"	0.0757	0.0285
77-78	0,0851	0.1340	0.0732	0.0233	0.1043	0.0835	"	0.0372	0.0515	0.1528	"	0.1301	0.0971
78-79	0.0577	0.0731	0.0626	0.0603	0.0838	0.0623	"	0.0950	0.0287	0.0787	"	0.0873	0.0939

NA: Data not available

Source: Data from [57]

Table B.53

Coefficient of Variation in Off-seasional Average Wholesale Prices of Gram in Different Primary Agricultural Markets of Pakistan. 1955-56 - 1978-79

Year	FD	GA	HD	KL	LR	MN	OK	PR	SL	ST	SG	SKR	RPI
1955-56	0.0318	0.0727	0.0582	0.0624	0.0668	0.0672	0.0324	0.0685	0.0768	0.0265	0.0766	0.0601	0.0658
56-57	0.1957	0.1477	0.1419	0.1543	0.1830	0.2011	0.1856	0.1791	0.2083	0.1951	0.2118	0.1239	0.1529
57-58	0.0685	0.0873	0.0645	0.0639	0.0790	0.0832	0.0741	0.0793	0.0713	0.0747	0.0783	0.0878	0.0741
58-59	0.1109	0.1460	0.0846	0.0717	0.1078	0.0878	0.1166	0.0855	0.0848	0.09	0.0852	0.1358	0.0898
59-60	0.1555	0.0732	0.1385	0.1207	0.1337	0.1376	0.2744	0.1457	0.1581	0.1445	0.1448	0.0721	0.1337
60-61	0.0821	0.0591	0.0611	0.0779	0.0802	0.0785	0.0718	0.0809	0.0763	0.0806	0.0688	0.0611	0.0812
61-62	0.0726	0.0692	0.0214	0.0494	0.0505	0.0725	0.0565	0.0840	0.0425	0.0836	0.0623	0.0294	0.0616
62-63	0.0401	0.0566	0.0531	0.0376	0.0399	0.0491	0.0429	0.0348	0.0451	0.0321	0.047	0.0533	0.0533
63-64	0.0816	0.1011	0.0681	0.0647	0.0746	0.1012	0.0853	0.0889	0.0667	0.0618	0.0867	0.0982	0.801
64-65	0.1137	0.1166	0.0862	0.0561	0.1008	0.0844	0.0828	0.0998	0.0914	0.0975	0.1082	0.1176	0.0908
65-66	0.0950	0.1131	0.0916	0.0961	0.0963	0.0909	0.0724	0.1002	0.0873	0.1010	0.1070	0.1120	0.0865
66-67	0.0875	0.1163	0.0902	0.0877	0.0856	0.0902	0.084	0.0925	0.0911	0.1105	0.1097	0.1151	0.0754
67-68	0.0542	0.0772	0.0556	0.0677	0.0625	0.0532	0.0702	0.0559	0.0557	0.0551	0.0597	0.0872	0.0575
68-69	0.0599	0.0528	0.0586	0.0573	0.0719	0.0696	0.0614	0.0475	0.0655	0.0842	0.0650	0.585	0.0639
69-70	0.0621	0.0743	0.0815	0.0498	0.0395	0.0700	0.0612	0.0629	0.0454	0.0633	0.0472	0.0763	0.0895
70-71	0.0687	0.0844	0.0905	0.560	0.0714	0.0678	0.0606	0.0525	0.084	0.0625	0.0413	0.0842	0.0688
71-72	0.0556	0.0753	0.0821	0.0513	0.605	0.0593	0.0517	0.0541	0.0720	0.0576	0.0430	0.0756	0.0692
72-73	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
73-74	"	"	"	"	"	"	"	"	"	"	"	"	"
74-75	0.1947	0.1406	0.1179	0.1176	0.1416	0.1411	0.0859	0.1374	0.1278	0.1579	0.1481	0.1159	0.1311
75-76	0.0913	0.1136	0.0571	0.0862	0.0860	0.1021	0.0645	0.0827	0.0857	0.1000	0.0990	0.0872	0.0805
76-77	0.1797	0.1655	0.1351	0.1272	0.1594	0.1813	0.1834	0.1787	0.1531	0.1555	0.1093	0.1522	0.1432
77-78	0.1912	0.1926	0.1742	0.2014	0.1937	0.1904	0.051	0.1995	0.2151	0.1994	0.1975	0.1762	0.1857
78-79	0.0896	0.0589	0.0862	0.1082	0.0894	0.0783	0.0629	0.0677	0.0776	0.0826	0.0980	0.0671	0.0804

NA: Data not available

Source: Data from [57]

Appendix C

Mean and Standard Deviations of Average Monthly Wholesale Prices of Selected Agricultural Commodities in Selected Agricultural Markets in Pakistan, from January 1955 to June 1979.

MARKET	MEAN			STANDARD DEVIATION		
	Wheat	Gram	(Basmati) Rice	Wheat	Gram	(Basmati) Rice
1. Faisalabad	22.46	28.50	58.53	12.01	25.78	37.04
2. Gujranwala	22.63	28.65	54.74	11.65	25.25	35.58
3. Hyderabad	22.93	28.82	67.17	11.77	26.00	42.15
4. Karachi	23.92	29.75	97.46	12.82	27.06	46.21
5. Lahore	22.57	28.74	61.98	11.68	25.51	40.66
6. Multan	21.85	27.95	58.90	11.49	25.15	35.55
7. Okara	21.83	27.76	NA	11.43	25.59	NA
8. Peshawar	23.08	27.81	70.63	12.35	23.02	46.44
9. Rawalpindi	22.53	28.30	69.23	12.00	25.11	43.79
10. Sahiwal	21.99	28.01	60.66	11.55	25.76	37.37
11. Sargodha	21.89	27.63	NA	11.95	25.03	NA
12. Sialkot	22.30	28.27	51.77	11.64	26.04	34.91
13. Sukkar	NA	28.12	59.96	NA	25.84	41.84
14. Average	22.50	28.33	64.64	11.86	25.47	40.14

Source: Computations based on data from [57]

N.A. : Price data not available.

Appendix D

Minimum Average Costs of Marketing One Maund of Wheat and Gram at Different Stages of Marketing in Pakistan. 1955-56 - 1978-79. (Rupees per Maund)*

Year	WHEAT: Farmer to Primary Market (1)	WHEAT: Market to Mills (2)	WHEAT: Mills to Whole-Saler (3)	WHEAT: Wholesaler to Retailer (4)	GRAM: Farmer to Primary Market (1)	GRAM: Market to Mills (2)	GRAM: Mills to Whole-saler (3)	GRAM: Wholesaler to Retailer (4)
1955-56	0.72	0.52	0.36	0.31	0.73	0.53	1.26	0.32
56-57	0.75	0.54	0.37	0.33	0.76	0.55	1.28	0.34
57-58	0.76	0.56	0.38	0.34	0.78	0.57	1.30	0.35
58-59	0.79	0.59	0.40	0.36	0.81	0.61	1.35	0.37
59-60	0.82	0.59	0.40	0.36	0.85	0.67	1.36	0.37
60-61	0.83	0.64	0.43	0.38	0.86	0.66	1.41	0.39
61-62	0.88	0.66	0.44	0.41	0.90	0.67	1.43	0.43
62-63	0.87	0.63	0.42	0.39	0.89	0.64	1.40	0.41
63-64	0.85	0.64	0.43	0.40	0.88	0.66	1.41	0.42
64-65	0.88	0.67	0.44	0.41	0.90	0.69	1.43	0.43
65-66	0.91	0.71	0.47	0.43	0.92	0.73	1.45	0.44
66-67	1.05	0.80	0.52	0.48	1.10	0.85	1.80	0.51
67-68	1.06	0.83	0.55	0.50	1.12	0.88	1.75	0.51
68-69	1.05	0.81	0.56	0.48	1.09	0.87	1.65	0.50
69-70	1.07	0.91	0.57	0.51	1.10	0.95	1.70	0.53
70-71	1.14	0.91	0.58	0.53	1.16	0.94	1.75	0.54
71-72	1.18	0.98	0.62	0.55	1.24	1.05	1.78	0.56
72-73	NA	NA	NA	NA	NA	NA	NA	NA
73-74	NA	NA	NA	NA	NA	NA	NA	NA
74-75	2.15	1.48	1.08	0.89	2.63	1.55	5.89	0.94
75-76	2.20	1.80	1.30	0.96	2.70	1.75	6.11	1.01
76-77	2.80	1.85	1.35	1.04	2.98	1.76	6.25	1.08
77-78	3.10	1.90	1.40	1.13	4.15	2.60	8.23	1.12
78-79	2.92	1.93	1.60	1.21	3.90	2.35	7.75	1.15

Source: Data for 1955-56 to 1960-61 are based on estimates given in A. Rashid [79], R. Khan [43]. For 1968-69, 1974-75, we used estimates from M. Javid [35], R. Qureshi [75], M. Siddiqi [84], and A. Sattar [81]. However, since different studies gave different estimates of various cost categories, we used an average of their estimates for each year. For 1975-76 to 1978-79 we relied on the transportation costs data provided by different trucking companies, and reported in Appendix . For the remaining years published information was not available, therefore we simply used wholesale price indexes to complete the missing data.

* These costs include both transportation costs from one point to the other and handling costs such as packaging, weighing, loading and unloading. For different categories of handling costs see Appendix of this study.

Appendix E

Monthly Wholesale Price Indices for Pakistan from July 1953 to Dec. 1979 with a base of July 1953 = 100.

Month \ Year	1953	1954	1955	1956	1957	1958	1959	1960	1961
1. January		100.0	96.6	95.0	97.6	104.3	100.0	113.0	113.0
2. February		100.9	94.9	97.0	97.6	106.2	101.0	114.0	113.0
3. March		100.9	94.9	96.0	97.6	104.3	101.0	113.0	114.0
4. April		100.0	94.1	96.0	97.6	106.2	104.0	112.0	114.0
5. May		98.3	93.2	96.0	98.6	105.2	104.0	113.6	113.0
6. June		96.6	93.2	97.0	99.5	106.2	104.0	114.0	115.0
7. July	100.0	100.0	94.0	98.0	100.5	108.1	106.0	114.0	114.0
8. August	100.9	99.2	95.0	99.0	103.3	107.1	108.0	112.0	117.0
9. September	101.7	99.2	96.0	100.0	103.3	108.1	110.0	112.0	119.0
10. October	101.7	100.0	96.0	100.0	104.3	107.0	110.0	113.0	117.0
11. November	100.9	99.2	96.0	99.0	104.3	103.0	112.0	112.0	117.0
12. December	100.0	99.2	94.0	99.0	104.3	100.0	112.0	113.0	115.0
Month \ Year	**1962**	**1963**	**1964**	**1965**	**1966**	**1967**	**1968**	**1969**	**1970**
1. January	116.0	109.7	112.9	119.3	124.7	148.7	134.9	143.8	143.8
2. February	118.0	108.7	115.0	121.3	125.3	148.2	134.9	142.7	143.8
3. March	117.0	110.8	116.1	120.3	126.3	147.2		145.0	143.8
4. April	115.0	111.8	115.0	120.3	130.5	146.1		147.2	147.2
5. May	114.0	110.8	113.9	120.3	132.5	145.1	137.1	148.3	148.3
6. June	110.8	112.9	113.9	120.3	133.6	145.1	140.5	147.2	151.6
7. July	108.7	112.9	116.1	121.3	139.9	145.1	143.8	148.3	147.5
8. August	108.7	111.8	117.1	121.3	144.0	144.0	148.3	151.6	151.1
9. September	108.7	111.8	118.2	122.4	150.3	145.1	150.5	158.3	152.2
10. October	109.7	111.8	119.2	121.3	148.2	141.9	149.4	156.[illegible]	153.2
11. November	108.7	112.9	117.1	124.2	146.1	140.9	150.5	156.8	154.4
12. December	108.7	111.8	118.2	124.5	147.9	138.8	139.4	145.0	152.0
Month \ Year	**1971**	**1972**	**1973**	**1974**	**1975**	**1976**	**1977**	**1978**	**1979**
1. January	148.9	164.6	207.9	259.5	324.2	353.0	385.7	439.2	451.3
2. February	148.7	165.6	207.7	252.30	322.9	352.1	386.7	446.5	454.8
3. March	149.7	168.6	202.0	249.2	332.9	350.1	390.1	454.1	456.1
4. April	153.7	173.6	206.9	254.4	349.6	346.6	391.6	447.2	458.9
5. May	155.7	168.9	220.4	267.4	340.3	348.8	388.7	434.4	461.3
6. June	158.9	168.6	226.0	278.8	346.0	356.0	387.2	437.9	464.8
7. July	160.8	169.9	232.2	286.2	351.2	364.8	389.1	445.5	484.1
8. August	163.0	170.6	239.2	295.1	350.0	NA	390.6	453.0	488.9
9. September	164.0	171.4	253.4	305.1	356.2	370.5	394.3	456.5	475.1
10. October	162.3	179.0	255.1	309.4	354.1	NA	397.1	456.1	475.1
11. November	163.9	177.8	256.9	312.0	352.1	NA	418.9	454.4	468.6
12. December	164.8	195.7	258.2	321.8	352.2	380.9	437.9	458.9	472.7

Source: [62]

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