A STUDY OF SEASONAL MARKETING MOVEMENTS

THE SEASONAL BEHAVIOR IN THE MARKETING OF VEGETABLES IN THE BOSTON MARKET

Presented
by
Teiichi Kyono

Department of Agricultural Economics
Faculty of Agriculture
Hokkaido University
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CHAPTER 1

INTRODUCTION

1.1 Purpose

The purposes of this study are (1) to examine the seasonal marketing movements of farm products in a market, (2) to classify these seasonal marketing movements into several patterns, (3) to explain them theoretically, and then (4) to consider the relationships between these patterns and the marketing characteristics of these farm products. In this case the seasonal movement embraces the time of one crop year. In other words, the term "seasonal" means the period during which the farm products, from a certain year, enter into and disappear from a market. Accordingly "seasonal" pertains to the movement in the short-run.

The term "marketing movement" does not simply mean the price movement or the receipts movement but it embodies the complex series of relationships between the price movement and the receipts movement. Thus, this term will be adoptd in order to distinguish it from simple price movements or simple receipts movements. Of course, the consideration of price movements and receipts movements will from the basis for this study. Consequently, seasonal price movements and seasonal receipts movements will be considered as a preliminary step. Next, the marketing movements which differ from the simple price movements or the simple receipts movements, and are thought of as the omplex of relationships of both movements, will be explained more concretely.

In general, a specific amount of a commodity is sold or bought at a certain price in a market. In other words, when a commodity is traded in a market, the following explanation will theoretically be possible. There is the demand schedule and the supply schedule for the commodity behind each transaction, and a certain amount of the commodity will be sold and bought at a certain price at the epuilibrium value in a maeket. Consequently, in a study

of seasonal mrketing movements, how these sets of prices and receipts at the equilibrium value move seasonally, will be the core of the study. Thus in this study, the seasonal movements of equilibrium points in a market will be examined and classified into several patterns. Then these patterns will be explained theoretically, and finally the relationships between these patterns of equilibrium point movements and the marketing characteristics of certain farm products will be investigated.

1.2 Motives and meaning of this study.

Many studies of the seasonal movements of farm products in a market have been reported up to this time. But most of them involved no more than the seasonal receipts movements and or the seasonal price movements. Though the relationship of both movements gave rise to discussions, they were only considered in an arrangement of monthly or weekhly time series. In other words, these relationships were not analyzed to determine the economic interdependent relationships. Thus, it is important that the relationships between the seasonal receipts movements and the seasonal price movements are understood in the meaning explained above and also that economic analyses are made for these relationships with this understanding in mind. Insofar as the problem of the seasonal marketing movements are understood in this way and the actual research for these problems are so aimed, this study will be obliged to start with the observations of a set of prices and receipts as the equilibrium value in a market. Thus, what can be observed will be neither the simple price movements nor the simple receipts movements but the movements of equilibrium points (of demand and supply) which will enable us to examine them as discussed earlier. The demand relationships and the supply relationships are behind these observations and cannot be observed directly. Thus it should be noticed that what can be observed directly are ex post facto sets of corresponding prices and receipts in a market equilibrium. Various analyses in this study are based on this viewpoint.

A similar situation to this can be found in the mechanism of measuring

the demand curve. In order to carry out an actual analysis of the law of demand, one starts from the observation of corresponding sets of prices and consumption with most of the commodities. But can a consumed amount equal a demanded amount? A consumed amount may not coincide with a demanded amount. These relationships between prices and consumption may be thought of as the consumption function in connection with price rather than the demand relationship. Cenceding this point, if the demand curve can be measured from the relationship between prices and consumption, that is, if the consumed amount coincides with the demanded amount, the following problems will still remain. For example, in order to measure the elasticity of demand, it was assumed that the data of prices and consumption are observed in an arrangement of yearly time series. In such a case do these relationships really express the demand relationships?

It cannot be asserted that they express the real demand schedule. These sets of observed points will only express sets of equilibrium points of demand and supply in a market. In such a case the demand schedule and the supply schedule are behind them and will not be able to be observed directly, but what can be observed directly will be sets of equilibrium points.

Thus when studies of the marketing movements are attempted, what can be observed directly are only sets of equilibrium points in a long-run or a short-run. Consequently the actual studies for the marketing movements should be carried out on the ground of such a cognition. This is one of the motives which guided me to study this problem

Some comments on the determination of the demand schedule will be added at this point. In the actual studies of the demand schedule, even though the data shows a real demand relationship and even though the influences of inchanges in price or the influenes of increases in population for the demand relationship are eliminated from these data by deflating prices or by using the consumption per capita, respectively, the following important problems will still remain:

1. Insofar as the data which are used for the study of the demand

schedule are obtained from time series data, a demand schedule may be affected by a changing consumption structure. For example, the measurement of the demand schedule for dairy products may be affected by an upward trend in the consumption of dairy products.

2. When time series data are used, the demand schedule may be influenced by the substitutional effects of a certain commodity by a substitutable commodity which exists at that time or by the appearance of a new substitutable commodity.

Consequently the manner of controling these influences has to be considered in order to determine the real demand relationships. Generally speaking, these points have been largely ignored in past studies of demand schedules.

Some suggestions for the actual studies of demand relationships will be given at this point, explaining the methods by which demand relationships can be determined for greater purity and accuracy.

1. Cross-section data representing market locations at a given time should be used to construct the demand schedule. In such a case the areas from which the cross-section data are obtained should be chosen as homogeneously as possible. This is especially important in connection with income. The problems which were mentioned earlier will be largely avoided by using this method. But now influences affecting the demand schedule arising from differences in the consumption structure or differences of supply conditions among areas may enter into these data.

2. The demand schedule should be measured according to the data which are obtained in surveys based on an experimental design. In such a survey, variations which are caused by time or variations which are caused by local differences, such as income and the like, can be controlled in the process of analysis of variance. Accordingly most problems mentioned earlier will be avoided by using this method. This is one of the fields which is of special personal interest for later study.

Moreover, in general the classification of commodities, for example, milk, meat, vegetables, fruits, eggs, et cetera, which have been used up to the

present, will not always be suitable for studies in from products marketing. Other classifications of commodities from different standpoints ought to be carried out. For example, milk and some fruits or vegetables might be thought of as belonging to the same category from the standpoint of perishability, and so on. Also it may be possible that the patterns of seasonal price movements or the patterns of seasonal marketing movements can be used as one of the criteria for such classifications. Of course, expectations of results arising from this study may be very small, because only vegetables are the objects of analysis. But it is thought that this study will be significant as a trial in this field. This is also one of the motives which led me to study these problems.

1.3 Data

In order to make this study twenty major vegetables, which are traded in the Boston market were used. The data of receipts and prices were obtained from "Receipts and Estimated Market Values of Certain Products Trucked into the Boston Produce Market for the Marketing Seasons, 1946 throught 1952", which are published by the Commonwealth of Massachusetts, Department of Agriculture, Boston. The average weekly receipts and the average weekly prices of each vegetable were reported in this publication.

After the receipts movements and the price movements were observed seasonally for each year, it was found that they had almost similar trends for each year. However, there was a little variation in movement levels between years for each vagetable depending upon the size of havests. In the years of good harvests the receipts movements were maintained at a comparatively high level and the price movements at a comparatively low level, and vice versa in the years of short harvests. But in spite of these facts the movements of each year showed similar trends at different levels. Consequently the movements of averaged weekly receipts and prices were calculated for seven years and these averaged movements were used as the

basic seasonal movements for this study.

Major vegetables were chosen according to the value of products in Massachusetts and the amount of receipts in the Boston market. These vegetables were as follows: Onions, tomatoes, radishes-hothouse, carrots-cut, potatoes-50 lb. bags, spinach, squash-Blue Hubbard, squash-Butternut, cucumbers-outdoor, potatoes-100 lb. bags, radishes-outdoor, cabbage, carrots-bunched,corn-yellow, beans-green, lettuce, asparagras, cucumber-hothouse-cartons, cucumber-hothouse-boxes, and peppers.

1.4 Organization of this study

The purpose of this study was to analyze the seasonal marketing movements of major vegetables in the Boston market as discussed in the first section. In order to do this, the seasonal receipts movements and the seasonal price movements had to be considered first. These considerations were preliminary for this study, but it is thought that they have also very great significance by themselves, especially in the case of seasonal price movements.

Thus, this study will be organized as follows:

1. Seasonal receipts movements. This is treated in Chapter 2. In this chapter an outline of the seasonal receipts movement of each vegetable is explained first. Then the comparison of these movements is made mainly from the standpoint of the characteristics of the distribution curves.

2. Seasonal price movements. This is treated in Chapter 3. In this chapter an outline of the seasonal price movement for each vegetable is considered. Then trend lines are fitted to these price movements. After that the classification of the patterns of movements is made according to their types of trends. Finally the variations in the price movements is measured and the relationships beween the amount of variations and the marketing characteristics of vegetables is considered.

3. Rajationships between the seasonal receipts movements and the seasonal price movements. This is treated in Chapter 4. In this chapter the relationships between the seasonal receipts movements and the seasonal price

movements is considered in an arrangement of weekly time series. Then these relationships are classified into several patterns. After that the patterns of relationships mentioned above are again considered in terms of price-receipts relationships.

4. Theoretical consideration of the seasonal marketing movements. This is treated in Chapter 5. In this chapter the problem of how the patterns of price-receipts relationships can be explained theoretically is stated. Here all of the theoretical explanations are based on the proposition that sets of price-receipts relationships should be thought of as sets of equilibrium points in a market. Also these considerations are carried out by dividing the whole marketing poriod into two partial periods, the poriod of expansion and the period of reduction. At first, the question of how the demand curve and the supply curve can be changed with expansion or reduction of the market is generally considered. Then the changes of movements of the marketing equilibrium points as intersections of the demand curve and the supply curve with expansion or reduction of market, is considered. After that the question of what kinds of patterns these seasonal marketing movements have, is considered in the light of information which was obtained above.

5. Relationships between the patterns of the seasonal marketing movements and the marketing characteristics of vegetables. This is treated in Chapter 6. In this chapter the results of the seasonal marketing movement patters obtained by using the price-receipts relationships in chapter 4 are explained accoring to the theoretical considerations described in chapter 5. Then the explanation of relationships between the seasonal marketing movement patterns and the marketing characteristics of vegetables are given.

6. Conclusions. These are treated as Chapter 7. In this chapter the conclusions of this study are briefly stated and the problems, which are left for the future, will be pointed out.

CHAPTER 2

SEASONAL RECEIPT MOVEMENTS

The seasonal receipt movements of major vegetables in the Boston market are considered in this chapter. The averages of weekly receipts which are averaged for the seven years from 1946 through 1952 are used. These averaged average weekly receipt movements are shown in Table 2. 1 and in Chart 2. 1. The marketing periods start from the earliest week in which the vegetable appears in the market and contiue until the last week in which the vegetable is traded in the market. Consequently these marketing periods are different for the different kinds of vegetables. In other words, the starting week of these marketing periods for various vegetables varies according to their harvest time and the ending week varies according to their yield, their perishability, the possibilities for storage, and so on. The seasonal receipt movements of vegetables are considered in their marketing periods as described above and as shown in Table 2. 1.

In the next section which follows, the behavior of the seasonal receipt movements for these vegetables will be briefly described. In the second section the patterns of the seasonal receipt movements will be considered from the viewpoint of the several characteristics of the distribution curves.

2. 1 Brief explanation of the seasonal receipts movement for each vegetable.

The seasonal receipts movement of onions starts at the beginning of July and then increases rapidly and reaches its peak at the beginning of August.

Table 2. 1. Average Weekly Receipts

Vegetables	Units	Febuary				Marrch		
		1st week	2nd week	3rd week	4th week	1st	2nd	3rd
(1) Onions	100 Bags	–	–	–	–	–	–	–
(2) Tomatoes	1000 Ib	–	–	–	–	–	–	–
(3) Radishes (Hothouse)	100 Boxes	–	–	–	–	–	–	–
(4) Potatoes (50lb Bags)	100 Bags	–	–	–	–	–	–	–
(5) Potatoes (100lb Bags)	100 Bags	–	–	–	–	–	–	–
(6) Cabbage	100 Boxes	–	–	–	–	–	–	–
(7) Carrots (Buncheb)	100 Boxes	–	–	–	–	–	–	–
(8) Carrots (cut)	100 Boxes	–	–	–	–	–	–	–
(9) Radishes (Outdor)	100 Boxes	–	–	–	–	–	–	–
(10) Spinach	100 Boxes	–	–	–	–	–	–	–
(11) Squash (Butternnts)	100 Boxes	–	–	–	–	–	–	–
(12) Sqnash (Blue Hubbard)	1000 Ib	–	–	–	–	–	–	–
(13) Cucumhers (Outdor)	100 Boxes	–	–	–	–	–	–	–
(14) Corn (Yellaw)	100 Boxes	–	–	–	–	–	–	–
(15) Beans (Green)	100 Boxes	–	–	–	–	–	–	–
(16) Lettuce	100 Crates	–	–	–	–	–	–	–
(17) Asparagas	100 Crates	–	–	–	–	–	–	–
(18) Cucumbers (Hothouse, Boxes)	100 Boxes	–	–	1	1	2	2	3
(19) Cucumlers (Hothouse, Cartons)	100 Cartons	–	–	2	4	10	18	30
(20) Peppers	100 Boxes	–	–	–	–	–	–	–

※ I.W. means the intermediate week.

Table 2. 1. (Continued)

		I. W.※	April				I.W.	May				I.W.	June	
	4th		1st	2nd	3rd	4th		1st	2nd	3rd	4th		1st	2nd
(1)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(2)	–	–	0	0	2	6	11	16	35	60	72	–	135	153
(3)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(4)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(5)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(6)	–	–	–	–	–	–	–	–	–	–	–	–	–	11
(7)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(8)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(9)	–	–	–	–	–	–	–	4	29	73	107	103	105	105
(10)	–	–	–	3	18	42	51	66	94	122	134	–	139	126
(11)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(12)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(13)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(14)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(15)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(16)	–	–	–	–	–	–	–	–	–	–	–	22	55	255
(17)	–	–	–	–	–	1	–	17	49	80	95	102	78	85
(18)	4	–	5	5	6	9	–	11	11	12	12	17	13	16
(19)	43	–	47	53	57	59	68	64	60	61	52	–	44	42
(20)	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 2. 1. (Continued)

	June		I.W.	Jnly				I.W.	August				I.W.	
	3rd	4th		1st	2nd	3rd	4th		1st	2nd	3rd	4th		1ts
(1)	–	–	–	13	19	31	61	–	71	64	58	42	–	45
(2)	154	161	–	166	168	129	89	61	33	16	7	3	–	–
(3)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(4)	–	–	–	–	–	–	–	–	4	6	34	27	28	25
(5)	–	–	–	–	2	41	54	–	92	108	95	91	72	58
(6)	48	116	119	144	156	123	128	–	118	123	124	112	–	109
(7)	–	–	5	5	32	78	84	116	73	90	98	73	60	50
(8)	–	–	–	–	–	–	4	7	2	9	7	13	10	11
(9)	72	77	69	64	55	46	40	–	38	27	27	26	–	23
(10)	77	81	52	47	43	32	26	18	16	17	21	20	35	25
(11)	–	–	–	–	–	–	–	0	1	9	15	25	29	30
(12)	–	–	–	–	–	–	–	–	–	–	–	–	–	22
(13)	–	–	–	–	16	17	39	–	82	88	102	70	63	59
(14)	–	–	–	–	54	116	213	284	397	330	251	240	206	189
(15)	–	2	13	26	66	83	57	67	51	40	45	45	–	42
(16)	395	365	311	236	235	141	80	21	30	17	40	9	16	12
(17)	69	68	–	43	24	–	–	–	–	–	–	–	–	–
(18)	14	17	23	16	11	8	4	4	1	–	–	–	–	–
(19)	30	25	–	21	19	16	8	4	5	4	–	–	–	–
(20)	–	–	–	–	0	1	8	13	36	70	90	100	–	96

Table 2. 1. (Continued)

	September			I.W.	October				I.W.	Nonemher				I.W.
	2nd	3rd	4th		1st	2nd	3rd	4th		1st	2nd	3rd	4th	
(1)	34	33	31	23	14	17	15	9	–	8	9	16	10	–
(2)	1	4	13	27	22	32	48	65	66	63	66	72	55	60
(3)	–	–	–	–	–	–	0	1	7	5	9	12	16	12
(4)	31	64	50	55	56	48	68	62	75	54	43	31	21	18
(5)	69	63	43	–	30	35	31	21	–	20	14	9	8	4
(6)	104	105	106	112	110	103	104	114	–	100	107	104	59	–
(7)	66	67	58	–	54	53	52	56	76	64	58	53	33	38
(8)	13	17	17	22	27	26	22	20	24	23	23	26	24	31
(9)	25	23	22	–	22	25	24	23	21	19	12	7	4	2
(10)	41	53	68	64	83	82	95	91	121	92	92	99	46	43
(11)	30	42	42	46	45	33	41	39	36	32	33	46	49	–
(12)	45	65	124	–	193	201	262	213	265	238	265	461	366	251
(13)	42	29	18	12	6	6	–	–	–	–	–	–	–	–
(14)	169	92	46	–	31	28	–	–	–	–	–	–	–	–
(15)	44	47	35	14	23	14	5	–	–	–	–	–	–	–
(16)	6	–	–	–	–	–	–	–	–	–	–	–	–	–
(17)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(18)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(19)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(20)	108	120	127	144	136	81	61	70	–	67	13	9	–	–

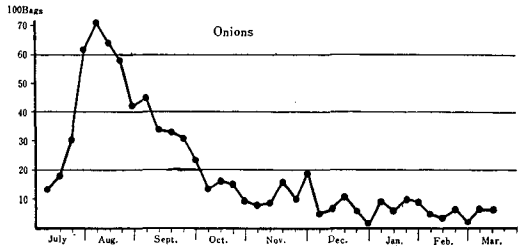
Table 2.1. (Continued)

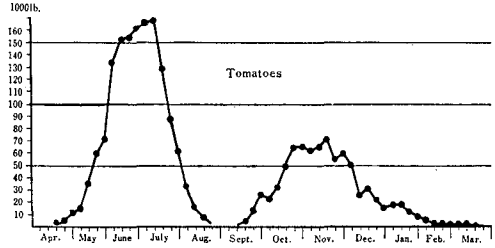
	Decemher				I.W.	January				I.W.	February				I.W.
	1st	2nd	3rd	4th		1st	2nd	3rd	4th		1st	2nd	3rd	4th	
(1)	5	7	12	6	1	9	6	10	9	–	5	4	7	2	–
(2)	50	25	31	22	16	17	17	11	8	–	5	3	2	2	–
(3)	12	10	10	9	7	7	7	9	10	8	9	11	13	14	–
(4)	15	10	9	6	4	5	8	6	8	–	2	5	3	–	–
(5)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(6)	60	51	30	12	9	11	9	3	3	–	–	–	–	–	–
(7)	20	11	–	–	–	–	–	–	–	–	–	–	–	–	–
(8)	26	30	31	16	–	21	28	30	23	28	26	21	22	15	–
(9)	2	2	–	–	–	–	–	–	–	–	–	–	–	–	–
(10)	43	33	14	9	–	–	–	–	–	–	–	–	–	–	–
(11)	30	29	37	27	21	23	21	19	14	–	10	9	9	3	–
(12)	221	276	352	404	–	236	193	209	175	174	206	196	231	184	–
(13)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(14)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(15)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(16)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(17)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(18)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(19)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(20)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

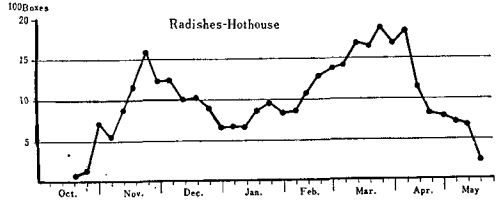
Table 2. 1. (Concluded)

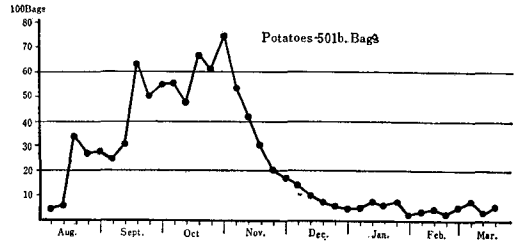
	March				I.W.	April				I.W.	May				I.W.
	1st	2nd	3rd	4th		1st	2nd	3rd	4th		1st	2nd	3rd	4th	
(1)	7	7	–	–	–	–	–	–	–	–	–	–	–	–	–
(2)	2	0	0	0	–	–	–	–	–	–	-	–	–	–	–
(3)	14	17	17	19	17	18	11	8	8	–	7	7	2	–	–
(4)	8	2	6	–	–	–	–	–	–	–	–	–	–	–	–
(5)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(6)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(7)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(8)	18	15	14	13	–	13	14	9	11	–	10	2	0	–	–
(9)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(10)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(11)	2	2	–	–	–	–	–	–	–	–	–	–	–	–	–
(12)	177	179	154	121	–	101	119	77	57	–	55	52	21	10	2
(13)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(14)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(15)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(16)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(17)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(18)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
(19)	–	–	–	–	–	–		–	–	–	–	–	–	–	–
(20)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

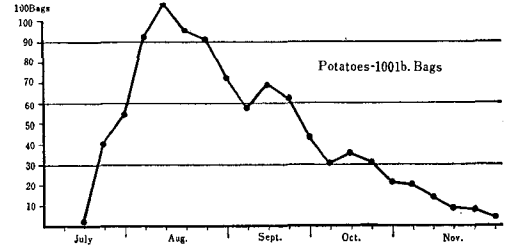
Chart 2. 1. Seasonal receipt movements

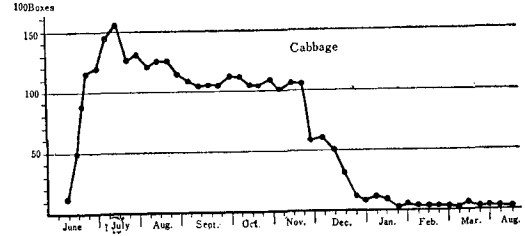












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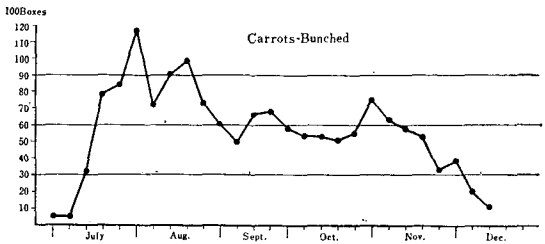
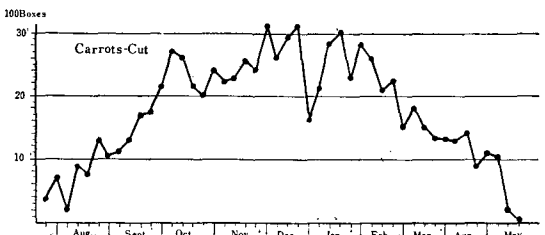
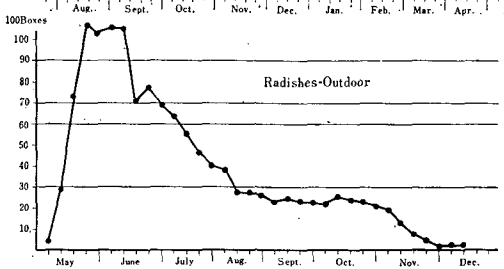
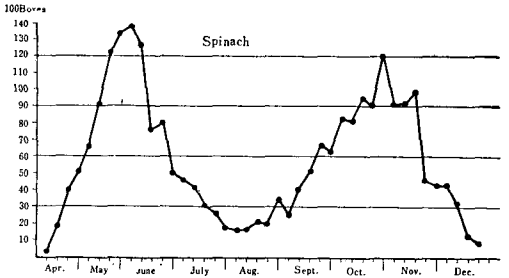
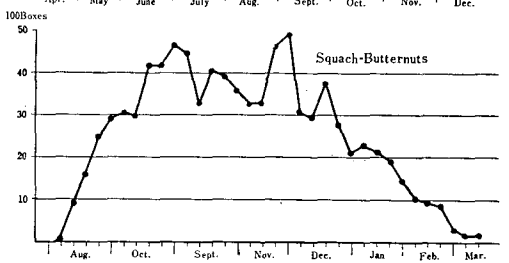










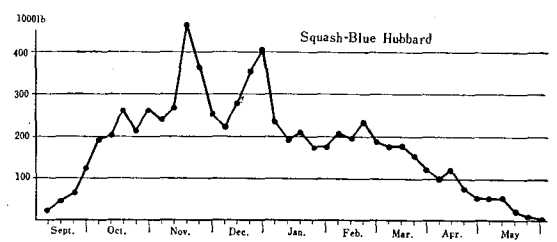
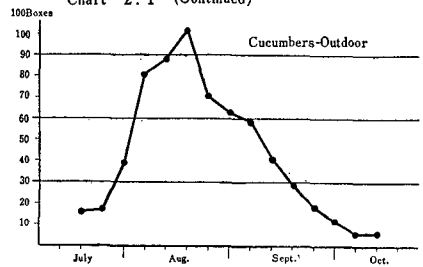
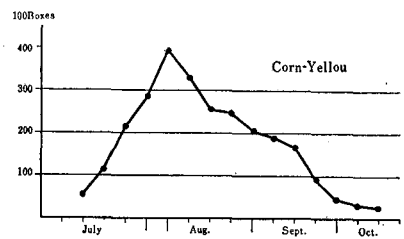
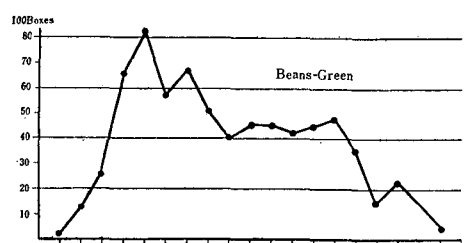
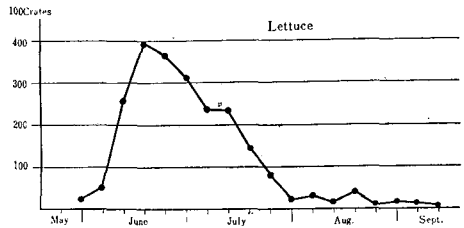


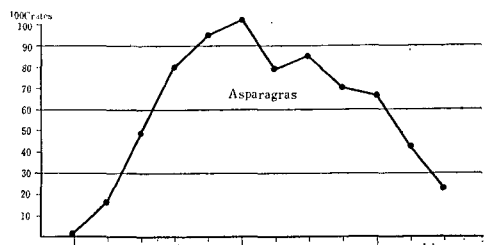
Chart 2.1 (Continued)

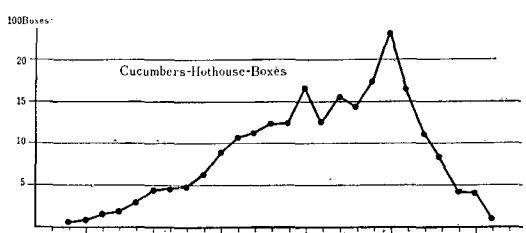












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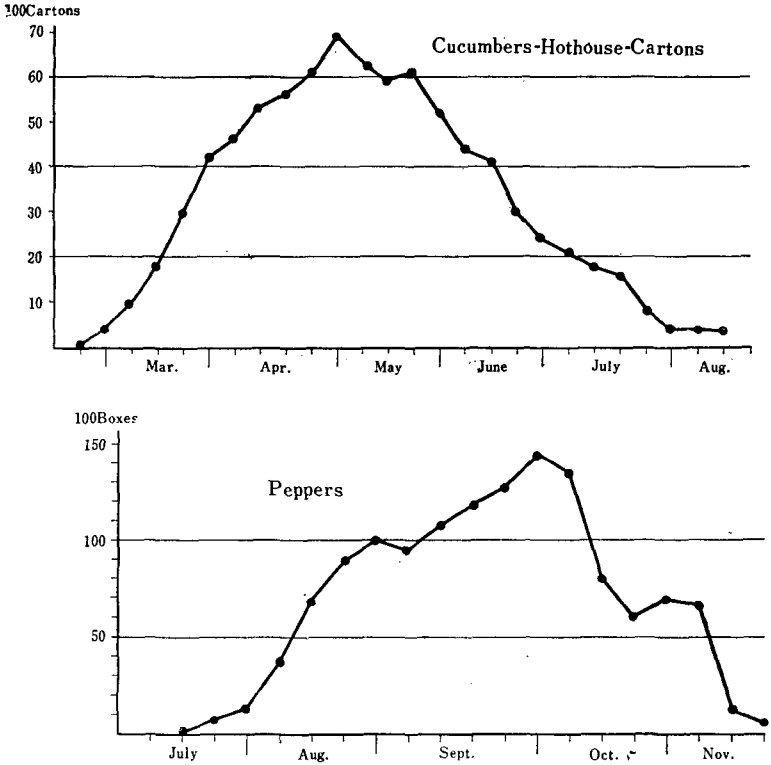


After reaching its peak, it decreases relatively rapidly until the end of October. During November and the following months it decreases slowly with small fluctuations, and ends during the middle of March. Accordingly the marketing period for onions is about nine months or thirty-eight weeks in length.

The seasonal receipts movement of tomatoes starts at the beginning of April and increases comparatively rapidly and reaches its peak during the middle of July. After that it decreases rapidly and ends at the end of August. From the middle of September it starts to increase and reaches its peak again in November. After that it starts to decrease and ends during the middle of February. The amount of its peak in the second period is less than half of the peak in the first period. The marketing period of tomatoes is about five months or twenty-three weeks in the first periood and about seven months or thirty-one weeks in the second period. Thus, the marketing period for tomatoes extends throughout the entire year.

The receipts movement of hothouse radishes starts during the middle of October and increases very rapidly reaching its peak at the end of November. Then it decreases and reaches a low point at the end of December which is about half of the amount of its peak, After that it starts to increase more slowly than for the first period and reaches its peak again at the end of March. Then it decreases rapidly and ends during the middle of May. The marketing period is longer and the level of receipts movement is a little higher in the second period than in the first period. The marketing period for hothouse radishes extends over three months or thirteen weeks for the first period and four and a half months or twenty-one weeks for the second period. The total is about seven and a half months or thirty-four weeks.

The marketing period for potatoes in 50 lb. bags starts at the beginning of August and ends during the middle of March and extends about seven and a half months or thirty-five weeks. In its process of increasing, irregular fluctuations occur to some extent and receipts reach their peak at the end of October. After that they begin to decrease rapidly until the end of December

and then retard slowly with small fluctuations ending during the middle of March.

The marketing period for potatoes in 100 lb. bags is a little longer than for potaoes in 50 lb. bags. It starts during the middle of July and increases rapi. ly reaching its peak during the middle of August. (This is the time at the time at which potatoes in 50 lb. bags start to enter the market.) Then it decreases gradually and constantly in amount to the end of November. In this process of decreasing, its decreasing velocity is somewhat slow and small fluctuations are included. The marketing period of potatoes in 100 lb. bags extends about five months or twety-one weeks.

Cabbage has a different type of seasonal receipts movement than most other vegetables. It starts at the beginning of June and increases rapidly and reaches its peak at the beginning of July. After that it begins to decrease very slowly until the middle of November and many fluctuations are included in this process. Then it decreases rapily and ends at the close of January. The marketing period for cabbage is about eight months or thirty-four weeks. It is remarkable that a very high level of receipts is maintained for more than half of the whole marketing period.

The marketing period for bunched carrots starts at the beginning of July and receipts increase reaching their peak at the end of July. Then they decrease gradually until the middle of November and end duving the middle of December. During this phase of decrease some rather heavy fluctuations occur. The marketing period for bunched carrots is about five and a half months or twenty-seven weeks in length.

The receipts movement for cut carrots starts at the end of July and increases gradually reaching its peak around the middle of December. After that it decreases gradually and ends during the middle of May. In this case, many small fluctuations occur during the entire period. The marketing period for cut carrots extends over about ten months or forty-six weeks.

The receipts movements for outdoor radishes from the beginning of May and increases very rapidiy reaching its maximun at the end of May. Then

it starts to decrease from the middle of June and ends during the middle of December. But its decreasing velocity is very slow. The marketing period for outdoor radishes is about seven and a half months or thirty-four weeks in length.

Spinach has two peaks in its seasonal receipts movement similar to tomatoes and hothouse radishes. In the first period receipts start during the middle of April and reach their peak at the beginning of June. Then they decrease and reach their bottom at the beginning of August. This marketing period extends over about four months or eighteen weeks. In the second period receipts start to increase from the middle of August and reach their peak at the beginning of November. Then they decrease and end at the close of December. This marketing period is about five months or twenty-four weeks in duration. Thus the total marketing period for spinach extends over about nine months of forty-two weeks.

The seasonal receipts movement of Butternut squash starts at the bigenning of August and ends at the middle of March. its marketing period is about seven and a half months or thirty-five weeks. The peak of receipts movement is not clear, because irregualr fluctuations occur during the middle part of its movement. But it is probable that its peak occurs between the beginning of October and the end of November.

The seasonal receipts movement of Blue Hubbard squash starts at the beginning of September and ends at the end of May, its marketing period being about nine months or forty weeks in length. As with Butternut squash the location of this peak is not clear but it occurs sometime between the middle of November and the beginning of January,

The seasonal receipts movement for outdoor cucumbers starts during the middle of July, and increases rapidly reaching its peak during the middle of August. After that it starts to decrease gradually and ends during the middle of October. The marketing period of outdoor cucumbers is about three months or sixteen weeks in length, -a relatively short marketing period.

The marketing period for yellow corn is very short, starting during

the middle of July and ends during the middle of October, and is about three months or sixteen weeks long. The peak of this receipts movement is at the beginning of August. After that receipts decrease gradually.

The seasonal receipts movement of green beans starts at the end of June and increases rapidly reaching its maximun during the midde of July. Then it decreases gradually until the middle of September, comparatively rapidly after the middle of September, and closes near the end of October. Thus the marketing period for green beans is about four months or twenty weeks in length.

The receipts of lettuce start to increase rapidly at the beginning of June and reach their peak during the middle of June and then decrease comparatively rapidly until the end of July. After that they taper off at a very low level and end during the middle of September. The marketing period is about three and a half months or eighteen weeks.

The receipts movement for asparagras starts at the beginning of May and increases rapidly reaching its peak at the end of May. Then it starts to decrease with fluctuations ending during the middle of July. Thus, the marketing period for asparagras is very short, that is, about two and a half months or thirteen weeks in duration.

The seasonal receipts movement for hothouse cucumbers in boxes starts at the end of February and receipts increase very slowly reaching their peak at the end of June. Some small fluctuations take place in the final part of this increasing phase. After the peak, receipts decrease rapidly and end at the beginning of August. The marketing period for hothouse cucumbers in boxes extends over about five and a half months or twenty-six weeks.

The seasonal receipts movement of hothouse cucumbers in cartons starts at the end of February, too, and increases grandually reaching its peak at the end of April. After that it starts to decrease gradually and ends during the middle of August. Thus, this marketing period also is about five and a half months or twenty-six weeks long.

The receipts movement for peppers starts during the middle of July

and increases gradually reaching its peak at the end of September. Then it decreases gradually and irregularly ending during the middle of November. Consequently its marketing period extends about four months or twenty weeks.

2.2 Some analyses of the seasonal receipt movements.

The behavior of the seasonal receipt movements of vegetables was briefly explained in section 2.1. In this section some analyses for these seasonal receipt movements will be carried out from the viewpoint of several of the characteristics of the distribution curves.

At first the problem in which there are two kinds of receipt movements will be considered. The first of them is the movement which has a single peak of receipts. The second is the movement which has double peaks. Generally speaking, the seasonal receipt movements for most vegetables will form the first type of distribution. That is to say, the receipts of most vegetables will increase in the earlier part of their marketing period and reach their peak and then decrease rapidly or slowly. As a matter of fact, most vegetables included herein have this type of distribution. But tomatoes, radishes and spinach form a type of distribution which has double peaks. These vegetales which have double peaks in their movements will be treated as two differnt kinds of vegetables by separating their marketing periods into two parts, the former period and the latter period.

Next, these receipt movements from the viewpoint of symmetry will be examined. It will be presumed that the peak of receipts for most vegetables will occur in the earlier part of the marketing period because of the higher costs of production and storage which are involved in later marketings. It is to be expected that there are greater or smaller differences between the seasonal receipt movements of the different vegetables as brought to mind by the following questions: When do the peaks of receipt movements occur? Will receipts decrease rapidly or slowly after reaching their peaks? And so on. As a matter of fact, several different types of movements relating to these points will be found according to Table 2.1 and Chart 2.1. For

example, some of the receipts peaks occur earlier in the season and are biased to the left and others occur later in the season and are biased towards the right end of the distribution curve. Also some of the peaks of receipts are located in a midde of their marketing periods. Therefore, the measurements of skewness will be made in order to grasp these characteristics of their movements more clearly.

There are several methods to measure skewness of distribution shapes. One is the method which measures them by the locative relatiooships among a mode, a median, and an arithmetic mean. Another is the method in which the locative relationships among a median and quartiles are used. Here the ratio of the cube root of the third moment compared to a standard deviation will be employed in order to measure the skewness. This ratio is as follows:

$$S = \sqrt[3]{\mu_3} / \sigma$$

Here, μ_3 is the third order moment and σ is the standard deviation.

If the value which is calculated by this formula is positive, it will have positive skewness, that is the peak will lean to the left. And if this calculated value is negative, it will have negative skewness and the peak will lean to the right. The degree of this lean can be measured by the absolute value of a skewness. The results of measuring the skewnesses of all of the vegetables are shown in Table 2.2.

Generally speaking, the vegetables which have a relatively short harvest season show a peak which is skewed to the left and the vegetables which are harvested gradually and over a longer period show a peak skewed to the right.

Table 2.2. The Values of Skewness

Vegotables	$\sqrt[3]{\mu_3}$	σ	Skewness $\left(\frac{\sqrt[3]{\mu^3}}{\sigma}\right)$
Radirhes-Outdor	39.17	47.14	0.83
Onions	25.88	39.82	0.65
Lettuce	19.05	32.47	0.59
Potatoes-50 lb Bags	18.60	33.21	0.56
Tomatoes (Latter Period)	11.96	25.03	0.48
Patatoes-100 lb Bags	13.63	29.36	0.46
Carrots- Bunched	21.52	49.56	0.43
Cucumbers-Outdoor	7.87	19.60	0.40
Cucumbers-Hethouse -Cartons	10.75	28.33	0.38
Beans-Green	9.98	26.20	0.38
Spinach (Former Period)	10.07	29.57	0.34
Squash-Butternuts	13.30	36.60	0.33
Corn-Yellow	12.33	41.05	0.30
Squash-Blue Hubbard	33.13	114.56	0.29
Cabbage	19.74	68.15	0.29
Arparagras	4.56	19.78	0.23
Radishes-Hatbouse (Former period)	1.54	8.31	0.18
Peppers	− 1.44	30.58	− 0.05
Carrots-Cut	− 6.52	43.71	− 0.15
Tomatoes (Former period)	− 6.64	30.48	− 0.22
Radishes-Hothouse (Latter period)	− 4.83	16.76	− 0.29
Spinach (Latter period)	− 13.27	37.23	− 0.36
Cucumhers-Hothouse -Boxes	− 8.48	15.48	− 0.55

Storable vegetables show a tendency for the peak to occur later than it would otherwise and the distribution range, after reaching its peak, will be relatively narrow. Non-storable (perishable) vegetables show a tendency for the peak to occur earlier within its marketing period and the distribution range after reaching its peak, will be relatively wide. Such tendencies can be observed in Table 2.2.

In addition to these observations some supplemental explanations will be made regarding the vegetables which have a negative skewness. Peppers have a negative skewness but its absolute value is very small. Accordingly it is possible to think of this seasonal receipts movement as being almost symmetric. Tomatoes (former period), hothouse radishes (latter period) and spinach (latter period), all belong to the vegetables which have double peaks during their marketing period. The fact that they show negative skewnesses probably has something to do with their double peak characteristic of distribution. But more detailed analyses will be required in order to establish this point clearly.

Also hothouse cucumbers in boxes have a negative skewness. It seems that the peak of hoshouse cucumbers in boxes will probably occur during the later part of the marketing period, because hothouse cucumbers in cartons have their peak in the earlier part of their marketing period. The former is a fancy grade of cucumbers.

CHAPTER 3

SEASONAL PRICE MOVEMENTS

The seasonal price movements of the major vegetables in the Boston market will be considered in this chapter. The seasonal price movements of the average weekly prices which are averaged for the seven-year period, 1946 to 1952, will be used. These average weekly prices are shown in Table 3. 1 and Chart 3. 1.

An analysis of some aspects of the seasonal behavior of average weekly prices will be presented in this chapter. In the first place, a determination of the patterns of these seasonal price movements will be carried out by fitting strainght trend lines. From these, types of patterns will be determined and classified. In the second place, the variations of these price movements will be measured and the relationships between the marketing characteristics of vegetables and the amounts of these variations will be pursued. These price movements may show some seasonal trends, but in some vegetables they may have pronounced variatiens from their trend lines and in the others they may have quite stable price movements.

3. 1 Determination of seasonal price patterns.

One thing should be considered before carrying out a determination or a classificatien of seasonal price patterns. This is the fact that seasonal price movements of most vegetables will undoubtedly show unique seasonal trends but there will be clear differences in the trends between the period of reaching the peak of their receipt movents and the period of decreasing from their peaks as shown in Table 3. 1 or Chart 3. 1. Conaequently it is reasonable that these price trends be separately determined for the two pericds which are divided by the peak of their receipt movements.

The period of reachiging the peak will be called "the period of expansion". The period in which there is a decrease from the peak, will be called

Table 3. 1. Auerage weekly prices

Vegetables Unit; Dollars		February				March	
		1st week	2nd week	3re week	4th week	1st	2nd
(1)	Onions	(per Bag)	–	–	–	–	–
(2)	Tomataes	(per lb)	–	–	–	–	–
(3)	Radishes (Hathouse)	(per Box)	–	–	–	–	–
(4)	Potatoes (50 lb bags)	(per Bag)	–	–	–	–	–
(5)	Potatoes (100 lb bags)	(per Bag)	–	–	–	–	–
(6)	Cabbage	(per Box)	–	–	–	–	–
(7)	Carrots (Buuched)	(per Box)	–	–	–	–	–
(8)	Carrots (Cut)	(per Box)	–	–	–	–	–
(9)	Radishes (Out door)	(per Box)	–	–	–	–	–
(10)	Spinach	(per Box)	–	–	–	–	–
(11)	Squash (Butternuts)	(per Box)	–	–	–	–	–
(12)	Squash (Blue Hubbard)	(per 1000lb)	–	–	–	–	–
(13)	Cucumbers (Out door)	(per Box)	–	–	–	–	–
(14)	Corn (Yellow)	(per Box)	–	–	–	–	–
(15)	Beans (Green)	(per Box)	–	–	–	–	–
(16)	Lettuce	(per Crate)	–	–	–	–	–
(17)	Asparagras	(per Crate)	–	–	–	–	–
(18)	Cucumhers (Hothouse, Boxes)	(per Box)	–	18. 85	16. 31	15. 53	13. 20
(19)	Cucumhers (Hothouse, Cartons)	(per Carton)	–	7. 13	6. 36	5. 89	5. 19
(20)	Peppers	(per Box)	–	–	–	–	–

※ I.W. means the intermediate week,

Table 3.1. (Continued)

	March		I.W.※	Arih				I,W.	May			
	3rd	3th		1st	2nd	3rd	4th		1st	2nd	3rd	4th
(1)	–	–	–	–	–	–	–	–	–	–	–	–
(2)	–	–	–	.48	.49	.49	.47	.46	.42	.39	.35	.31
(3)	–	–	–	–	–	–	–	–	–	–	–	–
(4)	–	–	–	–	–	–	–	–	–	–	–	–
(5)	–	–	–	–	–	–	–	–	–	–	–	–
(6)	–	–	–	–	–	–	–	–	–	–	–	–
(7)	–	–	–	–	–	–	–	–	–	–	–	–
(8)	–	–	–	–	–	–	–	–	–	–	–	–
(9)	–	–	–	–	–	–	–	–	1.50	1.66	1.28	.78
(10)	–	–	–	–	1.38	1.08	.94	.83	.92	.88	1.00	.96
(11)	–	–	–	–	–	–	–	–	–	–	–	–
(12)	–	–	–	–	–	–	–	–	–	–	–	–
(13)	–	–	–	–	–	–	–	–	–	–	–	–
(14)	–	–	–	–	–	–	–	–	–	–	–	–
(15)	–	–	–	–	–	–	–	–	–	–	–	–
(16)	–	–	–	–	–	–	–	–	–	–	–	–
(17)	–	–	–	–	–	–	7.50	–	5.99	5.87	4.71	4.45
(18)	11.88	9.77	–	10.95	10.85	10.32	8.59	–	6.80	6.75	7.01	6.49
(19)	4.97	4.68	–	4.34	4.40	4.15	3.48	3.07	2.90	2.72	2.91	2.79
(20)	–	–	–	–	–	–	–	–	–	–	–	–

Table 3.1. (Continued)

	I.W.	June				I.W.	July				I.W.	
		1st	2nd	3re	4th		1st	2nd	3rd	4th		1st
(1)	–	–	–	–	–	–	1.00	1.50	1.60	1.76	–	1.55
(2)	–	.26	.28	.29	.30	–	.30	.31	.28	.24	.23	.16
(3)	–	–	–	–	–	–	–	–	–	–	–	–
(4)	–	–	–	–	–	–	–	–	–	–	–	1.28
(5)	–	–	–	–	–	–	–	2.63	3.06	2.72	–	2.56
(6)	–	–	1.49	1.43	1.06	1.05	1.05	1.19	1.33	1.44	–	1.70
(7)	–	–	–	–	–	1.25	1.21	1.31	1.07	.96	.84	.90
(8)	–	–	–	–	–	–	–	–	–	1.75	1.53	1.33
(9)	.89	.92	1.04	1.01	1.00	.89	.96	1.03	1.28	1.36	–	1.17
(10)	–	.70	.86	1.06	.91	.99	1.05	1.26	1.32	1.50	1.45	1.72
(11)	–	–	–	–	–	–	–	–	–	–	2.00	2.88
(12)	–	–	–	–	–	–	–	–	–	–	–	–
(13)	–	–	–	–	–	–	–	6.50	3.59	3.07	–	3.12
(14)	–	–	–	–	–	–	–	2.75	2.41	2.04	1.96	1.39
(15)	–	–	–	–	5.00	4.51	4.36	3.28	2.47	2.59	2.13	2.48
(16)	2.41	1.76	1.25	.96	1.05	1.40	1.36	1.41	1.37	1.39	1.53	1.13
(17)	4.03	5.39	4.77	4.96	4.31	–	4.02	5.02	–	–	–	–
(18)	7.50	6.32	5.14	5.43	5.58	4.90	6.21	5.94	6.00	3.79	3.00	2.00
(19)	–	2.50	2.28	2.46	2.29	–	2.52	2.44	1.92	1.69	1.40	1.33
(20)	–	–	–	–	–	–	–	2.30	3.60	2.97	2.68	2.57

Table 3. 1. (Continued)

	August			I.W.	September				I.W.	Octoher		
	2nd	2rd	4th		1st	2nd	3rd	4th		1st	2nd	3rd
(1)	1.53	1.59	1.63	–	1.70	1.59	1.68	1.49	1.55	1.74	1.63	1.59
(2)	.13	.09	.12	–	–	.04	.10	.12	.11	.17	0.19	.19
(3)	–	–	–	–	–	–	–	–	–	–	–	.95
(4)	1.55	1.44	1.73	1.49	1.41	1.34	1.28	1.23	1.36	1.21	1.28	1.30
(5)	2.53	2.73	2.48	2.47	2.44	2.49	2.43	2.30	–	2.32	2.49	2.39
(6)	1.56	1.36	1.22	–	1.24	1.11	1.03	1.10	1.12	1.03	.97	1.05
(7)	.97	1.07	1.07	1.02	1.07	1.09	1.15	1.17	–	1.04	.92	.83
(8)	1.26	1.34	1.43	1.70	1.30	1.52	1.51	1.52	1.20	1.51	1.36	1.26
(9)	1.17	1.28	1.13	–	.98	.86	.83	.92	–	.92	.84	.84
(10)	1.61	1.61	1.47	1.24	1.44	1.31	1.11	1.01	.85	.93	.82	.67
(11)	2.87	2.54	2.11	1.35	1.41	1.35	1.27	1.23	1.26	1.17	1.20	1.21
(12)	–	–	–	–	2.80	2.15	2.28	2.37	–	2.14	2.02	1.90
(13)	2.17	1.92	1.66	2.08	2.04	2.85	2.67	3.41	2.96	3.25	3.13	–
(14)	1.61	1.66	1.48	1.44	1.23	1.34	1.35	1.48	–	1.49	1.45	–
(15)	2.83	2.71	2.73	–	2.63	2.61	2.42	2.86	2.45	2.69	2.59	2.38
(16)	1.24	1.47	1.15	1.08	1.13	1.46	–	–	–	–	–	–
(17)	–	–	–	–	–	–	–	–	–	–	–	–
(18)	–	–	–	–	–	–	–	–	–	–	–	–
(19)	1.50	–	–	–	–	–	–	–	–	–	–	–
(20)	2.13	1.86	1.59	–	1.44	1.51	1.58	1.53	1.40	1.38	1.25	1.41

Table 3.1. (Continued)

		I.W.	November				I.W.	December				I.W.
	4th		1st	2nd	3rd	4th		1st	2nd	3rd	4th	
(1)	1.71		1.75	2.10	2.11	1.99	1.97	2.10	1.86	1.94	1.97	2.17
(2)	.19	.20	.21	.22	.23	.23	.23	.23	.26	1.30	.34	.35
(3)	1.33	1.21	2.03	2.25	2.69	3.38	3.60	3.10	2.82	3.38	3.81	3.89
(4)	1.31	1.18	1.29	1.35	1.41	1.33	1.27	1.42	1.30	1.52	1.51	1.75
(5)	2.71	–	2.61	2.86	2.32	2.73	2.78	–	–	–	–	–
(6)	1.03	–	1.06	1.20	1.17	1.21	–	1.38	1.36	.99	1.06	1.54
(7)	.80	1.05	.92	.98	1.10	1.13	1.09	1.03	1.08	–	–	–
(8)	1.21	1.30	1.25	1.41	1.63	1.65	1.26	1.56	1.58	1.64	1.77	–
(9)	.91	.70	1.03	1.18	1.11	1.22	1.08	1.20	1.10	–	–	–
(10)	.67	.72	.70	.87	0.87	0.93	1.11	1.20	1.13	1.12	1.15	1.35
(11)	1.21	1.10	1.25	1.23	1.38	1.49	–	1.61	1.82	1.88	2.07	2.83
(12)	1.83	1.50	1.92	1.93	2.00	1.99	1.75	2.18	2.24	2.26	2.45	–
(13)	–	–	–	–	–	–	–	–	–	–	–	–
(14)	–	–	–	–	–	–	–	–	–	–	–	–
(15)	–	–	–	–	–	–	–	–	–	–	–	–
(16)	–	–	–	–	–	–	–	–	–	–	–	–
(17)	–	–	–	–	–	–	–	–	–	–	–	–
(18)	–	–	–	–	–	–	–	–	–	–	–	–
(19)	–	–	–	–	–	–	–	–	–	–	–	–
(20)	1.27	–	.91	1.05	.80	–	–	–	–	–	–	–

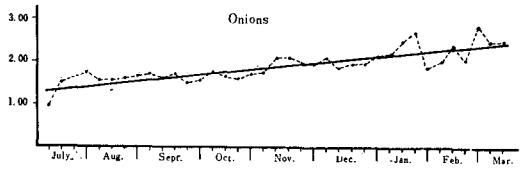
Table 3.1. (Continued)

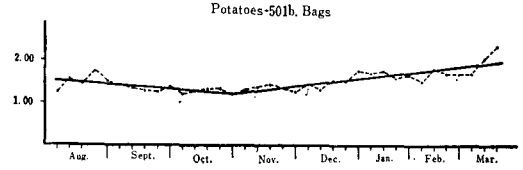
	January				I.W.	February				March		
	1st	2nd	3rd	4th		1st	2nd	3rd	4th	1st	2nd	3rd
(1)	2.19	2.50	2.71	1.86	–	2.00	2.40	2.06	2.88	2.49	2.50	–
(2)	.35	.36	0.41	.41	–	.41	.41	.42	.45	.51	.50	.50
(3)	3.96	3.20	3.09	3.25	3.65	3.26	3.13	3.19	3.16	2.96	3.25	3.46
(4)	1.70	1.73	1.58	1.66	–	1.50	1.80	1.70	–	1.70	2.05	2.35
(5)	–	–	–	–	–	–	–	–	–	–	–	–
(6)	1.48	1.66	1.49	1.06	–	–	–	–	–	–	–	–
(7)	–	–	–	–	–	–	–	–	–	–	–	–
(8)	1.78	1.71	1.69	1.67	1.46	1.80	1.85	1.93	1.78	1.72	1.39	1.87
(9)	–	–	–	–	–	–	–	–	–	–	–	–
(10)	–	–	–	–	–	–	–	–	–	–	–	–
(11)	2.94	3.03	2.75	2.81	–	3.25	3.65	3.69	3.82	4.25	4.00	–
(12)	3.13	3.34	3.51	3.43	3.05	3.27	3.37	2.88	3.05	3.37	3.85	3.80
(13)	–	–	–	–	–	–	–	–	–	–	–	–
(14)	–	–	–	–	–	–	–	–	–	–	–	–
(15)	–	–	–	–	–	–	–	–	–	–	–	–
(16)	–	–	–	–	–	–	–	–	–	–	–	–
(17)	–	–	–	–	–	–	–	–	–	–	–	–
(18)	–	–	–	–	–	–	–	–	–	–	–	–
(19)	–	–	–	–	–	–	–	–	–	–	–	–
(20)	–	–	–	–	–	–	–	–	–	–	–	–

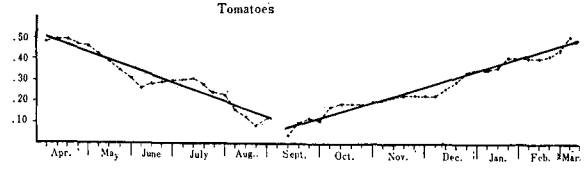
Table 3. 1. (Concludeb)

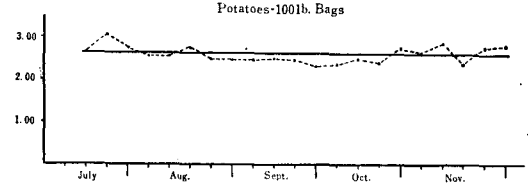
		I.W.	April				I.W.	May				I.W.
	4th		1st	2nd	3rd	4th		1st	2nd	3rd	4th	
(1)	–	–	–	–	–	–	–	–	–	–	–	–
(2)	–	–	–	–	–	–	–	–	–	–	–	–
(3)	3. 14	3. 27	3. 49	3. 96	3. 71	3. 28	–	3. 28	2. 91	3. 06	–	–
(4)	–	–	–	–	–	–	–	–	–	–	–	–
(5)	–	–	–	–	–	–	–	–	–	–	–	–
(6)	–	–	–	–	–	–	–	–	–	–	–	–
(7)	–	–	–	–	–	–	–	–	–	–	–	–
(8)	1. 94	–	1. 80	1. 42	1. 59	1. 50	–	1. 75	1. 49	1. 50	–	–
(9)	–	–	–	–	–	–	–	–	–	–	–	–
(10)	–	–	–	–	–	–	–	–	–	–	–	–
(11)	–	–	–	–	–	–	–	–	–	–	–	–
(12)	4. 30	–	4. 08	4, 13	4. 23	4. 73	–	3. 85	4. 05	5. 10	4. 40	4. 00
(13)	–	–	–	–	–	–	–	–	–	–	–	–
(14)	–	–	–	–	–	–	–	–	–	–	–	–
(15)	–	–	–	–	–	–	–	–	–	–	–	–
(16)	–	–	–	–	–	–	–	–	–	–	–	–
(17)	–	–	–	–	–	–	–	–	–	–	–	–
(18)	–	–	–	–	–	–	–	–	–	–	–	–
(19)	–	–	–	–	–	–	–	–	–	–	–	–
(20)	–	–	–	–	–	–	–	–	–	–	–	–

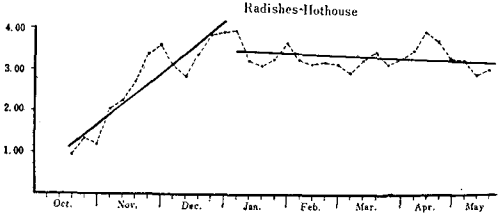
Chart 3. 1. *Seasonal Price movements*











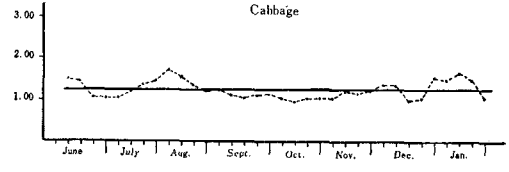
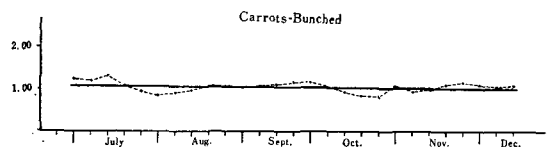
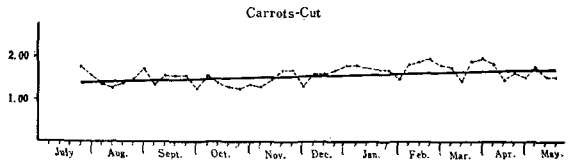
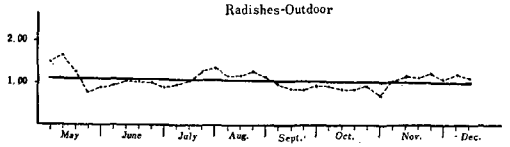
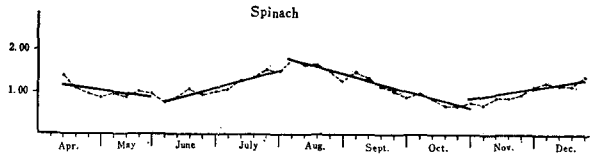


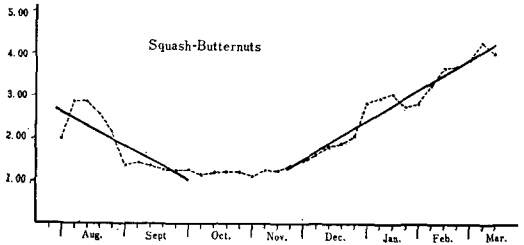
Chart 3. 1. (Continued)











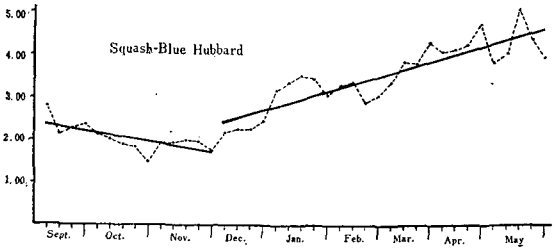
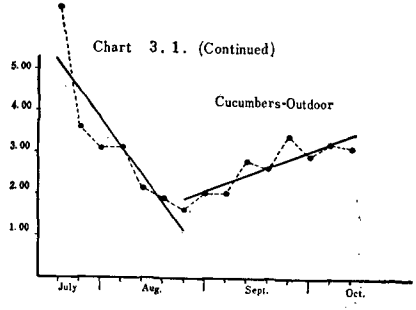
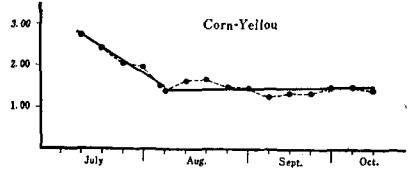
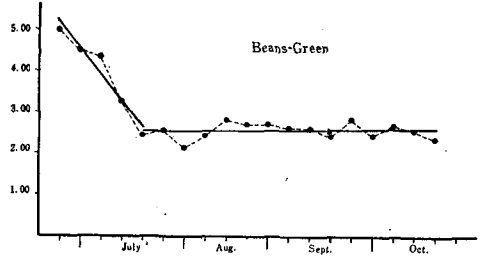
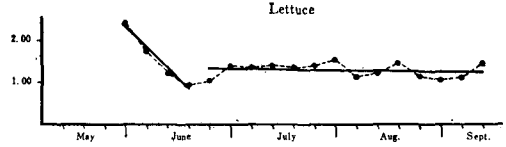


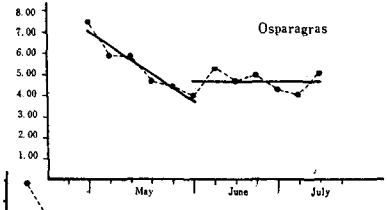
Chart 3.1. (Continued)











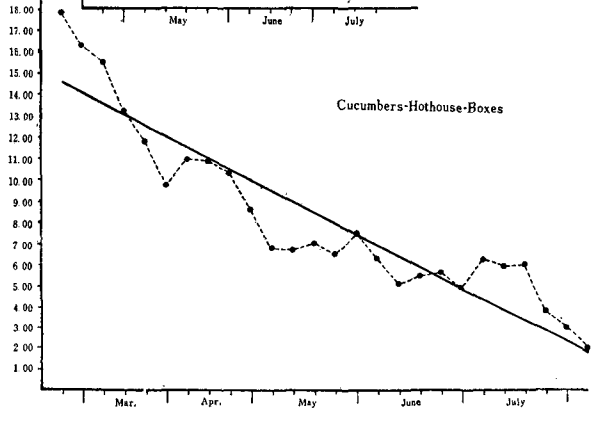
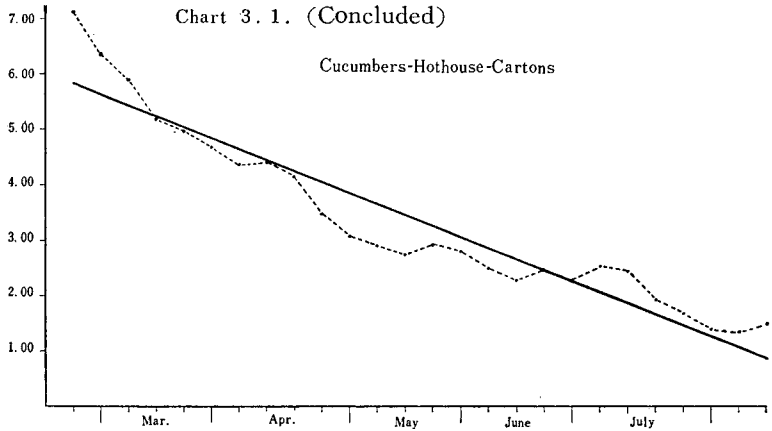
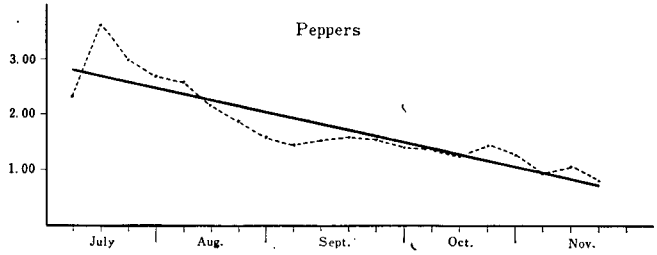


Chart 3.1. (Concluded)





"the period of reducthion'. Thus, the price pattern of each vegetable will be measured for the two periods, that is, the period of expansion and the period of reduction. But for some vegetables the price trend line may be contiunous during both periods and in these cases they will be treated as continuous trends extending over both periods.

The results of fitting straight lines (regression lines) for the seasonal price movements are shown in the first column of Table 3.2 and in Chart 3.1. In Table 3.2, tomatoes, hothouse radishes and spinach are shown twice to include the former period and the latter period. That is to say, since they have two peaks in their seasonal receipts movements as observed in Chapter 2, they are treated as two seperate vegetables.

Generally aperaking, these price trends will be classified into the following three types on the basis of using only straght lines as trends. The first is the rising trend; the secod, the horizontal trend; and the third, the declining trend. Thus, it will be possible for either of these three trends to occur in the period of expansion and in the period of reduction. Accordingly, it is possible for these three trends to appear in combinations of nine different price patterns as follows:

1. The pattern which is rising in both periods.
2. The pattern which is rising in the period of expansion and hrorizotal in the period of reduction.
3. The pattern which is rising in the period of expansion and declining in the period of reduction.
4. The pattern which is horizontal in the period of expansion and rising in the period of reduction.
5. The pattern which is horizontal in both periods.
6. The pattern which is horizontal in the period of expansion and declining in the period of reduction.
7. The pettern which is declining in the period of expansion and rising in the period of reduction.
8. The pattern which is declining in the period of expansion and

Table 3.2

Vegetables	Regression equations	Regression Coefficient b
(1) Onions	P = 128.73+ 3.25x	+ 3.25
(2) Tomatoes (Latter period)	P = 6.26+ 1.45x	+ 1.45
(3) Rabishes—Hothouse (Former period)	P = 93.00+24.56x	+ 24.56
(4) Carrots—Cut)	P = 138.29+ 0.72x	+ 0.72
(5) Potatoes—50lb Bags	P = 152.19− 2.03x P = 119.02+ 3.87x	− 2.03 + 3.87
(6) Spinach (Fomer period)	P = 118.25− 4.08x P = 65.53+ 8.27x	− 4.08 + 8.27
(7) Potatoes—100lb Bags	P = 260.16− 0.17x	− 0.17
(8) Cabbage	P = 123.82+ 0.02x	+ 0.02
(9) Carrots--Bunched	P = 109.18− 0.36x	− 0.36
(10) Radishes—Outdoor	P = 114.14− 0.46x	− 0.46
(11) Radishes—Hothouse (Latter period)	P = 346.23− 1.32x	− 1.32
(12) Spinach (Latter period)	P = 178.39− 7.98x P = 79.40+ 4.01x	− 7.98 + 4.01
(13) Squash—Butternuts	P = 282.34−16.35x P = 116.41+17.96x	− 16.35 + 17.96
(14) Squash—Blue Hubbard	P = 243.28− 5.22x P = 235.32+ 8.79x	− 5.22 + 8.79
(15) Cucumbers—Outdoor	P = 582.71−67.00x P = 168.97+19.65x	− 67.00 + 19.65
(16) Lettuce	P = 281.00−48.60x P = 133.63− 0.51x	− 48.60 − 0.51
(17) Corn—Yellow	P = 306.10−31.70x P = 150.62− 0.98x	− 31.70 − 0.98
(18) Beans—Green	P = 581.10−62.90x P = 253.02+ 0.51x	− 62.90 + 0.51
(19) Asparagras	P = 773.80−66.09x P = 467.57− 0.82x	− 66.09 − 0.82
(20) Cucumhers—Hothouse —Boxes	P = 1,505.75−50.26x	− 50.20
(21) Cucumbers—Hathouse —Cartons	P = 601.72−19.70x	− 19.70
(22) Peppers	P = 291.20−10.96x	− 10.96
(28) Tomatoes (Former period)	P = 51.26− 1.68x	− 1.68

Table 3.2. (Concluded)

	b/P̄ (%)	Calculated t	Degree of Freedom	Tabulated t		
				10%	5%	1%
(1)	1.69	3.25	36 (30)	1.70	2.04	2.75
(2)	2.83	29.00	28	1.70	2.05	2.76
(3)	9.27	11.06	11	1.80	2.20	3.11
(4)	0.46	3.60	44 (40)	1.68	2.02	2.70
(5)	− 1.49	2.90	13	1.77	2.16	3.01
	2.42	6.56	18	1.73	2.10	2.88
(6)	− 4.08	3.44	6	1.94	2.45	3.71
	7.45	4.10	8	1.86	2.31	3.36
(7)	− 0.07	0.25	20	1.72	2.09	2.85
(8)	+ 0.02	0.05	32 (30)	1.70	2.04	2.75
(9)	− 0.35	1.16	25	1.71	2.06	2.79
(10)	− 0.43	1.28	32 (30)	1.70	2.04	2.75
(11)	− 0.40	1.21	19	1.73	2.09	2.86
(12)	− 6.97	7.85	13	1.77	2.16	3.01
	3.88	7.52	9	1.83	2.26	3.25
(13)	− 8.87	4.30	9	1.83	2.26	3.25
	6.46	16.94	15	1.75	2.13	2.95
(14)	− 2.56	3.46	12	1.78	2.18	3.05
	2.48	9.06	24	1.71	2.06	2.80
(15)	− 21.29	4.21	5	2.01	2.57	4.03
	7.35	4.99	7	1.89	2.36	3.50
(16)	− 30.47	8.51	2	2.92	4.30	9.92
	− 0.39	0.46	12	1.78	2.18	3.05
(17)	− 15.02	8.43	3	2.35	3.18	5.84
	− 0.68	0.83	9	1.83	2.26	3.25
(18)	− 16.03	6.65	3	2.35	3.18	5.84
	− 0.20	1.96	13	1.77	2.16	3.01
(19)	− 12.18	7.21	4	2.13	2.78	4.60
	− 0.18	0.06	5	2.01	2.57	4.03
(20)	− 6.08	11.20	24	1.71	2.06	2.80
(21)	− 5.87	14.81	24	1.71	2.06	2.80
(22)	− 6.22	10.44	18	1.73	2.10	2.88
(23)	− 5.40	15.27	21	1.72	2.08	2.83

horizontal in the period of reduction.

9. The pattern which is declining in both periods.

In Table 3.2, the vegetables are arranged into these nine different price patterns. None of these vegetables could be classified into numbers 2, 3, or 6. in Table 3.2.

After having calculated these regression lines, the question of what kinds of price patterns these regession lines will belong to, should be stated. In oher words, the problem is to determine whether these regression lines are rising, horizontal, or declining. Of course, the criteria by which this problem is judged must be the regerssion coefficients of the regression lines.

But the question as to whether the calculated values of the regression coefficients can be thought as zero or not, that is, whether derived linear regression lines should be thought of as horizontal lines or not, will still exist. In order to solve this question, the method of testing a statistical hypotheses will be applied. And in this case the question which was stated above will be treated as the significance test of the regression coefficient in linear regression.

In general the significant test of the linear regression coefficient will be carried out by calculating the following t

$$t=\frac{b-\beta}{\sqrt{Spx^2/\Sigma x^2}}$$

Here, b is the calculated rgression coefficient and β is the population regression cnefficient which should be compared with the calculated regression cnefficient. Spx^2 is called the standard error of estimate or the standard deviation of p for fixed x or the standard deviation of p holding x constant and it is defined as

$$Spx^2=\frac{\Sigma((P-\hat{P})^2}{n-2}$$

Also this method of testing the hyppothesis will be calld the t-test. In this special case the null hypothesis which should be tested is $\beta=0$. Accordingly the significance test of this null hypothesis will be carried out by

calculating the following t

$$t=\frac{b}{\sqrt{Sp^2/\Sigma x^2}}$$

The results of calculating t are shown in the fourth column of Table 3.2. Also the tabulated t at the 10 percent level, the 5 percent level, and the 1 percent level which should be compared with the observed t, is shown with each degree of freedom in the sixth, seventh and eighth columns of Table 3., respectively. Then the following observations will be possible upon comparing these t valtes to each other.

Onions, tomatoes (former period), hothouse radishes (former period), and cut carrots have positive regression coefficients over the periods of expansion and reduction, and the results of these t-tests are significanc at the 1 percent level. Consequently the null hypothesis which is $\beta=0$ will be rejected and their rising price trend will be acceptable. Thus it should be judged that the price patterns of these vegetables belong to the numder 1 price pattesn as listed above.

Potatoes in 50 lb. bags and spinach (former period) have positive regession coefficients and the results of the t-tests are significant at the 1 percent level, and accordingly their rising trends should be accepted for their period of reduction. But during their period of expansion they have negative regression coeffieients and the results of the t-tests are significant at the 5 percent level but non-significant at the 1 percent level. Consequently their price trends during the period of expansion are thought to be approximately horizontal. Thus, their price patterns will form a group which is similar to price pattern number 4.

Potatoes in 100 lb. bags, bunched carrots, outdoor radishes, and hothouse radishes (latter period) have negative regression coefficients for both of their periods. Cabbage has a positive regression coefficient for both of its periods. But their absolute values are very small and the results of the t-tests are non-significant even at the 10 percent level. Then the values of these regression coefficients should be thought of as zero. Accordingly their price patterns

should be included in the number 5 group.

Spinach (latter period), Butternut squash, Blue Hubbard squash, and outdoor cucumbers have negative coefficients in their periods of expansion and inversely have positive coefficients during their periods of reduction, and all results of the t-tests are significant at the 1 percent level. Thus, their price trende should be thought of as declining in their periods of expansion and rising during their period of reduction. In other words, they will be inclnded in the price pattern group number 7.

Lettuce, yellow corn, green beans and asparagras have negative regression coefficients during their periods of expansion, and lettuce, yellow corn and asparagras have negative regression coefficients during their periods of reduction and green beans, a positive regression coefficient during its period of reduction. And the results of the t-tests of these coefficfents are significant, except lettuce, at the 1 percent level during the period of expansion, but non-significant at the 10 percent level during the period of reduction. Thus the price trends of these vegetables are thought to be declining during the period of expansion and horizontal during the period of reduction. In other words, they are classified into gruop number 8. In the ease of lettuce, a regression coefficient for the period of expansion is negative and the t-test is significant at the 5 percent level but non-significant at the 1 percent level. But because of the lack of degree of freedom during this period, it will be admitted that the price trend of lettuce during its period of expansion is declining and its price pattern classified into group number 8.

Finally, hothouse cucumbers in boxes, hothouse cucumbers in cartons, peppers, and tomatoes (latter period) have negative coefficients in both period and the results of t-tests are significant at the 1 percent level. Accordingly the null hypotheses will be rejected and the declining price patterns should be accepted over both periods. Thus the price patterns for these vegetables are included in group number 9.

The classification of the price patterns has been accomplished. But it is obvibous that there are some differences in the degree of rise or decline.

And these differneces prbably can be judged by regression coefficients. But it should be noticed that even though the amounts of regression coefficient are not large, they may show relatively large rising or declining trends if the levels of the price movents are low. Also it should be noticed that even though the amounts of regression coefficients are not small, they may show relatively small rising or declining trends if the levels of the price movements are high. Thus the absolute values of regression coefficients can not be used as suitable criteria for judging the degree of rising or declining trends. In order to express the acceptable criteria which were discussed above, the ratios of regression coefficients compared with the averages of prices in that period, were calculated. These ratios are shown in the third column of Table 3.2. These ratios are acceptable criteria that show which trends are relatively large or small.

3.2 Variations in seasonal price movements.

Variations in the seasonal price movemets of vegertables will be considered in this section. Then relationships between variations in the seasonal price movements and the marketing characteristics of these vegetables will be presented. These variations will be observed by measuring the following two ratios.

1. The amplitude of the seasonal price movement will be measured by using an interval between the highest average weekly price and the lowest average weekly price. But in this case the following matter should be noted. The higher the price level over the whole period, the larger will be the fluctuations. And the lower the price level over the whole period, the smaller will be the fluctuations. Consequently the ratio which divides the interval, that is obtained by subtracting the lowest average weekly price from the highest average weekly price, by the average price will be used in order to express the relative amount of variation. This has nothing to do with the price movement level. This ratio is as follows:

$$\frac{P\ max. - P\ min.}{\bar{P}}$$

Here, P max. and P min. mean the maximum value and the minimum value among average weely prices. Also $\bar{P}$ means the average of average weekly prices. This ratio will be called the relative range of variation. It will be possible to compare varitions by using this relative ratio.

Also the relationship between these relative ranges of variation and the seasonal price patterns which are discussed in a former section are as follows: The larger the tendenecies of rising or declining are, or in other words, the larger the relative ratios of regression coefficients to the average psice are, the larger these relative ranges of variation will be, generally speaking. And when the seasonal price patterns are horizontal, these relative ranges of variation will be very small.

2. But in the case in which the seasonal price movement has a certain trend as a rule because of its marketing characteristics, the measurement of variation by the relative range of variation, which is mentioned above, means that the trend itself is included in its variability. In order to avoid this, anther measurement should probably be considered. This is the standard error of estimate. In this case the trend is accepted as it is and only fluctuations from this trend will be considered as variability. But when the values of the standard deviation of estimate are individually used, it will be under the control of price levels, as discussed in the case of the relative regression coefficient or the relative range of variation. Consequently the relative ratio of standard deviation of estimate comrared with the average price should be used. This ratio is expessed as follows:

$$Spx/\bar{P}$$

Here Spx is the standard deviation of estimate or the standard error of estimate. This ratio in this study will be called the coefficeint of variation of estimate for the sake of convenience. And the values measured by this ratio will have nothing to do directly with the seasonal price pattern.

The results of measuring variations by using the first measurement of

Table 3. 3. The value of variations in the seasonal price movements.

Vegetables	$\frac{Pmax.-Pmin.}{\bar{P}}$	$\frac{Sp.x}{\bar{P}}$
Onions	0. 985	0. 113
Tomataes	1. 709	0. 103
Radishes (Hothouse)	1. 226	0. 095
Patatoes (50lb Bags)	0. 663	0. 090
Patatoes (100lb Bags)	0. 284	0. 077
Cabbage	0. 547	0. 173
Carrats (Bunched)	0. 483	0. 119
Carrats (Cut)	0. 471	0. 117
Radishes (Out door)	0. 814	0. 195
Spinach	0. 879	0. 092
Squash (Butternuts)	1. 178	0. 112
Squash (Blue Huabard)	1. 091	0. 107
Cucumhers (Outdoor)	1. 186	0. 214
Corn (Yellow)	0. 764	0. 068
Beans (Green)	0. 805	0. 071
Lettuce	0. 861	0. 117
Asparagras	0. 604	0. 111
Cucumhers (Hotbouse, Bcxes)	1. 614	0. 205
Cucumhers (Hothouse, Cartons)	1. 418	0. 151
Peppers	1. 273	0. 154

variation, that is, the relative rang of variation, and the second measurement of variation, that is, the conffieient of variation of estimate, are shown in the first column and the second column of Table 3. 3, respectively.

At first, the follewing observations will be possible according to the first column of Table 3. 3. Tomatoes, cucumbers, peppers, radishes, squashes and so on which showed steep rising or declining tendencies in the relative ratio of regression coeffients, $b/\overline{P}$, form the group in which larger values of the relative range of variation are shown. Inversely, cabbage, carrots, potatoes and so on with relative ratios of regression coefficients that are almost zero, form the group in which rather smaller values of the relative range of variation are shown.

Next, it will be possible to make the following observations according to the second column of Table 3. 3 Cucumbers, radishes, cabbage, peppers and so on have relatively large variabilities and potatoes, beans, corn, and so on have relatively small variabilities.

In general, the price of perishable farm preoducts can be expected to have larger fluctuations seasonally than the prices of durable farm probucts. Tis phenomenon might be determined more precisely by observing all farm products. For example, a farm product like strawberries may have very large fluctuations and at the other extreme, durable farm products like wheat, cotton, rice, et cetera, may have rather small comparative fluctuations. But it will be a little difficult to find these relations among vegetables which are thought of as having almost similar chasacteristics. Also whether a certain vegetable is perishable or durable (storable) will have something to do with the availability of storage equipment, costs of storage, et cetera. In other words, this chasacteristic of vegetables or other farm products should be thought as the characteristic which has a relative meaning in connection with the problem of storage as discussed above.

Acocrdingly, the relationships between the variations in the seasonal price movements and the marketing characteristics of vegetables such as perishability, can not be studied more minutely or more exactly until the actual

circumstances of vegetable storage are sufficiently studided. Even though these points which are discussed above are take into consideration, it will be recongized that relatively perishable vegetables have larger variations and relatively durable vegetables have smaller variations, according to the observations obtained by using the relative range of varition or the coefficient of variation of estimate. If the rankings are made for these vegetables from a vegetable which has the largest variation to a vegetable which has the smallest variation in these two measurements, and the total of these two rankings are calculated, the tendency which is mentioned above should probably be accepted.

CHAPTER 4

RELATIONSHIPS BETWEEN SEASONAL RECEIPT MOVEMENTS AND SEASONAL PRICE MOVEMENTS

The seasonal receipt movements and the seasonal price movements have been examined in Chapter 2 and Chapter 3 separately. In this chapter the relationships between seasonal receipt movements and seasonal price movements will be considered. In order to do this their relationships will first be observed in the arrangement of weekly time series. Then they will be classified into several patterns. Finally, these relationships and patterns will be reconsidered in terms of the price-receipts relationships.

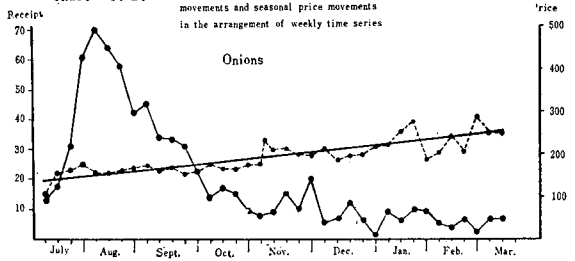
4.1 Relationships between seasonal receipt movements and seasonal price movements.

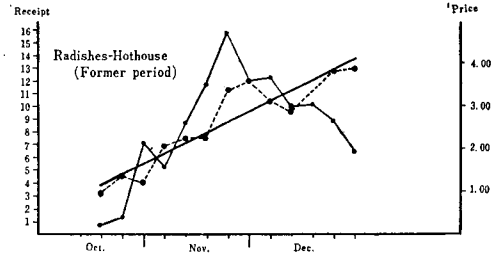
The relationship beween seasonal receipt movements and seasonal price movenets for each vegetable is shown in Chart 4.1. In this chart these relationships of both movements are arranged according to the types of the seasonal marketing patterns which will be stated later.

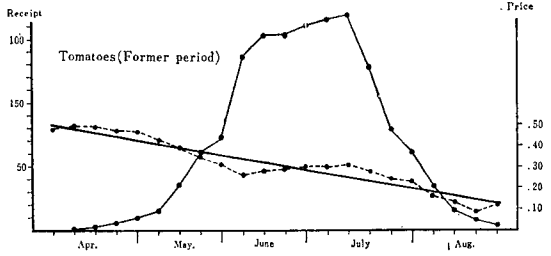
The whole marketing period of vegetable was divided into two partial periods, the period of expansion and the period of reduction. And the three types of price trends, rising, horizontal, and declining, were possible in each partial period. Accordingly nine patterns of the relationships of both movements in the whole marketing period will be possible as combination of the three price trends of both partial periods. Three are not represented by the vegetables which are included in this study. The remaining six patterns and the vegetables which belong to these patterns are as follows:

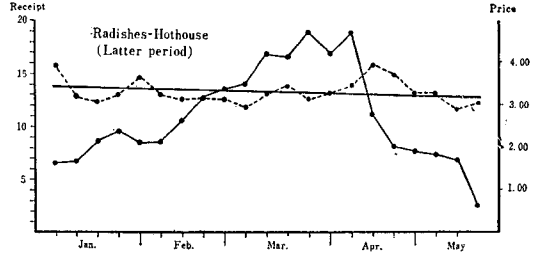
1. The pattern in which the seasonal price trend is rising in the period of expansion and also rising in the period of reduction. Onions, tomatoes

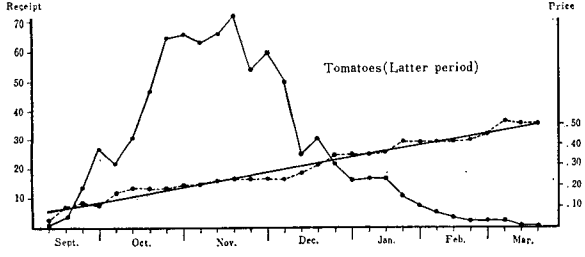
Chart 4.1. Relationships between seasonal receipts movements and seasonal price movements in the arrangement of weekly time series











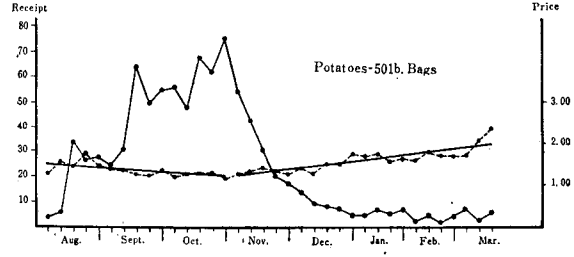
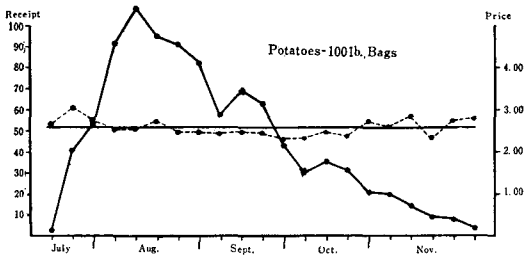
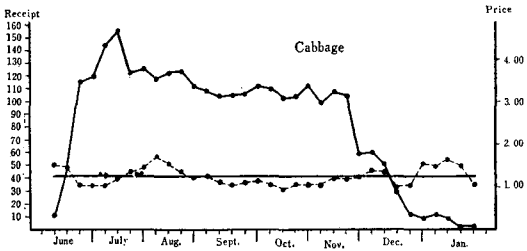
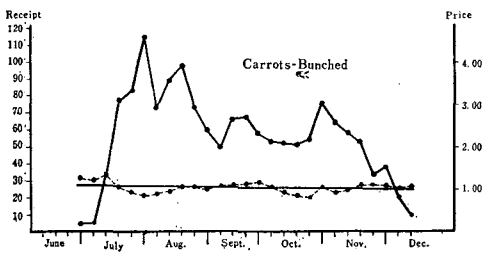
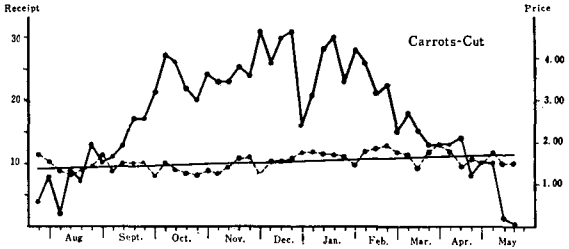


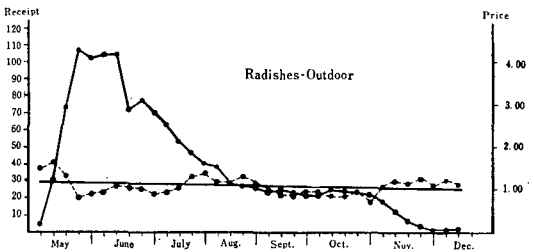
Chart 4. 1. (Continued)











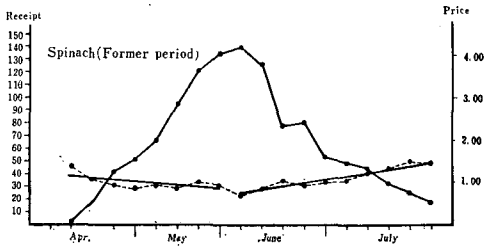
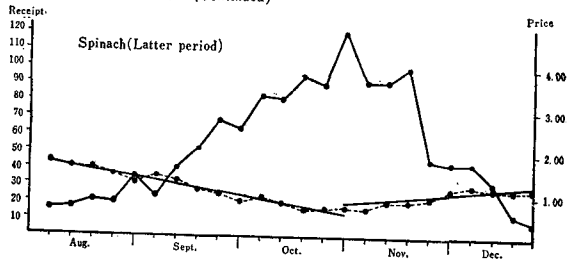
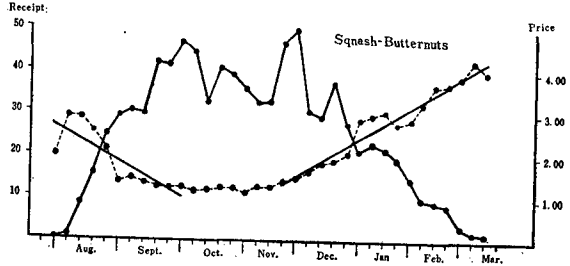
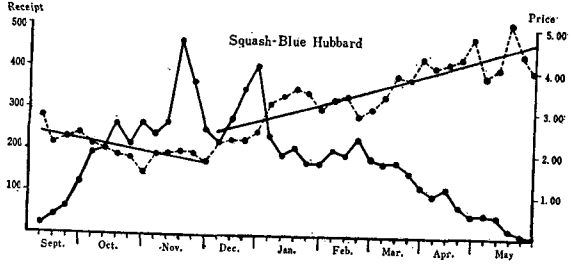
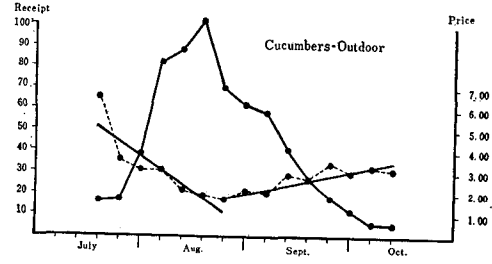


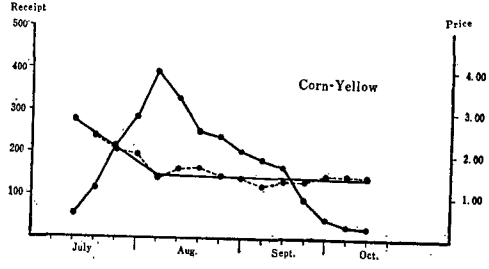
Chart 4.1. (Continued)











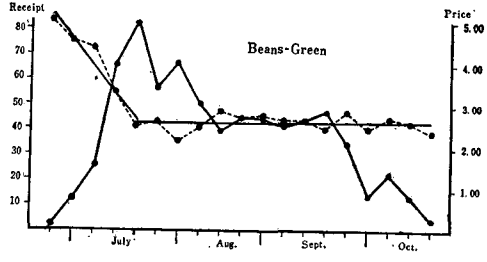
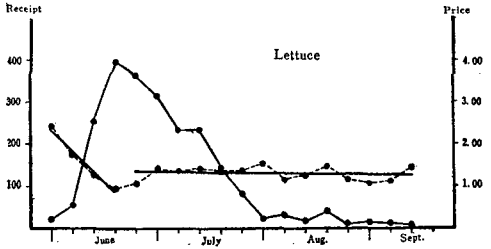
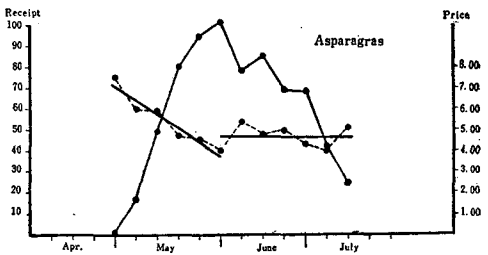
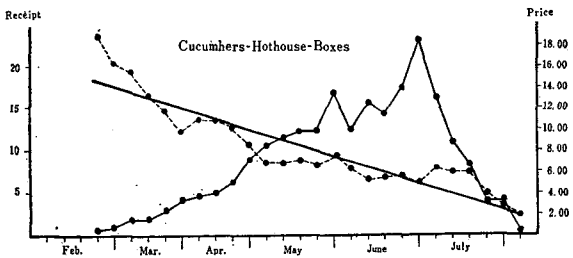
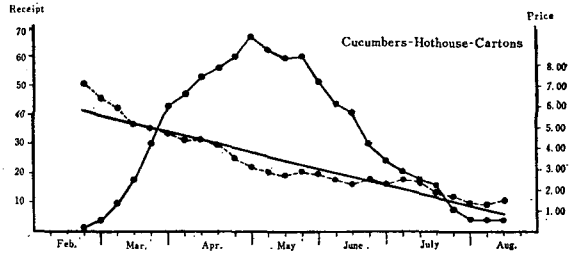


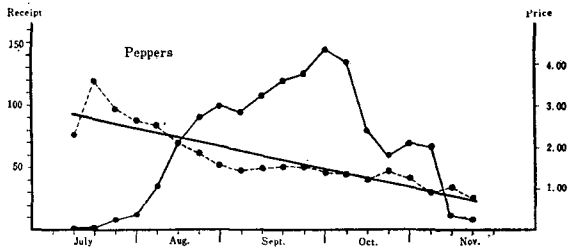
Chart 4.1. (Concluded)











(former period), hothouse radishes (former period), and cut carrots are included in this pattern.

As mentioned befor, the pattern in which the seasonal price trend is rising during the period of epxansion and horizontal during the period of reduction or the pattern in which the seasonal price trend is rising during the period of expansion and declining during the period or reduction, have not been found in the vegetables which are studied herein.

2. The pattern in which the seasonal price trend is horizontal during the period of expansion and rising during the period of reduction. Potatoes in 50 lb. bags and spinach (former period) are included in this pattern.

3. The pattern in which the seasonal price trend is horizontal during the period of expansion and also horizontal during the period of reduction. Pot atoes in 100 lb. bags, bunched carrots, outdoor rasishes, hothouse rasishes (latter period), and cabbage are included in this pattern.

The pattern in which the seasonal price trend is horizntal during the period of expansion and declining during the period of reduction, is not repersented by the vegetables which are included in this study.

4. The pattern in which the seasonal price trend is declining during the period of expansion and rising during the period of reduction. Spinach (latter period), Butternut squash, Blue Hubbard squash, and outdoor cucumbers are included in this pattern.

5. The pattern in which the seasonal price trend is declining during the period of expansion and horizontal during the period of reduction. Yellow corn, green beans, lettuce, and asparagras are included in this pattern.

6. The pattern in which the seasonal price trend is declining during the period of expasion and also declining during the period of reduction. Hothouse cucumbers in boxes, hothouse cucumbers in cartons, peppers, and tomatoes (latter period) are included in this pattern.

4.2 Observation of seasonal marketing movements according to Price-receipts relationships.

In this section the seasonal receipt movements and the seasonal price movements which are shown visually in section 4.1 of this chapter, will be considered statistically in terms of the price-receipts relationships. These relationships are shown in Chart 4.2.

In this chart the price-receipts relationships during the period of expansion are expressed by dots, and the price-receipts relationships during the period of reduction are expressed by X's. Of conse in this chart of the price-receipts relatonhips, the expansion of the market is thought of as going from left to right and the reduction of the market is thought of as going from right to left. Also these dots and X's express the weekly equilibrium points, (that is, the intersections of the weekly demand curves anb the weekly supply crves), and the analysis of the movement of these equilibrium points is the subject of the seasonal marketing movements and the core of this study.

As can be expected from the considerations which were outlind in section 4.1, there is a possibility of three types of equilibrium point movements during the period of expansion, (1) those rising to the right, (2) those moving horizotally to the right, and (3) those declining to the right. Likewise there is a possibility of three types of equilibrium point movements during the period of rduction, (1) those rising to the left, (2) those moving horizontally to the left, and (3) those declining to the left. Consequently the following nine patterns as combinations of these will be possible.

1. The pattern in which the epuilibrium point movement is rising to the right during its period of expansion and rising to the left during its period of reduction.

2. The pattern in which the equilibrium point movement is rising to the right during its period of expansion and moving horizontally to the left during its period of reduction.

Chart 4. 2. Price-Receipts Relationships

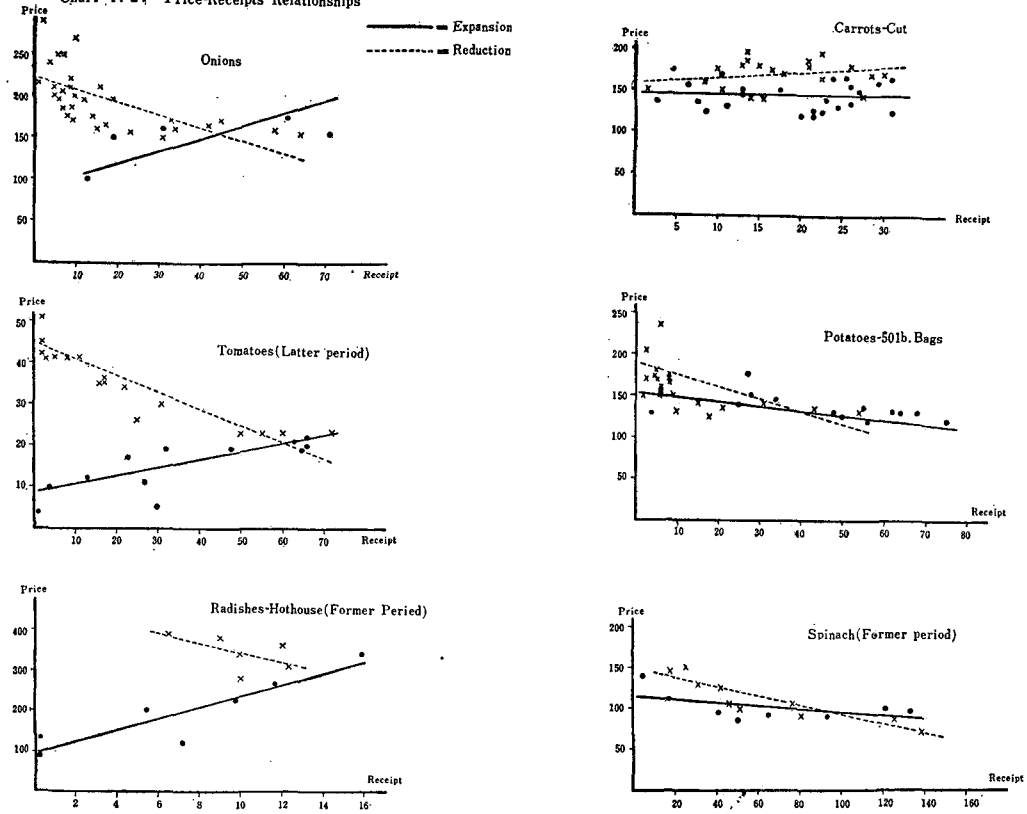
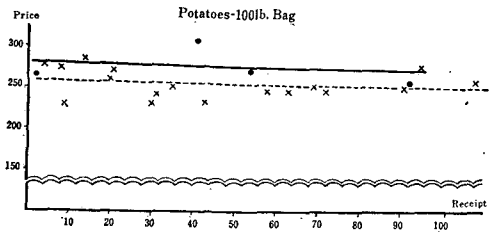
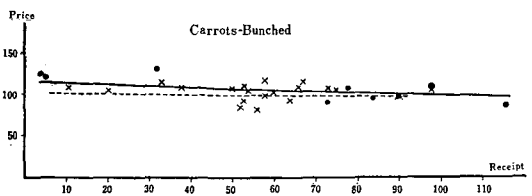
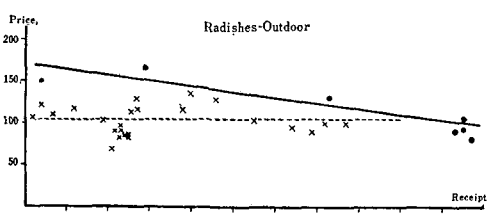
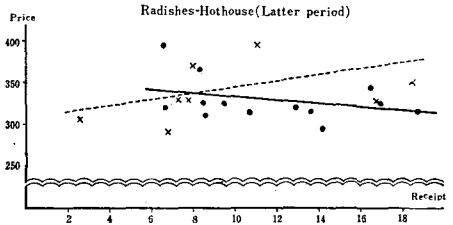


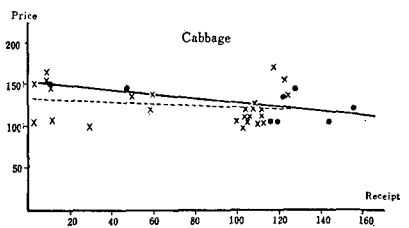
Chart 4. 2. (Continued)











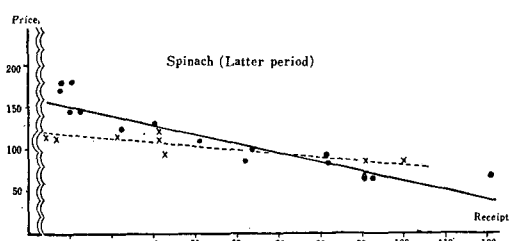
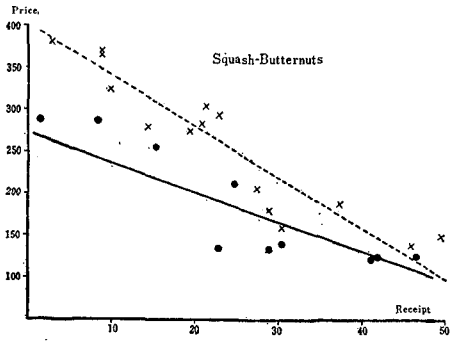
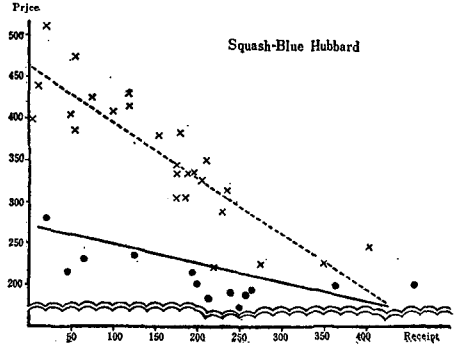
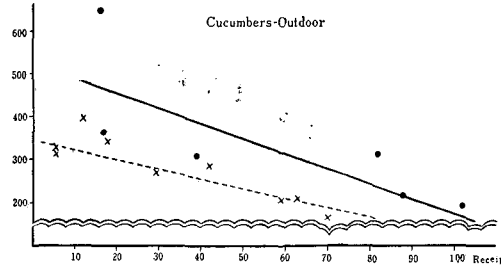
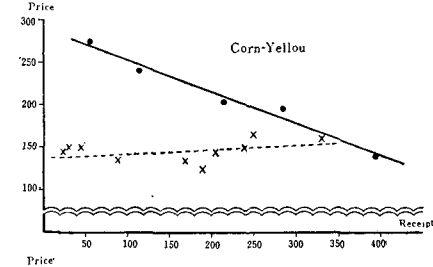


Chart 4. 2. (Continued)









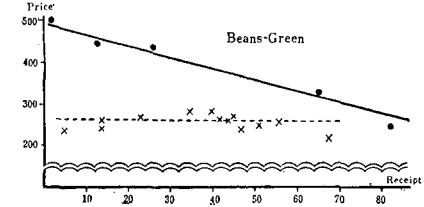
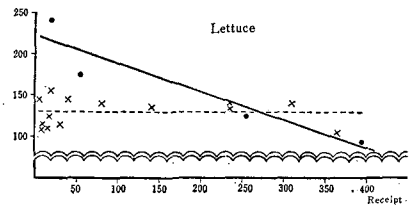
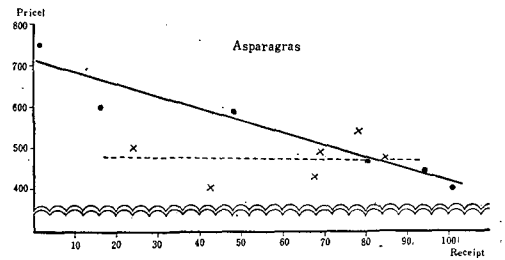
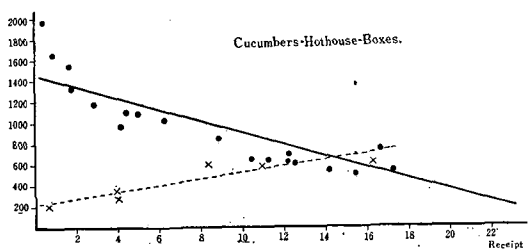
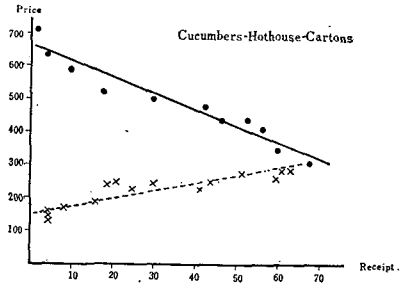


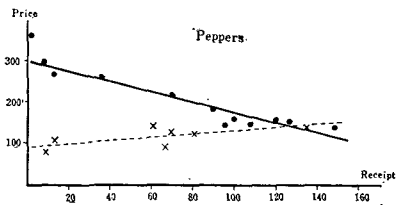
Chart 4. 2. (Concluded)

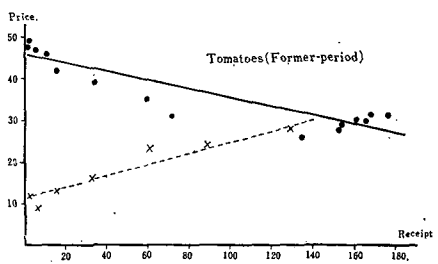












3. The pattern in which the equilibrium point movement is rising to the right during its period of expansion and decining to the left during its period of reduction.

4. The pattern in which the equilibrium point movement is moving horizontally to the right during its period of expansion and rising to the left during its period of reduction.

5. The pattern in which the equilibrium point movement is moving to the right horizontally during its period of expansion and moving to the left horizontally during its period of reduction.

6. The pattern in which the equilibrium point movement is moving to the right horizontally during its period of expansion and declining to the left during its period of reduction.

7. The pattern in which the equilirium point movement is declining to the right during its period of expansion and rising to the left during its period of reduction.

8. The pattern in which the equilibrium point movement is declining to the right during its period of expansion and moving to the left horizontally during its period of reduction.

9. The pattern in which the equilibrium point movement is declining to the right during its period of expansion and declining to the left during its period of reduction.

Six of the nine types outlined above are illustrated by the vegetables studied herein and are shown in Chart 4.2. The other three types, Nos. 2, 3, and 6, did not occur among the observations included in this study.

In order to describe these patterns more precisely, linear regression lines were fitted to the equilibrium point movements. The results of these fittings are shown in Table 4.1 and also in Chart 4.2 with solid lines during the period of expansion and dotted lines during the period of reduction. Thus, the patterns of the seasonal marketing movements are shown directly in these six types of trend lines in the price-receipts relationsips.

The relationships between these seasonal marketing patterns and the

Table 4.1. The equations of regression lines

Vegetables	Regression lines in the period of expansion	Regression lines in the Period of reduction
(1) Onions	P = 88.53+ 1.53q	P =222.99− 1.54q
(2) Tomataes (Latter period)	P = 8.42+ 0.20q	P = 44.69− 0.40q
(3) Radishes-hothouse (Former period)	P = 86.63+ 14.40q	P =458.93− 11.56q
(4) Carrots−Cut	P =144.97− 0.05q	P =157.65+ 0.64q
(5) Potatoes−50lb Bags	P =152.39− 0.39q	P =173.51− 1.05q
(6) Spinach (Former period)	P =111.80− 0.18q	P =147.54− 0.57q
(7) Potatoes−100lb Bags	P =280.39− 0.13q	P =258.40− 0.11q
(8) Cabbage	P =151.91− 0.25q	P =133.78− 0.13q
(9) Carrots−Bunched	P =129.87− 0.36q	P =105.25− 0.06q
(10) Radishes−Outdoor	P =170.14− 0.73q	P =103.70
(11) Radisher−Hothouse (Latter period)	P =354.10− 2.13q	P =306.19+ 3.70
(12) Spinach (Latter period)	P =177.66− 1.03q	P =122.87− 0.42q
(13) Squash−Butternuts	P =270.11− 3.51q	P =403.59− 6.08q
(14)Squash−Blue Hubbard	P =238.09− 0.16q	P =461.81− 0.67q
(15) Cucumhers−Outdoor	P =523.49− 3.53q	P =342.80− 2.23q
(16) Letuce	P =221.30− 0.34q	P =129.79
(17) Corn−Yellaw	P =289.74− 0.37q	P =138.97+ 0.04q
(18) Beans−Green	P =492.79− 2.67q	P =263.14− 0.14q
(19) Asparagras	P =712.73− 2.94q	P =482.45− 0.13q
(20) Cucumhers-hothouse -Boxes	P =1459.19−56.07q	P =234.35+ 29.27q
(21) Cucumbers-hathouse -Cartons	P =662.79− 4.91q	P =156.66+ 2.22q
(22) Peppers	P =293.90− 1.21q	P = 91.62+ 0.38q
(23) Tomatoes (Former period)	P = 45.69− 0.11q	P = 11.58+ 0.13q

marketing characteristics of the vegetables have to be considered. But, before doing this the theoretical meanings of these patteerns must be made clear. These theoretical problems will be considered in Chapter 5. Then the relationships which were described above will be taken up in Chaqter 6.

CHAPR 5

THEORETICAL CONSIDERATIONS OF SEASONAL MARKETING MOVEMENTS

In this chapter the patterns of seasonal marketing movements, that is, the patterns of the price-receipts relationships or the seasonal movement of equilibrium points, will be discussed theoretically.

5.1 Shifts of the demand curve and the supply curve with the expansion or the reductien of the market.

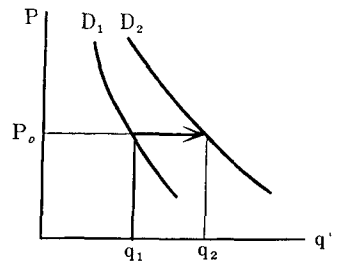
In this section the inferences for the demand curve and the supply curve which are given by expansion or reduction of the market, will be theoretically considered.

1. In the case of the demand curve the expansion or the reduction of the market must mean the expansion or the reduction of the amount demanded at a certain price. In other words, at a given price, when the market is expanding, the demand curve must be shifting to the right and vice versa.

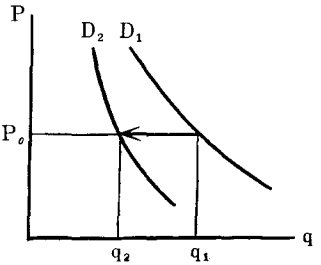
These circumstances are graphically explained as follows: The expansion of the maket means that the demanded amount q_1 increases up to q_2 at the same price P_0 in A of Chart 5.1 and the reducion of the maket means that the demanded amount q_1 decreases to q_2 at the same price P_0 in B of Chart 5.1.

This means that the demand curve will move to the right and flatten out in the case of expansion, and inversely it will move to the left and become steeper in the case of reduction. Next, the reason for the changing slopes wiht the shifting of the demand curve will be explained. When the demand curve moves to the right keeping its slope constant, the elasticity of demand will decrease. In other words, the demand will become more inelastic. Inversely, if the demand curve moves to the left keeping its slope constant, the elasticity of demand will increase or, in other words, the demand will become more elastic. In A and B of Chart 5.2, when the demand curve is

Chart 5. 1.

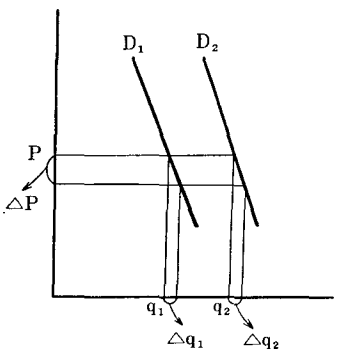


A. Expansion

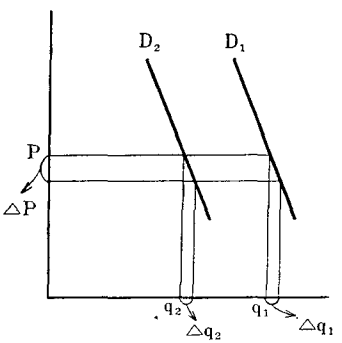


B. Reduction

Chart 5. 2.

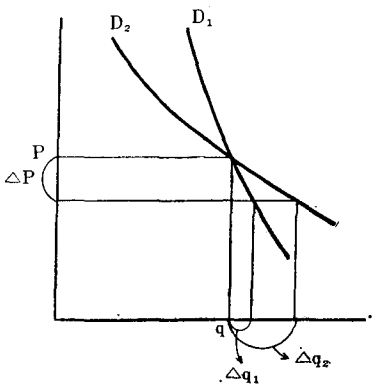


A. Expansion

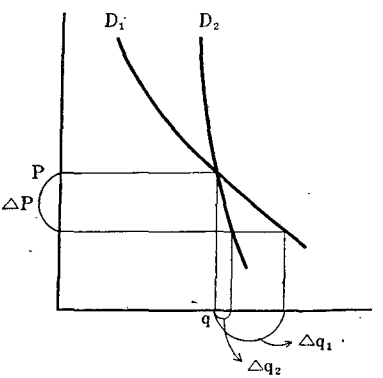


B. Reduction

Chart 5. 3.



A. Expansion



B. Reduction

D_1, the elasiticity of demand is

$$\eta_1 = \frac{\Delta q_1}{q_1} \Big/ \frac{\Delta P}{P}$$

and when the demand curve is D_2, the elasiticity of demand is

$$\eta_2 = \frac{\Delta q_2}{q_2} \Big/ \frac{\Delta P}{P}$$

Here, $\Delta q_1 = \Delta q_2$

anb $q_1 < q_2$ in the case of expansion (A)

$q_1 > q_2$ in the case of reduction (B)

Then $\eta_1 > \eta_2$ in the case of expansion (A)

$\eta_1 < \eta_2$ in the case of reduction (B)

When the demand curve becomes flatter at a given price, the elasticity of demand will increase. That is, the demand will become more elastic. Inversely, when the demand curve becomes steeper at a given price, the elasticity of demand will decrease or the demand will become more inelastic. In A and B of Chart 5.3 when the demand curve is D_1, the elasiticity of demand is

$$\eta_1 = \frac{\Delta q_1}{q} \Big/ \frac{\Delta P}{P}$$

And when the demand curve is D_2, the elasiticity of demand will become

$$\eta_2 = \frac{\Delta q_2}{q} \Big/ \frac{\Delta P}{P}$$

Here $\Delta q_1 < q_2$ in the case ofexpansion (A)

$\Delta q_1 > q_2$ in the case of reduction (B)

Then $\eta_1 < \eta_2$ in the case of expansion (A)

$\eta_1 > \eta_2$ in the case of reduction (B)

If it can be assumed that the elasiticity of demend is almost constant for a given commodity at a given price whether the demanded amount is large or not, then an expansion of the market (demanded amount) will cause the demand curve to move to the right and flatten out, and a reduction of the market will cause the demand curve to move to the left and become ste-

eper. These are the reasons for the shifting of the demand curve in the manner as described above.

2. In the case of the supply curve the expansion or the reduction of the market must mean the expansion or the reduction of the amount supplied at a certain price. In other words, at a given price, when the market is expanding, the supply cusve must be shifting to the right and vice versa.

Thus, it is possible to explain graphically these circumstances as follows. In A of Chart 5.4 the expansion of the market means that the supplied amount q_1 increases up to q_2 at the same price level p and in B of Chart 5.4 the reduction of the market means that the supplied amount q_1 decreases to q_2 at the same price level p.

These changes of the market will mean that the supply curve moves to the right and becomes flatter with the expansion of the market (supplied amount), and inversely it moves to the left and becomes steeper with the reduction of the market. The reasons for the changing slopes with the shifting of the supply curve will be considered below.

When the supply curve moves to the right holding its slope constnt, the elasticity of supply will decrease. In other words, the supply will become inelastic. Inversely, if the supply curve moves to the left holding its slope constant, the elasiticity of supply will increase or, in other words, the supply will become more elastic. In Chart 5.5 if the supply curve is S_1 the elasticity of supply will be

$$\eta_1 = \frac{\Delta q_1}{q_1} \Big/ \frac{\Delta P}{P}$$

Also if the supply curve becomes S_2, the elasticity of supply will become

$$\eta_2 = \frac{\Delta q_2}{q_2} \Big/ \frac{\Delta P}{P}$$

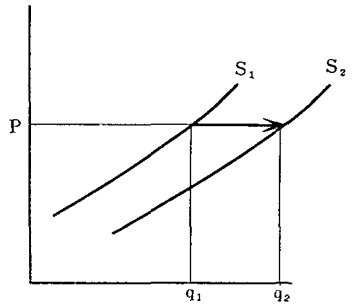
But $\Delta q_1 = \Delta q_2$

And $q_1 < q_2$ in the case of expansion (A)

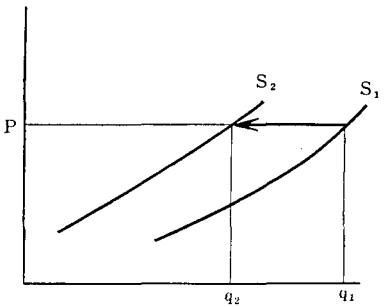
$q_1 > q_2$ in the case of reduction (B)

Then $\eta_1 < \eta_2$ in the case of expansion (A)

Chart 5. 4.

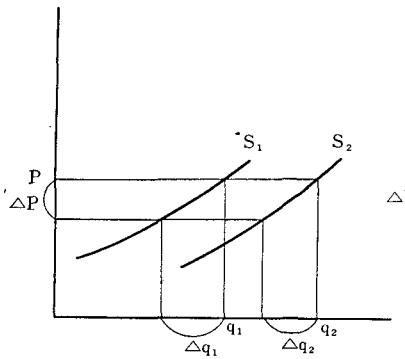


A. Expansion

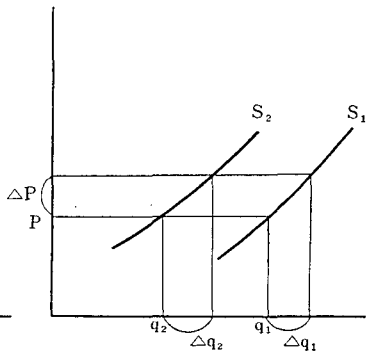


B. Reduction

Chart 5. 5.



A. Expansion



B. Reduction

$\eta_1 < \eta_2$ in the case of reduction (B)

If the supply curve becomes flatter at a give price, the elasticity of supply will increase. That is, the supply will be more elastic. Inversely, if the supply curve becomes steeper at a given price, the elasticity of supply will decrease. That is, the supply will become more inelastic. In Chart 5.6, when the supply curve is S_1, the elasticity of supply is

$$\eta_1 = \frac{\Delta q_1}{q_1} \Big/ \frac{\Delta P}{P}$$

if the supply curve becomes S_2. the elasticity of supply will become

$$\eta_2 = \frac{\Delta q_2}{q_2} \Big/ \frac{\Delta P}{P}$$

Here $\Delta q_1 < \Delta q_2$ in the case of expansion (A)

$\Delta q_1 > \Delta q_2$ in the case of reduction (B)

Then $\eta_1 < \eta_2$ in the case of expansion (A)

$\eta_1 > \eta_2$ in the case of reduction (B)

If it can be assumed that the elasticity of supply is almost constant for a given commodity at a given price whether the supplied amout incraeses or not, then an expansion of the market (supplied amount) will cause the supply curve to move to the right and become flatter, and a reduction of the market will cause the supply curve to move to the left and become steeper.

Thus, at a given price, both the demand curve and the supply curve will shift to the right and flatten out with the expansion of the market, that is, with the expansion of the demanded or the supplied amount. Inversely, at a given price they will shift to the left and become steeper with a reduction of the market.

Next to be considered is how the seasonal marketing movement, that is, the movement of equilibrium points (the intersctions of the demand curve and the supply curve) are affected by the shifts of the demand curve and the supply curve in accordance with the expansion or the reduction of market.

Chart 5. 6.

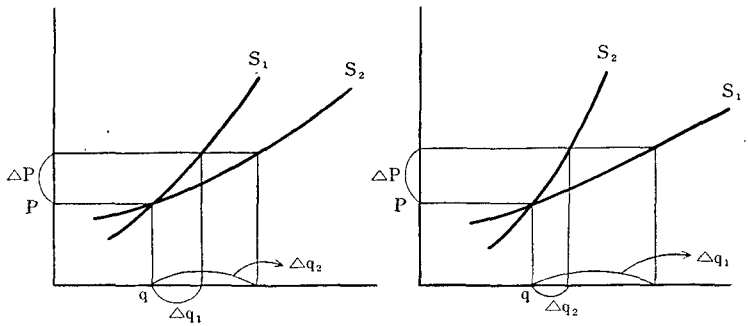
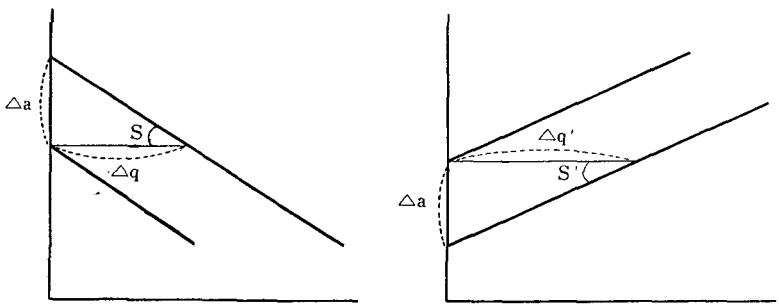


Chart 5. 7.



5.2 Shits of the movements of equilibrium points with expansion of reduction of the market.

In this section the relationships betwen the movement of the equilibrium points (that is, the intersections of the demand curve and the supply curve) and the shifts of the demand curve and the supply curve with the expansion or the reduction of the market will be considered.

In order to see these relationsips more clearly, the situations will be simplified as follows: That is to say, it is assumed that both the demand curve and the supply curve are linear and their equations are $p = a - bq$, and $p = a' + b'q$, respectively. Here p is price and q is qnantity which is demanded or supplied. Also the costants, a, b, and b' are poaitive and a' can be positive or negative. And the shifts according to which the demand curve and the supply curve move to the right means that the value of a becomes larger and the value of a' becomes smaller. Inversely, the shifts accoring to which the demand curve and the supply curve move to the left mean that the value of a becomes smaller and the value of a' becomes larger.

Also the shifts according to which the demand curve and the supply curve become flatter mean that the value of b and b' become smaller, and the shifts according to which the demand curve and the supply curve become steeper mean that the value of b and b' become larger.

Accordingly, the relationships between the movements of the equilibrium points and the shifts of the demand curve and the supply curve will be considered in the following two cases, (1) changing the values of a and a' and (2) changing of the values of b and b'.

First, the relationship in the case of changing the value of a and a' will be explained, in which case the demand curve and the supply curve move to the right or to the left without changing their slopes. In order to explain this, the equilibrium point (intersection) of the demand curve and the supply curve will be determined. This value is as follows:

$$p=\frac{ab'+a'b}{b+b'} \qquad q=\frac{a-a'}{b+b'}$$

First, the expansion of the market will be taken up. It is assumed that the value of p equals p_1 when the value of a and a' remain unchanged, and the value of p equals p_2 when the value of a and a' become $a+\Delta a$ and $a'-\Delta a'$, respectively. Then the following eqnations will come into existence.

$$p_1=\frac{ab'+a'b}{b+b} \quad \text{and} \quad p_2=\frac{(a+\Delta a)\,b'+(a'-\Delta a')b}{b+b'}$$

Then the change of p with the changes of a and a' can be considered by examining the difference between the two values, that is, p_1-p_2

$$p_1-p_2=\frac{ab'+a'b}{b+b'}-\frac{(a+\Delta b)b'+(a'-\Delta a')\,b}{b+b'}=\frac{\Delta a'b-\Delta ab'}{b+b'}$$

In the above equation, the value of p_1-p_2 will depend upon the value of $\Delta a'b-\Delta ab'$, because the denominator, $b+b'$, is positive.

If	$\Delta a'b > \Delta ab'$	then	$P_1 > P_2$
	$\Delta a'b = \Delta ab'$		$P_1 = P_2$
	$\Delta a'b < \Delta ab'$		$P_1 < P_2$
Also if	$\Delta a'b > \Delta ab'$	then	$\Delta a'/b' > \Delta a/b$
	$\Delta a'b = \Delta ab'$		$\Delta a'/b' = \Delta a/b$
	$\Delta a'b < \Delta ab'$		$\Delta a'/b' < \Delta a/b$

Consequently

if	$\Delta a'/b' > \Delta a/b$	then	$P_1 > P_2$
	$\Delta a'/b' = \Delta a/b$		$P_1 = P_2$
	$\Delta a'/b' < \Delta a/b$		$P_1 < P_2$

And when $p_1>p_2$, the movement of the equilibrium points will decline to the right. When $P_1=P_2$, the movement of the equilibrium points will move to the right horizontally. Finally, when $P_1<P_2$ the movement of the equilibrium points will rise to the right.

Next, the case of the reduction of the market will be considered. Here, it is assumed that the value of P equals P_1 when the values of a and a' remain unchanged, and the value of P equals P_2 when the values of a and

a' become $a-\Delta a$ and $a'+\Delta a'$, respectively. Thus, the difference of P_1 and P_2, that is, P_1-P_2, will become as follows:

$$P_1-P_2=\frac{ab'+a'b}{b+b'}-\frac{(a-\Delta a)b'+(a'+\Delta a')b}{b+b'}=\frac{\Delta ab'-\Delta a'b}{b+b'}$$

In this equation, the value of P_1-P_2 depends upon the value of $\Delta ab'-\Delta a'b$, because the $b+b'$ is positive, again,

If	$\Delta ab' > \Delta a'b$	then	$P_1 > P_2$
	$\Delta ab' = \Delta a'b$		$P_1 = P_2$
	$\Delta ab' < \Delta a'b$		$P_1 < P_2$
Aiso if	$\Delta ab' > \Delta a'b$	then	$\Delta a/b > \Delta a'/b'$
	$\Delta ab' = \Delta a'b$		$\Delta a/b = \Delta a'/b'$
	$\Delta ab' < \Delta a'b$		$\Delta a/b < \Delta a'/b'$

Consequently if

$\Delta a/b > \Delta a'/b'$	then	$P_1 > P_2$
$\Delta a/b = \Delta a'/b'$		$P_1 = P_2$
$\Delta a/b < \Delta a'/b'$		$P_1 < P_2$

Also when $P_1>P_2$, the movement of equilibrium points will decline to the left and when $P_1=P_2$, the movement of equilibrium points will move to the left horizontally and when $P_1<P_2$, the movement of equilibrium points will rise to the left. Thus, the criteria by which the types of movements of the epuilibrium points can be judged where the demand curve and the supply curve move to the right (expansion) or to the left (reduction) without changing their slopes, have baen determined.

Next, the characteristics of $\Delta a/b$ and $\Delta a'/b'$ which are the ratios of additional increases of a and a' compared to their slopes and which are used as the criteria mentioned above, will de considered. In A of Chart 5.7 which shows the case of the demand curve

$$b=tan\ s=\frac{\Delta a}{\Delta q}$$

Therefore $\Delta a/b=\Delta q$

Here, Δq is the additonal increase or decreasse of the amount which

is demanded, and s is the angle at which the demand curve intersects the horizontal axis. Thus $\Delta a/b$ means an additional incerase (in the case of expansion) or an additional decrease (in the case of reduction) of the amount which is demanded at a certain price. As can be supposed, according to B of chart 5.7, $\Delta a'/b'$ means an additional increase (in the case of expansion) or an additional decrease (in the case of reduction) of the amount which is supplied at a certain price.

Also Δq can de called "the marginal increase of demand" in the case of expansion or "the marginal decrease of demand" in the case of reduction, and $\Delta q'$ can be called "the marginal increase of supply" in the case of expansion or "the marginal decreaase of supply" in the case of reduction.

Consequently the criteria which were induced above will be concluded as follows: In the case of expansion

1. If $\Delta q' > \Delta q$, that is, the marginal increase of supply is larger than the marginal increase of demand, the movement of equilibrium points will decline to the right.

2. If $\Delta q' = \Delta q$, that is, the marginal increase of supply equals the marginal increase of demand, the movement of equilibrium points will move to the right horizontally.

3. If $\Delta q' < \Delta q$, that is, the margimal increase of supply is smaller than the marginal increase of demand, the movement of the equilibrium points will rise to the right.

In the case of reduction

1. If $\Delta q > \Delta q'$, that is, the marginal decrease of demand is larger than the marginal decrease of supply, the movment of the equilibrium points will decline to the left.

2. If $\Delta q = \Delta q'$, that is, that marginal decrease of demand equals the marginal decrease of supply, the movement of equilibrium points will move to the left horizontally.

3. If $\Delta q < \Delta q'$, that is, the marginal decrease of demand is smller than the marginal decrease of supply, the movement of equilibrium points

will rise to the left.

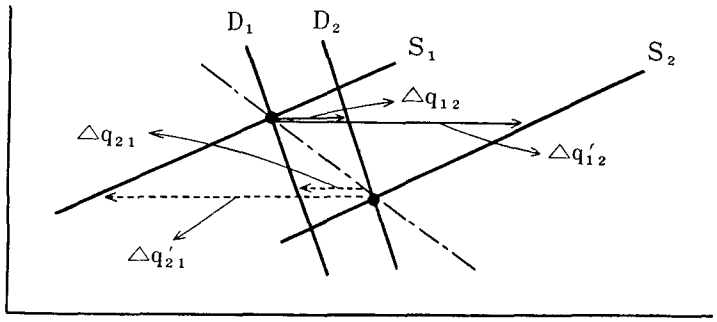
These conclusions in the case in which the demand curve and the supply curve move to the right (expansion) or to the left (reduction) without changing their slopes, may become more distinct in the following graphical explanation: In A, B and C of Chart 5.8, D_1 and S_1 are the demand curve and the supply curve during period 1, and D_2 and S_2 are the demand curve and the supply curve during period 2, respectively. Also Δq_{12} and $\Delta q'_{12}$ show the marginal increase of demand and the marginal increase of supply, when the amount which is demanded and supplied, expand from period 1 to period 2. And Δq_{21} and $\Delta q'_{21}$ show the marginal decrease of demand and the marginal decrease of supply, when the amount which is demanded and supplied are reduced from period 2 to period 1.

Then it will be easy to understand that the movement of the equilibrium points declines to the right when $\Delta q'_{12} > \Delta q_{12}$ in the case of expansion and rises to the left when $\Delta q'_{21} > \Delta q_{21}$ in the case of reduction in A. In B, it will be easy to undersand that the equilibrium points move to the right or to the left horizontally, respectirey, when $\Delta q'_{12} = \Delta q_{12}$ or $\Delta q'_{21} = \Delta q_{21}$ either when there is expansion or reduction. Finally in C, it can be readily seen that the equilibrium points rise to the right when $\Delta q'_{12} < \Delta q_{12}$ in the case of expansion, and decline to the left when $\Delta q'_{21} < \Delta q_{21}$ in the case of reduction.

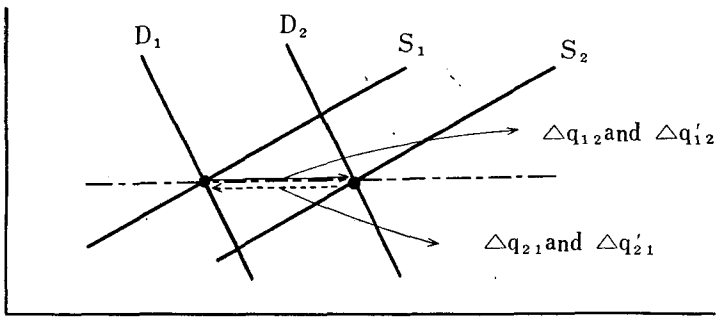
Next, to be considered will be the relationships between the movements of the equilibrium points and the shifts of the demand and the supply curves in the case of the changing of the values of b and b′, that is, the case in which the slopes of the demand curve and the suppby curve become flatter or steeper at the same price level.

First, the case of market expansion will be taken up. It is assmed that the values of b and b′ decrease to $b-\Delta b$ and $b'-\Delta b'$, and also that the value of P equals P_1 when the values of b and b′ remain unchanged, and the value of P equals P_2 when the values of b and b′ become $b-\Delta b$ and $b'-\Delta b'$, respectively. After that the change of P with the changes of b and b′ will be examined.

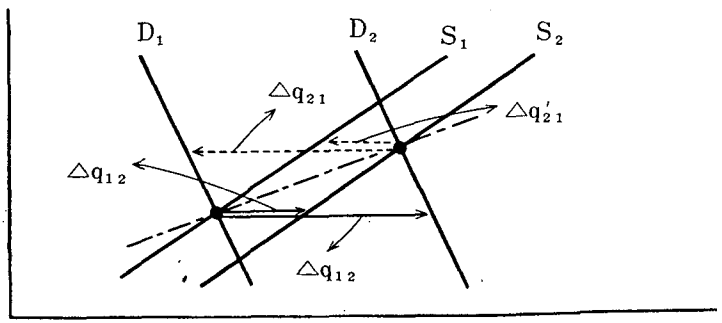
Chart 5. 8.


D1
D2
S1
S2
△q12
△q21
△q'12
△q'21

A


D1
D2
S1
S2
△q12and △q'12
△q21and △q'21

B


D1
D2
S1
S2
△q21
△q'21
△q12
△q12

C

The value of P_1 and P_2 are as follows:

$$P_1=\frac{ab'+a'b}{b+b'} \qquad P_2=\frac{a(b'-\Delta b')+a'(b-\Delta b)}{(b-\Delta b)+(b'-\Delta b')}$$

And the difference between these two values of P will be as follows:

$$P_1-P_2=\frac{a'b+a'b}{b+b'}-\frac{a(b'-\Delta b')+a'(b-\Delta b)}{(b-\Delta b)+(b'-\Delta b')}$$

$$=\frac{(a-a')(b\Delta b'-\Delta bb')}{(b+b')\{(b-\Delta b)+(b'-\Delta b')\}}$$

Here, the denominator and $(a-a')$ are positive, then whether P_1 is larger than P_2 or not, will be decided by whether $b\Delta b'$ is larger than $\Delta b\, b'$ or not.

If	$b\Delta b' > \Delta bb'$	then	$P_1 > P_2$
	$b\Delta b' = \Delta bb'$		$P_1 = P_2$
	$b\Delta b' < \Delta bb'$		$P_1 < P_2$
Alse if	$b\Delta b' > \Delta bb'$	then	$\Delta b'/b' > \Delta b/b$
	$b\Delta b' = \Delta bb'$		$\Delta b'/b' = \Delta b/b$
	$b\Delta b' < \Delta bb'$		$\Delta b'/b' < \Delta b/b$

Then the following reletions will be derived

If	$\Delta b'/b' > \Delta b/b$	then	$P_1 > P_2$
	$\Delta b'/b' = \Delta b/b$		$P_1 = P_2$
	$\Delta b'/b' < \Delta b/b$		$P_1 < P_2$

Second, the case of market reduction will be considered. In this case it is assumed that the value of P equals P_1 when the values of b and b′ remain unchanged, and the value of P equals P_2 when the values of b and b′ become $b+\Delta b$ and $b'+\Delta b'$, respectively.

Thus the difference P_1 and P_2 will bdcome as follows:

$$P_1-P_2=\frac{ab'+a'b}{b+b'}-\frac{a(b'+\Delta b')+a'(b+\Delta b)}{(b+\Delta b)+(b'+\Delta b')}$$

$$=\frac{(a-a')(\Delta bb'-b\Delta b')}{(b+b')\{(b+\Delta b)+(b'+\Delta b')\}}$$

In the above equation, the denominator and $(a-a')$ ase positive, then the value of P_1-P_2 will depend upon the value of $\Delta bb'-b\Delta b'$.

If	$\Delta bb' > b\Delta b'$	then	$P_1 > P_2$
	$\Delta bb' = b\Delta b'$		$P_1 = P_2$
	$\Delta bb' < b\Delta b'$		$P_1 < bP_2$
Also if	$\Delta bb' > b\Delta b'$	then	$\Delta b/b > \Delta b'/b'$
	$\Delta bb' = b\Delta b'$		$\Delta b/b = \Delta b'/b'$
	$\Delta bb' < b\Delta b'$		$\Delta b/b < \Delta b'/b'$

Consequently

If	$\Delta b/b > \Delta b'/b'$	then	$P_1 > P_2$
	$\Delta b/b = \Delta b'/b'$		$P_1 = P_2$
	$\Delta b/b < \Delta b'/b'$		$P_1 < P_2$

Here $\Delta b/b$ is the ratio of an additional decrease of the slope of the demand curve (in the case of expansion) or the ratio of an additional increase of the slope of the demand curve (in the case of reductiion) compared with the original slope of the demand curve, and can be called "the relative decreasing ratio of slope" (in the case of expansion) and "the relative increasing ratio of slope" (in the case of reduction) of the demand curve.

Also $\Delta b'/b'$ is the ratio of an additional decrease of the slope of the supply curve (in the case of expansion) or the ratio of an additional increase of the slope of the supply curve (in the case of reduction) compared with the original slope of the supply curve, and can be called "the relative decreasing ratio of slope" (in the case of expansion) or "the relative increasing ratio of slope" (in the case of reduction) of the supply curve.

Thus, the criteria by which the types of the equilibrium point movements can be judged, in the case in which the slopes of the demand curve and the supply curve become flatter or steeper, have been obtained. These criteria are as follows:

In the case of expansion

1. If the relative decreasing ratio of slope of the supply curve is larger than the relative decreasing ratio of slope of the demand curve, the movement of equilibrium points will decline to the right.

2. If the relative decreasing ratio of slope of the supply curve equals

the relative decreasing ratio of slope of the demand curve, the movement of equilibrium points will move to the right horizontally.

3. If the relative decreasing ratio of slope of the supply curve is smaller than the relative decreasing ratio of slope of the demand curve, the movement of equilibrium points will rise to the right.

In the case of reduction

1. If the relative increasing ratio of slope of the demand curve is larger than the relative increasing ratio of slope of the supply curve, the movement of equilibrium points will decline to the left.

2. If the relative increasing ratio of slope of the demand curve equals the relative increasing ratio of slope of the supply curve, the movement of equilibrium points will move to the left horizontally.

3. If the relative increasing ratio of slope for the demand curve is smaller than the relative increasing ratio of slope of the supply curve, the movement of equilibrium points will rise to the left.

5.3 Patterns of the market

According to the conclusions determined in the former sections of this chapter, the patterns of the market can be classified into three types for market expansion and three types for market reduction.

1. The supply superior market.

This is a market in which the expansion or the reduction of the market is mainly caused by the expansion or the reduction of demand. Of course, in this case the supply is expanded or reduced too, but the forces of expanding or declining demand are stronger than the forces of expanding or declining supply. That is to say, in the case of market expansion, the marginal increase of demand and the relative decreasing ratio of slope of the demand curve are larger than the marginal increase of supply and the relative decreasing ratio of slope of the supply curve. In the case of market reduction, the marginal decrease of demand and the relative increasing ratio of slope of the demand curve are larger than the marginal decrease of supply and the

relative increasing ratio of slope of the supply curve, respectively. Consequsntly, the movement of equilibrium points in this market will be of the type that rises to the right in the case of expansion and declines to the left in the case of reduction.

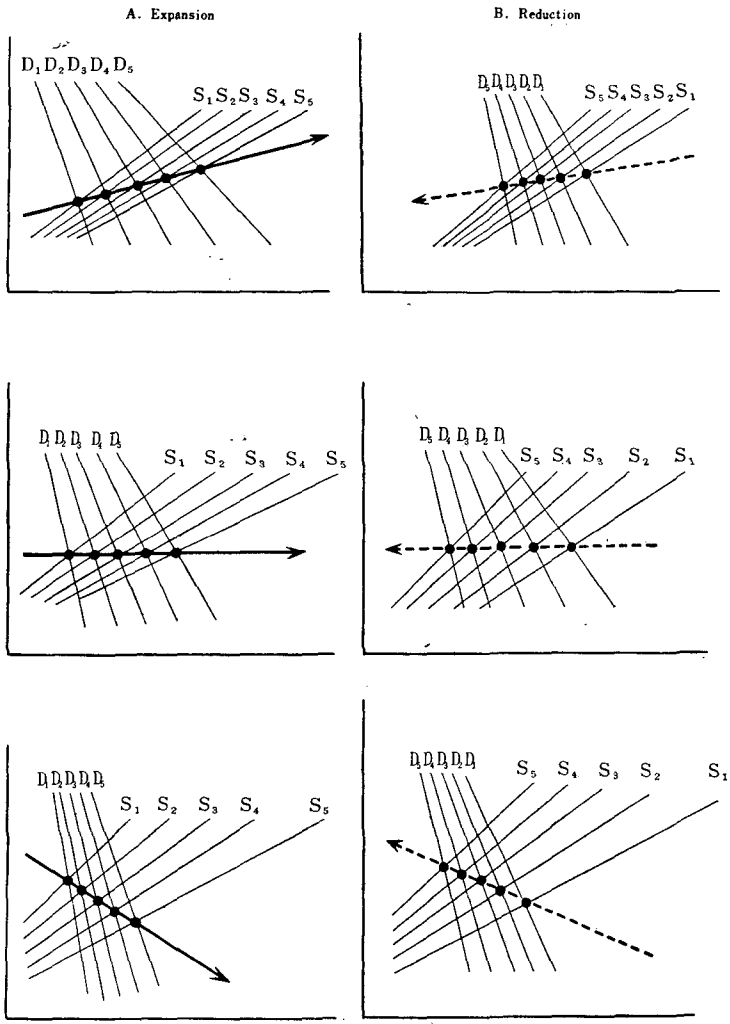
2. The demand-supply balanced market

This is a market in which the demand and the supply will expand or reduce equally, and the expansion and the reduction of the market is equally caused by the expansion and the reduction of both demand and supply. That is to say, in the case of market expansion, the marginal increase of demand and the ralative decreasing ratio of slope of the demand curve equal the marginal increase of supply and the relative decreasing ratio of slope of the supply curve, respectively. In the case of market reduction, the marginal decrease of demand and the relative increasing ratio of slope of the demand curve equal the marginal decrease of supply and the relative increasing ratio of slope of the supply curve, respectively. Accordingly the movement of equilibrium points will be of the type that move to the right horizontally in the case of expansion and move to the left horizontally in the case of reduction.

3. The demand superior market.

This is a markes in which the expansion or the reduction of market is mainly caused by the expansion or the reduction of supply, and the demand will be kept almost constant or will be expanded or reduced very slightly. That is to say, in the case of market expansion, the marginal increase of demand and the relative decreasing ratio of slope of the demand curve are smaller the marginal increase of supply and the relative decreasing ratio of slope of the supply curve. Also in the case of market reducion, the marginal decrease of demand and the relative increasing ratio of slope of the demand curve are smaller than the marginal decrease of supply and the reltive incressing ratio of slope of the supply curve, respectively. Consequently, the movement of equilibrium points in this market will be of the type that declines to the right in the case of expansion and that rises to the left in the case of reduction.

Chart 5. 9.


A. Expansion
B. Reduction
D1 D2 D3 D4 D5
S1 S2 S3 S4 S5
D5 D4 D3 D2 D1
S5 S4 S3 S2 S1
D1 D2 D3 D4 D5
S1 S2 S3 S4 S5
D5 D4 D3 D2 D1
S5 S4 S3 S2 S1
D1 D2 D3 D4 D5
S1 S2 S3 S4 S5
D1 D2 D3 D4 D5
S5 S4 S3 S2 S1

These three types of markets in both cases (expansion and reduction) are graphically shown in Chart 5.9. Thus, the type of market for a certain commodity can be determined by the examination of patterns which are formed by the movements of equilibrium points.

CHAPTER 6

RELATIONSSHIPS BETWEEN THE PATTERNS OF THE SEASONAL MARKETING MOVEMENTS AND THE MARKETING CHARACTERISTICS OF VEGETABLES

In this chapter the relationships between the patterns of the seasonal marketing movements, considered in Chapter 4, and the marketing characteristics of vegetables, will be investigated on the basis of the theoretical considerations discussed in Chapter 5.

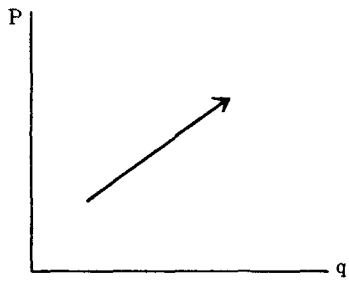
To do this, first, the theoretical characteristics of the possible seasonal marketing patterns explained in Chapter 5 will be rearranged for application to this problem.

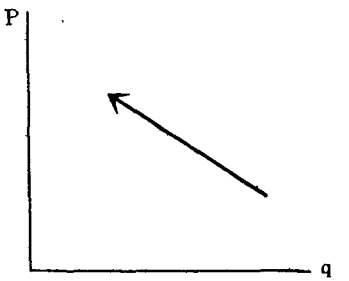
The patterns of the seasonal marketing movements, that is, the patterns of the movements of equilibrium points, were grouped into three types, (1) those rising to the right, (2) those moving to the right horizontally, and (3) those declining to the right during the period of expansion. Also, they were grouped into three types, for the period of reduction, (1) those rising to the left, (2) those moving to the left horizontally, and (3) those declining to the left.

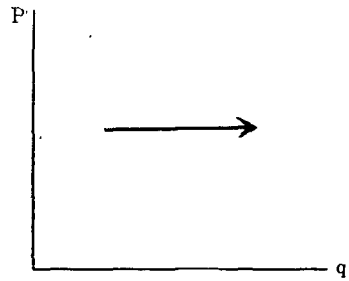
These patterns are shown in Chart 6.1 symbolically. In other words, during the period of expansion, the pattern "rising to the right" means that as receipts increase, price increases. The pattern "moving to the right horizontally" means that as receipts increase price remains almost unchanged, and the pattern "declining to the right" means that as receipts increase, price declines.

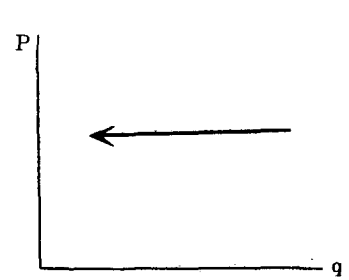
During the period of reduction, the pattern "rising to the left" means that as receipts decrease, price increases. The pattern "moving to the left horizontally" means that as receipts increase, price remains almost constant,

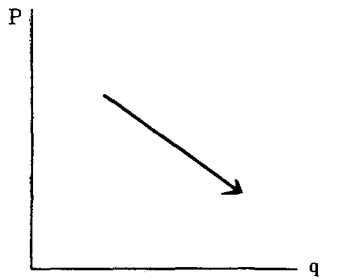
Chart 6. 1.

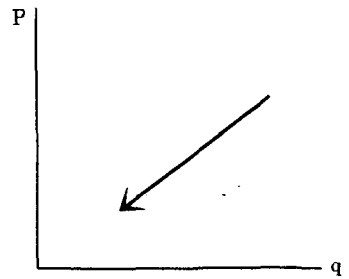












A. Expansion

B. Reduction

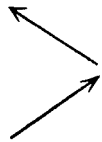
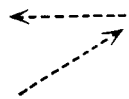
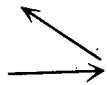
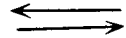
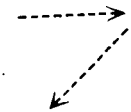
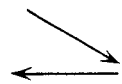
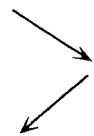
and the pattern "declining to the left" means that as receipts decrease, price declines.

Accordingly, nine combinations of patterns of the seasonal marketing movements are theoretically possible during an entire marketing period. These patterns of seesonal marketing movements are shown in Chart 6.2 symbolically. Three were not illustrated in this study. They are shown by dotted lines in Chart 6.2. In Chart 6.2, the series represented by the first column shows that after reaching the peak of the receipts movement, the forces of demand are reduced at a slower rate than supply as supply decreases during the reduction period of the market. The series represented by the second column shows that after reaching the peak of the receipts movement, the forces of demand and supply are reduced at the same rate. In other words, supply and demand remain in balance. The series represented by the third column shows that after reaching the peak of the receipts movement, the forces of demand are reduced at a faster rate than supply.

The series represenied by the first row shows that during the period of market expansion, the forces of demand are relatively stronger than the forces of supply. In this series, it should be noted that when demand expands more rapidly than supply during the period of expansion, demand probably will not be reduced at the same rate as supply or faster than supply during the period of reduction. In this study the seasonal marketing movements to illustrate the latter two types ((1) (2) and (1) (3)) did not appear. Thus, it may be said for vegetables that classify into this series, that demand is dominant or unusually strong, even during the period of expansion, (that is, supply is increasing, but demand is increasing even faster) hence, during the period of reduction demand still remains relatively strong, that is, so strong that it may (1) decrease more slowly than supply but probably (2) it will not decrease at the same rate as supply or (3) faster than supply.

The series represented by the second row shows that during the period of market expansion, the forces of demand and supply are increased at the same rate. In this series, it should be noted that when the demand expands at

Chart 6. 2.

Reduction / Eexpansion	① Rising to the left	② Moving to the left horizontally	③ Declining to the left
① Rising to the right			
② Moving to the right horizontally			
③ Declining to the right			

——— = Patterns which occur in this stndy.

- - - - - = Patterns which do not occur in this study.

the same rate as the supply during the peried of expansion, demand probably will not be reduced faster than the supply during the period of reduction. In this study the seasonal marketing movements to illustrate this type ((1) (2)) did not exist. Thus, it may be said for vegetables that classify into this series, where demand increases at the same rate during expansion, that during the period of reduction demand may (1) decrease more slowly than supply (2) decrease at the same rate as supply but probably (3) it will not decrease faster than supply.

The series reprsented by the third row shows that during the period of market expansion, the forces of demand are relatively weaker than the forces of supply. That is, demand increases relatively more slowly than supply. During the market reduction, demand may (1) decrease more slowly than supply (2) decrease at the same rate as supply, or (3) decrease faster than supply.

Next, the following conclusions on the economic meaning of the patterns of the seasonal marketing movements and on the marketing characteristics of vegetables, are induced.

The type (1) (1) in Chart 6.2 illustrates a market in which demand is dominant during both phases (expansion and reduction). That is, during expansion, demand increases faster than supply. During the reduction phase, demand may (1) continue to increase, (2) remain constant, or (3) decline at slower rate than supply.

In this type of market situation, most likely to be found, are the more staple vegetables considered most necessary for consumption. In this study, onions, tomatoes (former period), hothouse radishes, and cut carrots fall into this group.

The type (2) (1) illustrates a market in which demand increases as the same rate as supply during the expansion phase and during the reduction phase, demand may (1) continue to increase, (2) reemain constant, or (3) decline at slower rate than supply.

In this type of market situation, most likely to be found, are the staple

vegetables considered more necessary for consumption but a little less so than for type (1) (1). In this study, potatoes in 50 lb, bags and spinach (former period) fall into this group.

The type (3) (1) illustrates a market in which demand increases more slowly than supply during the expansion phase but during the reduction phase, demand may (1) continue to increase, (2) remain constant, or (3) decrease at slower rate than supply.

In this type of market situation, most likely to be found, are the staple vegetables considered necessary for consumption but a little less so than for type (2) (1). In this study, spinach (latteh period), Butternuts squash, Blue Hubbard squash, and outdoor cucumbers fall into this group.

The type (2) (2) illustrates a market in which demand increases at the same rate as supply during the expansion phase and during the reduction phase, decreases at the same rate as supply.

In this type of market situation, most likely to be found, are the vegetables considered moderately necessary for consumption. In this study, potatoes in 100 lb. bags, outdoor radishes, hothouse radishes (latter period), cabbage, and bunched carrots are included in this group.

The type (3) (2) illustrates a market in which demand increases more slowly than supply during the expansion phase and during the reduction phase, demand decreases at the same rate as supply.

In this type of market situation, most likely to be found, are the vegelables considered slightly less than moderately necessary for consumption. In this study, yellow corn, green beans, lettuce, and asparagras fall into this group.

Finally, the type (3) (3) illustrates a market in which demand increase more slowly than supply during the expansion phase and decreases faster than supply during the reduction phase.

In this type of market situation, most likely to be found, are the vegetbles considered relatively unnecessary for consumption. In this study hothouse cucumbers in boxes, hothouse cucumbers in cartons, peppers, and

tomatoes (former period) fall into this group.

Accorcingly it can be concluded that the patterns of marketing movements are arranged from the market for the necessaries to the market for the commodities which are relatively unuecessary, arranged in ordor from type (1) (1) to type (3) (3), and further that the vegetables which are included in each pattern of the market also have such characteristics.

CHAPTER 7

CONCLUSIONS

7.1 Conclusions

As stated in Chapter 1, the purpose of this study is to analyze the seasonal marketing movements of vegetables in the Boston market,and to develope theoretical illustrations of these movements. To accomplish this objective it was necessry to start with empirical data of averge weekly receipts and average weekly prices and determine seasonal receipt movements and seasonal price movements. But my central idea was to carry an analysis beyond the simple observations of seasonal receipt movements and seasonal price movements and from these construct seasonal movements of weekly equilibrium points of supply and demand and analyze these and construct a system of theoretical illustrations from which to base my conclusions. This study has followed these procedures from beginning to end.

The results of these analyses were explained in detail in each chapter. They will be summarized below as follows:

The seasonal receipt movements of most vegetables have a distribution which is characterized by one peak.

The marketing period for most vegetables is divided into two partial periods, the period of expansion which is the period of reaching its peak and the period of reduction which is the period of decreasing from its peak.

Three types of seasonal marketing movements are possible during the period of expansion and also three types of seasonal marketing movements are possible during the period of reduction. Consequently nine patterns of seasonal marketing movements are possible over the whole marketing period as combinations of these.

Six of these patterns are found among the vegetables used in this study and certain tendencies are found from which a pattern is obtained as

discussed in Chapter 6. These tendencies were as follows:

In the series of the three market situations in which demand increases faster than supply during the period of expansion, two patterns are not represented by vegetables included in this study. They were (1) the pattern in which demand reduces at the same rate as supply during the period of reduction and (2) the pattern in which demad reduces faster than supply during the period of reduction.

In the series of the three market situations in which demand increases at the same rate as the supply during the period of expansion, one pattern is not represented by vegetables included in this study. This was the pattern in which demand reduces faster than supply during the period ot reduction.

Consequently these tendencies probably mean that after demand is expanded at a certain rate, it will remain almost constant, and demand during the period of reduction is never reduced faster than the velocity of expanding demand during the period of expansion. These tendencies should be of great interest for future researchers.

The economic meanings of the seasonal marketing patterns of these vegetables have been made clear according to the results of the theoretical considerations discussed in Chapter 5. Based on the considerations mentioned above, it has been determined that the pattern of the seasonal marketing movement of each vegetable reflects the degree of its importance in consumption.

As discussed in Chapter 1, when the economic interdependent relationships between seasonal receipt movements and seasonal price movements are examined as price-receipts relationships, the phenomena which can be observed directly will be the series of equilibrium points. Most of the marketing theories up to present have been developed by using directly the theory of demand and supply. But here, what can be observed directly are the series of equilibrium points and the demand relationships or the supply relationships that are behind them. Consequently, some marketing theories based on the locus of these equilibrium points should be developed in the future. It is thought that the

theoretical considerations which were mainly discussed in Chapter 5 might provide an answer to this problem. The theories which were developed in Chapter 5 may be inadequate or incomplete and also the methods by which the theories were developed may not be sufficient. But it is thought that the clue for developing these theories is provided by this study.

7.2 Problems which are left for the future.

The conclusions of this study are as mentioned above. But there are many problems which should be solved in the ,future in connnection with this study. The major problems will be pointed out here.

1. In this study only vegetables have been used to study the seasonal marketing movements of farm products. Accordingly the applications of this study for the other farm products, for example, fruits, meat, eggs, and so on, should be carried out in the future.

And in such a case, the theoretical methods which were developed in this study should basically be applied, although some modifications may be necessary. Thus, the relationships between seasonal marketing patterns and marketing characteristics among all farm products, should be examined.

2. Marketing movements in the short-run have been observed in this study. The methods whhch were developed herein can be applied to the study of marketing movements in the long-run. In other words, similar studies of marketing movements will be possible, too, by using the data which are arranged in yearly time series. But in such cases, the pattern of the marketing movement which declines to the right, may prevail for most farm products. In other words, it is presumed that for most farm products the expansion of the market in the long-run, will mainly be caused by the expansion of supply.

In general, the supply will mainly be expanded by the increase of production, and the demand will mainly be expanded by the increase of income, in the long-run. As a matter of fact, the production and the income will increase year after year, and the increase of production will directly be reflected

on the increase of supply, but the relationship between the increase of income and the expansion of demand will not be direct as with the relationship between the increase of production and the expansion of supply. That is to say, the preblem of income elasticity of demand will erter in.

In general, it is presumed that the increase of income will not result greatly in the increase of demand for farm preducts, because the income elasticity of demand for farm products will be very small. And also it is presumed that there are some differences in the relationships between the increase of income and the expansion of demand among farm products, because there will be some differences in the amount of income elasticity of demand among farm products. This would be one of the essential reasons why the patterns of the marketing movenents of most farm products in the long-run, will decline to the risht. Of course the elasticity of demand for farm products will also be related to this problem. In any event, it will be of interest to pursue the relationships between income elasticity of demand for farm products and their marketing movement patterns in the long-run.

3. As can be expected by the considerations mentioned in this study, the elasticity of demand will be closely related to these studies. Accordingly, the behavior of demand elasticity is likely to be a very important problem for study in the future. And as discussed in Chapter 1 there are serious suspicions in the method of measuring the elasticity of demend which have been carried out up to the present. Thus, the actual study of elasticity of demand by the methods suggested in Chapter 1, will be one of the problems left for the future.

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