PRICE RELATIONS BETWEEN JULY AND SEPTEMBER WHEAT FUTURES AT CHICAGO SINCE 1885

THE price spread between July and September wheat is determined primarily by current domestic supplies of all wheat in the United States, conveniently measurable in terms of July 1 carryover. Early in the season the spread may show little relation to the statistical supply position, but by June the relation normally becomes very close. Given an accurate appraisal of the domestic supply position, the price spread in June may usually be predicted with great accuracy.

Substantial disparity between the actual spread in June and that to be expected from the supply statistics has occurred in eight years since 1896. In each of these years there was a peculiar market situation—usually a corner or "squeeze" in the futures market. Existence of such a disparity gives prima facie evidence of abnormal speculative market conditions.

Changes in the spread tend to occur in response to influences specifically related to the spread, and not in response to general price influences. The spread-related influences necessarily affect the price of at least one of the two futures. Under certain circumstances they affect the price of July wheat and not the price of September; under other circumstances they affect September and not July; under still other circumstances they affect the price of both futures, but July more than September.

The July–September price spread is subject to conspicuous and reliably predictable seasonal changes. Most of these are related to even stronger seasonal tendencies in price of the July future, which have hitherto been only imperfectly understood because their character is dependent in part on factors related to the July–September spread in a way not previously recognized.

WHEAT STUDIES

OF THE

FOOD RESEARCH INSTITUTE

PRICE RELATIONS BETWEEN JULY AND SEPTEMBER WHEAT FUTURES AT CHICAGO SINCE 1885

The subject of relations between prices of different wheat futures is one on which very little published information is available. It has generally been regarded as a highly technical subject which most traders and students of wheat prices might better leave to specialists — the professional spreaders, and the hedgers who must watch spreads in order to keep their hedges advantageously placed.

This general neglect of the subject of spreads is unfortunate for at least these reasons. Knowledge of the factors that affect relations between prices of different wheat futures can contribute much to an understanding of the behavior of prices of the individual futures. The trader who understands spreads will often find that the information or judgments which lead another trader to buy or to sell a single future might more appropriately, and more safely, be used as a basis for spreading between futures—that is, to buy one future and sell an equal quantity of another. A liberal volume of well-informed trading in spreads is quite as essential to the satisfactory functioning of a futures market as is a liberal volume of well-informed trading for simple price changes.

The scope and significance of the present study of relations between the July and September wheat futures at Chicago may best be indicated by the following brief summary of the main facts developed. They rest upon a critical analysis of statistics and other market information covering a period of nearly half a century.

1. Although the July future at Chicago is commonly regarded as a new-crop future, its behavior is almost wholly that of an old-crop future, like the May. In years of shortage of old-crop supplies, the price of the July future tends to be well below that of the May future,

reflecting the fact that by the end of July sufficient new wheat will have become available to moderate the shortage. But it is only as regards relative price level that the Chicago July future may be regarded as a new-crop future. As regards the basic factors which influence the price movements of Chicago July wheat it is an old-crop future, though influenced to a degree, like any old-crop future, by developments that affect prospects for the new crop.

2. The spread between the price of July wheat and the price of September wheat is a specific reflection of judgments regarding the relative ease or tightness of the supply situation near the end of the crop year. Early in the season these judgments may be rather inaccurate, but by June the July–September spread has usually been within ¾ cent per bushel of the spread to be expected from a statistical measurement of the total United States wheat carryover on July 1 and its normal relation to the spread. In the few years in which the spread in June has not so accurately reflected the general domestic supply situation, the disparity has generally been a consequence of a corner or "squeeze" or some other abnormal technical market situation.

3. The market influences which bear on prices of Chicago futures during the period from January to July fall into two main classes, sharply distinguishable in their manifestations. One class of influences is related chiefly to prospects for the next crop year, and these influences affect the price of both July and September wheat alike, leaving the July–September spread unaffected. The other class of influences is related to the domestic supply situation for the current crop year and these influences bear directly on the July–September spread.

4. Change in the spread of course involves change in the price of at least one of the two futures involved; but the price effects of these influences bearing on spread differ according to circumstances. When July wheat is the dominant future, these influences tend to affect chiefly the price of July wheat, but the price of September wheat tends to be carried along in the same direction, though only about one-fourth as far. After July wheat loses its dominance to September wheat, however, only the price of July wheat tends to be affected by these influences. Earlier in the season, when May wheat is the dominant future, the tendency in most years is the reverse of that late in the season: the influences affecting the July–September spread tend to bear only on the price of the September future, leaving the price of July wheat unaffected. Under certain circumstances, however, the tendencies when May wheat is the dominant future are broadly similar to those observed when the July future is dominant.

5. There exist pronounced tendencies to seasonal change in the spread between July and September wheat—tendencies which vary in systematic fashion according to the direction and size of the spread. The most pronounced and uniform of these is a tendency for the price of September wheat to rise 1¼ to 3 cents relative to July (or for July to fall 1¼ to 3 cents relative to September) during the month of June. Most of the seasonal tendencies in the spread are related to important seasonal tendencies in the price of July wheat.

In the analysis of the data in the subsequent sections, leading to the conclusions stated above, we start with a study of price fluctuations which reveals the need for distinguishing between the two main classes of price influences (the one affecting the July–September spread, the other not), and provides measures of the price effects of these classes of influences. The next two sections deal with the basic conditions which chiefly determine the price spread between the July and the September futures. Then follows a section presenting the seasonal characteristics of the spread and of the price of the July future. A final section deals briefly with additional considerations to be taken into account when the results developed earlier are employed for forecasting purposes.

I. RELATIONS AMONG PRICES AND SPREADS

Certain characteristics of the relations between the July and the September wheat futures at Chicago are readily demonstrated. Some indeed are rather generally recognized even by those who have made little or no study of spreads. Other important characteristics of the relations between the July and the September future are more obscure. Some of the characteristics here discussed may have escaped the attention even of professional spreaders, for they are clearly demonstrable only by a type of statistical analysis little used by wheat traders.

EXAMPLES OF RELATIONS

In the larger movements of wheat prices the July and the September futures usually follow very similar courses. When the September future is selling at about the same price as the July future, or above it, the correspondence is nearly perfect, whether the changes be large or small. This may be illustrated by the price data plotted in Chart 1 for three years in which price changes were large. Because of an optical illusion, the distance between two curves seems to narrow when the curves turn sharply up or down, even though the distance between them is everywhere the same. Changes in spread are therefore more reliably judged from a spread curve than from comparison of a pair of price curves. Examination of the spread curves (plotted with the lowest line of each section as zero) shows that in these years the spreads are virtually unaffected in periods of large price changes. In other words, price changes in the July future in each of these years were always accompanied by almost exactly equal price changes in the September future.

In years in which the price of the September future is considerably below the price of the July future, the spread between the two

CHART 1.—PRICES OF CHICAGO JULY AND SEPTEM-
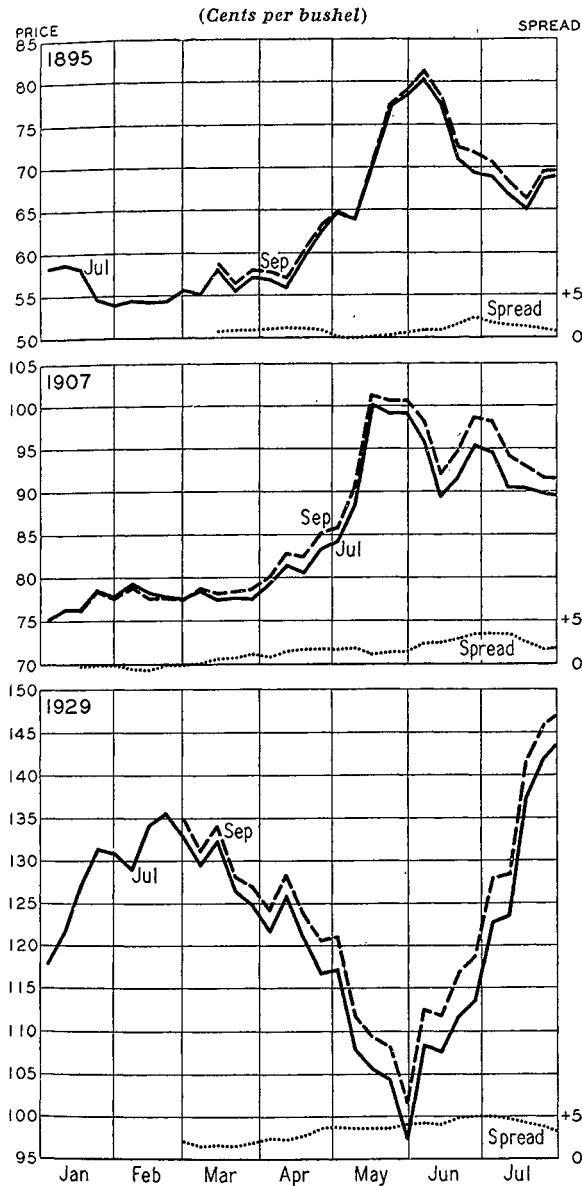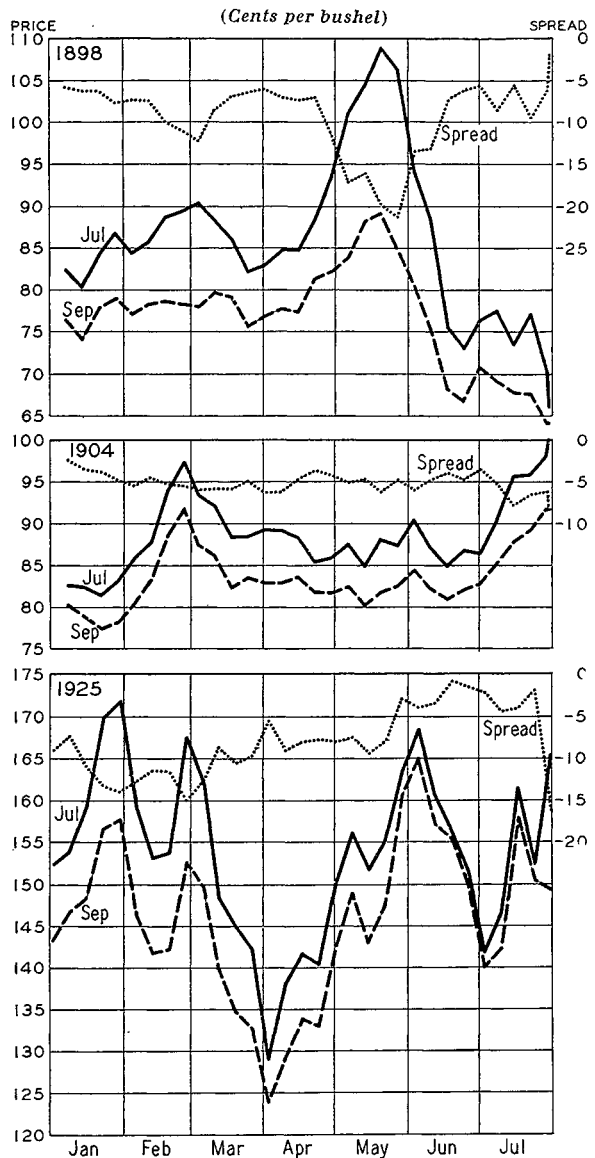BER WHEAT AND PRICE SPREAD, WEEKLY,
1895, 1907, AND 1929*

(Cents per bushel)

CHART 2.—PRICES OF CHICAGO JULY AND SEPTEM-
BER WHEAT AND PRICE SPREAD, WEEKLY,
1898, 1904, AND 1925*

(Cents per bushel)

* Data from Appendix Table I, except price of Septem-
ber future, which is readily obtainable by adding the
spread to the price of the July future, and is consequently
not tabulated.

These three years, with their wide and markedly differ-
ent price fluctuations, illustrate the great stability of the
July–September spread in years in which the spread is
positive. They suggest that there is no close relation be-
tween price changes and changes in the spread in years of
this class.

Mere comparison of the two price curves gives a much
less accurate impression of changes in the spread than does
the separate spread curve.

* Data from Appendix Table I.

These three years of wide price fluctuations and large
negative spread between prices of the two futures illustrate
the relative instability of the spread in years in which the
price of September wheat is much below that of July. Price
changes are frequently not accompanied by related changes
in the spread, but changes in the spread are almost always
accompanied by related—usually inverse—changes in the
price of at least one of the two futures. The character of
this relationship is different when July wheat is dominant
—in terms of volume of trading—than when May wheat is
dominant; and different again after September wheat be-
comes the dominant future.

fluctuates more. The data for three such years
have been chosen for presentation in Chart 2

to illustrate the main types of relationship
observable with wide price fluctuations in
such years. Here the spread curves are plotted

with the top line of each section as the zero line, the depth of the curve indicating the extent to which the September future was below the July.

In 1898 there were two especially conspicuous periods of change in the July–September spread. The first, in four or five weeks in February–March, showed great stability in the price of September wheat, but rather large changes in the price of July. The spread curve during this period is therefore almost an inverted image of the price curve for the July future. From late in April to late in June, on the other hand, the prices of both July and September wheat moved through wide ranges, but always in the same direction. In most weeks of this movement the change in price of the July future was greater than that of the September future, and the spread changed in the direction opposite to that in which the prices moved.

Another feature of significance in the chart for 1898 is the relation observable in July. During this month, as during the two months which preceded, the price movements of July wheat continued to show a striking inverse correspondence with the changes in spread; but the changes in price of the September future ceased to show significant relationship to the changes in the July–September spread.

In 1904 the strong price movement of February–March and the steep price rise that began in June were accompanied by no clearly related changes in the spread. The two price curves show a degree of similarity comparable with that observed in years in which September wheat sold mostly above July wheat (Chart 1). But the spread curve for 1904 shows clearly that there were indeed substantial week-to-week changes in spread, reflecting fairly large differences between the changes in price of July wheat and the changes in price of September wheat.

Two different types of systematic relation are observable between price changes and spread changes in 1925 (lowest section of Chart 2). From early January to early April, with the exception of one week in the middle of March, the spread curve shows striking similarity to the price curves, inverted. Prices of both July and September wheat moved

regularly in the direction opposite to that of the change in spread, but the price of July wheat almost invariably changed more than the price of September wheat.

In May 1925, however, the relationship was for a time completely reversed. Through four successive weeks of May the weekly changes in the July–September spread were in the same direction as the weekly price changes. In each case the prices of both futures moved in the same direction as the spread, the price of September wheat changing always more than the price of July wheat.

CONCLUSIONS FROM STATISTICAL ANALYSIS

If one were compelled to draw conclusions from the record of prices and spreads in only the six years discussed above, representative as they are, few conclusions could be reached. It is clear that the July–September spread tends to fluctuate more widely when September is at a considerable discount under July than when it is only slightly under or over July. It is clear also that large price changes are frequently accompanied by changes in spread which for several weeks at a time are in the same direction as the changes in price, or for several consecutive weeks in the opposite direction. But it is confusing to find that the correspondence between changes in price and changes in spread is sometimes direct and sometimes inverse. It is also puzzling to find that many large changes in price are apparently accompanied by no related changes in spread. In short, the record for these few years does not give adequate evidence of the existence of any systematic relation or relations between changes in spread and changes in price.

When, however, the records for a large number of years are studied together and in connection with other pertinent information, the confusing diversity of relationships noted above is resolved into a systematic and logical set of relationships.

Demonstration of the existence of these relationships is possible only through appropriate statistical analysis, resting on the computation of suitable averages and of measures of the accuracy of the averages. Once the relationships are discovered, however, it is

easy to see their reflections in the price movements and spread changes of most years. Indeed, study of price and spread changes in individual years, in the light of the conclusions drawn from the statistical analysis, serves in a measure to verify the conclusions, and in particular to make clearer their meaning and significance.

For those who are chiefly interested in checking the conclusions by reference to movements in individual years, we here summarize the results of the statistical analysis to be presented in later paragraphs and insert charts which provide a convenient basis for study of the record in individual years. Charts 3a and 3b (pp. 192 and 194) show the movements of the July–September spread at Chicago, weekly throughout the life of the spread, in each year from 1885 to 1932. Facing these charts are Charts 4a and 4b (pp. 193 and 195), which show for the same years the movements of the Chicago July future. The charted data represent spreads or prices as of the close on Friday of each week; or, when Friday quotations were not available, as of the close on Thursday or Saturday.

In comparing the fluctuations in price with the fluctuations in spread, as shown in these charts, one must keep in mind that the vertical distance representing 1 cent on the spread charts represents 4 cents on the price charts. If plotted to the same scale as the price curves, the spread curves in many years would be so flat as to be difficult to study.

The spreads are here shown, as in the preceding charts, as premiums of September wheat over July, or as discounts under July. July is taken as the base to conform with what seems to be the most common practice in discussions of spreads, not because there is any special merit in treating July wheat as the basis for measurement.[1] In subsequent pages it will frequently be necessary to speak of the direction of movement of the spread. The common and generally convenient practice of speaking of widening or narrowing

spreads has to be avoided, for the narrowing of a negative spread involves a change in the same direction as does the widening of a positive spread. We speak, therefore, always of upward and downward movements of the spread, meaning movements as they appear on these charts.

The main conclusions reached in the subsequent analysis may now be briefly summarized:

1. Of the conclusions regarding the relations between changes in price and changes in the July–September spread, one is fundamental: the changes in spread are not to be regarded as *consequences* of changes in price, except in a sterile mathematical sense. The spreads change because a certain set of market influences tends specifically to affect the spread; they do not change merely because certain factors cause prices to move up and down. These spread-affecting influences necessarily affect the price of at least one of the two futures involved, and under most circumstances affect both futures but in different degree. In later sections it will be shown that these influences are chiefly those related to the immediate and prospective domestic supply situation up to, but not beyond, the end of the crop year.

Prices of both July and September wheat are subject to large changes in consequence of influences related solely to prospects for the next crop year. These influences, however, tend to have no effect on the July–September spread. Therefore they tend to produce identical price movements in both July and September wheat. With this distinction between classes of market influences in mind, one does not look for spread changes corresponding to each important price change, but for price changes corresponding to each important spread change. Also it follows that frequently the correspondence between spread changes and price changes must be obscured by the occurrence of price movements in response to influences which tend to have no effect on the spread.

2. The relations that tend to exist between changes in spread and changes in prices are altered when July wheat becomes the dominant future in place of May wheat, as judged

[1] Aside from established custom, there would be a slight advantage in treating September wheat as the basis for measuring the July–September spread. If this were done, the spread curves would be simply inverted images of those shown in Charts 3a and 3b.

by relative volume of trading; and altered again when September wheat supplants July as the most active future. The period of dominance of the May future generally lasts nearly through the month of April; July wheat is dominant from late April to near the first of

and price changes is dependent also upon the direction and magnitude of the spread. (a) When the price of September wheat is above the price of July wheat or not more than about two cents below, as in the majority of years, influences which affect the July–Sep-

CHART 3A.—PRICE SPREADS BETWEEN CHICAGO JULY AND SEPTEMBER WHEAT, WEEKLY, 1885–1912*
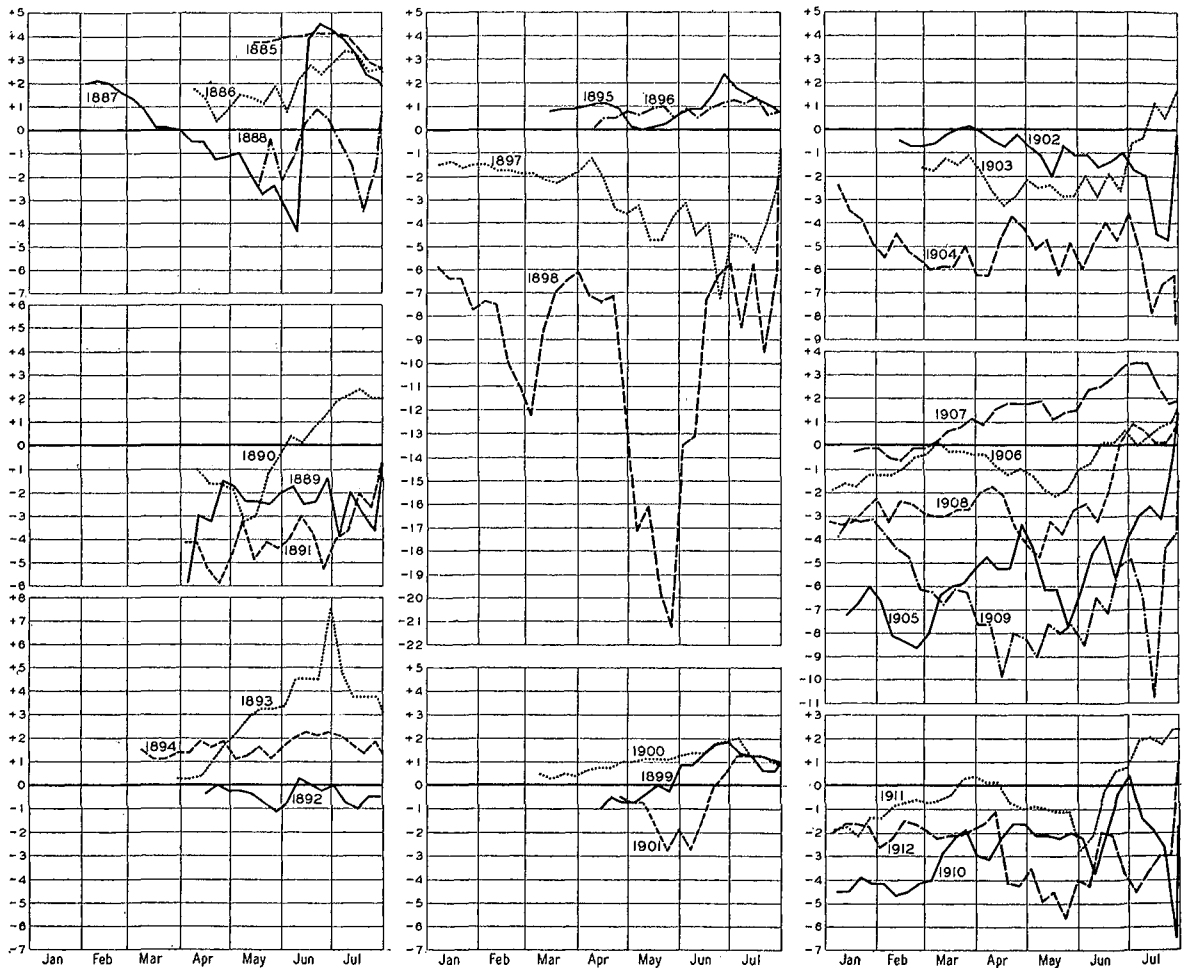
(*Cents per bushel*)

* Data from Appendix Table I, based generally on Friday closing prices. The price spreads are plotted as premiums (+) of September wheat over July, or discounts (−) of September under July.

July; and September wheat is dominant through July and beyond. In years in which September wheat sells at a premium over July, however, all these periods fall earlier in the season: July tends to be the dominant future through most of April and May, and September through most of June and July.

During the period when the May future is dominant, the relation between spread changes

tember spread appear to have little or no effect on the price of July wheat, but to be reflected solely in changes in the spread and in the price of September wheat; changes in the spread tend to show no relation to changes in the price of July wheat, but to be reflected in equal changes in the price of September wheat, in the same direction as the changes in spread. (b) When September wheat, how-

ever, is selling at a large discount under July wheat, the relations between changes in spread and changes in price during the period when the May future is dominant are similar to the relations after July wheat becomes dominant, but frequently more extreme. The price of September, both in the direction opposite to that of the change in spread.

During the period in which July wheat is the dominant future, influences affecting the spread bear chiefly on the price of the July future, but the price of September wheat tends

CHART 4A.—PRICES OF CHICAGO JULY WHEAT, WEEKLY, 1885–1912*

(Cents per bushel)
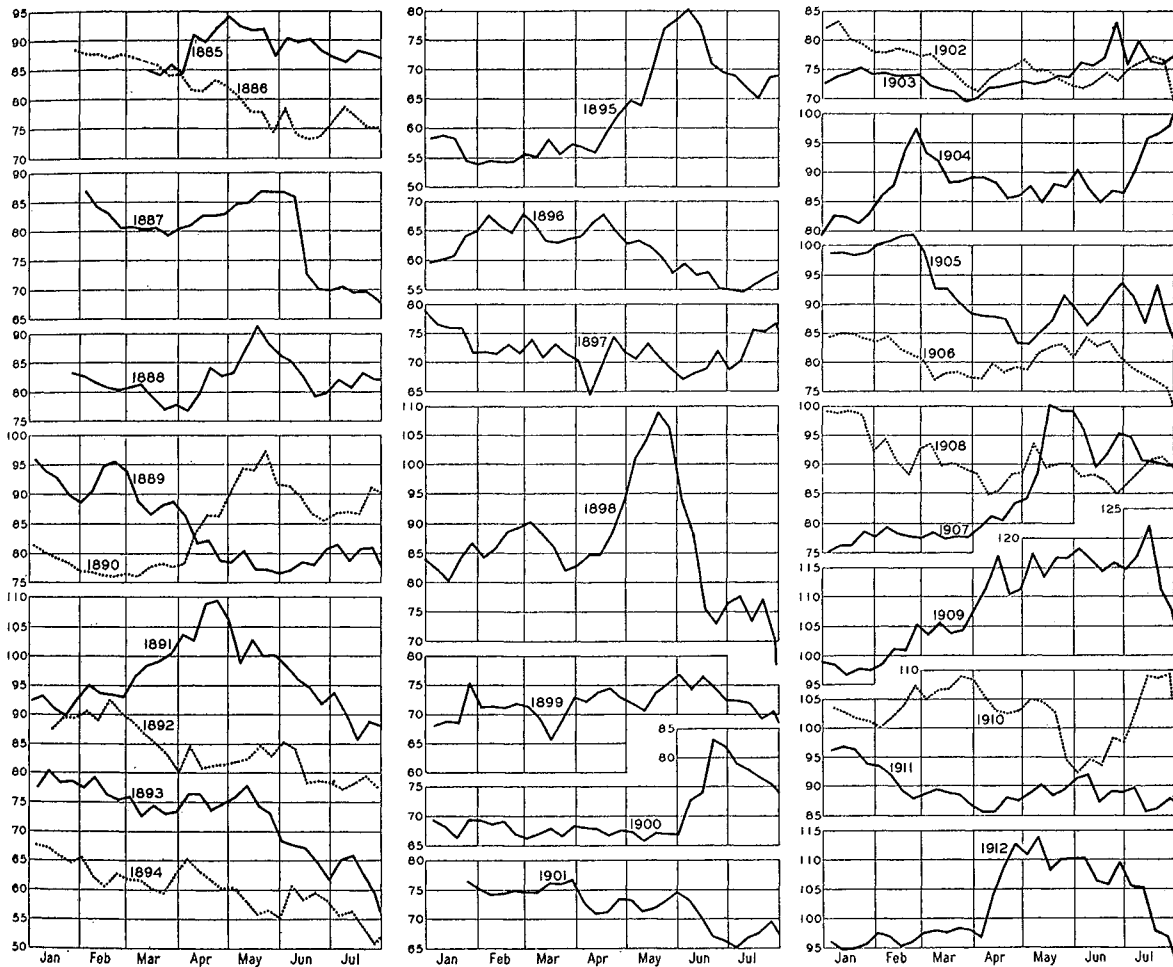
* Data from Appendix Table I, representing generally Friday closing prices.

influences affecting the spread are strongly reflected in the price of July wheat, and the price of September wheat is carried along with that of July. The quantitative relations differ with the amount of the discount on September wheat, but in the average for eighteen such years a change of 1 cent in the spread accompanied a change of nearly 2 cents in the price of July wheat, and of nearly 1 cent in the to be carried along with that of July; in general a change of 1 cent in the July–September spread tends to be accompanied by a change of 1⅓ cents in the price of July wheat and of ⅓ cent in the price of September, both price changes in the direction opposite to that of the change in spread.

When September is the dominant future, changes in the July–September spread show

no relation to changes in price of the September future, but tend to be reflected entirely in corresponding (necessarily inverse) changes in price of the July future.

MEASURES OF AVERAGE WEEKLY CHANGE

Since changes in the July–September spread reflect primarily the effects of one set of market influences, and changes in price reflect the effects of other factors plus more or less influence from factors affecting the spread, it is

Month	11 years of positive spread		12 years of small negative spread		18 years of large negative spread	
	Price change	Spread change	Price change	Spread change	Price change	Spread change
Jan.........	....[a]	....[a]	1.08	0.36	3.19	1.44
Feb.........	2.19	0.27	1.40	0.39	4.02	0.91
Mar.	2.67	0.27	1.08	0.37	3.47	1.26
Apr.	2.67	0.36	1.56	0.42	4.86	1.84
May.........	3.43	0.34	2.71	0.67	6.13	2.52
June	3.74	0.60	2.73	1.22	5.10	2.23
July.........	3.57	0.57	2.26	1.12	7.41	5.22

[a] The computed average changes in price and in spread were 1.46 and 0.18 cents, respectively, but based on such a small number of weekly changes as to be untrustworthy.

CHART 3B.—PRICE SPREADS BETWEEN CHICAGO JULY AND SEPTEMBER WHEAT, WEEKLY, 1913–33*
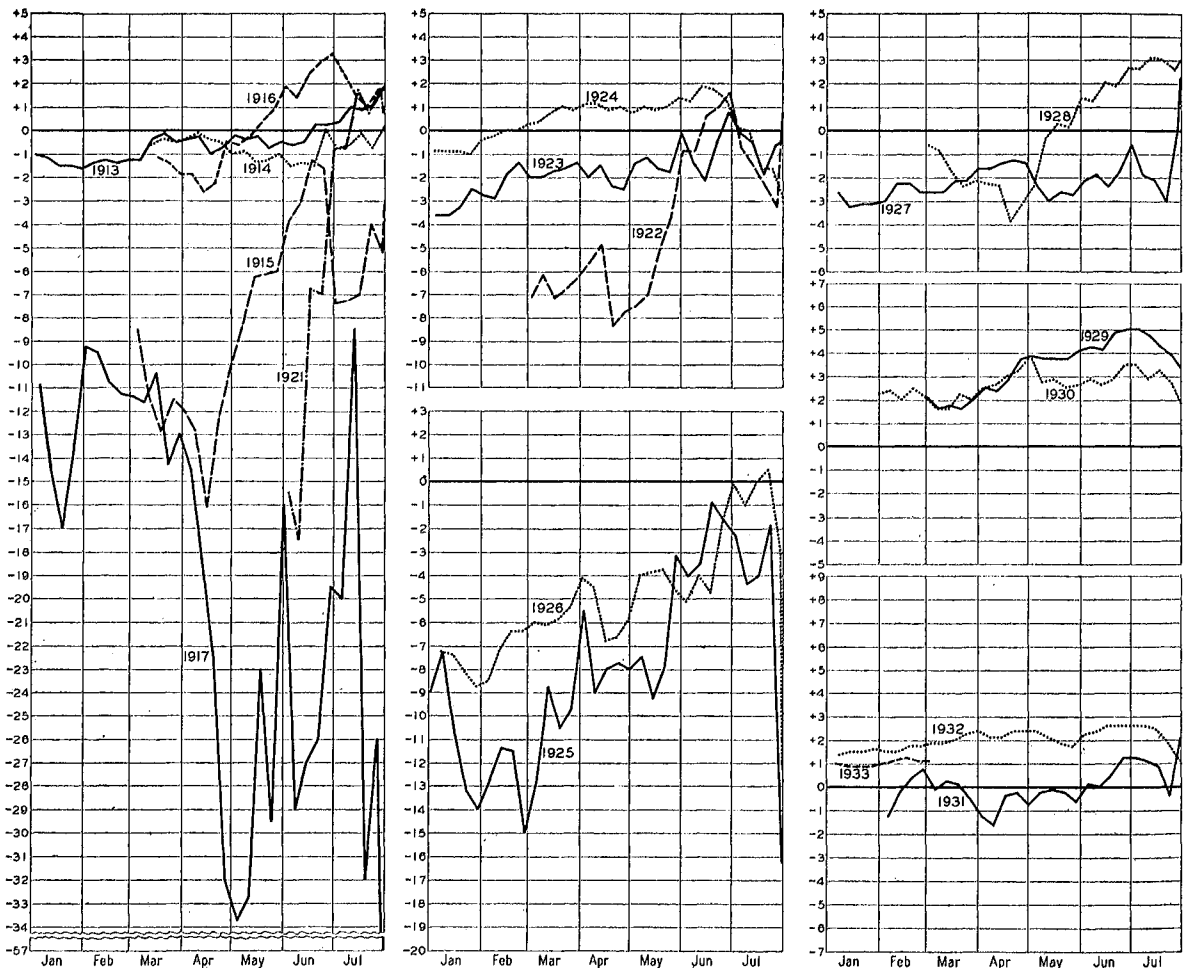
(*Cents per bushel*)

* Data from Appendix Table I, based generally on Friday closing prices. The price spreads are plotted as premiums (+) of September wheat over July, or discounts (−) of September under July.

useful to compare the average weekly change in the July–September spread, month by month, with the average weekly change in price of July wheat. The averages, in cents per bushel, are as follows:

For the purpose of classifying the years into groups according to the size and direction of the July–September spread, the average difference between the prices of the two futures as of the close on three Fridays center-

ing on the middle of April was used. The spread was classed as positive if the price of September wheat was above that of July wheat, or exactly equal to it. Negative spreads were classed as small if the price of September wheat was not more than 2 cents under the price of July wheat. Negative spreads were classed as large if they exceeded 2 cents. On this basis eleven years were classed as showing a positive July–September spread; twelve were classed as showing a small nega-

culated are not the familiar simple arithmetic means of the weekly changes (ignoring the direction of the change), but a form of average known technically as the standard deviation. In comparisons among the averages, the fact that they are of this special type may be disregarded. If comparisons are to be made with other averages which are simple arithmetic means, it should be borne in mind that averages of the type here used tend to be a fourth larger than arithmetic means calcu-

CHART 4B.—PRICES OF CHICAGO JULY WHEAT, WEEKLY, 1913–33*

(Cents per bushel)
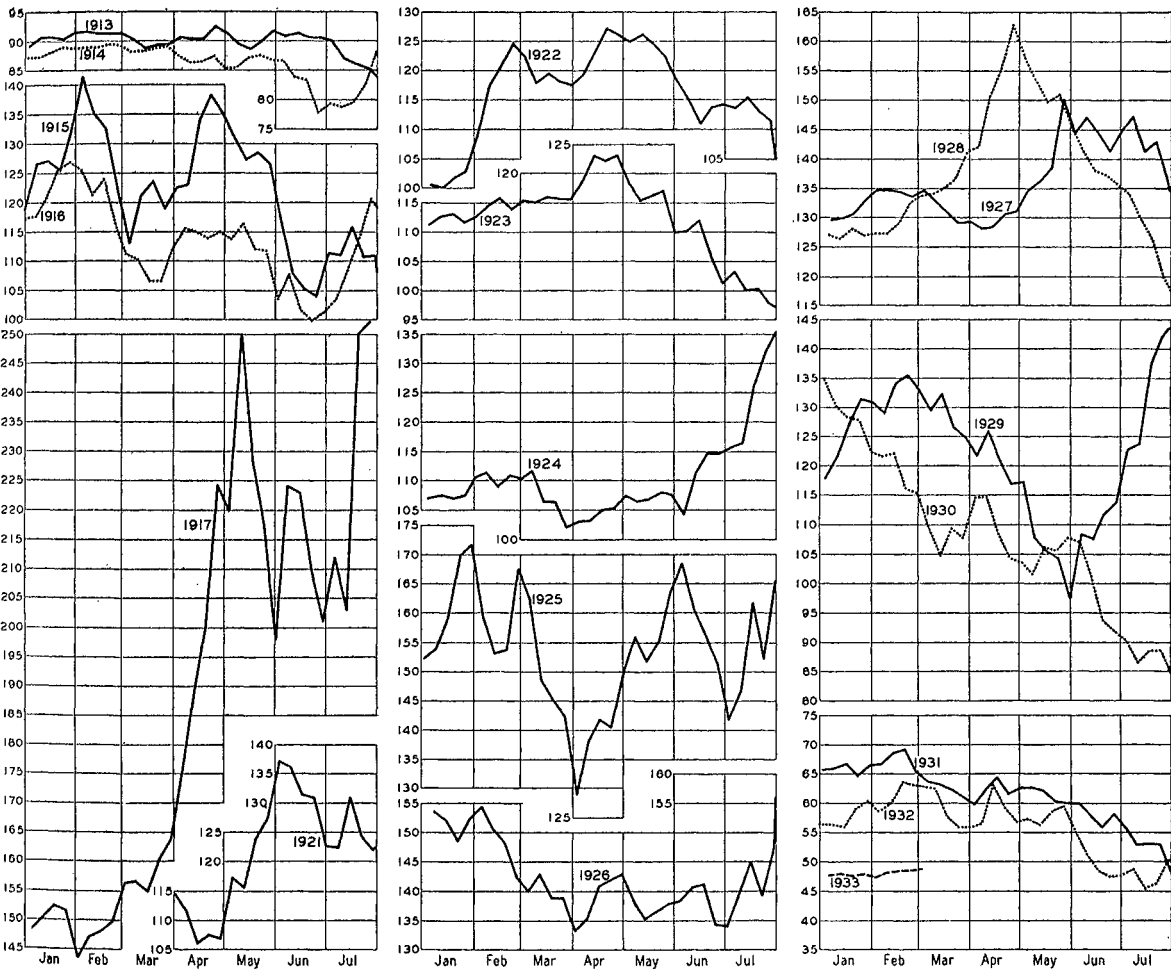
* Data from Appendix Table I, representing generally Friday closing prices.

The absence of curves for 1918–20 here and in Chart 3b reflects the fact that trading in wheat futures at Chicago was suspended from August 25, 1917, to July 15, 1920.

tive spread; and eighteen were classed as showing a large negative spread.

Owing to the requirements for other uses to be made of the figures, the averages cal-

lated without regard to the direction of the change.

The average changes as given in the foregoing tabulation and shown graphically in

Chart 5, indicate the striking stability of the July–September spread in years in which the price of September wheat was above that of

CHART 5.—AVERAGE WEEKLY CHANGES IN PRICE OF CHICAGO JULY WHEAT AND OF JULY–SEPTEMBER SPREAD, BY MONTHS AND BY CLASSES OF YEARS*

(Cents per bushel)
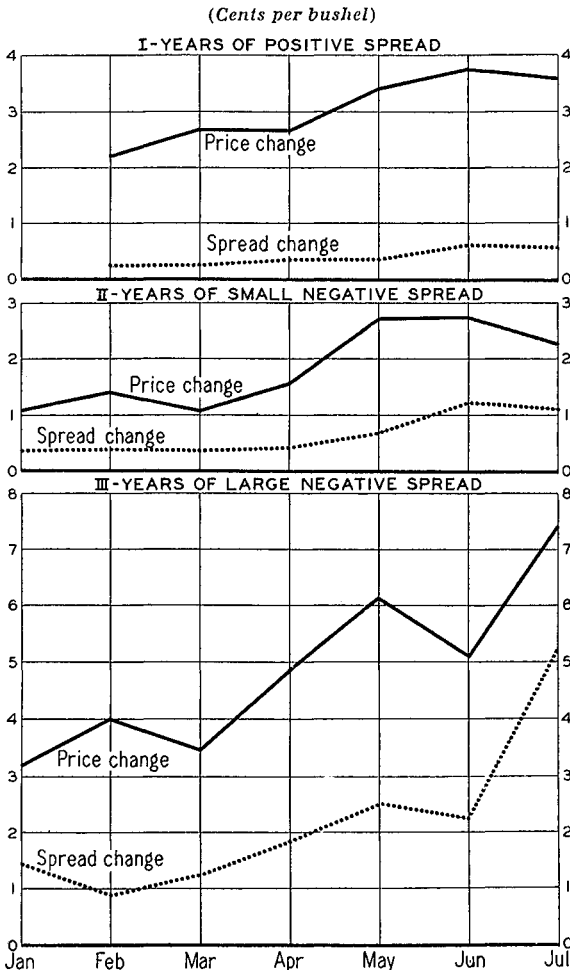
* Data from Appendix Table II.

The July–September spread is slightly more variable in years of small negative spread than when the spread is positive; much more variable in years of large negative spread. In all three classes of years the average weekly change in the spread tends to increase as the season advances.

Years in which September wheat has sold only slightly under July wheat (Class II) have been years of smaller price fluctuations, on the average, than the other two classes of years. In years of positive spread the average weekly change in the spread is very small relative to the average weekly change in price, but in years of negative spread, whether large or small, the variation in spread is fairly large in comparison with the variation in price.

The averages are calculated, of course, without regard to the direction of the weekly changes; they are computed by a formula that gives results about one-fourth larger than the ordinary arithmetic means would be if likewise calculated without regard to direction of the changes.

July. Prior to June the average weekly change of the July–September spread in such years was only about $\frac{1}{10}$ of the average weekly change in price of the July future, and even in June and July was less than $\frac{1}{6}$ of the average weekly change in price of the July future. In years of small negative spread the average weekly change in the July–September spread prior to May was not much larger than in years of positive spread, and in May, June, and July was only about twice as large. For years of large negative spread, the tendency to instability of the spread is reflected in average weekly changes greatly exceeding the average weekly changes in other years.

Comparison of the average changes in spread with the average changes in price, by groups of years, makes clear the fact that, in years of positive spread, influences affecting the July–September spread have been of very little market importance in comparison with influences which affected the price of July and September wheat alike and thus caused large price changes without simultaneous changes in spread. In years of negative spread, however, the influences affecting the July–September spread assumed much greater importance. The years of large negative spread show average changes in spread which ranged in most months from $\frac{1}{3}$ to $\frac{1}{2}$ as large as the average weekly changes in price of the July future. Even in the years of small negative spread the moderate average changes in spread were fairly large in comparison with the relatively small average price changes; the average weekly change in the July–September spread ranged in different months from $\frac{1}{4}$ to $\frac{1}{2}$ of the average change in price of the July future.

A striking feature of these data, worthy of comment even though not of itself important in the present connection, is the fact that the average weekly changes in price were much smaller, month by month, in the years of small negative spread than in other years.

MEASURES OF RELATIONS BETWEEN SPREAD CHANGES AND PRICE CHANGES

Statistics such as the foregoing, showing merely a comparison of average amount of change in spread with average amount of

change in price, are interesting and useful for some purposes; but they throw no light on the question whether the changes in price of the July future are related to the changes in the July–September spread, or entirely unrelated. Specific measures of average relationship are required to determine whether any systematic relationship exists, and, if so, what type of relationship.

For this purpose the most satisfactory measure found is a measure of average change in price per 1-cent change in the July–September spread.[1] The changes have been taken over weekly intervals. The fundamental principle on which the calculation is made is readily described. If among a number of cases in which the July–September spread rose 1 cent, it was found that in half the cases the price of the July future rose and in half the cases it fell; and if the average price change in the cases of increase was the same as the average price change in the cases of decrease, then it would appear that there was no relation between the change in July–September spread and the change in price of the July future— that the average price change accompanying a 1-cent rise in the spread was nil. If the same absence of relation were found for 1-cent declines in the spread, and for rises and declines both larger and smaller than 1 cent, it would appear that in general there was no relation between change in spread and change in price.

If instead it were found that among a number of cases in which the July–September spread rose 1 cent, the price of July wheat sometimes rose and sometimes fell but more often fell, and that the average change in price (having regard to the directions of the individual changes) represented a decline

of 1 cent, then an inverse relation between change in spread and change in price would be indicated, at least as regards cases of 1-cent rise in the spread. If, in addition, 1-cent declines in the spread were found accompanied sometimes by price rises and sometimes by price declines, but taking all the cases together, by an average price rise of 1 cent, and furthermore if larger and smaller changes in spread were accompanied on the average by equal but opposite changes in price, then it would appear that in general changes in spread had tended to be accompanied by equal but opposite changes in price.

Under other circumstances the averages might show that changes in spread had on the average been accompanied by changes in price 1½ times as large as the changes in spread, and so on.

The kind of measure just described is known in statistical parlance as a regression coefficient. In expressing the fact that the record for certain months and years shows an average change in price 1½ times as large as the accompanying change in spread, it is usually more convenient to say that the change in price averaged 1.5 cents per 1-cent change in spread, or that the average change in price accompanying a 1-cent change in spread was 1.5 cents. All three forms of statement are used to carry the same meaning, although the last form in particular might be subject to different interpretation.

For each of the seven months, January–July, averages such as have been described have been computed separately for each of the three classes of years already described (pp. 194–95), which were as follows:

---

[1] Probably most statisticians would choose the coefficient of correlation as the most natural measure of relationship. Coefficients of correlation corresponding to all the measures of average change in price per 1-cent change in spread have been computed and most of them are shown in Appendix Table IV for the benefit of interested statisticians. They proved of so little use that they are not mentioned in the text. Still less useful are the regression coefficients representing average change in spread per 1-cent change in price. They are readily obtained, if desired, by dividing the square of each coefficient of correlation by the corresponding regression coefficient shown in Appendix Table III.

Years of positive spread		Years of small negative spread		Years of large negative spread	
(I)		(II)		(III)	
1886	1907	1887	1911	1889	1910
1893	1924	1890	1913	1891	1912
1894	1929	1892	1914	1897	1915
1895	1930	1899	1923	1898	1916
1896	1932	1902	1927	1903	1917
1900		1906	1931	1904	1922
				1905	1925
				1908	1926
				1909	1928

Four years for which data are given in the Appendix Tables and shown graphically in

Charts 3 and 4 failed of classification because trading in September wheat did not start until late April or May (1885, 1888, and 1901) or even until June (1921). For present purposes no particular significance attaches to the choice of the April spread as the basis of classification rather than the spread in a later month. Although at the outset it seemed wise to keep the constitution of each group of years constant over as many weeks as possible without unduly restricting the number of years included, it now appears that all available data might as well have been used.

As noted in the summary of conclusions given on a previous page, the relations between changes in the July–September spread and changes in prices differ according as the May future, the July future, or the September future is the subject of most active trading. We shall accordingly treat separately the measures of relationship reflecting these three sets of conditions, and for convenience consider them in reverse order.

PERIOD OF DOMINANCE OF SEPTEMBER FUTURE

September wheat usually replaces July wheat as the most active future during the last week in June. In some years, however, substantial deliveries on July contracts are expected to begin on the first of July; and most traders then prefer to get out of July wheat before the first of the month, so that September becomes the most active future by about the middle of June, or earlier. The likelihood of deliveries on futures contracts on July 1 is indicated if September wheat sells at a premium over July wheat in April, and is more precisely indicated by the spread in June.

These tendencies may be illustrated by the following tabulation of dates in the last twelve years on which the September future became the most active, based on records of volume of trading compiled by the United States Grain Futures Administration. The years in the first half of the tabulation are those in which September wheat sold at a premium over July in early June and during most or all of the remainder of the month. All other post-war years are included in the second half.

Year	Date	Year	Date
1924	June 10	1921	June 21
1928	June 14	1922	June 24
1929	June 17	1923	June 25
1930	June 9	1925	June 9
1931	May 25	1926	July 1
1932	June 20	1927	June 27

It should be noted that this post-war period is exceptional as regards the proportion of years in which September wheat sold at a premium over July in early June and during most of the remainder of the month. The twelve years 1906–17 were perhaps as exceptional in the other direction; they included only two years in which September wheat sold at a premium in early June, namely 1907 and 1916.

Somewhat different dates result if dominance of a future be judged by the volume of open contracts, as has been the practice of the United States Grain Futures Administration. For some purposes volume of open contracts undoubtedly provides the better criterion of dominance, but for present purposes we regard volume of trading as the more significant. The dates given by the two criteria so seldom differ appreciably that the same general conclusions would result from use of either.

The foregoing facts clearly indicate that July is always a month in which September wheat is the dominant wheat future, and that in years of positive July–September spread the September future tends also to be dominant during more than half of June, and therefore dominant for the month of June as a whole.

In these months of dominance of the September future in the Chicago market a change of 1 cent in the July–September spread tends to be accompanied by a change of 1 cent in the price of July wheat, and by no change in the price of September wheat. Because we express the spread as a premium of September wheat over July (+), or a discount under July (−), in conformity with common practice, the change in price of July wheat in an average case is in the direction opposite to that of the change in spread. This is illustrated by the following hypothetical figures, in cents per bushel:

	First week	Second week	Change
Price of July wheat......	60	61	+1
Price of September wheat	62	62	0
Spread	+2	+1	−1

A more concrete and meaningful statement of the relations in July may be given in terms of the influences bearing on prices and spreads. During July, influences affecting the price of September wheat tend to affect the price of July wheat in the same direction and by the same amount. In addition, the price of July wheat is affected by influences which bear on the July–September spread but have no effect on the price of the September future.

These tendencies are clearly indicated by the average changes in price accompanying a change of 1 cent in the July – September spread, as shown, in cents per bushel, in the first two columns below:

Month and class of years	Change in July future	Change in September future	Standard error
June			
Years of positive spread	−1.0	0.0	±0.90
July			
Years of positive spread	−1.4	−0.4	±0.86
Years of small negative spread	−1.0	0.0	±0.24
Years of large negative spread	−1.1	−0.1	±0.10
All data combined........	−1.09	−0.09	±0.077

In this tabulation, as in subsequent similar tabulations, the minus signs indicate that the change in price is in the direction opposite to that of the change in spread.

The "standard errors" shown in the final column of the tabulation above apply alike to the averages for the July and the September futures.[1] The averages tabulated in the first two columns represent precisely the facts as observed in certain years. Various factors, however, may make these averages more or less unrepresentative of the general tendency in such years. The standard errors provide

[1] The standard error of the regression coefficient $b_{y\cdot x}$ is given by the formula

$$\sigma_b = \frac{\sigma_y}{\sigma_x} \cdot \sqrt{\frac{1-r^2}{n-2}}$$

where r is the coefficient of correlation between x and y, and n the number of observations.

an index of the reliability of the averages as measures of the general tendency. Their use may be indicated with sufficient precision for present purposes as follows: the average weekly change in price of the July future for each 1 - cent change in spread, in eighteen years of large negative spread, was precisely 1.1 cents, in the direction opposite to that of the change in spread; but if the data are to be taken as an indication of general tendency in such years, they indicate merely that the *probable tendency* in such years is for the price of the July future to change somewhere between 1.0 cent (1.1 − 0.10) and 1.2 cents (1.1 + 0.10) for each change of 1.0 cent in the spread. In other words, the tendency is indicated as probably lying within a range given by the standard error.

At first glance, it might appear that the indicated tendency in July of years of positive spread is distinctly different from that in the other groups of years. Reference to the standard error, however, shows the average to indicate merely that the probable tendency in July of years of positive spread is for the change in price of the July future to be somewhere between 0.54 and 2.26 cents, for each 1-cent change in the spread. Consequently there is no good evidence that the tendency in years of positive spread is any different from the tendency in July of other years. All the results are consistent with the original statement that, during the period of dominance of the September future, influences affecting the July–September spread tend to have no effect on the price of September wheat and to produce changes in the price of July wheat equal to the change in the spread, but, naturally, in the opposite direction.

RELATIONS WHEN JULY FUTURE IS DOMINANT

The July future has probably always been the dominant, or most active, wheat future at Chicago throughout May. In years of positive spread the July future tends to be dominant in April, taken as a whole, and in May, but not in June. In other years the July future tends to be dominant in June, taken as a whole, as well as in May, but not in April.

The dates on which the July future became dominant in post-war years are shown in the following tabulation. The first section gives the years and dates for cases in which September wheat was at a premium over July throughout the month of April. The other two sections give the years and dates for cases in which September wheat was at a discount throughout April.

Year	Date	Year	Date	Year	Date
1924	Apr. 21	1922	Apr. 26	1927	Apr. 25
1929	Apr. 15	1923	Apr. 11	1928	Mar. 27
1930	Mar. 11	1925	Apr. 23	1931	Dec. 20
1932	Apr. 7	1926	Apr. 17		(1930)

The case of 1931 is of course an exception occasioned by the fact that control of the May future by the Grain Stabilization Corporation destroyed speculative interest in that future. It is clear that the general tendency is for the July future to become dominant before the middle of April in years of positive July–September spread, and for the May future to remain dominant until well after the middle of April in other years.

During these months of customary dominance of the July future, influences affecting the July–September spread have tended to produce a change of about 1 1/3 cents in the price of the July future and 1/3 cent in the price of the September future, for each change of 1 cent in the spread. In addition, there are always other important influences affecting price which tend to cause equal changes in both the July and the September futures. At present, however, we are not concerned with these other influences and emphasize merely the fact that those influences which affect the spread tend to cause changes in price of both July and September wheat, both in the same direction, but to cause changes in the price of July wheat about four times as large as the changes in price of September.

The averages on which this conclusion rests are as follows, together with their standard errors. As before, the averages are changes in cents per bushel accompanying changes of 1 cent in the July–September spread.

Month and class of years	Change in July future	Change in September future	Standard error
April			
Years of positive spread	−2.6	−1.6	±1.04
May			
Years of positive spread	−1.9	−0.9	±1.44
Years of small negative spread	−1.6	−0.6	±0.52
Years of large negative spread	−1.1	−0.1	±0.25
June			
Years of small negative spread	−1.5	−0.5	±0.23
Years of large negative spread	−1.6	−0.6	±0.18
All data combined	−1.34	−0.34	±0.115

Each of the averages in the foregoing tabulation, when considered in connection with its standard error, is found in satisfactory agreement with the general conclusion that, during the months in which July wheat is the future most actively traded in, the influences which affect the July–September spread tend to cause the September future to change one-third as much as the spread, and the July future to change 1 1/3 times as much as the spread, both price changes in the direction opposite to the change in spread.

RELATIONS WHEN MAY FUTURE IS DOMINANT

In earlier months, when the May future is dominant, a marked difference is observed between relationships characteristic of years of large negative spread, on the one hand, and years of small negative spread or of positive spread on the other. Some suggestion appears of a special type of relation in January of years of small negative spread and in both January and February of years of positive spread; but the peculiarities of the averages for these months are regarded as meaningless. Data covering these situations are left out of consideration in the main discussion below and reserved for brief presentation in a footnote in their appropriate relation to the discussion.

In years of large negative spread—that is, years in which September wheat sells at a discount of more than 2 cents under July wheat — the influences affecting the July–September spread before the July future becomes dominant tend to cause large changes in the price of both the July and the September futures, both in the direction opposite to

that of the changes in spread. Of the more extreme of these years, conspicuously exemplified by 1925, it would be substantially correct to say that the price factors in operation tend to produce larger changes in the July future than in the September, and that the change in spread is merely a consequence of the differential price influence of the same factors bearing on both futures. But this would be a substantially correct statement only because in such cases the chief price influences are specific spread-determining influences—that is, influences related to the appraisal of the current domestic supply situation. In so far as price influences related to prospective new-crop supplies appear, or foreign developments of little import for the domestic supply situation attain prominence, the effect of such price influences tends to be the same on both the July and the September futures, with little resulting change in the spread. And in years in which September wheat is not at such an extreme discount under July as in the first few months of 1925, it is important in fact as well as in principle to maintain the distinction that only influences specifically related to the July–September spread tend to have a differential effect on the prices of the two futures.

On an average for the months January–April in all eighteen years classed as showing a large negative spread, a change of 1 cent in the July–September spread was accompanied by a change of about 3 cents in the price of the July future and 2 cents in the price of the September future. These figures, however, are unlike those previously given in that they are not to be taken as reflecting a uniform quantitative relation tending to hold whenever the price of the September future is 2 cents or more below the price of the July future. Rather, the amount of change in the July future accompanying a 1-cent change in spread tends to be much greater when the spread itself is wide than when it is relatively narrow. If the spread be very wide, a change of 1 cent in spread is likely to be accompanied by a change of 5 or 6 cents in price of the July future and of 4 or 5 cents in the price of the September future. But if the price of September wheat be only a little

more than 2 cents under the price of July wheat, a change of 1 cent in spread is likely to be accompanied by a change of only about 1 cent in price of the July future and no appreciable change in the price of the September, as will be shown to be the case in years of small negative spread.

The averages on which these conclusions chiefly rest, together with their standard errors, are shown below. All are based only on data for eighteen years in which the September future was at a discount of 2 cents or more below the July future in April, and represent changes in price of the future, in cents per bushel, accompanying a change of 1 cent in the July–September spread.

Month	Change in July future	Change in September future	Standard error
January	—1.4	—0.4	±0.30
February	—3.2	—2.2	±0.47
March	—1.9	—0.9	±0.24
April	—1.9	—0.9	±0.22
All data combined	—1.90	—0.90	±0.136

Among the foregoing averages, those for February appear distinctly inconsistent with the others. They differ by nearly three times their standard error from the corresponding figures for March and April and for the four months taken together. If data for the one year 1925 be omitted from the calculations, the following quite consistent figures result:

Month	Change in July future	Change in September future	Standard error
January	—1.2	—0.2	±0.28
February	—1.9	—0.9	±0.51
March	—1.5	—0.5	±0.27
April	—1.9	—0.9	±0.21
All data combined	—1.7	—0.7	±0.134

The consistency thus obtained must not be regarded as evidence that the averages measure tendencies that are uniform for all years except 1925. It will be shown shortly that the average relations in years of small negative spread differ sharply from the relations reflected by the foregoing averages for years of large negative spread. Hence one may conclude that the quantitative relation between changes in spread and changes in price is dependent upon the width of the spread, and therefore not the same for all years in which the price of September wheat is more than 2

cents under the price of July. In the light of these facts, it is quite to be expected that the changes in price per 1-cent change in spread should have been very large in 1925, since September wheat was at an extraordinary discount under July in January–March of that year.

RELATIONS IN YEARS OF POSITIVE OR SMALL NEGATIVE SPREAD

In years when the price of September wheat is above that of July, or less than 2 cents below, the relations between changes in spread and changes in price while the May future remains dominant are in general very different from the relations in years of large negative spread. For all such months for which trustworthy data are available, a tendency is clearly indicated for influences affecting the spread to have no effect on the price of the July future and to exert their full effect on the price of the September. These conclusions rest on the following averages of change in price accompanying a 1-cent change in the July–September spread.

Month and class of years	Change in July future	Change in September future	Standard error
Years of small negative spread			
February	+0.2	+1.2	±0.72
March	−0.4	+0.6	±0.48
April	−0.2	+0.8	±0.56
Years of positive spread			
March	+1.3	+2.3	±1.94
All data combined	−0.03	+0.97	±0.376

In the foregoing tabulation the averages shown for March are obtained with the data for 1930 omitted. If the data for March 1930 be included, the average change in price of July wheat for each 1-cent change in spread appears as +3.7 for years of positive spread and +0.27 for "all data combined." The standard errors remain substantially as above. It makes no great difference in the conclusions indicated whether the data for March 1930 be included or excluded; but it seems clear that the situation in that month was quite unrepresentative and is therefore better neglected in determining a normal relationship. Throughout March 1930 the relationships among futures were radically dis-

turbed by the futures transactions of the Grain Stabilization Corporation.

All the averages in the foregoing tabulation, when considered in connection with their standard errors, are consistent with the conclusion that in the months in question the price of the July future tends to be unaffected by influences which affect the July–September spread. The figures suggest a possibility that in March of years of positive spread there is some tendency for the July as well as the September future to move in the same direction as the spread, but the statistical evidence is quite inconclusive. Since we have found no other good ground for supposing that this unique tendency actually exists, we conclude that the tendency in March of years of positive spread is the same as the tendency in February, March, and April of years of small negative spread.[1]

[1] There are so few years of small negative spread in which there was trading in September wheat during January, and so few years of positive spread in which there was trading in September wheat in either January or February, that it seemed at first quite unprofitable to calculate averages for those cases. When it was found, however, that the average for March of years of positive spread suggested a relationship different from that in years of small negative spread, it became desirable to see if averages of such data as were available for the earlier months of this class of years would give any support to that suggestion. Since they have real bearing on that point, the averages are here reproduced, and with them the similarly unreliable average for January of years of small negative spread.

In connection with the calculated average change in price of the July future per 1-cent change in spread, we show in the following tabulation not only the computed standard error but also the number of weekly changes from which each average was computed and the number of years providing one or more weekly change.

Month and class of year	Change in July future	Standard error	No. of weeks	No. of years
January, years of positive spread	+5.0	±2.35	9	3
February, years of positive spread	−2.8	±2.00	16	4
January, years of small negative spread	−1.6	±0.63	19	5
Three months	−1.45	±0.818	44	9

All of the averages above differ from the corresponding general average (for March in years of positive spread and February, March, and April in years of small negative spread) by more than the computed standard errors of the differences. But doubt is at once cast on their significance by their lack of mutual consistency. Moreover, the standard errors for individual months are themselves un-

SIGNIFICANCE OF DIFFERENCES IN TYPES
OF RELATION

In the foregoing paragraphs four different types of relation between spread changes and price changes have been described, and in each case it has been shown that all the averages representing the type of relation under discussion were mutually consistent. There still remains, however, the question whether the data fully support the contention that four distinct types of relation are actually represented.

The four different types of relations may be described in tabular form in terms of the average change in price of the futures accompanying each 1-cent change in the July–September spread, as follows:

	Change in July future	Change in September future	Standard error
Period of dominance of May future			
A. Years of positive or small negative spread	−0.03	+0.97	±0.376
B. Years of large negative spread	−1.90	−0.90	±0.136
Period of dominance of July future (all years)	−1.34	−0.34	±0.116
Period of dominance of September future (all years)	−1.09	−0.09	±0.077

The statistics above do not conclusively

demonstrate the existence of a real difference between the relation in the period of dominance of the July future and the relation in the period of dominance of the September future. The difference (0.25 cent) between the averages expressing the relations in the respective periods is only 1.8 times its standard error of 0.138.[1] From a purely technical statistical standpoint the difference may be regarded only as highly suggestive of a real difference in tendency. Because the difference is one to be expected on other important grounds, we have no hesitation in concluding that a real difference exists between the average price effect of spread-related influences when July is the dominant future and the average price effect of spread-related influences when September is the dominant future.

All the other indicated differences in tendency are clearly significant even when judged solely on the statistical evidence. For the period of dominance of the May future the differences between the averages for the different classes of years are 4.7 times their standard errors. The differences between each of these averages and the averages for the period of dominance of the July future are three or more times their standard errors.

II. BASIC SPREAD-DETERMINING FACTORS

The influences which affect the July–September spread are numerous and of widely varying character. As with price influences generally, some are ephemeral, related chiefly

to temporary technical situations in the market; some are more lasting, but rest on fallible human judgment and are subject to sudden change; some are related more specifically to the basic objective facts on which, in the last analysis, all prices have their foun-

trustworthy when the number of observations is so small. The general average for the three months together, which alone is based on enough cases to make its standard error reasonably trustworthy, differs from the general average for comparable later months by 1.42 cents (1.45 − 0.03). The standard error of the difference is ±0.90. On the customary assumption of normal distribution of error the probability of such a difference occurring by chance is about 1 in 10. The difference therefore constitutes far from conclusive evidence of a real difference in the tendencies reflected by the two averages.

In short, the figures in the foregoing tabulation demonstrate only two facts, and those of negative character. The averages give no good evidence to oppose the otherwise reasonable assumption that the tendency in these months is like that indicated for subsequent months of dominance of the May future— namely, for influences affecting the July–September

spread to have no effect on the price of July wheat and to exert their full effect on the price of the September future. Second, the average for February in years of positive spread fails entirely to support the suggestion of the average for March that the tendency in such years, while the May future is dominant, is different from that in years of small negative spread. Pending the accumulation of other evidence, at least, our conclusion is that the relation between changes in July–September spread and changes in price remains the same in all months of dominance of the May future, and the same in years of positive spread as in years of negative spread.

[1] The standard error of the difference between two averages such as are here involved is the square root of the sum of the squares of the standard errors of the individual averages.

dation. The July–September spread will be found more intimately tied to the basic supply-and-demand situation pertinent to it than wheat prices in general seem to be to the basic supply-and-demand situations pertinent to them.

It is readily apparent that the price relation between the July and the September futures at Chicago must depend in considerable degree upon the quantity of wheat that will be carried over into the new crop year in the United States. If supplies of wheat are so large as to result in a heavy carryover, it is to be expected that September wheat will sell at a premium over July. Elevator operators who hedge must depend chiefly on spreads between futures for profits from storage of wheat. The elevator operator has little inducement to carry heavy wheat stocks into the new crop year unless September wheat is selling or is expected to sell at a higher price than July wheat when he transfers his hedges from the July to the September option. The difference between the price at which he buys in his hedge in the July future and the price at which he replaces it by sale of September wheat provides the elevator operator his chief or only return for storage of wheat, as distinct from returns `for merchandising. It is on account of this fact that the spread between futures is frequently referred to as a "carrying charge."

If supplies of wheat are short, prices of cash wheat tend to be higher in the winter and spring than they are expected to be after the new crop is harvested. Under such circumstances the July and September futures of course always sell at discounts under the May future. Substantial supplies of new wheat reach the market during July, and the July future at Chicago is consequently regarded usually as a new-crop future. The July movement of new wheat, however, is not sufficient to meet normal milling requirements, plus the demand for replacement of depleted merchandising supplies that results from shortage of wheat during the previous crop year. When wheat supplies are short, therefore, the July future as well as the May tends to stand at a premium over the September future.

As will shortly be shown, the supply of wheat, as reflected in carryover as of July 1, is indeed the dominant factor determining the spread between July and September wheat in Chicago. The present section is therefore devoted chiefly to a statistical analysis of the relation between wheat supplies and the July–September spread. In the subsequent section other influences are discussed, in particular certain technical market situations that occasionally have a marked effect on the spread.

The first question about the relation of the July–September spread to wheat supplies concerns the measurement of supplies. Carryover, as customarily measured in terms of July 1 stocks, forms a convenient basis for expressing supplies. The principal question requiring investigation in this connection is whether the July–September spread is more closely related to total supplies or to commercial supplies, or perhaps to the visible supply alone among commercial supplies.

WHEAT STOCKS AND THE PRICE SPREAD

In the upper part of Chart 6 is shown the average spread between the prices of July and September wheat at Chicago during the first three full weeks in June. The data are shown for each year in which trading in the futures has been carried on since 1896. That year is made the starting-point because it is the first for which adequate statistics of year-end supplies of wheat are available for study in connection with the price spread. The points on the chart representing the average spread in June of each year show an average premium of September wheat over July as a positive spread (+), and an average discount as a negative spread (−).

The lower part of Chart 6 shows total stocks of wheat in the United States as of July 1 of each year since 1896, together with stocks of wheat in commercial hands, and the visible supply. This part of the chart is drawn to a logarithmic vertical scale in order to show in correct proportion the relative changes in the three classes of stocks.

The fact that the July–September spread is rather closely related to wheat supplies as of July 1 is at once apparent from an examina-

tion of Chart 6. Certain important features of the relationship, however, appear clearly only when the data are placed in the form

CHART 6.—CHICAGO JULY–SEPTEMBER SPREAD IN JUNE AND UNITED STATES STOCKS OF WHEAT JULY 1, 1896–1932*

(Cents per bushel; million bushels)
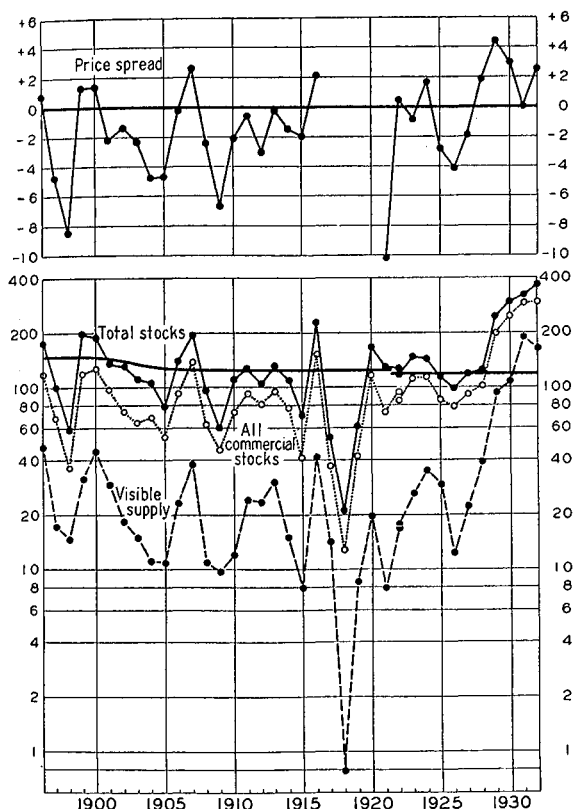
* Data from Appendix Table VI (spreads from column B).

The price spread between July and September wheat at Chicago in the first three full weeks of June is rather closely related to the stocks of wheat remaining in the United States at the end of the crop year. On actual measurement, the relation with the visible supply is found to be not nearly as close as the relation with all commercial stocks (all stocks not on farms); the relation with total stocks of all United States wheat, on farms and off, is closest of all.

used for Chart 7 (p. 206), which shows the relation between the spread and total United States wheat stocks.

THE SPREAD AND TOTAL STOCKS

For the purpose of Chart 7 it is necessary to take account of changes in the level of "normal" July 1 stocks. As acreage of early harvested winter wheat increased and the milling industry became adjusted to utiliza-

tion of the winter wheat, and as transportation facilities in the new winter-wheat areas improved, there resulted, in the early years of the present century, a substantial reduction in the quantity of old-crop wheat which it was necessary to hold over into July. The stocks statistics used for years since 1922 are not precisely comparable with the earlier statistics; this also affects the normal carryover as interpreted in terms of these statistics.[1]

These changes in "normal" stocks are reflected in the heavy trend line shown in connection with the graphic record of total wheat stocks appearing in Chart 6. For the purposes of Chart 7 they are taken into account by expressing total stocks as deviations from normal: a stated number of million bushels above the estimated normal or a stated number of million bushels below. The determination of the normal is more or less arbitrary, and the absolute value assigned to it in any year is unimportant. It is only the changes in level of normal stocks from period to period that are important for present purposes, and these have been determined as accurately as possible.

In Chart 7 deviations of July 1 stocks from normal are plotted to the horizontal scale in terms of millions of bushels. The associated July–September spread is plotted on the vertical scale. Each point plotted in Chart 7 is numbered to designate the year to which the data apply. For example, the point numbered 07 near the upper center of the chart indicates that in 1907 total stocks of wheat in the United States were some 70 million bushels above the estimated normal and that September wheat sold about 2½ cents over July wheat on the average in the first three full weeks of June. Similarly, the point numbered 98 at the lower left corner of the chart indicates that in 1898 total stocks of wheat in the United States on July 1 were nearly 90 mil-

[1] The only approximately complete statistics of total July 1 wheat stocks in the United States for pre-war years are estimates prepared by the Food Research Institute and published in WHEAT STUDIES, February 1928, IV, 180. These are the figures here used for 1896–1921. For 1922 and subsequent years we have used the carryover "in four positions" as compiled from official sources and published currently in WHEAT STUDIES.

lion bushels below normal and that September wheat averaged 8½ cents under the price of July wheat.

One further adjustment of the data was made for Chart 7. During all but the latest

Through the points plotted in Chart 7 a smooth curve is run, to represent the indicated average relation between stocks and spread. This relation may be described as follows. With normal stocks, that is, stocks

CHART 7.—RELATION BETWEEN CHICAGO JULY–SEPTEMBER SPREAD IN JUNE AND TOTAL UNITED STATES WHEAT STOCKS, JULY 1*

(Cents per bushel; million bushels)

PRICE SPREAD

TOTAL WHEAT STOCKS, JULY 1, AS DEVIATIONS FROM NORMAL
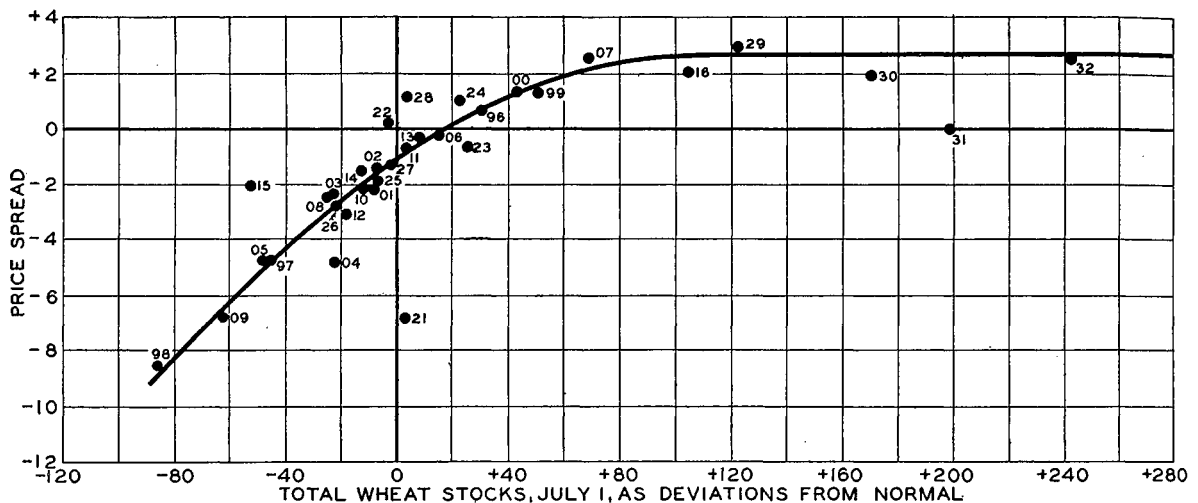
* Spreads and stocks from Appendix Table VI, but with spreads (column B) for 1921–30 reduced one-third to adjust for the markedly higher price and cost level in this period; stocks expressed as deviations from the "normals" represented by the trend line in Chart 6. The position of each dot reflects both the price spread and the total wheat stocks in one year, the dots being identified by the last two digits of the number of the year.

As here shown, and with the adjustments described above, the statistics of July–September price spread in June and total United States wheat stocks present a relationship only incompletely discernible in the separate curves of Chart 6. With the exception of eight years, one of which (1917) is so exceptional that the point representing it would lie far below the bottom of the chart, the relationship is extraordinarily close. The explanation of the unusual discrepancy in each of the eight abnormal years is given in Section III below. Usually the discrepancy results from some technical market situation, including corners and "squeezes."

post-war years, prices of wheat and prices and costs generally were so much higher than in pre-war years that spreads might be expected to be wider in somewhat the same proportion. The actual spreads in the years 1921–30, inclusive, were reduced one-third for plotting in Chart 7, on the assumption that if prices and costs had remained about as in pre-war years spreads in these post-war years would have been one-third smaller than they were. Thus the average spread for June of 1930, which was actually nearly +3 cents, is plotted as close to +2 cents.[1]

[1] Regarding the spread as essentially a price series, as we do, the common statistical practice of "deflating" by dividing each figure by an index number of price level is naturally suggested. We have been doubtful of the full theoretical validity of such ad-

corresponding to zero on the horizontal scale of Chart 7, the spread tends to be about −1 cent. This is purely a matter of definition, determining what are regarded for present statistical purposes as normal stocks. A de-

justment as applied to the spreads, and have preferred the simpler adjustment here used, since it proved adequate. If the spreads were deflated, it would undoubtedly be found necessary to apply an additional adjustment analogous to that of expressing deflated prices as a percentage of trend; but because spreads are both positive and negative, the adjustment would have to take the form of a series of factors by which both positive and negative spreads were multiplied, or very likely two such series, one for positive and one for negative spreads, would be required for full adjustment. The data are quite inadequate to warrant hope that they could be made to yield trustworthy statistical measures of the minor adjustments theoretically called for by these considerations.

crease of stocks to 10 million bushels below normal tends to widen the July–September spread to about 1¾ cents. Further decreases in stocks widen the spread somewhat more than proportionately. For stocks much below normal, a change of 10 million bushels in stocks tends to be accompanied by a change of 1 cent in the spread.

As stocks rise above normal, the September future tends to stand higher relative to the July future. The prices of the two futures tend to be equal during the first three full weeks of June—that is, the spread tends to be zero—when stocks are about 18 million bushels above normal. As applied to post-war years, and measuring July 1 stocks in terms of the official statistics which we currently use in WHEAT STUDIES, this means that the July and September futures tend to stand on a par when the total of visible supply, mill stocks, country mill and elevator stocks, and farm stocks, as of July 1, is 138 (120 + 18) million bushels.

With larger wheat stocks a positive "carrying charge" develops. With stocks 55 million bushels above normal (175 million bushels, in terms of the statistics we use for post-war years), the September future tends to stand about 2 cents over the July. Further increases in stocks lead to only slight further increase in the July–September spread.

The foregoing statements with regard to spreads, it must be borne in mind, assume a level of prices and costs broadly comparable to those of the pre-war period. It is some such level of prices and costs which exists now and appears to be in prospect for at least the next few years. If statements were to be framed to apply to conditions as they obtained between 1921 and 1930 or 1931, all the spread figures above given should be increased 50 per cent. If in the future, prices and other pertinent costs should rise to levels comparable with those of the earlier post-war years, such a revision of the figures for expected spreads should be made, but for the present and immediate future it appears that expression in terms of pre-war circumstances is most appropriate.

The maximum positive spreads shown in Charts 6 and 7 have been exceeded in two years which, for lack of associated stocks statistics, do not appear on the charts. In 1885 September wheat averaged 4 cents over July wheat during the first three full weeks of June, and in 1893 the spread for these weeks averaged 4.4 cents. To judge by the very incomplete statistics available, July 1 stocks in these years exceeded those of any year shown in the charts prior to 1929, and, therefore, maximum carrying charges were to have been expected. That they were so high, however, suggests that in those early years the maximum carrying charge to be expected was higher than in subsequent years in which stocks have been very large.

THE SPREAD AND COMMERCIAL STOCKS

It might be supposed that the July–September spread would be more closely dependent upon the visible supply of wheat in the United States than upon stocks of wheat in all positions, or perhaps that it would be more closely dependent on total commercial stocks than on total stocks or on the visible supply alone. The fluctuations of all these stocks are so similar, however, that visual comparison of the curves in Chart 6 results in no conclusive decision as to which supply series is most closely related to the July–September spread. It is necessary to resort to numerical measurement of the degree of relationship.

For this purpose the Pearsonian coefficient of correlation is useful. When the line describing the relation between two sets of data is not a straight line, but a curved line, as that in Chart 7, the coefficient of correlation understates the degree of relationship, but the coefficients remain useful for comparative purposes. Omitting the years 1929–32, in which stocks rose beyond the point where increases in stocks cease to affect the spread, and omitting also the very exceptional case of 1917, to be discussed later, the coefficients of correlation with the July – September spread are:

For total stocks.................... +.81
For all commercial stocks........ +.83
For visible supply................ +.47

Although a low correlation is shown be-

tween the visible supply and the July–September spread in June, it should be noted that the visible supply is actually quite closely related to the July–September spread so long as the spread remains of moderate size. But with a moderate shortage of supplies, such as results in September wheat selling 3 cents or more under July, the visible supply falls to an approximate absolute minimum, below which it does not ordinarily fall however severe the shortage. This failure of the relationship to continue in years of very short supplies chiefly accounts for the low correlation between visible supply and July–September spread.

Whether the July–September spread during the first three full weeks of June is more closely dependent on commercial stocks (that is, all stocks not on farms) or upon total stocks is essentially a question whether the spread is significantly influenced by farm stocks as well as commercial stocks. Consequently, the coefficients of correlation given above suggest that the July – September spread is somewhat more closely related to all commercial stocks than to total stocks of wheat—that is, that the level of farm stocks has little bearing on the price spread. On detailed investigation, however, it appears that this result arises solely from a peculiar situation in 1921.

The spread in that year was largely influenced by what amounted to a "corner" in the Chicago market. The correspondence between the spread and the volume of commercial stocks in that year was largely fortuitous. These circumstances render the data for 1921 valueless as evidence on the significance of farm stocks. With the data for 1921 omitted, the correlations with the July–September spread are:

For total stocks.................. +.89
For all commercial stocks....... +.84

These coefficients indicate that farm stocks must be taken into account—that total supplies rather than only commercial supplies are influential in determining the July–September spread during the first three weeks of June.

STOCKS AND SPREADS IN VARIOUS MONTHS

The July–September spread during other 3-week periods is not so closely related to year-end wheat supplies as is the spread in June. In terms of comparable coefficients of correlation, the relations of total July 1 stocks to the spread in various months appear as follows:

March .... +.59
April .... +.63
May .... +.79
June .... +.88
July .... +.65

Because in the years 1896, 1899, 1901, and 1921 the September future was not quoted in March, data for these years cannot be used in the correlation of stocks with March spread. To maintain comparability so far as possible, the foregoing coefficients for other months were also computed without data for these years. Data for 1921 would have been omitted even though available for all months on the ground of the exceptional and unrepresentative circumstances affecting the spread in that year. Similar exceptional conditions in 1915 dictated omission of that year also.[1]

Three features of the foregoing correlation coefficients are especially noteworthy: (1) the great increase in the correlations between March and June; (2) the fact that over half of this increase occurs between April and May; and (3) the sharp drop in the correlations between June and July — a decline nearly to the April level. These facts have an important bearing on the explanation of the behavior of the July–September spread.

The suggestion naturally occurs that the July–September spread in earlier months of the season is related more particularly to stocks at the time rather than to July 1 stocks. Computation of correlation coefficients, however, shows the March spread to be somewhat less closely related to March 1 stocks than to July 1 stocks, the correlation coefficients being +.52 and +.59, respectively. Moreover, the spread in June is al-

[1] With 1915 included, the coefficients were:

March .... +.60
April .... +.62
May .... +.80
June .... +.86
July .... +.68

most as closely related to March 1 stocks as to July 1 stocks. The correlation coefficients are +.86 and +.88, respectively.

From these facts one may infer first of all that no particular significance attaches to the date at which stocks are measured. It appears rather that either March 1 or July 1 stocks serve about equally well to reflect the supply situation during the latter part of the season and that it is that supply situation, subject usually to little fundamental change during the four months from March 1 to July 1, which is dominant in determining the July–September spread in June.

One may infer also that it is not primarily the accumulation of additional statistical information on the volume of stocks that has resulted in bringing the spread in later months of the season more closely in line with the supply situation. In most years of the period the chief additions to statistical information on stocks have occurred in March, with publications of estimates of March 1 farm stocks, and then in July. Nor can the close relation between stocks and spread in June be attributed primarily to judgments formed on the basis of stocks statistics, for the only statistics of stocks currently available during pre-war years were very incomplete figures which, though commonly regarded at the time as substantially

complete, actually show a less close relation to the spread than do the substantially complete statistics which we have built up only recently.[2] The close relation between total United States wheat stocks and the spread in June must arise from the fact that the market is influenced by a supply situation statistically measurable in terms of total stocks of all wheat, but felt in the market through channels other than trading based on statistics of stocks.

But why should this supply situation be so imperfectly reflected in the July–September spread during March and April; why should it find so much more accurate expression in the spread during May, and the most accurate expression in the spread during June; and why should the July–September spread tend in July again to get badly out of line with the supply situation?

We are not prepared at present to attempt definitive answers to these questions, but they serve to summarize an important set of facts regarding the relations shown in the foregoing paragraphs. Taken together, they are as important as the more obviously significant fact that the July–September spread in June is dominantly determined by a supply situation conveniently measurable in terms of the volume of the year-end carry-over of all wheat in the United States.

III. OTHER FACTORS AFFECTING THE SPREAD IN JUNE

The relationship between the July–September spread in June and total stocks of wheat remaining in the country on July 1 shows one peculiar and significant characteristic. In most years the spread conforms with extraordinary closeness to that to be expected on the basis of the supply of all wheat in the United States, but in occasional years there occur rather extreme divergencies from expectation. This fact may be seen from a study of the scatter diagram in Chart 7 (p. 206), or more conveniently from the following tabulation, which shows, in cents per bushel, the amount by which the average price of the September future during the first three full weeks of June exceeded (+) or fell below (−) a normal relation to the July future.[1]

Year	Cents	Year	Cents	Year	Cents
1896	0	1907	+ ⅜	1921	−5⅞
1897	0	1908	+ ½	1922	+1½
1898	+ ⅜	1909	− ¼	1923	−1⅛
1899	− ¼	1910	− ¼	1924	+ ¾
1900	0	1911	+ ⅛	1925	− ⅜
1901	− ⅝	1912	− ⅝	1926	0
1902	+ ⅛	1913	+ ¼	1927	0
1903	+ ⅜	1914	+ ½	1928	+2
1904	−2	1915	+ 3⅜	1929	+ ¼
1905	+ ⅜	1916	− ⅝	1930	− ¾
1906	− ⅛	1917	−20½	1931	−2¾
				1932	− ⅛

These thirty-four years include nineteen in

[1] To maintain comparability, discrepancies for the years 1921–30 are reduced one-third, for the same reason that the spreads themselves, as plotted in Chart 7, are reduced one-third.

[2] See "The Disposition of American Wheat since 1896," WHEAT STUDIES, February 1928, IV, 135–80.

which the July–September spread was within ⅜ cent of that to be expected from the level of total July 1 wheat stocks; in twenty-six years the spread was within ¾ cent of that to be expected. In six years, however, the spread differed by 2 cents or more from that appropriate to the stocks situation, and in two additional years the discrepancy exceeded 1 cent.

The discrepancies of ⅜ cent or less, and even discrepancies of ¾ cent, may generally be regarded as negligible. With July 1 stocks of wheat near normal, an error of only 10 million bushels in the estimate of total stocks (that is, an error of only about 8 per cent) would produce an error of from ½ to ¾ cent in the calculation of the spread to be expected. Most of the discrepancies of from ⅜ to ¾ cent may be due merely to errors of 5 or 10 million bushels or less in the estimates of total stocks. With total stocks ranging commonly between 60 and 200 million bushels, mostly not statistically recorded (except in the latest years) but merely estimated, frequent errors of as much as 5 or 10 million bushels are to be expected.[1]

The fact that most of the discrepancies between observed and expected spreads are so small as to be possibly attributable solely to such errors as may be expected in the estimates of total stocks, together with the fact that in a few years the discrepancies are relatively very large, leads to two significant conclusions. (1) In most cases the wheat supply situation, as reflected simply in total stocks of wheat in the United States, has been the only important factor influencing the average July–September spread during the first three full weeks of June; and (2) in occasional years special situations have developed to substantially modify the spread.

The eight cases in which the July–September spread in June differed by more than ¾ cent from that to be expected in view of the wheat stocks on July 1 deserve special attention. They show the effect of no single factor varying in influence from year to year, but rather the effects of a variety of special situations, only one of which was even approximately duplicated in a second year. Five of the eight cases, however, may be classed under the general head of consequences of intentional or unintentional corners or squeezes in the futures market.

EFFECTS OF CORNERS

The five examples of corners or squeezes affecting the July–September spread developed in 1904, 1915, 1917, 1921, and 1922. It is noteworthy that the famous Leiter corner of 1898 and the alleged Patten corner of 1909 produced no abnormal effects on the average July–September spread for June. The July–September spread was strongly affected in May by the Leiter corner, but only minor effects carried over beyond the first week or so of June. As for the alleged Patten corner of 1909, the evidence from the behavior of the July–September spread supports Mr. Patten's contention and other evidence that there was no real corner in Chicago wheat during the spring of 1909.

The corner of 1904 was a most interesting one and is apparently the only intentional and successful corner in the period since 1896 that left its impress on the July–September spread in June. It was run, not in Chicago, but in St. Louis; and it started as a corner in the 1903 December future.

Both winter and spring wheat had been damaged by heavy rains at the time of harvest in 1903, with the result that quality was generally poor and supplies of deliverable grades were extremely limited. Advantage was taken of this situation by a syndicate which ran a corner in December wheat in St. Louis, where only No. 2 Red Winter wheat (soft) was deliverable on contracts. This corner in St. Louis December resulted in attracting to St. Louis practically all the No. 2 Red Winter available in the West, giving the syndicate a corner on the contract grade. This they utilized by disposing of the wheat sparingly at high prices until late March. Between then and late May they moved the wheat rapidly out, mostly to the East, and perhaps into export, whence it would not be returned to embarrass their further operations. They were thus enabled to force hold-

---

[1] Indeed the fact that the discrepancies are so small gives striking evidence of the substantial accuracy of the estimates of total stocks.

ers of short contracts in St. Louis May wheat also to settle at high prices.

Until May, Chicago futures prices remained relatively little affected by the St. Louis corner. Although most of the available No. 2 Red Winter had been drained out of the Chicago market and the normal sources of additional supplies similarly exhausted, there remained in Chicago enough No. 1 Northern Spring to satisfy needs with traders exercising the caution which the situation clearly required. During May some tightness developed in the Chicago May future, but not enough to bring it to within 5 cents of the price of No. 2 Red Winter being maintained by the St. Louis syndicate.

Although deliveries on the May future were No. 1 Northern and a small amount of No. 2 Hard Winter delivered at a 5-cent penalty,[1] Chicago July wheat was priced, as usual, on the expectation that before the end of July there would be available sufficient No. 2 Red Winter from the new crop to bring its price well below that of No. 1 Northern. The cornering of the supply of No. 2 Red Winter, however, and the movement of the surplus to the East, had created a shortage in that grade comparable with that which would have prevailed under normal conditions if the country-wide supplies of wheat had been much smaller than they were. It was this artificially produced shortage of deliverable wheat that caused Chicago July wheat in June to sell as high as it did above September wheat.

THE EPISODE OF 1915

As regards the case of 1915, there appears to be no ground for supposing that a corner was attempted, but a so-called "squeeze" developed in May wheat, of a rather peculiar character. Because the culmination of the squeeze occurred when the price tendency of wheat in other markets and in other Chicago futures was downward, the squeeze did not

manifest itself in the rising prices usual in such instances; its price effects are clearly discernible only in price spreads.

The crop year 1914–15 started with rather liberal supplies of wheat. A carryover of 110 million bushels, plus the large crop of 891 million bushels, left a surplus of some 300 million bushels readily available for export, and a possibility of exporting some 350 million bushels if year-end stocks were to be reduced to the approximate absolute minimum of 50 million bushels. Exports, however, proceeded at an unprecedented rate, not only in the autumn and winter, but with little diminution during March and some increase in April over March. The July 1 carryover, actually reduced to about 70 million bushels, would have fallen to 50 million bushels if the March–April rate of export had continued through May and June.

In this situation the discount of around 12 cents at which September wheat sold, relative to July, during late March and early April, represented a not unreasonable appraisal of the supply position as it might then have appeared. As export sales declined, however, the supply position became easier and the change was reflected in a rapid closing up of this extraordinarily wide negative spread from about the middle of April.

The easing of the supply position was more pronounced in other markets than in Chicago. In particular the price of St. Louis May wheat declined from a discount of 5½ cents under Chicago May on April 10 to a discount of more than 7 cents during most of the two weeks April 17–29. An abnormal increase in the flow of wheat to Chicago resulted. With shipments falling off, the increased receipts led to an enlargement of total reported elevator stocks in Chicago from 1,130,000 bushels on April 10—roughly normal in view of the general supply situation — to 2,745,000 bushels on May 15.

Whether the strength in Chicago May wheat was primarily a consequence of the holding open of "long" contracts by shippers desiring to obtain wheat for export by taking delivery, or a consequence merely of bullishness of speculators generally, is not apparent. We find no helpful discussion of the epi-

---

[1] At that time only No. 1 and No. 2 Red Winter wheat and No. 1 Northern Spring were regular for delivery on futures contracts in Chicago. Nos. 1 and 2 Hard Winter were deliverable at a 5-cent discount, or after July 1, on "new style" contracts, at a 2-cent discount.

sode either in contemporary market reports or in the reports of the Federal Trade Commission based on its investigation of the grain trade, and must reconstruct the picture wholly from the records left in contemporary statistics. It is clear, however, that the strength in the Chicago market rested primarily on a technical situation in May wheat.

To meet this technical market situation, 1,537,000 bushels of contract wheat were added to the stocks in public elevators, raising them from 70,000 bushels on April 10 to 1,607,000 bushels on May 15, about one-third being No. 2 Hard Winter wheat, and two-thirds No. 2 Red Winter.[1] This increase in stocks of contract wheat in public elevators represented virtually the total increase of all reported wheat stocks in Chicago.

Because of the importance of the statistics of Chicago wheat stocks as evidence of the situation in May and June of 1915, the data are reproduced below in considerable detail, in thousands of bushels.

Date	Total Chicago stocks	Private elevator stocks	Public elevator stocks		
			Total	No. 2 Red Winter	No. 2 Hard Winter
April 3........	911	821	90	27	8
10........	1,130	999	131	31	39
17........	1,149	956	193	61	97
24........	1,448	923	525	225	241
May 1........	1,774	685	1,089	598	428
8........	2,537	849	1,571	858	676
15........	2,745	1,087	1,658	997	610
22........	2,293	656	1,637	967	616
29........	2,711	464	2,247	1,424	779
June 5........	2,526	433	2,019	1,256	726
12........	1,536	364	1,172	640	512
19........	1,447	649	716	509	199
26........	510	257	160	120	40
July 3........	140	71	69	31	38

As was to be expected, since this wheat had been put in the elevators for the purpose of delivery on futures contracts, deliveries on May 1 were heavy. They were reported by the Chicago *Daily Trade Bulletin* at 940,000 bushels. Deliveries during the next two weeks brought the total reported deliveries to May 15 to 2,024,000 bushels.[2]

During the first half of the month, while deliveries on futures contracts remained fairly large, Chicago May wheat had fallen

from the premium of 7–7½ cents over St. Louis May, which had prevailed through most of the last half of April, to a premium ranging from 3½ to 4¾ cents over St. Louis May. But these deliveries fell either into the hands of large speculators who were willing to carry the cash wheat or into the hands of shippers who had been holding for delivery in order to obtain wheat for export, and left the situation in the May future still tight. Between May 15 and May 25, the Chicago May future rose again, from 4¼ cents over St. Louis May on the 15th to a premium of 8¾ cents over St. Louis May on the 25th of the month. Relative to Kansas City, the rise was from a premium of 5 cents to one of 8¾ cents. Reported deliveries, meanwhile, amounted to only 162,000 bushels.

The renewed tightness in Chicago May wheat and its rise out of line with other markets brought additional wheat to the market and led to the transfer of several hundred thousand bushels from private to public elevators to be available for delivery. Deliveries on the last six trading days of the month were reported as follows, in thousand bushels:

May 24......... 2		May 27........182
May 25.........40		May 28........170
May 26.........50		May 29........375

The increased deliveries on futures contracts were readily taken on the 25th. Probably the actual deliveries on the 26th also

[1] The dates here given are those of the Saturdays to which the visible-supply statistics apply. The detailed statistics of public elevator stocks, by grades, and of total private elevator stocks in Chicago are published a day later and stated to apply to Monday, but in this period at least represent merely a breakdown of the Saturday figures, for their total is always identical with that of the visible supply as of Saturday. Accordingly we have here used the Saturday dates.

[2] Of course there is probably duplication in these figures, since the same lot of wheat may be delivered several times. The Federal Trade Commission obtained from the Secretary of the Chicago Board of Trade a statement showing total deliveries in May 1915 of 2,123,000 bushels, which compares with a total of 2,963,000 based on the daily reports of the *Daily Trade Bulletin*. With regard to the figures supplied by the Secretary of the Chicago Board of Trade, the Federal Trade Commission says they "are probably for notices issued and stopped." (See *Report on the Grain Trade*, VII, 137.)

had little direct price-depressing influence, but on that day 245,000 bushels of additional wheat was received in the market, presaging heavy deliveries later. Of the price decline which started on that day, the St. Louis *Daily Market Reporter* of May 26 said: "The slump in Chicago was caused by large arrivals of cash contract wheat from St. Louis, Kansas City and Omaha."

It became apparent that most of the remaining holders of long contracts did not want cash wheat. There ensued a rush to unload Chicago May wheat which carried its price down 15 cents from the close on May 25 to the close on May 29, while the price of September wheat remained totally unaffected, closing at the same figure on the 29th as on the 25th. On May 29 Chicago May wheat actually closed 2 cents below the closing quotation on St. Louis May wheat, in place of its customary premium.

The fact that shipments of wheat out of Chicago rose notably soon after the beginning of heavy deliveries on May wheat, in contrast to the declining tendency through March and April, suggests that the original tightness in the Chicago future was occasioned by shippers who chose to hold for delivery on large quantities of May contracts. Whether from this initial cause, or otherwise, there arose a belief among speculators that the situation in May wheat would become still tighter. Thus the price was well supported until the final days of settlement, when the price crashed, and it appeared that there was in Chicago a great quantity of cash wheat which nobody wanted there. The result was that during most of the ensuing month of June the July–September spread in Chicago became a measure of the local abundance of supplies rather than of a country-wide shortage.

Cash Wheat Buyers' "Corners"

In 1917 and again in 1921 severe congestion developed in the Chicago futures market in consequence of abnormal use of futures contracts as a medium for obtaining cash wheat, in both cases for the purpose of export. The consequences were like those of a successful corner. The view is commonly held that,

since the "sale of a future" actually represents the making of a contract to deliver cash wheat, no blame can attach if buyers of futures choose to hold for delivery on extraordinary quantities of futures. This view, we suggest, is unsound and based on an unrealistic interpretation of the facts. Unreasonable exercise of the legal privilege to demand delivery of cash wheat on futures contracts may well be compared with unreasonable exercise of the legal privilege of depositors suddenly to demand payment of their total bank deposits in cash.

In 1917 the price of September wheat averaged 26¼ cents under the price of July wheat during the first three full weeks of June. This spread is so wide that the point for 1917 could not be plotted on Chart 7 without unduly increasing the size of the chart. The great discount on September wheat (or premium on July) in 1917 was primarily a consequence of the use of the Chicago futures by European governments as a means of obtaining cash wheat. These governments held Chicago May wheat in such quantities that it became clear there was no possibility of bringing enough wheat into Chicago to satisfy the contracts. Accordingly a settlement price was agreed upon, and trading in May wheat was discontinued as of May 11, 1917. In July wheat the situation was not so severe, and trading was continued to the end of the delivery month, but the July future remained almost continuously at an extreme premium over the September future.

The abnormal July–September spread of June 1921 was also the consequence of use of futures contracts to obtain wheat for export. In this case, however, a single private exporter, one A. C. Fields, was responsible for the situation. In May 1921 Mr. Fields chose to hold for delivery on large quantities of Chicago May futures. With only 24,361 bushels of wheat in public elevators in Chicago on May 2 and 151,551 on May 30, deliveries on futures contracts during the month amounted to 1,025,000 bushels. Receipts of wheat during the month totaled 1,906,000 bushels, and shipments 1,754,000 bushels. The effect was again that of a corner, although it does not appear that such

was the intent.[1] The price of May wheat was pushed to nearly 60 cents over the price of July wheat at the close on May 31.

Fear of a similar squeeze in July wheat was a dominant factor in supporting its price, so that when trading in September wheat was first started, on June 4, the July future ranged between 13 and 16 cents over the September. Receipts of wheat during June were liberal, however, and the price of the July future rapidly declined until by the end of the month the July–September spread was in line with the general stocks position. During July, indeed, September wheat ruled abnormally high in relation to July.

THE EPISODE OF 1922

In the fifth case classed as showing the effects of a corner, we lack clear evidence that a corner was actually attempted. The events were similar in several respects to those of 1915. Whether by intent or by chance, extreme tightness developed in the Chicago May future in April 1922. It was generally thought that shorts would be squeezed as in the previous year. By April 21, May wheat in Chicago had risen to more than 17 cents above the July delivery and July had risen to 8⅜ cents above the September. Perhaps more important, on April 28 Chicago May wheat went to 11 cents over Kansas City May.

The premium on May wheat, the relatively higher prices in Chicago, and perhaps also the fear of outside elevator operators with hedges in the Chicago May future that they would be even more severely squeezed, resulted in heavy shipments of wheat to Chicago. During April and May 11,617,000 bushels arrived, 9,414,000 in the month of May alone. Stocks of wheat in public elevators rose from 1,137,870 bushels on April 3 to 6,466,577 bushels on June 5. On May 11 the car-lot delivery rule was invoked, making

wheat in cars regular for delivery on futures contracts.

The huge supplies of wheat thus brought into Chicago not only completely broke the "squeeze" in May wheat, but left such an abnormally large supply of wheat in Chicago that No. 2 Hard Winter, which since late January had been selling at premiums of from 10 to 20 cents over the July future, dropped in price nearly to the level of the July future. As a reflection of the same abnormal distribution of supplies, Chicago July wheat fell below the price of the September delivery instead of remaining at a premium of from 1 to 2 cents, as might have been expected from the size of total United States stocks.[2]

ANOTHER TECHNICAL SITUATION

In 1928 developments were similar to those of 1915 and 1922 in the respect that Chicago prices got temporarily out of line with another market, inducing heavy shipments to Chicago. In other respects, however, the situation was notably different. We find no good evidence of even a so-called "natural" corner developing in 1928. Nor was the movement of cash wheat into Chicago sufficiently heavy to account, by itself, for the effect produced.

The culmination at the end of April 1928 of the bull market that had been gathering momentum fairly steadily since February brought into the Chicago market such a flood of buying orders that inter-market spreading operations were insufficient to keep Minneapolis in line with Chicago. At the end of April the Chicago May future rose to 8 and even 8½ cents above the Minneapolis May future on several days in late April. This abnormal spread was soon narrowed, almost disappearing by the end of May, but it lasted long enough to result in the shipment of some 3 million bushels of No. 1 Northern Spring wheat to Chicago. This wheat, a contract grade at Chicago at that time, arrived chiefly during the first half of May. It served to raise the supply of wheat in store in public elevators at Chicago from 2,361,598 bushels on April 28 to 5,214,395 bushels on May 26. Of the latter amount, 3,881,573 bushels were

---

[1] *Report of the Federal Trade Commission on the Grain Trade,* VII, 67.

[2] More detailed information on the situations in 1917, 1921, and 1922 may be found in the Federal Trade Commission's *Report on the Grain Trade,* especially VII, 66–67, 245, 260, 267–70, and 382–84.

No. 1 Northern Spring and only 1,117,169 bushels were No. 2 Hard Winter.

Once in Chicago, the spring wheat was out of position with reference to normal trade utilization, and by late May fell to a discount of 3 cents a bushel under No. 2 Yellow Hard Winter wheat, which would normally have been the cheapest contract grade at Chicago. The Chicago May and July futures became spring-wheat instead of winter-wheat futures — spring - wheat futures based on nearly 4 million bushels of spring wheat out of position.

The assumption prevailed that by September winter wheat would have regained its normal dominance in the Chicago market, and in consequence the September future was regarded as a winter-wheat future. The July–September spread was therefore increased by approximately the 3-cent discount at which the temporary surplus of spring wheat was currently held.

Two Exceptional Cases

Of the remaining two cases of abnormal July–September spread in June, one (1931) invites the appellation of "the exception that proves the rule," and the other (1923) constitutes a real and important exception to the principle that appears to have been in operation in all other years.

The apparent abnormality in the July–September spread in June 1931 is scarcely a real one. The huge wheat supplies remaining in the country at that time would ordinarily have justified a liberal carrying charge in the form of a premium of September wheat over July. But in 1931 most of the wheat stocks of the country were in the control of the Grain Stabilization Corporation, under commitment to hold them, in the main, off the market. In consequence, the commercially available stocks of old wheat were not large in 1931, and, in terms of a relation between the spread and wheat supplies actually available to the trade, no large premium of September wheat over July was to have been expected.

It is impossible to determine the quantity of wheat that was in effect commercially

available as of July 1, 1931. One may estimate closely the amount of wheat outside the holdings of the Grain Stabilization Corporation as of July 1, but for an estimate of commercially available supplies it is necessary to add to this quantity an indeterminate amount of the Corporation's holdings which might be sold, net, under its announced policy, plus additional amounts which it was willing to sell against purchases of futures. A liberal interpretation of the announced policy was necessary to avoid serious disruption of the grain trade and the milling industry, especially in spring-wheat territory. In consequence of the indeterminateness of the "commercially available" wheat supplies of July 1931, it is not possible to demonstrate statistically that the July–September spread in June was in line with the supply situation.

On the other hand, there is no evidence that the Grain Stabilization Corporation undertook to regulate the July – September spread as such. Rather, the spread seems to have been determined in the ordinary way on the basis of the effective supply situation as it appeared at the time. The fact that on this occasion the supply situation was not subject to statistical expression in terms of effective July 1 stocks is without significance, for estimates of July 1 total wheat stocks probably never play a large part in the actual determination of the spread. Prior to the last few years no adequate statistics of total stocks were currently available. The spread was determined in 1931, as in other years, by actions of traders, each influenced by knowledge of certain aspects of the supply position. That the net effect is usually substantially equivalent to determination of the spread on the basis of the carryover as of July 1 is purely incidental from the standpoint of the actual mechanism of determination.

An Important Exception

Finally, there remains for consideration the discrepancy of 1923. The amount of the discrepancy in this year is the smallest among the eight discrepancies which have been deemed worthy of special investigation: the average spread during the first three weeks of June was only 1⅛ cents below that

to be expected on the basis of July 1 wheat stocks.[1] In significance, however, it is one of the most important discrepancies, for it exhibits a true exception to the general relationship observed in other years, and an exception likely to be repeated.

The general conclusion indicated by the relationships in other years is that the July–September spread is determined by total supplies, irrespective of their distribution geographically, by classes of holders, or by types of wheat, except as abnormal distributions of stocks are created by artificial situations, such as (*a*) a corner or squeeze, (*b*) heavy shipments of deliverable wheat in response to a temporarily abnormal inter-market spread, or (*c*) government control. In 1923, however, a marked effect was produced by an unusual distribution of stocks arising under natural conditions.

Except for the latest years there are no available estimates of total wheat stocks segregated either by classes of wheat or by regions; but the situation in 1923 is well indicated by the geographical distribution of commercial stocks shown in the tables of "available supplies" compiled monthly by the Chicago *Daily Trade Bulletin* in co-operation with the Minneapolis *Daily Market Record*. The percentages of the reported July 1 stocks which were in the spring-wheat states of Minnesota, Wisconsin, and the Dakotas are shown below for 1923 and other comparable years. With the percentages are given the actual stocks statistics in thousand bushels.

[1] This is the only year in which there is a significant difference between my estimate of total United States wheat stocks, 1922 to 1927, derived in the same way as for earlier years, and the official statistics currently carried in WHEAT STUDIES for years since 1922. The difference rests on the fact that in our current compilation we use for "city mill stocks" an estimate of 44 million bushels published by the U.S. Department of Agriculture, but designated as unofficial. My method of estimation does not include mill stocks as a separate item, but may be interpreted as implying an estimate of "city mill stocks" of some 65 million bushels. Use of my earlier estimate of total United States wheat stocks as of July 1, 1923, would give a discrepancy of 2¼ cents between the actual spread and that to be expected from the estimated supply situation. For present purposes it is fortunately unnecessary to try to determine which figure is more nearly correct.

Year	United States	Spring-wheat states	Percentage
1896	64,103	33,502	52.3
1900	70,860	28,652	40.4
1906	39,776	21,427	53.9
1911	40,073	12,423	31.0
1913	45,424	27,254	60.0
1921	22,360	11,430	51.1
1922	32,788	9,091	27.7
1923	51,913	31,717	61.1
1924	52,775	17,200	32.6
1927	37,525	15,840	42.2

The estimates of farm stocks admit of regional comparison in the same way as the commercial stocks, as follows:

Year	United States	Spring-wheat states	Percentage
1896	48,524	19,896	41.0
1900	58,363	18,198	31.2
1906	47,393	13,890	29.3
1911	34,071	8,696	25.5
1913	35,515	15,476	43.6
1921	56,707	8,787	15.5
1922	32,359	4,788	14.8
1923	35,894	10,155	28.3
1924	30,981	4,491	14.5
1927	27,222	5,066	18.6

The years selected for comparison in the tabulations above are years in which the general level of stocks and the July–September spread were about the same as in 1923. Years of widely differing total stocks were omitted, for these would be expected to show widely differing percentages of the stocks remaining in the spring-wheat states; in particular, when supplies are short, stocks in winter-wheat states may be allowed to fall very low on July 1, while the spring-wheat states must retain supplies for at least two months.

Both of these tabulations show an unusual concentration of wheat stocks in spring-wheat states in 1923. The commercial stocks statistics show for 1923 a concentration closely approached only in 1913. The farm stocks statistics for 1923 show a percentage in spring-wheat states that was not high in comparison with pre-war years, but very high in comparison with other post-war years.

In spite of this concentration of stocks in spring-wheat states at the end of the crop year terminating in 1923, there was a premium on spring wheat, especially spring wheat of good protein content, which prevented its use for delivery on Chicago futures contracts or its free substitution for the rela-

tively scarce winter wheat. This premium is not reflected in quotations on cash wheat in Chicago, for they show the influence of small quantities of inferior spring wheat coming into Chicago, but it is clearly indicated by the cash prices of spring wheat in Minneapolis and the character of the stocks of contract wheat held in public elevators in Chicago. As of the close on June 15, for example, No. 2 Yellow Hard Winter wheat at Chicago was quoted at $1.13–$1.14 per bushel, while No. 2 Northern Spring, at that time deliverable without discount on Chicago contracts, was quoted at $1.11–$1.15 per bushel. But at Minneapolis on the same date No. 2 Northern Spring wheat was quoted as closing at $1.11⅜–$1.18⅜, clearly offering no opportunity for its profitable shipment to Chicago in competition with hard winter wheats.

The fact that spring wheat was in fact not going to Chicago for purposes of delivery on futures contracts is clearly shown by the stocks in public elevators, by grades. Quantities of deliverable wheat in Chicago as of June 18, 1923, were as follows:

    No. 1 Hard Winter............ 1,095 bushels
    No. 2 Hard Winter............997,946 bushels
    No. 2 Yellow Hard Winter....240,610 bushels
    No. 2 Northern Spring........ 7,978 bushels

In 1913, on the other hand, a similar dominance of spring wheat in the year-end stocks resulted in its free utilization in place of winter wheat. On June 16, 1913, stocks of contract wheat in public elevators in Chicago were as follows:

    No. 2 Hard Winter.......... 160,115 bushels
    No. 2 Red Winter........... 14,550 bushels
    No. 1 Northern Spring......1,722,763 bushels

At this time No. 2 Northern was not deliverable on contracts and no wheat of that grade was reported in public elevators at Chicago.

With supplies of winter wheat relatively short in 1913, there was free substitution of spring wheat for winter, and the July–September spread remained in normal relation to total wheat supplies. In 1923, however, with a similar supply situation, the spring wheat did not so freely take the place of winter wheat and the July–September spread in Chicago reflected the shortage of winter wheat rather than the relative abundance of total stocks.

The reason for this difference between 1913 and 1923 is to be found not in circumstances peculiar to 1923 alone, but in a feature of the wheat situation broadly characteristic of the whole post-war period. Since the war, spring wheat has generally represented a smaller proportion of the total crop than in pre-war years, and changes in flour characteristics demanded by an expanding commercial baking industry have favored spring wheat, with the result that spring bread wheats of all but the poorest quality have become normally premium wheats.

Because of the decline in relative production, it is not to be expected that spring-wheat supplies will often be relatively abundant at the close of the crop year, but when such is the case it is to be expected that spring wheat will not freely take the place of winter wheat. In consequence, it is likely that situations similar to that of 1923 will recur in the future: that when shortage of year-end supplies of winter wheat occurs in conjunction with relative abundance of spring-wheat supplies, the July – September spread will be such as to suggest less ample supplies than are indicated by the statistics for all wheat.

Subject to this qualification, pertinent only in the relatively unlikely case of comparative abundance of spring wheat, the conclusion to be drawn from this and the preceding section is that one may expect the spread between July and September wheat in June to conform closely to the total supply of all wheat in the United States except as the situation may be disturbed by corners, squeezes, or other abnormal situations primarily of a technical character.

A subsidiary conclusion of some importance is that the July–September spread, interpreted in connection with statistics of the supply situation, provides a useful index both of the existence and of the severity of abnormal speculative situations in the wheat market. It provided the sole basis for selecting for special investigation the eight years which have just been discussed, in each of

which we were able to determine whether the abnormality arose from a situation of the character of a speculative corner or "squeeze," or from some other abnormality in the situation. It provided also persuasive evidence that there was neither a corner nor a "squeeze" in Chicago wheat futures in the spring of 1909, despite widespread belief that the high prices at that time were attributable to a corner.

IV. SEASONAL TENDENCIES IN PRICES AND SPREAD

There are several clear seasonal tendencies in the July–September price spread, one of which in particular is probably quite as useful for the purpose of forecasting spread changes as are the relationships developed in the last two sections. Associated with these seasonal tendencies in the spread, and for the most part causally related to them, are important seasonal tendencies in the prices of the futures, which are here treated specifically only as they appear in the Chicago July future.

The seasonal tendencies in both price and spread differ somewhat according to the direction and size of the July–September spread and must be studied separately by classes of years. The classification is the same as that used in Section I above: years in which the July–September spread was positive in April are included in Group I; years of small negative spread in April are included in Group II; years of large negative spread (more than 2 cents) are included in Group III. April was chosen as the criterion month simply because it is desirable to have a basis of classification available as early in the season as possible, and April is the first month that may be used for the purpose without rendering an excessive number of years unusable owing to absence of a July–September spread.

The true seasonal tendencies both in the price of July wheat and in the July–September spread appear clearly in the averages by weeks shown graphically in Charts 8 and 9. The curves in the charts show also some movements which reflect merely the peculiarities of a few individual years rather than true seasonal tendencies. A brief preliminary summary of the tendencies accepted as significant will serve both to avoid erroneous first impressions from the charts, and to indicate certain systematic characteristics of the tendencies which deserve to be kept in mind from the outset.
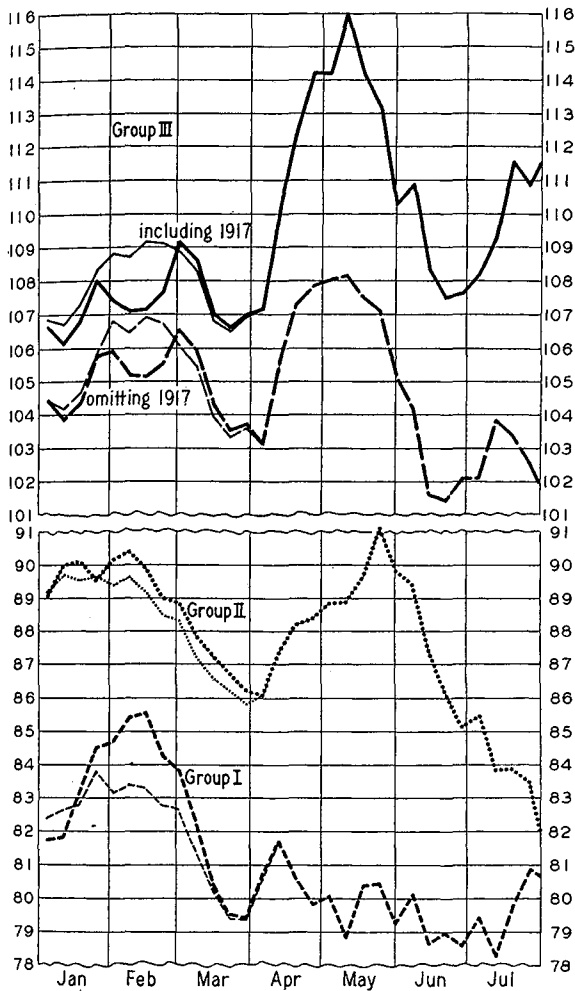
The most conspicuous seasonal characteristic of the spread is a strong tendency to rise in June, reflecting a corresponding tendency for the price of September wheat to rise relative to the price of July wheat, or for July to fall relative to September, during June. This tendency appears, though perhaps for somewhat different reasons, in each of the three classes of years into which the data have been divided for analysis. The other tendencies differ somewhat from class to class. One of these is a tendency toward decline in the spread during July, conspicuous in years of positive spread,[1] but absent as a true tendency in other years. Another is a tendency toward slight decline of the spread during May among years of positive spread, which appears as a tendency to decline during both April and May in other years. A fourth tendency is one toward rise in the spread, through January–April in years of positive spread, through January–March in years of small negative spread, and only during March in years of large negative spread. Finally, there is a tendency in years of large negative spread for the January–February rise that occurs in other years to disappear if the spread itself is only moderately large, and to be replaced by a pronounced tendency for the spread to decline—that is, to widen—if the negative spread is very large.

The seasonal tendencies in prices here discussed are tendencies which, in their general features, many students of the market have believed to exist. The more important of these tendencies, however, are not found in

[1] Because of the seasonal tendency, a positive spread in April, which is the basis of classification, means normally a positive spread of over 1½ cents by about the first of July.

CHART 8.—AVERAGES, BY WEEKS, OF PRICE OF
CHICAGO JULY WHEAT*

(Cents per bushel)

* Data chiefly from Appendix Table V.

The curves represent averages for years classified into the following groups:

I. Years of positive spread.
II. Years of small negative spread (not over −2 cents).
III. Years of large negative spread.

The averages represented by the heavy lines are based in each case on data for the same years employed for the curves of Chart 9 and should be used when comparing corresponding curves in the two charts. The connecting light curves are based on data for a larger number of years, available for these averages because trading in July wheat begins before trading in September wheat. As indications of seasonal tendency, these light curves are more trustworthy than the heavy curves.

The seasonal tendency for the price of July wheat to decline in March appears in all these groups of years; the tendencies toward price rise in April and toward price decline in May–June or in June–July appear only in years of Groups II and III. The tendency toward price increase in January is reasonably clear only in years of Group III.

all classes of years. Lack of understanding of the conditions under which the tendencies

assert themselves has hitherto led to much skepticism as to their reality. As a set of characteristics related to the behavior of the July–September price spread, they are here treated only as they are reflected in the price of the July future.

CHART 9.—AVERAGES, BY WEEKS, OF SPREAD BETWEEN CHICAGO JULY AND SEPTEMBER WHEAT*

(Cents per bushel)
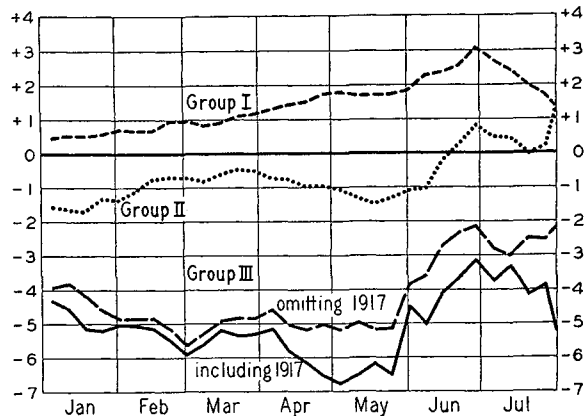
* Data and classification as for Chart 8.

Changes in the July–September spread during 1917 were so extraordinarily large that their nonseasonal movements tend to distort the averages unduly; the averages omitting 1917 are more accurately representative of the true seasonal tendencies in years of Group III. The most important seasonal tendency is that of June: a rise in September wheat relative to July has occurred in almost every year in each of the three groups, except prior to 1904 in years of Group III, when no such tendency existed. The very regular tendency for the spread to decline during July in years of Group I reflects a true tendency only in that group. The tendency to decline in the spread curves during May of years of Group I extends through most of April and May in the other two groups and is most pronounced in Group II. The earlier rising tendency extends through January–April in Group I, January–March in Group II, and only through March in Group III. In years of large negative spread (Group III) the January–February tendency is horizontal if the spread be moderately large, and sharply down if the spread be very large.

Most of these seasonal tendencies in spread, except in Group I, are closely related to the main seasonal tendencies in price of July wheat.

Among the seasonal price tendencies in the July future, the only one common to all classes of years is a tendency toward price decline through the month of March. Similar or stronger tendencies toward price increase in April and price decline during May–June or June–July are found in years of negative July–September spread, but not in years in which the spread is positive. Finally, a likelihood of price increase in January is found as

a true tendency only in years of large negative spread.

SEASONAL TENDENCIES IN PRICE OF JULY WHEAT

In earlier studies we have pointed out the absence of any general tendency for futures prices to be seasonally depressed in the period immediately following harvest, as are prices of cash wheat, but have noted evidence of possibly significant seasonal characteristics in the behavior of futures prices during the period January–May.[1] In examining the seasonal tendencies of the July–September spread, we have come somewhat unexpectedly upon at least one highly illuminating set of facts regarding the seasonal characteristics of futures prices themselves over the period January–July.[2] Owing to important relations with the seasonal tendencies in the spread, these seasonal characteristics of the price of the July future require brief presentation at this point.

The charts, it will be noted, are drawn to a scale that emphasizes fluctuations in the curves. The scales were chosen with the object of having the curves of average spreads in Chart 9 directly comparable with the individual spread curves in Chart 3 (pp. 192 and 194)—although the scales are larger in the reproduction, the proportion between horizontal and vertical scales in Chart 9 is the same as in Chart 3. Chart 8, in turn, is made directly comparable with Chart 9.

The heavy curves in Chart 8 are compa-

rable with the corresponding curves of average weekly spreads shown in Chart 9, being based on data for the same years. Since trading in July wheat starts earlier in the season than trading in September, prices of July wheat are available in January–March of many years in which the spread is not available. The light curves connecting with the heavier ones in Chart 8 result from utilization of prices of July wheat whenever it was quoted. Being based on fuller data, these give the more trustworthy indication of seasonal tendencies.

To appraise the validity of the impression of seasonal tendencies given by averages, it is necessary also to examine in detail the records for all years separately and judge whether they bear out the suggestion of a true underlying tendency. A description here of the detailed facts brought out in such an analysis of the price movements of individual years would be exceedingly tedious—uninteresting to the reader willing to accept our conclusions, and of little use to the reader desirous of reviewing them critically. For the latter, the price curves for individual years are made available in Chart 4 (pp. 193 and 195). We content ourselves at this point with summarizing our conclusions, supported by only brief suggestion of their bases.

The only true seasonal tendency which we find among years of positive July–September spread (i.e., years of Group I) is the strong tendency for a price decline from the middle of February, or somewhat earlier, to the latter part of March. The price decline over this interval has rarely exceeded 5 cents, but only twice among the eleven years in the group did the decline fail to appear. In one case (1907) the price movement was horizontal, and in the other exceptional year (1895) was only slightly upward.

The irregular downward tendency indicated by the averages for the remainder of the season in years of positive spread is a rather misleading statistical expression of the fact that after March, in years of this class, prices have usually moved either strongly downward or strongly upward, with a slight predominance of downward movements. In two years this latter interval has included crop-

---

[1] See "The Post-Harvest Depression of Wheat Prices," WHEAT STUDIES, November 1929, VI, 25–26; and "Cycles in Wheat Prices," WHEAT STUDIES, November 1931, VIII, 4–5, including footnotes.

[2] The fact that unmistakable evidence of these seasonal characteristics has come out in the present study and not before is primarily attributable to the fact that we have here been using averages by weeks; the tendencies run mostly through such short intervals that they do not appear clearly in monthly averages. Much has been gained, however, by study of the seasonal price characteristics in connection with the classification of years found advantageous for investigation of the July–September price spread; for one of the seasonal price tendencies here demonstrated is present in only one class of years, two are absent in one class of years, and one of these two differs greatly in character as between the two classes of years in which it is present.

scare cycles culminating in May or June.[1] It is perhaps significant that these two years are the two which failed to show the usual February–March price decline.

Among years of small negative price spread (Group II), there appears evidence of three distinct seasonal price tendencies: (a) a declining tendency in February–March; (b) a rising tendency in April; and (c) a strong declining tendency through June and July. No one of the individual years shows all these movements in the proportions indicated in the curve of averages, but each of the tendencies described appears in the separate years with extraordinary consistency of occurrence, despite large variation in the strength with which it is manifested.

The tendency in February–March is the least regular of the three tendencies described. Among the twelve years included in the group, seven showed large price declines from the middle of February, or earlier, to the end of March; four showed a horizontal tendency with great price stability, except for a sharp dip and recovery in March of 1899; and only a single year (1890) showed a price increase, and that a very slight one.

The upward price tendency of July wheat during most of April in years of small negative price spread only once (1890) much exceeded the 2–3 cents indicated by the average, but it revealed itself in some degree in every year of the twelve except 1914. The stronger declining tendency of June–July has also manifested itself with remarkable uniformity, as regards both occurrence and magnitude of the decline. Only once (1887) was the price decline greater than 1½ times its average magnitude of nearly 9 cents, and only once did it fail to occur. Strangely enough, there is room for difference of opinion as to which one of two years failed to show the otherwise invariable June–July decline: in 1914 the price of July wheat declined steadily through June, but in the last two weeks of July recov-

[1] That is, movements including a price increase of 14 cents or more within an interval of five weeks or less, the price change being calculated from *weekly averages* of daily prices and expressed in cents per bushel at the 1913 price level. See WHEAT STUDIES, November 1931, VIII, 18–27, for an analysis of this important type of price movement.

ered its loss; in 1902, on the contrary, the price rose rather steadily through June and most of July, but in a very irregular market during the last few days of July dropped to the levels of early June.

With respect to the eighteen years of large negative spread between prices of July and September wheat, the statistical averages indicate the existence of four periods of upward or downward seasonal price tendency, namely, January, March, April, and May–June. The indicated tendency for the price to rise during most of January is of somewhat questionable validity and certainly of little practical consequence, for price decreases in this month have occurred about as often as price increases. It is accepted as probably a true though minor tendency, largely because an entirely clear corresponding tendency is found in the July–September spread.

The indication that the price of July wheat tends to decline from late February through most of March, in years of large negative spread, is of little more practical significance than the indication that the price tends to rise in January, for the manifestation of the tendency has been highly irregular. Its existence as a true tendency is indicated both by the fact that such a decline, either large or small, occurred in twelve out of eighteen years, and by the fact that the indicated tendency is the same as that clearly apparent in the other two classes of years.

The seasonal tendencies in the price of July wheat during the next two intervals—April and the interval from mid-May to mid-June—are quite as clear and somewhat more significant practically than the tendency in February–March. The tendency toward price decline in the latter part of May and early June is peculiar in that it appears to have developed since about 1903. The period ending with 1903 includes five years falling in Group III, of which only two show a May–June price decline; the period beginning with 1904 includes thirteen years falling in Group III, of which nine show this characteristic decline. This seasonal tendency, moreover, is related to a seasonal tendency in the July–September spread in the same years,

which appears even more clearly to have developed since about 1903.

SEASONAL TENDENCIES IN SPREADS

Turning now to the principal subject of the present section—the seasonal tendencies in the price spread between Chicago July and September wheat—we have to consider both the observable seasonal tendencies and their relation, or lack of relation, to seasonal tendencies in the price of July wheat.

Among years of positive spread in April (Group I in Chart 9, p. 219), there appear four distinct seasonal tendencies in the July–September spread. The first is a tendency for September wheat to rise relative to July from the beginning of trading in that delivery to about the end of April; the second, a tendency toward slight decline through May; the third, a notable tendency to rise in June; and the fourth, a strong tendency to decline in July. All these tendencies are unrelated to the main seasonal characteristics of the price of July wheat in this class of years. In the price averages for Group I, by weeks, as shown in Chart 8, one may discern dimly the reflection of the May, June, and July tendencies in the spread—inverted, of course—but the seasonal tendencies in the spread contribute so little, relatively, to the price movements that they would be quite impossible to demonstrate from the price movements alone, and are of no practical importance with respect to them.

This absence of important relation between seasonal tendencies in the July–September spread and seasonal tendencies in the price of July wheat is quite to be expected in years of positive spread. The spread changes primarily in consequence of changing market appraisal of the current domestic supply situation; the existence of a positive spread between July and September wheat is evidence, however, of more than adequate domestic supplies, and in such circumstances any change in appraisal of the supply situation can only rarely be an important price influence.

Regarding the validity of the foregoing conclusions with respect to seasonal tendencies in the July–September spread in years in which it is positive, the following facts may

be noted. Although there have been only four years in the class in question in which trading in September wheat began as early as the first of February, and eight years in which it began before the middle of March, all but one of these years exhibits in greater or less degree the tendency for the spread to rise from its start to late April. The only exception among the twelve years is found in 1886, one of the three years of this group in which active trading in the September future did not start until the end of March or early April. In 1886 the spread declined more than 1½ cents during the first two weeks of trading in the September future, but rose thereafter.

The tendency for the July–September spread to turn slightly downward in May, in years of positive spread, is not conspicuous as it appears in the averages shown in Chart 8, and might readily be passed over as a variation in trend of no real significance. Study of the record for individual years, however, shows that the spread moved about horizontally or down in all but one of the eleven years in this class. In 1893, however, under the influence of financial conditions just preceding the panic of that year, the spread turned sharply up in April and rose steeply through the financial panic of May. This exceptional rise distorts the averages, causing them to understate the magnitude of the tendency toward decline in the spread during May. Though the downward tendency in May is not strong, it marks a clear change from the upward tendency in the spread during earlier months.

From near the end of May to about the end of June, the tendency in this class of years is for September wheat to rise about 1¼ cents relative to the July future. Sometimes the rise has been greater, sometimes less; in 1924 the rise began about the middle of May and ended about the middle of June; but in no year did a rise fail to occur over the period of one month to about the end of June.

From about the first of July, the tendency of the July–September spread is rather sharply downward for years of positive July–September spread. These are years in which substantial deliveries of wheat are made on

July contracts beginning with the first of the month. With that date the price of the July future becomes in effect a price of cash wheat. The premium at which the September future sells represents a carrying charge, which naturally tends to narrow from day to day as the minimum carrying period decreases from two months on the first of July to one month on the last of July.

YEARS OF SMALL NEGATIVE SPREAD

Among years of small negative spread also (Group II), the period from January through July may be divided into four successive intervals, differing as to seasonal tendency in movement of the July–September spread. In this group of years, however, the distinguishing characteristic of the final interval, extending through the month of July, is the absence of any clear downward or upward tendency in the spread. For earlier months, the intervals and tendencies are the same as for years of positive spread, except that the initial period of rising tendency ends, on the average, with late March; and the succeeding period becomes one of definite decline rather than of stability or only slight decline, and extends over an interval of two months to near the end of May.

In the curve of averages, as shown in Chart 9, all these tendencies except the final one in July appear more strongly than in the curve of averages for years of positive spread. In the records for individual years, however, the tendencies appear rather less clearly than the similar tendencies among individual years of positive spread, owing to the greater irregularity of spread fluctuations in years of negative spread. The chief exceptional movements, however, occur in 1887 and 1931. The peculiarities in 1887 are clearly attributable to manipulations incident to the corner in Chicago May wheat in that year, and the attempt and failure to carry the corner on into July wheat. In 1931 the peculiarities are attributable to uncertainties regarding the policy that would be followed by the Grain Stabilization Corporation with respect to its huge holdings of cash wheat and of futures.

Leaving out of consideration the fluctuations in spread in these two years, we may note the following facts. The initial upward tendency is clear and fairly uniform in all six years in which trading in the September future started early enough to give it expression (the beginning of January in five years and the middle of February in one year). In 1906 the rise ended before the middle of March; in 1927 not until near the last of April.

The subsequent tendency to decline is less regular in manifestation. In two years out of ten (1913 and 1923) it was presumably offset by other influences—in any case there occurred in these years only an irregular horizontal movement of the spread through April and May. In 1899 the general movement of the spread was upward from the beginning of trading just before the middle of April.

Among the remaining seven years of clear manifestation of the April–May tendency toward decline in the spread, only five permit clear dating of the beginning of the decline. In 1906 it began with the second week of March; in 1902 and 1911, with the final week of March; in 1914, with the second week of April; and in 1927 it did not begin until the last week of April and lasted only two weeks, but was of more than average extent. Among the same seven years out of ten, the date of termination of the decline was more uniform. It varied only from the second week of May to about the end of May.

The June tendency for rise in the July–September spread is apparent even in 1887 and 1931. Among the twelve years of small negative spread, a June rise was absent only in 1902. Generally it took the form of a fairly uniform rise throughout the month. In 1887, however, it came almost entirely in the few days following the disastrous collapse of the attempted corner in July wheat; in 1892 it extended through only two weeks and was followed by a slight decline through the last half of June or a little more; and in 1923 there was a sharp decline in the spread during the first two weeks of June, followed by a greater rise.

The month of July, in years of small negative spread, is a period of very irregular movement of the July–September spread. Although declines in the spread predominate

during the first three weeks of the month and result in a well-marked decline in the curve of averages in Chart 9, it is doubtful whether they reflect any uniform underlying tendency.

RELATIONS WITH SEASONAL PRICE TENDENCIES

The seasonal tendency in the July–September spread over the interval January–March in years of small negative spread finds no true counterpart in the seasonal characteristics of prices over the same interval. This absence of relation in seasonal tendencies is consistent with the conclusions of Section I that in January–April of this class of years week-to-week changes in the July–September spread are not reflected in the price of July wheat.

In April and again in June, the seasonal tendencies of spreads and of prices are undoubtedly related in cause as well as in timing. It is worthy of note that the downward tendency of the spread in April continues clearly to about the middle of May, whereas the corresponding upward tendency of prices, though continuing to find expression in the averages, becomes very irregular in its manifestation after the end of April. Contrariwise, the downward tendency of prices in June continues somewhat moderated, through July, after the upward tendency of the spread has ceased. It should be recalled also that the analysis of weekly changes showed only a negligible relation in April between spread changes and price changes for this class of years; and that for June it showed price changes tending to be only 1 1/3 times as great as the related spread changes.

Since the July – September spread constitutes primarily a reflection of market appraisals of the current domestic supply situation, the tendency of the spread to rise in June suggests a tendency for the domestic supplies to give the appearance in June of being more ample than had previously been judged. The related tendency for the price of July wheat to decline in June may be assumed to arise from the same cause. The fact that the price change in this seasonal movement is over twice the amount of the change in spread is not inconsistent with the

conclusion of Section I, above, that weekly changes in the price of July wheat tend in June of this class of years to be only 1 1/3 times as large as the changes in spread, for seasonal changes in the appearance of the domestic supply situation may well have greater price significance than irregular week-to-week changes.

That the seasonal changes in appraisal of the domestic supply situation do have greater price significance than the irregular week-to-week changes is indeed an important conclusion to be drawn from these facts. It serves to explain why the seasonal easing of the supply situation may continue to cause the price of July wheat (and of course the price of September wheat also) to decline through July after other influences associated with entry into the delivery month have checked the rising tendency in the spread. It serves to explain why, despite the fact that in April of this class of years the week - to - week changes in the July–September spread tend to find no reflection in changes in price of the July future, the *seasonal* decline in spread beginning in April is accompanied by a tendency toward *seasonal* rise in the price of July wheat at the same time.

The absence of any clear relation between seasonal tendencies in the July–September spread and seasonal tendencies in price during January–March, on the other hand, suggests that the March tendency toward price decline is related to factors largely independent of the domestic supply situation. This absence of relation between seasonal tendencies in spread and in price was noted in years of positive spread as well as in the years of small negative spread here under discussion. A different situation will be noted below in the analysis of tendencies in years of large negative spread.

YEARS OF LARGE NEGATIVE SPREAD

Turning, finally, to consideration of the seasonal tendencies of the July–September spread in years in which September wheat is at a large discount under July (Group III of Chart 9, p. 219), we find the same four seasonal tendencies observed in years of small negative spread, and also a fifth tendency.

All the tendencies are more accurately reflected in the averages from which data for 1917 have been omitted.[1] The rising tendency of the spread which extended through January–March in years of small negative spread is confined in years of large negative spread to March alone. In its place during January–February there now appears a tendency for the spread to decline. An additional, but minor, difference between the two classes of years appears in the fact that in Group III the April–May tendency is only very slightly downward; but the tendency in this interval contrasts quite as sharply with tendencies in the preceding and following intervals as in years of Group II.

It should be remarked also that in years of large negative spread the seasonal tendencies in the spread, other than the June rise, appear less clearly than in other years. It is not that the seasonal tendencies are less strong than in other years — in general they are stronger—but the fluctuations in the July–September spread in consequence of non-seasonal influences are so much greater when the spread is strongly negative that the effects of the seasonal influences are relatively less prominent.

The downward tendency of the July–September spread during January and February in this class of years merits fairly detailed consideration, since it appears in neither of the other two classes of years. Among the fifteen years of large negative spread were eleven in which trading in Chicago September wheat began before about the first of March, and in each of these it commenced on the first trading day of January or very shortly thereafter. Of these eleven years, five (1898, 1904, 1905, 1909, and 1925) showed sharp declines in the July–September spread through January and February. In one year (1926) there occurred a sharp decline in January, but it was followed by a sharper

rise through February. Another year (1917) showed a precipitous dip and recovery in January, followed by sharp decline through February. The remaining four years (1897, 1908, 1910, and 1912) exhibited a fairly even horizontal movement of the July–September spread through these two months. All four of these were years in which the spread was in the uncertain zone between "small" and "large," but here classed arbitrarily as large. Inasmuch as years of larger negative spread show a declining tendency in the spread during January and February, but years of small negative spread, as noted earlier, show a rising tendency, the discovery of a horizontal tendency in these years of moderate negative spread serves to round out a fully consistent set of relations.

The seasonal tendencies in the two intervals comprising, respectively, March and April–May are so weak relative to the wide fluctuations in the spread commonly occurring in these months that, from a practical standpoint, it might be best to say merely that spread changes starting in March have more often been upward than downward; and spread changes starting in April have more often been downward than upward. But because the seasonal tendencies indicated by the averages for these two intervals conform so closely with the clear seasonal tendencies apparent in the same months among years of small negative spread, we accept the averages as evidence of true, if in this case relatively minor, seasonal tendencies.

The rising tendency in the spread which characterizes June appears commonly to start in May and to run usually through June. As in the other two groups of years, this is an interval of extraordinary uniformity in manifestation of the seasonal tendency. Of the thirteen years of large negative spread beginning with 1904, every one shows a notable rise in the July – September spread through much of June, and commonly through the latter half of May also. Among these thirteen years, the rise runs to about the end of June, except in 1912, 1915, and 1925, when it ended about the middle of June.

Among the five years of large negative spread prior to 1904, however, no tendency

---

[1] In no individual year in this group do the actual movements of the spread conform closely to the curve of averages, and in this respect 1917 is no more exceptional than several other years. But the spread changes in 1917 were so extraordinarily large that the movements which were not typical, but peculiar to that one year, are not offset in the averages by the contrary peculiarities of other years.

for the July–September spread to rise during June is apparent. In the first three such years the major tendency in June was horizontal or downward. In the next year, 1898, the spread rose steeply during June, but most if not all of this rise is attributable to the liquidation of the great, but unprofitable, Leiter corner in Chicago May wheat.[1] And in 1903 the evidence of any rising tendency during June is very questionable.

It is noteworthy that this apparent change in the tendency of the July–September spread during June is observable only in the case of years of large negative spread. It is paralleled by a precisely corresponding change in seasonal tendency in the price of July wheat, as noted earlier in this section. These companion seasonal tendencies in price of July wheat and in July–September spread during June of years of large negative spread are the only ones among the several types of tendency or relationship discussed in the present study in which a fundamental change has been found during the period of nearly half a century under review.[2]

This change in the June tendency of the July – September spread (among years of large negative spread) and the related change in tendency of the price of July wheat are probably attributable chiefly to the expansion in hard winter-wheat production, improved transportation facilities, and technical advances in milling. These combined to reduce dependence on old-crop spring wheat in July and occasioned the drop in "normal" carryover noted on page 205 above. The precise timing of the change as regards the behavior of Chicago futures prices was determined largely by the date of admission of hard winter wheat to the list of grades deliverable on Chicago futures contracts. Prior to 1903 only spring wheat and soft red winter wheat were deliverable on Chicago futures. On June 2, 1903, provision was made for delivery, at a 5-cent discount, of No. 1 and No. 2 Hard Winter wheat on "new style" contracts, beginning with the July future. On February 17, 1904, this discount was reduced to 2 cents, effective on "new style" contracts for delivery in July or later.

Among years of large negative spread, the final interval again comprises the month of July, and is marked by even less suggestion of a regular upward or downward seasonal tendency than is found among years of small negative spread. To speak of the tendency as horizontal would be misleading, for the movement of the July–September spread during July has rarely been even irregularly horizontal. Usually it has been rather sharply and irregularly up or down—about as often in one direction as in the other.

With respect to evidence of relations between seasonal tendencies in spreads and seasonal tendencies in prices in years of large negative spread, the correspondence between the changes in the two June seasonal tendencies, just discussed, is particularly significant. Of importance, also, is the fact that the January–February tendency toward decline in the spread, peculiar to this class of years, is paralleled by the January tendency toward price advance, likewise peculiar to this class of years. The March tendency toward rise in the July–September spread has the appearance in this class of years of being related to the March tendency toward decline in price of the July future. This is not surprising, since the weekly changes in price were found definitely related to the weekly changes in spread among years of large negative spread. The April–May tendency toward decline in the spread appears related to the April tendency toward rise in the July future, as do the June tendencies in spread and in price.

All these facts point to the conclusion that

---

[1] The general price decline of May–June 1898 was due to much more than the liquidation of the Leiter corner. Leiter's operations can be regarded as no more than a secondary factor in the great price increase which culminated in May 1898, and in the subsequent decline, but the behavior of the July–September spread from late April into June may be attributed primarily to technical market situations centering about the Leiter corner.

[2] We have noted in Section III above that since the war a situation has developed which appears to have given importance to the distribution of year-end stocks, by classes of wheat, as a factor affecting the July–September spread in June under certain rare circumstances. If this has occurred, it is an important development, but represents merely a slight modification of an earlier tendency, not a fundamental change.

during the entire period January – June, among years of large negative spread, the same conditions apply as during the period April–June in years of small negative spread: the seasonal tendencies in spread and in price are related, not directly, but through the influence of common causes related to appraisal of the domestic supply situation; and these changes in appearance of the domestic supply situation have generally a larger relative effect on price than the irregular week-to-week changes.

V. FORECASTING THE SPREAD

Most of the conclusions reached in each of the foregoing sections are of significance to one who is under the necessity of estimating probable changes in the spread between July and September wheat (as is the hedger of wheat stocks or of flour sales) or to one who by choice elects to deal in inter-option spreads. The results obtained in two of the sections lend themselves particularly to use in making quantitative estimates of probable spread or of probable change in the spread. Here we bring together the main results of those sections with some further explanation and illustrations to facilitate their practical application.

ESTIMATING ON THE BASIS OF SEASONAL TENDENCY

The simplest and perhaps at present the most reliable basis for estimating changes in the July–September spread, after trading in the September future has started, is provided by the seasonal tendencies in the spread. Some points regarding the method of utilization of this basis of estimation may be illustrated by applying it to the situation as it appears early in March 1933. In the first days of March (before trading was halted by closing of the banks), Chicago September wheat was selling about 1 cent over July. An average increase for years of positive spread would carry this premium up about 2 cents by the end of June, to result in September wheat selling about 3 cents over July in the last days of June.

As will be seen from study of the spread curves for individual years, however, any such estimate of change in the spread is subject to considerable error in individual years. Among years of positive spread, such as the present year, the premium of September wheat over July failed only in 1930 to rise

to a higher point in June than in any earlier month, and this in consequence of abnormal conditions produced by the operations of the Grain Stabilization Corporation. The year 1932, however, presents a conspicuous instance of failure of the spread to rise much between March and June. Near the other extreme stands 1929, in which September wheat rose from a premium of 1½–2 cents during March to a premium of 5 cents and over in June.

In making use of observed seasonal tendencies for the purpose of estimating probable changes in spread, it may well be borne in mind that a great volume of spreading based on recognition of these past tendencies would be capable of canceling the effect of the tendencies, or producing reverse tendencies. It may confidently be assumed, however, that no great volume of spreading of this character will arise suddenly. If it does arise, it will undoubtedly be rather gradually, permitting discovery of the fact that the tendency is being altered before the change goes so far as to reverse the seasonal tendencies. It must be supposed that seasonal tendencies that have been observed as regularly as those found in the movements of the July–September spread, and over such a long period of years, rest on rather fundamental characteristics of the wheat market that are not readily counteracted or removed.

ESTIMATING ON THE BASIS OF EXPECTED CARRYOVER

The relation between the July–September spread in June and the total carryover of wheat in the United States as of July 1 obviously provides a basis for estimating probable spread and, by direct inference, probable change in spread from that existing at the time the estimate is made. Any such esti-

mates of change in spread are wholly independent of estimates based on seasonal tendency, and the two estimates may provide valuable checks on each other.

For the purpose of use solely for mechanical forecasting, the results of Section II and the more directly related results of Section IV may be condensed into the following tabulation and supplementary statements. With various indicated levels of total United States wheat stocks on July 1, relative to normal, the price relations between July and September wheat may be expected to be as follows, in cents per bushel:

Total stocks, July 1	Sept. over July	Sept. under July
Above normal by 100 million bushels or more	2¾	...
Above normal by 50 million bushels	1⅝	...
Above normal by 20 million bushels	⅛	...
Normal	...	1
Below normal by 20 million bushels	...	2⅝
Below normal by 40 million bushels	...	4⅜
Below normal by 60 million bushels	...	6¼

"Normal" stocks since the war have been about 120 million bushels, in terms of a total made up from the following statistics:[1] (a) *farm stocks;* (b) *interior mill and elevator stocks;* (c) *"commercial stocks,"* as reported weekly by the United States Department of Agriculture or (nearly equivalent) as given in *Bradstreet's* "visible supply"; (d) *mill stocks* (commonly, but inaccurately, designated "city mill stocks"), as estimated by the United States Department of Agriculture by raising to 100 per cent the mill stocks reported to the Census Bureau under the head of wheat stocks in mills and mill elevators attached to mills, in transit to mills, and "stored for others."

[1] These are the statistics which we now employ in discussion and tabular statement of United States carryover in the "Review" and "Survey" numbers of WHEAT STUDIES. Any other substantially complete and accurate statistics of stocks may be used with equal satisfaction if appropriate adjustment be made in the figure for "normal" carryover. As stated in Section II above, we arbitrarily define normal carryover as the level of July 1 stocks which tends to be accompanied by a price of Chicago September wheat 1 cent per bushel under the price of July wheat.

The spreads shown in the foregoing tabulation represent estimated averages for the first three full weeks of June; to estimate the probable spread as of about the end of June, ½ cent may be added to any figure showing September over July, ½ cent deducted from any figure showing September under July. A larger average error must be expected in estimates of spread at the end of June than in estimates of the 3-week average; for practical purposes, the estimate theoretically applicable to the end of June is better regarded as an estimate of the spread likely to be reached at some time in the latter half of June.

The really difficult problem to be met in estimating probable July–September spread in this way is that of estimating in advance the probable July 1 stocks of wheat in the United States. This may be done through an analysis of supplies and probable disposition of wheat. Carryover from the previous year provides the first supply figure to be entered in the computation, and this figure should be made up of the stocks statistics listed above, or closely corresponding statistics. To the carryover from the previous year may be added the surplus of production over estimated domestic requirements for food, seed, and "feed and waste." There must then be deducted net exports of wheat and of flour as wheat to the latest date available and an estimate of net exports for the remainder of the season.

Valuable supplementary information indicative of probable July 1 stocks begins to become available in the winter and spring with the publication of estimates of wheat stocks outside the positions covered in the weekly visible-supply statistics. Beginning with 1933, official estimates of farm and interior mill and elevator stocks will be made as of April 1 instead of March 1, thus bringing their date into agreement with that of the Census Bureau's statistics of mill stocks and permitting a compilation of stocks statistics as of April 1 precisely comparable with that outlined above for July 1. If the United States Department of Agriculture is able to carry out its announced plan of issuing estimates of farm and interior mill and

elevator stocks as of January 1 also, a similar compilation will be possible for that date. As soon as such stocks statistics become available, year-end carryover may probably be estimated most closely by deducting anticipated domestic utilization and net exports from the indicated stocks as of April 1 or January 1.

This year it happens to be easy to estimate July 1 stocks with sufficient accuracy for the purpose in hand. Late in December we estimated probable United States stocks as of July 1, 1933, at around 370 million bushels.[1] Recent evidence of heavier feeding of wheat than had been anticipated may call for a slight reduction of this figure, but in any case it is clear that the carryover will exceed 220 million bushels, making it more than 100 million bushels above "normal." There is thus indicated the expectation that during the first three full weeks of June 1933 the price of Chicago September wheat will average about 2¾ cents over the price of July

[1] WHEAT STUDIES, IX, 159.

wheat; and that the premium of September over July will rise to the neighborhood of 3 or 3¼ cents by about the end of June.

In the light of discrepancies in past years between actual spreads and spreads indicated as appropriate to the supply position, it will not be surprising if the foregoing estimates should prove in error by as much as from ½ to ¾ cent. Some abnormal technical market situation might develop to cause a greater discrepancy, but this cannot now be regarded as probable.

In estimating the probable July–September spread for June, on the basis of probable carryover, special caution should be observed if in any year it should appear that the bulk of the carryover will be spring wheat. As noted in the discussion of the special situation which appeared in 1923 (p. 217), it is probable that conditions which have developed since the war tend to modify the usual relationship when the carryover of spring wheat is liberal but that of winter wheat unusually small.

This study has been prepared by Holbrook Working

APPENDIX

TABLE I.—PRICE OF CHICAGO JULY WHEAT AND JULY–SEPTEMBER SPREAD, WEEKLY, 1885–1933*

(Cents per bushel)

Date	Price	Spread	Date	Price	Spread	Date	Price	Spread	Date	Price	Spread
1885			**1886**			**1887**			**1888**		
Jan. 2....	....	...	Jan. 8....	....	...	Jan. 7....	....	...	Jan. 6....	....	...
9....	....	...	15....	....	...	14....	....	...	13....	....	...
16....	....	...	22....	....	...	21....	....	...	20....	....	...
23....	....	...	29....	....	...	28....	....	...	27....	....	...
30....	....	...	Feb. 5....	....	...	Feb. 4....	....	...	Feb. 3....	82¾	...
Feb. 6....	....	...	12....	....	...	11....	84¼	+ 2⅛	10....	81⅝	...
13....	....	...	19....	....	...	18....	83	+ 2	17....	80¾	...
20....	....	...	26....	87½	...	25....	80⅝	+ 1⅝	24....	80⅜	...
27....	....	...	Mar. 5....	....	...	Mar. 4....	81½	+ 1⅜	Mar. 2....	80¾	...
Mar. 6....	....	...	12....	....	...	11....	81	+ ⅞	9....	81⅛	...
13....	....	...	19....	85⅞	...	18....	80⅝	+ ⅛	16....	79¼	...
20....	....	...	26....	....	...	25....	79⅜	+ ⅛	23....	76¾	...
27....	....	...	Apr. 2....	....	...	Apr. 1....	80⅛	0	29....	77¾	...
Apr. 3....	84¼	...	9....	81½	+ 1¾	7....	81	— ½	Apr. 6....	76¾	...
10....	90¾	...	16....	81½	+ 1⅜	15....	82½	— ½	13....	80	...
17....	89⅝	...	22....	83¼	+ ⅜	22....	82½	— 1¼	20....	83½	...
24....	92¾	...	30....	82⅛	+ ⅞	29....	83⅜	— 1⅛	27....	82½	...
May 1....	94½	...	May 7....	80½	+ 1½	May 6....	85⅛	— 1	May 4....	83½	...
8....	92½	...	14....	78⅛	+ 1⅜	13....	85	— 1⅞	11....	87½	...
15....	91⅜	+ 3¾	21....	77⅛	+ 1⅛	20....	86⅝	— 2¾	18....	90¼	— 2⅜
22....	91¾	+ 3¾	28....	74⅝	+ 1⅞	27....	86½	— 2⅜	25....	87⅝	— ⅜
29....	87⅜	+ 3⅞	June 4....	78⅜	+ ¾	June 3....	86⅝	— 3⅜	June 1....	86½	— 2⅛
June 5....	91⅛	+ 4	11....	74⅛	+ 2⅛	10....	85¾	— 4⅜	8....	85¼	— 1⅛
12....	89½	+ 4	18....	73	+ 2¾	17....	72¾	+ 3⅞	15....	82⅛	+ ¼
19....	89¾	+ 4⅛	25....	73⅜	+ 2⅜	24....	70⅛	+ 4½	22....	79¼	+ ⅞
26....	88⅛	+ 4⅛	July 2....	76	+ 2⅞	July 1....	69⅞	+ 4¼	29....	79⅜	+ ½
July 3....	87	+ 4⅛	9....	78⅝	+ 3⅜	8....	70⅛	+ 3⅝	July 6....	82⅛	— ½
10....	86⅜	+ 4	16....	77⅛	+ 3¼	15....	69½	+ 3¼	13....	80⅝	— 1½
17....	88¾	+ 3½	23....	75¼	+ 2½	22....	69¾	+ 2⅜	20....	83¾	— 3½
24....	87½	+ 2⅞	30....	75	+ 2⅝	29....	68¼	+ 2⅛	27....	82	— 1⅝
31....	87	+ 2⅝	31....	74⅜	+ 2½	30....	67¾	+ 1⅞	31....	82	+ ¾

* Data based on closing prices on the dates indicated, compiled from the Chicago *Daily Trade Bulletin*, except those for 1885–86, which are compiled from the old Chicago *Daily Commercial Bulletin*. The spread is shown as the premium (+) of September wheat over July, or discount (—) of September under July. Dots (....) indicate absence of trading in the July or the September future or both, or, rarely, insufficient trading to provide the basis for a quotation. The absence of data for 1918–20 arises from the fact that trading in Chicago wheat futures was suspended, August 25, 1917, to July 15, 1920, with trading in July and September wheat not resumed until March 28 and June 1, 1921, respectively.

The quotations are for Fridays, with the following exceptions: when Fridays fell on market holidays, Thursday quotations were used by preference, or, if not available, Saturday quotations; the final figure for each year is for the last trading day of July, whether a Friday or not; in 1892 the character of our source made it preferable to use Saturday quotations as far as possible. In many years the usual published tables in the *Daily Trade Bulletin*, as well as in all other available publications, omit quotations on a future during the first few weeks of trading; for the present compilation the regular tables have been supplemented in all such cases by use of quotations appearing in the text of the market news paragraphs.

When the closing price represented a range or a split quotation, the lower of the quoted figures has been used. In the years 1903, 1904, and 1932, in which changes in regulations governing contract grades resulted in trading in both "old style" and "new style" contracts during part of the period, all data shown above are based on the "old style" contracts. In 1886 a reduction in elevator storage charges necessitated a change of regulations that resulted in trading in both "old style" and "new style" contracts from July 1. Absence of quotations on "old style" contracts after that date made it desirable to use "new style" quotations through July for both the price of July wheat and the spread, although "old style" July was regularly stated to be "quotably about ½ cent under 'new style' July."

TABLE I—*Continued*

(Cents per bushel)

Date	Price	Spread	Date	Price	Spread	Date	Price	Spread	Date	Price	Spread
1889			**1891**			**1893**			**1895**		
Jan. 4....	96	...	Jan. 2....	92¼	...	Jan. 6....	77⅜	...	Jan. 4....	58¼	...
11....	94⁻	...	9....	93⅛	...	13....	80¼	...	11....	58¾	...
18....	92⅞	...	16....	91	...	20....	78¼	...	18....	58⅛	...
25....	89⅞	...	23....	89⅞	...	27....	78⅝	...	25....	54½	...
Feb. 1....	88⅝	...	30....	92⅝	...	Feb. 3....	77⅜	...	Feb. 1....	53⅞	...
8....	90½	...	Feb. 6....	95	...	10....	79¼	...	8....	54⅜	...
15....	94¾	...	13....	93⅜	...	17....	76¼	...	15....	54⅛	...
21....	95½	...	20....	93¼	...	24....	75⅜	...	21....	54¼	...
Mar. 1....	93⅞	...	27....	93	...	Mar. 3....	75⅞	...	Mar. 1....	55⅝	...
8....	88⅝	...	Mar. 6....	96½	...	10....	72⅝	...	8....	55⅛	...
14....	87¼	...	13....	98⅜	...	17....	74⅜	...	15....	58	+ ¾
22.:..	88⅛	...	20....	99⅛	...	24....	73	...	22....	55½	+ ⅞
29....	88⅝	...	26....	100⅜	...	30....	73¼	...	29....	57⅛	+ ⅞
Apr. 5....	86⅜	− 5⅝	Apr. 3....	103⅝	− 4⅛	Apr. 7....	76⅛	+ ¼	Apr. 5....	56¾	+ 1
12....	81¾	− 3	10....	102⅝	− 4⅛	14....	76¼	+ ⅜	11....	55⅞	+ 1⅛
18....	82¼	− 3¼	17....	108¾	− 5¼	21....	73¾	+ 1⅛	19....	59⅛	+ 1⅛
26....	78¾	− 1½	24....	109⅜	− 5⅞	28....	74¾	+ 1¾	26....	62⅜	+ ⅞
May 3....	78½	− 1¾	May 1....	106¼	− 4¾	May 5....	75¾	+ 2¼	May 3....	64⅝	+ ⅛
10....	80⅜	− 2⅜	8....	98¾	− 3¼	12....	77½	+ 2⅞	10....	63⅞	+ 0
17....	77⅛	− 2⅜	15....	102⅝	− 4⅞	19....	74¼	+ 3¼	17....	70⅛	+ ⅛
24....	77⅛	− 2½	22....	100	− 4⅛	26....	73	+ 3¼	24....	77	+ ¼
31....	76⅝	− 2	29....	100¼	− 4⅜	June 2....	68¼	+ 3⅜	31....	78⅜	+ ⅝
June 7....	77⅛	− 1¾	June 5....	98¼	− 4	9....	67⅝	+ 4½	June 7....	80¼	+ ⅞
14....	78½	− 2½	12....	96	− 3	16....	67	+ 4½	14....	77½	+ ⅞
21....	78	− 2⅜	19....	94½	− 3¾	23....	64⅞	+ 4½	21....	70⅝	+ 1½
28....	80⅝	− 1⅜	26....	91¾	− 5¼	30....	61½	+ 7½	28....	69⅜	+ 2⅜
July 5....	81½	− 3⅞	July 2....	93½	− 4	July 7....	65	+ 4¾	July 5....	68⅞	+ 1¾
12....	78¾	− 2	10....	90⅛	− 3⅝	14....	65⅞	+ 3¾	12....	66¾	+ 1½
19....	80¾	− 2⅞	17....	85⅝	− 2	21....	62⅝	+ 3¾	19....	65	+ 1¼
26....	81	− 3⅝	24....	88¾	− 2⅝	28....	59⅛	+ 3¾	26....	68⅝	+ 1
31....	77⅞	− ¾	31....	88	− ¾	31....	56¼	+ 3⅛	31....	68⅞	+ ¾
1890			**1892**			**1894**			**1896**		
Jan. 3....	81⅜	...	Jan. 2....	....	...	Jan. 5....	67½	...	Jan. 3....	59⅝	...
10....	80¼	...	9....	....	...	12....	67⅛	...	10....	60⅛	...
17....	79¼	...	16....	....	...	19....	65⅞	...	17....	60¾	...
24....	78½	...	23....	....	...	26....	64⅝	...	24....	64⅛	...
31....	77	...	30....	....	...	Feb. 2....	65⅛	...	31....	65	...
Feb. 7....	76⅞	...	Feb. 6....	....	...	9....	62⅛	...	Feb. 7....	67⅝	...
14....	76¼	...	13....	....	...	16....	60½	...	14....	65¾	...
21....	76⅛	...	20....	91¾	...	23....	62⅝	...	21....	64⅝	...
28....	76½	− ¼	27....	88⅝	...	Mar. 2....	61¾	...	28....	67⅞	...
Mar. 7....	76⅛	...	Mar. 5....	88	...	9....	61½	+ 1½	Mar. 6....	66⅛	...
14....	77⅝	...	12....	86½	...	16....	60	+ 1⅛	13....	63¼	...
21....	78¼	...	19....	85¾	...	22....	59½	+ 1⅛	20....	62⅜	...
28....	77⅝	...	26....	81¾	...	30....	62½	+ 1⅜	27....	63½	...
Apr. 3....	78¼	...	Apr. 2....	79	...	Apr. 6....	65⅛	+ 1⅜	Apr. 2....	64	...
11....	83½	− 1	9....	83⅛	...	13....	63⅛	+ 1⅞	10....	66⅜	0
18....	86⅜	− 1⅝	16....	80¼	− ⅜	20....	61¾	+ 1⅝	17....	67¾	+ ½
25....	86⅜	− 1⅝	23....	80½	0	27....	60⅛	+ 1⅞	24....	65⅛	+ ½
May 2....	90⅜	− 1⅞	30....	81½	− ¼	May 4....	60⅜	+ 1⅛	May 1....	62¾	+ ¾
9....	94¼	− 3¼	May 7....	82¾	− ¼	11....	58⅛	+ 1¼	8....	63⅛	+ ⅝
16....	94	− 3	14....	81⅝	− ⅜	18....	55¼	+ 1⅝	15....	62¼	+ ⅞
23....	97¼	− 1¼	21....	83	− ¾	25....	56⅜	+ 1⅛	22....	60⅝	+ 1
29....	91½	− ½	28....	83¼	− 1⅛	June 1....	55⅛	+ 1⅝	29....	57⅞	+ ½
June 6....	91⅜	+ ⅜	June 4....	86	− ¾	8....	60⅝	+ 2	June 5....	59⅜	+ ⅞
13....	89½	+ ⅛	11....	79⅜	+ ¼	15....	58⅜	+ 2¼	12....	57½	+ ½
20....	86⅝	+ ¾	18....	78½	0	22....	59½	+ 2⅛	19....	58	+ ⅞
27....	85½	+ 1¼	25....	78⅜	− ¼	29....	58⅛	+ 2⅛	26....	55⅛	+ 1⅛
July 3....	86¾	+ 1⅞	July 2....	78½	0	July 6....	55½	+ 2⅛	July 3....	54⅞	+ 1¼
11....	87	+ 2⅛	9....	77	− ¾	13....	56¼	+ 1⅞	10....	54⅝	+ 1⅛
18....	86⅝	+ 2⅜	16....	77⅞	− 1	20....	53¾	+ 1⅞	17....	55⅞	+ 1⅜
25....	90⅝	+ 2	23....	78¼	− ½	27....	50⅞	+ 1⅞	24....	57⅛	+ ⅝
31....	90¼	+ 2	29....	77½	− ½	31....	52	+ 1⅜	31....	58⅛	+ ¾

TABLE I—Continued
(Cents per bushel)

Date	Price	Spread	Date	Price	Spread	Date	Price	Spread	Date	Price	Spread
1897			**1899**			**1901**			**1903**		
Jan. 8....	76⅜	− 1½	Jan. 6....	68	...	Jan. 4....	....	...	Jan. 2....	72½	...
15....	75⅞	− 1⅜	13....	68¾	...	11....	....	...	9....	73⅝	...
22....	75¾	− 1⅝	20....	68½	...	18....	....	...	16....	74⅜	...
29....	71⅞	− 1½	27....	75¼	...	25....	....	...	23....	75¼	...
Feb. 5....	71¾	− 1½	Feb. 3....	71	...	Feb. 1....	....	...	30....	74⅛	...
11....	71⅜	− 1¾	10....	71¼	...	8....	....	...	Feb. 6....	74⅜	...
19....	73	− 1¾	17....	71	...	15....	74¼	...	13....	73⅞	− 1⅝
26....	71½	− 1⅞	24....	71¾	...	21....	74⅜	...	20....	73⅞	...
Mar. 5....	73⅞	− 1⅞	Mar. 3....	71⅜	...	Mar. 1....	74½	...	27....	74	− 1⅛
12....	70¾	− 2⅛	10....	69¼	...	8....	74½	...	Mar. 6....	72¼	− 1¾
19....	73	− 2¼	17....	65⅝	...	15....	76	...	13....	71½	− 1¼
26....	71⅜	− 2	24....	69½	...	22....	75⅞	...	20....	71¼	− 1½
Apr. 2....	70⅛	− 1¾	30....	73	...	29....	76⅝	...	27....	69½	− 1⅛
9....	64½	− 1¼	Apr. 7....	72⅛	...	Apr. 4....	72¾	...	Apr. 3....	70⅛	− 1¾
15....	69¼	− 2	14....	73¾	− 1	12....	70⅞	...	9....	71⅞	− 2⅝
23....	74⅜	− 3⅜	21....	74⅜	− ½	19....	71⅛	...	17....	72	− 3¼
30....	71¾	− 3¾	28....	72¾	− ¾	26....	73⅜	− ½	24....	72½	− 2⅞
May 7....	70½	− 3¼	May 5....	71¾	− ¾	May 3....	73⅛	− ¾	May 1....	72⅞	− 2⅛
14....	73⅛	− 4⅜	12....	70½	− ⅜	10....	71⅛	− ¾	8....	72½	− 2½
21....	70⅞	− 4¾	19....	73¾	0	17....	71¾	− 1¾	15....	72⅞	− 2⅜
28....	68⅞	− 3¾	26....	75¼	− ¼	24....	73	− 2¾	22....	73¾	− 2⅞
June 4....	67¼	− 3⅛	June 2....	76¾	+ ⅞	31....	74½	− 1⅞	29....	73½	− 2⅞
11....	68⅛	− 4½	9....	74⅜	+ ⅞	June 7....	73⅛	− 2¾	June 5....	76	− 2
18....	68⅞	− 4	16....	76⅜	+ 1⅛	14....	70⅛	− 1½	12....	75⅝	− 2⅞
25....	71⅞	− 7¼	23....	74½	+ 1¾	21....	67	− ⅛	19....	76⅞	− 1⅞
July 2....	68¾	− 4½	30....	72¼	+ 1⅞	28....	66¼	+ ½	26....	83	− 2⅝
9....	70¼	− 4¾	July 7....	72¼	+ 1⅜	July 5....	65⅛	+ 1¼	July 2....	75⅝	− ⅝
16....	75½	− 5¼	14....	71⅞	+ 1¼	12....	66⅞	+ 1¼	10....	79¾	− ⅜
23....	75¼	− 4	21....	69¼	+ ⅝	19....	67¾	+ 1¼	17....	76¼	+ 1⅛
30....	76¾	− 2¼	28....	70½	+ ⅝	26....	69½	+ 1⅛	24....	75⅝	+ ½
31....	75½	− ⅞	31....	68⅝	+ 1	31....	67⅜	+ 1	31....	77¼	+ 1⅛
1898			**1900**			**1902**			**1904**		
Jan. 7....	82⅜	− 5⅞	Jan. 5....	69⅜	...	Jan. 3....	82⅛	...	Jan. 8....	82⅝	− 2⅜
14....	80⅜	− 6⅜	12....	68⅛	...	10....	83⅛	...	15....	82⅜	− 3½
21....	84⅛	− 6¾	19....	66⅜	...	17....	80⅛	...	22....	81⅜	− 3⅞
28....	86¾	− 7¾	26....	69⅜	...	24....	79⅜	...	29....	83	− 4⅞
Feb. 4....	84⅜	− 7⅞	Feb. 2....	69¼	...	31....	77⅞	...	Feb. 5....	85⅞	− 5½
11....	85¾	− 7½	9....	68⅝	...	Feb. 7....	77⅞	...	11....	87¾	− 4½
18....	88⅝	−10	16....	69	...	14....	78½	− ½	19....	93⅞	− 5¼
25....	89¼	−11	23....	66⅞	...	21....	78	− ¾	26....	97⅜	− 5⅞
Mar. 4....	90¼	−12¼	Mar. 2....	66¼	...	28....	77⅜	− ¾	Mar. 4....	93⅜	− 6
11....	88¼	− 8⅝	9....	66⅞	+ ½	Mar. 7....	77⅝	− ⅝	11....	92⅛	− 5⅞
18....	86⅛	− 7	16....	67⅞	+ ¼	14....	75⅛	− ¼	18....	88¼	− 5⅞
25....	82⅛	− 6½	23....	66½	+ ½	21....	74¼	0	25....	88½	− 5
Apr. 1....	82⅞	− 6⅛	30....	68⅜	+ ⅜	27....	72⅛	+ ⅛	31....	89⅛	− 6¼
8....	84¾	− 7¼	Apr. 6....	68⅛	+ ⅝	Apr. 4....	71⅜	− ⅛	Apr. 8....	89⅛	− 6¼
15....	84¾	− 7⅜	12....	67⅞	+ ¾	11....	73½	− ½	15....	88¼	− 4¾
22....	88⅜	− 7¼	20....	66¾	+ ¾	18....	74¾	− ¾	22....	85½	− 3¾
29....	93½	−11⅜	27....	67½	+ 1	25....	75¼	− ¼	29....	85⅝	− 4¼
May 6....	101	−17⅛	May 4....	67⅞	+ 1	May 2....	76⅛	− ¾	May 6....	87½	− 5¼
13....	104¼	−16⅛	11....	65¾	+ 1⅛	9....	74¾	− 1⅛	13....	84⅞	− 4¾
20....	108⅞	−19⅜	18....	67⅛	+ 1⅛	16....	74⅞	− 2	20....	88	− 6¼
27....	106	−21¼	25....	67	+ 1⅛	23....	73¼	− ¾	27....	87⅜	− 4⅞
June 3....	94	−13½	June 1....	66⅞	+ 1¼	29....	72⅛	− 1⅛	June 3....	90⅝	− 6
10....	88¼	−13⅛	8....	72⅝	+ 1⅜	June 6....	71⅞	− 1⅛	10....	87	− 4⅞
17....	75½	− 7⅜	15....	74	+ 1⅜	13....	72½	− 1⅝	17....	84⅞	− 4
24....	73	− 6¼	22....	83⅛	+ 1¾	20....	74¼	− 1⅜	24....	86¾	− 4¾
July 1....	76½	− 5⅜	29....	81⅞	+ 1⅞	27....	73	− 1	July 1....	86⅜	− 3⅝
8....	77½	− 8½	July 6....	78⅞	+ 2	July 3....	75	− 1¾	8....	90⅜	− 5¼
15....	73½	− 5¾	13....	77⅞	+ 1¼	11....	76¼	− 2	15....	95⅝	− 7⅞
22....	77	− 9½	20....	76½	+ 1¼	18....	77	− 4½	22....	95¾	− 6⅝
29....	70¼	− 6¼	27....	75⅜	+ 1	25....	76½	− 4¾	29....	98	− 6¼
30....	66	− 2	31....	74	+ ⅞	31....	69¾	− ¼	30....	100	− 8⅜

TABLE I—*Continued*

(Cents per bushel)

Date	Price	Spread	Date	Price	Spread	Date	Price	Spread	Date	Price	Spread
1905			**1907**			**1909**			**1911**		
Jan. 6....	98⅝	...	Jan. 4....	75⅛	...	Jan. 8....	98⅜	− 3⅞	Jan. 6....	96¼	− 1⅞
13....	98¾	− 7¼	11....	76¼	...	15....	96⅝	− 3⅛	13....	96⅞	− 1¾
20....	98¼	− 6¾	18....	76¼	− ¼	22....	97¾	− 3¼	20....	96⅜	− 2⅛
27....	98⅜	− 6	25....	78⅝	− ⅛	29....	97⅝	− 3⅛	27....	93⅞	− 1⅜
Feb. 3....	100⅛	− 6⅝	Feb. 1....	77¾	− ⅛	Feb. 5....	98½	− 3⅜	Feb. 3....	93½	− 1⅜
10....	100¾	− 8⅛	8....	79⅜	− ½	12....	101⅛	− 4⅜	10....	92	− ⅞
17....	101⅝	− 8⅜	15....	78¼	− ⅝	19....	101	− 4⅜	17....	89⅜	− ¾
24....	101⅞	− 8⅝	21....	77¾	− ⅛	26....	105⅜	− 6½	24....	87⅜	− ⅝
Mar. 3....	98⅞	− 8	Mar. 1....	77½	− ⅛	Mar. 5....	103½	− 6¼	Mar. 3....	88¾	− ¾
10....	92½	− 6⅜	8....	78½	+ ¼	12....	105½	− 6¾	10....	89½	− ⅝
17....	92⅝	− 6	15....	77⅜	+ ⅝	19....	103⅞	− 6⅛	17....	88⅜	− ⅜
24....	90⅜	− 5⅞	22....	77⅝	+ ¾	26....	104⅜	− 6¼	24....	88½	+ ¼
31....	88⅜	− 5¼	28....	77½	+ 1⅛	Apr. 2....	108	− 7⅞	31....	86¾	+ ⅜
Apr. 7....	87⅞	− 4¾	Apr. 5....	79¼	+ ⅞	8....	111⅝	− 7⅝	Apr. 7....	85⅝	+ ⅛
14....	87¾	− 5¼	12....	81¼	+ 1½	16....	117	− 9⅞	13....	85¾	+ ⅛
20....	87⅜	− 5¼	19....	80½	+ 1¾	23....	110¼	− 8	21....	88	− ¾
28....	83⅜	− 3⅞	26....	83¼	+ 1¾	30....	111¼	− 8¼	28....	87⅝	− 1
May 5....	83⅛	− 4⅜	May 3....	84⅛	+ 1¾	May 7....	117¼	− 9	May 5....	88¾	− ⅞
12....	85⅛	− 6⅛	10....	88½	+ 1⅞	14....	113⅜	− 7⅝	12....	90¼	− 1
19....	87	− 6⅛	17....	100⅛	+ 1¼	21....	116¾	− 8	19....	88½	− 1⅛
26....	91½	− 7¾	24....	99⅛	+ 1⅜	28....	116⅝	− 7⅝	26....	89½	− 1⅛
June 2....	89	− 6¼	31....	99⅛	+ 1½	June 4....	118¼	− 8½	June 2....	91⅜	− 2¾
9....	86⅜	− 4⅝	June 7....	95⅞	+ 2⅜	11....	116⅜	− 6½	9....	92	− 2¼
16....	88⅛	− 3⅞	14....	89½	+ 2½	18....	114⅜	− 7¼	16....	87⅜	− ¼
23....	91⅛	− 5⅝	21....	91⅝	+ 2⅞	25....	115⅞	− 5⅛	23....	89⅛	+ ⅝
30....	93⅝	− 4	28....	95¼	+ 3⅜	July 2....	114¾	− 4⅞	30....	89	+ ¾
July 7....	91¼	− 3	July 5....	94⅝	+ 3½	9....	117	− 6½	July 7....	89¾	+ 1⅞
14....	86⅝	− 2⅝	12....	90½	+ 3½	16....	122	−10¾	14....	85⅝	+ 2
21....	93¼	− 3⅛	19....	90⅜	+ 2½	23....	111⅜	− 4⅜	21....	86¼	+ 1¾
28....	86	− ⅝	26....	89⅞	+ 1¾	30....	107½	− 3¾	28....	87⅞	+ 2⅜
31....	84	+ 1⅜	31....	89⅝	+ 1⅞	31....	105⅞	− 1½	31....	87⅜	+ 2⅜
1906			**1908**			**1910**			**1912**		
Jan. 5....	84⅜	− 1⅞	Jan. 3....	99⅛	− 3¼	Jan. 7....	103½	− 4½	Jan. 5....	96	− 2
12....	84⅞	− 1⅝	10....	98¾	− 3⅜	14....	102⅝	− 4½	12....	94¾	− 1⅝
19....	84⅞	− 1¾	17....	99⅛	− 3¼	21....	101½	− 3⅞	19....	94⅞	− 1⅝
26....	84	− 1¼	24....	98⅜	− 2¾	28....	101¼	− 4⅛	26....	95⅝	− 1¾
Feb. 2....	83½	− 1¼	31....	92⅜	− 2¼	Feb. 4....	100⅛	− 4⅛	Feb. 2....	97½	− 2⅝
9....	84⅜	− 1¼	Feb. 7....	94¼	− 3¼	11....	101⅞	− 4⅝	9....	97	− 2¼
16....	82¼	− 1	14....	90¼	− 2⅜	18....	103⅜	− 4½	16....	95¼	− 1½
23....	81⅝	− ½	21....	88⅜	− 2½	25....	107¼	− 4⅛	23....	96	− 1⅝
Mar. 2....	80⅜	− ⅜	28....	92⅝	− 2⅞	Mar. 4....	105	− 4	Mar. 1....	97⅝	− 1⅞
9....	77	+ ⅛	Mar. 6....	93½	− 3	11....	106½	− 2⅞	8....	98	− 2¼
16....	78	− ¼	13....	89⅞	− 3	18....	106¾	− 2¼	15....	97⅝	− 2⅛
23....	78¼	− ¼	20....	90⅛	− 2¾	24....	108⅞	− 1⅞	22....	98¼	− 2⅛
30....	77½	− ⅜	27....	89¼	− 2¾	Apr. 1....	108¼	− 3	29....	98	− 1⅞
Apr. 6....	77¼	− ⅜	Apr. 3....	88½	− 2	8....	105⅜	− 3⅛	Apr. 5....	96⅞	− 1⅝
12....	79⅝	− ⅞	10....	84⅞	− 1¾	15....	103	− 2⅛	12....	107⅜	− 1⅛
20....	78¼	− 1¼	16....	85⅝	− 2⅛	22....	102½	− 1⅝	19....	108½	− 4⅛
27....	79	− 1	24....	88⅜	− 3½	29....	103⅛	− 1⅝	26....	112⅝	− 4¼
May 4....	78¾	− 1¼	May 1....	88½	− 4¼	May 6....	104⅞	− 2⅛	May 3....	110⅞	− 3½
11....	81½	− 1⅞	8....	93½	− 4¾	13....	104½	− 2⅛	10....	113½	− 4⅞
18....	82½	− 2⅛	15....	89½	− 3¼	20....	102¾	− 2¼	17....	108⅛	− 4½
25....	83⅛	− 1⅞	22....	90⅛	− 3¾	27....	94½	− 2	24....	110	− 5⅝
June 1....	80¾	− 1	29....	90⅛	− 2¾	June 3....	92⅜	− 2¼	31....	110	− 4
8....	84⅛	− ¾	June 5....	87⅞	− 2½	10....	94½	− 3¾	June 7....	110⅛	− 4¼
15....	82¾	+ ¼	12....	88¼	− 3¼	17....	93¾	− 2	14....	106¼	− 2
22....	83½	+ ⅛	19....	87¼	− 1⅞	24....	98⅜	− ⅜	21....	105½	− 2⅛
29....	81	+ ⅝	26....	84⅞	+ ¼	July 1....	97⅝	+ ¾	28....	109½	− 3¾
July 6....	79	0	July 3....	86¾	+ ⅞	8....	103	− 1⅜	July 5....	105½	− 4½
13....	77⅞	+ ⅜	10....	88¾	+ ⅝	15....	108⅞	− 1⅞	12....	105⅛	− 3¾
20....	76⅞	+ ¾	17....	90¾	+ ⅛	22....	108½	− 2⅝	19....	97¾	− 3
27....	75½	+ 1	24....	91¼	+ ⅛	29....	109¼	− 6½	26....	96⅞	− 3
31....	72⅝	+ 1½	31....	89⅜	+ ⅞	30....	105	− 1¾	31....	92½	+ 1

TABLE I—*Continued*

(Cents per bushel)

Date	Price	Spread	Date	Price	Spread	Date	Price	Spread	Date	Price	Spread
1913			**1915**			**1917**			**1922**		
Jan. 3	89⅛	− 1	Jan. 8	126⅝	...	Jan. 5	148⅛	−10⅞	Jan. 6	100⅝	...
10	90⅝	− 1⅛	15	127⅛	...	12	150	−14½	13	100	...
17	90¾	− 1½	22	125½	...	19	152¼	−17	20	101¾	...
24	90⅜	− 1½	29	132⅜	...	26	151½	−13½	27	102¾	...
31	91½	− 1⅝	Feb. 5	141⅜	...	Feb. 2	143⅛	− 9¼	Feb. 3	109¼	...
Feb. 7	91⅝	− 1⅜	11	135	...	9	147	− 9½	10	117¼	...
14	91¼	− 1¼	19	132½	− 8¾	16	148	−10¾	17	120⅝	...
21	91¼	− 1⅜	26	122¼	...	23	149⅝	−11¼	24	124½	...
28	91¼	− 1¼	Mar. 5	127⅛	− 8½	Mar. 2	156⅛	−11⅜	Mar. 3	122⅜	− 7⅛
Mar. 7	90¼	− 1¼	12	121	−11⅜	9	156½	−11⅝	10	117⅞	− 6⅛
14	88¾	− ⅜	19	123⅝	−12⅞	16	154⅞	−10⅞	17	119⅜	− 7⅛
20	89¼	− ⅛	26	119	−11½	23	160⅜	−14¼	24	118	− 6¾
28	89⅜	− ½	Apr. 1	122½	−12	30	163½	−13	31	117½	− 6¼
Apr. 4	90⅝	− ⅜	9	123⅛	−12⅞	Apr. 5	175¼	−14½	Apr. 7	119¼	− 5⅝
11	90⅜	− ¼	16	137⅞	−16¼	13	188¾	−18½	13	123⅛	− 4⅞
18	90⅜	− 1	23	138¼	−12¼	20	200	−22½	21	127⅛	− 8⅛
25	92½	− ¾	30	135⅛	−10⅛	27	223½	−32	28	126⅛	− 7¾
May 2	91⅜	− ¼	May 7	131	− 8⅜	May 4	219½	−33¾	May 5	124⅞	− 7½
9	89½	− ⅜	14	127⅞	− 6¼	11	249¾	−32¾	12	126⅛	− 7
16	88⅝	− ¼	21	128½	− 6⅛	18	228	−23	19	124⅜	− 5⅛
23	90	− ¾	28	126⅝	− 6	25	217½	−29½	26	122½	− 3¾
29	91¾	− ½	June 4	116⅝	− 3⅞	June 1	198	−16	June 2	118¼	− ⅞
June 6	90⅞	− ⅝	11	108⅛	− 3⅛	8	224	−29	9	115	− ⅞
13	91⅜	− ½	18	105⅜	− 1¼	15	223	−27	16	111	+ ⅝
20	90⅝	+ ¼	25	104⅛	− 1⅝	22	210	−26	23	113⅞	+ 1
27	90⅝	+ ¼	July 2	111⅜	− 7⅜	29	201	−19½	30	114¼	+ 1⅝
July 3	90	+ ⅜	9	111	− 7¼	July 6	212	−20	July 7	113⅝	− ¾
11	87	+ 1	16	115⅞	− 7	13	203	− 8½	14	115¼	− 1½
18	86⅛	+ ⅞	23	110¾	− 4	20	250	−32	21	113	− 2⅜
25	85¼	+ 1⅛	30	111	− 5¼	27	252	−26	28	111½	− 3¼
31	84	+ 1⅞	31	108¼	− 3⅛	31	274	−57	31	105	+ ¾
1914			**1916**			**1921**			**1923**		
Jan. 2	87⅛	...	Jan. 7	117⅝	...	Jan. 7	....	...	Jan. 5	111⅛	− 3⅜
9	87⅛	...	14	120¾	...	14	....	...	12	112⅝	− 3⅝
16	88⅛	...	21	125⅝	...	21	....	...	19	113	− 3¼
23	88⅞	...	28	126¾	...	28	....	...	26	111⅝	− 2½
30	88¾	...	Feb. 4	125½	...	Feb. 4	....	...	Feb. 2	112⅝	− 2¾
Feb. 6	88⅞	...	11	121¼	...	11	....	...	9	114⅜	− 2⅞
13	88⅞	...	18	123⅞	...	18	....	...	16	115⅝	− 1⅞
20	89⅜	...	25	115⅞	...	25	....	...	23	114	− 1⅜
27	89¼	...	Mar. 3	111¼	...	Mar. 4	....	...	Mar. 2	115⅜	− 2
Mar. 6	88⅛	...	10	110⅜	...	11	....	...	9	115	− 2
13	88¼	− ⅝	17	106⅝	− 1⅛	18	....	...	16	115⅞	− 1¾
20	88¾	− ⅜	24	106¾	− 1⅜	24	....	...	23	115⅝	− 1⅝
27	89	− ½	31	112	− 1⅞	Apr. 1	114½	...	29	115½	− 1⅜
Apr. 3	87⅜	− ⅜	Apr. 7	115½	− 1⅞	8	111¾	...	Apr. 6	118¾	− 2
9	86¼	− ⅛	14	115	− 2⅝	15	106	...	13	123	− 1½
17	86⅜	− ⅜	20	113⅞	− 2¼	22	107½	...	20	122⅛	− 2⅜
24	87¼	− ½	28	114⅞	− ½	29	106¾	...	27	123⅛	− 2½
May 1	85⅜	− 1	May 5	113¾	− ⅝	May 6	117	...	May 4	118¼	− 1⅜
8	85⅜	− ⅞	12	116⅜	− ¼	13	115½	...	11	115⅜	− 1⅛
15	87	− 1⅜	19	112⅛	+ ⅜	20	123¾	...	18	116⅛	− 1⅝
22	87½	− 1¼	26	111¾	+ ⅞	27	127¼	...	25	117	− 1¾
29	86¾	− 1	June 2	103½	+ 1⅞	June 4	131¼	−15½	June 1	109⅞	− ⅛
June 5	86⅝	− 1½	9	107¾	+ 1⅜	10	136	−17½	8	110⅛	− 1⅜
12	83⅞	− 1⅜	16	101½	+ 2⅜	17	131¼	− 6¾	15	111⅞	− 2⅛
19	83⅜	− 1½	23	99¾	+ 2⅞	24	130¾	− 7	22	105⅞	− ½
26	77⅞	− 0	30	101⅜	+ 3¼	July 1	122½	− ¾	29	101⅜	+ ¾
July 3	79⅜	− ¾	July 7	103½	+ 2⅜	8	122¼	− ¾	July 6	103¼	− ⅛
10	78¾	− ⅝	14	108½	+ 1½	15	130¾	+ 1¾	13	100⅛	− ½
17	79⅝	− ⅛	21	114⅛	+ 1	22	124¼	+ ¾	20	100⅜	− 1⅞
24	82½	− ¾	28	120½	+ 1¾	29	122	+ 1¾	27	97⅞	− ⅝
31	88¼	+ ⅛	31	119⅜	+ 1¾	30	122½	+ ¾	31	97⅛	− ½

TABLE I—*Continued*

(Cents per bushel)

Date	Price	Spread	Date	Price	Spread	Date	Price	Spread	Date	Price	Spread
1924			**1926**			**1928**			**1930**		
Jan. 4....	106⅞	− ⅞	Jan. 8....	153½	− 7¼	Jan. 6....	127	...	Jan. 3....	134¾	...
11....	107⅜	− ⅞	15....	152	− 7⅜	13....	126⅜	...	10....	130⅛	...
18....	106⅞	− ⅞	22....	148½	− 8⅛	20....	128	...	17....	128¼	...
25....	107⅜	− 1	29....	152¼	− 8¾	27....	126⅞	...	24....	127¾	...
Feb. 1....	110½	− ⅜	Feb. 5....	154⅜	− 8½	Feb. 3....	127¼	...	31....	122⅜	+ 2¼
8....	111⅜	− ¼	11....	150½	− 7⅛	10....	127⅛	...	Feb. 7....	121⅝	+ 2⅜
15....	108⅞	0	19....	148¼	− 6⅜	17....	129	...	14....	122⅛	+ 2
21....	110⅞	0	26....	142¼	− 6⅜	24....	132½	...	21....	116	+ 2½
29....	110¼	+ ¼	Mar. 5....	140	− 6	Mar. 2....	135⅝	− ⅝	28....	115¼	+ 2⅛
Mar. 7....	111⅝	+ ⅜	12....	142⅞	− 6¼	9....	137⅜	− ⅞	Mar. 7....	109⅜	+ 1⅛
14....	106⅜	+ ¾	19....	138⅞	− 5⅞	16....	134⅞	− 1¾	14....	104¾	+ 1⅛
21....	106¼	+ 1	26....	138⅞	− 5⅜	23....	136½	− 2⅜	21....	109⅜	+ 2¼
28....	102⅞	+ ⅞	Apr. 1....	133⅜	− 4⅛	30....	141⅛	− 2⅛	28....	107⅝	+ 2
Apr. 4....	103⅛	+ 1⅛	9....	135⅜	− 4½	Apr. 5....	142	− 2¼	Apr. 4....	114½	+ 2½
11....	103¼	+ 1⅛	16....	140¾	− 6¾	13....	150⅝	− 2⅜	11....	114⅝	+ 2⅝
17....	105	+ ⅞	23....	141⅞	− 6⅝	20....	155¼	− 3⅞	17....	108⅝	+ 3
25....	105¼	+ 1	30....	142⅞	− 5⅞	27....	162¾	− 3⅛	25....	104⅜	+ 3¼
May 2....	107⅜	+ ¾	May 7....	138¼	− 4	May 4....	157⅛	− 2⅜	May 2....	103⅝	+ 3⅞
9....	106⅜	+ 1	14....	135¼	− 3⅞	11....	153¼	− ⅜	9....	101½	+ 2¾
16....	106¾	+ ⅞	21....	136½	− 3¾	18....	149⅝	+ ¼	16....	106	+ 2⅞
23....	107⅞	+ 1	28....	137⅞	− 4⅝	25....	150⅞	+ ⅛	23....	105½	+ 2½
29....	105⅝	+ 1⅜	June 4....	138⅜	− 5⅛	June 1....	145¾	+ 1⅜	29....	107¾	+ 2⅝
June 6....	104⅜	+ 1¼	11....	140⅝	− 4	8....	141½	+ 1¼	June 6....	107	+ 2⅞
13....	111⅛	+ 1⅞	18....	141⅛	− 4¾	15....	138	+ 2	13....	101	+ 2⅝
20....	114⅝	+ 1¾	25....	134⅜	− 1¾	22....	137⅛	+ 1⅞	20....	93¾	+ 2⅞
27....	114⅝	+ 1⅜	July 2....	134⅛	− ⅛	29....	135⅝	+ 2⅝	27....	91¾	+ 3½
July 3....	115⅝	+ ⅛	9....	139⅜	− 1	July 6....	134	+ 2⅝	July 3....	90¼	+ 3½
11....	116⅜	0	16....	145	0	13....	129¾	+ 3⅛	11....	86½	+ 2⅞
18....	126¼	− 1⅝	23....	139⅜	+ ½	20....	126⅛	+ 3	18....	88½	+ 3¼
25....	132¼	− 1⅝	30....	147⅛	− 3	27....	119⅞	+ 2⅝	25....	88⅝	+ 2¾
31....	135½	− 2⅞	31....	156	−12¼	31....	117½	+ 3	31....	84¾	+ 1⅞
1925			**1927**			**1929**			**1931**		
Jan. 2....	152¼	− 9	Jan. 7....	129⅝	− 2⅝	Jan. 4....	117⅞	...	Jan. 2....	65⅝	...
9....	153⅞	− 7¼	14....	129⅞	− 3¼	11....	121⅝	...	9....	65⅞	...
16....	159¼	−10⅞	21....	130⅝	− 3⅛	18....	127	...	16....	66⅛	...
23....	169¾	−13¼	28....	132⅞	− 3⅛	25....	131⅜	...	23....	64⅝	...
30....	171⅝	−14	Feb. 4....	134⅝	− 3	Feb. 1....	130⅞	...	30....	66⅜	...
Feb. 6....	159	−12¾	11....	134⅝	− 2¼	8....	129	...	Feb. 6....	66⅝	− 1¼
13....	153⅛	−11⅜	18....	134¼	− 2¼	15....	134⅛	...	13....	68½	− ¼
20....	153¾	−11½	25....	133½	− 2⅝	21....	135½	...	20....	69⅛	+ ⅜
27....	167½	−15	Mar. 4....	134⅝	− 2⅝	Mar. 1....	132⅞	+ 2⅛	27....	65⅜	+ ¾
Mar. 6....	162¼	−12¾	11....	132¾	− 2⅝	8....	129½	+ 1⅝	Mar. 6....	63⅝	− ⅛
13....	148½	− 8¾	18....	130⅞	− 2⅛	15....	132¼	+ 1¾	13....	63⅛	+ ¼
20....	145	−10½	25....	129	− 2⅛	22....	126½	+ 1⅝	20....	62¼	+ ⅛
27....	142¼	− 9¾	Apr. 1....	129¼	− 1⅝	28....	124⅞	+ 2	27....	61⅛	− ½
Apr. 3....	129	− 5½	8....	128⅛	− 1⅝	Apr. 5....	121¾	+ 2½	Apr. 2....	59¾	− 1¼
9....	138	− 9	14....	128⅜	− 1⅜	12....	125⅞	+ 2⅜	10....	62¼	− 1⅝
17....	141¾	− 8	22....	130½	− 1¼	19....	120⅞	+ 2⅞	17....	64¼	− ⅜
24....	140½	− 7¾	29....	130⅞	− 1⅜	26....	116¾	+ 3¾	24....	61½	− ¼
May 1....	150	− 8	May 6....	134½	− 2⅜	May 3....	117⅛	+ 3⅞	May 1....	62½	− ¾
8....	156	− 7½	13....	136	− 3	10....	107⅞	+ 3¾	8....	62½	− ¼
15....	151¾	− 9¼	20....	138½	− 2⅝	17....	105⅝	+ 3¾	15....	62	− ⅛
22....	155⅛	− 7⅞	27....	150⅛	− 2¾	24....	104⅜	+ 3¾	22....	60¼	− ¼
29....	163¼	− 3⅛	June 3....	144¼	− 2⅛	31....	97½	+ 4⅛	29....	60	− ⅝
June 5....	168½	− 4	10....	147	− 1⅞	June 7....	108⅜	+ 4¼	June 5....	59⅞	+ ⅛
12....	160⅝	− 3½	17....	144½	− 2⅜	14....	107⅝	+ 4⅛	12....	57⅞	0
19....	156⅛	− ⅞	24....	141¼	− 1¾	21....	111¾	+ 4⅞	19....	55⅞	+ ½
26....	151½	− 1⅝	July 1....	144⅝	− ⅝	28....	113⅝	+ 5	26....	58⅛	+ 1¼
July 3....	141¾	− 2¼	8....	147⅛	− 1⅞	July 5....	122¾	+ 5	July 3....	55¼	+ 1⅛
10....	146½	− 4⅜	15....	141¼	− 2⅛	12....	123⅝	+ 4¾	10....	52⅞	+ 1⅛
17....	161⅝	− 4	22....	142¾	− 3	19....	137¼	+ 4¼	17....	53⅛	+ ⅞
24....	152¼	− 1⅞	29....	136¼	0	26....	142	+ 3⅞	24....	53	− ⅜
31....	165½	−16¼	30....	134½	+ 2¼	30....	143½	+ 3⅜	31....	48	+ 2⅛

TABLE I—*Concluded*

(*Cents per bushel*)

Date	Price	Spread	Date	Price	Spread	Date	Price	Spread	Date	Price	Spread
1932			**1932**			**1932**			**1933**		
Jan. 8....	56¼	+ 1⅜	Mar. 24....	55⅞	+ 2¼	June 3....	55⅛	+ 2¼	Jan. 6....	47⅞	+ 1
15....	55⅞	+ 1½	Apr. 1....	55⅞	+ 2⅜	10....	51⅛	+ 2⅜	13....	47⅞	+ ⅞
22....	59	+ 1½	8....	56½	+ 2⅛	17....	48⅜	+ 2⅝	20....	47½	+ ⅞
29....	60¼	+ 1⅝	15....	63	+ 2⅛	24....	47⅜	+ 2⅝	27....	47⅞	+ ⅞
Feb. 5....	58½	+ 1½	22....	59	+ 2⅜	July 1....	47⅝	+ 2⅝	Feb. 3....	47¼	+ 1
11....	59⅞	+ 1½	29....	56¾	+ 2⅜	8....	48⅝	+ 2⅝	10....	48⅛	+ 1⅛
19....	63½	+ 1¾	May 6....	57¼	+ 2⅜	15....	45⅜	+ 2½	17....	48⅜	+ 1¼
26....	63	+ 1¾	13....	56¼	+ 2⅛	22....	46¼	+ 2	24....	48½	+ 1¼
Mar. 4....	62¾	+ 1⅞	20....	58⅜	+ 1⅞	29....	50¼	+ 1¼	Mar. 3....	48¾	+ 1⅛
11....	62⅜	+ 1⅞	27....	59⅜	+ 1¾	30....	50¼	+ 1⅛			
18....	57¾	+ 2									

TABLE II.—STANDARD DEVIATIONS OF WEEKLY CHANGES IN PRICE OF JULY WHEAT, PRICE OF SEPTEMBER WHEAT, AND JULY–SEPTEMBER SPREAD AT CHICAGO, BY MONTHS AND BY CLASSES OF YEARS*

(*Cents per bushel*)

Month	I. Years of positive spread			II. Years of small negative spread			III. Years of large negative spread		
	July wheat	Sept. wheat	July–Sept. spread	July wheat	Sept. wheat	July–Sept. spread	July wheat	Sept. wheat	July–Sept. spread
Jan.	1.458	1.579	0.183	1.077	0.940	0.355	3.186	2.568	1.442
Feb.	2.186	2.106	0.274	1.401	1.476	0.390	4.018	3.422	0.910
Mar.	2.398[a]	2.438[a]	0.232[a]	1.084	1.102	0.372	3.468	2.741	1.260
Apr.	2.669	2.566	0.359	1.559	1.597	0.421	4.865	3.793	1.843
May	3.428	3.378	0.344	2.709	2.531	0.665	6.132	5.515	2.515
June	3.741	3.688	0.602	2.726	2.114	1.222	5.096	3.846	2.234
July	3.571	3.491	0.574	2.261	1.950	1.119	7.410	4.793	5.222

* Data and classification as for Table V. These standard deviations constitute measures of average weekly change, and as such are discussed in the text in Section I.

[a] Excluding data for 1930; with data for 1930 included, the figures are 2.673, 2.783, and 0.267, respectively.

TABLE III.—AVERAGE CHANGE IN PRICES OF CHICAGO WHEAT FUTURES FOR EACH 1-CENT CHANGE IN JULY–SEPTEMBER SPREAD, BY MONTHS AND BY CLASSES OF YEARS*

(*Cents per bushel*)

Month	Change in price of July future			Change in price of September future		
	I	II	III	I	II	III
Jan. ..	+4.988	−1.598	−1.355	+5.988	−0.598	−0.355
Feb. ..	−2.787	+0.207	−3.180	−1.787	+1.207	−2.180
Mar. ..	+1.317[a]	−0.358	−1.920	+2.317[a]	+0.642	−0.920
Apr. ..	−2.567	−0.165	−1.916	−1.567	+0.835	−0.916
May ..	−1.935	−1.551	−1.067	−0.935	−0.551	−0.067
June ..	−1.043	−1.493	−1.619	−0.043	−0.493	−0.619
July ..	−1.359	−1.024	−1.086	−0.359	−0.024	−0.086

* Data and classification as for Table V; the Roman numerals in the column headings designate the classes of years as there defined. These "average changes" are Pearsonian regression coefficients. They must be interpreted in the light of their standard errors, which are given in connection with the analysis of these statistics in Section I above.

[a] Excluding data for 1930.

TABLE IV.—COEFFICIENTS OF CORRELATION BETWEEN WEEKLY CHANGES IN JULY–SEPTEMBER SPREAD AND WEEKLY CHANGES IN PRICES OF CHICAGO WHEAT FUTURES, BY MONTHS AND BY CLASSES OF YEARS*

Month	With July future			With September future		
	I	II	III	I	II	III
Jan. ..	+0.626	−0.527	−0.613	+0.694	−0.266	−0.199
Feb. ..	−0.349	+0.058	−0.720	−0.232	+0.318	−0.579
Mar. ..	+0.127[a]	−0.123	−0.698	+0.220[a]	+0.217	−0.424
Apr. ..	−0.348	−0.045	−0.707	−0.222	+0.220	−0.421
May ..	−0.194	−0.381	−0.438	−0.095	−0.145	−0.031
June ..	−0.168	−0.669	−0.710	−0.008	−0.285	−0.360
July ..	−0.218	−0.506	−0.765	−0.058	−0.013	−0.093

* Data and classification as for Table V, the Roman numerals in column headings referring to classes of years. Standard errors for any of these correlation coefficients, if desired, may be obtained by dividing the correlation coefficient by the corresponding regression coefficient, as given in Table III, and multiplying by the standard error of the regression coefficient.

[a] Excluding data for 1930.

TABLE V.—AVERAGES, BY WEEKS, OF PRICE OF CHICAGO JULY WHEAT AND OF JULY–SEPTEMBER SPREAD, BY CLASSES OF YEARS*

(Cents per bushel)

Date	I. Years of positive spread			II. Years of small negative spread			III. Years of large negative spread		
	Price (all years available)	Price (years used for spread)	July–Sept. spread	Price (all years available)	Price (years used for spread)	July–Sept. spread	Price (all years available)	Price (years used for spread)	July–Sept. spread
Jan. 5........	82.4	81.7	+0.45	89.2	89.1	−1.57	106.9	106.7	−4.30
12........	82.7	81.8	+0.51	89.7	90.0	−1.64	106.7	106.2	−4.55
19........	82.8	83.1	+0.51	89.5	90.1	−1.72	107.3	106.8	−5.13
26........	83.8	84.5	+0.55	89.7	89.5	−1.32	108.3	108.0	−5.19
Feb. 2........	83.2	84.7	+0.72	89.4	90.1	−1.37	108.8	107.4	−5.02
9........	83.4	85.4	+0.69	89.6	90.4	−1.09	108.7	107.1	−5.05
16........	83.3	85.6	+0.69	89.2	89.9	−0.75	109.2	107.1	−5.16
23........	82.8	84.3	+0.94	88.5	89.0	−0.67	109.1	107.7	−5.49
Mar. 2........	82.7	83.8	+0.94	88.3	88.9	−0.72	108.9	109.1	−5.93
9........	81.5	82.4	+0.81	87.2	87.9	−0.80	108.3	108.6	−5.61
16........	80.3	80.5	+0.88	86.6	87.2	−0.61	106.8	107.0	−5.22
23........	79.4	79.5	+1.07	86.2	86.7	−0.46	106.5	106.6	−5.36
30........	79.4	79.4	+1.15	85.9	86.2	−0.50	106.9	107.0	−5.29
Apr. 6........	80.6	80.7	+1.27	86.1	86.1	−0.74	107.1	107.1	−5.15
13........	81.7	81.7	+1.39	87.4	87.4	−0.75	110.3	110.3	−5.80
20........	80.6	80.6	+1.49	88.2	88.2	−0.96	112.4	112.4	−6.17
27........	79.9	79.9	+1.73	88.4	88.4	−0.95	114.2	114.2	−6.54
May 4........	80.1	80.1	+1.76	88.8	88.8	−1.04	114.2	114.2	−6.78
11........	78.8	78.8	+1.70	88.9	88.9	−1.29	116.0	116.0	−6.51
18........	80.3	80.3	+1.69	89.6	89.6	−1.48	114.2	114.2	−6.17
25........	80.4	80.4	+1.73	91.1	91.1	−1.29	113.2	113.2	−6.49
June 1........	79.3	79.3	+1.82	89.8	89.8	−1.08	110.3	110.3	−4.52
8........	80.1	80.1	+2.26	89.4	89.4	−1.01	110.9	110.9	−5.01
15........	78.6	78.6	+2.36	87.4	87.4	−0.23	108.4	108.4	−4.08
22........	79.0	79.0	+2.56	86.1	86.1	+0.26	107.5	107.5	−3.66
29........	78.6	78.6	+3.08	85.1	85.1	+0.78	107.6	107.6	−3.13
July 6........	79.4	79.4	+2.73	85.5	85.5	+0.45	108.2	108.2	−3.76
13........	78.3	78.3	+2.39	83.8	83.8	+0.41	109.4	109.4	−3.33
20........	79.8	79.8	+1.99	83.8	83.8	−0.03	111.5	111.5	−4.15
27........	80.8	80.8	+1.72	83.5	83.5	+0.19	110.9	110.9	−3.85
31........	80.7	80.7	+1.34	82.0	82.0	+1.24	111.5	111.5	−5.24

* Computed from data in Table I.

On the basis of the average spread for the three Fridays centering on the middle of April (average spreads not greater than −2 being classed as small negative spreads), the years were divided into three classes as follows:

Years of positive spread: 1886, 1893, 1894, 1895, 1896, 1900, 1907, 1924, 1929, 1930, and 1932.

Years of small negative spread: 1887, 1890, 1892, 1899, 1902, 1906, 1911, 1913, 1914, 1923, 1927, and 1931.

Years of large negative spread: 1889, 1891, 1897, 1898, 1903, 1904, 1905, 1908, 1909, 1910, 1912, 1915, 1916, 1917, 1922, 1925, 1926, and 1928.

In several years included in each class, trading in the September future did not start until long after the first week of January, hence no July–September spread could be computed for many early weeks of some years. In a smaller number of weeks in some of these years even the July future was not quoted. To avoid erratic fluctuations in the averages on this account, all the original averages based on data for less than the full number of years in the class have been adjusted to remove fluctuations due solely to the dropping out of data for one or more individual years.

Because in many weeks prices of the July future were available when a spread was not, full utilization of the price statistics results in averages not strictly comparable with the averages of spreads. For purposes of comparison a second set of price averages is shown, using data only for the dates for which spreads are available.

The dates shown represent the approximate average date of all the items included in each average.

TABLE VI.—UNITED STATES WHEAT STOCKS, JULY 1 AND MARCH 1, AND AVERAGE JULY–SEPTEMBER PRICE SPREAD BY MONTHS, 1896–1932*

(Million bushels; cents per bushel)

Year	July 1 stocks			March 1 stocks	July–September spreads					
	Visible	All commercial	Commercial and farm	Commercial and farm	March	April	May	June A	June B	July
1896....	47.3	118.1	175.2	335.2	....	+ 0.33	+ 0.83	+ 0.83	+ 0.77	+ 1.04
1897....	17.3	67.5	100.4	258.9	− 2.12	− 2.21	− 4.42	− 5.25	− 4.77	− 4.62
1898....	14.6	36.1	58.7	246.1	− 7.38	− 7.21	−19.04	− 8.92	− 8.47	− 7.92
1899....	31.4	118.2	195.8	383.7	....	− 0.75	− 0.21	+ 1.33	+ 1.30	+ 1.33
1900....	44.6	125.6	188.2	385.5	+ 0.42	+ 0.83	+ 1.12	+ 1.50	+ 1.40	+ 1.17
1901....	29.3	96.8	134.2	357.7	....	....	− 1.75	− 0.38	− 2.17	+ 1.21
1902....	18.3	72.9	130.4	332.0	− 0.04	− 0.50	− 1.29	− 1.33	− 1.40	− 3.75
1903....	14.9	63.6	109.7	307.1	− 1.29	− 2.92	− 2.58	− 2.46	− 2.33	+ 0.67
1904....	11.1	68.0	106.3	271.7	− 5.58	− 4.25	− 5.29	− 4.54	− 4.80	− 6.58
1905....	10.8	53.3	78.1	240.7	− 6.08	− 4.62	− 6.67	− 4.71	− 4.73	− 2.12
1906....	23.0	92.2	139.7	314.3	− 0.12	− 1.04	− 1.96	− 0.17	− 0.27	+ 0.71
1907....	37.8	136.7	192.4	375.6	+ 0.50	+ 1.67	+ 1.46	+ 2.92	+ 2.57	+ 2.58
1908....	10.9	62.3	95.5	281.6	− 2.83	− 2.46	− 3.92	− 1.67	− 2.47	+ 0.29
1909....	9.8	45.4	59.8	227.4	− 6.38	− 8.50	− 7.75	− 6.25	− 6.73	− 7.21
1910....	12.0	72.7	110.1	280.9	− 2.33	− 2.33	− 2.12	− 2.04	− 2.13	− 1.96
1911....	23.9	91.9	126.0	301.1	− 0.25	− 0.54	− 1.08	− 0.58	− 0.67	+ 2.04
1912....	23.3	80.7	104.6	277.3	− 2.17	− 3.17	− 5.00	− 2.62	− 3.07	− 3.25
1913....	29.9	95.0	130.5	327.4	− 0.33	− 0.67	− 0.46	0.00	− 0.23	+ 1.00
1914....	15.0	77.3	109.5	304.2	− 0.50	− 0.33	− 1.17	− 0.96	− 1.53	− 0.50
1915....	7.9	40.7	69.7	321.0	−11.92	−13.50	− 6.12	− 2.00	− 2.03	− 6.08
1916....	41.1	151.6	226.3	465.4	− 1.25ᵃ	− 1.79	+ 0.33	+ 2.21	+ 2.07	+ 1.42
1917....	14.1	37.2	52.8	268.7	−12.08	−24.33	−28.42	−27.33	−26.23	−22.17
1918....	0.8	12.8	20.9	207.9	....	....	....	....	....	....
1919....	8.5	41.6	60.9	302.1	....	....	....	....	....	....
1920....	19.5	115.2	164.8	387.5	....	....	....	....	....	....
1921....	7.8	72.7	129.4	380.1	....	....	....	−10.42	−10.20	+ 0.58
1922....	17.8	84.1	116.6	321.7	− 6.67	− 7.00	− 5.29	+ 0.25	+ 0.40	− 2.38
1923....	26.3	110.5	145.7	345.4	− 1.79	− 2.12	− 1.50	− 1.33	− 0.93	− 1.00
1924....	34.9	113.2	142.5	328.8	+ 0.88	+ 1.00	+ 0.96	+ 1.67	+ 1.60	− 1.08
1925....	29.1	85.2	113.8	325.0	− 9.67	− 8.25	− 8.21	− 2.00	− 2.83	− 3.42
1926....	12.3	77.9	98.5	298.4	− 5.79	− 5.96	− 4.08	− 3.50	− 4.17	− 0.17
1927....	22.1	91.2	117.9	333.0	− 2.29	− 1.42	− 2.79	− 2.00	− 1.97	− 2.33
1928....	38.9	100.7	124.1	318.8	− 1.67	− 3.12	0.00	+ 1.71	+ 1.84	+ 2.92
1929....	92.7	196.4	242.2	450.1	+ 1.67	+ 3.00	+ 3.75	+ 4.67	+ 4.42	+ 4.29
1930....	107.5	243.4	290.8	497.6	+ 1.96	+ 2.96	+ 2.71	+ 3.00	+ 2.92	+ 2.96
1931....	187.3	286.7	318.6	511.2	− 0.04	− 0.75	− 0.21	+ 0.58	− 0.01	+ 0.54
1932....	163.2	290.7	362.6	560.4	+ 2.04	+ 2.21	+ 1.92	+ 2.54	+ 2.49	+ 2.38

* Data for July 1 stocks, 1896–1921, from WHEAT STUDIES, IV, 180; for 1922–32, from WHEAT STUDIES, IX, 129 (with minor revisions), including as "commercial" all stocks of United States wheat not on farms. March 1 total stocks exclude supplies for spring-wheat seeding and are derived by adding March–June exports and domestic consumption to July 1 total stocks. Dots (....) indicate absence of data.

The spreads are for averages of the second, third, and fourth Fridays of each month, based on data in Table I, except those in "B" under June, which are averages of daily spreads at the close during the first three full weeks of June.

ᵃ Average for third and fourth Fridays only.

WHEAT STUDIES *of the* FOOD RESEARCH INSTITUTE

VOLUME VII

VOLUME VIII

VOLUME IX

RECENT CONTRIBUTIONS FROM THE FOOD RESEARCH INSTITUTE

(Reprints available free on request)

G 56. "Agricultural Commodities and the Business Cycle," Holbrook Working. *Proceedings of the Institute of Finance,* 1931

G 57. "Review of *Japan's Economic Position*" (by John E. Orchard and D. J. Orchard), E. F. Penrose. *Journal of the American Statistical Association,* September 1931

G 58. "Economic Aspects of Adulteration and Imitation," C. L. Alsberg. *Quarterly Journal of Economics,* November 1931

G 59. "Farm Relief, Agricultural Prices, and Tariffs," Louis B. Zapoleon. *Journal of Political Economy,* February 1932

G 60. "Review of *Wheat*" (by W. W. Swanson and P. C. Armstrong), Holbrook Working. *Journal of Farm Economics,* April 1932

E 37. "Preparation of Glutenin in Urea Solutions," W. H. Cook and C. L. Alsberg. *Canadian Journal of Research,* September 1931

E 38. "On the Carbohydrates of the Muscles of the Frog," Melville Sahyun. *Journal of Biological Chemistry,* November 1931

E 39. "On the Carbohydrates of Muscle," Melville Sahyun. *Journal of Biological Chemistry,* November 1931

E 40. "Preparation and Heat Denaturation of the Gluten Proteins," W. H. Cook. *Canadian Journal of Research,* October 1931