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THE CHICAGO WHEAT FUTURES MARKET: RECENT PROBLEMS IN HISTORICAL PERSPECTIVE

In March of 1979 the Commodity Futures Trading Commission (CFTC) ordered trading terminated in the expiring March wheat futures contract at Chicago, which had three trading days remaining. The CFTC has authority, under the 1974 Act, "to direct the contract market to take such action as, in the Commission's judgment, is necessary to maintain or restore orderly trading in, or liquidation of, any futures contract. . . . whenever it has reason to believe that an emergency exists" (CFTC, 1976). The Chicago Board of Trade obtained an injunction against the CFTC order, allowing the March contract to trade out, and providing at least transitory comfort to those who feared that this unprecedented intervention might establish a precedent. The court, in granting the injunction, said "this is a case where a government agency has overreached itself. It has been called upon to justify its actions, and instead of attempting to do so has chosen to stand behind a rule of law which . . . it misconceives" (Board of Trade, 1979). But the Appeals Court subsequently ruled (upheld by the Supreme Court) that the CFTC order was not subject to judicial review.

The CFTC had presented a list of seven market factors upon which the order had been based (CFTC, 1979a):

> (1) a small number of speculative traders has established and, as of this date, is continuing to maintain large, potentially dominant, long open positions in the Contract;
> (2) although only four trading days remained before expiration of trading in the Contract on March 21, 1979, this small number of speculative traders is continuing to maintain large long open positions in the Contract while at the same time other traders in the Contract are reducing their long open positions; as a result, the combined long positions of this small number of traders are comprising an increasingly large portion of the total open interest in the Contract as the last day of trading approaches, with that combined interest representing as of this date more than eighty percent of the total open interest in the Contract;

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(3) the combined long open positions presently maintained in the Contract by this small number of traders substantially exceed the total quantity of wheat currently available in positions from which delivery can be made in fulfillment of the Contract;
(4) even as to wheat currently in deliverable position pursuant to the Contract, not all is acceptable or available for delivery on the Contract in that a portion of this wheat is of undeliverable variety or grade, or is owned by or committed to commercial users;
(5) there is a significant shortage of transportation facilities by which additional wheat may be moved into deliverable position during March 1979, the period allowed for deliveries to be made pursuant to the Contract;
(6) there is a significant shortage of warehouse facilities to accommodate any such additional wheat; and
(7) there is a perceived distortion of the price relationships between the Contract and other values of wheat.

Material bearing upon each of these factors will be adduced in this study, with special attention devoted to the seventh factor as being a key element which should be amenable to economic analysis.

An historical approach is taken in order to provide a context for the analysis of the 1979 affair. It also helps to provide perspective for another matter which faces the CFTC—that of delivery points for futures markets.

EARLY BACKGROUND

Futures trading emerged at Chicago shortly after the opening (1848) of the Illinois-Michigan Canal which joined the Great Lakes to the Illinois waterways and immediately set the stage for the expansion of grain production in the Chicago hinterlands. Chicago became the spout of the funnel through which all of this grain moved, and as such was the ideal location for futures delivery. In later years, with the great railroad boom, Chicago contrived to entrench its preeminence as a transportation hub by seeing to it that the major east-west railroads converged upon Chicago. We say "contrived" because Wyatt Belcher's (1947) account of the economic rivalry between the two cities contains the arguments why St. Louis, located at the confluence of two great rivers, should have become the railroad hub that Chicago did become, as well as the explanation in terms of civic aggressiveness and newspaper and Chamber of Commerce enthusiasm of why Chicago actually prevailed. Also in Belcher is adumbration of the great resurgence in river barge traffic that was to occur following World War II. Futures delivery, as this is intended to suggest, should relate to commodity flows—directions, modes of transport, and gathering or transshipment points that emerge. The more recent history of the railroads is well known—having been established as monopolies, they went through a lengthy period in which they could not learn to act like competitors, and viewed rate increases as the only answer to any threat, thereby providing aid and comfort to all competition. The trucking and barge industries blossomed in this benign climate, while the Interstate Commerce Commission indulged the railroads in their rusty-rail policies.

In recent decades Chicago's primacy as a grain terminal has rapidly dwindled. The emergence of a multifarious transportation system, truck-barge combinations, and the response which this finally evoked from the railroads, including larger cars, unit trains, rental trains, ten-car rates, and all of the associated facilities built by grain merchandisers, has largely bypassed Chicago. But for all of its complexities, the system's central thrust has been a north to south movement on the rivers, upon exports and southern livestock and poultry feeding, and in wheat a rail to Gulf movement for exports. The mode of transport has come full circle back to the water; but the direction, which a century ago was west to east through Chicago, is today north and south, bypassing Chicago.

EARLY OFFICIAL CONCERN

As early as 1926 the Federal Trade Commission (FTC) expressed concern over the Chicago delivery problem in the following words (FTC, 1926, p. 286):

> The historical development which has made the proposal under consideration a practical question is the tendency toward a loss by Chicago of its primacy as a market for the physical handling of grain, especially as regards wheat, while maintaining its dominant position in futures. An increasing quantity of grain that never goes to Chicago is hedged in Chicago futures. Outside deliveries might be considered a further logical step in making the national market for future trading, so far as practicable, also national in some sense as regards the facilities offered for delivery on its futures.

Subsequent events would suggest minor modifications to the 1926 view, but its major thrust is even stronger today. The FTC in its studies culminating in 1926, did not strongly urge "multiple" or "outside" delivery points for Chicago wheat. Instead they recommended to the Congress "That the Chicago Board of Trade be requested to permit the delivery of grain on futures contracts at other important markets than Chicago, under proper safeguards and equitable terms, whenever necessary in order to prevent a squeeze or corner in the Chicago market" (FTC, 1926, p. 287). This suggestion of "whenever necessary" implied occasional action of an emergency nature, in contrast to the cotton recommendation "that some form of southern delivery on New York contracts should be adopted, and recommends that Congress enact legislation to that end" (FTC, 1924, p. 207) which clearly implied a change in the standard delivery terms for cotton. The FTC study of New York cotton futures contained evidence that New York City was no longer a primary cotton terminal, having become too expensive in storage and handling charges, and that futures market performance suffered in consequence. It was shown that price distortions were caused by small and unrepresentative stocks adjustments in New York, that cotton often moved there even though commercial demand was lacking, and that hedging positions had to be protected by spreads; in short, the same allegations more recently encountered regarding Chicago grains were made regarding New York cotton in 1924. The New York Cotton Exchange did adopt multiple deliveries at a series of southern locations and has continued to employ such a contract. Meanwhile, both the FTC and the Commodity Exchange Authority expressed concern over the need for multiple delivery points for grains at various times after 1926.

With ongoing recognition both at the exchange and governmental levels of Chicago's decline as a grain terminal during four or five decades, why did it take so long to do something about it? It is an oversimplification at best and a misrepresentation at worst to blame the delay upon sheer apathy or upon the recalcitrance of vested interests. Fundamental economic factors militated against departure from the Chicago delivery. Examination of these factors in their historical context helps explain the persistence of a Chicago delivery, as well as providing evidence that the standards by which performance of the Chicago contract must be judged have changed. The determinants of the recent CFTC emergency intervention will be examined against the historical and analytical backdrop.

The historical analysis can be broken into three distinct periods. The first, 1921 through 1934, represents a much longer preceding period during which wheat prices were essentially free of government influence. The second, 1951 through 1964, was a time of deep governmental involvement in the wheat economy. The third period, 1965 through 1979, was one of diminished governmental involvement and substantial growth of wheat exports. Each period is about the same duration and allows enough observations to lend significance to the relationships which are portrayed. For each period three major sets of factors will be considered: (1) those which determine the price relationship between delivery months at Chicago, e.g., March to May, May to July; (2) those which determine the relation between Chicago and Kansas City futures prices; and (3) those which determine the relation between soft red winter (soft wheats) and hard red winter (hard wheats) wheat prices, which intertwines with (2). The first two periods are considered more briefly and in more narrative form, partly because earlier studies have dealt with the relationships more rigorously, but largely because the focus here is upon the current era, and earlier eras are considered primarily in order to place the modern era in perspective. Statistical analyses embodying relationships not heretofore considered are developed for the modern periods.

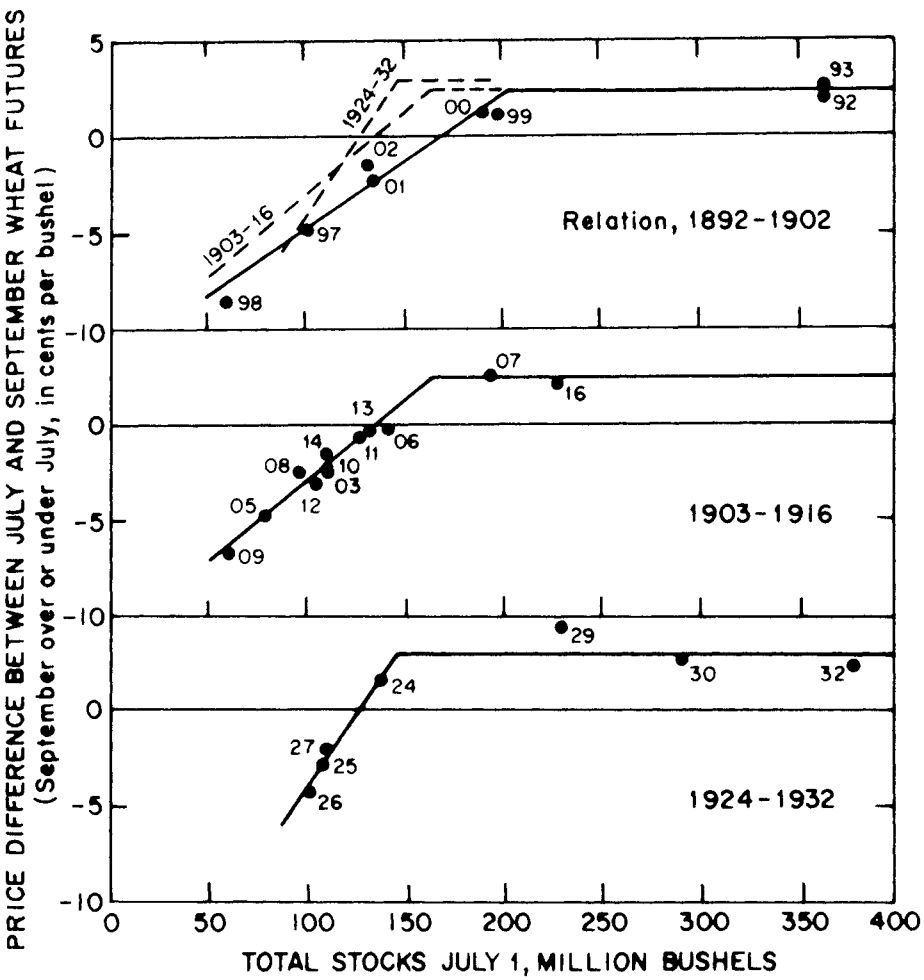
PRICE RELATIONSHIPS DURING 1921–34

The three major price relationships—intertemporal, intermarket, and between wheat classes, are sufficient to describe the early free market period, represented by the 1921–34 period.

The Price of Storage

Holbrook Working (1948, 1949, 1953) developed the classic explanation of intertemporal price relationships (between cash and futures, and between successive futures) in the form of a supply function for storage services. The essence of this functional relationship was that the level of current stocks of grain (wheat) dictated intertemporal price spreads. When stocks were plentiful the supply-of-storage function was essentially horizontal with respect to stocks at "full carrying charges." At lower stocks levels, the price spreads (price of storage) declined steeply as stocks levels diminished, passing continuously through a zero carrying charge to sometimes significantly negative (inverse) carrying charges. The graphic depiction of this relationship for several segments of years is reproduced

CHART 1. — RELATION OF WHEAT STOCKS TO THE "CARRYING CHARGE" IN CHICAGO WHEAT FUTURES*



* Holbrook Working (1953), "Hedging Reconsidered," *Journal of Farm Economics*, Vol. 35, No. 4, November, p. 556.

in Chart 1. Later writings on futures markets have incorporated this fundamental empirical finding in one form or another.[1]

Three aspects of Working's findings are important in distinguishing between the earlier era and more recent eras, particularly the current one. The first is that the very close functional relationships depicted by Working related *Chicago* price spreads to *total national stocks*. Stocks of wheat of all classes and in all locations found expression in Chicago prices, clearly indicating that classes and

[1] See, for example, L. G. Telser (1958), M. J. Brennan (1958), F. H. Weymar (1965), and Peck (1977–78).

locations were so intricately bound together that, from the standpoint of Chicago price spreads, differential classes and locations were irrelevant. The second important aspect is that, within the various periods considered by Working, interest rates did not fluctuate very much. Interest comprises a major fraction of the true cost of storage, but Working did not need to allow for this because interest rates were fairly constant over his periods of observation. The third important aspect of Working's graphs is that the price spreads are measured in absolute terms—in cents per bushel. The cost of carrying five-dollar wheat is much greater, at constant interest rates, than the cost of carrying one-dollar wheat, but wheat price levels, too, were fairly steady during the periods studied by Working. The significance of all three elements becomes much more evident in the present era.

The Chicago-Kansas City Relationship

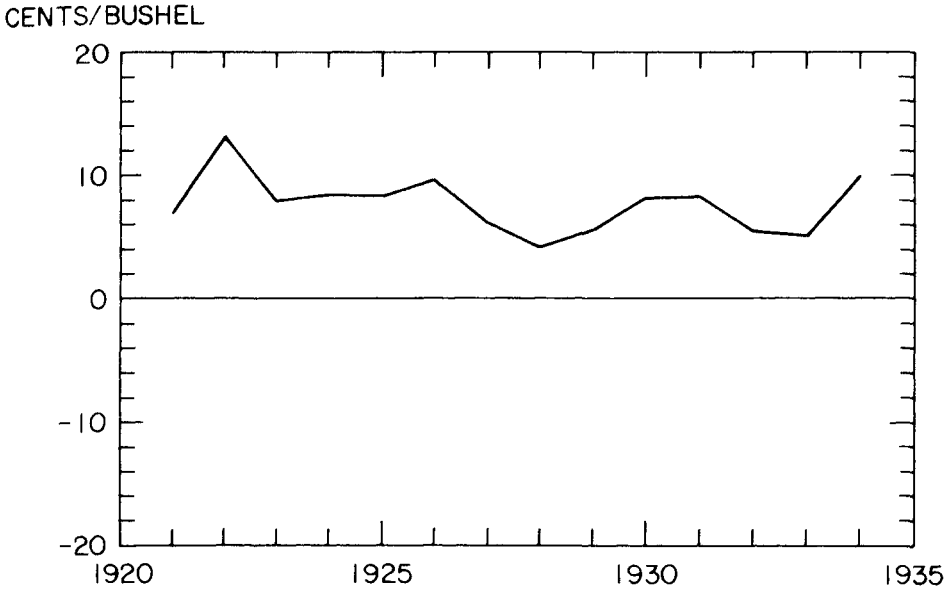
The relationship between Chicago and Kansas City wheat futures prices was relatively constant from 1921 to 1934. To demonstrate this compare May futures prices in May, this being the last old crop delivery and the one that displays most sharply the differences which have had to be sorted out during the course of the crop year. The seven-day delivery rule was not invoked until 1938 to alleviate presumed squeezes at Chicago, hence the fairest comparison is of same day closing prices of May futures prices on or about the middle of May. Kansas City futures did not always trade throughout May, as did Chicago futures. For later periods, after the invocation of the seven-day rule, prices can be compared reasonably on the last day of trading (usually around May 20).

The price differences, Chicago over Kansas City, are depicted in Chart 2. Where a closing range was reported, the smaller of the two differences, low minus low or high minus high, is taken. The price differential remained relatively constant at less than the rail freight charge, probably approaching the freight difference in 1922. The interpretation is fairly straightforward and will be fortified in the next subsection dealing with wheat classes. Kansas City was an important milling center; Chicago was an important transshipment center with some milling. Wheat grown between the two cities could move in either direction, so that the price differential could remain fairly constant at a fraction of the freight charge between them. This relationship, like the price of storage relationship just discussed, takes on greater significance as it changes in the later periods.

The Relationship Between Soft and Hard Wheats

In the area tributary to Chicago mostly soft wheats are produced, whereas mostly hard wheats are produced tributary to Kansas City. Chicago futures contracts permitted delivery (and still do) of these as well as spring wheats. Hard wheat production considerably exceeded soft wheat production, and the predominant flow of wheat and flour was west to east, hence deliveries against Kansas City futures contracts were of hard wheats. Chicago, too, despite its tributary production of soft wheats, attracted mostly hard wheat deliveries during the earlier era. Deliveries against futures should and do occur when futures contract prices established in earlier trading turn out not to be warranted as the

CHART 2.—DIFFERENCE BETWEEN CHICAGO AND KANSAS CITY MAY WHEAT FUTURES PRICES IN MID-MAY, 1921–34*



* Data from *Statistical Annuals*, Chicago and Kansas City Boards of Trade, various years.

delivery month approaches, and the cheapest available wheat by class and location will be tendered against the contract. During this earlier era, Chicago, with its multiple-class contract, attracted more hard wheats for delivery than other classes. As mentioned above, wheats between Kansas City and Chicago could move either direction to keep Chicago and Kansas City price relationships stable. Similarly the delivery potential could adjust cash-futures relationships, and at Chicago this came chiefly from hard wheats grown between Kansas City and Chicago. Table 1 shows what is known about deliveries to Chicago in the period.

PRICE RELATIONSHIPS DURING 1951–64

The long and gradual transition to the modern era is best summarized in terms of the 14-year period (1951–64) of prolonged government influence upon prices. It is possible that the transition would have come about without the influence of government programs, but some change can be attributed directly to the programs, hence the choice of this time period.

The Price of Storage

The government loan program had both a general and a differential influence upon the market-determined price of wheat storage (price spreads between contracts). The general influence was to reduce the price of storage, narrowing the

TABLE 1.—WHEAT FUTURES: INITIAL DELIVERIES BY CLASS AT CHICAGO BOARD OF TRADE, COMBINED FOR THE PERIODS SEPTEMBER 1924–DECEMBER 1925 AND DECEMBER 1930–MAY 1934*

Wheat class	Initial deliveries (*million bushels*)	Percent of total
Hard winter	48	73
Soft winter	10	15
Spring	8	12
Total	66	100

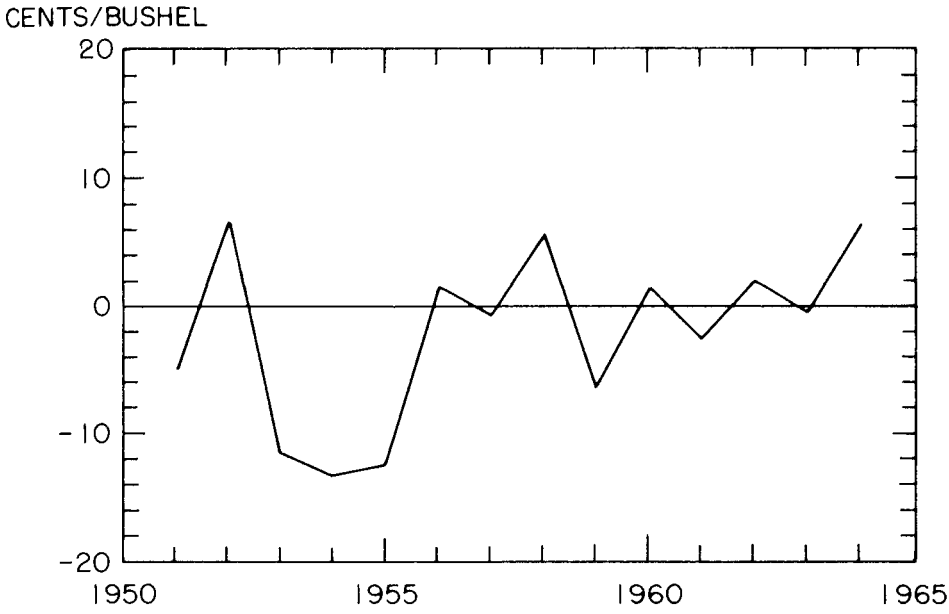
* Data from United States Department of Agriculture (1953), *Grain Futures Statistics, 1921–1951*, Statistical Bulletin No. 131, Commodity Exchange Authority, July. Delivery data for Chicago Board of Trade not available prior to September 1924 and initial deliveries by grades not available from May 1926–September 1930.

carrying charges and inducing inverse carrying charges. Wheat surpluses went into government hands. This meant that plentiful current supplies which would have occasioned full carrying charges, thereby inducing private holding, instead went largely under loan and were not reflected in carrying charges. The seasonal market inversion, characteristically at the end of the season when the current crop had been mostly disposed of, came earlier in the year as wheat was accumulated by the government. The differential influence was even more important to the present analysis. Chicago futures came increasingly to reflect soft wheat prices and relationships, and Kansas City futures continued to reflect hard wheats. Soft wheat growers did not participate nearly so fully in the government program as did hard wheat growers. They produced on much smaller acreages in a mixed farming area, and most of them elected not to comply with program acreage requirements, but to produce wheat or other crops according to their perception of the market. Soft wheats therefore traded relatively freely and occasioned carrying charges at Chicago not available at Kansas City. Thus began the gradual estrangement between soft and hard wheat markets, between Kansas City and Chicago futures, and between the factors which determined delivery month price spreads at Chicago. It now became the supply of soft wheats, rather than total national wheat stocks, that dictated Chicago price relations. In particular, as we shall see later, it became necessary to focus upon Chicago stocks as reflective of soft wheat supplies, instead of national stocks as reflective of all wheat supplies, in order to explain Chicago price spreads.

The Chicago-Kansas City Price Relationship

The estrangement between Chicago and Kansas City is perhaps most clearly seen when comparing Chart 2 with Chart 3. Where Chicago prices earlier displayed a fairly constant premium over Kansas City (Chart 2), they ruled below Kansas City prices in more than half the years from 1951 to 1964, and

CHART 3.—DIFFERENCE BETWEEN CHICAGO AND KANSAS CITY MAY WHEAT FUTURES PRICES IN MID-MAY, 1950–64*



* Data from *Statistical Annuals*, Chicago and Kansas City Boards of Trade, various years.

sometimes markedly below. Consistent with the change in storage practices, there was also a seasonal tendency for Chicago futures to gain relative to Kansas City by some 7 cents on average, further widening the estrangement between the two markets.

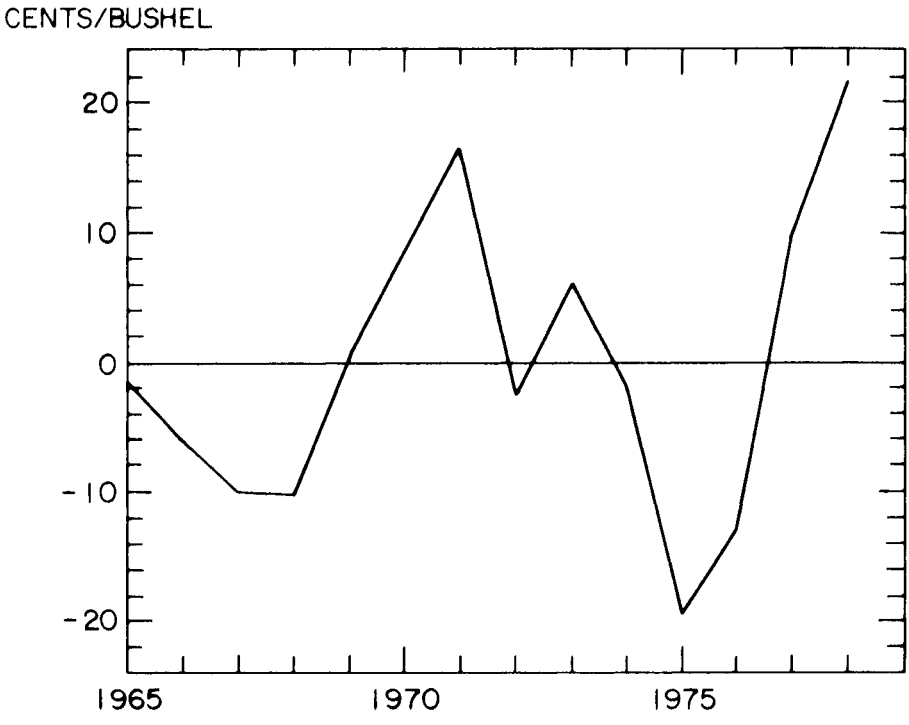
The Relationship Between Soft and Hard Wheats

The relationship from 1951 to 1964 between soft and hard wheats has been described as one of estrangement, but in some respects divorcement might be the better term. In the early 1950s, some soft wheats were delivered against the Kansas City futures contract for the first time in history and as a direct result of the loan program "supporting" hard wheat prices more effectively than soft wheat prices. This episode forced Kansas City to specify deliveries of "hard wheat only" in a new contract which became the only one traded there.[2] Meanwhile Chicago, while continuing to allow deliveries of other classes, became effectively a "soft wheat only" market; free wheat stocks held at Chicago during this era were either soft red wheats or nondeliverable grades.

The emergence of distinct soft wheat and hard wheat markets did not mean that the two markets lost all relationship to one another. Instead the relationship became based upon different terms than had previously been established. The estrangement was peaceful, the divorce has been friendly, and soft wheats and hard wheats are still seeing each other.

[2] See Working (1954).

CHART 4.—DIFFERENCE BETWEEN CHICAGO AND KANSAS CITY MAY WHEAT FUTURES PRICES IN MID-MAY, 1965–78*



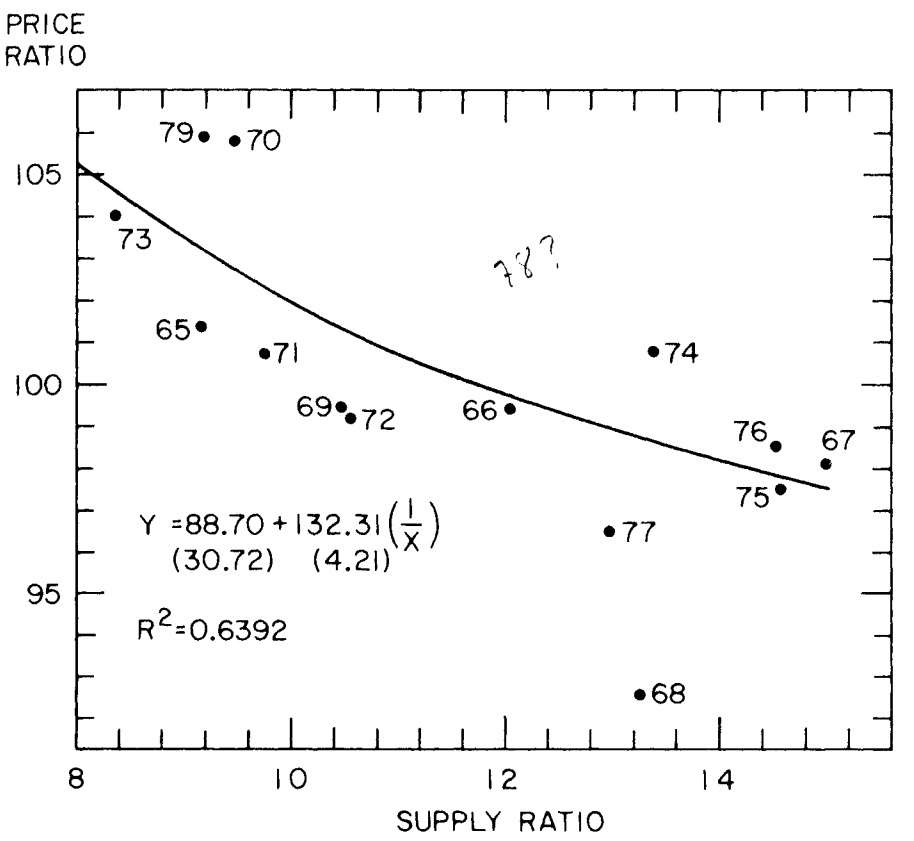
* Data from *Statistical Annuals*, Chicago and Kansas City Boards of Trade, various years.

PRICE RELATIONSHIPS IN THE MODERN PERIOD, 1965–79, AND THE 1978–79 PERFORMANCE OF THE CHICAGO FUTURES MARKET

It might have been anticipated that the removal of the price support mantle would induce a reversion to the traditional role of the Chicago futures market vis-a-vis national wheat stocks. That this was not so is apparent from Chart 4, showing the basic Chicago-Kansas City price relationship continuing its seemingly erratic course. That this is only seemingly erratic, however, will be shown by examining the fundamental nature of the relationships between soft and hard wheat prices, Chicago and Kansas City futures prices, and between Chicago price spreads and relevant stocks other than national stocks. It is in the context of these relationships that the Chicago market performance of 1978–79 needs to be judged, and assessment made of the emergency declared by the CFTC in March 1979.

In point of fact, Chicago has emerged even more clearly as a focus of soft wheat values, which relate economically to other wheat values, but by no means perfectly. The strong growth of wheat exports from Gulf ports, incumbent shifts

CHART 5.—RATIO IN AUGUST OF CHICAGO TO KANSAS CITY PRICES OF WHEAT FOR SEPTEMBER DELIVERY AND RELATIVE AVAILABILITY OF SOFT RED WHEAT, 1965–79*



* Based on data from *Statistical Annuals*, Chicago and Kansas City Boards of Trade, and United States Department of Agriculture, Economics, Statistics, and Cooperative Service, "Wheat Situation," July or August. Price ratio (Chicago-Kansas City prices) uses the mean of high and low prices of the September future in Chicago and Kansas City in August if the August 1 supply estimates are used and in July if the July 1 estimates are used. Supply ratio is the estimated supply of soft red wheat expressed as a percent of total wheat supplies, estimates as of July 1 or August 1. Reported regression results exclude data from 1968, 1969, and 1979.

in freight and movement patterns, increased commercial separation among wheat classes according to demand with a clear preference for soft wheats in certain uses and markets, and a continuing relative increase in storage and handling costs at Chicago—all contrived to finalize the divorcement between the Chicago market and the hard wheats, but on terms that have been spelled out in a continuing friendly relationship.

An underlying relationship is depicted in Chart 5, where the early season relations between Chicago and Kansas City futures prices are seen to reflect the projections of total supplies of soft red winter wheat relative to all wheats. The pro-

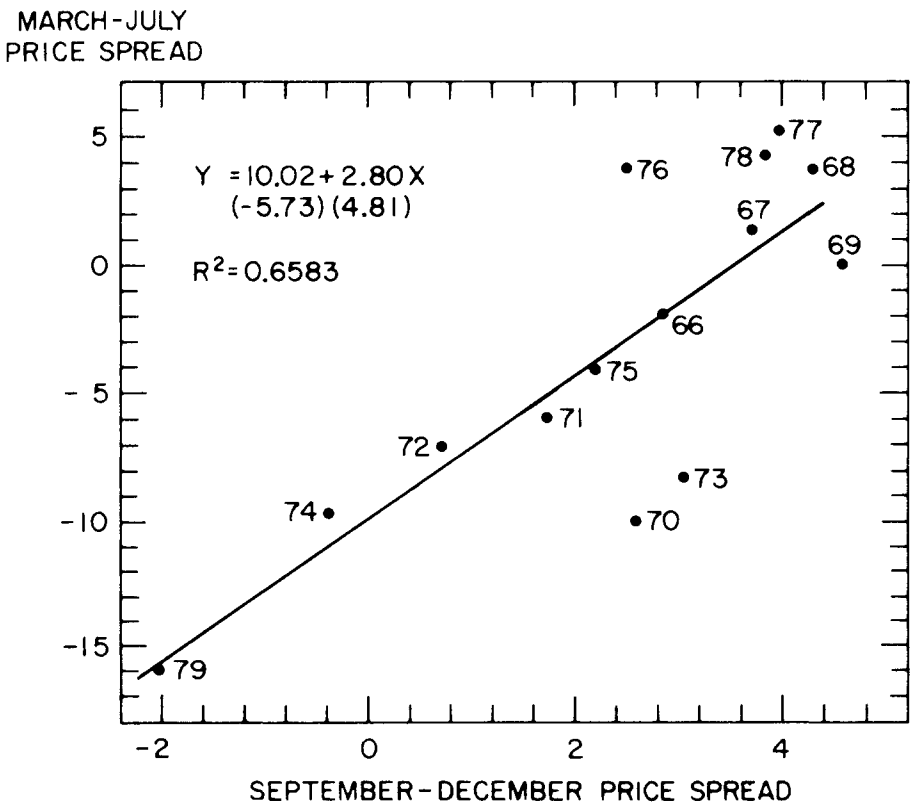
jections were released by the United States Department of Agriculture as of August 1 in most years, and as of July 1 in the others. When the projections were released in August, the average August prices (mean of monthly highs and lows) of the September futures prices at the two markets were used in estimating this relationship. For July projections the July prices of the September futures were used. Two years, 1968 and 1969, were deleted from the estimate because only in these two years did farm prices fall to or below the loan level. This of course caused reversion to a previous pattern whereby hard wheats gained better price support from the program than did soft wheats, hence Chicago prices fell well below the average relationship for the period early in the marketing year, a characteristic of price relationships in the prior period.

It can hardly be expected that these supply projections alone would explain the price relationships, given the myriad other factors considered by market participants. But this simple correlation reveals the strong influence of the projected supply relation and speaks clearly to the point that at the beginning of the 1978–79 marketing season, Chicago futures prices reflected a tight supply of soft red winter wheats. Obviously other factors would emerge in the course of the season to alter this price relationship, but the early warning signal had already been sounded.

Shifting now from the Chicago-Kansas City relationship to the intertemporal price spreads at Chicago, Chart 6 reveals an even stronger early signal. In this chart it is seen that the September-December futures price relationship at Chicago affords a good explanation of the later March-July relationships. Two aspects of this formulation require attention—aspects which were adumbrated in the discussion of Working's formulations for an earlier period. The price spreads are shown in percentages for this era, and they are also adjusted for interest rate changes. The reason for this is that both price levels and interest rate levels changed radically in the course of the modern period, and both significantly affect the price of storage. At constant interest rates, price levels affect the cost of carrying wheat; at constant price levels, interest rates affect the cost of carrying wheat. Both fluctuated dramatically, but not together. Converting price spreads to percentages takes account of the price level changes, whereas normalizing all spreads to average (prime) interest rates to the average for the period takes account of their changes. In Chart 6 and in subsequent Chicago spread charts, much better estimates are obtained making these adjustments than could be obtained using Working's unadjusted procedure.

It is particularly noteworthy that the beginning of the 1978–79 season marked the only occasion during the modern period when September futures at Chicago sold at a premium over December futures. Both of the 1978 observations, in Charts 5 and 6, are close to the average line of relationship, and both reflect relative tightness at Chicago. The observation in Chart 6 reflects even greater tightness than that in Chart 5, for the reason that not only were soft red wheats relatively scarce, but corn and soybeans were in unusually ample supply. Attractive carrying charges for these two crops dictated that they would be moved into Chicago and Toledo elevators (and other elevators where they compete for space with soft wheat) thus magnifying, from a commercial standpoint, the already evident shortage of soft wheat supplies. The March-July (1979) spread in

CHART 6.—SEPTEMBER-DECEMBER PRICE SPREAD ON PRIOR SEPTEMBER 15 AND MARCH-JULY PRICE SPREAD ON SUBSEQUENT MARCH 15, CHICAGO FUTURES, 1966–79*

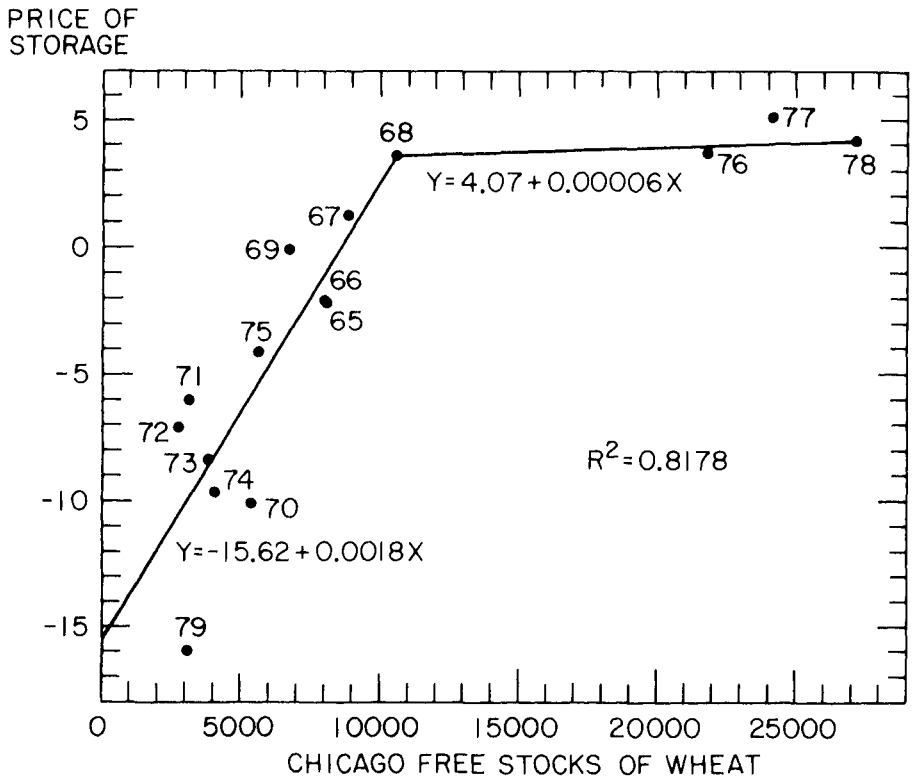


* Based on data from *Statistical Annuals*, Chicago Board of Trade, various years. March-July spread measured as a percent of the March price. September-December price spread measured as a percent of the September price. All spreads have been adjusted for changes in interest rates over the period.

Chicago futures was quite close to the average line of relationship between September-December spreads and later March-July spreads.

It may be noted that the March-July spread was estimated here, instead of the March-May spread which has been emphasized in CFTC presentations. In principle, a spread to July is a more reliable indicator of the extent of current shortage than a spread to May, because July futures reflect new crop relief of current shortage. When the March-July spread is an essentially "correct" reflection of the underlying soft wheat fundamentals, as it would appear to have been from Charts 6 and 7, the May quotation in between these two is unlikely to reflect a different view of the underlying fundamentals, but may reflect different manifestations of those fundamentals in different years. For example, in the

CHART 7.—PRICE OF STORAGE, JULY-MARCH, AND CHICAGO STOCKS ON MARCH 15, 1965–79*



* Based on data from *Statistical Annuals*, Chicago Board of Trade, various years. Price of storage measured as the interest rate adjusted difference between the July and May futures, as a percent of the March price. Chicago free stocks of wheat, including deliverable supplies in Toledo for the years 1974–79, are measured (in 1,000 bushels) on the second Friday in March. Reported R^2 is the overall fit of the storage curve shown, constrained to be quasi-continuous.

spring of 1979 the underlying shortage of soft wheats may have been exacerbated by the competition for elevator space from plentiful grains. This space situation, as distinct from the underlying supply situation, could be relieved by May as lake shipping opened, but could not be relieved by March. Hence a greater than usual proportion of the March-July inversion (which in itself appears to have been justified) would be accounted for by the March-May inversion. A consequence, then, of the coincidence of an all-time record crop of corn and soybeans with the not unrelated short crop of red winter wheat, is that the wheat shortage is exacerbated by the glut of other grains through space occupancy, and the March-May inversion reflects potential release of space.

Space and transportation considerations (contrary to the implications of the CFTC presentations) are fundamental determinants of price. It appears

altogether likely that traders were already taking space considerations into account by mid-September in 1978, explaining the inversion to December futures, which corresponds rather closely to the average line of relationship to the March-May inversion as well as to the March-July inversion.

Chart 7 brings up to date the fundamental supply of storage relationship at Chicago. Two adjustments to the earlier formulations by Working have already been discussed. The most important change, however, has now to be described. Chicago price spreads no longer closely reflect total national stocks. Instead, they reflect stocks of wheat at Chicago, most of it soft. Also included in this formulation are wheat stocks at Toledo for the period since 1974 when Toledo stocks were made deliverable against Chicago futures contracts. Price relations between March and July futures at Chicago are seen to be influenced by Chicago stocks, as would be expected in an era during which Chicago has been a predominantly soft wheat market.[3]

The 1979 observation is not a serious outlier even in this simple formulation. Further, no account is taken here of such additional fundamental forces as space or transportation limitations. It is also worth noting that some curvilinear function must logically apply to the sloping segment of the fitted line, since a zero stocks level is scarcely consonant with the intercept of the straight line. Given the statistical and economic constraints involved, it is reasonable to conclude that the 1979 price relationship was an appropriate reflection of the relevant stocks situation.

A similar formulation is shown in Chart 8 for the March-May futures relationship. It is not surprising to find the 1979 observation a further outlier in this graph than in Chart 7. The prior discussion of the relative merits of March-May vs. March-July, and of the differential influences upon them, suggests merely that fundamental factors came into play in the March-May relationship in 1979 which were not so prominent in earlier years.

To bring this analysis of price relationships full circle in respect to the March wheat future in 1979, it remains to consider Chicago vis-a-vis Kansas City futures at that time. Having seen that these futures became increasingly estranged over the course of the three periods under review, as Chicago became increasingly a soft wheat market, the underlying determinant of the Chicago-Kansas City price relationship for the modern period may now be portrayed in order to place the 1979 observation of that relation in perspective. This is done in

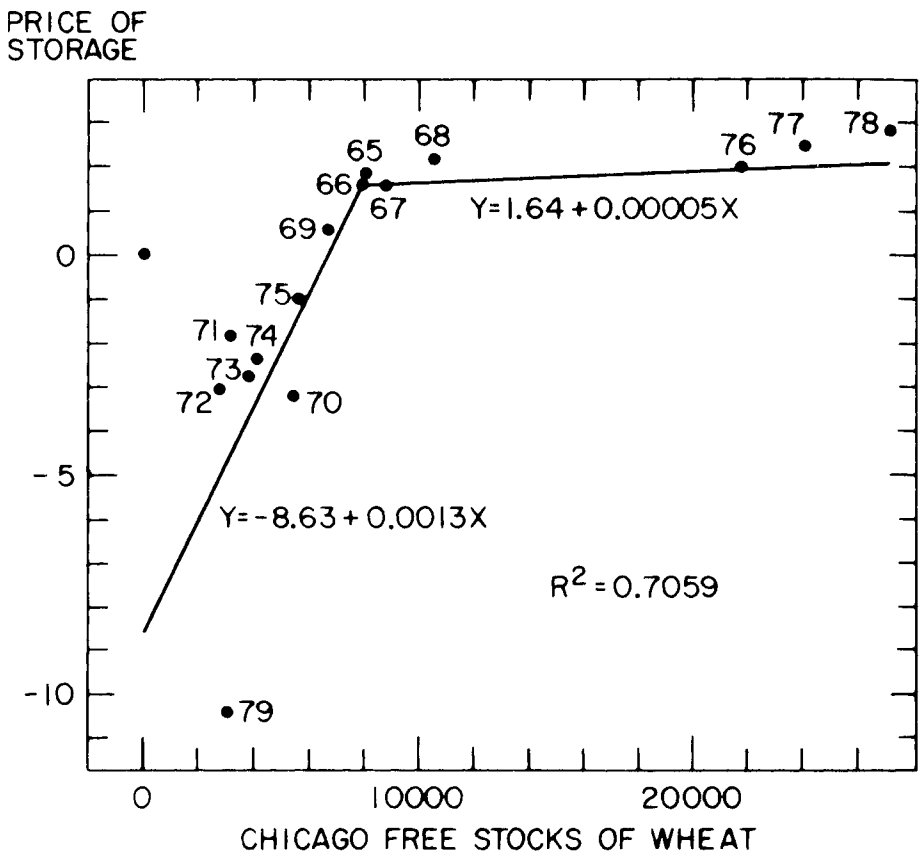
[3] The supply of storage curves shown in Charts 7 and 8 were estimated with linear techniques constraining the point of inflection to one of the data points. All likely inflection points were tested, and the one which provided the maximum R^2 is reported. The estimating equations for Charts 7 and 8 are, respectively:

$$Y = \underset{(-7.37)}{-15.62} + \underset{(5.42)}{0.0018X} - \underset{(-3.78)}{0.0018\ D1(X-10495)}$$

$$Y = \underset{(5.00)}{-8.64} + \underset{(4.37)}{0.0013X} - \underset{(-3.55)}{0.0013\ D1(X-7897)}$$

where Y and X are defined on the charts, D1 is a binary variable which has a value of 1 whenever stocks are greater than or equal 10495 in Chart 7 (7897 in Chart 8) and 0 elsewhere. The figures in parentheses are t-statistics. R^2 is reported on the charts. The constrained technique was chosen here because it guarantees that a quasi-continuous curve will be estimated.

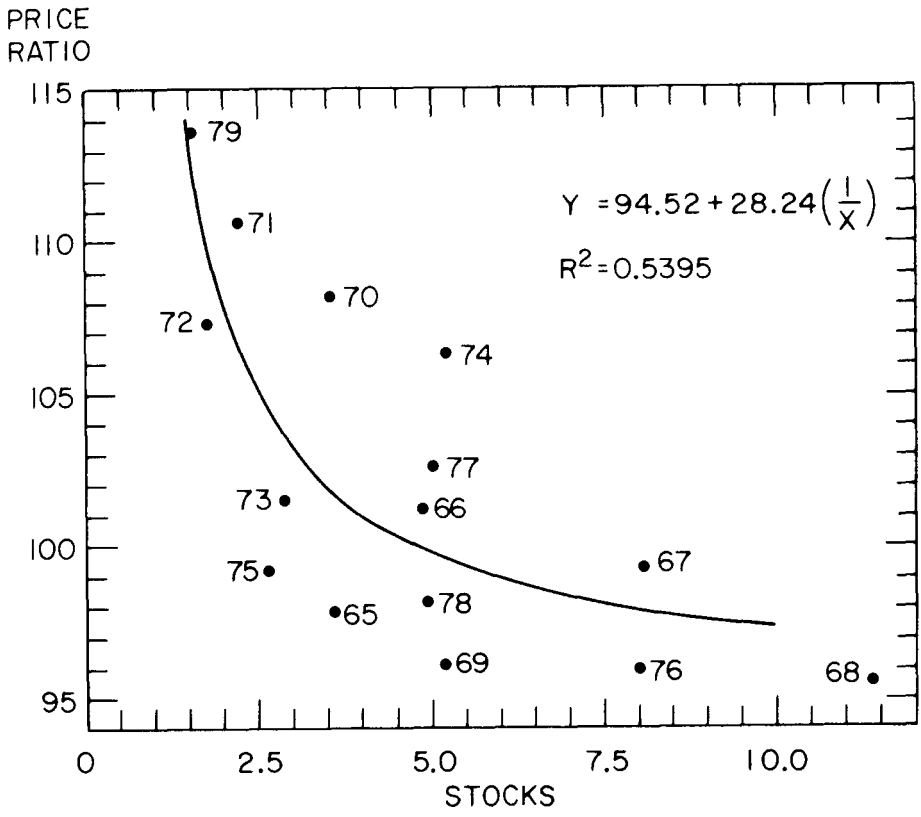
CHART 8.—PRICE OF STORAGE, MAY-MARCH, AND CHICAGO STOCKS ON MARCH 15, 1965-79*



* Based on data from *Statistical Annuals*, Chicago Board of Trade, various years. Price of storage measured as the interest-rate adjusted difference between the May and March futures, as a percent of the March price. Chicago free stocks of wheat, including deliverable supplies in Toledo for the years 1974–79, are measured (in 1,000 bushels) on the second Friday in March. R^2 is the overall fit of the storage curve shown, constrained to be quasi-continuous.

Chart 9, which expresses the Chicago-Kansas City price relationship as a function of the relationship between Chicago and national stocks. The modern average relationship is such that, with Chicago stocks reflecting soft wheat supplies and total national stocks reflecting hard wheat supplies priced at Kansas City, changes in the ratio of Chicago to national stocks explain much of the change in the ratio of Chicago to Kansas City prices. Whereas the CFTC would treat the high price ratio of 1979 as an aberration, when it is placed in the context of a fundamental determinant (Chart 9) it appears to be a very close reflection of that determinant. Chicago prices were high relative to Kansas City prices because Chicago stocks were low relative to total national stocks.

CHART 9.—RATIO OF CHICAGO TO KANSAS CITY MARCH WHEAT FUTURES ON MARCH 15 AND RELATIVE AVAILABILITY OF FREE WHEAT IN CHICAGO, 1965–79*



* Based on data from *Statistical Annuals*, Chicago and Kansas City Boards of Trade, various years. Price ratio expressed in percentages, Chicago divided by Kansas City prices. Stocks are the percentage of Chicago free stocks relative to total United States visible supplies on the second Friday in March.

THE PATTERN OF LIQUIDATION IN THE OPEN INTEREST

Typically the open interest in the futures contract for a given delivery month begins building up slowly about a year before the delivery date, and subsequently rises more rapidly, reaching a peak shortly after the expiration of trading in prior delivery month contracts, from which point contracts are liquidated until the end of trading. Although the pace and extent of liquidation just prior to and during the delivery month is looked upon as an indication of congestion or absence thereof, little or nothing has ever been written about it.

The ebb and flow in the total open interest in all (wheat) contracts, both within and between marketing seasons, are dictated largely by hedging needs. This was

first established by H. S. Irwin (1935), and has been confirmed in numerous later studies.[4] But these studies have not addressed the question of what determines the pace of liquidation for a particular contract. Not surprisingly, this too is largely a function of hedging. When markets display attractive carrying charges, the typical pattern is for the widest carrying charges to be reflected between nearby futures, and narrower carrying charges to be reflected between distant futures. Grain merchants in light of this tend to place hedges in nearby futures, and to move these hedges along to the next delivery month as the delivery date on their hedge approaches. Contrariwise, when carrying charges are narrow or inverted, short hedges against inventory tend to be placed in more distant months, in the hope and expectation that the later widening of inversions or narrowing of carrying charges will yield profitable basis results.

In the foregoing circumstances the result is that liquidation of a futures contract comes more rapidly and smoothly in carrying charge markets than in inverted markets. Hedgers move their hedges along with alacrity to the next month when there are carrying charges toward which to move, but more reluctantly when confronted by inversions. The pattern of this relationship for the March wheat futures contract at Chicago is shown in Chart 10.

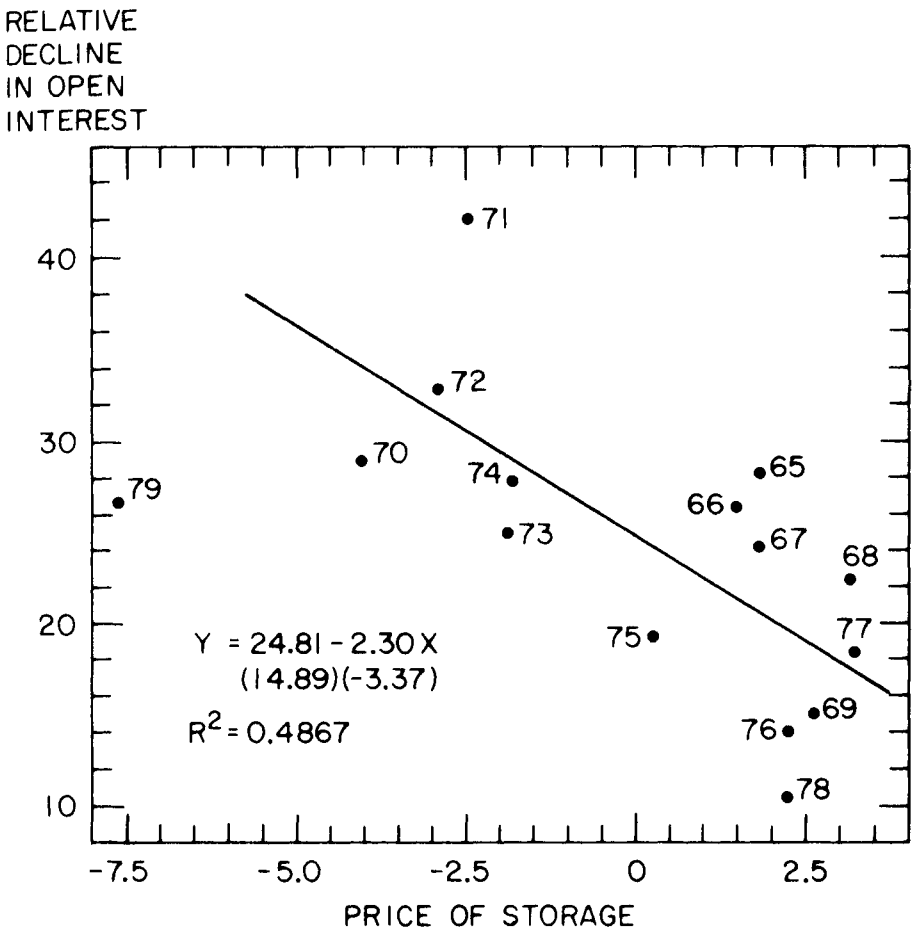
For each year the date of the peak open interest in the March futures contract is first identified, then the March 1 open interest is divided by this peak open interest as a measure of the amount by which the open interest declined between the date of its peak and March 1. These ratios are then plotted against the March-May futures relationship on March 1. As is readily seen, a significant relationship prevails between the price relation and the decline in the open interest, such that carrying charge markets liquidate rapidly by March 1, whereas inverted markets liquidate more slowly. The regression line has been fitted to all observations except that for 1979, about which more will be said below.

The next step in the analysis is to examine what happened between March 1 and March 15 during the delivery month. Given that a higher fraction of the open interest remained open on March 1 for inverted markets, what determined the rate of liquidation thereafter? Chart 11 shows the ratio between March 15 and March 1 open interest, as a measure of the rate of liquidation for that time interval, with the regression line fitted to all observations except that for 1979. Once again the major determining factor is the March-May relationship.

Now what about the 1979 observation? The Chicago Board of Trade, in opposing the CFTC emergency declaration, contended that the March futures contract had been liquidating in an orderly fashion, and that they fully expected this to continue. The CFTC took the opposite view. Charts 10 and 11 show that the March 1979 future had been liquidating more rapidly than normal up to March 1, and between March 1 and March 15 continued to liquidate more rapidly than normal. The conclusion must be drawn that the CFTC was mistaken, but the suggestion must also be made that they apparently employed no valid criteria in assessing whether or not an orderly liquidation was in progress.

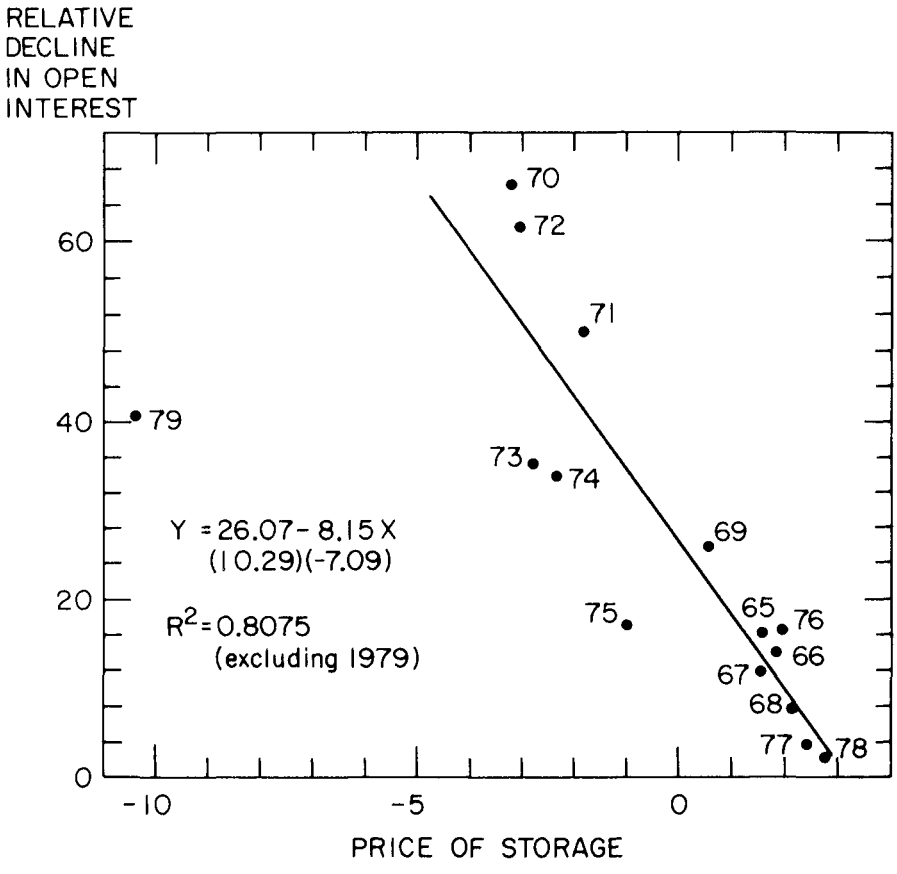
[4] See, especially, J. S. Schonberg (1956) and Gray (1960).

CHART 10.—DECLINE OF OPEN INTEREST IN MARCH WHEAT AND THE MAY-MARCH PRICE OF STORAGE, 1965–79*



* Based on data from *Statistical Annuals*, Chicago Board of Trade, various years. Open interest in the March wheat future on March 1 is measured as a percent of the prior peak open interest in the March future. Price of storage is the interest-rate adjusted spread between the May and March futures on March 1, expressed as a percent of the March price. Reported R^2 excludes the 1979 observation.

CHART 11.—DECLINE OF OPEN INTEREST IN MARCH WHEAT IN MARCH AND THE PRICE OF STORAGE, 1965–79*



* Based on data from *Statistical Annuals*, Chicago Board of Trade, various years. Open interest in the March future on March 15 expressed relative to that on March 1 (in percentages). Price of storage measured as the interest-rate-adjusted difference between the May and March futures on March 15, as a percent of the March price.

CONCENTRATION RATIOS IN THE OPEN INTEREST AND OPEN INTEREST RELATED TO DELIVERABLE SUPPLIES

Exhibit F accompanying the CFTC presentation (1979) to the House Agriculture Committee presents some data concerning concentration of futures positions and open interest related to deliverable supplies. Unfortunately, while some conclusions are drawn from these data by the CFTC, no analytical framework is provided for their interpretation. This section will attempt to provide such a framework, first with respect to concentration ratios.

There are two points to be made before looking at further evidence on concentration ratios. The first is that any given trader's position, regardless of its size, becomes a larger and larger fraction of the open interest in a particular delivery month as that open interest declines. There is no reason to expect each individual trader to reduce his position with the aggregate decline so that it is a foregone conclusion that the generalized concentration ratio across all traders will increase as the open interest declines. The ineluctable consequence is that the last trader out will have held 100 percent of the open interest. The second point is both logical and evidentiary: namely that larger traders, whether hedgers or speculators, are typically better situated, both financially and informationally, to make or take delivery. Thus small traders (short or long) are more prone to close out their positions (often under considerable suasion from their commission firms) than are large traders as the delivery date approaches. It is therefore by no means exceptional to find that four or five or eight or some other small number of traders hold a significant fraction of the open interest at the beginning of the delivery month, and that this fraction increases during the delivery month. Regularly published data from the CFTC allow confirmation of this pattern only for the beginning of certain delivery months (last old-crop delivery) and for a few recent years. These are shown for selected markets in Table 2. Further confirmation is provided in Exhibit F-2 of the CFTC presentation to the Congress (1979), reproduced here as Table 3.

If there is added to these rather obvious points the relationship developed above between relative scarcity and the rate of decline in the open interest, it will be seen that the CFTC staff has prepared an extraordinarily misleading exhibit in Table 3, where the only other years presented for comparative purposes are two recent years of unusually abundant supplies of soft wheats and extremely high stocks levels at Chicago. Nothing is said about the March futures in the early 1970s when some more nearly comparable circumstances prevailed. In Table 4 are shown the March futures open interest and these as a percentage of deliverable stocks for a period of years. Lacking access to CFTC data, we cannot show the concentration ratios for these dates, but it is not difficult to infer that the 1979 concentration ratio was not out of line when cast in an appropriate framework.

The other portion of Table 3 which was used in support of the CFTC finding without, however, being placed in any meaningful comparative framework, is the last column, futures positions of (one, two, three, or four) traders as a percentage of deliverable stocks. To the extent that a small number of traders held a significant fraction of the open interest in earlier years of low levels of deliverable

TABLE 2.—CONCENTRATION RATIOS IN LAST OLD CROP FUTURES IN WHEAT AND CORN, 1975–78*

End of month	Percent of open interest held by the indicated numbers of largest reporting traders			
	4		8	
	Long	Short	Long	Short
Chicago Wheat—May future:				
March 1975	40.2	51.4	49.7	59.6
April 1975	33.0	40.7	47.5	53.0
March 1976	26.2	54.6	31.8	63.0
April 1976	39.3	42.1	47.9	52.9
March 1977	25.3	38.3	32.3	50.8
April 1977	37.1	31.1	50.1	46.6
March 1978	13.6	40.7	22.0	55.3
April 1978	47.6	47.4	62.2	65.7
Corn—September future:				
July 1975	16.0	40.2	20.0	52.9
August 1975	38.9	40.1	52.2	55.5
July 1976	15.3	41.2	23.3	54.0
August 1976	28.3	45.2	42.2	60.6
July 1977	35.6	38.3	46.6	48.6
August 1977	40.8	44.0	56.0	62.4
July 1978	21.6	26.3	34.9	33.0
August 1978	45.9	41.7	64.9	61.2
Kansas City Wheat—May future:				
March 1975	55.0	54.3	67.8	72.4
April 1975	76.0	30.6	90.3	47.4
March 1976	63.7	69.8	81.8	77.5
April 1976	76.6	49.1	88.1	67.3
March 1977	59.1	61.8	72.3	77.1
April 1977	81.3	75.0	95.3	92.1
March 1978	38.3	44.3	62.3	60.8
April 1978	69.3	52.6	93.8	70.1
Minneapolis Wheat—July future:				
May 1975	86.3	64.7	96.9	84.8
June 1975	78.1	56.1	97.2	67.5
May 1976	71.7	53.2	86.1	72.3
June 1976	82.8	61.6	94.1	77.1
May 1977	41.6	66.4	59.3	83.0
June 1977	58.5	67.5	65.4	80.9
May 1978	34.0	52.4	47.8	60.4
June 1978	90.8	62.7	98.6	79.0

* Data from Commodity Futures Trading Commission, "Commitments of Traders in Commodity Futures," monthly. Figures here for gross positions.

TABLE 3.—CHICAGO BOARD OF TRADE WHEAT CONCENTRATION OF LARGEST REPORTABLE TRADERS AT MID-MONTH IN THE EXPIRING FUTURES*
(Million bushels unless otherwise indicated)

Date	Number of traders	Futures positions	Open interest	Deliverable stocks on previous Friday	Futures positions: Percent of open interest	Futures positions: Percent of deliverable stocks
1979—March 14	4	9.6	11.8	2.4	81	395
1978—Dec. 13	3	6.1	9.7	3.0	63	205
Sept. 13	4	10.4	11.8	7.5	88	139
July 12	4	4.1	8.7	11.0	47	37
1977—May 10	2	3.7	4.6	18.6	80	20
March 15	0	—[a]	0.3	27.0	0	0
Dec. 14	2	0.9	1.1	26.7	81	33
Sept. 14	1	2.4	3.6	24.8	67	10
July 13	1	0.6	3.6	21.0	18	3
1976—May 11	2	1.0	1.1	19.9	92	5
March 16	3	0.4	0.8	21.8	45	2
Dec. 15	4	3.7	5.3	23.9	70	16
Sept. 15	4	2.2	4.0	23.7	54	9
July 14	2	3.4	5.1	16.6	67	20
May 14	3	1.6	3.1	17.6	53	9
March 11	3	1.2	7.4	18.2	16	6

* Data from Exhibit F-2 of the Commodity Futures Trading Commission submission to the House Committee on Agriculture, Subcommittee on Conservation and Credit, March 28, 1979.

[a] Not reportable.

TABLE 4.—RATIO OF OPEN INTEREST TO DELIVERABLE STOCKS OF WHEAT IN THE EXPIRING MARCH FUTURES, 1971–79*

Year	March futures	Open interest (*thousand bushels*)	Deliverable stocks	Ratio
1971	3/5	11,665	941	12.40
	3/12	9,590	1,006	9.53
	3/19	3,155	874	3.61
	3/26	125	1,019	0.12
1972	3/3	12,295	895	13.74
	3/10	9,970	917	10.87
	3/17	6,105	1,848	3.30
	3/24	165	1,912	0.09
1973	3/2	13,075	3,206	4.08
	3/9	8,270	3,049	2.71
	3/16	4,460	3,107	1.44
	3/23	470	2,992	0.16
1974	3/1	13,725	3,413	4.02
	3/8	9,720	3,453	2.81
	3/15	4,640	3,746	1.24
	3/22	1,100	3,900	0.28
	3/29	—	4,000	—
1975	2/28	15,885	5,394	2.94
	3/7	6,040	4,799	1.26
	3/14	2,730	4,652	0.59
	3/21	40	4,379	0.01
1976	2/27	17,195	18,461	0.93
	3/5	6,205	18,354	0.34
	3/12	2,295	18,161	0.13
	3/19	1,015	17,180	0.06
1977	3/4	11,315	22,660	0.50
	3/11	2,250	21,796	0.10
	3/18	1,560	21,795	0.07
	3/25	10	21,756	0
1978	3/3	6,070	27,390	0.22
	3/10	3,475	27,034	0.13
	3/17	1,460	25,329	0.06
	3/24	20	25,319	0
1979	3/2	22,865	2,499	9.15
	3/9	17,045	2,432	7.01
	3/16	9,175	2,610	3.52

* Data from Chicago Board of Trade, *Statistical Annuals* and Commodity Futures Trading Commission, *Weekly Report on Stocks of Grain in Deliverable Positions*.

stocks, as can be inferred from Table 2 they probably did, then this combined with the information in Table 3 suggests again that the 1978–79 observations in their Exhibit F-2 are not really out of line, but are made to appear to be out of line by including only contrasting years along with these observations.

SUMMARY APPRAISAL OF THE CFTC EMERGENCY ORDER

In the introduction to this study were listed the seven factors upon which the CFTC relied in declaring an emergency in the 1979 March wheat contract at Chicago. This summary appraisal will address each of those factors.

Material adduced which has a bearing on the first two factors includes that focusing upon Charts 10 and 11, Tables 2 and 3, and the attendant discussions. When the four trader concentration is placed in historical perspective, it does not appear to be unduly large for this date, particularly considering that the March contract had been liquidating at a faster than normal pace.

So far as the third factor is concerned, Table 4 shows that it is by no means unusual for the open interest to greatly exceed deliverable supplies, particularly in years of relative shortage of soft wheats. The fourth factor—wheat in position but not available for delivery—is also a common occurrence which needs no further discussion.

The fifth factor is not in dispute as to the facts. The curious aspect is that the CFTC seems not to have recognized that the transportation shortage was a widespread and widely recognized fundamental price determinant. In discussing the failure of wheat to move from Minneapolis or Kansas City as futures price differentials approached or exceeded the freight rates, they may also impute more to the transportation shortage than is justified. *The Milling and Baking News* reported cash premiums at Kansas City on March 13 at 23 to 28 cents over Kansas City March for ordinary protein wheat, and premiums at Minneapolis ranging from – 2 to 43 cents over March depending on protein. It requires cash wheat to deliver against the futures contract, and it appears very unlikely that wheat was available in those markets at a price which would have warranted shipment to Chicago even with transport available.

The sixth factor was addressed above. There had been record crops of corn and soybeans and a short crop of soft red wheat. This was reflected early in the crop year in attractive carrying charges for corn and soybeans and inversions for wheat in Chicago. Naturally elevators stored corn and soybeans instead of wheat, and this fundamental space factor was recognized throughout the marketing season.

Most of this study has been devoted to the seventh factor—the CFTC's perception of price distortion. This study has shown that the critical relationships—Chicago March to other delivery months (May and July), and Chicago March to Kansas City March—were not distorted in relation to underlying supplies, production, and stocks of various wheat classes in various locations. There was an extreme shortage of soft red winter wheat and the market reflected this appropriately. The Chicago March wheat contract closed at 376¾ on March 15 and at 374 on March 21. The Chicago May contract closed at 382½ on May 11, and

subsequently declined on the news of the release of farmer-owned reserves. The Chicago July contract closed on June 6 at 385¾, before news of a shortfall in Soviet production fueled an increase in this futures price to a high of 475 on July 6. The evidence does not support the CFTC perception that an emergency existed on March 15.

CONCLUSIONS AND FURTHER IMPLICATIONS

If the evidence shown here vindicates the performance of the Chicago wheat market in 1979, it does so against a backdrop of historical developments which displaced formerly useful criteria of assessment. The portrait which emerges depicts a Chicago wheat futures market—still by far the largest despite recent gains in relative size by the Kansas City market—as reflecting values of soft red winter wheat which accounted for less than 15 percent of national production in the 1970s.

Inevitably the level of the open interest in Chicago futures, including as it does hedging of hard wheats and spreading to Kansas City, will frequently exceed not only Chicago wheat stocks, but all free stocks of soft red winter wheats. Inevitably also, since year-to-year variation in the production of soft red winter wheat is much greater than that of the major (hard) classes of wheat, Chicago futures prices must fluctuate around those at Kansas City. Since much smaller and more variable supplies dictate prices in the much larger market, the Chicago market may come to be perceived as being more susceptible to manipulation. This it may well be, and it may still be the case that better delivery provisions can be devised for Chicago. But under the present arrangement a fair assessment of the Chicago market performance must recognize the fact that it prices soft wheat. It should also be conducted within a proper analytical and historical framework, taking account of the general influences which underly the criteria employed in the assessment.

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