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CHAPTER 2.

HISTORICAL LEVELS OF DELIVERIES AND THE CHANGING COMMERCIAL IMPORTANCE OF THE DELIVERY LOCATIONS

It is important to begin with a clear impression not only of what the levels of delivery on the CBOT contracts have been in recent years, but also how they have changed over time and how they compare to levels of delivery in other markets. The absolute amounts of deliveries then are compared to the available deliverable stocks and levels of trading in order to obtain a sense of their size relative to both the cash market and the futures market. Finally, historical data on production and export movements provide a broader perspective on production in the region and show how commodity flows in the delivery locations have changed.

LEVELS OF WHEAT, CORN, AND SOYBEAN DELIVERIES

By almost every measure, deliveries on the CBOT wheat, corn, and soybean futures markets are much larger than has been widely appreciated. From the 1964/65 cropyear through the 1986/87 cropyear, deliveries in absolute amount on individual CBOT wheat futures contracts averaged some 15 million bushels, with a minimum of 0.03 and a maximum of 102 million bushels. For corn, the average was 20 million, ranging from 0.03 to 100 million bushels, and for soybeans the average was 24 million, ranging from 0.06 to 119 million bushels.

There is also some indication that deliveries in each market have been growing in size. For example, wheat deliveries averaged 9 million bushels over the first nine years (1964/65–1972/73), 15 million over the next six (1973/74–1978/79), and then 21 million in the next eight (1979/80–1986/87). In the earliest period, corn deliveries averaged about 15 million bushels, which increased to about 23 million over the two periods 1973/74–1978/79 and 1979/80–1986/87. Soybean deliveries have increased

as well, from 13 million to 21 million bushels and then to 38 million bushels in the third of these periods. Although deliveries from month to month vary substantially relative to the averages, the long-term trends in the levels of deliveries on each of the three markets are positive and statistically significant.[1] For example, soybean deliveries have increased an average of 142,000 bushels in each delivery period since 1964. With seven soybean contracts per year, the average annual increase amounts to about 1 million bushels. For wheat, the annual increase amounts to 0.4 million bushels while that for corn is 0.7 million bushels.

Other measures of the level of market activity provide a context in which to assess the absolute levels of deliveries and their growth. Comparisons with open interest and with deliverable stocks are listed in Table 2.1. Each comparison shows deliveries to be much larger than expected, given the prevailing wisdom that deliveries are insignificant in amount. Relative to the maximum amount of open interest in each contract (namely the peak open interest),[2] deliveries of wheat futures averaged about 18 percent over the past 25 years, those of corn were 11 percent, and those of soybeans 19 percent. Data in Table 2.1 also show comparatively little variation in these percentages over time, especially for wheat and soybeans. Put differently, the levels of deliveries on both the wheat and soybean futures contracts increased in close correspondence with increases in the maximum levels of open positions in each contract. Deliveries of corn did not grow apace with levels of open interest in corn contracts, declining from an average of 15 percent over the period 1964/65–1972/73 to only 7 percent over the period 1979/80–1988/89.

These measures of the relative importance of CBOT deliveries are quite similar to those from both the Kansas City wheat market and the Comex copper market. Over the 1972–89 period, KCBOT wheat deliveries averaged some 7 percent of the peak open interest for each contract while copper deliveries in the five principal delivery months averaged 19 percent. The KCBOT also reports just the amount of original deliveries each month

[1] In regressions of the levels of deliveries each expiration month on a simple trend variable, the coefficients of the trend variable are statistically significant in each market. These coefficients are the estimates of the amount of average increase in the level of deliveries from expiration to expiration and, when multiplied by the number of deliveries each year, are the estimated amount of the annual increase.

[2] The amount of open interest in any individual futures contract follows a relatively predictable pattern, starting at zero when trading in that option begins a year or more before expiration, increasing gradually until the option is the most actively traded one, and then declining as delivery and expiration approach. The maximum level of open interest usually occurs while the contract is the most actively traded one, some two to four months before expiration.

Table 2.1–Deliveries as Percentages of Open Interest and Stocks: Average Over 1964/65–1988/89

	Wheat	Corn	Soybeans
Peak open interest			
1964/65–1972/73	18.6	14.7	18.5
1973/74–1978/79	17.2	10.6	18.2
1979/80–1986/87	17.8	7.2	20.1
1987/88–1988/89	13.8	7.8	14.0
Open interest at the beginning of the delivery month[a]			
1964/65–1972/73	47.1	36.7	41.0
1973/74–1978/79	60.2	31.8	43.1
1979/80–1986/87	63.0	23.4	59.8
1987/88–1988/89	55.7	31.5	44.0
Total free stocks in the deliverable location(s)[b]			
1964/65–1972/73	117.9	116.3	148.6
1973/74–1978/79	109.5	159.9	243.9
1979/80–1986/87	192.5	123.1	208.9
1987/88–1988/89	275.2	130.8	114.8

Source: Based on data provided by the Chicago Board of Trade in their *Statistical Annuals*, in the Commodity Futures Trading Commission weekly "Stocks of Grain" reports, or in the U.S. Department of Agriculture, Agricultural Marketing Service, "Weekly Grain Stocks" reports.

[a]The open interest is measured at the close of the first position day for the approaching delivery month, which is two business days before the first day of the delivery month, because deliveries are subtracted from the open interest on first notice day, the last trading day in the month prior to expiration.

[b]Free stocks in the deliverable locations exclude government-owned stocks, but include stocks in the Farmer-Owned Reserve.

and these averaged some 5 percent of maximum open interest. Thus, in terms of maximum levels of trading in each commodity on each of the futures delivery options, the levels of deliveries at the CBOT in the 1980s do not appear to have been particularly different, either compared to those in earlier periods or to those in two other markets.

As another interesting indicator of the importance of deliveries, approximately 50 percent of the wheat and soybean futures contracts and 30 percent of the corn futures contracts that were still not closed at the beginning of the delivery month were settled by delivery. Again, in both wheat and soybeans, this percentage has been increasing over time, from less than half to 60 or more percent. Interestingly, the percentage declined somewhat

in the two most recent cropyears, 1987/88 and 1988/89, from 63 to 56 percent in wheat and from 60 to 44 percent in soybeans. The trends in corn were just the opposite. First, there has been a general long-term decline in the percentage of corn contracts remaining open just before deliveries began that were settled by delivery. Second, there was an increase in the last two cropyears, from 23 to 32 percent. Yet all these figures are within range of comparable data from Kansas City wheat, where an average of 28 percent of contracts open prior to the beginning of deliveries were settled by delivery, and from Comex copper, where the comparable percentage was 95.

A third indicator, CBOT deliveries compared to the levels of stocks available in the delivery location, provides a quite different view of their amount, however. The measure of stocks is now provided by the CFTC; it is total free stocks in the deliverable locations on the Friday closest to the beginning of the delivery month.[3] The averages reported in Table 2.1 show deliveries have been much greater than free stocks in the deliverable locations in all three markets over the entire 25-year period. Moreover, the percentages of deliveries with respect to these stocks have been increasing markedly over time. The increases in the wheat and soybean markets are greatest, with wheat deliveries increasing from an average of 118 percent of free stocks in the 1964/65–1972/73 period to 193 percent in the 1979/80–1986/87 period while soybean deliveries increased from an average of 149 to 244 percent and then declined slightly to 209 percent. Although much less, increases in the averages are evident in corn as well. Indeed, perhaps the most significant comparisons in the table are of the deliveries relative to deliverable stocks before and after Toledo was added as a delivery location and its stocks were added to the deliverable stocks. In each case, the addition of Toledo and its stocks served immediately to decrease the ratio of deliveries to stocks. Nevertheless, the longer-term cumulative effects of increasing delivery levels generally and declining cash markets in both Chicago and Toledo have meant the declines in the ratios were only temporary. For all three commodities, the post-1979 averages are already greater than those that prevailed prior to 1973 and the beginning of the contract changes that included Toledo. The increase in the percentages in wheat have been greatest, but even those for soybeans where Toledo was

[3] The CFTC also identifies Commodity Credit Corporation (CCC) stocks held in eligible warehouses and, for a period, was also trying to distinguish free stocks in eligible warehouses that were not eligible for delivery. The latter distinction is no longer of any consequence in the data due to changes in reporting procedures. Total free stocks are used throughout these analyses for consistency. Finally, the CFTC does not identify stocks in eligible warehouses that are being held in the Farmer-Owned Reserve (FOR). Prior to 1973, free stocks are those reported by the CBOT in its *Statistical Annual.*

added most recently have been positive. Thus, while the addition of Toledo as a delivery location did increase the stocks available to make deliveries, the easing of the relation between amounts delivered and those available to make delivery was temporary at best.

These percentages also illustrate how difficult it is to draw conclusions from the separate experiences of the wheat, corn, and soybean markets. For example, wheat deliveries had been averaging a mere 118 percent of available stocks each month in the period just before the CBOT added Toledo and increased the available deliverable stocks. Over that same period, corn deliveries were almost identical averages of free corn stocks, at 116 percent, even as soybeans were the greatest, at 149 percent. Notwithstanding these relative magnitudes, the CBOT did not add Toledo to either the corn or soybean contract at the time it did for wheat. Clearly, there are no cut-off values for any of these indicators that would permit the analyst to conclude with certainty that the market is in difficulty. Indeed, that is precisely why several indicators have been examined, both here and in the analyses that follow.

One of the main reasons for separating the 1987/88 and 1988/89 cropyears in the data in Table 2.1 is their variability with respect to the averages generally and especially as regards the ratio of deliveries to stocks. During the 1987/88 and 1988/89 cropyears, deliveries as percentages of available stocks varied greatly among the three commodities. Wheat deliveries as percentages of free wheat stocks increased again, to some 275 percent of available stocks on average. Corn percentages remained about the same, at 131 percent, and soybean deliveries were most unusual, declining to only 115 percent of total free stocks, levels lower than those seen in the 1960s.

These figures—deliveries significantly greater than 100 percent of stocks—make especially clear that the only available measure of deliveries on CBOT contracts includes redeliveries, namely those deliveries made when individuals who receive delivery notices do not hold them but redeliver them by initiating a second delivery procedure. By contrast, the KCBOT does distinguish original deliveries in its reports. Therefore, comparisons with the KCBOT are especially important, although the intramarket comparison of total to original deliveries is swamped by the intermarket differences in deliveries relative to stocks. Over the 1972–90 period, total deliveries on the KCBOT wheat contract averaged only 28.5 percent of deliverable stocks. Original deliveries were just 18 percent. For the other comparison commodity, copper, total deliveries averaged some 53 percent of warehouse stocks. Thus, compared to KCBOT wheat and Comex copper and to their own historical levels, deliveries of wheat, corn, and soybeans on the CBOT are large as percentages of deliverable stocks. Moreover, their size is not explained by the fact that CBOT data do not distinguish original from total deliveries.

Another check on the comparison matches deliveries from just the first day of the delivery period against deliverable stocks. Deliveries on the first day must be original deliveries. Over the significant subperiod beginning in May 1976 for which daily delivery data are available from the CBOT, an average of 38 percent of available stocks of wheat were delivered on just the first day of the delivery month. For corn, the average was 29 percent while for soybeans it was 25 percent. These percentages also varied a great deal among the delivery months, with first-day deliveries of wheat and soybeans representing as much as 90 percent of the available stock and those of corn as much as 67 percent. Both these averages and the extremes reinforce the impression that CBOT deliveries are very substantial relative to the available deliverable supply.

One overall measure not included in Table 2.1 is of deliveries with respect to volumes of trading. Although such comparisons are often made, they are much more difficult to justify conceptually because the volume includes all the within-day trading of market makers, which rarely results in overnight open positions, let alone deliveries. Nevertheless, for completeness, some comparisons with volume are necessary. For the 29 corn contract expirations from March 1982 through September 1987 (a nearly six-year period), deliveries averaged 0.3 percent of the volume traded in each contract over its life. In the wheat market over the period March 1982 through May 1987, deliveries averaged 0.6 percent of cumulative volume. For the 41 contract maturities in soybeans through September 1987, the average was 0.5 percent. As with the other measures reported here, the variability underlying these averages is high, with a range from 0.0 to 4.1 percent in wheat, 0.0 to 1.0 in corn, and 0.0 to 3.7 in soybeans.

These percentages of trading volume are the sorts of numbers people seem to have in mind when they speak of futures markets as markets where few contracts result in delivery. Even granting that the ratio of deliveries to trading volume is informative, it is important to place it in context with open interest and physical stocks available for delivery. When the total volume of trading is many times the level of the peak open interest, even very small delivery-to-volume ratios imply substantially higher delivery-to-open interest ratios. And, with relatively small physical stocks underlying both measures of levels of futures trading activity, the small delivery-to-volume ratios imply significant delivery-to-stocks ratios.

The most revealing comparisons remain those of deliveries to the deliverable stocks. Whether by their own historical standards or by comparison with other physical delivery markets, deliveries of wheat, corn, and soybeans are strikingly high percentages of the stocks available for delivery. The percentages became extraordinarily high for wheat in the 1987/88 and 1988/89 cropyears at some 275 percent, but declined markedly for soybeans, from levels, however, that were already more than 200 percent. Because of

their level and variability, these ratios underscore the need to examine the representativeness of supplies available in the delivery system. The remainder of this chapter examines data on the position of the delivery locations in the structure of production, marketing, and storage of the three crops.

CHANGES IN THE POSITION OF CHICAGO AND TOLEDO AS TRADING CENTERS

In the second half of the nineteenth century, the importance of Chicago as the principal market for surplus agricultural production was unquestioned. At that time, the CBOT emerged as a merchants' association to organize and regularize the already extensive trading of grains; more specifically, futures contracts emerged from standardization of the growing trade in time contracts. Direct reflections of their evolutionary character, the terms of the original grains futures contracts represented what was then standard in the substantial commercial movement of grains through Chicago elevators.[4] Today, although Chicago remains the undisputed center for futures trading, its primacy as a cash market for grains has long since eroded. The city's decline as a cash market over the last 25 years is documented here and the extent to which the addition of Toledo as a delivery location has compensated is examined.

Direct evidence of the status of Chicago and Toledo as commercial grain centers is provided by the records of annual receipts and shipments of grains and soybeans that are maintained by the CBOT. In addition to those for Chicago and Toledo, the CBOT also collects receipts and shipments data for ten other so-called primary markets.[5] Even though the annual summaries of these data are not available after 1985, the clearly established trends in them nonetheless provide a picture of a continuous fall in the commercial importance not only of Chicago and Toledo but also of all the primary markets over the 20 years since 1964. In 1964, for example, receipts of wheat in Chicago were some 34 million bushels. By 1985, they were a mere 7 million. Receipts of corn and soybeans in Chicago declined as well, from 156 to 95 million bushels and from 39 to 23 million bushels, respectively.[6] Receipts of wheat, corn, and soybeans in all primary markets in 1964 were 960 million bushels; in 1985 merely 507 million bushels.

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[4] Irwin documented the emergence of futures trading in the grains from the trading of time contracts in *Evolution of Futures Markets* (1954). Even today, designing contract terms that reflect important commercial flows of a commodity when developing a new futures market is important and is well documented in Sandor's (1973) description of CBOT's development of the plywood market.

[5] The other primary markets are Indianapolis, Kansas City, Milwaukee, Minneapolis, Omaha, Peoria, St. Joseph, St. Louis, Sioux City, and Wichita.

[6] The amounts of the declines are little affected if the terminal date is 1989

Table 2.2—Average Annual Changes in Production and Terminal Market Receipts of Wheat, Corn, and Soybeans, 1964–85

	Wheat	Corn	Soybeans
Annual changes in receipts (million bushels)			
Chicago	−1.2	−2.3	−1.2
Toledo	0.0	3.7	1.0
Chicago and Toledo	−1.5	0.0	−0.3
Total primary markets	−14.6	−7.0	−1.6
Annual changes in relative receipts and production			
Chicago and Toledo receipts as percents of primary market receipts	0.0	1.6	0.0
Production in Illinois, Indiana, and Ohio as percent of national production	−0.2	−0.3	−0.1

Sources: Receipts of wheat, corn, and soybeans in Chicago, Toledo, and the aggregate primary markets are taken from Chicago Board of Trade *Statistical Annuals*. Production data are from U.S. Department of Agriculture, Agricultural Marketing Service, "Crop Production" series. Entries in the table are the slope coefficients from linear regressions of the indicated dependent variable on a trend variable. If the coefficient was not significant at the 10 percent level or better, a 0.0 appears in the table.

Table 2.2 shows estimates of the average annual declines in receipts from 1964 to 1985 in the markets of interest. For each market, the annual receipts were regressed on a simple linear trend. The coefficient of the trend variable is thus the average annual change in receipts and is reported in Table 2.2. If the trend was not statistically significant, a change of 0.0 is reported in the table. As these results show, wheat and soybean receipts in Chicago declined an average of 1.2 million bushels per year, and those for corn an average of 2.3 million per year. The estimates also show that the decreases in Chicago were somewhat offset by increases in receipts for soybeans and corn in Toledo. When Toledo and Chicago are measured together, however, total receipts declined significantly in soybeans as well as wheat, with no net change in corn.

instead of 1985. Annual receipts in Chicago of all three commodities declined further from the 1985 levels reported above; 1989 is not used as a terminal date for these analyses because annual data on any of the other individual primary markets are not available from the CBOT after 1985.

The diminishing role of Chicago and Toledo as principal markets for these commodities presents a general pattern shared by all the primary markets the CBOT records. Thus, the position of Toledo and Chicago combined has not changed very much when measured relative to all primary markets, as evidenced by the figures representing annual-percentage changes in the next-to-last row in Table 2.2. The relative position of the two cities, however, belies the overall declines evidenced in all markets and, hence, the continued erosion of underlying commercial grain flows to support futures contracts. Another important implication of the annual declines in receipts at the primary markets is that none of them individually is likely to be a alternative delivery location with significantly increasing commercial flows. In other words, while the addition of another primary market as an alternative location for contract deliveries might add short-run support to the market, it is unlikely to solve the longer-run problems caused by declining cash markets everywhere.

Another indication of the waning importance of Chicago and Toledo as commercial markets is the evident decline in the relative production of these commodities in the surrounding states. Production of all three commodities in the states principally tributary to the Chicago and Toledo markets—that is, Illinois, Indiana, and Ohio—has diminished relative to nationwide production.[7] In wheat, there has also been an absolute fall in production in the three states from 165 million bushels in 1964 to 133 million in 1985. And, although production of corn and soybeans has risen absolutely since the 1960s, the results in Table 2.2 show that these increases were less than those experienced elsewhere.

Moreover, the production data do not tell the full story. Estimates of the direction of export movements of these commodities from Illinois, Indiana, and Ohio show a marked decline in the use of the Great Lakes ports. Data in Table 2.3 summarize some results from the Hill et al. studies on just this question. They show that in 1977 some 26 percent of the 106 million bushels of wheat exports originating in Illinois, Indiana, and Ohio went through the Great Lakes ports. Although in 1985 the percentage was little changed, the level of total exports from the three states had shrunk by more than one-half, with a consequent decline in export origination of wheat from the Great Lakes.[8] The losses for both corn and soybeans have been even greater, a combination of falling exports of corn and soybeans

[7] Chicago also attracts some grains and soybeans from Iowa and Wisconsin, depending on price relations. The purpose here, however, is simply to provide some sense of their overall position, and so focus on just the three principal states seemed most appropriate.

[8] Data in Table 2.3 do not include exports that may have originated in Chicago but were moved to the Gulf for export, which was the most common direction of export movement of grain and soybeans from Illinois in both 1977 and 1985.

Table 2.3—Total Shipments for Export from Illinois, Indiana, and Ohio and the Percent Shipped Through the Great Lakes Ports, 1977 and 1985

	1977	1985
Wheat		
Total exports (million bushels)	106	50
Percent through Great Lakes	26	28
Corn		
Total exports (million bushels)	108	51
Percent through Great Lakes	14	6
Soybeans		
Total exports (million bushels)	51	25
Percent through Great Lakes	22	12

Source: Based on data in Lowell Hill et al., *Wheat Movements in the United States*, University of Illinois Bulletins 767 and 795, 1981 and 1990; *Corn Movements in the United States*, University of Illinois Bulletins 768 and 793, 1981 and 1990; *Soybean Movements in the United States*, University of Illinois Bulletins 766 and 794, 1981 and 1990.

from the three states with sharp reductions in the percentage that passes through the Great Lakes ports.

Taken together, the evidence clearly underscores the increasing scarcity of grains available for delivery as Toledo and even more so Chicago have become less important as commercial grain centers, although the extent of decline varies by commodity, location, and measure. In addition to the flows of grains into and out of Chicago and Toledo, concerns have been expressed about the seasonal representativeness of stocks there relative to other commercial centers. Accordingly, the next section examines the relation between deliverable stocks and broader, aggregate series.

REPRESENTATIVENESS OF THE DELIVERABLE STOCKS

An examination of the representativeness of wheat, corn, and soybean deliverable stocks, both historically and over 1987/88 and 1988/89 in particular, provides yet another view of the adequacy of the current delivery arrangements.[9] If stocks in Chicago and Toledo vary in proportion to those held elsewhere, the incentives for delivery on futures contracts are consistent with conditions at many other locations. Such proportional movement

[9] Recall deliverable stocks are the total free stocks in eligible warehouse space in approved delivery locations, as reported by the CFTC (since 1973) and by the CBOT earlier. They exclude CCC stocks but include stocks in the FOR.

includes the seasonal component, for Chicago and Toledo should not be out of phase with other commercial locations.

Consequently, deliverable stocks need to be compared to more aggregate measures of supplies, the so-called visible supply and total national free stocks of grains. The visible supply is a USDA series, currently reporting stocks in some 53 commercial locations nationwide. It includes both government-owned and under-loan stocks, which are held in the surveyed commercial facilities and yet are unresponsive to commercial price signals. Because of this problem with the definition of visible supply, a second measure of stocks, national free stocks, is also tested. The limitation with the national stocks measure is its availability only on a quarterly basis.

Figure 2.1 shows the average seasonal patterns of wheat, corn, and soybean stocks in the deliverable locations as they have varied by subperiod. The effects of adding Toledo as a deliverable location for each commodity are clear in the panels of Figure 2.1, namely with the obvious shift upward in the average levels of total deliverable stocks over the entire season. Deliverable wheat stocks increased the most, on average, in the initial period after Toledo was added, that is, 1973/74–1978/79. Also evident in the top panel of Figure 2.1 is the marked decline in deliverable stocks for wheat in the 1980s, a direct reflection of the continuing declines in receipts noted earlier. In the middle panel of Figure 2.1, for corn, the seasonal index for stocks in the middle period (1973/74–1978/79) is omitted because the transition to Toledo delivery occurred mid-period. Although not as large an effect, the addition of Toledo added to corn stocks throughout the season. Similarly, as shown in the bottom panel, the addition of Toledo added to soybean deliverable stocks. The increase in the average stocks of soybeans was also accompanied by a pronounced shift in the pattern of accumulation, with levels of deliverable stocks peaking much sooner in the cropyear after the addition of Toledo.[10]

Of particular interest is the relation of these seasonal patterns to those of stocks representing broader commercial movements of the commodities. Visible supplies and national stocks are the two most widely used such measures. The results in Table 2.4 show the degree to which deliverable stocks relate to these series. Each entry is the degree of squared correlation (R^2) between deliverable stocks and the indicated series along with a set of seasonal shifters in order to account for regular differences in the individual seasonal pattern in each. Table 2.4 indicates substantial variation in the degree of relation among these series. The relations involving wheat were most variable over the last 25 years, with corn second, and soybeans third.

[10] Separate seasonal indices were calculated for the 1964/65–1972/73 and 1973/74–1978/79 subperiods, both periods entirely before Toledo was added as a delivery location for soybeans. The separate indices were virtually identical and statistical tests rejected finding significant differences in the seasonals.

Figure 2.1 Average Seasonal Accumulations of Deliverable Stocks of Wheat, Corn, and Soybeans

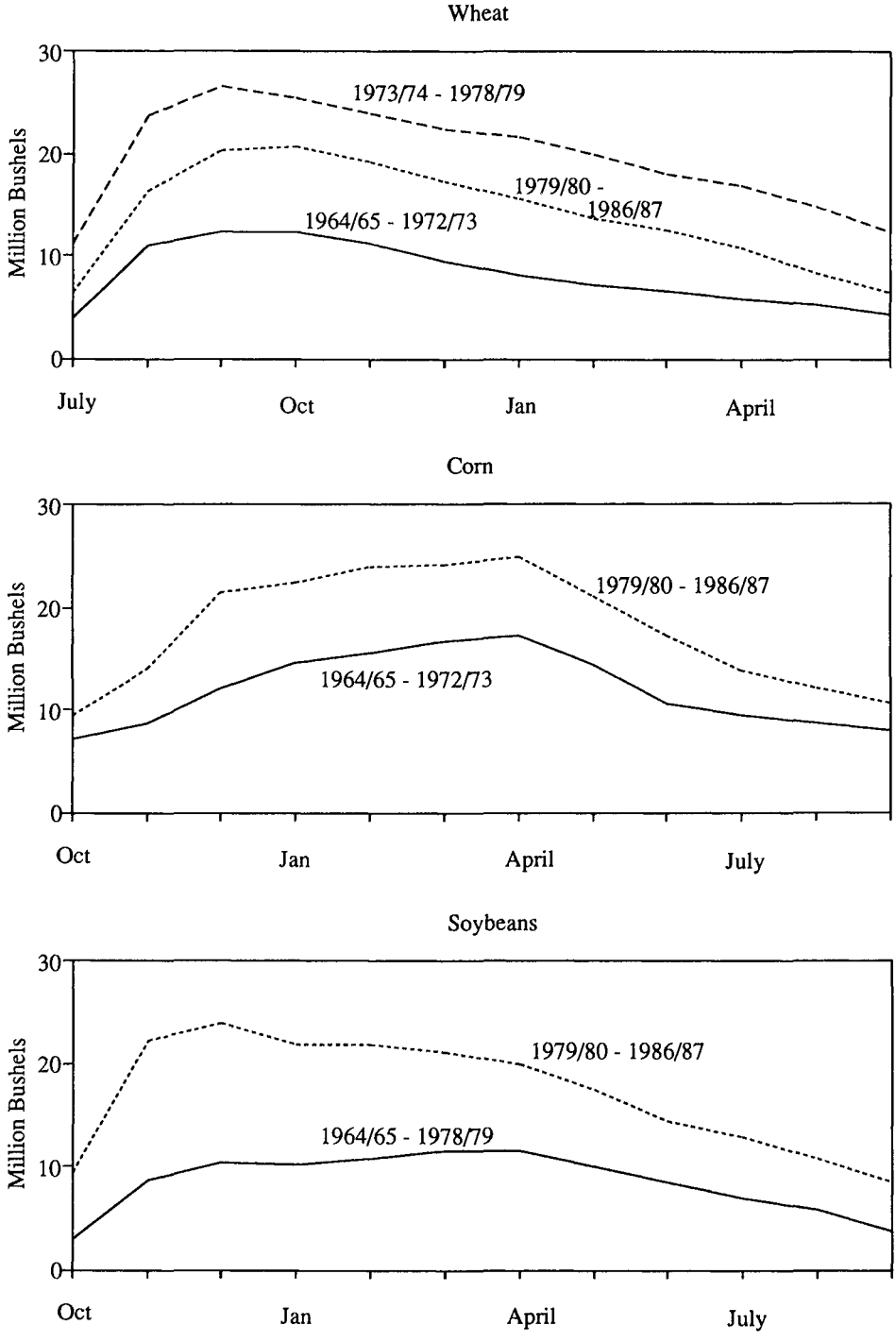

Table 2.4—The Degree of Relation Between Deliverable Stocks and Aggregate Commercial Stocks, Wheat, Corn, and Soybeans, 1964/65–1986/87

Explanatory variable	1964/66–1972/73	1973/74–1978/79	1979/80–1986/87
Wheat			
Visible supply	0.37	0.80	0.13
National free stocks	0.46	0.21	0.65
Corn			
Visible supply	0.57	0.61	0.52
National free stocks	0.46	0.81	0.29
Soybeans			
Visible supply	0.62	0.59	0.64

Sources: Deliverable free stocks are from the Chicago Board of Trade *Statistical Annuals* and Commodity Futures Trading Commission "Stocks of Grain" weekly reports, while visible supply and national stocks are U.S. Department of Agriculture series. Entries in the table are squared correlation coefficients (R^2) from linear regressions of the indicated aggregate stock measure on the deliverable supply. All regressions also include a set of monthly or quarterly shifter variables in order to take account of any differences in the seasonality of the two series. Visible supply relations are monthly and national stocks ones are quarterly.

The pronounced variability in relations involving wheat and corn stocks is in part a reflection of the changing influence of the various government programs. For example, so-called free deliverable stocks exclude stocks in the deliverable locations that are owned by the Commodity Credit Corporation (CCC) but include those in the Farmer-Owned Reserve (FOR). Visible supplies have included all forms of program stocks over the years as well as truly free commercial stocks. Not surprisingly then, the relation between deliverable wheat stocks and visible supplies was (0.80) in the 1970s—a period characterized by comparatively little government intervention in the market and, hence, less program-induced difference in the relation between the two series—whereas in the 1960s, the squared correlation was only 37 percent and, in the 1980s it was only 13 percent.[11] Both periods 1964/65–1972/73 and 1979/80–1988/89 were characterized by extensive government

[11] Tests of the overall relation indicate the observed differences between periods are generally statistically significant.

wheat program activity. Although not as pronounced, the degree of relation between deliverable corn stocks and visible corn supplies was also influenced by government programs.

The deliverable stocks have also been compared to the quarterly stocks series comprising total national stocks less those owned by the CCC and less those being held under the provisions of the loan programs. FOR stocks were left in this measure of total stocks because they are also included in reported deliverable stocks. In wheat, these relations are just the opposite of those with visible supplies, with the poorest relation evident in the 1970s and substantially stronger ones in the earlier and later years. The results underscore the difficulties in assessing commercial representativeness when government programs have had differential effects on the available measures.

Taken together, these comparisons about the representativeness of corn and wheat stocks unfortunately offer few conclusions. The relations of deliverable stocks to broader measures of commercial stocks have clearly changed over the years examined here. Much of this variation is apparently due to the differential effects of government programs on the measures themselves, not necessarily to changes in the representativeness of deliverable stocks per se. But perhaps this too is an important message—changes in government programs have had pervasive effects on otherwise fundamental market relations. These changes, often comparatively dramatic, as with the announcement of new program provisions, serve to mask the nature of other changes that are occurring more gradually. With those caveats, it is not surprising that subsequent analyses revealed no statistically significant changes from the previous period in the wheat or corn stocks relations during the 1987/88 and 1988/89 cropyears.

For soybeans, only the relation between deliverable stocks and visible supplies could be profitably analyzed. Quarterly estimates of national stocks were not made until the 1970s and, more important, government programs in the soybean market have been much less extensive. Indeed, the USDA does not publish a separate free stocks series for soybeans. The results in Table 2.4 suggest there has been little change in the relation between deliverable and visible stocks of soybeans. On the contrary, the relations are statistically significantly different among the periods. The primary difference in the relations has been the degree to which visible supply accounts for the overall degree of fit. In the 1980s it has been most closely related. Moreover, comparison of the relations in 1987/88 and 1988/89 with those existing in the 1980s showed another significant change, with the overall degree of correspondence increasing to some 72 percent. During this period, however, the portion of that explanatory power attributable to visible supplies declined. That is, the simple (squared) correlation between visible supply and deliverable stocks (excluding the shifter variables for dif-

ferential monthly seasonality) declined from 62 percent in the 1980s to 47 percent in just the last two cropyears, even as differences in the two series' seasonals became more important. Again, variability is the rule--stocks in the deliverable location(s) appear to be quite variably related to more aggregate measures of stocks.

CONCLUSIONS

For many years, the amount of deliveries clearly has been important on all physical delivery markets, including those of the CBOT. Although highly variable, delivery amounts seem to bear some relation to open interest, so that, as the levels of trading of a specific commodity increase so also do deliveries. The CBOT deliveries do stand out, however, in relation to the deliverable stocks where they are multiples rather than fractions of available stocks. Redeliveries make this possible, of course. But redelivery was also possible historically and is possible on both the Kansas City wheat market and the Comex copper market and, compared to both history and the two other markets, the current CBOT markets are exceptional. The evidence also shows that the addition of Toledo has not fundamentally altered the underlying relations, and deliveries are already at relative levels beyond those that existed when the CBOT began contract reversions in 1973 to add Toledo to each of the contracts.

Chicago and, to a lesser extent, Toledo are declining as cash markets. Total receipts have been trending downward in Chicago for the last 25 years. Although the addition of Toledo as a second delivery source has slowed the overall total decline, there is little prospect for significant increases in receipts or stocks to match the growth in levels of futures trading. Production in tributary areas has been falling and the Great Lakes have been declining as a source of export originations. Without some significant changes in their terms, the current CBOT wheat, corn, and soybean contracts appear to be increasingly jeopardized by comparatively small deliverable stocks. These deliverable stocks do seem to move reasonably closely, both across seasons and across years, with broader measure of stocks. The dominant influence on the closeness of these relationships is, however, government programs, which have been both important and highly variable in their effects in recent years.