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**Marketing Corn: A Survey of Seasonal Price
and Price Variation Characteristics**

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COLLEGE OF AGRICULTURAL, FOOD, AND ENVIRONMENTAL SCIENCES

UNIVERSITY OF MINNESOTA

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Marketing Corn: A Survey of Seasonal Price and Price Variation Characteristics

Introduction

The corn market has seasonal structures. The manager/decision maker that understands these structures can potentially translate this knowledge into improved price results and at the same time reduce the marketing component of the risk associated with growing and marketing corn. The focus of this study is to review the seasonal structures of the corn market for the period 1988 through 1999, and to suggest in broad terms the main management implications for those that seek to improve their marketing performance.

The Time Frame: Crop Years 1988 through 1999

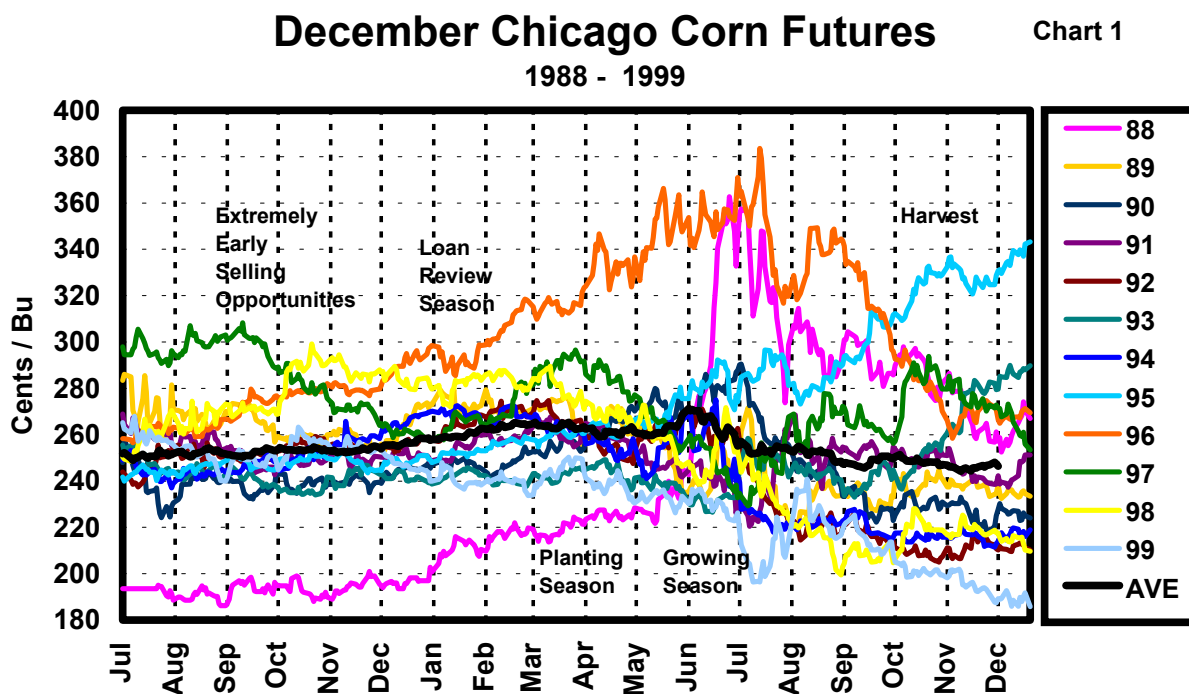
The time frame chosen is the market price history associated with the twelve corn production years 1988 through 1999 inclusive. Years prior to 1988 have strange characteristics that will likely convey false notions of the true nature of today's markets. The years 1983 through 1987 were almost totally disconnected from the fundamental principles of supply and demand. The government programs of the time dominated. The corn market prices were quite artificial, especially from the side-effects of the PIK (payment in kind) certificates that were prominent in 1986 and 1987. After the drought of 1988, the overwhelming stocks of corn in the background were sharply reduced and the market began to be the market again.

Defining A Corn Price Level Measuring Rod

Various measuring rods for the price of corn are available. The two main categories are, one, the Chicago corn futures markets and, two, the various local corn markets that link to the corn-belt. Local corn markets tend to be higher or lower than the Chicago corn futures markets by some fairly stable amount called the local basis adjustment (a local basis adjustment is equal to the local corn price minus the Chicago corn futures price) at a point in time. So, once a basis adjustment is made much of the seasonal price level and price variation traits of the Chicago futures carry through to become the local market price level and price variation traits as well.

The Chicago December Corn Futures History

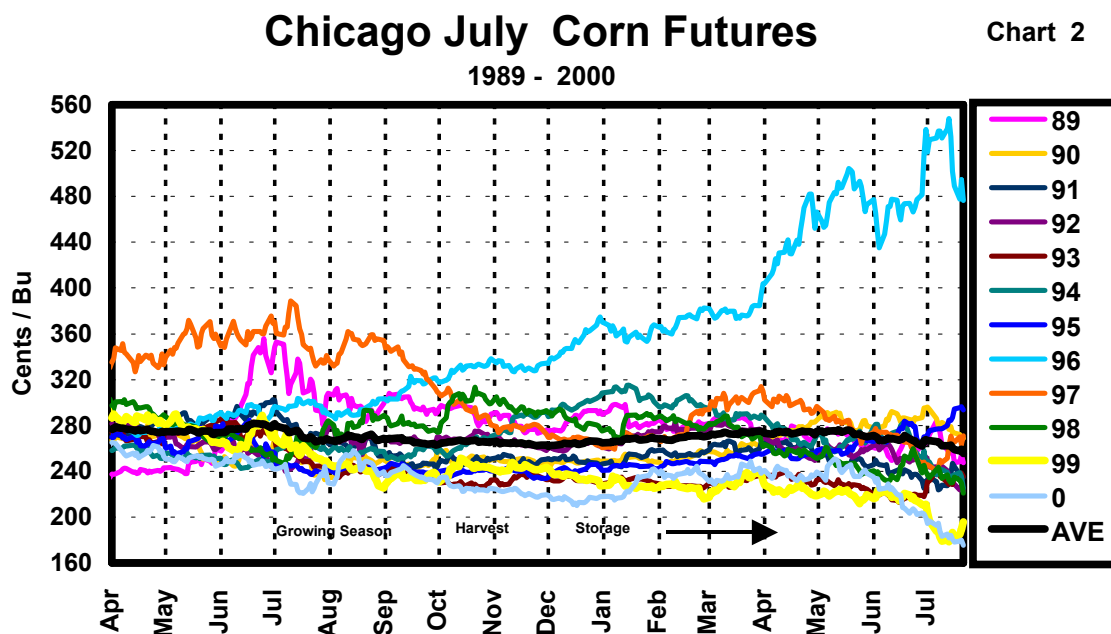
December corn futures sometimes trade years in advance, but not always. In the period 1988 to 1999 they were always available from July 1, one year ahead of planting, until the December following harvest. Keeping in mind that in some years it may have been possible to sell futures even earlier, our December futures measuring rod will be for the 18-month period that precedes the expiration of any December futures contract (See Chart 1).



The Chicago July Corn Futures History

Since delayed marketing strategies need a price reference beyond the expiration of the December corn futures contract (a few months after harvest), the July futures contract is available. For the crop production years 1988 through 1999, data for the April 1 through expiration of the July, (July 1989 corn futures are associated with the crop grown in 1988, etc.), 1989 through 2000 futures contracts is presented in Chart 2. There is a period of overlap from April 1 until the expiration of the December futures contract, and then price information from the July futures contract alone carries forward for another seven months. Since at any point in time during the period of overlap these two contracts are typically not the same price, they need to be reconciled for our purpose of measuring objectively the price of corn. We can measure the price characteristics in terms of December corn futures or we can measure it in terms of July corn futures. It is important

to have a single measuring rod operating as we think about marketing management decisions over the total time range of possibilities.

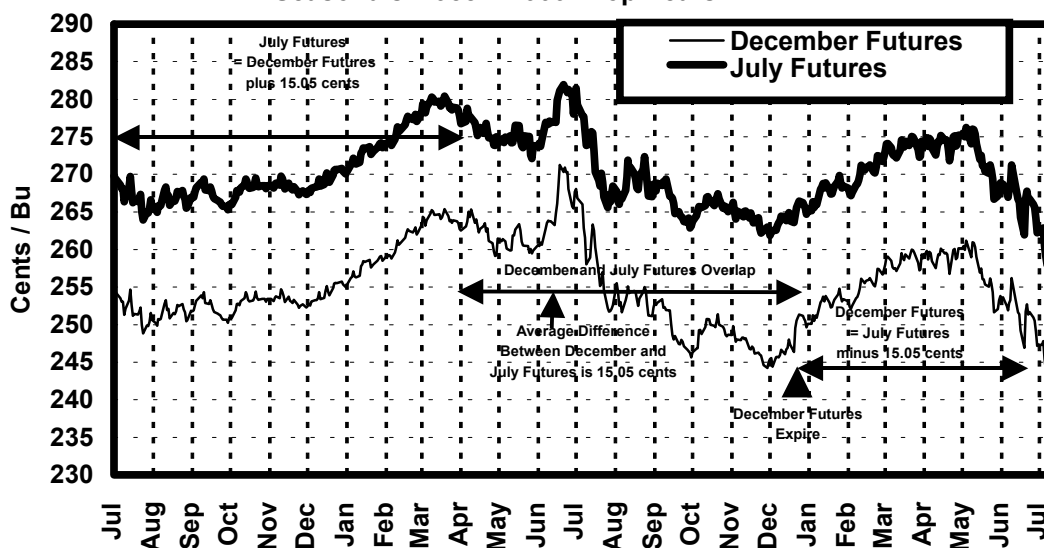


Toward a Single Measuring Rod-December or July Futures?

In order to stretch the December corn futures measuring rod forward past its expiration until the next July, and/or attempting to stretch the July corn futures measuring rod back in time prior to its official April 1 record, we have resorted to looking closely at how they are related during the period of time that they do overlap and then have simulated what would have been their price in the extended periods if this relationship had in fact held. For purposes of this adjustment, we have calculated the average overlap price difference between December and July futures for the crop years 1988 through 1999. It is 15.05 cents; that is, on the average over these twelve years July futures have been higher than December futures by 15.05 cents during the period of overlap. Chart 3 shows the average December and July futures (as extended by this simulation) for the period beginning July 1 about a year in advance of growing the crop to the expiration of the July futures contract, about a year after growing the crop. Either of these two measuring rods will now be adequate for our purposes, but we will choose the December futures contract-measuring rod.

Chicago December & July Corn Futures Chart 3

Seasonals 1988 - 1999 Crop Years



Local Corn Markets

Local markets in southern Minnesota tend to be lower than the December or July futures prices. They also have a strong tendency to gain relative to the Chicago futures environment from fall to spring. For most southern Minnesota markets, bids for spring delivery tend to be about 25 cents per bushel higher than bids for fall delivery as the market normally appreciates about this much to generate a return to the storage of corn through the winter. Chart 4 illustrates this for Rice County, Minnesota for the years 1988 through 1998 using the July Chicago futures as a benchmark.

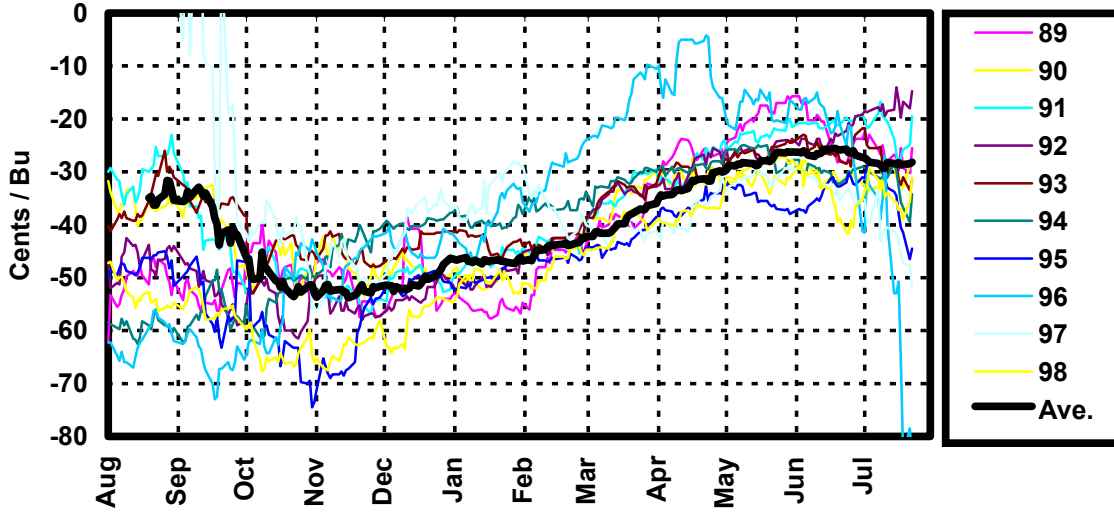
Notice in Chart 4 that Rice County corn bids for fall delivery averaged approximately about 52 cents under the July Chicago futures, but by spring they had appreciated to about 27 cents under the July Chicago futures. Where July Chicago corn futures tend to be higher than December Chicago corn futures by about 15 cents per bushel, this translates into southern Minnesota fall bids of about 37 cents per bushel less and spring bids 12 cents per bushel less than the December Chicago futures.

Therefore, it is appropriate for the “fall sales” line in Chart 5 to be calculated by subtracting about 37 cents from the December futures or about 52 cents from the July futures to generate this approximation to the local southern Minnesota cash markets. The “spring sales” line in Chart 5 is calculated by subtracting about 27 cents from the December futures or about 52 cents from the July futures contracts. If your local fall bids tend to be more or less than 37 cents under December corn futures you should adjust accordingly to evaluate these results in the context of your local markets.

Southern Minnesota Corn Prices

Bids for Current Delivery minus July Corn Futures
Rice County: 1988-1998

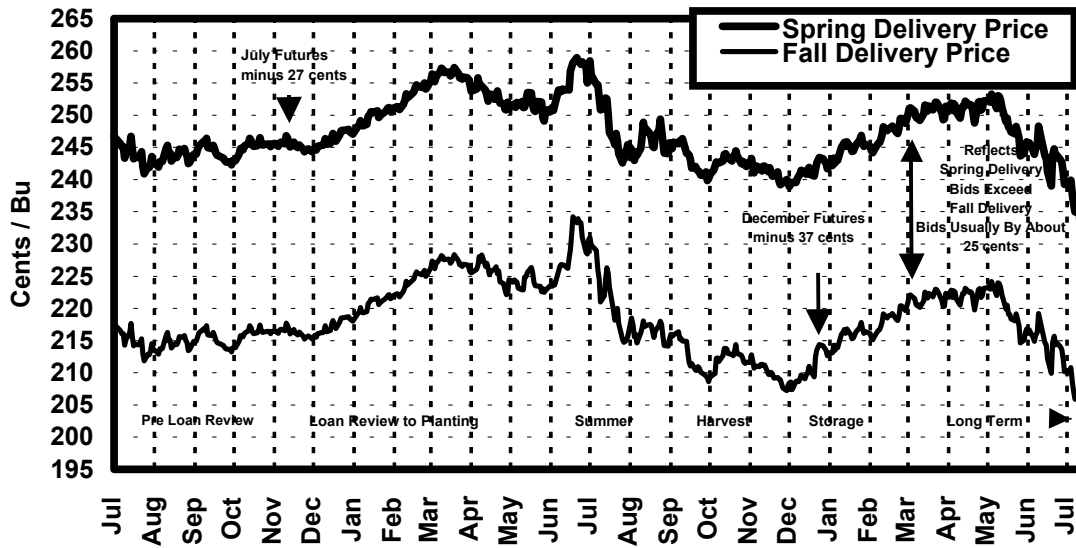
Chart 4



Southern Minnesota Corn Market

Seasonals 1988 - 1999 Crop Years

Chart 5



Marketing Management Time Frames

Corn/soybean farming operations encounter considerable risk as an inherent part of the business. Let's try to segregate this risk into two components: production risk and marketing risk. Production risk is the risk associated with optimizing the possibilities for good yields, some of it within the realm of good management decision-making and some of it not. Unfavorable weather and crop infestation by insects and disease cannot always be avoided by a management decision. Marketing risk is the risk associated with the variation in pricing possibilities that present themselves each season. Here we are focused on marketing risk and we define five seasons that are available for the marketing decision maker.

1. Pre Loan Review: July to December
2. Loan Review to Planting: January through May
3. Summer: June to September
4. Harvest: October - November
5. Storage: December through the following September
6. Long term holding: Beyond the next harvest.

Selling Early (Pre-Loan Review)

The seasonal history of this period suggests that this is probably not a good idea. Better prices are usually possible in the spring.

Selling Early (Loan Review to Planting)

This is an attractive period for selling! Pricing opportunities are better than the previous fall by about 10 cents per bushel. The rewards for holding into the summer are not there. The possibilities to do just as well by holding into the storage season are questionable.

Summer Selling (June to September)

This is historically a very poor time to be selling. The possibility to recover back to missed opportunities in the spring is real, but it is a struggle to get all the way back.

Harvest (October to November)

This is probably not a favorable time to be making sales. Delivery of previous sales made for fall delivery are fine, but here the question is when to set the price, regardless of when it is scheduled for delivery. The fall period typically does not offer attractive prices relative to what was offered in the previous spring or is likely to be offered the following spring.

Storage (December to September)

Prices often recover to levels close to those that could have been obtained the previous spring, but tend to fall short by a few cents per bushel. In the meantime, working capital is tied up, and all the risks of maintaining the condition and quality of the stored crop are present. Sales made the previous spring are likely to offer better results.

Long Term Holding (Multiple Years)

This is not a good idea for two reasons.

Reason #1: It is an especially bad idea if it involves storing the actual corn. The basis (local markets relative to the Chicago futures markets) appreciation from fall to spring that was illustrated in Chart 4 is given back from spring through the summer as the old crop encounters competition from new crop supplies. Chart 6 illustrates this phenomenon for Rice County, Minnesota for the period 1988 to 1998.

One way to sidestep the negative impact outlined here in reason #1 is to sell the corn after the period of basis appreciation illustrated in Chart 4, probably in the spring, but certainly by July 1, and replace it with a futures contract. The summer decline in the value of the stored crop relative to the futures prices illustrated in Chart 6 is then avoided.

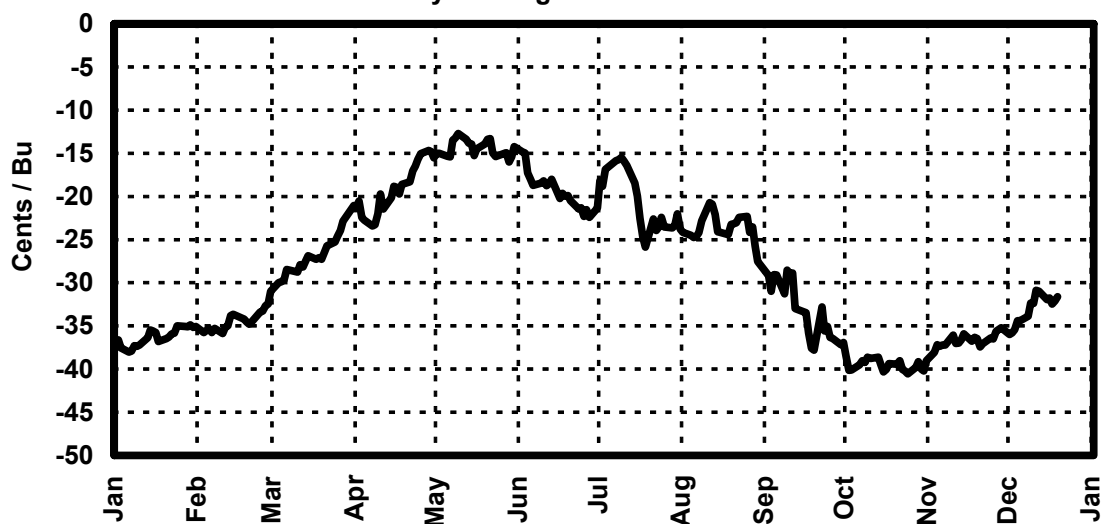
Corn ownership is retained instead as a futures position, which, if in fact prices do go up, will reward the holder. This kind of ownership can continue indefinitely into the future, because when the replacement futures contract is about to expire, it is possible to sell it and replace it with fresh ownership of an even more deferred contract that then has become available.

Southern Minnesota Corn Prices

Bids for Current Delivery minus December Futures

Chart 6

Rice County: Average for 1988-1998



Reason #2: Long term holding of futures contracts, where contracts are sold just before expiration and then replaced with subsequent futures contracts that have become available with more deferred expiration dates, just don't usually work out very well. This is visible in Table 1 which for the eleven years 1988 through 1998 shows the price, as of the first trading day of December, of the December futures contract that is about to expire, in comparison to the next year's (12 months away) replacement December futures contract. Over these particular years the replacement contract on the average cost four and one-quarter cents more. Years where the replacement cost was 10 to 30 cents higher were common. The sought after benefits from higher corn prices in the future are not captured when the replacement contract consistently costs more than the contract that is being replaced.

Table 1

Crop Year	Expiring December Corn Futures	Next Years December Corn Futures	Cost to Replace
88	257.25	256.00	-1.25
89	234.50	239.00	4.50
90	230.25	250.25	20.00
91	242.25	255.25	13.00
92	210.75	243.00	32.25
93	279.75	260.50	-19.25
94	214.00	244.50	30.50
95	331.25	249.75	-81.50
96	266.50	264.00	-2.50
97	272.75	288.00	15.25
98	217.75	253.25	35.50
Average			4.23

Market Variability

There is more to grain marketing than just getting a good price. A farmer that is able to consistently avoid low prices will gain “reputation” benefits. Consistently achieving results in the midrange of the possibilities offers some special advantages to the grain growing and marketing enterprise. Advantages include:

- A better standing with creditors that translates into better access to working capital to run and possibly expand the business.
- A strong reputation in the local farming community as a good manager, respected for being able to avoid trouble and move ahead when others are stressed.
- An improved self-image and a more comfortable day-to-day working experience as the anxiety of the experience of the extremes of the market are avoided.

But the markets are very volatile. What can a good manager do? There are a few possibilities with some associated with management decisions focused on the market variability with-in the marketing year, and others associated with management decisions across marketing years.

Measuring Market Variability With-in The Marketing Year.

Just as we were able to construct the seasonal price level characteristics by blending the prices for the years 1988 through 1999 (See Charts 1 to 4) it is also possible to construct and illustrate the seasonal characteristics of market variability. Market variability becomes visible by looking not at price level, but at price change. A price level focus is as of a point in time. A price change focus is for an interval of time. It could be the price change in 1 minute, one hour, one day, one week, one month, etc. Consider a focus on a time interval of about one month. Although it varies by a day or so, there are approximately 22 business days in a typical calendar month.

Table 2 shows how the one calendar month market variability is calculated for the very volatile July period for the years 1988 through 1999. Specifically, it calculates the difference between the December futures closing price, as of the close on the first trading day of July, versus its closing price twenty-two trading days later (early August).

Table 2

Seasonal Price Variability: Calculation Example

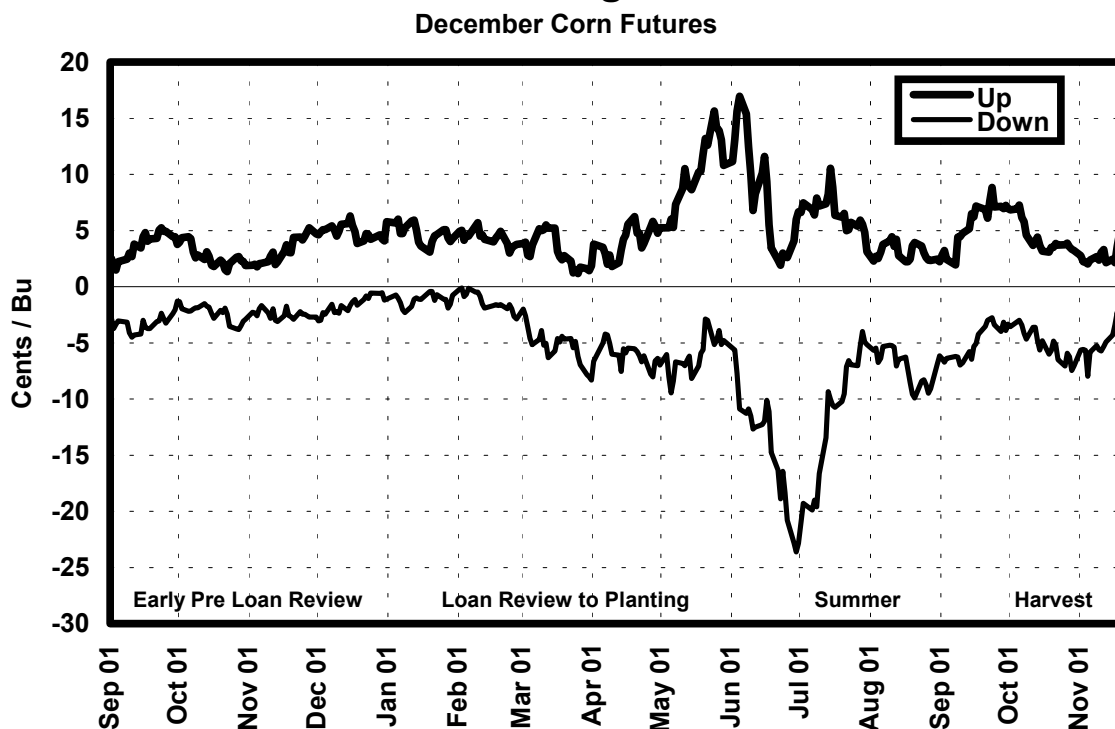
Crop Year	Early July	Early August	Change	Up	Down
1988	355.50	306.00	-49.50	0.00	-49.50
1989	261.50	219.50	-42.00	0.00	-42.00
1990	290.25	246.75	-43.50	0.00	-43.50
1991	231.75	268.25	36.50	36.50	0.00
1992	262.75	222.75	-40.00	0.00	-40.00
1993	246.50	247.75	1.25	1.25	0.00
1994	239.50	219.75	-19.75	0.00	-19.75
1995	285.00	278.50	-6.50	0.00	-6.50
1996	371.00	328.75	-42.25	0.00	-42.25
1997	232.75	269.00	36.25	36.25	0.00
1998	252.50	220.50	-32.00	0.00	-32.00
1999	218.25	230.75	12.50	12.50	0.00
Average			-15.75	7.21	-22.96

In this example calculation the roughly one month price change is segregated by whether the change was positive (up) or negative (down).

Chart 7 (based on December futures) and Chart 8 (based on July futures) illustrate the seasonal capacities for prices to move either higher or lower. Clearly most of the variation in market prices comes in the late spring/summer period when the crops are being planted and grown. Selling before this volatile period is a potentially effective way of avoiding it. This fact along with the observation that the best seasonal price levels also tend to be offered ahead of the planting/growing season strongly suggest that over a period of years early selling will likely outperform holding. The benefits to early selling come in terms of the long-term average price level and the tendency for the results to avoid the price variation with-in the marketing period. In the following section the potential for this to also translate into a capture of the long-term year-to-year “reputation” benefits are evaluated.

Seasonal Price Change Characteristics

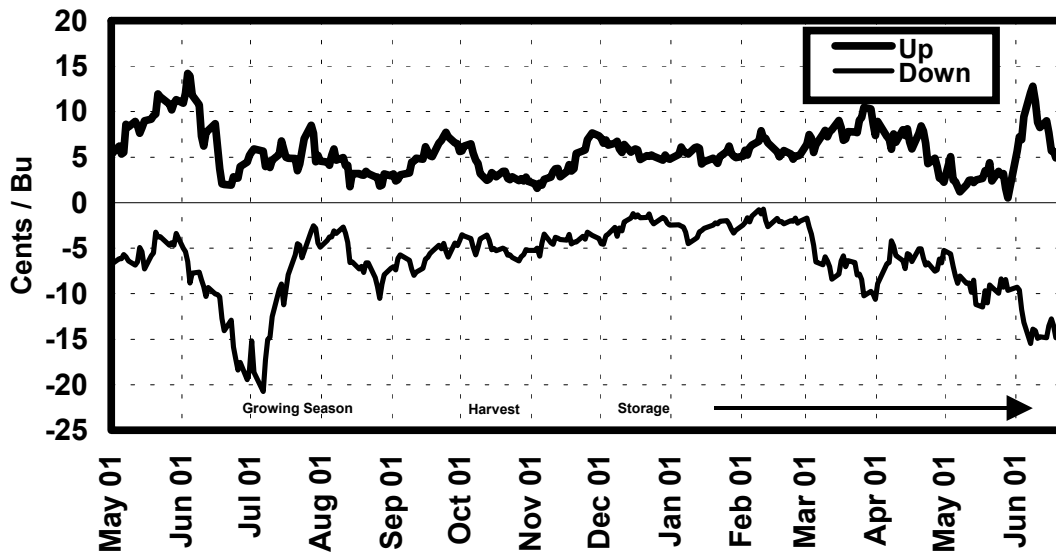
Chart 7



Seasonal Price Change Characteristics

July Corn Futures

Chart 8



Focus on Measuring Variation in Marketing Performance Across Marketing Years

Previously several basic marketing decision making time-frames were defined:

1. Pre-Loan Review: July to December
2. Loan Review to Planting: January through May
3. Summer: June to September
4. Harvest: October - November
5. Storage: December to September

and preliminary observations were made with a price level focus. The seasonality of monthly level price variation reinforced the preliminary results that were based only on price level objectives. Since the better price levels tend to be present during the loan review through planting period and this period also has low month to month price variation, it would seem reasonable to expect that the year-to-year variation in marketing performance might turn out well. Table 3 presents for inspection a survey of the long-term year-to-year price level and year-to-year price variation results. The results remain favorable to spring focused market timing.

Specifically, Table 3 posts for each crop year (1988 through 1999) the historical prices as of the first trading day of the month for each of twelve months: starting July 1

approximately 1 year ahead of growing the crop and ending with June 1 of the year after harvesting the crop. December corn futures prices are used during the first 18 months until December futures expire. Then for the January through June period following harvest the July futures contract is used. A 15 cent per bushel adjustment (July futures equals December futures plus 15 cents) is used to standardize the price level measuring rod as was discussed previously in the section entitled **“Toward a Single Measuring Rod-December or July Futures?”**.

Table 3

Crop Growing Year	Early Dec Fut Jul 1	Early Dec Fut Aug 1	Early Dec Fut Sep 1	Early Dec Fut Oct 1	Early Dec Fut Nov 1	Early Dec Fut Dec 1	Loan Rev. Dec Fut Jan 1	Loan Rev. Dec Fut Feb 1	Loan Rev. Dec Fut Mar 1	Loan Rev. Dec Fut Apr 1	Plant Dec Fut May 1	Grow Dec Fut Jun 1
88	191.50	191.50	186.25	196.25	192.00	199.00	202.75	210.50	219.25	223.50	228.50	242.75
89	283.50	281.50	269.25	259.25	260.00	256.00	273.00	276.75	271.75	255.75	265.50	237.00
90	248.00	229.00	241.70	244.75	238.50	239.00	245.50	243.25	252.50	258.25	270.75	266.75
91	268.00	255.25	254.50	242.75	249.50	250.25	248.00	260.75	266.25	264.50	250.50	248.00
92	246.00	254.50	249.75	254.00	256.00	255.25	257.75	269.25	274.75	258.25	252.75	266.50
93	259.25	243.50	243.00	237.50	241.75	243.00	238.75	242.25	243.25	243.00	241.75	230.50
94	249.00	239.00	244.75	248.25	252.75	260.50	270.25	263.25	268.75	256.75	255.50	268.50
95	241.75	243.50	249.25	248.50	249.75	244.50	248.00	254.00	257.75	264.75	266.50	279.75
96	240.00	241.00	245.25	244.00	251.00	249.75	297.25	298.75	311.75	323.50	336.75	341.75
97	300.00	296.25	303.00	289.00	275.75	264.00	257.75	263.25	288.25	291.75	277.35	258.25
98	249.50	268.75	273.25	268.75	293.25	288.00	279.00	286.00	284.25	271.00	262.25	246.25
99	265.25	253.50	241.50	244.75	253.50	253.25	240.75	239.75	234.00	241.25	232.25	230.25
Dec 88-99	253.48	249.77	250.12	248.15	251.15	250.21	254.90	258.98	264.38	262.69	261.70	259.69
Spread Adj	15	15	15	15	15	15	15	15	15	15	15	15
Jul 88-99	268.48	264.77	265.12	263.15	266.15	265.21	269.90	273.98	279.38	277.69	276.70	274.69
Ave Dev.	18.10	18.52	16.59	13.15	14.06	12.63	17.60	17.52	19.19	17.01	18.15	20.80

Table 3 Continued

Crop Growing Year	Grow Dec Fut Jul 1	Grow Dec Fut Aug 1	Grow Dec Fut Sep 1	Harvest Dec Fut Oct 1	Harvest Dec Fut Nov 1	Store Dec Fut Dec 1	Store Jul Fut Jan 1	Store Jul Fut Feb 1	Store Jul Fut Mar 1	Store Jul Fut Apr 1	Store Jul Fut May 1	Store Jul Fut Jun 1	Pre-Harv 6 Mos. Ave. Jan 1-Jun 1
88	355.50	298.75	301.00	290.00	284.75	257.25	289.75	284.00	281.25	262.00	274.75	260.00	221.21
89	261.75	222.50	234.25	241.50	237.50	234.50	248.00	247.25	257.00	266.75	284.75	275.75	263.29
90	290.25	250.00	234.25	223.00	229.75	230.25	245.25	258.00	262.00	264.75	252.50	249.75	256.17
91	231.75	268.25	254.25	254.75	254.00	242.25	261.25	278.75	282.00	265.25	253.25	258.75	256.33
92	262.75	222.75	220.00	213.75	211.25	210.75	229.00	229.00	229.50	235.50	233.25	219.50	263.21
93	246.50	246.75	233.75	242.75	260.75	279.75	309.25	296.75	296.75	276.00	271.75	281.00	239.92
94	239.50	221.75	223.25	217.50	215.75	214.00	240.75	244.00	248.25	259.25	258.00	269.25	263.83
95	285.00	282.25	294.25	312.25	336.50	331.25	372.75	365.75	379.25	403.75	466.25	465.25	261.79
96	371.00	328.75	341.50	296.00	263.00	266.50	262.75	266.00	300.75	314.00	296.75	274.00	318.29
97	232.75	269.00	272.25	256.25	285.25	272.75	275.25	288.00	281.75	261.50	251.00	238.75	272.77
98	252.50	220.50	203.00	204.75	216.75	217.75	228.00	226.25	217.25	228.00	220.50	216.25	271.46
99	218.25	226.50	221.00	205.00	198.25	189.25	214.75	237.00	231.25	242.75	244.00	225.25	236.38
Dec 88-99	270.63	254.81	252.73	246.46	249.46	245.52	249.73	253.40	257.25	258.29	260.56	254.46	260.39
Spread Adj	15	15	15	15	15	15	15	15	15	15	15	15	15
Jul 88-99	285.63	269.81	267.73	261.46	264.46	260.52	264.73	268.40	272.25	273.29	275.56	269.46	275.39
Ave Dev.	36.54	28.82	33.27	29.49	31.25	29.98	31.35	28.55	31.38	28.98	36.84	36.36	15.32

The four summary lines of Table 3 convey the overall results:

Dec 88-89: December 1988 to December 1999 Corn futures: The average December futures price that would have been realized if a contract had been sold on the first trading day of the month during each of the twelve crop year marketing time-frames.

Spread Adj: The Spread Adjustment: This is the adjustment described in the paragraph entitled “**Toward a Single Measuring Rod-December or July Futures?**”.

Jul 88-89: July 1989 to July 2000 Corn Futures: The average July futures price that would have been realized if a contract had been sold on the first trading day of the month during each of the twelve crop year marketing time-frames.

Ave Dev. The Average Deviation: The following example shows how the calculations were made to derive a value for the Average Deviation of the right most column in the table that bears the heading “Pre-Harv 6-Mos. Ave. Jan 1-Jun 1”

Table 4

Crop Year	6 Month Average Price	12-Year Average Price	Deviation From 12-Yr Ave	Absolute Value of Dev.
1988	221.21	260.39	-39.18	39.18
1989	263.29	260.39	2.90	2.90
1990	256.17	260.39	-4.22	4.22
1991	256.33	260.39	-4.06	4.06
1992	263.21	260.39	2.82	2.82
1993	239.92	260.39	-20.47	20.47
1994	263.83	260.39	3.44	3.44
1995	261.79	260.39	1.40	1.40
1996	318.29	260.39	57.90	57.90
1997	272.77	260.39	12.38	12.38
1998	271.46	260.39	11.07	11.07
1999	236.38	260.39	-24.02	24.02
Average	260.39	260.39	0.00	15.32

The value of the Average Deviation is--the average amount by which the market price achieved in any particular year deviated from the twelve-year average price. In this example the Average Deviation is 15.32. The smaller this number is, the better the “reputation” benefits that have previously been discussed. Year-to-year marketing outcomes are tending to be similar from year to year. The wild extremes of very poor and also very high market price outcomes are being avoided more than with other scenarios that register a higher Average Deviation.

A scan of the year-to-year variability in marketing performance as measured by the Average Deviation show clearly that the “reputation” benefits of marketing prior to growing the crop are present just as expected from earlier analysis. Long term year-to-year variation in marketing performance increases dramatically for market timing scenarios that operate after the crop is planted. Although the data suggest that selling as early as the fall before planting would generate the lowest variation in marketing price outcomes, the price level during this period is modestly lower than the loan-review through planting period. Overall the loan-review through planting period seems to offer the best balance between good prices and long-term “reputation” building objectives.

Since it is not necessary to market the total crop at a single point in time, it is likely that the “reputation” outcome could be improved (with an even lower year-to-year Average Deviation) by marketing over a period of time. The loan review through planting period: January through June looks especially attractive. A special column at the extreme right of Table 3, calculates the necessary figures for an evaluation of this prospect. Although the average price level of \$260.39 based on December futures is slightly less than that suggested by several other months (March 1 and July 1) it clearly offers a lower Average Deviation result (15.32) than selling all at any one point in time in the January through June time frame. The lowest Average Deviation for a time point sale in this period was 17.01 for March 1 ahead of planting.

Management Implications

These results suggest that for conservative approaches to marketing corn superior prices accompanied by low long-term year-to-year variation in marketing outcomes can be achieved by selling aggressively in the loan review through planting seasons.

Aggressive and/or long term holding approaches that do not place a heavy weight on the risk associated with price variation, and perhaps seek to do better than the modest seasonal advantages suggested by the results of this study, will find these results useful as a base line against which to measure. To be considered as worthwhile, aggressive and/or long term holding approaches need to do better than this passive seasonal approach in terms of price level, “reputation risk” or some combination of the two.