

## **Seasonality of Historical Grain and Oilseed Futures Prices: Do Optimal Marketing Strategies Exist?**

*Kevin C. Dhuyvetter and Terry L. Kastens*

*Department of Agricultural Economics, Kansas State University*

*July 2006*

Marketing is a topic that gets considerable attention from about everybody involved in the agricultural industry (e.g., producers, lenders, consultants, media, educators, researchers). It is fairly obvious why there is so much interest in this topic – get a higher price, all else equal, and economic returns increase significantly. Although that statement is true, the difficulty with pulling that off is that research generally suggests that both futures and cash markets are quite efficient. That is, it is extremely difficult to consistently “beat the market” to capture higher prices. This means that identifying market highs or lows in real-time, signaling when to sell in any given year, is very difficult. Likewise, it also suggests that routine systematic marketing strategies will not work in the long run either. Given these statements, it is obvious why many producers get frustrated with marketing. This also indicates why contracts that pay an average price over some longer time period (e.g., six months) have become somewhat more popular with producers in recent times. That is, producers are recognizing that spending a lot of their limited management time on trying to beat the market is likely not the best use of their time. On the other hand, if they produce a crop they do have to market it and thus decisions still have to be made as to when and how to sell the crop.

The objective of this paper is to look at long-run historical seasonal patterns for grain and oilseed futures, both pre- and post-harvest. To the extent that seasonal patterns exist, this provides some hindsight evidence as to what the returns would have been from following a systematic marketing strategy. In addition to the expected results from following some systematic marketing strategy, year-to-year variation in returns are examined to indicate the associated risk. Of course the usual caveat of “past performance is no guarantee of future performance” applies. In other words, keep in mind that the analysis presented in the paper is done completely in hindsight where it is always easy to identify “what would have been optimal.” More to the point, studying the past is only useful if worthwhile features can be extracted that will hold true in the future. Nonetheless, it is hoped that producers may find this information useful as they consider alternative ways to market their crops.

Be reminded that cash grain marketing strategies depend not only on movements in futures prices, but also movements in basis, which is the difference between cash price in some location at some time and the corresponding nearby futures contract price at the same time. Yet, it appears that most marketers focus their efforts in the area of price movement and not basis movement. Hence, this paper considers only futures prices and says nothing at all about basis. So, any reference to “forward pricing” refers strictly to futures trading and not forward contracting cash grain.

### **SEASONAL INDEX**

Typically, a seasonal index is calculated such that the price in any given month is relative to the annual average price (either on a calendar year or for a crop marketing year). However, in this case, seasonal indices are calculated relative to the average price of the harvest or post-harvest futures contracts in some “final” month and are reported on a percentage basis. For a pre-harvest contract we consider the final month to be the harvest month and for a post-harvest contract we consider final to be the month prior to contract expiration. We intentionally do not consider expiration

month on any contract because cash prices typically are based on the next-out contract once the nearby contract gets into the expiration month and because few hedgers will remain hedged into the delivery month anyway.

Defined in this manner, the seasonal index for a given futures contract in some year will be, by definition, equal to 100% in the final month. Consequently, the average across years for that month's index value also will equal 100%. On the other hand, the seasonal index for the months prior to harvest or post-harvest months will depend on how the market was trading in that particular year and thus will vary from year to year. That is, the seasonal index prior to the final month, in any year and when averaged across years, can be greater than, less than, or equal to 100%.

## **PRE-HARVEST SEASONAL PATTERNS**

Pre-harvest hedging of crops entails selling (a short, or contract to make delivery, position) the harvest-time futures contract prior to harvest and then buying it back (a long, or contract to accept delivery, position) at harvest time when the cash commodity could be sold. Ignoring basis, if forward pricing a crop prior to harvest is to generate a higher price than simply waiting until harvest, then the price of the harvest-time contract needs to be higher prior to harvest than it is at harvest (i.e., sell high and buy low). Monthly average futures prices for KCBT wheat, CBT corn, and CBT soybeans are analyzed for crops harvested in the years 1973-2005 (33 years). Seasonal patterns of monthly average prices for harvest-time futures contracts were examined for nine months prior to harvest through the final (harvest) month of the contract, where harvest contracts considered were July (JUL) for wheat (final or harvest month is June), December (DEC) for corn (final or harvest month is October), and November (NOV) for soybeans (final or harvest month is October).

### ***Wheat***

Figure 1 shows the average pre-harvest index for the KCBT wheat JUL futures contract starting in September of the year preceding harvest through harvest in June. As stated previously, the average index in June is 1.0 by definition and each point in the figure represents the average for that month across 33 years. It can be seen that, on average, the JUL futures contract price has been above the price in June for each month prior to harvest, suggesting the opportunity to profit from forward pricing. The maximum seasonal index value occurs in the month of October and has averaged 104.0%. The interpretation of this is that the price of JUL KCBT wheat futures has averaged 4.0% higher in the month of October preceding harvest than at harvest. Over this 33-year period, this percent difference was equivalent to 9.2¢ per bushel. Thus, a wheat producer that would have hedged his wheat crop around the time of planting each year for the last 33 years would have gained about 9¢ per bushel less the cost of hedging (e.g., commission costs, slippage, interest on margin money) compared to simply waiting and pricing the wheat at harvest. It also can be seen that the longer one waited to forward price after October, the lower the gains would have been. For example, by waiting until March the average gain would have been only 1.1% (1.6¢ per bushel).

The risk associated with routinely selling JUL wheat futures in October and then buying back in June is demonstrated in Figure 2. It can be seen that the variation in the annual values making up the average gain of 9.2¢ per bushel is quite large, ranging from a gain of almost \$1.80 per bushel in 1975 to a loss of almost \$1.40 per bushel in 1996. Furthermore, over a third of the time (36.4% of the time) this strategy would have resulted in a loss. Because of the high year-to-year variability, we only have 79% confidence that the true long-term gain to forward selling ahead of harvest is

even greater than 0. That is, though our average historical gain was 9.2¢, we are only marginally confident in using that value as an indicator of future gains.

Note that most scientific research depends on confidence levels of 90% to 95%. For example, suppose a researcher were examining the potential crop yield gains to planting wheat variety X over wheat variety Y. The researcher, from a yield trial, might report an observed 5 bu/acre advantage with variety X but a stated confidence of say 80%. In that case, the researcher would conclude that “there was no statistical difference in the varieties’ yields” and hence the inference is that it should not matter which variety is planted. Yet, farm managers routinely must make decisions on low statistical confidence. So, that is the light in which we present results here. That is, our wheat futures findings above are consistent with the following statement. “Assuming history is a reliable predictor of the future, we would expect a 9¢ per bushel gain to pre-harvest selling in October over selling at harvest, but we do not have particularly high confidence in that expectation.”

### ***Corn***

The average seasonal index for the DEC corn futures contract from January through October is shown in Figure 3. As with wheat, it can be seen that, on average, the DEC futures contract price has been above the price in October for each month prior to harvest. The maximum average seasonal index value is in the month of March (April is similar) and is 106.6%. The interpretation of this is that the price of DEC CBT corn futures have averaged 6.6% higher in March preceding harvest than they did at harvest. Over this 33-year period, the average price difference was 10.0¢ per bushel. Thus, a corn producer that would have hedged his corn crop around the time of planting each year for the last 33 years would have picked up about 10¢ per bushel less the cost of hedging compared to simply waiting and pricing the corn at harvest. Similar to wheat, it also can be seen that the longer one waited after March or April to forward price, the lower the gains would have been.

Figure 4 shows the risk associated with routinely selling DEC corn futures in March and then buying back in October. The variability around the average gain of 10.0¢ per bushel is quite large, ranging from a gain of slightly less than \$1.00 per bushel in 2004 to a loss of approximately \$1.00 per bushel in 1973 and 1974. A third of the time (33.3%) this pre-harvest strategy would have resulted in a loss on the futures position. The confidence we have that the expected return is greater than zero is better for corn (87%) than it was for wheat (79%). In other words, even though the corn returns also are extremely variable, they are not quite as bad for corn as they are for wheat.

### ***Soybeans***

Figure 5 shows the average pre-harvest index for the CBT soybean NOV futures contract starting in January and going through harvest in October. The soybean index follows a different pattern than wheat and corn. Rather than peaking at planting time, the soybean NOV contract price increases throughout the winter and early spring months before peaking in June and then decreases to harvest. Thus, with soybeans there is more of a disadvantage to pricing too early. The maximum average index value in June is 104.2%, indicating the price of NOV CBT soybean futures have averaged 4.2% higher in the month of June preceding harvest than it did at harvest. Over this 33-year period, this percent difference was equivalent to 15.7¢ per bushel. Thus, a soybean producer that would have hedged his soybean crop in early summer each year for the last 33 years would have gained about 16¢ per bushel, less the cost of hedging, compared to waiting and pricing the soybeans at harvest.

The risk associated with routinely selling NOV soybean futures in June and then buying back in October is shown in Figure 6. It can be seen that the variability around the average gain of 15.7¢ per bushel is quite large, ranging from a gain of approximately \$1.90 per bushel in 1977 to a loss of almost \$3.15 per bushel in 1974. The frequency of losses with this routine pre-harvest strategy is the same as with corn and less than the comparable strategy for wheat. That is, losses occurred one third of the time (33.3%), but the losses in some of those years have been quite substantial (exceeded \$1.50 per bushel 4 times). Thus, even though the frequency of losses is the same as with corn, we have less confidence (79%) that the expected return to this forward selling strategy is indeed positive. This confidence level is the same as for wheat even though the frequency of losses is slightly less (33.3% versus 36.4%).

## **POST-HARVEST SEASONAL PATTERNS**

Analyzing post-harvest pricing strategies is potentially more complex than a pre-harvest analysis since stored grain typically is associated with storage and interest costs. In keeping with our focus on price changes rather than basis changes, we examine only the benefits to going long deferred futures following harvest. The motive for this analysis is that marketers routinely suggest selling cash grain at harvest and buying a call option. Though such call options have limited downside risk, they also have a cost. Moreover, making a profit on call options nearly always depends on the underlying markets rising over time (since the time value of options generally deteriorates with time). So, our analysis turns to an examination of post-harvest futures movements, with the expectation that futures prices generally rise after harvest.

Monthly average futures prices from 1973-2006 (34 years) for KCBT wheat and from 1973-2005 (33 years) for CBT corn and soybeans are analyzed to examine post-harvest price patterns. Seasonal patterns of monthly average prices were examined from harvest through the final months of the examined contracts. We considered only March (MAR) wheat, with a final month of February, and July (JUL) corn and soybeans, with a final month of June.

### ***Wheat***

Figure 7 shows the average post-harvest index for the KCBT wheat MAR futures contract starting at harvest (July) and going through February. By definition, the average index in February is 100%. On average, the MAR futures price tends to increase from harvest through October and then declines to December, whereupon prices remain basically flat through February. The average seasonal index in the month of July is 100.9% indicating that prices decreased slightly under one percent, on average, over the 34-year period analyzed. In absolute terms, the average price change was actually an increase, in contrast to the index suggesting a decrease, of 4.5¢ per bushel, indicating that the average price rally from harvest through February is quite small. Given that the seasonal index peaks in October, this suggests that the best strategy in hindsight would be to buy MAR futures at harvest and hold them only until October. This strategy would represent about a 1.4% increase in price, equating to 10.7¢ per bushel on average over the years, which likely would not be much more than the cost of an at-the-money call option. The fact that the seasonal index basically is quite flat from June through February over this 34-year period is evidence that the wheat futures market is efficient.

Year-to-year price changes in the MAR contract from June through February are shown in Figure 8. As would be expected, the variability from year to year is quite high, with price changes ranging from an increase of about \$3.15 per bushel to a decrease of over \$1.30 per bushel. While the

average price increase has been a positive 4.5¢ per bushel, from a statistical standpoint we are only 63% confident that the true expected value is even a positive number. As further evidence of market efficiency, the price of the MAR futures basically has about an equal likelihood of being lower in February than it is in June as it does of being higher, i.e., prices increased 47.1% of the time and decreased 52.9% of the time. Thus, routinely buying MAR call options to take advantages of price rallies does not necessarily make sense because the fact that prices in March will be higher than they are in July is already factored into the futures market at harvest time.

### ***Corn***

The 33-year average index for the CBT corn JUL futures contract from harvest (October) through June is shown in Figure 9. It can be seen that the average index values are either above or right at 100% for all months leading up to June, which indicates that, on average, prices of the JUL contract tend to fall or are basically stable over the post-harvest period studied. The index value was highest in October at 101.4% indicating prices were 1.4% higher in October than they were in June. In absolute values, the actual average price decrease between October and June was less than 1¢ per bushel. The seasonal index from December through June was basically flat over the 33 years, providing additional evidence of market efficiency. While average price changes consistent with the seasonal index in Figure 9 would be quite small, the one thing to remember is that with the index either above or right at 100% for all months, this indicates the JUL futures contract price tends to be flat to down after harvest as opposed to rallying. Thus, buying call options for the JUL contract would not be profitable, on average, given historical price patterns.

Figure 10 shows the year-to-year price changes in the JUL contract from October through June. Price changes are highly variable, ranging from a maximum increase of over \$1.40 per bushel in 1996 to a maximum price decrease of \$1.14 in 1975. Not surprisingly, given the large price change variability and the average actually being slightly negative, we would have virtually no confidence that the expected price change is positive. Moreover, the price of the JUL contract from October to June decreased 60.6% of the time. Given that prices have decreased more often than they have increased, yet the average price change is basically zero, this indicates that price rallies tend to be larger than price declines.

### ***Soybeans***

Figure 11 shows the average post-harvest index for the CBT soybean JUL futures contract starting at harvest (October) and going through June. For all of the months the average index is below 100%, indicating the price of the JUL contract in June is higher than in those particular months (i.e., price increases over time). If a producer routinely bought futures at harvest and then held the position until June, on average he would have seen prices increase slightly more than 1%, and this would have been almost a 29¢ per bushel increase. However, to have realized this gain he would have seen prices decline for four straight months through February before finally increasing. In hindsight, the best thing would be to wait until February and then buy JUL futures or call options and hold them until May or June. But even this “perfect hindsight” routine strategy would have resulted in average gains of only 35¢ per bushel because prices do not increase or follow that pattern every year.

Year-to-year price changes in the JUL contract from October through June are shown in Figure 12. As would be expected, the variability from year to year is quite high, with price changes ranging from an increase of almost \$7.50 per bushel in 1973 to a decrease of almost \$3.90 per bushel just two years later in 1975. From a statistical standpoint, we are 81% confident that the expected

outcome of this strategy (28.8¢ per bushel) is indeed positive. Even though the average gains have been positive, prices from harvest through June did decrease over 40% of the time. Thus, routinely buying JUL call options to take advantages of price rallies does not necessarily make sense because the fact that prices generally are higher in June than they are in October is already factored into the futures market at harvest time.

## **SUMMARY**

Hindsight analysis of harvest-time futures contracts indicates that average gains of 9¢ to 16¢ per bushel would have been acquired by routinely forward pricing (i.e., hedging) wheat, corn, and soybeans prior to harvest over the last 33 years. Seasonal patterns for wheat and corn are similar, where optimal selling time is around the time the crops are planted, whereas, harvest-time futures contract prices peaked in June for soybeans. While average gains to pre-harvest hedging exist, the year-to-year variability around these averages is extremely high. Prices of post-harvest futures contracts have less seasonal variation than pre-harvest contracts and are less consistent across crops. For example, MAR wheat futures contract prices increase in the months following harvest and then fall back in the spring, corn JUL futures contract prices decrease slightly from harvest forward, and soybean JUL futures contracts prices decline following harvest for several months and then rally through the spring and early summer. As with the harvest-time contracts, there is significant year-to-year variability in the post-harvest futures contract prices.

The analysis here of futures prices generally reinforces that futures markets are efficient in the sense that potential gains from following a systematic marketing strategy are small to non-existent. But, the large year-to-year variability makes it easy to see why people continue to search for ways to “beat the market,” as the gains of doing the “right thing” in any given year are huge. While it is easy to see what the right thing to do was in hindsight, figuring out how this can be done in real-time is another matter and most research suggests it cannot consistently be done. That is, had we observed an actual farm marketer over the last 33 years use futures seasonality in an attempt to “beat the odds,” the results likely would have been even less impressive than those shown here since he likely would have constantly changed his pricing points over the years in an effort to follow what was observed to be an optimal strategy historically. However, it is these “if only I would have ...” situations that likely will keep marketing a hot topic among producers, lenders, consultants, media, educators, and researchers for years to come.

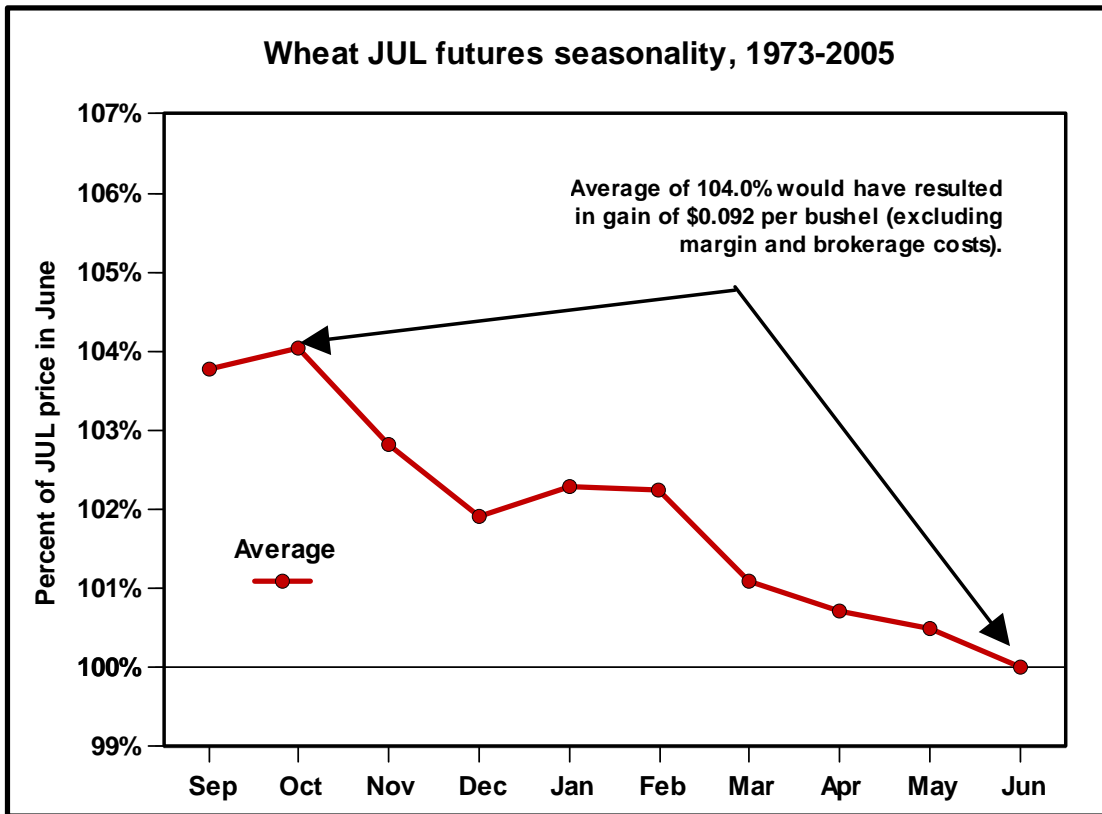


Figure 1

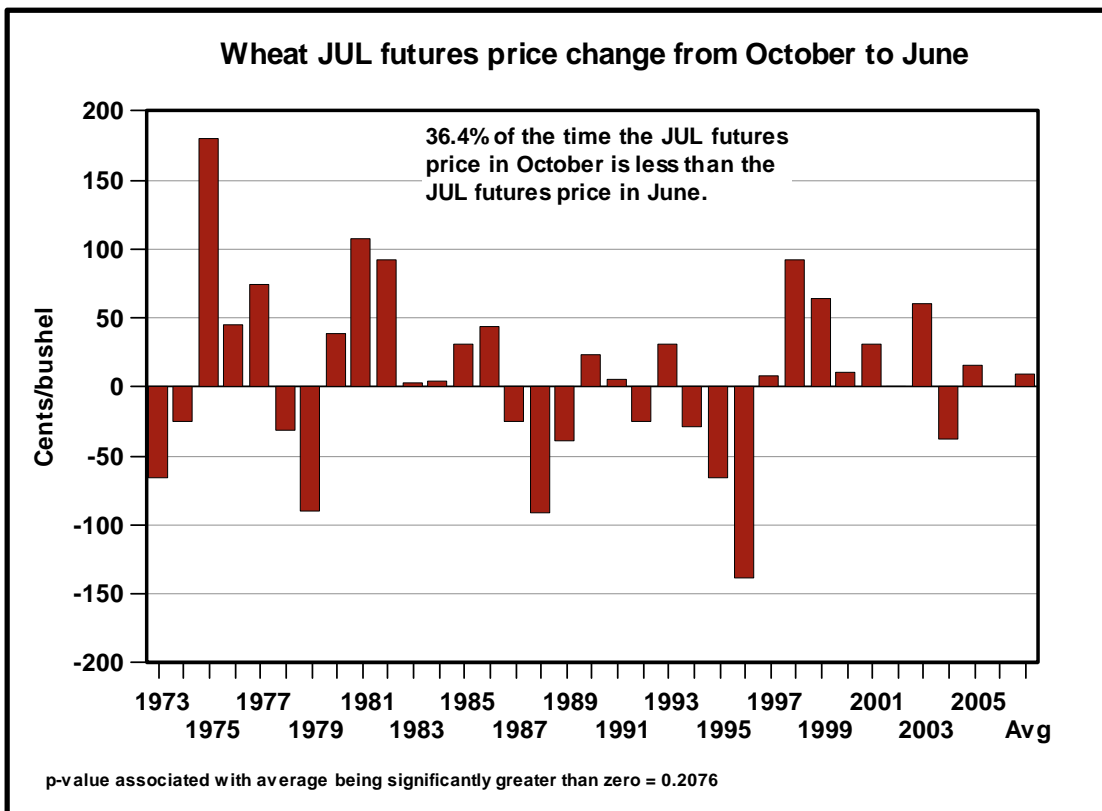


Figure 2

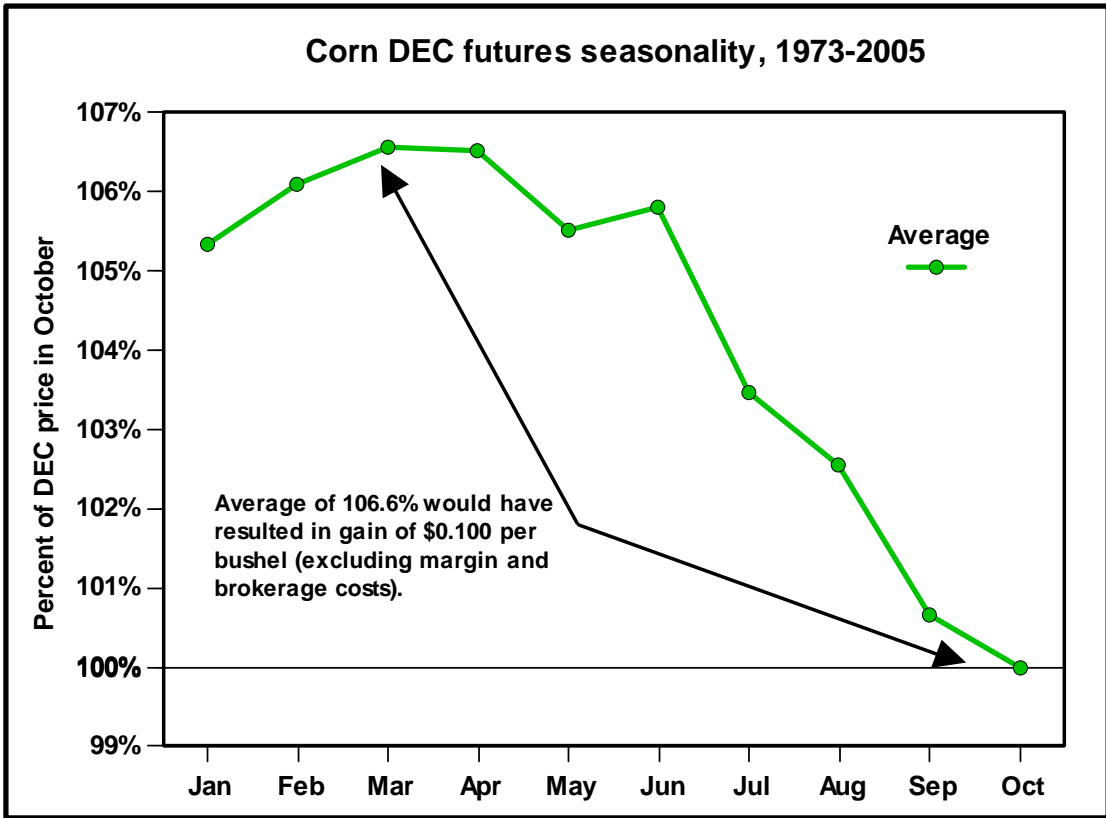


Figure 3

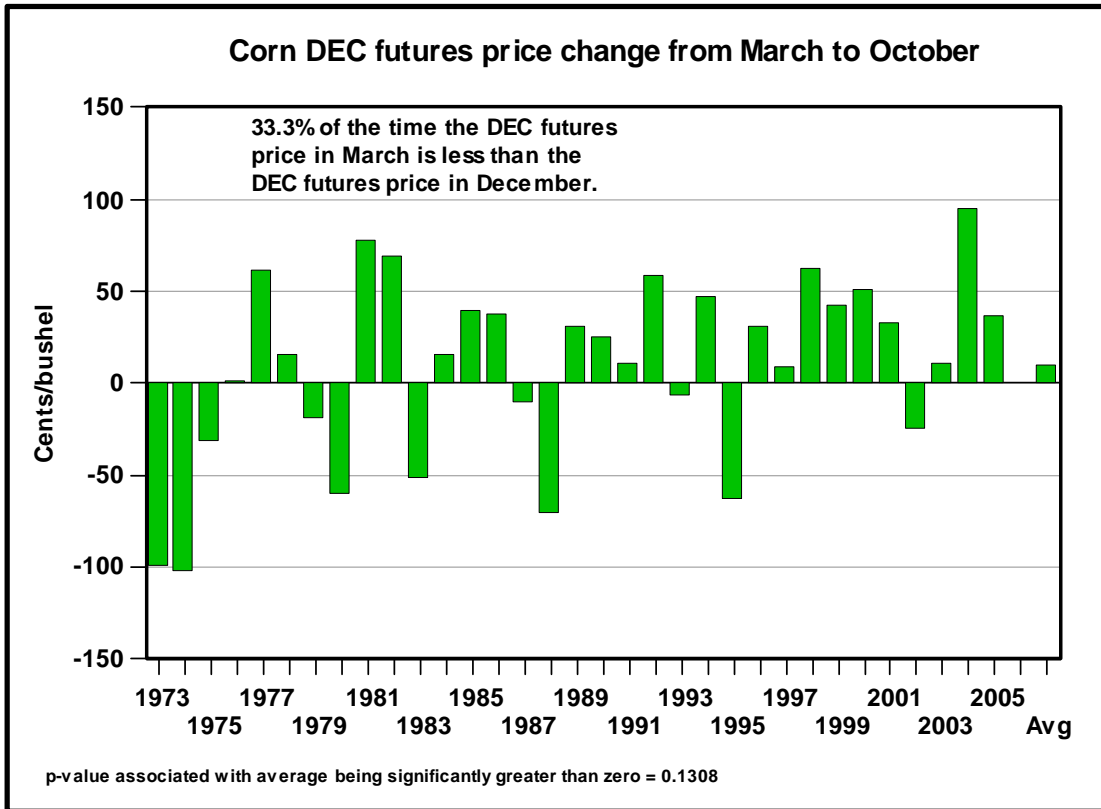


Figure 4

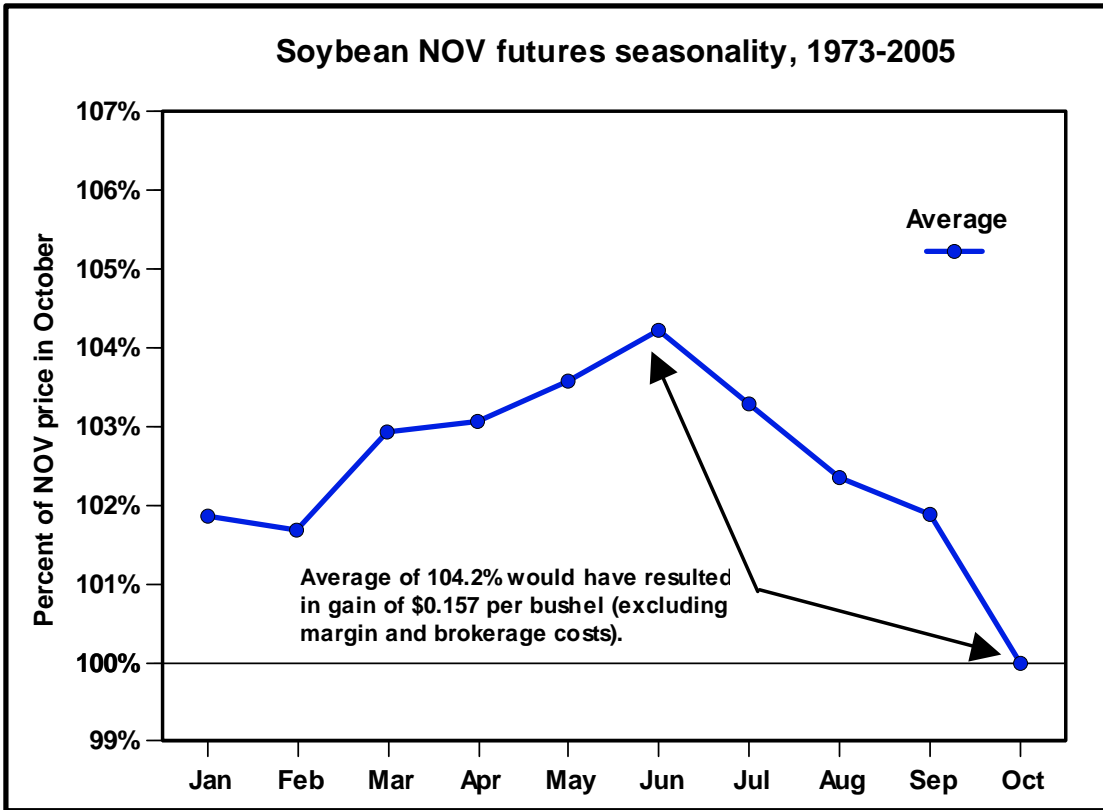


Figure 5

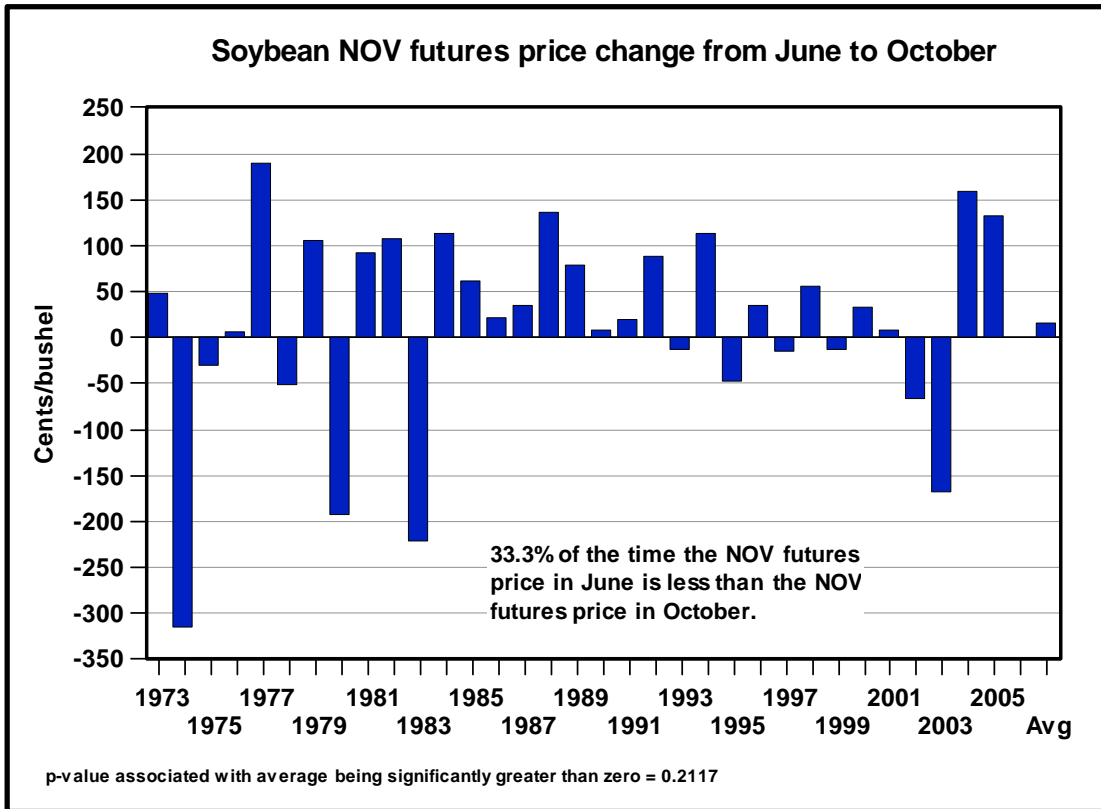


Figure 6

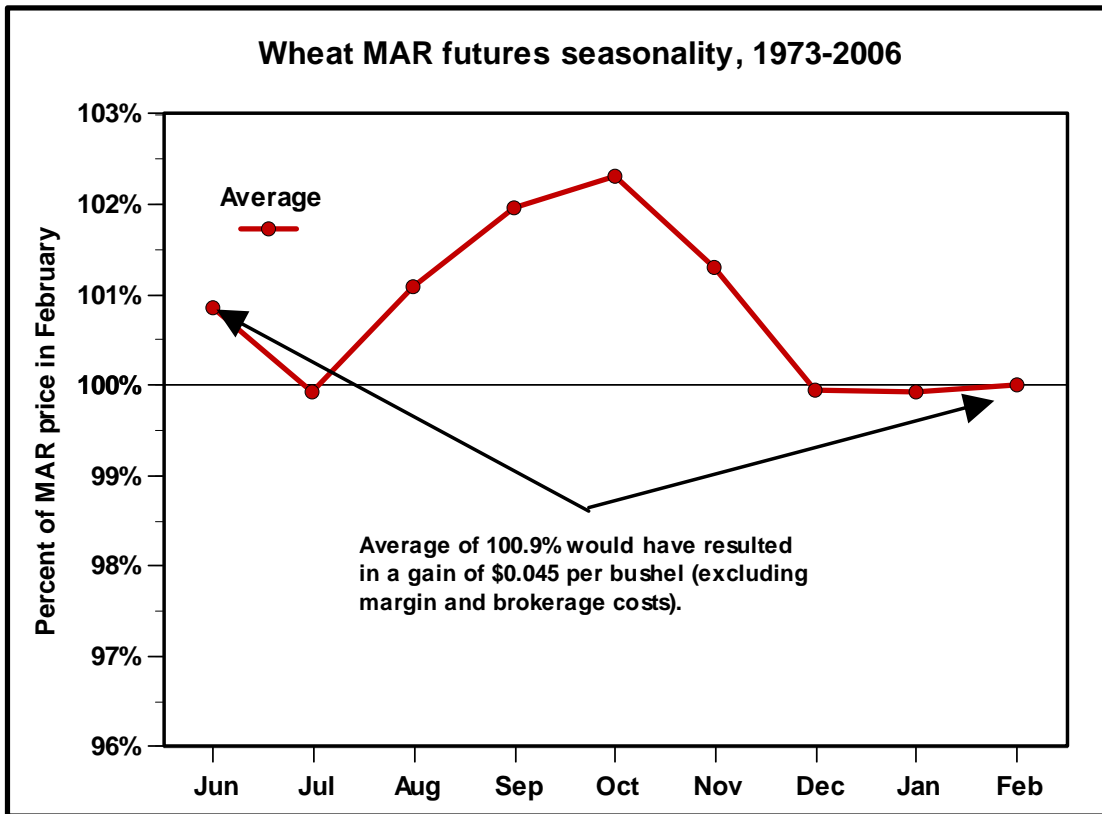


Figure 7

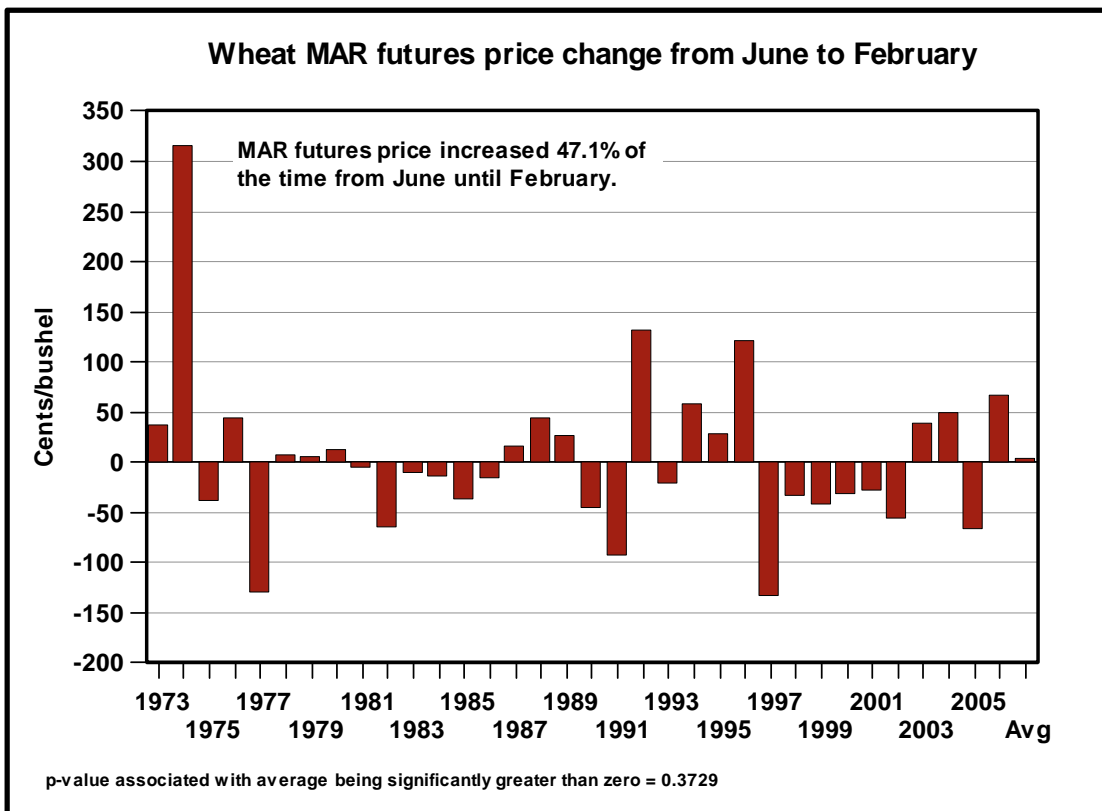


Figure 8

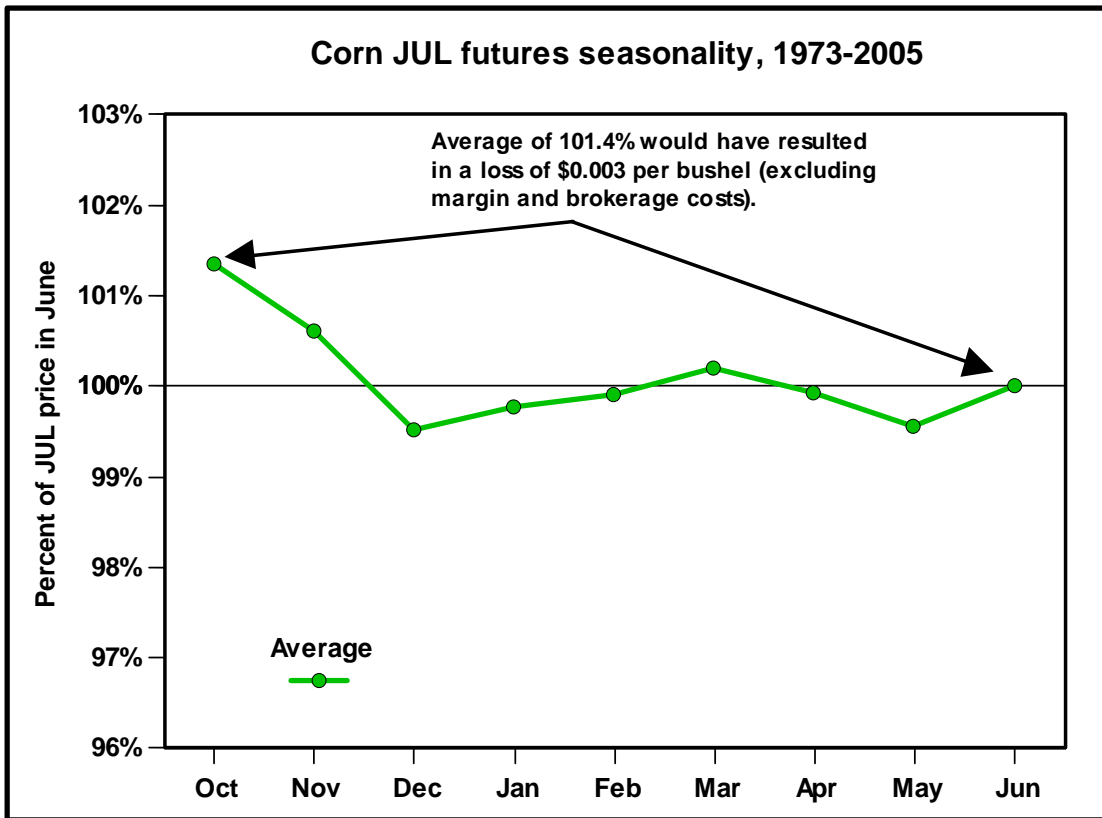


Figure 9

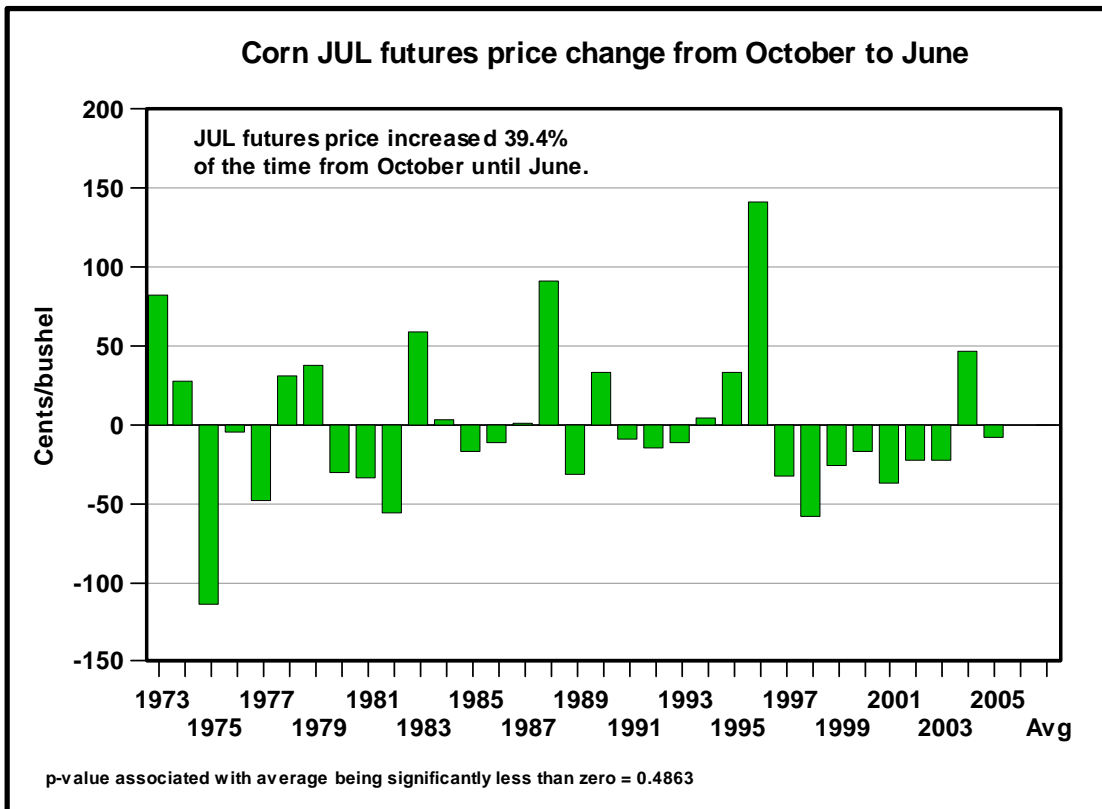


Figure 10

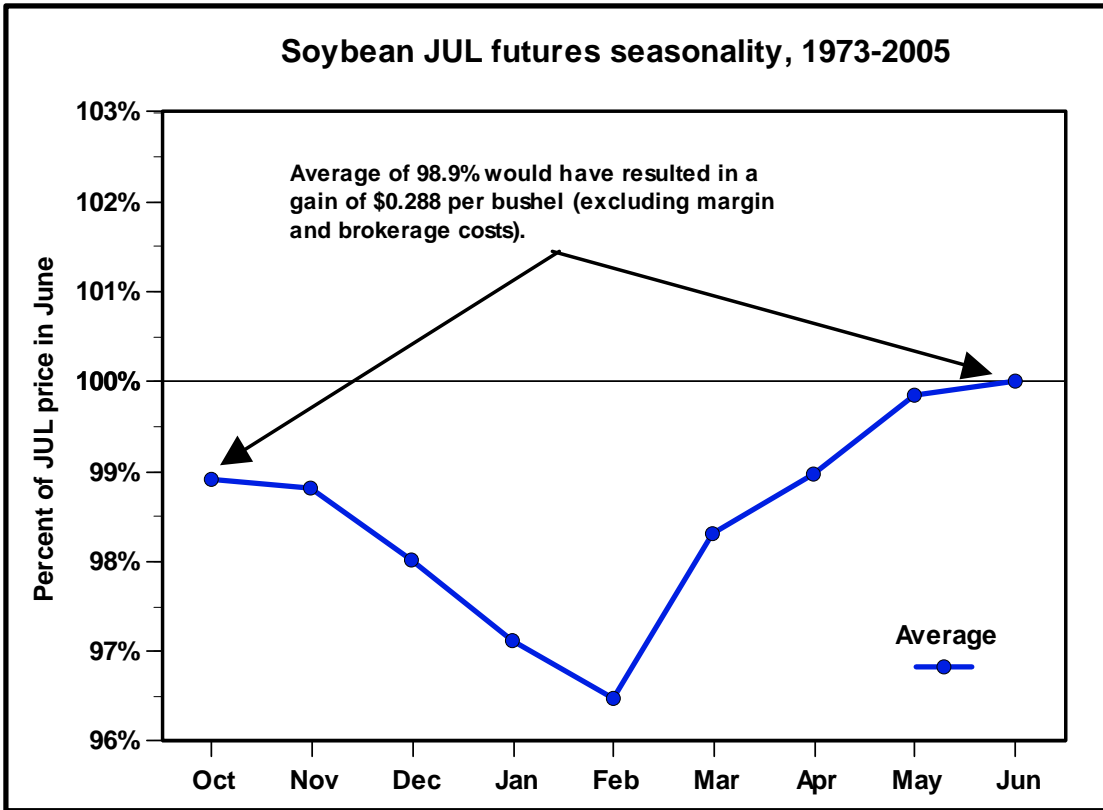


Figure 11

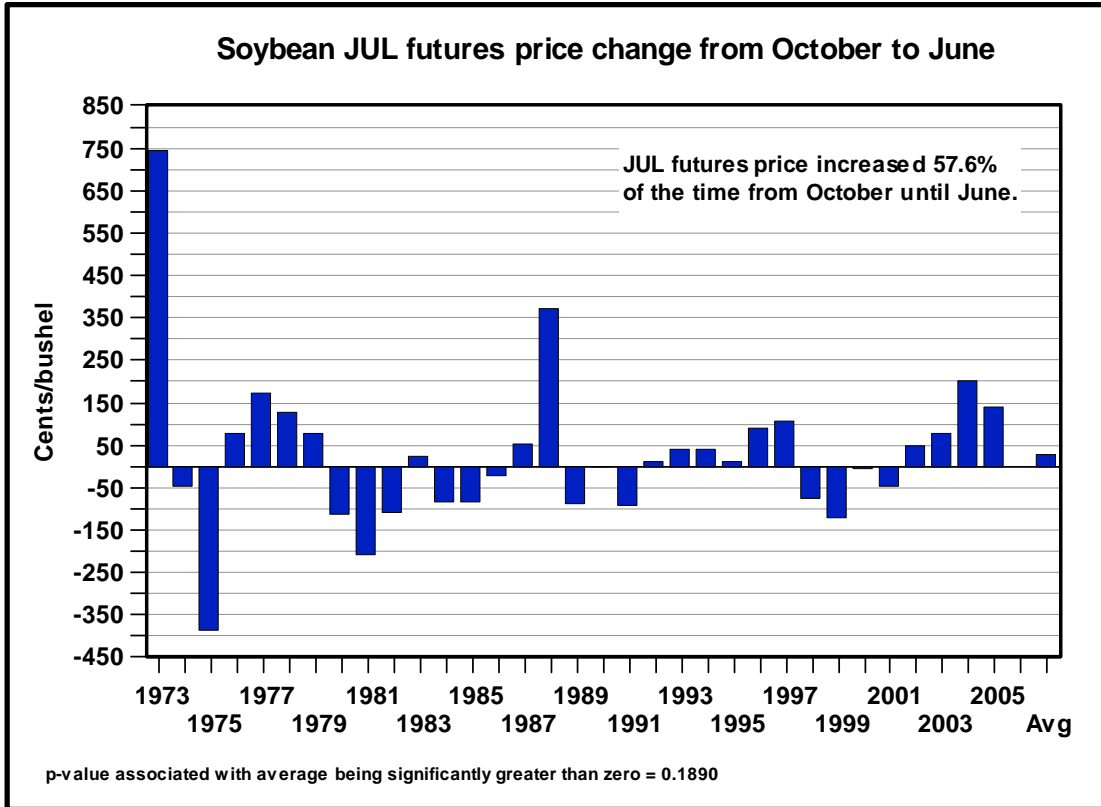


Figure 12