University of Nebraska Lincoln

Nebraska Cooperative Extension EC03-831

# Seasonality Trends in the Soy Complex

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Marketing decisions, whether buying or selling commodities, are influenced by seasonal trends in prices for the commodity itself and related commodities. Seasonal trends, or variations in the annual average price that routinely occur each year, can affect cash marketing decisions and futures hedging programs for both commodity producers and processors. Additionally, the relationship between cash market prices and futures prices, called basis, is important to consider when making buying and selling decisions. This Extension Circular summarizes the historical seasonal trends in cash prices, futures prices, and basis for soybeans, soybean oil, and soybean meal that may affect soybean producers' and processors' marketing decisions.

Futures prices for soybeans, soybean oil, and soybean meal are established in Chicago, Ill., for delivery of the products to specified locations near Chicago and on the Illinois River system. Cash prices tend to follow futures prices closely but may deviate from a one-to-one correspondence according to supply and demand conditions in the local cash market. Additionally, cash prices typically reflect a discount relative to the price at a futures delivery location

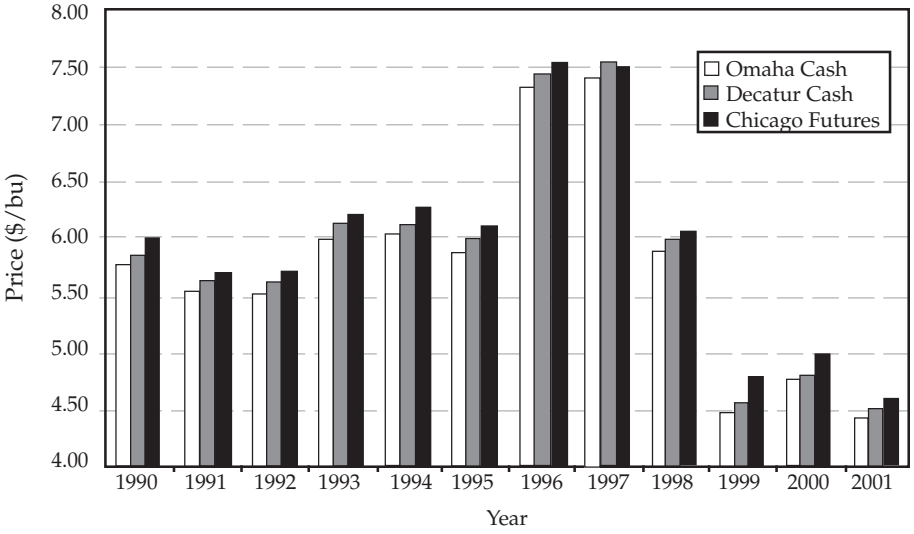


**Figure 1. Soybean cash and futures prices, annual averages, 1990 to 2001.**

by the cost of transportation between the local cash market and futures delivery point. *Figure 1* illustrates these price differentials for soybeans between Omaha, Neb., (not a futures delivery location) and Decatur, Ill., (near a futures delivery location for soybeans)[1] cash prices and Chicago futures prices. On average, Omaha cash soybean prices were about $0.09/bu lower than Decatur from 1990 to 2001. Futures prices were, on average, $0.11/bu higher than Decatur cash soybean prices during these years.

## Soybean Price Seasonality and Basis Patterns

*Figure 1* demonstrates that soybean prices vary over time. Higher prices in 1996 and 1997 resulted from low inventory levels, unfavorable weather affecting production, and strong demand. In turn, lower prices since then have

[1]Decatur, Ill., is used as the futures delivery market here because it is a delivery point for soybean oil and soybean meal and is close to the Illinois River where delivery of soybeans can be made against a futures contract.

resulted from increased inventories and increased world production, despite continued strong demand. In addition to trends over time, soybean prices vary seasonally within a year. *Figure 2* depicts the seasonal price pattern for the nearby (closest to expiring) soybean futures contact.[2] The index indicates the percentage of the annual average price that typically occurs during a given month. For example, May soybean futures prices generally are 3 percent higher than the annual average. The standard deviation lines above and below the index value define a range into which the index value is likely to fall approximately 68 percent of the time, thereby providing a measure of variability associated with the index value.

The soybean cash price seasonal trend at both Decatur and Omaha (*Figures 3* and *4*) follow a pattern similar to that of the soybean futures price *(Figure 2)*. Cash soybean prices seasonally are lowest in October at harvest time when the new crop supply becomes available. Prices seasonally increase during the winter and early spring months, peak in May, and decline through the summer months. Higher prices later in the soybean marketing year (Sept. 1 to Aug. 31) are needed to encourage producers and grain merchandisers to store soybeans until purchased by processors.

*Figure 1* also suggests that although the cash prices track closely with the futures price, they do not move perfectly together. At times, cash prices may increase (decrease) relative to futures price, thus strengthening (weakening) the basis. *Figures 5* and *6* show the

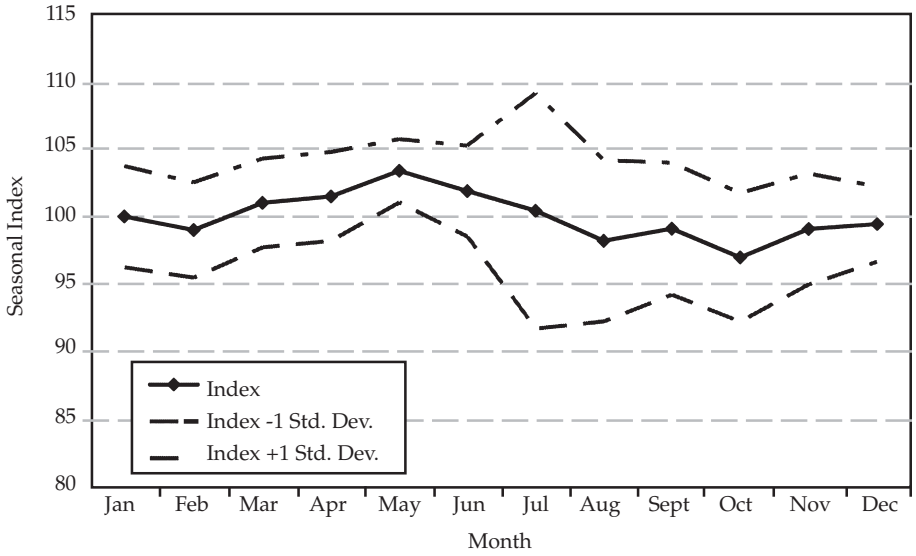


**Figure 2. Seasonal index of soybean futures price, 1990 to 2001.**

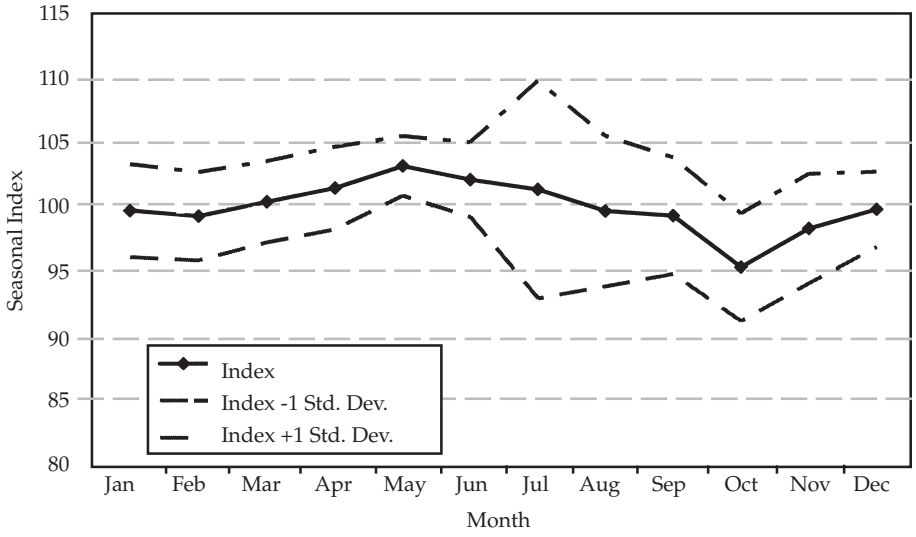


**Figure 3. Seasonal index of soybean cash price, Decatur, Ill., 1990 to 2001.**

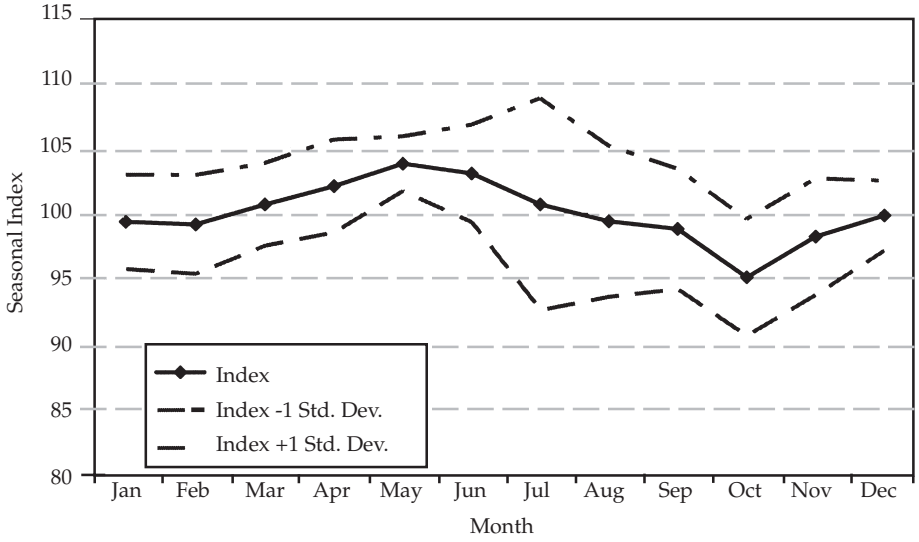


**Figure 4. Seasonal index of soybean cash price, Omaha, Neb., 1990 to 2001.**

[2]Because multi-year trends in price series, such as those in *Figure 1,* can inappropriately affect seasonal indices computed using a simple annual average method, the seasonal indices in this paper were computed after de-trending the appropriate price series.

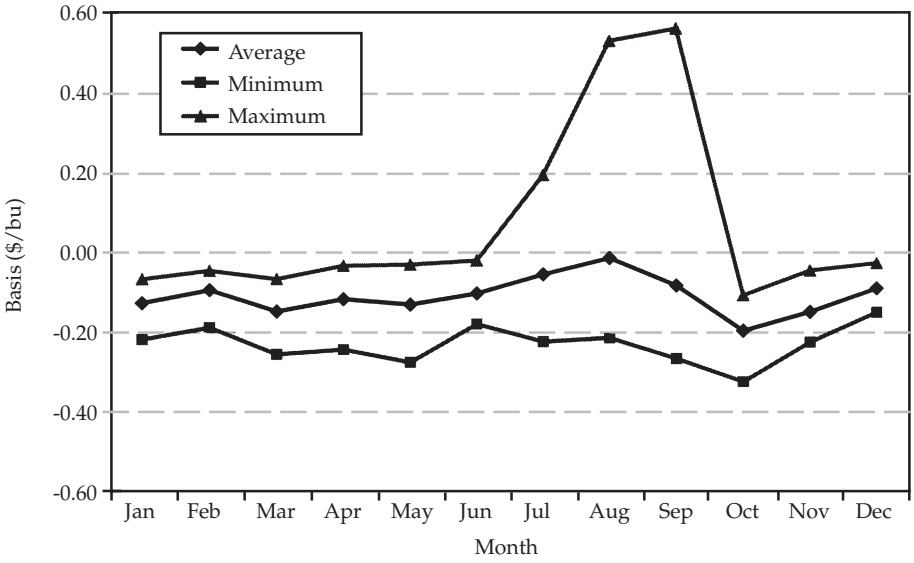


**Figure 5. Decatur, Ill., soybean basis, 1990 to 2001.**

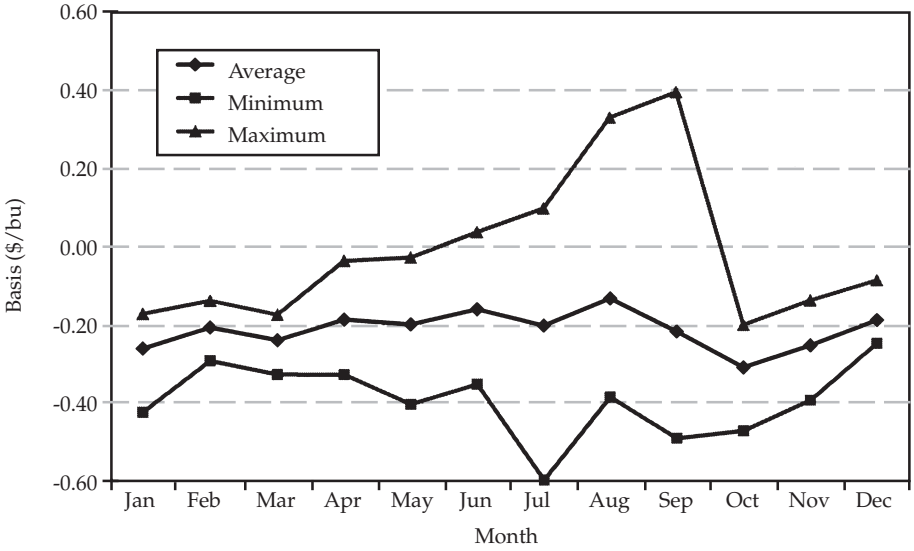


**Figure 6. Omaha, Neb., soybean basis, 1990 to 2001.**

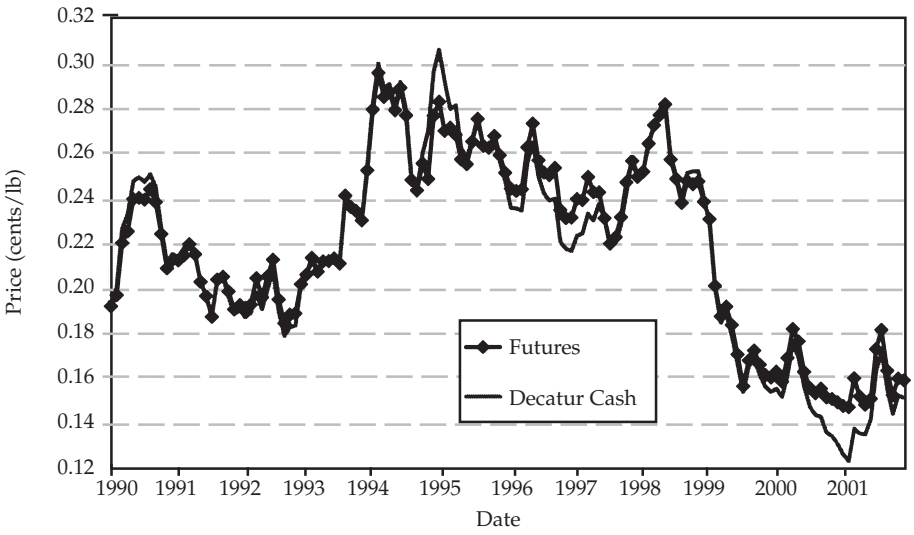


**Figure 7. Soybean oil futures and Decatur, Ill., cash prices, 1990 to 2001.**

average soybean basis levels over the 1990 to 2001 time period in Decatur and Omaha. Basis levels are seasonally weakest during harvest, reflecting high local supply relative to local demand. Basis strengthens as local supplies are used. Soybean basis is generally stronger in Decatur than Omaha because Decatur, as a delivery point market, is closer to end users (processors). *Figures 5* and *6* also present the weakest and strongest basis levels to occur during each month. The minimum basis at Omaha was generally about $0.18/bu lower than the 12-year average for each month. The maximum basis was typically $0.20/bu higher than the average, but ranged from $0.07/bu to $0.61/bu over the monthly average basis *(Figure 6)*. During the summer of 1997, basis strengthened substantially as a result of low local supplies. Although soybean basis similarly strengthened at Decatur in 1997, basis was generally somewhat less variable in Decatur relative to Omaha.

## Soybean Oil Price Seasonality and Basis Patterns

Demand for soybeans is derived from the demand for its products: soybean oil and soybean meal. As a result, soybean prices are influenced by the prices for soybean oil and soybean meal. Producers can gain a better understanding of the demand for the soybeans they sell through observing the demand for soybean products. Soybean processors are especially interested in both soybean prices and prices for oil and meal because it defines their processing margin, or profit potential (this is discussed later).

Similar to soybean prices, soybean oil prices were relatively high from 1994 to 1998 *(Figure 7)*. This was due to relatively tight soybean supplies and strong demand for

soybean oil, which is used in edible oil products (e.g., shortening, cooking oils) and industrial products (e.g., paints, lubricants). Increased world production of soybeans since 1998 for soybean oil production served to lower oil prices to the $0.14-0.18/lb range, even with strong demand for products made with soybean oil.

Seasonally, soybean oil futures prices *(Figure 8)* and soybean oil cash prices at Decatur *(Figure 9)* are highest in March, April, and May.[3] After peaking in May at 102.6 percent of its annual average, soybean oil prices typically decline to near or slightly below their annual average for the summer and early fall. Seasonal lows are often posted in October, at about 2.2 percent below the annual average. Soybean oil price variability is highest in July and November.

Monthly average soybean oil basis at Decatur, Ill., ranged between -$0.0015/lb and -$0.0037/lb *(Figure 10)*. The maximum and minimum basis observed over the 12-year period was about $0.01/lb above and below the average during the middle of the year. However, basis levels strengthened to more than $0.02/lb at the end of 1994 and beginning of 1995. The weakest basis levels (bottoming at -$0.024/lb) occurred late in 2000 and the first half of 2001.

## Soybean Meal Price Seasonality and Basis Patterns

From 1990 to 2001, soybean meal futures and Decatur, Ill., cash prices averaged $183.60/ton and

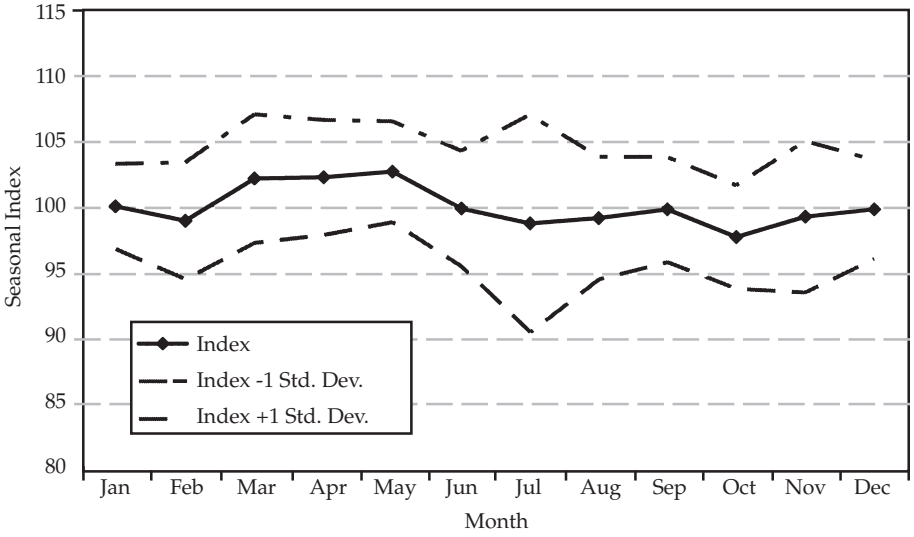


**Figure 8. Seasonal index of soybean oil futures price, 1990 to 2001.**

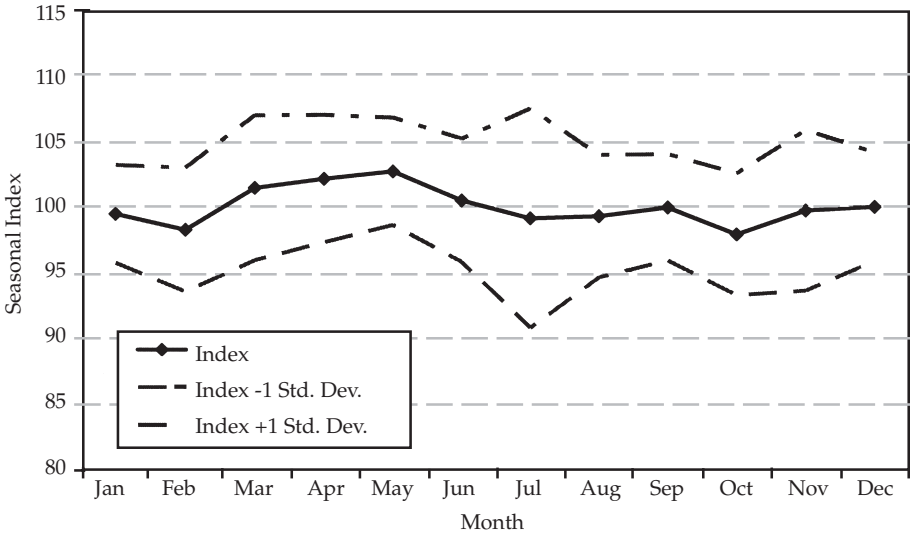


**Figure 9. Seasonal index of soybean oil cash price, Decatur, Ill., 1990 to 2001.**

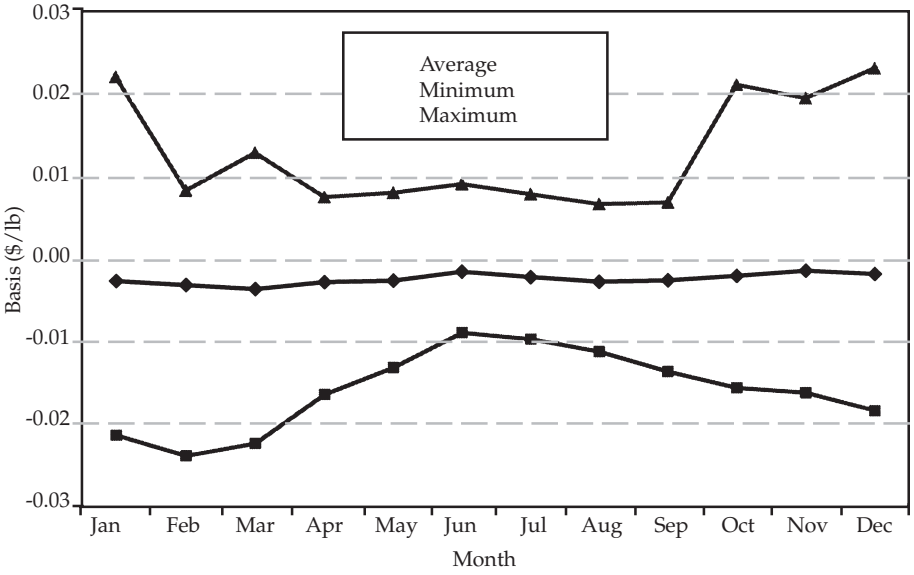


**Figure 10. Decatur, Ill., soybean oil basis, 1990 to 2001.**

[3]A time series of cash market prices for soybean oil in Nebraska is not available; thus, soybean oil prices and basis for Nebraska are not reported. Limited price information suggests that eastern Nebraska soybean oil cash prices are approximately $0.01-0.02/lb below Decatur, Ill., cash prices.

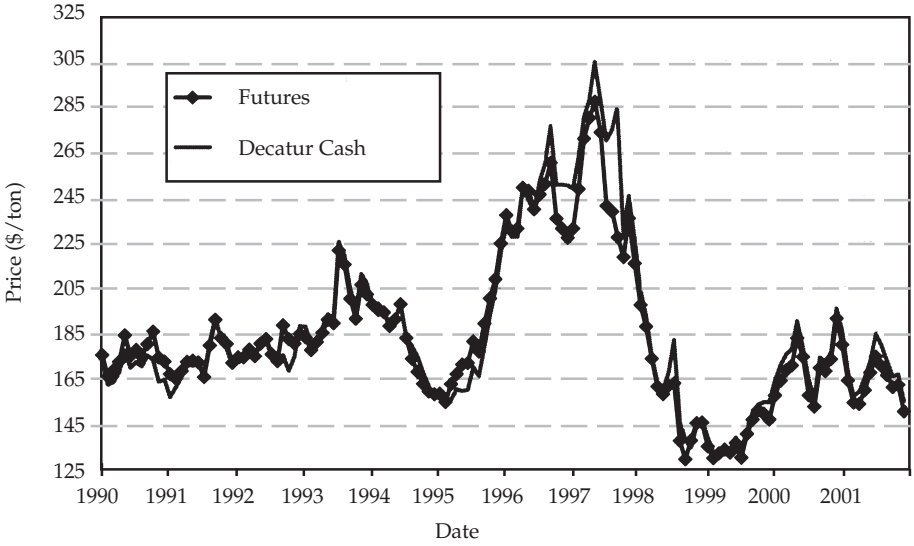


**Figure 11. Soybean meal futures and Decatur, Ill., cash prices, 1990 to 2001.**

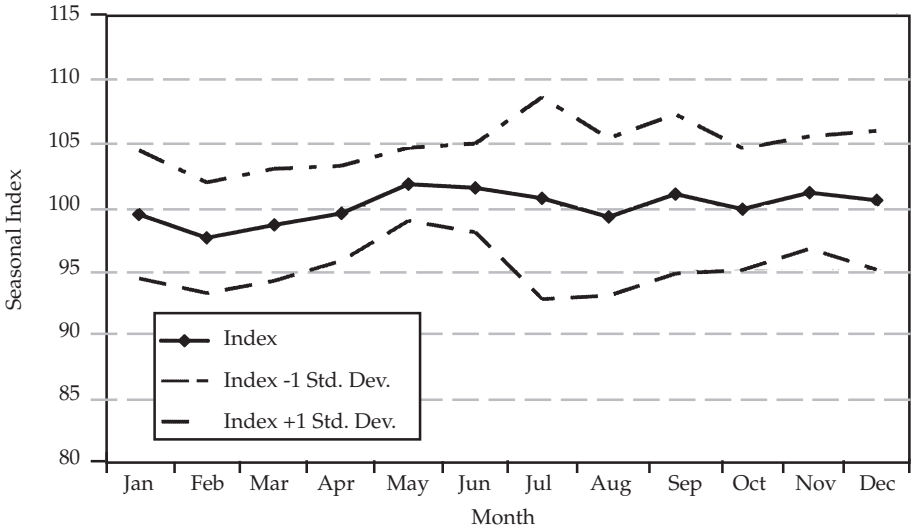


**Figure 12. Seasonal index of soybean meal futures price, 1990 to 2001.**

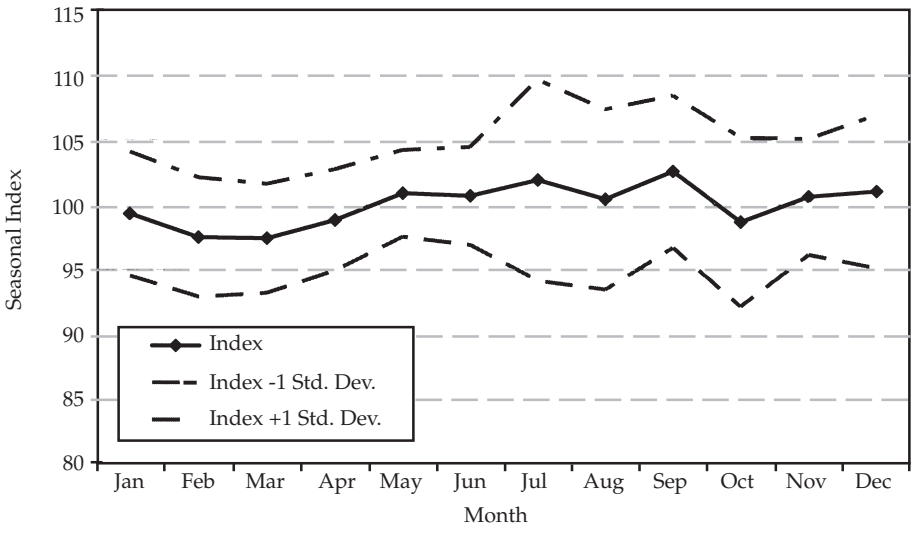


**Figure 13. Seasonal index of soybean meal cash price, Decatur, Ill., 1990 to 2001.**

$186.20/ton, respectively.[4] However, soybean meal prices have surpassed $300/ton (in 1997) and fell below $130/ton (in 1998 and 1999) *(Figure 11)*. Although soybean production increased in the late 1990s, strong demand for soybean meal as a protein supplement for livestock feed has caused soybean meal prices to increase since the 1998-1999 low.

Soybean meal prices are seasonally at their lowest in February (*Figures 12* and *13*). Meal prices seasonally increase until May and remain near their annual average price through the remainder of the year. Soybean meal price variability is lowest in April and May and highest during the summer and early fall months.

Soybean meal basis at Decatur, Ill., is strongest from July to September, directly before harvest *(Figure 14)*. It is weakest in October and March. The widest soybean meal basis fluctuations have been during the summer months. Decatur meal basis increased to $57/ton in September 1997. Minimum basis levels for soybean meal over the 12-year period were about -$10/ton.

## Gross Processing Margin Seasonality and Basis Patterns

Soybean processors purchase soybeans and manufacture soybean meal and soybean oil to sell. The difference between the revenue they receive from selling meal and oil and the cost of the soybeans purchased defines their gross processing margin (GPM). The GPM is used to cover manufacturing costs and provide a

[4]A time series of cash market prices for soybean meal in Nebraska is not available; thus, soybean meal prices and basis for Nebraska are not reported. Limited price information suggests that eastern Nebraska soybean meal cash prices are approximately $3-4/ton below Decatur, Ill., cash prices.

profit. Therefore, a sufficiently positive GPM is needed in order for processors to earn a profit. Because of the risk of changing soybean, soybean oil, and soybean meal prices, soy processors often hedge these positions in the futures market. Unlike a short or long hedge to protect only a future sale or purchase, soy processors initiate a spread hedge (or crush hedge) by simultaneously buying soybean futures and selling soybean meal and oil futures. Therefore, the relationship between meal, oil, and soybean prices (GPM) is of particular interest to soy processors.

Because meal, oil, and soybeans are sold in different units ($/ton, $/lb, and $/bu, respectively), a common unit ($/bu) for the three is necessary to calculate the GPM. From one bushel of soybeans, 11 lbs of soybean oil and 44 lbs of soybean meal can be produced. Using these conversions, the price of soybean oil in soybean-price-equivalents is determined by multiplying the soybean oil price in $/lb by 11. The price of soybean meal in soybean-price-equivalents is calculated by multiplying the soybean meal price in $/ton by 0.022 (44 lbs divided by 2,000 lbs). The cost of soybeans purchased to manufacture into meal and oil is then subtracted from the sum of the soybean-price-equivalents of meal and oil to find the GPM. For example, if prices of soybeans, soybean oil, and soybean meal were $4.30/bu, $0.154/lb, and $149.16/ton, respectively, the GPM would be $0.6755/bu. This is calculated as:

| | |
|---|---|
| Oil Value ($0.154/lb x 11 lbs/bu) | $1.6940/bu |
| Meal Value ($149.16/ton x 0.022 tons/bu) | $3.2815/bu |
| Combined Sales Value | $4.9755/bu |
| Less Soybean Price | $4.3000/bu |
| GPM | $0.6755/bu |

The GPM can be computed using futures prices or cash prices.

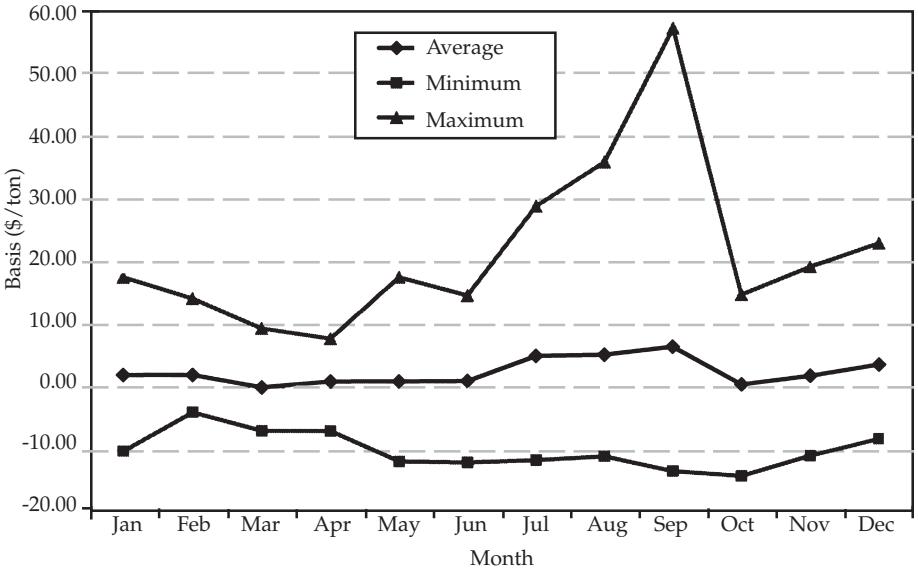


**Figure 14. Decatur, Ill., soybean meal basis, 1990 to 2001.**

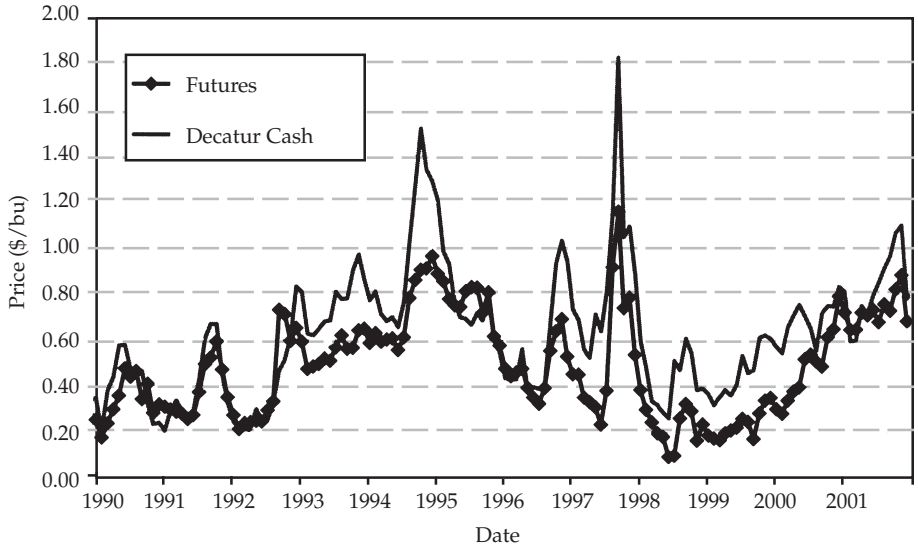


**Figure 15. Gross processing margin, futures and Decatur, Ill., cash prices, 1990 to 2001.**

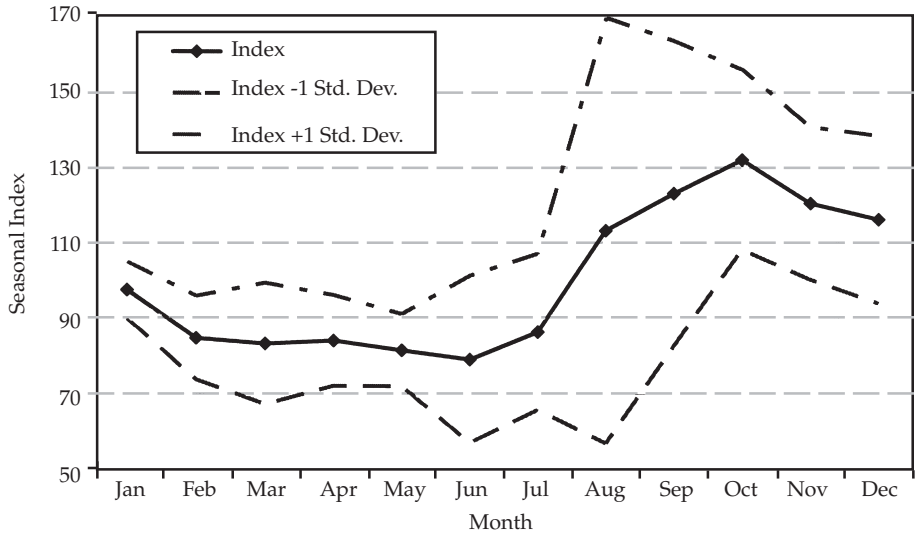


**Figure 16. Seasonal index of futures price gross processing margin, 1990 to 2001.**

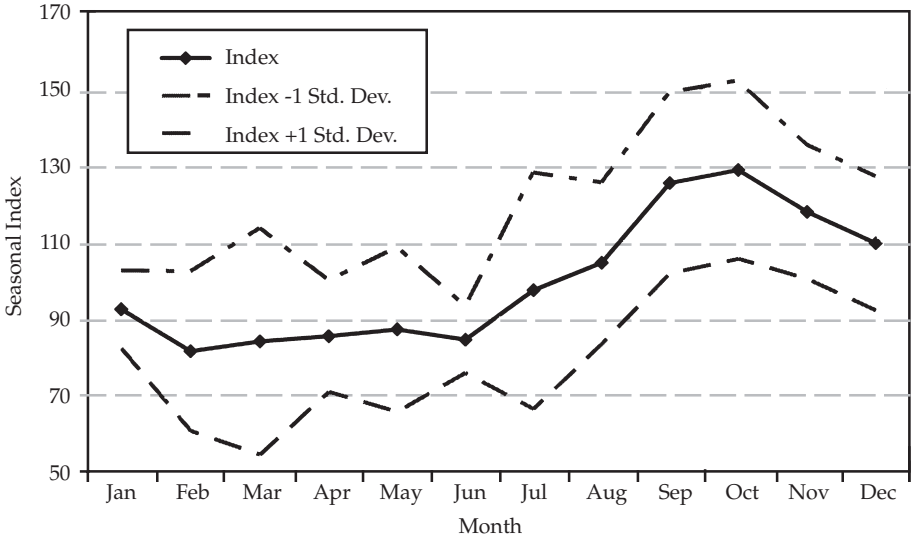


**Figure 17. Seasonal index of Decatur, Ill., cash price gross processing margin, 1990 to 2001.**

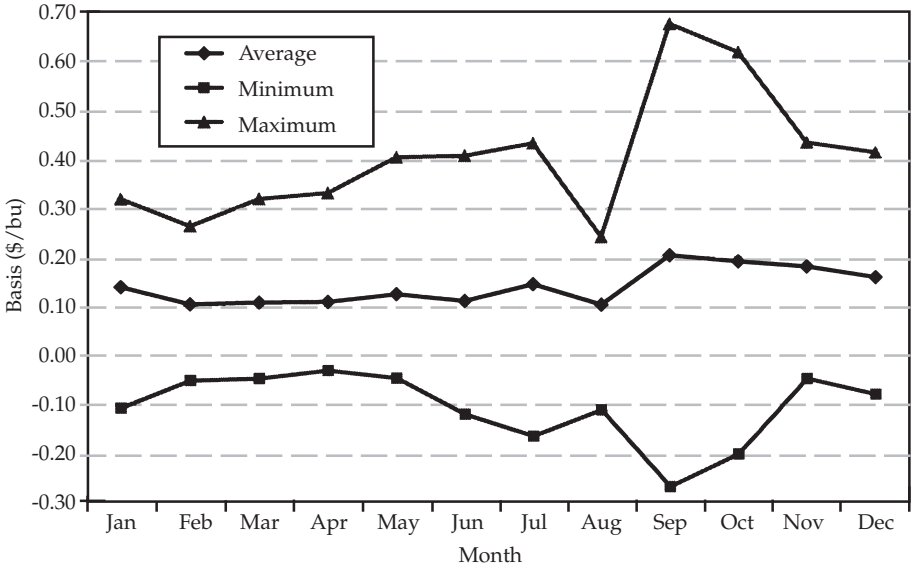


**Figure 18. Decatur, Ill., gross processing margin basis, 1990 to 2001.**

The difference between the futures GPM and cash GPM can be thought of as the "basis GPM," which is the sum of the oil and meal basis in soybean-price-equivalents less the soybean basis. The approximate one-to-one correspondence between futures and cash prices for soybeans, meal, and oil translate into cash and futures GPMs that are similarly related *(Figure 15)*. The futures price GPM has averaged $0.49/bu from 1990-2001, but ranged from $0.10/bu to $1.20/bu. The cash price GPM at Decatur, Ill., averaged $0.63/bu during this time period. The GPM is not constant over time due to differences in the relative demand for soybean oil and soybean meal and the available supply of soybeans. The GPM was relatively high in 1994-1995 and 1997 *(Figure 15)*, indicating that the combined price increase in oil and meal exceeded the soybean price increase. The increasing GPM since 1998 has resulted from adequate world supplies of soybeans (keeping soybean prices relatively low) and strong feed and industrial demand for meal and oil (that move meal and oil prices relatively higher).

The GPM's seasonal trend results from the seasonal pattern in soybean, oil, and meal prices. The GPM is seasonally highest in October (corresponding to harvest time and low soybean prices) (*Figures 16* and *17*). The GPM then declines until June. Variability in GPM is highest during the summer months.

The difference between the futures and Decatur, Ill., cash GPM is typically between $0.10/bu and $0.20/bu *(Figure 18)*. Historically, the greatest difference between the maximum and minimum GPM basis levels occurred during September and October.

## Conclusion

Seasonal trends in price and basis levels for soybeans, soybean oil, and soybean meal are important to consider when making marketing decisions. Depending on storage cost and availability, storage until expected seasonal highs can, over time, yield higher returns. Further, it can lead to decisions of whether and how to hedge future sales of soybeans. While futures hedges protect against changes in price levels, basis risk remains unhedged. The historical basis levels shown in the graphs can provide a forecast of basis at those locations for futures dates. For soy processors, the seasonal trends in the gross processing margin (GPM) indicate relatively higher profit potential (after manufacturing costs) during the fall harvest season. Knowledge of the GPM also provides market speculators with the possibility to arbitrage deviations from the normal, or expected, GPM.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Elbert C. Dickey, Dean and Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.



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