

Risk Management

Seasonality and Its Effects on Crop Markets

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Seasonality and Its Causes

Seasonality is the phenomenon that causes crop prices (including cash, futures, basis, option volatility, intramarket, intermarket, and inter-commodity spreads) to behave in a relatively predictable manner, year in and year out. Generally speaking, there are two major components to crop seasonality: 1) the harvest lows, followed by 2) the post-harvest rally. Sometimes seasonality is a strong element of the pattern of crop consumption (domestic usage as well as exports).

The dominant (but not the only) factor driving seasonality is the on-off nature of crop harvest. Most of the principal field crops grown in the U.S. have a single harvest season. Consequently, the total supply of the crop becomes available to the marketplace in a relatively short period of time. It is this sudden increase in supply that provides the most dramatic evidence of seasonality—the harvest lows.

Following harvest lows, the supply of the commodity is reduced by inevitable (but not always steady) domestic consumption and export demand. In order for the market to ensure that some portion of the year's crop will be available for use later in the marketing year, forward price bids at harvest generally are higher than harvest prices. In most years, prices follow an upward trend, staying on-track with the pattern of forward price bids initially laid down at harvest. Therefore, a corollary to the harvest low is the post-harvest rally.

Seasonality vs. Cycles

In most cases, seasonality is restricted to one production cycle (the period of time that passes between one production event and the next). For most of the principal field crops produced in the U.S., seasonality occurs over a 12 month period (stretching over all four seasons—hence the term seasonality).

Seasonality should be distinguished from other cycles. Seasonality is related to the calendar, such as months or seasons, and is usually based on changes in supply and demand. Cycles can last any length of time (from minutes to decades). While there is ample statistical evidence (and a sound theoretical explanation) for seasonality in crop markets, there is only limited evidence that other types of cycles affect the markets for most of the principal U.S. field crops.

Unlike price cycles, which may have a basis of explanation in technical analysis, the few fundamental crop cycles that have been identified are widely believed to be triggered by external events that have an unusual impact on the market. Often referred to as market shocks (and often associated with droughts), these events of unusual impact trigger production, demand, and even policy reactions. The effects of market shocks gradually dampen over time and do not continue indefinitely.

Some economists argue that because these crop cycles lack continuity (are not self-perpetuating), they are not true cycles. There is far



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more support for the concept of cyclical influences in livestock markets (particularly cattle and hogs) than in crop markets.

Seasonality vs. Trends

Many other factors besides seasonal fluctuations in supply and demand affect crop prices. Price trends are the result of gradual one-directional changes in supply and demand that occur over a period of time. These trends can have a powerful influence on market prices and can significantly alter seasonal patterns (Fig. 1). Consequently, trends and other inconsistencies can cause prices to deviate substantially from those that would be expected based on the crop's seasonal pattern.

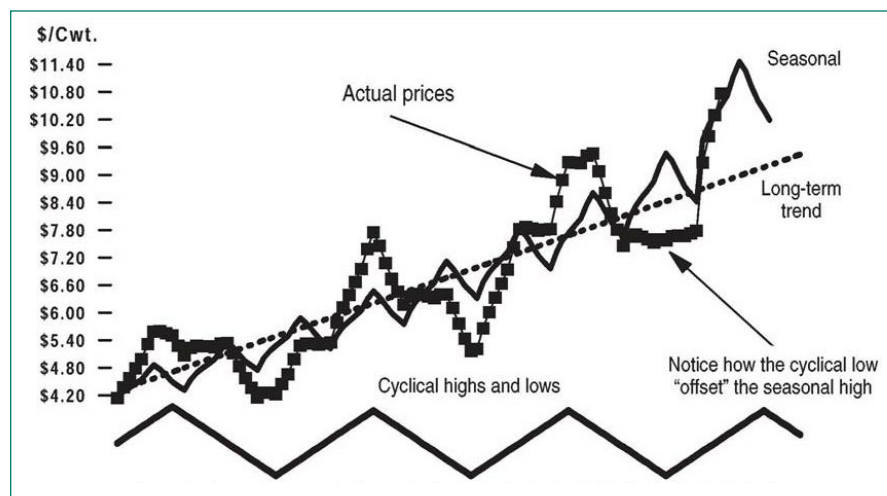


Figure 1. Relationship between seasonal, cyclical and trend effects on prices for a hypothetical crop.

Normal vs. Conditioned Seasonals

The normal seasonal pattern that prevails can be estimated as the average of **all** years or the average of the **majority of years deemed to be free of unusual market shocks**. Or, a conditioned seasonal could be constructed using data from **years in which a specific condition is applied**. Sometimes referred to as analog modeling, it is a technique commonly used in forecasting other things besides commodity prices. For example, meteorologists often look for distinctive and anomalous weather phenomena. If a particular unusual weather event is present in the current period (such as the occurrence of an El Niño or a major volcanic eruption), then meteorologists look at past years when these events

occurred to see if certain weather patterns necessarily followed the event in question. For example, do strong La Niña events strongly correlate with drought in North America?

In commodity analysis, it is common to separate grain seasonals into two groups: 1) short crop years—years in which yields fell significantly below the trend because of drought, freezes, floods, lack of growing degrees, blight, etc.; and 2) normal years—all years other than short crop years.

A 1995 study of optimal corn marketing strategies (Wisner, Baldwin and O'Brien) found that the best marketing strategy in years following short crops was a futures hedge on 100 percent of the expected production in the fourth week of February,

covered by a \$.20 out-of-the-money call on new crop futures that was offset in the first week of July. Conversely, in years that did not follow a short crop, the best marketing strategy was to purchase \$.20 out-of-the-money puts on new crop futures on 80 percent of expected production in the third week of May, hedge with futures the remaining 20 percent in the first week of July, and offset the puts in the second week of September.

Another criterion commonly used to discriminate between years is to examine years when another major fundamental supply/demand factor changed. For example, crop prices may have

a distinctive pattern in years in which two events occurred—both total beginning supplies and ending stocks increased. The logic of this type of seasonal is this: “Did prices behave differently in years in which the market had to struggle with a persistent, year-long over supply of the crop (over supply relative to the final quantity consumed)?”

It is sometimes useful to construct a conditioned seasonal, picking the appropriate years based not on a particular supply/demand fundamental but on an unusual price phenomenon. For example, if the December corn futures contract set a new life-of-contract low in July (a month in which the contract normally is setting its high), is that a reliable predictor that the contract will trade lower in the succeeding months?

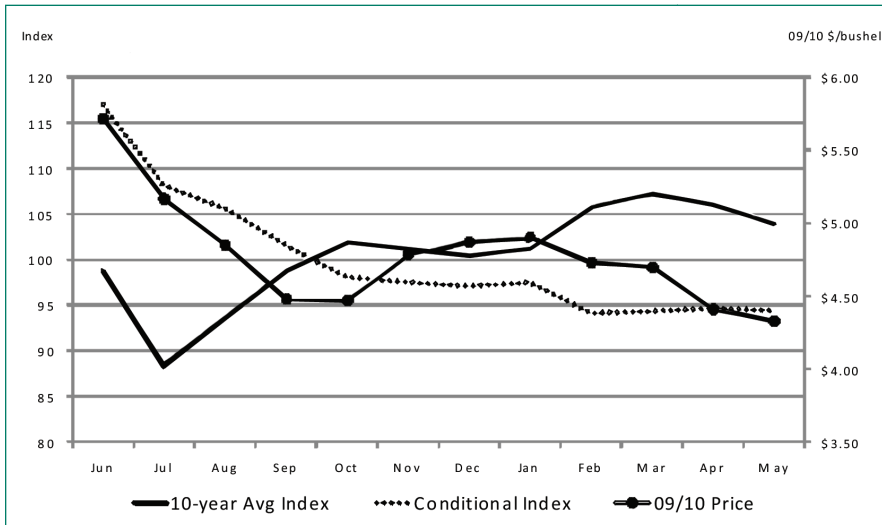


Figure 2. 10-year Average Wheat Price Index (2001-2011) and Conditional Seasonal Wheat Price Index

One example of a seasonal of this type is provided in Figure 2. It examines the pattern of wheat prices in years when the January price was close to or below the preceding July price (something which occurred in 1989, 1990, 1996, 2009, and 2010). Clearly, this phenomenon is associated with even weaker prices in the February-May period.

Another method of checking for seasonal patterns is the seasonal high-low table (see Schwager, 1984). This method simply requires identification of the season of interest and recording the months in which the highs and lows occurred over a number of years. Table 1 provides an example of a high-low

seasonal lows (which may be more consistent than the highs) and then rely on magnitude to predict the high. For example, a particular crop's seasonal low may have occurred in October-November 80 percent of the time. The seasonal high was 12 to 15 percent above the seasonal low 75 percent of the time. Based on this analysis, one would expect the seasonal low to come at harvest (in October or November) and the high to be 12 to 15 percent above the low.

Of the two, timing is the more important for **speculative** purposes, whereas magnitude is often more important for **hedging** purposes.

Farmers (or other hedgers) may make or lose money in their commodity futures/options accounts, but the ultimate profitability of the agricultural enterprise depends on the net profit of the crops produced (net any futures/options gains or losses). It follows, therefore, that a farmer should be more interested in selling a crop at a profitable price than selling it at the seasonal high.

Table 1. Month of High and Low of December Corn Contract during the January to December Period

| Contract year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 2000 | | | | | H | | | L | | | | |
| 2001 | H | | | | | | | | | | L | |
| 2002 | | | | | L | | | | H | | | |
| 2003 | | | | | | | L | | | | | H |
| 2004 | | | | H | | | | | | | | L |
| 2005 | | | | | | | H | | | | L | |
| 2006 | | | | | | | | L | | | H | |
| 2007 | | | | | | H | L | | | | | |
| 2008 | | | | | | H | | | | | | L |
| 2009 | | | | | | H | | | L | | | |
| 2010 | | | | | | L | | | | | H | |

table for the December corn contract. The calendar year contract highs tend to cluster in late spring to early summer with contract lows more dispersed, but generally in the second half of the year.

Timing and Magnitude of Price Changes

There are two purposes of seasonal analysis: 1) to correctly identify the timing of a season's high and low; and 2) to estimate the magnitude of the difference between the high and low price. Sometimes market analysts rely on timing to identify the sea-

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