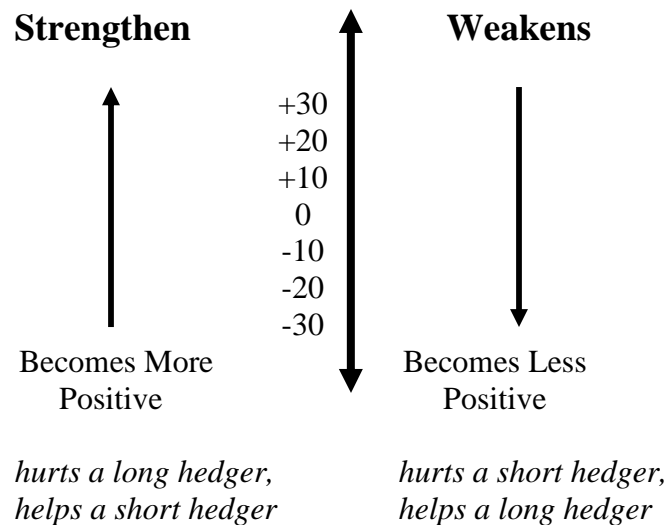_____

<u>Using Futures Spreads to Manage Basis Risk:</u>

<u>Introduction:</u>

In managing the risk of an adverse change in cash prices, there are essentially two risks exposed to this change in price. A cash price consists of both a futures component or benchmark price, as well as a basis differential that relates that futures value or benchmark to a local cash market in which the commodity will be priced. By definition, CASH = FUTURES + BASIS; therefore, BASIS = CASH - FUTURES. Often, futures are used as a hedge against an adverse move in cash prices. If futures are priced as a *substitute* to a cash purchase or sale, then this element of price is covered or hedged; however, the basis differential remains a floating variable to the final determinant price and is itself exposed to adverse variation in its value between the time the futures are hedged and the time the hedge is removed and the cash price is set in the local market.

As a long hedger (someone who is short the physical commodity in the cash market), one is exposed to a stronger basis. As a short hedger (someone who is long the physical commodity in the cash market), one is exposed to a weaker basis. The graph below illustrates the movement of basis and its impact on the long and short hedger.

Strengthen   **Weakens**

+30
+20
+10
0
-10
-20
-30

Becomes More   Becomes Less
Positive   Positive

hurts a long hedger,   *hurts a short hedger,*
helps a short hedger   *helps a long hedger*

<u>Hedging Basis:</u>

Fortunately, basis variation is the smaller portion of overall price variation. By most measures, futures variation accounts for approximately 80% of the overall variation in cash prices. Despite this, unfavorable movements in basis can limit the effectiveness of a futures or options hedge in protecting price. For many markets, including corn, soybean meal and hogs, basis can be set independent of price well ahead of time, thus removing this variable cash price risk from the equation. Unfortunately, because of uncertainties associated with basis movement – particularly in years of extreme price volatility – the costs associated with establishing basis can be high and the forward basis value offered in the cash market can appear unattractive relative to historical levels.

As an alternative to forward pricing basis, futures spreads can be used to hedge the basis element of a cash price. The reasoning behind this is that basis and spreads tend to move together. As an example, in situations where the cash market is very strong, basis tends to be increasing. This typically is reflected in the spot futures contract gaining relative to deferred contracts. In the opposite case where the cash market is very weak, basis tends to be decreasing and this usually corresponds with spot futures declining relative to deferred contracts.

With respect to futures spreads, the direction of the underlying market is not necessarily indicative of how a spread will perform. In other words, just because a market is moving higher does not necessarily mean that spot contracts are gaining on deferred contracts. Similarly, just because the underlying market is moving lower does not automatically mean that spot contracts are losing on deferred contracts.

One way to think of this is in the case where a declining market discourages cash sales and begins to strengthen basis levels. This often leads to strength in spot contracts relative to deferred contracts. This can occur even as futures continue moving lower – it happens when the spot contract is not going down as much as deferred contracts are in an overall declining market.

To hedge against the risk of a *stronger* basis, a *bull* spread would be used which consists of buying a futures contract with a nearby expiration, and selling a futures contract with a later expiration. To hedge against the risk of a *weaker* basis, a *bear* spread would be used which consists of selling a futures contract with a nearby expiration, and buying a futures contract with a later expiration.

It is important to realize that a futures spread will not necessarily offset basis risk in a local cash market on a one-for-one basis. In other words, if corn basis in my local cash market moves up by 10 cents, spot futures will not necessarily gain 10 cents on deferred futures. This is because there is a bit of a disconnection between any specific local cash market and the futures market. The futures market serves as a benchmark price for the collective cash market across many different locations. In any given locale, supply/demand fundamentals specific to that area can lead to basis fluctuations that are distinct and separate from the rest of the country.

The point is that *basis and spreads tend to move together*. If the <u>overall</u> trend of the cash market is a strengthening basis, this tends to correspond with spot futures contracts gaining on deferred futures contracts while if the <u>overall</u> trend of the cash market is a weakening basis, this tends to correspond with spot futures contracts losing ground to deferred futures contracts. If the basis movement in a local cash market is not reflected in the general trend of basis across the rest of the country, it will not likely be reflected in the movement of futures spreads either.

Another important point to note is that using a futures spread to hedge basis risk is separate and distinct from using futures or options to hedge price risk. As an example, if I am short hog futures as a hedge against lower cash prices in a forward period, and in addition, I am short nearby futures and long deferred futures, these are two separate positions hedging two separate risks. In fact, these basis hedge positions are typically *segregated* in a separate account to prevent unintentional offsets of price hedges. To illustrate the point, let's consider the following theoretical hedges for exposure on 4Q and 1Q hogs:

4Q: Short 10 December Hog Futures
1Q: Short 10 February Hog Futures

Next, let's consider the following bear spread to hedge against a weaker basis on 4Q hogs:

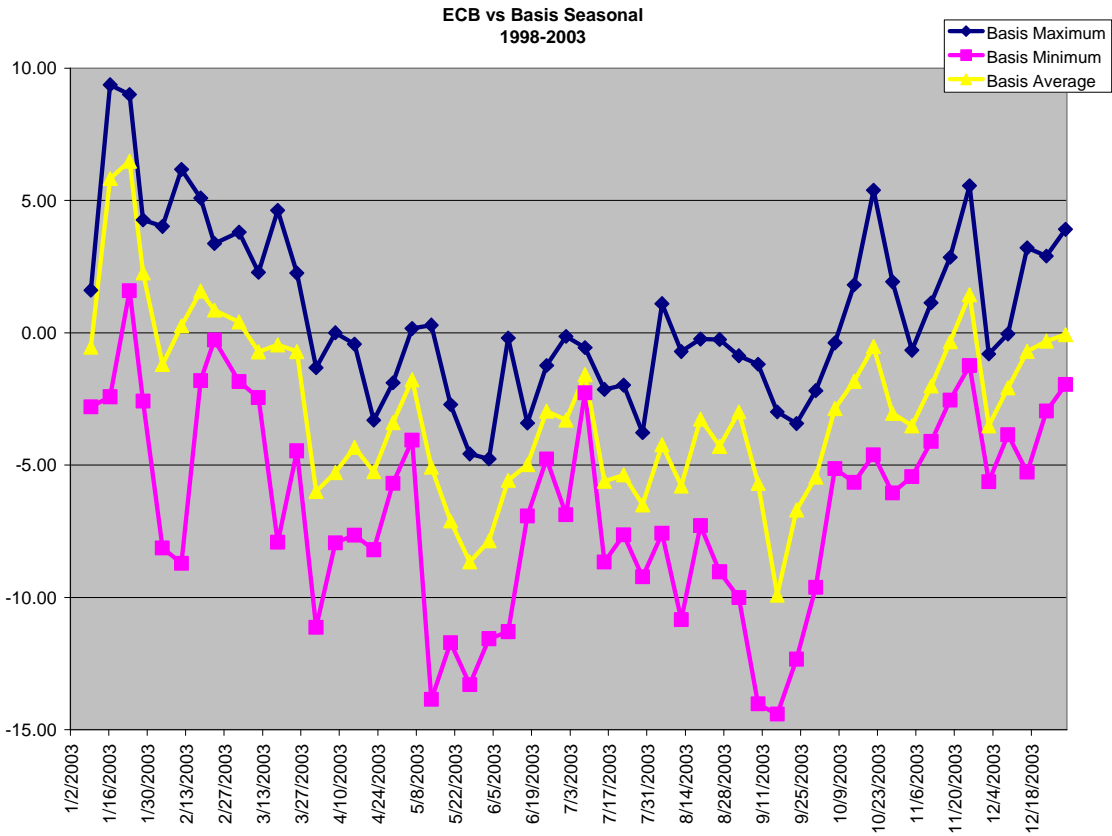Sell 10 December Futures, Buy 10 February Futures

If I were to place this hedge into my hog account, the long February futures position of the 4Q basis hedge would offset the short February futures position of my 1Q price hedge, which I do not want to do. I therefore need to create a separate place to put these positions to prevent this offsetting and to better keep track of the performance of the basis hedge relative to the price hedge.

It is also important to note that the purpose of using futures spreads is to hedge the risk of a stronger or weaker basis, *<u>not to make money on the spread.</u>* In the aforementioned example, assuming I sell December futures and buy February futures as a 4Q basis hedge, if the December contract gains on the February contract I will lose money on the spread; however, this should be offset by a stronger basis in the cash market. If I am selling my hogs to the packer at a stronger basis, this improves my overall price and is favorable for my 4Q margin, which is what I want for the hog operation.

<u>Seasonality of Basis:</u>

Just as futures prices display seasonal tendencies, so does basis. As an example, corn basis tends to be the weakest around harvest time when a surge of supply moves into the cash market pipeline. Conversely, corn basis typically strengthens in the spring during planting time as most producers are preoccupied in the field and not delivering any supply to their local elevators. Because basis itself has seasonality, one can reference

seasonal basis patterns to help optimize cash purchases and sales. The following chart illustrates hog basis in the Eastern Corn Belt over the past 5 years (excluding 2004):

ECB vs Basis Seasonal
1998-2003

- Basis Maximum
- Basis Minimum
- Basis Average

From the above chart, one can notice that there has been a general tendency for hog basis in the Eastern Corn Belt to deteriorate during the first five calendar months of the year. Interestingly, this usually corresponds to a period in which the cash hog market itself seasonally moves higher. Similarly, there has been a tendency for hog basis to strengthen after Labor Day into late October. It is also interesting to note that this corresponds to a period where seasonally the cash hog market tends to move lower. While not always the case, it is not uncommon for basis and price to move in opposite directions. This helps illustrate why it is optimal to separate the two components in managing price, and manage the associated risks of basis and price separately as well.

As you may have already contemplated, because there are seasonal basis patterns, there are also seasonal patterns to futures spreads. This is logical as the two are related to one another. In managing a basis risk using futures spreads, it is helpful to be aware of these seasonal tendencies when it comes to timing both the implementation and removal of these hedges. In a previous example, we looked at using a bear spread to hedge against a decline in basis for 4Q Hogs. This consisted of selling December futures and buying February futures. The following chart illustrates the 15-year seasonal pattern of that futures spread:

Some data provided by Prophetfinance.com

Current Market

15 Year Pattern

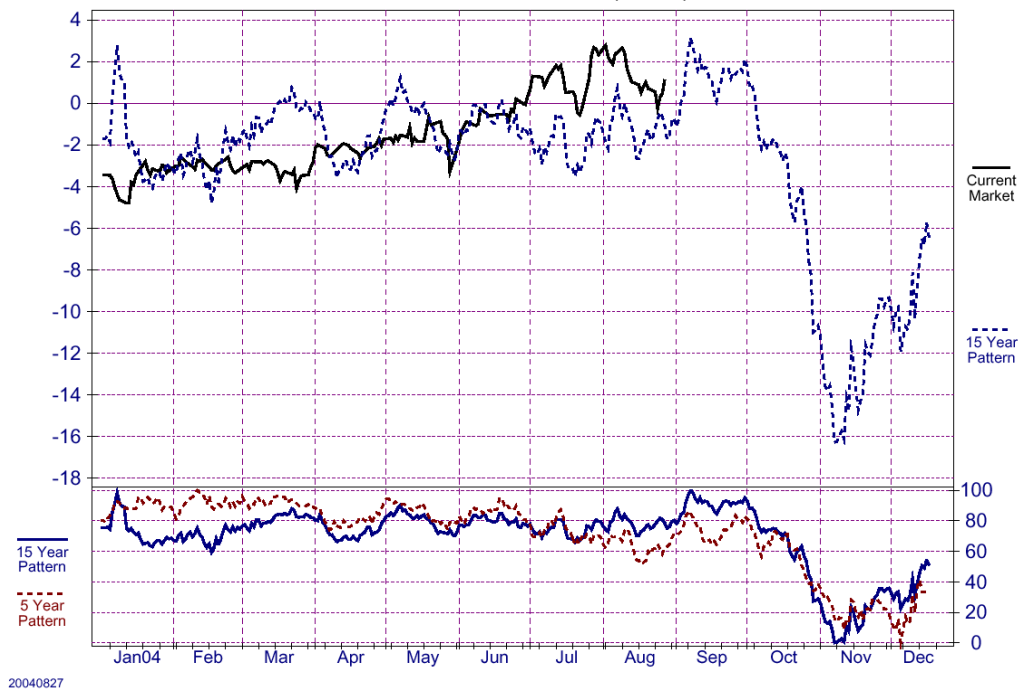15 Year Pattern

5 Year Pattern

Chart provided courtesy of Moore Research Center, Inc. www.mrci.com

One can see from the above chart that there is a very strong seasonal tendency for December futures to begin losing ground relative to February futures through the month of October into early November.

Executing a Futures Spread as a Basis Hedge for Hogs:

Now let us assume that it is early September and we are considering a forward basis quote from our packer for hogs to be delivered during the middle of November. Let us further assume that the forward offer from our packer is quite weak compared to the current spot quote, and consequently, we do not want to lock this level in. We remain concerned that basis values in 2 months time could be considerably weaker than where they are presently in the spot market, and we wish to protect ourselves from this basis risk. As an alternative to locking in the forward basis offered by our packer, we could initiate a *bear spread,* selling December futures and buying February futures simultaneously. Remember, this is independent from any price hedge we may have in place to protect lower 4Q hog values – we are only addressing the basis risk component of the hogs to be delivered during this time frame.

When executing a spread order, we typically specify the *premium* at which we wish to initiate the position. Continuing with the previous example, let us assume the following futures values for both the December and February hog futures contracts:

December: $62.00/cwt.
February: $60.00/cwt.

We wish to go ahead with this basis hedge and initiate the bear spread. We could simply enter an order at the market to sell December hogs and buy February hogs; however, if we wish to guarantee no worse than the differential between the two contracts we witness above then the order would be entered as follows:

Sell 10 December Hogs and Buy 10 February Hogs at $2.00 premium to the December sell side. Generally speaking, when placing a limit order on a spread, we specify the price by looking at which contract is trading at a premium to the other and stating the differential based on that premium. Assuming the prices were reversed (December trading at $60.00 and February trading at $62.00), the order would read as follows: Sell 10 December Hogs and Buy 10 February Hogs at $2.00 premium to the February buy side.

The most important thing to keep in mind when executing a spread is which contract to sell versus which to buy. To execute a *bear spread*, we would be *selling* a contract with a *nearby expiration* and *buying* a contract with a *deferred expiration.* To execute a *bull spread*, we would be *buying* a contract with a *nearby expiration* and *selling* a contract with a *deferred expiration.*

Continuing with the above example, let us assume that we go ahead with the bear spread and now have the following position in our spread account for basis hedges:

Short 10 December Hogs @ $62.00/cwt.
Long 10 February Hogs @ $60.00/cwt.

Also, let's assume that it is early September and our current spot basis for hogs is option price (we can sell our hogs at parity to October futures). Now let's advance the clock ahead 9 weeks and assume it is mid-November. We observe the following spot basis for hogs and futures prices in the marketplace:

December Hog Futures:	$56.00/cwt.
February Hog Futures:	$58.00/cwt.
Spot Basis for Cash Hogs:	$6.00/cwt. under December futures

We sell our hogs to the packer at $6.00/cwt. under December futures and simultaneously remove our basis hedge. To do this, we need to buy December futures and sell February futures. Again, assuming we want to assure no worse than the differential we see above, the order would be placed as follows:

Buy 10 December Hogs and Sell 10 February Hogs @ $2.00 premium to the February sell side. This order is filled and we calculate the following P&L on our basis hedge:

Sold 10 December Hogs @ $62.00/cwt., bought 10 December Hogs @ $56.00/cwt. = $6.00/cwt. gain = $24,000.

Bought 10 February Hogs @ $60.00/cwt., sold 10 February Hogs @ $58.00/cwt. = $2.00/cwt. loss = ($8,000).

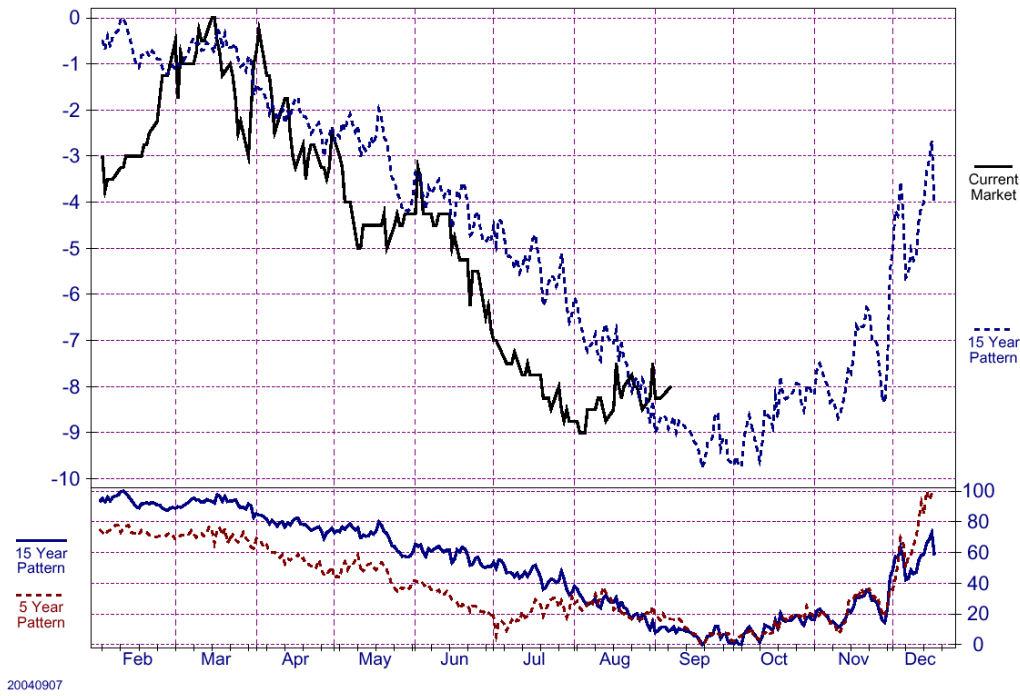Net P&L = $6.00/cwt. gain - $2.00/cwt. loss = $4.00/cwt. gain = $16,000.

Now let us look at the cash market side of the ledger. When we executed our bear spread in early September, spot hog basis was trading at parity to the board. When we offset our bear spread in mid-November, the spot basis had weakened to $6.00 under the board. The spread thus was effective in protecting $4.00/cwt. out of a total $6.00/cwt. drop in basis levels. It is important to note that even though the spread made money ($4.00/cwt.), we are actually worse off by $2.00/cwt. because the basis weakened by more than what the futures spread gained. Again, the objective is not to make money on the spread, but to protect an adverse move in the basis.

It is also important to remember that this $4.00/cwt. gain on the bear spread is only protecting any weakness in basis over a given time frame. If we had no price protection on during this period, there would have been another $6.00/cwt. opportunity cost in the loss on December futures during this period between early September and mid-November referencing the prices above. A separate hedge would have been needed to address this risk component, either in the form of a hedge-to-arrive contract with the packer, a short futures position, a long put option or some type of option spread that would protect hog prices in a declining market.

Executing a Futures Spread as a Basis Hedge for Corn:

Now let's consider an example as a long hedger (one who is short the physical commodity in the cash market). We are coming into harvest and are concerned that corn basis may strengthen in our local market, even if futures are moving lower as additional supply fills the cash pipeline. Just as in the previous example with hogs, we are interested in protecting our price exposure on the basis component of this open market risk; however, we are not satisfied with the forward basis offer we receive from our local elevator to lock in a basis for corn to be picked up in late November. As an alternative to locking in this forward basis offer from our elevator, we could initiate a *bull spread*, which will consist of buying December futures and selling March futures. The following chart illustrates the 15-year seasonal pattern of that futures spread:

Chart provided courtesy of Moore Research Center, Inc. www.mrci.com

Just as we observed seasonality in the previous hog spread example, one can see from the above chart that there is a strong seasonal tendency for December corn to begin gaining on March corn from late September into mid December. Continuing on with the hedge example, let us assume that it is late September and we witness the following prices in the marketplace:

December Corn Futures:	$2.30/bu.
March Corn Futures:	$2.39/bu.
Spot Basis for Cash Corn:	$0.15/bu. under December futures

We decide to go ahead with the bull spread to protect basis risk on corn. Like the hog example, we could simply place an order to buy December futures and sell March futures; however, if we wish to guarantee no worse than the differential we see above, then the order would be entered as follows:

Buy 10 December Corn and sell 10 March Corn at 9 cents to the March sell side. Again, just as was the case in the hog spread example, we specify the limit price in placing the spread order by looking at which contract is trading at a premium to the other and stating the differential based on that premium. Remember, in executing a *bull spread*, we are *buying* a contract with a *nearby expiration* (in this case the December) and *selling* a contract with a *deferred expiration* (in this case the March). Continuing with the above example, let us assume that we go ahead with the bull spread and now have the following position in our spread account for basis hedges:

Long 10 December Corn @ $2.30/bu.
Short 10 March Corn @ $2.39/bu.

Also, let's assume that it is late September and our current spot basis for corn is $0.15/bu. under December futures. Now let's advance the clock ahead 2 months and assume it is late November. We observe the following spot basis for cash corn and futures prices in the marketplace:

December Corn Futures:	$2.45/bu.
March Corn Futures:	$2.50/bu.
Spot Basis for Cash Corn:	$0.09/bu. under December futures

We purchase our corn from the local elevator at $0.09/bu. under December futures and simultaneously remove our basis hedge. To do this, we need to sell December futures and buy March futures. Again, assuming we want to assure no worse than the differential we see above, the order would be placed as follows:

Sell 10 December Corn and Buy 10 March Corn @ $0.05 premium to the March buy side. This order is filled and we calculate the following P&L on our basis hedge:

Bought 10 December Corn @ $2.30/bu., sold 10 December Corn @ $2.45/bu. = $0.15/bu. gain = $7,500.

Sold 10 March Corn @ $2.39/bu., bought 10 March Corn @ $2.50/bu. = $0.11/bu. loss = ($5,500).

Net P&L = $0.15/bu. gain - $0.11/bu. loss = $0.04/bu. gain = $2,000.

Now let us compare this to the cash market side of the ledger. When we executed our bull spread in late September, spot corn basis was trading at $0.15/bu. under December futures. When we offset our bull spread in late November, the spot basis had strengthened to $0.09/bu. under December futures. The spread thus was effective in protecting $0.04/bu. out of a total $0.06/bu. increase in basis levels. It is important to note that even though the spread made money ($0.04/bu.), we are actually worse off by $0.02/bu. because the basis strengthened by more than what the futures spread gained. Again, just as in the hog example previously, the objective is not to make money on the spread, but to protect an adverse move in the basis.

It is also important to remember that this $0.04/bu. gain on the bull spread is only protecting any strengthening in basis over a given time frame. If we had no price protection on during this period, there would have been another $0.15/bu. opportunity cost in the gain on December futures during this period between late September and late November referencing the prices above. A separate hedge would have been needed to address this risk component, either in the form of a hedge-to-arrive contract with the elevator, a long futures position, a long call, or some type of option spread that would protect corn prices in a rising market.

Executing a Futures Spread as a Basis Hedge for Meal:

Similar to corn, as a long hedger who is exposed to higher prices in soybean meal, we are also exposed to the potential of a stronger basis which can likewise be addressed with a bull spread. Keeping with the same general time frame we have been referencing, let us assume that we are in late September and concerned that meal basis will strengthen over the next 2 months. We request a forward basis quote from our local soybean processor; however, we are discouraged from locking it in as it is being quoted at a significant premium relative to spot basis levels. As an alternative, we can execute a bull spread, which will consist of buying December soymeal futures and selling January soymeal futures. The chart below illustrates the 15-year seasonal pattern of that futures spread:
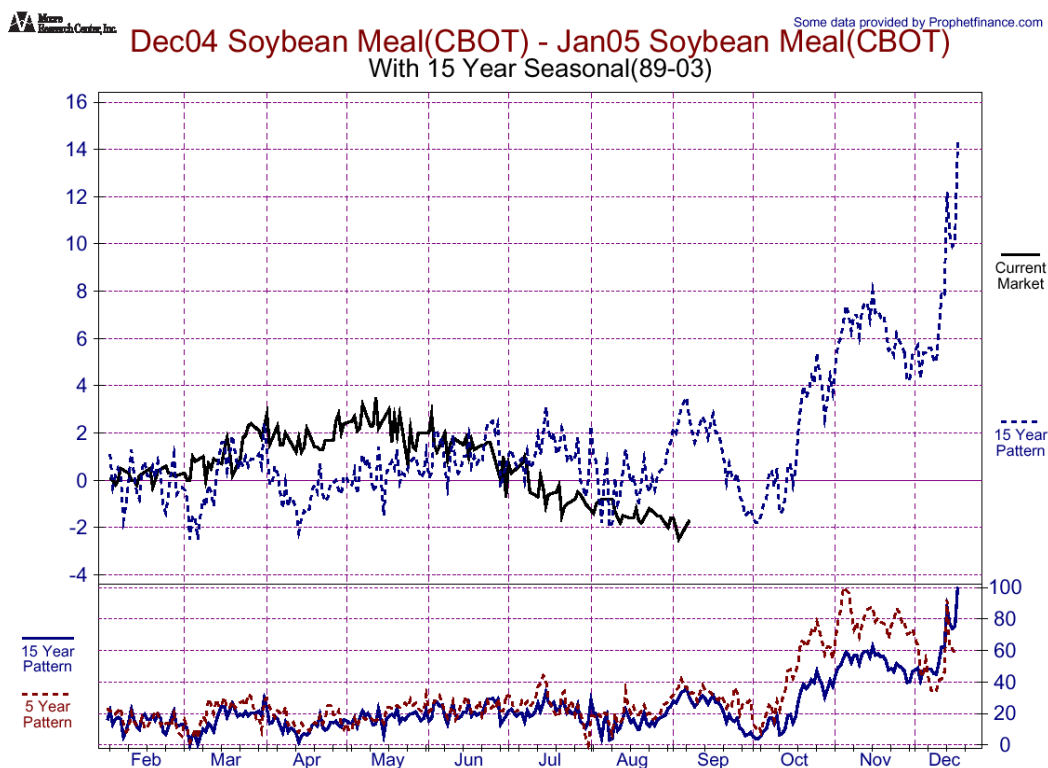

Chart provided courtesy of Moore Research Center, Inc. www.mrci.com

Again we can see the seasonality of this spread just as we observed in the corn, with a strong tendency for the December contract to begin gaining on January in late September through mid December. Let us again assume that it is late September and we witness the following prices in the marketplace:

December Meal Futures:	$170.00/ton
January Meal Futures:	$172.00/ton
Spot Basis for Cash Meal:	$10.00/ton over December futures

We decide to go ahead with the bull spread to protect basis risk on soymeal. To assure a limit price of no worse than the differential we see above, we would place an order as follows:

Buy 1 December Soymeal and sell 1 January Soymeal at $2.00 to the January sell side. The order is executed and we now have the following position in our spread account for basis hedges:

Long 1 December Meal @ $170.00/ton
Short 1 January Meal @ $172.00/ton

Now let's advance the clock ahead 2 months and assume it is late November. We observe the following spot basis for soymeal and futures prices in the marketplace:

December Meal Futures:	$198.00/ton
January Meal Futures:	$192.00/ton
Spot Basis for Cash Meal:	$20.00/ton over December futures

We purchase our soymeal from the local processor at $20.00/ton over December futures and simultaneously remove our basis hedge. To do this, we need to sell December futures and buy January futures, and place this order as follows:

Sell 1 December Meal and Buy 1 January Meal @ $6.00 premium to the December sell side. This order is filled and we calculate the following P&L on our basis hedge:

Bought 1 December Meal @ $170.00/ton, sold 1 December Meal @ $198.00/ton = $28.00/ton gain = $2,800 gain.

Sold 1 January Meal @ $172.00/ton, bought 1 January Meal @ $192.00/ton = $20.00/ton loss = ($2,000).

Net P&L = $28.00/ton gain - $20.00/ton loss = $8.00/ton gain = $800.

Now let us look at the cash market side of the ledger. When we executed our bull spread in late September, spot soymeal basis was trading at $10.00/ton over December futures. When we offset our bull spread in late November, the spot basis had strengthened to $20.00/ton over December futures. The spread thus was effective in protecting $8.00/ton out of a total $10.00/ton increase in basis levels.

Just as was the case in the corn and hog examples, while the spread made money, our overall price was worse as the spread did not cover all of the adverse basis movement against us. Also similar to the corn and hogs, without a separate price hedge in place, there would have been an additional opportunity cost in that the reference December futures price increased $28.00/ton over that time frame – increasing our net purchase price of cash soymeal by a similar amount.

One important point to emphasize on all of these basis hedge examples is the seasonality of the futures spreads. Unlike a price hedge where there is a high degree of correlation between the cash price and the futures price, there is not as high a correlation between local cash basis variation and variation in the associated futures spreads. Because of this, it is often optimal to time the implementation and removal of these futures spreads with the seasonal tendencies, *not necessarily with setting the basis in the local market.*

Please contact us directly for further explanation and specific applications addressing your basis exposure.

All futures spread charts were provided courtesy of Moore Research Center, Inc. For more information on the seasonality of these spreads, and/or to subscribe please visit: www.mrci.com.