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How Much Money Can We Lose in Grain Markets?

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Market Report	Yr Ago	4 Wks Ago	2/7/14
Livestock and Products,			
Weekly Average Nebraska Slaughter			
Steers, 35-65% Choice, Live Weight	$124.27	$140.46	$140.48
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb.	169.76	211.23	209.49
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb.	142.93	172.88	169.22
Choice Boxed Beef, 600-750 lb. Carcass	183.31	210.00	216.30
Western Corn Belt Base Hog Price Carcass, Negotiated	84.77	77.18	82.97
Pork Carcass Cutout, 185 lb. Carcass, 51-52% Lean	82.44	83.33	90.15
Slaughter Lambs, Ch. & Pr., Heavy, Wooled, South Dakota, Direct	107.50	159.00	160.25
National Carcass Lamb Cutout, FOB	296.00	368.54	369.43
Crops,			
Daily Spot Prices			
Wheat, No. 1, H.W. Imperial, bu.	7.39	5.96	6.19
Corn, No. 2, Yellow Nebraska City, bu.	7.15	4.21	4.27
Soybeans, No. 1, Yellow Nebraska City, bu.	14.32	12.86	13.08
Grain Sorghum, No. 2, Yellow Dorchester, cwt.	12.00	7.30	7.48
Oats, No. 2, Heavy Minneapolis, MN , bu.	4.10	4.21	4.30
Feed			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton.	247.50	+	+
Alfalfa, Large Rounds, Good Platte Valley, ton.	230.00	130.00	130.00
Grass Hay, Large Rounds, Good Nebraska, ton.	212.50	107.50	107.50
Dried Distillers Grains, 10% Moisture, Nebraska Average.	284.00	177.50	185.00
Wet Distillers Grains, 65-70% Moisture, Nebraska Average.	108.00	62.50	61.00

+ No Market

Price risk in the soybean and corn markets was discussed in this newsletter last December (*Cornhusker Economics*, 12/04/2013 and 12/11/2013). Now we'll follow up with a discussion about another way to measure risk in commodity markets. This measure essentially tries to answer the question "How much money can I lose over a given period of time?" as compared to the measures on price variability that we discussed last month.

As a quick review, let's take a look at daily nearby futures price for soybeans and corn between July 1959 and May 2013 (Figure 1 on next page), and split the sample into four periods: Aug/59-Jul/72; Aug/72-Jul/88; Aug/88-Jul/05; and Aug/05-May/13. Then let's look at percentage price changes during the same four periods (Figure 2 on next page), which are calculated as the change in price between today and yesterday, divided by yesterday's price. For example, if today's price is $4.00/bu and yesterday's price was $3.90/bu, the price change is $0.10/bu and the percentage price change is 0.10/3.90 = 0.0259 = 2.59 percent. In other words, today's price of $4.00/bu is 2.59 percent higher than yesterday's price of $3.90/bu.

We previously looked at those charts and discussed the increasing variability of corn and soybean prices over time. But since we typically think about risk as the possibility of loss, it would be useful to have a measure that indicates how much can actually be lost. Note that "loss" is a relative notion. When grain prices go down, grain sellers lose because they will receive a lower price; while grain buyers gain because they will be able to pay a lower price. When grain prices go up, grain sellers gain because they will receive a higher price; while grain buyers lose because they will have to pay a higher price. Here we will focus on grain sellers (producers), so losses are associated with prices going down.

Two of the most popular risk measures related to potential losses are the Value-at-Risk (VaR) and Expected

Shortfall (ES). The VaR shows the maximum loss for a given probability during a certain period of time. In Figure 3 (on next page) we set the probability at 99 percent for a one-day period and calculate VaR based on daily price changes in corn and soybean markets. The VaR of -5.62 percent for corn in Aug/05-May/13 means that there was a 99 percent chance that the daily price change in the corn market would not exceed -5.62 percent, i.e., prices would not drop more than -5.62 percent in 99 out of 100 days during that period. The VaR is often thought of as the estimated worst-case scenario for a given probability. A daily VaR of -5.62 percent with 99 percent probability estimates that the worst daily loss we can have is 5.62 percent in 99 out of 100 days.

A natural follow-up question is: how much can we lose in that one day (out of 100 days), when prices drop more than 5.62 percent? The ES answers this question by showing us the average price change when the market goes beyond the VaR value. The ES complements the VaR, and both measures can be used together. Figure 4 (on next page) shows the estimated ES, following up on the VaR calculations in Figure 3. In Aug/05-May/13 the ES for corn was -6.89 percent, while its VaR was -5.62 percent. This means that, in the one percent of the days when corn prices dropped more than the VaR estimated, the average price change was -6.89 percent.

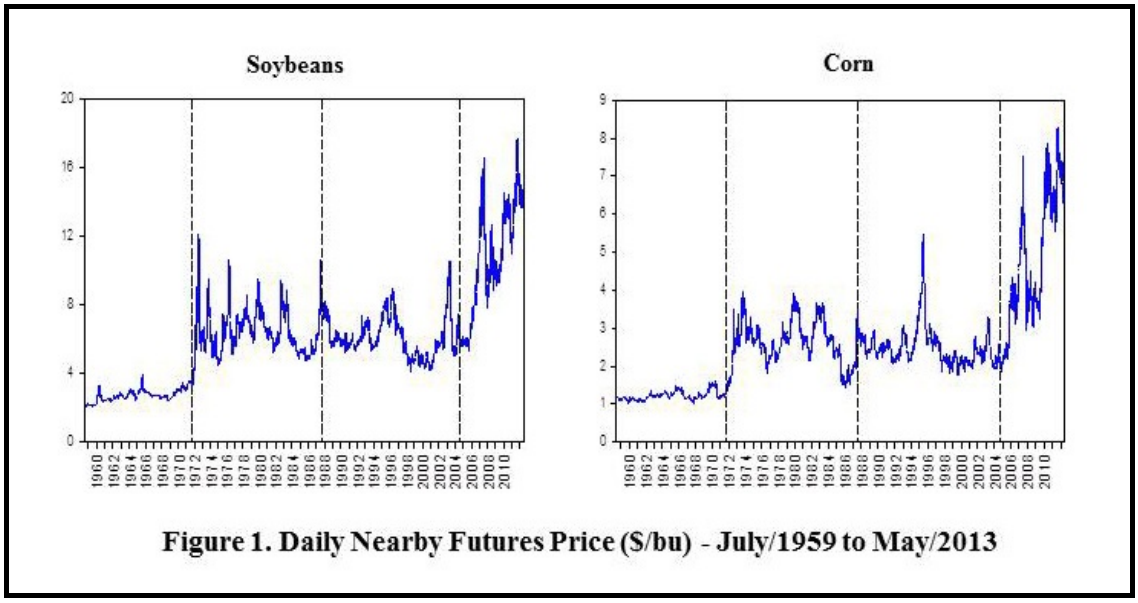

Figure 1. Daily Nearby Futures Price ($/bu) - July/1959 to May/2013

Based on the observed distributions of corn and soybean price changes, Figures 3 and 4 show that potential losses have increased in recent years. The VaR numbers in Aug/05-May/13 are larger than in previous periods. Similarly, the magnitude of the ES, if those thresholds were breached, has also increased in recent years. Still, thinking from a sellers perspective, the implication is that corn and soybean markets have become exposed to larger negative price changes (i.e., possibility of larger losses), which is consistent with our previous discussion that volatility has increased. So, while volatility can tell us about variability in prices, VaR and ES allows us to quantify how much can actually be lost.

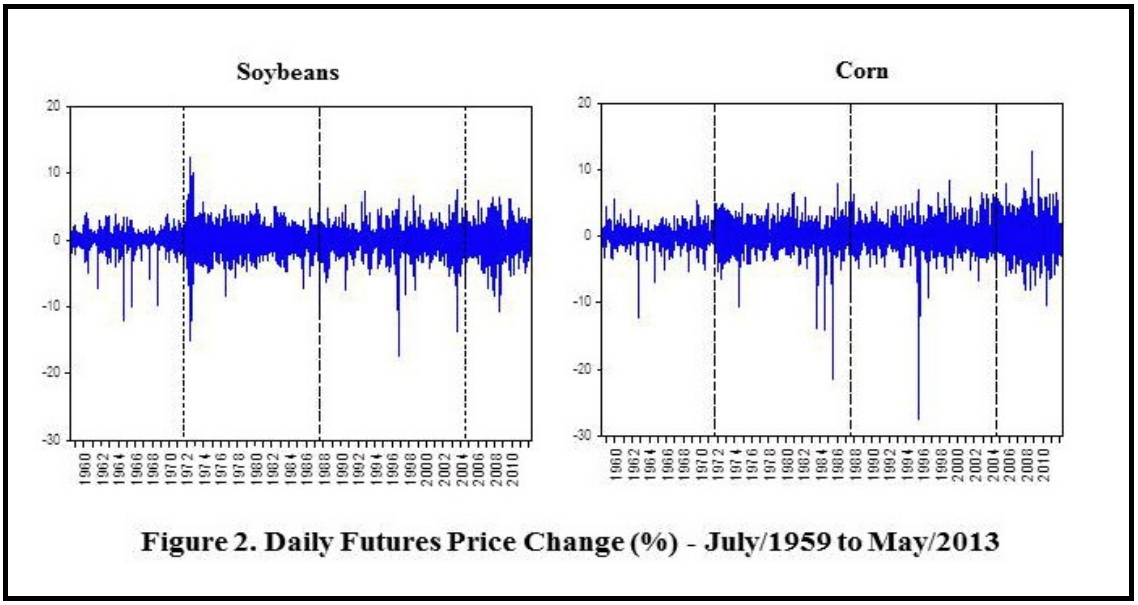

Figure 2. Daily Futures Price Change (%) - July/1959 to May/2013

Putting these numbers in perspective, what do they represent for today's markets? Let's think about a corn price around $4.30/bu and consider a daily VaR and ES of -5.62 percent and -6.89 percent (with 99 percent probability), respectively. Based on those numbers, the largest drop in corn prices would be $0.24/bu in 99 out of 100 days. In those days when prices fall more than that, the average drop would be $0.30/bu. Now let's repeat this exercise for soybeans, thinking about a soybean price around $13.00/bu and consider a daily VaR and ES of -5.14 percent and -7.46 percent (with 99 percent probability), respectively. Based on those numbers, the largest drop in soybean prices would be

$0.67/bu in 99 out of 100 days. In those days when prices fall more than that, the average drop would be $0.97/bu.

But how much can we rely on the above exercise? Note that the calculations above are based on VaR and ES values estimated from 2005-2013 data. The above exercise is useful as long as one believes that current market conditions are similar to what happened in the corn and soybean markets in 2005-2013. This raises an important issue. Historical data can be used to estimate VaR and ES for the future, allowing us to forecast how much can be lost during a certain period. However, those estimates implicitly assume that the future will be similar to the past, i.e., price behavior in the future will resemble observed price behavior during the period whose data was used in the estimates. This may be a dangerous assumption, since the behavior of prices has not been constant over time. Historical data can still be used as a reference for future volatility and other risk measures, but it is recommended to also use stress tests with the estimates. A stress test is essentially an exercise to explore what can happen if market conditions change and volatility, VaR and ES levels turn out to be larger than what was initially forecast. In a future *Cornhusker Economics* article we will get back to this point and discuss the benefits and challenges of stress tests.

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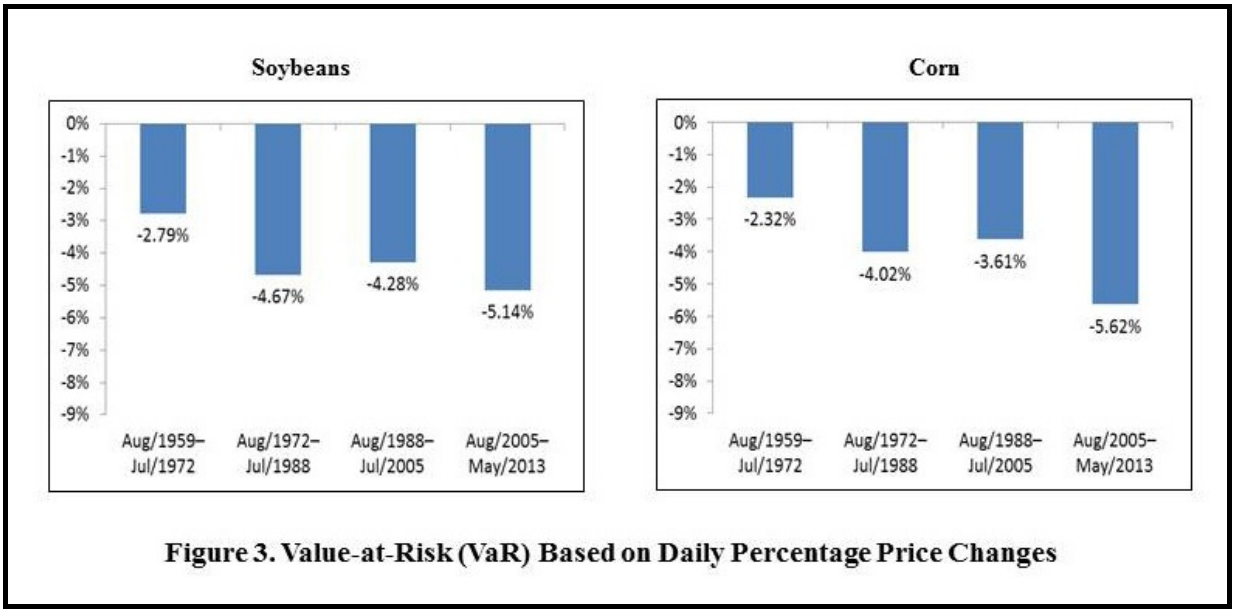

Figure 3. Value-at-Risk (VaR) Based on Daily Percentage Price Changes

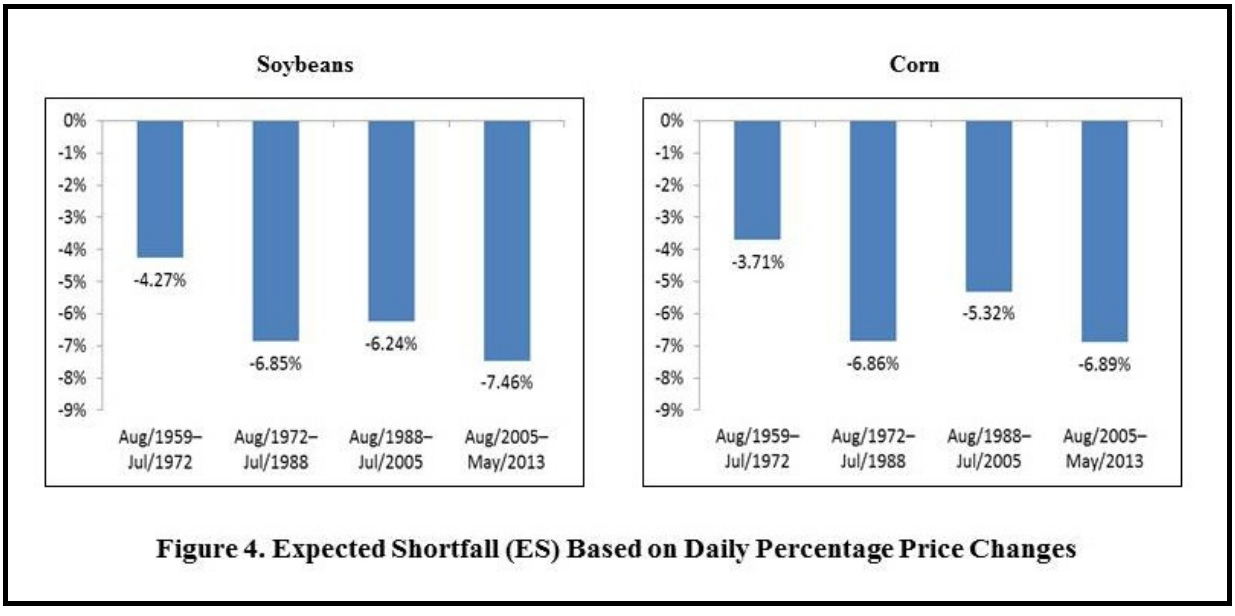

Figure 4. Expected Shortfall (ES) Based on Daily Percentage Price Changes