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More on Commodity Prices, Volatility and Risk: Is the Corn Market Becoming Riskier?

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Market Report	Yr Ago	4 Wks Ago	12/6/13
Livestock and Products, Weekly Average			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight	$123.26	$131.06	$131.48
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb.	169.63	188.29	189.26
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb.	152.33	166.56	168.55
Choice Boxed Beef, 600-750 lb. Carcass	194.49	204.47	202.65
Western Corn Belt Base Hog Price Carcass, Negotiated	79.40	82.13	77.56
Pork Carcass Cutout, 185 lb. Carcass, 51-52% Lean	84.96	93.83	89.37
Slaughter Lambs, Ch. & Pr., Heavy, Wooled, South Dakota, Direct	97.13	151.00	162.38
National Carcass Lamb Cutout, FOB	297.59	330.03	359.11
Crops, Daily Spot Prices			
Wheat, No. 1, H.W. Imperial, bu.	8.06	6.68	6.57
Corn, No. 2, Yellow Nebraska City, bu.	7.31	4.15	4.16
Soybeans, No. 1, Yellow Nebraska City, bu.	14.62	12.54	12.98
Grain Sorghum, No. 2, Yellow Dorchester, cwt.	12.29	7.18	7.32
Oats, No. 2, Heavy Minneapolis, MN , bu.	4.03	3.62	3.73
Feed			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton.	+	+	225.00
Alfalfa, Large Rounds, Good Platte Valley, ton.	215.00	140.00	135.00
Grass Hay, Large Rounds, Good Nebraska, ton.	215.00	115.00	115.00
Dried Distillers Grains, 10% Moisture, Nebraska Average.	282.50	205.00	220.00
Wet Distillers Grains, 65-70% Moisture, Nebraska Average.	104.25	60.00	61.00

+ No Market

In last week's *Cornhusker Economics* newsletter (12/04/2013), we discussed price risk in the soybean market. This week, we are following up with a discussion about volatility and risk in the corn market. Again, let us begin by looking at daily nearby futures prices for corn between July 1959 and May 2013 (Figure 1, on next page), and split the sample into four periods for our analysis: Aug/59–Jul/72, Aug/72–Jul/88, Aug/88–Jul/05 and Aug/05–May/13.

Since volatility is often discussed in terms of how much prices are changing, we will talk about percentage price changes instead of price levels. Percentage price changes 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. Figure 2 (on next page), shows daily percentage price changes for corn between July 1959 and May 2013, also divided into four periods.

As a quick review, volatility is often represented by the standard deviation of percentage price changes over a certain period of time, so it measures how much percentage price changes deviate from the average of the period. Figure 3 (on next page), shows the calculated volatility (standard deviation) of percentage price changes in each of the four periods in our sample. In the most recent time period (Aug/05–May/13), percentage price changes in the corn market indeed showed the highest volatility compared to the previous time periods. These numbers suggest that in the last eight years, the corn

market has been through the most volatile period since 1959. But does it also mean the corn market has recently been experiencing the highest levels of risk since 1959?

As we discussed last week, when we think about risk what typically comes to mind is the notion of loss. There is evidence in behavioral research that individuals normally think about risk as the failure to achieve a certain goal, while returns beyond that goal are seen as profit opportunities. But this is not the way that volatility is calculated. Volatility is based on the standard deviation, which takes into account all deviations from the average during a period of time. Therefore, there is high volatility if either upside deviations or downside deviations are large. Even though the possibility of losses is not necessarily affected by both types of deviations, using volatility as a measure of risk implies that both the failure to achieve a certain goal and the possibility of doing better than that goal are considered in the calculation of risk.

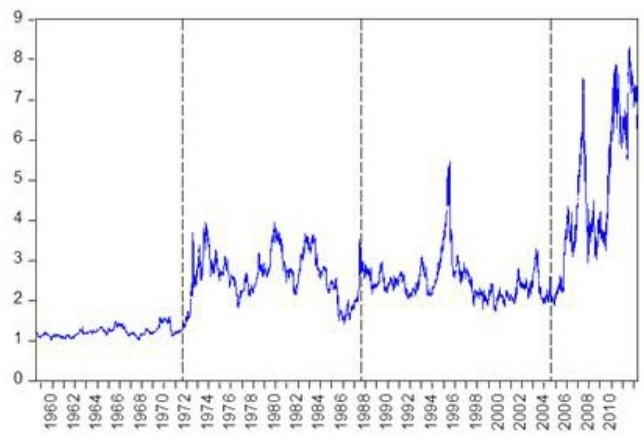

Figure 1. Corn Nearby Futures Price ($/bu) – July/1959 to May/2013

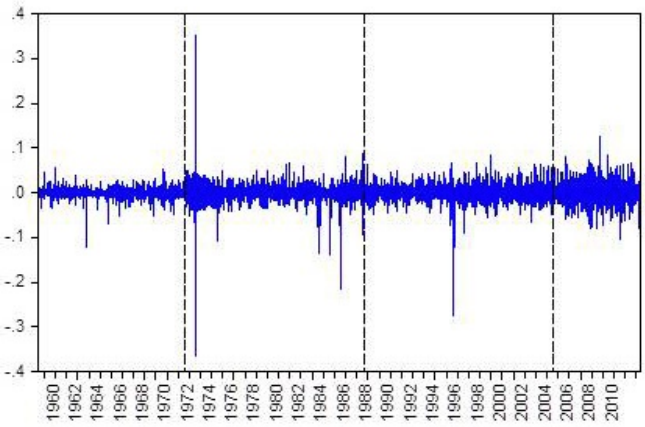

Figure 2. Corn Percentage Daily Price Changes – July/1959 to May/2013

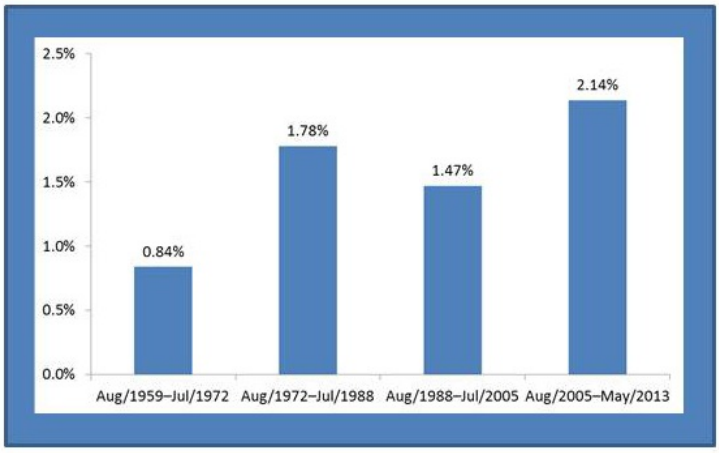

Figure 3. Volatility (Standard Deviation) for Corn Percentage Price Changes

Volatility would be more properly used as a measure of variability. When we say the corn market has reached a historically high level of volatility in the last eight years, it means that there has been larger dispersion in percentage price prices. This suggests a larger magnitude of downside percentage price changes, and also a larger magnitude of upside percentage price changes (recall that larger volatility implies more chances of losing, but also more profit potential). This leads to another issue that we discussed last week: volatility as a risk measure can be misleading if the distribution of percentage price changes is asymmetric (i.e., if there are more chances to make a profit than a loss, or vice-versa). So it is worth exploring how percentage price changes in the corn market have been distributed over time. In Figure 4 (on last page), we split the percentage price changes into positive and negative values. How many days exhibited positive and negative percentage price changes in each period were then counted. For example, in Aug/05–May/13 there were 436 days with positive percentage price changes, and 409 days with negative percentage price changes between zero and 0.99 percent. The charts in Figure 4 show that for each interval of percentage price changes, in general there has been relatively more days with positive changes in price. The exceptions are the 1 to 1.99 percent and 2 to 2.99 percent intervals in Aug/1988–Jul/2005 (when there were more days with negative rather than

positive price changes), and the interval above five percent for the other three periods.

This last observation raises the point of extreme percentage price changes. As can be seen in Figure 4, percentage price changes above five percent are much less frequent than percentage price changes below five percent. However, considering their magnitude, they are also important. Using the same example as last week, would a business be better off by losing money in 20 days, or by losing money in only one day during a certain time period? Now, what if the loss in each of those 20 days was $1,000 (for a total loss of $20,000 in 20 days) while the loss in that single day was $100,000? The frequency of losses is certainly important, but so is the magnitude of those losses. We can see in Figure 4 that the number of days with percentage price changes greater than five percent has increased over time, particularly in the last few years (Aug/2005–May/2013). It becomes even more significant if we notice that there were 1,966 business days in Aug/2005–May/2013, which is less than in the previous three periods. Still, there were more days with percentage price changes greater than five percent in Aug/2005–May/2013, than in any other period. That means the frequency of extreme price changes has increased in recent years.

The purpose of this newsletter is to follow up on last week's discussion about different ways to measure price risk, but this time focusing on the corn market. The main points from the analysis are summarized below.

- There are many ways to measure and think about price risk.
- Volatility shows price variability, which implies both profit potential and chance of losses.
- Looking at historical price changes divided into positive and negative values provides a more complete picture of the frequency and magnitude of profit potential and chances of loss.
- Positive percentage price changes have generally been more frequent than negative percentage price changes, except for percentage price changes greater than five percent.
- Extreme price changes (greater than five percent) have become proportionally more common in recent years in the corn market.

In a future edition of *Cornhusker Economics* we will discuss other ways to measure price risk, and talk more about the importance and procedures of stress tests as a tool to assess potential risks, especially in extreme market conditions.

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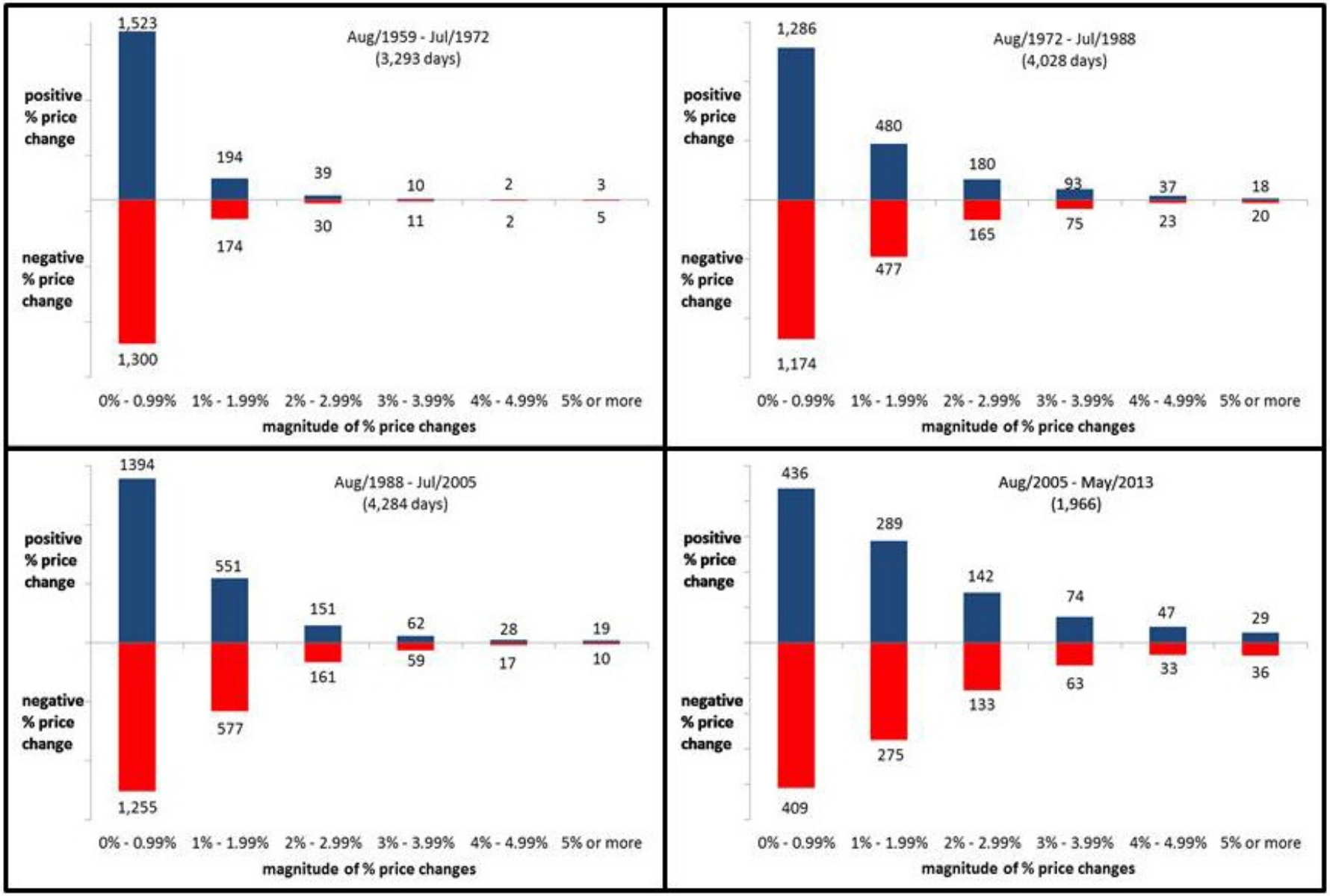

Figure 4. Number of Days with Positive and Negative Percentage Price Changes