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# The Importance of Reference Prices in Decision Making: An Application to Commodity Marketing

Fabio Mattos

*University of Nebraska-Lincoln*, [fmattos@unl.edu](mailto:fmattos@unl.edu)

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# Cornhusker Economics

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## The Importance of Reference Prices in Decision Making: An Application to Commodity Marketing

Market Report	Year Ago	4 Wks Ago	4-24-15
<b><u>Livestock and Products,</u></b>			
<b><u>Weekly Average</u></b>			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight. . . . .	146.67	163.11	158.63
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb. . . . .	*	277.73	284.70
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb. . . . .	*	218.88	229.80
Choice Boxed Beef, 600-750 lb. Carcass. . . . .	231.91	246.04	259.20
Western Corn Belt Base Hog Price Carcass, Negotiated. . . . .	115.42	57.61	64.57
Pork Carcass Cutout, 185 lb. Carcass 51-52% Lean. . . . .	116.27	67.78	67.83
Slaughter Lambs, woolled and shorn, 135-165 lb. National. . . . .	146.00	145.67	137.67
National Carcass Lamb Cutout FOB. . . . .	374.46	367.44	361.53
<b><u>Crops,</u></b>			
<b><u>Daily Spot Prices</u></b>			
Wheat, No. 1, H.W. Imperial, bu. . . . .	7.11	6.19	4.52
Corn, No. 2, Yellow Nebraska City, bu. . . . .	4.85	3.69	3.51
Soybeans, No. 1, Yellow Nebraska City, bu. . . . .	14.78	9.29	9.45
Grain Sorghum, No.2, Yellow Dorchester, cwt. . . . .	8.52	7.41	7.41
Oats, No. 2, Heavy Minneapolis, Mn, bu. . . . .	4.48	3.14	2.76
<b><u>Feed</u></b>			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton. . . . .	190.00	200.00	190.00
Alfalfa, Large Rounds, Good Platte Valley, ton. . . . .	115.00	77.50	72.50
Grass Hay, Large Rounds, Good Nebraska, ton. . . . .	102.50	105.00	120.00
Dried Distillers Grains, 10% Moisture Nebraska Average. . . . .	235.00	172.50	178.00
Wet Distillers Grains, 65-70% Moisture Nebraska Average. . . . .	68.00	55.50	58.00
<b>* No Market</b>			<b>+</b>

When we are selling something, we evaluate market prices by comparing them to some reference price that we have in mind. This comparison gives us an idea of whether a certain price is “good” or “bad”. For example, if I am a corn producer and had a chance to sell corn for \$4.20/bu a few months ago and now I can sell it only for \$3.50/bu, it might feel like the current price is “bad” because I am comparing it with a higher price that would have allowed me to make more money. On the other hand, if my break-even price is \$3.40/bu, then it might feel like the current price is “good” because I can still make a profit by selling above my break-even level.

The distinction between “good” and “bad” prices is often associated with the notion of gains and losses. Selling corn at \$3.50/bu when I could have sold at \$4.20/bu feels like a loss because I missed the chance to make an extra \$0.70/bu. Conversely, selling at \$3.50/bu can feel like a gain since I am still receiving a price above my break-even level. This discussion is important because our behavior can change depending on whether we are dealing with gains or losses.

Psychologists Amos Tversky and Daniel Kahneman were the first researchers who systematically investigated how we make decisions based on reference points and how our behavior changes as we face gains or losses. Kahneman eventually received the Nobel Prize in Economics for his work in this area (Tversky was not considered for the prize because he had already died). Their gen-

eral findings can be illustrated by a simple, yet powerful, experiment (Table 1). Participants were asked to choose between two investment strategies. First they were given two strategies involving gains: in A they would have a certain gain of \$240, while in B they could gain either \$1,000 (25% probability) or nothing (75% probability). The same participants were asked to make similar choices in the second part of the experiment, but then Strategy A would give them a certain loss of \$750, while in Strategy B they could lose either \$1,000 (75% probability) or nothing (25% probability).

Table 1. Decision-making Experiment

Part 1: Investment decision involving gains	Part 2: Investment decision involving losses
Strategy A: sure gain of \$240	Strategy A: sure loss of \$750
Strategy B: 25% chance of making \$1,000 75% chance of making nothing	Strategy B: 75% chance of losing \$1,000 25% chance of losing nothing

This experiment, applied to different situations and with some variations, was conducted with thousands of people and often provided the same general result. In Part 1, most participants would choose Strategy A, a guaranteed sure gain. They would not be willing to take the risk of making nothing for a chance to make more money. On the other hand, in Part 2 most participants would choose Strategy B, indicating that they would be willing to take more risks when facing losses. The majority of participants would prefer to take the risk of losing even more money for a chance to lose nothing.

These findings suggest that we tend to be more cautious when faced with gains and more prone to take risks when faced with losses. In other words, we are generally quick to guarantee a gain and reluctant to accept a loss. As Amos Tversky put it, “It is not so much that people hate uncertainty – but rather, they hate losing”. Further developments from neuroscience research have actually found that the human brain processes financial losses in the same areas that respond to mortal danger.

Since we often make decisions by comparing possible outcomes to reference points, and our behavior can change according to our perception of gains and losses, it is important to identify how our reference points are formed and how they may change over time. In

the context of commodity marketing, this is particularly relevant because it can affect the timing of marketing decisions. Going back to the initial example, if I focus on the price of \$4.20/bu from a few months ago, I might choose not to sell my corn now because I feel I would be losing money. But if I focus on my break-even of \$3.40/bu, I might decide to sell it now and guarantee a profit. Do we actually focus on a specific piece of information or use a combination of information?

Jamie Poirier and I conducted a marketing simulation with 75 wheat farmers in Manitoba, Canada to explore these ideas. Farmers were asked to make marketing decisions every month during the marketing year (September to August). Each month they could sell any quantity of wheat (from zero to their whole crop), and they could still store their grain after the end of the marketing year. In addition, in each month of the simulation, farmers were asked to indicate their price expectation for the next month, the price at which they would sell the rest of their wheat today (which we consider as “Reference Price 1”), and the price at which they would sell the rest of their wheat in the next month (which we consider as “Reference Price 2”).

Results from this marketing simulation showed that farmers were eager to sell their grain when the current market price was above their self-reported reference price, when the market was going up and when they expected price to go down in the following month. Conversely, they were reluctant to sell their grain in the opposite situations (Table 2). These findings are not surprising, but they suggest that reference prices are relevant in marketing decisions. In the next part of the analysis, we investigated how their reference prices were formed and updated over time.

Table 2. General Findings of our Marketing Experiment

<b>Farmers were <u>eager to sell</u> when:</b>	<b>Farmers were <u>reluctant to sell</u> when:</b>
(i) market price was above their reference prices (feeling of gain)	(i) market price was below their reference prices (feeling of loss)
(ii) market was in an uptrend	(ii) market was in an downtrend
(iii) they expected price to go down	(iii) they expected price to go up

Our analysis showed that their reference prices during the simulation were positively correlated with four pieces of information: highest price of the marketing year, their price expectation for the next month, their self-reported break-even price, and the current market price. In particular, the highest price observed during the marketing year had the strongest influence on their reference prices. In addition, farmers would update their reference prices based on changes in market prices during the marketing year and their price expectations for the following month. For example, they would increase their reference prices when the market was going up and they expected the market to go up in the next month, and decrease them when the market was going down and they expected the market to go down in the next month. Interestingly, upward adjustments were twice as strong as downward adjustment, i.e. farmers would quickly increase their reference prices when the market was up, but slowly decrease their reference prices when the market was down (Figure 1).

Let us think about the implications of these results in a marketing context using the following example. I am a

corn farmer working on marketing my grain in a scenario of downward prices. As I try to decide when to sell my grain, I incorrectly calculate my break-even price and end up overestimating it i.e., I believe it is higher than it really is. I keep focusing on the highest price of the marketing season that was observed a few weeks ago, which, combined with my overestimated break-even price, puts my reference price above the current market price. Therefore, I will be reluctant to sell my grain now. Further, although the market keeps dropping, I incorrectly evaluate market conditions and believe the price will go up in the near future, which means I will reduce my reference price very slowly as the market continues going down. This scenario looks like the chart of the hypothetical downward market in Figure 1. As market prices continue falling and I keep my reference price relatively high, I will become even more reluctant to sell my grain. Eventually, I will end up selling at much lower prices compared to what I could have sold.

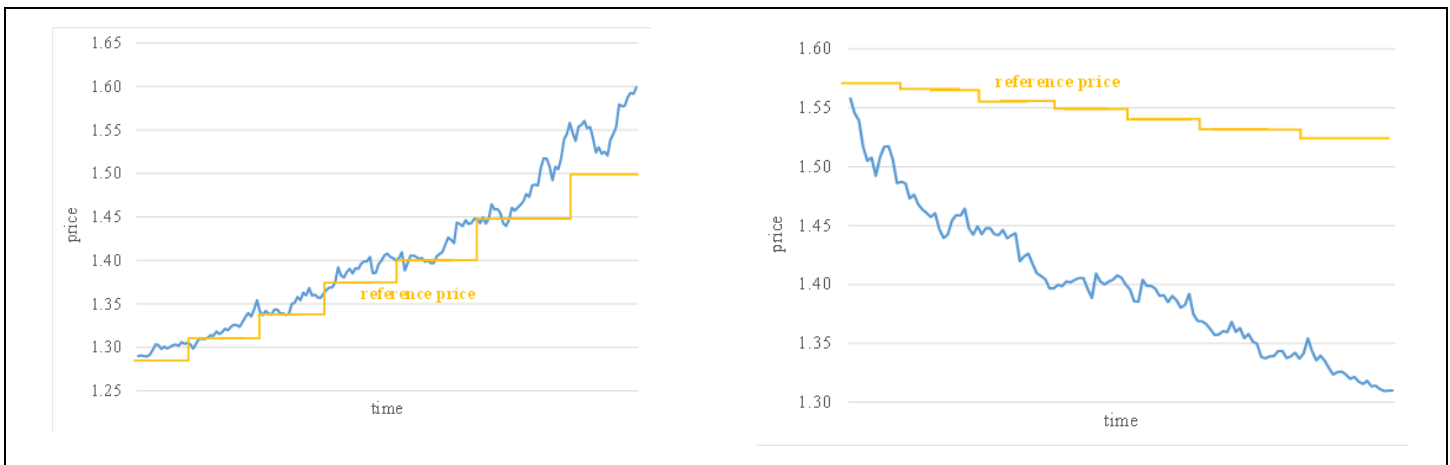


Figure 1: Example of Reference Price Adjustment When Market Is Up or Down

Two general lessons can be taken from this example. First, it is fundamental to have appropriate information on relevant variables that affect our reference prices and thus influence our marketing decisions. An accurate calculation of break-even prices is an essential starting point. In addition, we need a good outlook of commodity markets, which can be obtained with different tools such as fundamental and technical analysis (Cornhusker Economics, 11/12/2014). Second, it is important to have a plan that specifies carefully how we should act under distinct market conditions. Having a clear and detailed strategy can help us avoid “traps” such as focusing on the highest price of the season and update reference price differently in upward and downward markets. Following these lessons is not going to make marketing easy, but it can at least help us make fewer mistakes. As it is often said in sports, the winning team is the one that makes fewer

Fabio Mattos, (402) 472-1796  
Assistant Professor  
Department of Agricultural Economics  
University of Nebraska-Lincoln  
[fmattos@unl.edu](mailto:fmattos@unl.edu)