Hedging with Futures: An Experiential Learning Game

Teaching Notes

Statement of Purpose and Objectives

The purpose of the hedging game is (1) to provide a hands-on experience for students to better grasp the concept of hedging, (2) allow students to understand the mechanics of hedging, and (3) to instill a multi-year framework of hedging decisions and outcomes.

Intended Audience

This game was created for, and has been used in, courses covering futures markets. Students are typically undergraduate juniors or seniors. However, the game could easily be played with adult audiences (extension) or lower level college students.

Teaching Strategy Statement

The key concept emphasized in the game is hedging with futures contracts. The game is currently designed to be presented directly from the spreadsheet (via computer connected to a projector). Pre- and post-game questions are asked to offer objective and measurable learning outcomes.

Activity Statement

Welcome students to class. Provide the introduction and game setting (appendix A) – often this and the example crop year are covered in the lecture period immediately preceding the day of the game or via an online classroom. Next, inform the students to visit the website of the online form and to begin the survey/questionnaire, providing their name, student ID number, and to answer the preliminary questions (paper versions of the questions are easily adaptable). Ask them to pause after completing this portion of the questionnaire.

Provide the example crop year used as a practice round (appendix C and also in supplemental spreadsheet "RecordSheets" cells A1:H12) and the paper record sheet (appendix D and also in supplemental spreadsheet "RecordSheets" cells A14:H24). Explain the game using the example for the practice crop year. Display the starting page (supplemental spreadsheet "4chart-2") which shows expectations for the upcoming crop year. Explain these and how they may be used in their role as the crop producer. Then, switch to the planting period chart (supplemental spreadsheet "Plnt") which depicts the harvest period futures price since the start of the year. Inform the students that they will decide the number of futures contracts to trade at the price presented (in the example 10 contracts are shorted). Next, switch to the crop emergence period chart (supplemental spreadsheet "Emrg"). Again, inform the students that they will decide the number of futures contracts to trade at this price, but also letting them know that in reality a futures market participant can trade contracts anytime the market is open (in the example an additional 10 contracts are shorted). Switch to the mid-summer period chart (supplemental spreadsheet "midS"). As before, inform the students that they will decide the number of futures contracts to trade at this price, but once again letting them know that in reality a futures market participant can trade contracts anytime the market is open (in the example an additional 10

contracts are shorted). Finally, switch to the harvest period chart (supplemental spreadsheet "Harv"). Indicate to the students the actual outcome of yield (blue line and blue number), cash price (red dot and red number), and final futures price (orange line and orange number). Let the students know that the futures price displayed will be their offsetting price (all open futures positions are liquidated at harvest). Refer to the example record sheet which provides the calculation for revenue and profit. Ask for any questions. The most common question is, "Do I have to trade futures contracts?" The response is no, zero contracts traded is an acceptable decision.

Ask the students to continue to the next portion of the online form, which is crop year #1. At this point the students will make their own decisions with regard to futures contract positions. *{Note: Each individual instructor can choose the parameters that students must follow as they play the game. For example, as a true hedger who can only take short positions, as a cash participant who can also be short or long futures, or other potential situations specific to the setting.}* Switch back to the start page and choose a different lookup ID number (two through eighteen, excluding four which was used as the practice year), placing it in the yellow colored cell (cell B2). Follow the same steps as the example:

1. Start page
2. Planting futures chart
3. Emergence futures chart
4. Mid-summer futures chart
5. Harvest

Switch sheets slowly at the onset, allowing for time to make decisions and possibly answer questions that arise. At the end of the crop year (harvest), request that the students supply all the necessary information in the online form and to complete the paper form, then pause at the start of the next crop year.

Repeat the procedure, again, asking for questions along the way and ensuring all students are progressing together. With each subsequent crop year, it should be possible to move a little faster through each production stage.

Other Supplementary Materials

1. Introduction, Setting, and Instructions (Appendix A)
    a. Link to online introduction document: http://bit.ly/2KM5OfD
2. Pre/Post Game Questions (Appendix B)
    a. Link to online form: http://bit.ly/2Kuy32j
        - Online form is not transferable, but the questions asked and layout can be viewed and copied.
    b. Link to tabulation (Google) sheet: http://bit.ly/2XJHkY2
        - Tabulation sheet is linked to the online form such that student responses are transferred from the form to the sheet. This link will be lost for a new form. However, the setup, formulas, and calculations in the sheet could be mimicked.
3. Supplemental Spreadsheet
    a. Sheet "Corn_Cash&Fut" = nominal cash and futures price, price index calculations
    b. Sheet "Corn_adj" = index adjusted cash and futures price, basis calculations
    c. Sheet "Yld Hist" = Washington County, Nebraska corn yield history and trend adjustment outcomes
    d. Sheet "4chart-1" = organized cash prices, futures prices, and basis
    e. Sheet "4chart-2" = front page for game with expectation at planting and (hidden below) data for charts
    f. Sheet "Plnt" = harvest futures contract price from January through planting (approximately first of April)
    g. Sheet "Emrg" = harvest futures contract price from January through crop emergence (approximately end of May)
    h. Sheet "midS" = harvest futures contract price from January through mid-summer (approximately mid-July)
    i. Sheet "Harv" = harvest period information: harvest futures contract from January through harvest (approximately mid-November), actual cash price, and actual per acre corn yield
    j. Sheet "RecordSheets" = layout for the example crop year and student's printable record sheets
4. Supplemental Videos
    a. Video 1: Game Play
        - https://youtu.be/KlKe8NVEfqw
    b. Video 2: Data and Other Background Information
        - https://youtu.be/7Saj0ccbP3o
    c. Video 3: Online Student Submission Form and Tabulation Sheet
        - https://youtu.be/OvHQiUCgWBw
5. Practice Crop Year example (Appendix C)
6. Student Crop Year(s) Record Sheet (Appendix D)
7. A .pdf file with all 17 crop year charts provided

Appendix A: Game Introduction, Setting, and Instructions

[page 1]

Welcome aboard! You've just been hired as the risk manager for a 1,000 acre corn operation in Eastern Nebraska. Your primary responsibility is to make futures trading (hedging) decisions for each crop year. You will be provided expectations and norms at planting of each year (expected yield, basis, and variable cost of production).

You will make a selection regarding the number of corn futures contracts (Q = 5,000 bushels) to trade at three intervals during each growing season: planting, emergence, and mid-summer. The first three figures on next page depicts the information you will be provided at each of these intervals. Once harvest arrives, any open futures contract positions will be liquidated. The bottom right figure shows the information you will be given at harvest.

For crop year #1, you will only be allowed to take short positions (a true short hedger) during the growing season not to exceed the amount of expected corn production. For crop years #2-4 you can take short or long positions at any stage (planting, emergence, and harvest) but as noted, all open positions will be liquidated at harvest.

For example: (excluding crop year #1) You could take a long position on 8 contracts at planting (be long both cash and futures -- i.e., speculating); take a short position on 15 contracts at emergence (effectively offsetting the 8 long contracts and initiating a short position on 7 contracts); then add to your short position with 5 more contracts at mid-summer. At harvest, you would be forced to offset all open contracts by taking a long position on 7+5=12 contracts.

Go to the following link to start the process. Answer the few questions and then wait.

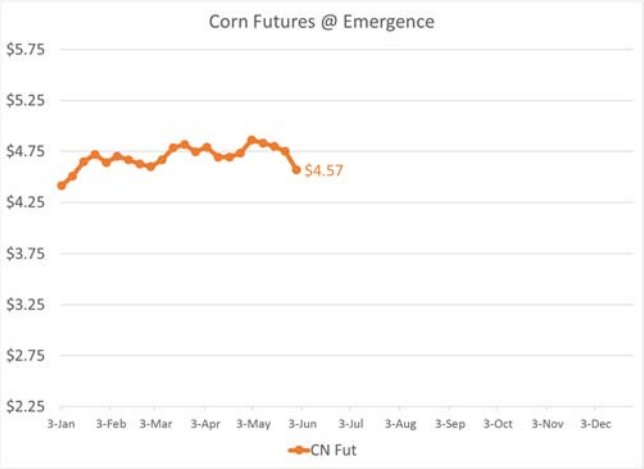
{insert link to online form (optional}

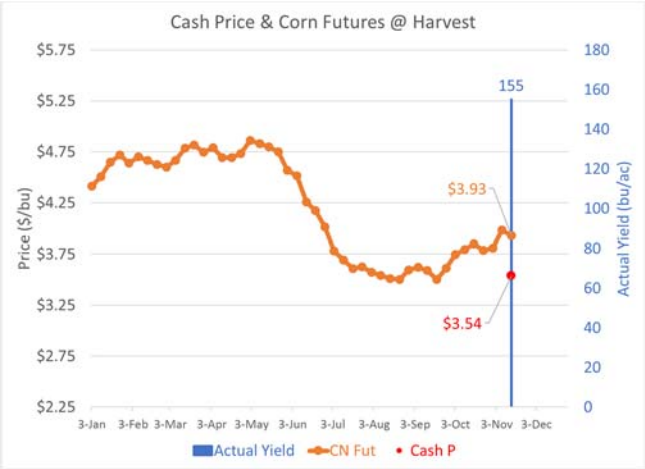
{insert QR code for online form (optional)}

[page 2]

Corn Futures @ Planting
$5.75
$5.25
$4.75
$4.25
$3.75
$3.25
$2.75
$2.25
$4.79
3-Jan 3-Feb 3-Mar 3-Apr 3-May 3-Jun 3-Jul 3-Aug 3-Sep 3-Oct 3-Nov 3-Dec
CN Fut

Corn Futures @ mid-Summer
$5.75
$5.25
$4.75
$4.25
$3.75
$3.25
$2.75
$2.25
$3.61
3-Jan 3-Feb 3-Mar 3-Apr 3-May 3-Jun 3-Jul 3-Aug 3-Sep 3-Oct 3-Nov 3-Dec
CN Fut


Corn Futures @ Emergence
$5.75
$5.25
$4.75
$4.25
$3.75
$3.25
$2.75
$2.25
$4.57
3-Jan 3-Feb 3-Mar 3-Apr 3-May 3-Jun 3-Jul 3-Aug 3-Sep 3-Oct 3-Nov 3-Dec
CN Fut


Cash Price & Corn Futures @ Harvest
Price ($/bu)
Actual Yield (bu/ac)
$5.75
$5.25
$4.75
$4.25
$3.75
$3.25
$2.75
$2.25
180
160
140
120
100
80
60
40
20
0
155
$3.93
$3.54
3-Jan 3-Feb 3-Mar 3-Apr 3-May 3-Jun 3-Jul 3-Aug 3-Sep 3-Oct 3-Nov 3-Dec
Actual Yield
CN Fut
Cash P

Appendix B: Pre/Post Student Questions

Q1. _____ A hedge can be placed…

A. … only at the end of the planning period.
B. … only at the beginning of the planning period.
C. … only at specific intervals during the planning period.
D. … at any time during the planning period.

Q2. _____ Hedging decisions of buyers/sellers CAN NOT be adjusted/altered until the end of the period.

A. True
B. False

Q3. _____ A producer who makes frequent use of futures, options, and forward contracts should have a higher expected price than a producer who always sells at harvest.

A. True
B. False

Q4. _____ Futures markets can always be used to lock in a profit.

A. True
B. False

Appendix C: Practice Crop Year Example

Name:

Crop Year:	Example	Period	# of Futures Contracts	Price	Futures Gain/Loss ($/bu)
Expected Yield:	157	Planting	-10	$4.79	$0.86
Expected Production:	157,000	Emergence	-10	$4.57	$0.64
Expected Basis:	-$0.27	mid-Summer	-10	$3.61	-$0.32
Expected Cash:	$4.26	Harvest	30	$3.93	
Cost:	$3.27				
Actual Yield:	155	Actual Cash Price:		$3.54	
Actual Production:	155,000	Actual Basis:		-$0.39	

Realized Price: [3.54*155,000]+[0.86*10*5,000]+[0.64*10*5,000]+[-0.32*10*5,000] = 548,700+43,000+32,000-16,000 = $607,700
$607,700/155,000 = $3.9206

> Realized Price=(Cash Price x Act. Prod.) + [(Planting Fut G/L) x #Con x 5000] + [(Emergence Fut G/L) x #Con x 5000] + [(mid-Summer Fut G/L) x #Con x 5000] / Act. Pr

Profit: $607,700 - [$3.27 * 155,000] = $607,700 - $506,850 = +$100,850

Appendix D: Student Record Sheet (Hardcopy)

-- Record Sheet with only futures hedging --

Crop Year:

Expected Yield:

Expected Production:

Expected Basis:

Expected Cash:

Cost:

Period	# of Futures Contracts	Price	Futures Gain/Loss ($/bu)
Planting			
Emergence			
mid-Summer			
Harvest			

Actual Yield:

Actual Cash Price:

Actual Production:

Actual Basis:

Realized Price:

> Realized Price=(Cash Price x Act. Prod.) + [(Planting Fut G/L) x #Con x 5000] + [(Emergence Fut G/L) x #Con x 5000] + [(mid-Summer Fut G/L) x #Con x 5000] / Act. Pr

Profit:

-- Record Sheet with futures and basis hedging --

Crop Year:

Expected Yield:

Expected Production:

Expected Basis:

Expected Cash:

Cost:

Period	# of Futures Contracts	Price	Futures Gain/Loss ($/bu)	Lock Basis, Y/N {= E[Basis]}	Set Futures Price (only w/ Basis Lock}
Planting					
Emergence					
mid-Summer					
Harvest					

Actual Yield:

Actual Cash Price:

Actual Production:

Actual Basis:

Realized Price:

> w/o Basis Lock: Realized Price=(Cash Price x Act. Prod.) + [(Planting Fut G/L) x #Con x 5000] + [(Emergence Fut G/L) x #Con x 5000] + [(mid-Summer Fut G/L) x #Con x 5000] / Act. Prod.

> w/ Basis Lock: Realized Price=((E[Basis]+Set Futures Price) x Act. Prod.)

Profit:

Note: For the record sheet that allows basis hedging, a student choosing to lock in the basis would commit to accepting the expected basis at planting (granted the producer could chose to lock basis at the other periods and the elevator would utilize a more current basis amount, but the learning concept is similar) and later chose the futures price associated with their basis, which determines their final cash price.