AGEC321, Fall 2011

Take-home Practice Opportunity 7

Due date: November 29, 5:00 p.m.

Hedging Price Risk with Futures Markets

1. In your own words (i.e., in a manner that you would explain it to someone who has not taken this course) explain how local price risk can be hedged using futures markets?

   Farmers typically are not interested in speculating on price changes in the futures market. They are more concerned with reducing/removing uncertainty in prices that occur in the local market, where they sell their commodities. They can use the fact that local and futures prices move in the same direction to hedge any adverse price movements in the local market. That is, if they lose money in the local market, they offset this loss by gaining money in the futures market.

2. Suppose that you are a Montana farmer growing spring wheat. You intend to sell the wheat to local elevators after it's harvested, but you don't know the price you will be quoted by the elevator at the time of sale (many things can change in the span of several months). It costs you \$5.50/bu to produce the wheat and you are only interested in earning a profit on your product (that is, you're not interested in using the futures market to speculate on prices). Respond to the following:

   (a) What position would you take in the futures market to offset local price variability risk? Why?

   You are naturally long in the local market, because if local prices go up, you win. Therefore, you need to take a short position in the futures market to offset price drops.

   (b) What is the lowest futures contract price you would need to observe in order to guarantee a per bushel profit?

   Because your costs are \$5.50/bu to produce the wheat, you need futures prices to be at least \$5.51/bu to lock in a profit.

   (c) Suppose that in May you take a position on a September futures contract that is priced at \$8.50/bu. Explain what you would do in September just before the contract expires.

In order to offset your obligations in the futures market, you must take an opposite position on a September contract in September. Therefore, you will have to go long on September futures contract in September. Then, you will be able to sell the wheat to local elevators.

(d) Assume that futures and local prices converge (are exactly the same in September). Calculate your per bushel profits *in the local* and *in the futures* markets if the price in September was one of the following (construct a table to summarize your results):

i. \$4.50/bu
ii. \$6.75/bu
iii. \$8.50/bu
iv. \$9.25/bu

Price in Sept.	\$4.50/bu	\$6.75/bu	\$8.50/bu	\$9.25/bu
Local Equity $(P - Cost)$	(\$4.50 - \$5.50) -\$1.00	(\$6.75 - \$5.50) \$1.25	(\$8.50 - \$5.50) \$3.00	(\$9.25 - \$5.50) \$3.75
Short Futures Position $(F_{Sept}^{May} - F_{Sept}^{Sept})$	(\$8.50 - \$4.50) \$4.00	(\$8.50 - \$6.75) \$1.75	(\$8.50 - \$8.50) \$0	(\$8.50 - \$9.25) –\$0.75
Total per Unit	\$2.75	\$3.00	\$3.00	\$3.00

3. (*Hedging with yield variability*) Consider the scenario in problem (2). In addition to the given information, you know that you operate a 2,500 acre farm that, on average, yields 30 bushels per acre. However, there is also yield risk, and you know that you typically observe production on 2,200 of the 2,500 acres. You are risk averse and wish to hedge as much risk as possible. Additionally, you wish to sell your wheat in November, rather than September. Respond to the following:

(a) How much wheat (in bushels) do you expect to produce?
2,200 acres × 30 bu/acre = 66,000 bushels

(b) How much wheat can you hedge using futures markets? Is there any wheat that will not be hedged?
You can only hedge 55,000 bushels because futures contracts are in 5,000 bushel increments. Therefore, 1,000 bushels will be unhedged.

(c) How many futures contracts will you need to establish?

To hedge 65,000 bushels, you will need $(65,000/5,000) = 13$ *contracts.*

(d) What position would you take in the futures market to offset local price variability risk? Why?

You are naturally long in the local market, because if prices go up, then you benefit. Therefore, you'd take a short position in the futures market to hedge adverse cash price movements.

(e) Given that you want to sell the wheat in a local market in November, which futures contract month will you choose? Why?

You would choose the nearby contract that has not yet expired. Therefore, you would choose the December futures contract.

(f) Explain what you would do just before the contract expires in order to offset your futures contract obligations.

To offset your obligations, you would take a long position on a December futures contract. Then, sell your wheat in the local market.

(g) Assume that you have enough liquid assets to cover any margin calls. Calculate your per bushel profits *in the local* and *in the futures* markets if the price in November was one of the following (construct a table to summarize your returns in the local market, the futures market, and overall):

i. Local: \$4.50/bu; Futures: \$5.25/bu
ii. Local: \$5.75/bu; Futures: \$6.20/bu
iii. Local: \$8.15/bu; Futures: \$8.50/bu
iv. Local: \$8.75/bu; Futures: \$9.25/bu

Prices in Nov.	L: \$4.50/bu F: \$5.25/bu	L: \$5.75/bu F: \$6.20/bu	L: \$8.15/bu F: \$8.50/bu	L: \$8.75/bu F: \$9.25/bu
Local Equity $(P - Cost)$	(\$4.50 - \$5.50) –\$1.00	(\$5.75 - \$5.50) \$0.25	(\$8.15 - \$5.50) \$2.65	(\$8.75 - \$5.50) \$3.25
Short Futures Position $(F_{Dec}^{April} - F_{Dec}^{Nov})$	(\$8.50 - \$5.25) \$3.25	(\$8.50 - \$6.20) \$2.30	(\$8.50 - \$8.50) \$0	(\$8.50 - \$9.25) –\$0.75
Total Local:[a] Total Futures:[b]	–\$66,000 \$211,250	\$16,500 \$149,500	\$174,900 \$0	\$214,500 –\$48,750
Total:	\$145,250	\$166,000	\$174,900	\$165,750

[a] Local revenues are calculated as the product of the price per bushel received in the local market and 66,000 bushels sold in the local market.
[b] Futures revenues are calculated as the product of the price per bushel from the futures contract and 65,000 bushels that were contracted.

4. You are a feedlot operator that purchases feeder cattle. You will purchase 2,000 head of feeders in August, and each feeder is on average 700 lbs. You will raise these cattle to a weight of 1,100 lbs. and the variable feed costs are \$0.60 per pound of weight gain. Feed acquisition has been forward contracted and, therefore, feed price will not change. It will take four months to raise the cattle to weight and you will sell them in December. Assume that all of the cattle will be raised to weight.

   You wish to hedge both the input (feeder cattle) price and the output (fed cattle) price. The current feeder cattle futures contract is trading at \$1.45/lb. and the fed cattle futures contract is trading at \$1.30/lb. You will purchase feeder cattle at a stockyard for the established price and you will sell the fed cattle to a local processing plant at the going local market price. Respond to the following:

   (a) What are the contract specifications for feeder and for fed cattle? That is, how many pounds are contracted using a futures contract?

   Feeder cattle contracts are 50,000 lbs. per contract. Fed (live) cattle contracts are 40,000 lbs. per contract.

   (b) How many pounds of fed cattle do you expect to produce with the acquired feeder cattle? What is the expected net revenue (profits) if current conditions do not change?

   You expect to produce $2,000 \times 1,100 = 2.2$ *million lbs.. The production will gross you* $2.2 \times \$1.30 = \$2.86$ *million. Your cost of acquiring feeders is*

$2,000$ head $\times$ 700 lbs./head $\times$ \$1.45/lb. = \$2.03 *million. Lastly, your cost of feed is* $2,000$ head $\times$ 400 lbs. gain/head $\times$ \$0.60/lb. = \$480,000.

Therefore, your profit is: $2.86 - (2.03 + 0.48) = \$0.35$ million = \$350,000.

(c) How much (in pounds) of the feeder cattle can you hedge? How many contracts will be required?

You will purchase 1.4 million pounds of feeders. Therefore, you can contract all of the feeders. You will need 28 futures contracts.

(d) How much (in pounds) of the fed cattle can you hedge? How many contracts will be required?

You will sell 2.2 million pounds of fed cattle. Therefore, you can contract all of the fed cattle. You will need 55 futures contracts.

(e) What positions would you take in the futures market to offset local price variability risk for feeder cattle and for fed cattle? Why?

In the feeder cattle market, you are naturally short, because if prices go up, you are adversely affected (have to pay more to acquire feeders). Therefore, you'd take a long position in the futures market for feeder cattle to hedge adverse cash price movements.

In the fed cattle market, you are naturally long, because if prices go up, you benefit (receive more money to sell feeders). Therefore, you'd take a short position in the futures market for fed cattle to hedge adverse cash price movements.

(f) Explain what you would do in just before the contracts expire in order to offset your futures contract obligations.

You would offset your long feeders contracts by going short. You would offset your short fed cattle contracts by going long.

(g) Calculate your net profits *in the local* and equity *in the futures* markets for the following price scenarios:

i. Local feeders: \$1.05/lb; Futures feeders: \$1.10/lb Local fed: \$0.95/lb; Futures fed: \$0.90/lb.

ii. Local feeders: \$1.10/lb; Futures feeders: \$1.20/lb Local fed: \$1.05/lb; Futures fed: \$1.05/lb.

iii. Local feeders: \$1.45/lb; Futures feeders: \$1.45/lb Local fed: \$1.35/lb; Futures fed: \$1.30/lb.

iv. Local feeders: \$1.55/lb; Futures feeders: \$1.60/lb Local fed: \$1.40/lb; Futures fed: \$1.25/lb.

	L fdrs: $1.05/lb L fd: $0.95/lb F fdrs: $1.10/lb F fd: $0.90/lb	L fdrs: $1.10/lb L fd: $1.05/lb F fdrs: $1.20/lb F fd: $1.05/lb	L fdrs: $1.45/lb L fd: $1.35/lb F fdrs: $1.45/lb F fd: $1.30/lb	L fdrs: $1.55/lb L fd: $1.40/lb F fdrs: $1.60/lb F fd: $1.25/lb
Costs				
Local Feeder Costs	($1.05× 2,000× 700)	($1.10× 2,000× 700)	($1.45× 2,000× 700)	($1.55× 2,000× 700)
Futures Feeder Costs	($1.45 - $1.10)× 28 × 50,000	($1.45 - $1.20)× 28 × 50,000	($1.45 - $1.45)× 28 × 50,000	($1.45 - $1.60)× 28 × 50,000
Feed Costs	$0.60 × 400 × 2,000	$0.60 × 400 × 2,000	$0.60 × 400 × 2,000	$0.60 × 400 × 2,000
Total Costs	$2.44 mil.	$2.37 mil.	$2.51 mil.	$2.44 mil.
Revenues				
Local Fed Revenues	($0.95× 2,000× 1,100)	($1.05× 2,000× 1,100)	($1.35× 2,000× 1,100)	($1.40× 2,000× 1,100)
Futures Fed Revenues	($1.30 - $0.90)× 55 × 40,000	($1.30 - $1.05)× 55 × 40,000	($1.30 - $1.30)× 55 × 40,000	($1.30 - $1.25)× 55 × 40,000
Total Revenues	$2.97 mil.	$2.86 mil.	$2.97 mil.	$3.19 mil.
Profits:	$0.53 mil.	$0.49 mil.	$0.46 mil.	$0.75 mil.