AGEC321, Fall 2011

Exam 3: Review

Review Session: December 15, 2011. Linfield Hall 109 – 6 p.m. - 7:30 p.m.

Futures Markets Concepts

In each the following scenarios, respond to the following:

- Your position in local market.
- Position in futures market needed to offset price risk.
- Margin requirement.
- Expected profit (profit that you believe you will attain).
- Actual local market profit, futures equity, total profit.
- You are a winter wheat farmer at planting time (e.g. September) who will sell the wheat after harvest in May. Your production costs are \$4.50/bu., the current price of a May futures contract is \$7.00/bu. and historical May basis is $E[B_{may}] = -0.15/bu$. You plan to plant 2,500 acres, expected a yield of 32 bushels per acre, and expect a 3% loss. In May, the price of a May futures contract is \$5.75/bu and the actual basis is $B_{may} = -0.10/bu$.

  In the local market you are naturally long, because you will own the commodity. Therefore, you will offset the long position by taking a short position in the futures market. Your expected production is:

  $$(2,500 \text{ acres} \times 32 \text{ bu/acre}) \times 97\% = 77,600 \text{ bushels}$$

  You are only able to hedge 75,000 bushels, which is $(75,000/5,000) = 15$ *contracts. Your margin requirement, therefore, is:*

  $$(15 \text{ contracts} \times 5,000 \text{ bushels/contract} \times \$7.00/\text{bu} \times 5\% = \$26,250$$

  To calculate your expected profits in May, you will need to determine the expected local price in May using the expected basis. That is:

  $$E[P_{May}] = F_{May} + E[B_{May}] = \$7.00 + (-\$0.15) = \$6.85/\text{bu}$$

$$E[Profit_{May}] = (\$6.85 \times 77,600) - (\$4.50 \times 77,600) = \$182,360$$

To calculate actual profits, you will need to determine the local, futures, and total equity as follows:

Local: $\{(\$5.75 + (-0.10)) - \$4.50\} \times 77,600 = \$89,240$

Futures: $(\$7.00 - \$5.75) \times 75,000 = \$93,750$

Total: $\$89,240 + \$93,750 = \$182,990$

- You are a grain exporter operating out of Portland, Oregon. Typically, you purchase grain from local terminals, load it on a barge, and ship it to Asia. It is December, and you plan to make a shipment of spring wheat in March, and find that the current March futures contract price is \$8.80/bu. Your transportation costs are \$1.25/bu. and you have negotiated to sell to a Japanese importer for \$12.00/bu. The historical March basis in Portland is $E[B_{march}] = 0.25/bu$ and you are planning on exporting 125,000 bushels. In March, the price of a March contract is \$9.00/bu. and the actual basis is $B_{march} = 0.20/bu$.

  Use similar steps as above to solve:

Local position:	Naturally short
Futures position:	Long contract
Margin requirement:	(25 contracts $\times$ 5,000 bushels/contract $\times$ \$8.80/bu $\times$ 5% $= \$55,000$
Expected profit:	$(\$12.00 \times 125,000) - \{(\$8.80 + \$0.25) + (\$1.25) \times 125,000)$ $= \$212,500$
Actual profits:	
Local:	$\{\$12.00 - (\$9.00 + 0.20) - \$1.25\} \times 125,000 = \$193,750$
Futures:	$(\$9.00 - \$8.80) \times 125,000 = \$25,000$
Total:	\$218,750

- You are a farmer raising hogs. You have contracted with a processing facility to sell 200,000 lbs. of lean hogs in July at \$1.10/lb. Each lean hog averages a birth weight of 15 pounds and will need to be brought up to 250 lbs. before being sold for processing. Average daily feed consumption is 4.25 pounds of soybean meal per day, which you also buy on a local market. To raise each hog, there is a \$138.5 labor cost. When you sell the hogs, you will need to replenish your feed supply for the next set of animals. Assume that this cost is immediately accounted for, so that your revenue from hog sales in July will be somewhat offset by the costs of purchasing soybean meal for the next set of hogs.

You wish to protect yourself from adverse price movements of both soybean meal and lean hogs. A July futures contract for lean hogs is in 40,000 lb. increments and is currently selling at \$0.90/lb. A July soybean meal contract is measured in 100 tons (1 ton = 2,000 lbs.) and is priced at \$3.00/ton. Assume that expected and actual basis are \$0.00 for both hogs and soybean meal.

See below for solutions.

Putting it all together

You are a feedlot operator who seeks to raise feeder cattle up to weight (1,200 lbs.) and then sell them to a processing facility. Each time that you sell a pen of animals to the processor, you need to replenish your feedlot with a new set of feeder cattle. When you replenish your feedlot, you also need to purchase enough feed (corn) to bring the new set of animals up to weight. Lastly, the production of fed cattle would require some labor.

Because you purchase feeder cattle and corn on the local markets, you worry that price volatility in the price of these inputs can cause you to forgo profits. Because feeder cattle and corn futures contracts exist, you wish to hedge local price risk using futures markets. Feeder cattle contracts are sold in 50,000 lb. increments and corn contracts are sold in 5,000 bushel increments.

Lastly, it is now December, and you will sell one of your fed cattle pens in May. At that point, you will replenish your feedlot with the same number of animals. The number of animals that you will sell and replenish is determined by equilibrium market conditions.

The following list provides several additional assumptions and information:

- In May, you will sell 200 steers to the processing plant at an agreed \$1.50/lb.
- Assume that each feeder steer weighs 750 lbs.
- Assume that the number of pounds of feed necessary for a steer to reach weight is 2,750 lbs.
- Steers are considered to have reached weight at 1,200 lbs.
- Each bushel of corn weights 55 pounds.
- Expected feeder cattle basis in May is: $E[B_{may}^{feeder}] = 0.20/lb.$
- Expected corn basis in May is: $E[B_{may}^{corn}] = 0.05/bu.$
- The current price of a May feeder cattle futures contract is: $F_{may}^{feeder} = \$1.20/lb.$

- The current price of a May corn futures contract is: $F_{may}^{corn} = \$5.75/bu$.

Your goals are as following:

1. Determine your expected profit in May. That is, the profit that exists after you sell the fed cattle to processing plant and purchase feeder cattle to replenish the feedlot. Assume that you number of feeders you acquire is the same as the number of fed cattle you sell.

2. Explain how you will use the futures market to hedge input cost risks, in order to maximize the likelihood that you will be able to attain your expected profit.

3. Determine what your actual May profit is if the following scenario occurs:

   - Actual feeder cattle basis in May is: $B_{may}^{feeder} = 0.24/lb$.
   - Actual corn basis in May is: $B_{may}^{corn} = 0.00/bu$.
   - The May price of a May feeder cattle futures contract is: $F_{may}^{feeder} = \$1.24/lb$.
   - The May price of a May corn futures contract is: $F_{may}^{corn} = \$5.80/bu$.

4. How much money did you lose/gain (relative to what you expected) because of basis movements?

   See below for solutions.

(3) Lean Hog Production

Provided the information in the problem, you can deduce the following:

- # of hogs : 200,000 lbs / 250 lb./hog = 800 hogs
- # of lbs to gain before sale: 250 − 15 = 235 lbs.
- # of lbs of feed for each hog: (4.255 × 235) = 1000 lbs = ½ ton
- Total feed necessary: ½ ton × 800 hogs = 400 tons
- Labor costs: ($12.50 × 800) = $10,000

Expected Profits

$$E[\pi] = \underbrace{\left(\$1.10 \times 200{,}000\right)}_{\{\text{Revenues}\}} - \left[\underbrace{\left(\$300 \times 400\right)}_{\{\text{Feed costs}\}} + \underbrace{\$10{,}000}_{\{\text{labor}\}}\right]$$

$$\boxed{E[\pi] = \$50{,}000}$$

Hedging

Soybean Meal

- Naturally short; long hedge
- MR = (5% × 4 contracts × 100 ton × $300/ton) = $6,000

Lean Hogs

- Naturally long; short hedge
- MR = (5% × 5 × 40,000 × $0.50/lb) = $9,000

Actual Π

Local:

$$\pi = \left[\left(0.85 \times 200{,}000\right) - \left\{\left(350 \times 400\right) + 10{,}000\right\}\right] = \$20{,}000$$

Futures:

Hogs: $F_\pi = \left(\$0.90 - \$0.85\right) \times 200{,}000 = \$10{,}000$

Meal: $\left(\$350 - \$300\right) \times 400 = \$20{,}000$

$$\boxed{\text{TOTAL } \pi = \$50{,}000}$$

(+) Same as expected Π. Why?

(4) Feedlot Operation

Information that can be deduced:

- # of gain for 1 steer: $(1200 - 750) = 450$ lbs
- # of lbs. of corn to raise 200 steers: $(2750 \times 200) = 550{,}000$
- # of bushels of corn to raise 200 steers: $550{,}000 / 55 = 10{,}000$ bu.

Expected Profits

$$E[\text{Revenues}] = (200 \text{ steers} \times 1200 \text{ lbs/steer} \times \$1.50/\text{lb}) = \$360{,}000$$

Feeders: $E[\text{costs}] = (200 \text{ feeders} \times 750 \text{ lbs/feeder} \times (\$1.20 + \$0.20)) = \$210{,}000$

Feed: $E[\text{cost}] = \left(200 \text{ feeders} \times \frac{2750 \text{ lbs/feeder}}{55 \text{ lbs/bu}} \times (\$5.75 + 0.05)\right) = \$56{,}000$

Labor: $E[\text{cost}] = (\$160 \times 200) = \$32{,}000$

$$\text{TOTAL } E[\Pi] = \$360{,}000 - [210{,}000 + 56{,}000 + 32{,}000] = \boxed{\$60{,}000}$$

Hedging

Feeders	Corn
• Naturally short; hedge long	• Nat. short; go long
• 3 contracts	• 2 contracts

Actual Π

Local:

$$(\$360{,}000) - [(200 \times 750 \text{ lbs/steer} \times \$1.48/\text{lb.}) + (200 \text{ steers} \times 50 \text{ bu/steer} \times \$5.80/\text{bu}) + (\$160 \times 200)]$$

$$\boxed{\text{Local } \Pi = \$48{,}000}$$

FUTURES

Feeders: $(\$1.24 - \$1.20) \times 200 \text{ steers} \times 750 \text{ lbs/steer} = \$6,000$

Corn: $(\$5.50 - \$5.75) \times 200 \text{ steers} \times 50 \text{ bu/steers} = \$500$

TOTAL Π

$\Pi = (\$48,000 + \$6,500) = \boxed{\$54,500}$