Chapter 30
Risk Management

30-5. BHP Billiton is the world's largest mining firm. BHP expects to produce 2 billion pounds of copper next year, with a production cost of $0.90 per pound.

a. What will be BHP's operating profit from copper next year if the price of copper is $1.25, $1.50, or $1.75 per pound, and the firm plans to sell all of its copper next year at the going price?

b. What will be BHP's operating profit from copper next year if the firm enters into a contract to supply copper to end users at an average price of $1.45 per pound?

c. What will be BHP's operating profit from copper next year if copper prices are described as in part (a), and the firm enters into supply contracts as in part (b) for only 50% of its total output?

d. Describe situations for which each of the strategies in parts (a), (b), and (c) might be optimal.

a. Operating profit = 2 billion pounds × (Price per pound – $0.90/lb). Thus:

Price ($/lb)	**1.25**	**1.50**	**1.75**
Operating Profit ($ billion)	0.70	1.20	1.70

b. In this case, they will sell for the contract price of $1.45/lb, no matter what the spot price of copper is next year:

Contract price ($/lb)	**1.45**
Operating Profit ($ billion)	1.10

That is, Operating Profit = 2 × (1.45 – 0.90) = $1.10 billion.

c. In this case, Operating Profit = 1 × (1.45 – 0.90) + 1 × (Price – 0.90). Therefore:

Contract price ($/lb)	**1.45**		
Contract Amount	1.00	billion pounds	
Spot Price ($/lb)	**1.25**	**1.50**	**1.75**
Operating Profit ($ billion)	0.90	1.15	1.40

d. Strategy (a) could be optimal if the firm is sufficiently profitable that it will not be distressed even if the copper price next year is low. Equity holders will in this case bear the risk of copper price fluctuations, and there is no gain from hedging the risk. It could also be optimal if the firm is currently in or near financial distress. Then by not hedging, the firm increases its risk. Equity holders can benefit if the price of copper is high, but debt holders suffer if the price is low. (Recall the discussion in Chapter 16 regarding equity holders incentive to increase risk when the firm is in or near financial distress.)

Strategy (b) could be optimal if the firm is not in distress now, but would be if the price of copper next year is low and it does not hedge. Then, by locking in the price it will receive at $1.45/lb, the firm can avoid financial distress costs next year.

Strategy (c) could be optimal if the firm would risk distress with operating profits of $0.7 billion from copper but would not with operating profits of $0.9 billion. In that case, the firm can partially hedge and avoid any risk of financial distress.

30-6. Your utility company will need to buy 100,000 barrels of oil in 10 days time, and it is worried about fuel costs. Suppose you go long 100 oil futures contracts, each for 1000 barrels of oil, at the current futures price of $60 per barrel. Suppose futures prices change each day as follows:

a. What is the mark-to-market profit or loss (in dollars) that you will have on each date?

b. What is your total profit or loss after 10 days? Have you been protected against a rise in oil prices?

c. What is the largest cumulative loss you will experience over the 10-day period? In what case might this be a problem?

a. You have gone long 100 × 1000 = 100,000 barrels of oil. Therefore, the mark-to-market profit or loss will equal 100,000 times the change in the futures price each day.

Day	Price	Price Change	Profit/Loss
0	$ 60.00		
1	$ 59.50	($0.50)	($50,000)
2	$ 57.50	($2.00)	($200,000)
3	$ 57.75	$0.25	$25,000
4	$ 58.00	$0.25	$25,000
5	$ 59.50	$1.50	$150,000
6	$ 60.50	$1.00	$100,000
7	$ 60.75	$0.25	$25,000
8	$ 59.75	($1.00)	($100,000)
9	$ 61.75	$2.00	$200,000
10	$ 62.50	$0.75	$75,000

b. Summing the daily profit/loss amounts, the total is a gain of $250,000. This gain offsets your increase in cost from the overall $2.50 increase in oil prices over the 10 days, which increases your total cost of oil by 100,000 × $2.50 = $250,000.

c. After the second day, you have lost a total of $250,000. This loss could be a problem if you do not have sufficient resources to cover the loss. In that case, your position would have been liquidated on day 2, and you would have been stuck with the loss *and* had to pay the higher cost of oil on day 10.

30-7. Suppose Starbucks consumes 100 million pounds of coffee beans per year. As the price of coffee rises, Starbucks expects to pass along 60% of the cost to its customers through higher prices per cup of coffee. To hedge its profits from fluctuations in coffee prices, Starbucks should lock in the price of how many pounds of coffee beans using supply contracts?

If the price of coffee goes up by \$0.01 per pound, Starbucks' cost of coffee will go up by \$0.01 × 100 million = \$1 million. But because it can charge higher prices, its revenues will go up by 60% × \$1 million = \$0.6 million. To hedge this risk, Starbucks should lock in the price for 40 million pounds of coffee, so that it will only suffer an increase in cost for the remaining 60 million pounds of coffee.