John E. Parsons
Anna Obizhaeva

Case Study Questions: Metallgesellschaft Part A

The reading packet contains a pair of articles describing Metallgesellschaft's oil futures trading business and the resulting crisis, one by Culp and Miller and the other by Mello and Parsons. The companion articles arrive at very different conclusions about what went wrong. The following questions are meant as a guide to help organize your critical reading of these articles and to enable you to better engage with the presentation in class.

The Dynamics of Oil and Futures Prices

Look at Culp and Miller's article.

1. What is the "cost of carry" formula and its components? What is meant by the term "basis"? How do the components change through time in the example? What happens to the shape of the term structure through time? What is "contango" and what is "backwardation"?

2. Explain how the "net cost of carry" in Table 1 is calculated?

3. Can you imagine a circumstance in which the "net cost of carry" is positive?

4. Recalculate Table 1 for your imagined case in which the "net cost of carry" is positive. Is the Total Net Income more or less than in the original Table 1 with a negative cost of carry?

5. At the top of page 66, Culp and Miller say that "the firm's net worth is indeed fully hedged against spot price risk." Explain this? How does your explanation fit with your answer to 4?

6. On page 66, Culp and Miller assert that the oil market is usually in "backwardation". Calculate an alternative version of Table 1, assuming the spot price stays constant and that the market remains in "backwardation" at the same level in all periods. What do the components of the firm's cash flow and income look like?

7. On page 69, Culp and Miller discuss a "parallel shift" in the term structure of oil prices. What do they mean? Is this the usual case, or an unusual case?

Look at Mello and Parsons' article.

8. Look at Table 1. How does the movement of spot and futures prices in this table correspond to the example used in Culp and Miller? What would be the “net cost of carry” in this example? Would it be negative or positive? Does this table reflect parallel shifts in the term structure? See also footnote #6 in Mello and Parsons.

9. On page 112, Mello and Parsons assert that the volatility of oil spot prices is greater than the volatility of futures prices. How does this match the geometric Brownian motion model? How does it match the mean reverting model? Which model would have parallel shifts in the term structure?

10. At the same place, they say that “a one dollar fall in the current spot price of oil implies a smaller change in the expected price of oil anytime in the future”. Is this true in the geometric Brownian motion model? Is it true in the mean reverting model? Can you explain why this might be so, or think of examples when this might be so?

11. On pages 112-115, Mello and Parsons mention “basis risk”. On pages 65-67, Culp and Miller also discuss the “basis”. Are they talking about the same thing?

12. On page 115, Mello and Parsons assert that “The rolling stack was a bet placed by MGRM management on the persistent backwardation that arises in the oil market. Buying a near-month futures contract when the market is in backwardation means buying at a price low relative to the prevailing spot. Assuming that the prevailing spot price remains constant, then as the contract matures and the futures price increases to the spot the position makes a profit.” Can you show this in a numerical example like that employed by Culp and Miller? Does it fit with their examples and explanations?

Hedging Mechanics

13. What is a hedge constructed with a “stack” of short-dated contracts? What is a hedge constructed with a “strip” of futures contracts? Assume the futures markets make all maturities available with plenty of liquidity. Explain how the problem of availability enters into the problem.

14. How do the two compare as far as locking in value? What happens if there is a parallel shift in the term structure of oil prices? What happens if the shift is not parallel? How do they compare in terms of spot price risk and basis risk?

15. How do the two compare as far as cash flow or funding risk is concerned?

16. On page 72, Culp and Miller discuss the possibility of collateralizing the margin loans. What do they mean?

17. Also on page 72, Culp and Miller say that the “program was ‘self-financing’”. What do they mean?

18. Culp and Miller say on page 72 that “the accreting gains on the flow contracts as oil prices fell should, in principle, have provided the economic equivalent of at least partial collateral to finance margin calls on the futures leg.” What do they mean by “partial”? Why only partial? What is the key variable determining how partial—i.e., whether it provides 10% collateral or 80% collateral?

19. Look at the original long-term supply contracts with the retailers. Analyze the credit risk.

20. How does a hedge composed of a “strip” of futures contracts compare to a “stack” in terms of credit risk?

21. How do the options in embedded in the forward contracts affect the right hedge? Answer this question first ignoring credit risk, and then taking it into account.

Profits and Losses

22. On pages 74-75, Culp and Miller cite figures of $1.3 billion, $1.0 billion and $200 million. What do each of these figures represent and what are the essential differences between them?

23. On page 118, Mello and Parsons cite figures of $900 million, $1.07 billion, and $1.276 billion. What do each of these figures represent and what are the essential differences between them?

24. On pages 118-119, Mello and Parsons cite figures of $620 million and $695 million. What do each of these figures represent and what are the essential differences between them? Relate them back to the figures in question 23.

25. On page 120, Mello and Parsons cite a figure of $3 billion. What does this represent?