
Lecture 7

- **Risk Minimization or Speculation?**

A Stylized Risk Management Decision Problem

- **Hedging Techniques**

Transactions Hedging

Optimal Hedging

- **Hedging Corporate FX Exposure**

Risk Minimization or Speculation?

- What is the objective for corporations to pursue in the use of derivative securities?
 - What is the solution to the primary corporate decision problem for a hedge?
 - The solution can be used to assess whether risk managers aim to minimize risk and what role speculation plays in the optimal solution.
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Midterm Exam Question

- Q#3a) Assuming mean-variance agents, derive an expression for the optimal speculative position size. What happens to this position as the sensitivity of the agent to risk diminishes? Based on this, what can you conclude about the equilibrium in a market dominated by risk-neutral speculators?
 - A solution to this question appears as a component of the solution to the **stylized** decision problem involving a hedge of a cash position (the **optimal hedge** solution).
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The Optimal Speculative Position

- Reading: RSD, p.113
- What is the objective function to optimize?

$$EU[B] = E[B] - b \text{ var}[B]$$

The mean-variance expected utility function where $b (> 0)$ measures the sensitivity of expected utility to changes in risk.

The Optimal Speculative Position (cont'd)

- Recall that the profit function for a speculator is:

$$B(1) = Q \{F(1, T) - F(0, T)\}$$

Solving the optimization problem gives the solution:

SEE EQUATION 1 on .pdf Equations Sheet

The Risk Minimizing Solution

- Risk minimizing hedgers do not take expected return on the hedge into account when arriving at an optimal solution.
- The objective function for a risk minimizer can be specified as:

$$EU[B] = - \text{var}[B]$$

Reading: RSD, p.114-5.

The Hedger Profit Function

- For a hedger long-the-spot and short-the-forward, the profit function is:

$$B(1) = Q_S \{S(1) - S(0)\} + Q_H \{F(0, T) - F(1, T)\}$$

It follows that the variance of the profit function is:

$$\text{var}[B] = Q_S^2 F_S^2 + Q_H^2 F_f^2 - 2 Q_S Q_H F_{Sf}$$

Reading, RSD, p.535-7.

The Risk Minimizing Solution

- Important Result: the risk minimizing solution can be estimated empirically using a regression of the (change in) spot price on the (change in) futures price.

SEE Equation 2 on Equations Sheet.

Note: some presentation use a minus sign.

Midterm Exam Question

- c) Derive a "closed-form" expression for the risk-minimizing hedge ratio. In what sense is this ratio an optimal hedge ratio? How is your answer affected if the commodity being hedged is undetermined at the time the hedge is "put on", e.g., a wheat farmer hedging the output for a crop which has just been planted.

Have now solved the first part. The second part depends on interpreting the solution to the optimization problem of mean-variance EU .

Optimal Hedging Solution

- The optimal hedge ratio associated with $\max EU = E[B] - b \text{ var}[B]$ using the short hedge expected profit, $E[B] = Q_S \{E[S(1)] - S(0)\} + Q_H \{F(0, T) - E[F(1, T)]\}$, has the solution:

SEE Equation #3 on Equations Sheet

The Optimal Hedge Ratio

- Examining the solution reveals that the optimal hedge ratio for the stylized hedger problem is a combination of the optimal speculative solution and the risk minimizing solution.
 - Exercise: do sensitivity analysis on the solution as the parameters in the formula are allowed to vary.
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Types of Hedges

- Transaction Hedging vs. Optimal Hedging

Together with insurance and diversification, hedging is an essential feature of corporate risk management.

There are a range of possible approaches that can be used – the selection of a particular approach depends on the firm's risk management philosophy.

Reading: RSD, p.293-6; Box 1, p.297-8.

Midterm Exam Question #4

4. a) Outline appropriate questions to be addressed by a commercial or chartered bank undertaking a financial futures hedging decision.

The answer to this question requires a discussion of the firm's risk management philosophy (RSD, p.151-6) as it relates to the specific situation of the type of firm involved.

Hedging Techniques

■ Transactions Hedging

The *transactions hedging* approach emphasizes the trading mechanics involved in *fully hedging* a specific transaction. A cash position is identified and the appropriate forward position is described and determined (see 03-3 midterm and sample midterm, Q#4b.i).

It is conventional to have spot and derivative positions that have little or no basis risk though this does not have to be the case.

Reading: RSD, p.299-309.

Transaction Hedging in Practice

- Application to currency hedges: RSD, p.329-32.
 - Midterm Questions: i) In June, a metals refinery wants to "lock-in" today's price on a purchase of 50,000 lbs. of copper cathodes due to take place in September. ii) In April, a money market mutual fund wants to "lock-in" today's interest rate on a \$5 million purchase of 1-month negotiable CD's due to take place in two weeks.
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Strip Hedge vs. Stack Hedge

- Example in RSD considers a hedge of a fixed rate loan that will be paid in quarterly installments (see also 03-3 midterm, Q#4b.ii).
- Another example, a refinery is hedging future purchases of 120,000 bbls. of crude oil that will be made continuously over the next year.

Possible to **stack hedge** this by starting with 120,000 bbls. in the nearby – rolling forward into the next nearby as contracts mature and sequentially reducing the size of the hedge as purchases are made.

Strip vs. Stack Hedge (cont'd)

- Also possible to *strip hedge* by placing 10,000 bbl. (x 12) hedge positions in each of the future months.

Actual Example: MGRM, RSD p.58-60.

In theory, the strip hedge will be superior to the stack hedge. However, in practice, insufficient liquidity in deferred contract months might make it difficult to execute a strip hedge.

Optimal Hedging

- In many situations, transactions hedges reduce to risk minimizing solutions.
 - Optimal hedging recognizes that hedges can be a source of profitability and competitive advantage.
 - From sensitivity analysis of optimal hedge solution, implementation depends on accuracy of subjective parameter estimates.
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Optimal Hedging in Practice

- Regression analysis provides a theoretical foundation for the implementation of optimal hedges. (Observe that regression analysis corresponds with the risk minimizing solution.)
 - Examples:
 - 03-3 midterm, Q#4b.iii (copper scrap)
 - Hedging a foreign asset: RSD, p.333-43.
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Hedging Corporate Economic FX Exposure

- See headline on next slide for example of economic exposure. See discussion in RSD, p.157-8
- How to measure the exposure? Optimal hedging theory provides a regression
- Is it necessary to hedge this risk? PPP arguments provide a theoretical rationale for not hedging

Reading: RSD, p.161-3

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SINGLE WOMEN DRIVE REAL ESTATE

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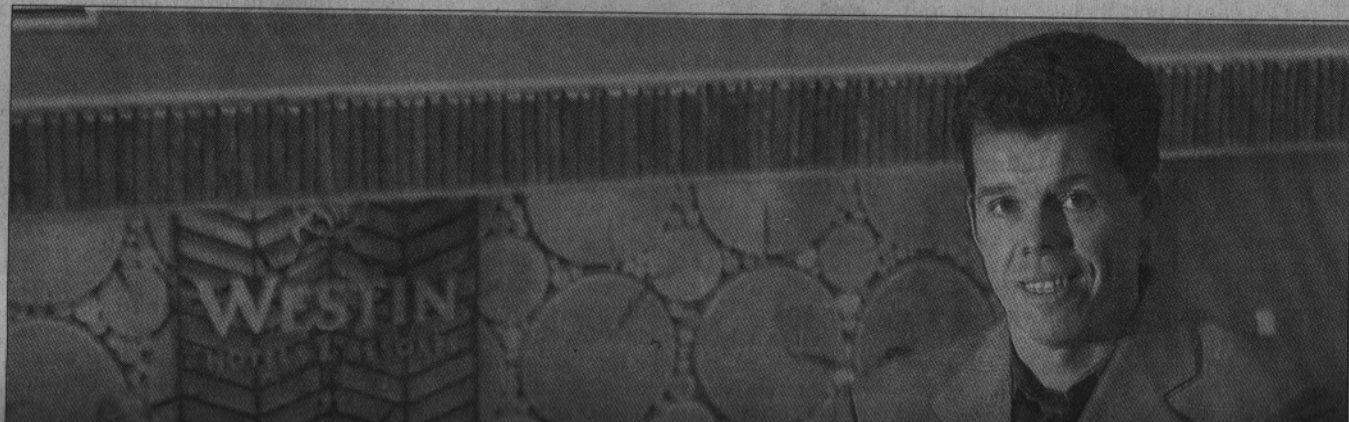
SPACE'S FINAL FRONTIER

E: The Imagination Station, a unit of CHUM Television, is getting into the movie production business with its first theatrical release, *Decoys*. Paul Gratton, VP and GM of the unit, said in a news release the movie was tailor-made for a specific demographic. The loyal viewers that SPACE will want to go see *Decoys* "is the movie." The release then went on to describe *Decoys* as "America meets *Species*." Why didn't he think of that?

ONE-HOUR PHOTO FINISHED?

Test advance in old-fashioned photography is coming soon: a service kiosk that can con-

Whistler visits drop with weak U.S. dollar



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