International Finance

The Risk Management Decision: Why Hedge?

Main issues

- Should a multinational firm hedge exchange rate exposure?
- The Modigliani-Miller irrelevance benchmark
- When does hedging increase firm value?
- The Slite case: what happens when you don’t hedge
- Empirical evidence on corporate hedging

The three decisions

The course now moves from macroeconomic context to the **firm's perspective**.

The firm faces three interconnected decisions:

1. **The hedging / risk management decision** ← *this lecture*
2. The financing decision
3. The capital budgeting (investment) decision

Recall: what we know

- Nominal exchange rates are volatile.
- Changes in nominal exchange rates are **not offset** by changes in relative prices (PPP fails).
- Hence, changes in the nominal exchange rate have **real effects**.
- It is **difficult to forecast** future exchange rates (UIP/UEH fail).
- Exchange rate risk premia exist — hedging is not “free.”

The firm cannot forecast its way out of exposure. **Should it hedge?**

Is the answer not obvious?

- Nominal and real exchange rates are volatile and difficult to predict.
- If firms do not hedge, their future revenues and costs are more volatile and more difficult to predict.
- Hence, designing hedging strategies that reduce the uncertainty of future revenues and costs **should increase value...**

...or shouldn't it?

Example: hedged vs. unhedged

Setup:

- You will receive EUR 500,000 in one year
- $r^{EUR} = 10\%$, $r^{USD} = 5\%$
- Spot rate: $S_0 = 1.10$ (USD/EUR)

Unhedged value today:

$$V_0^{UH} = \frac{\text{EUR } 500{,}000}{1 + 10\%} \times \frac{\text{USD}}{\text{EUR}} \, 1.10 = \text{USD } 500{,}000$$

Example: does hedging change the value?

Forward rate (from CIP):

$$F_{0,1} = S_0 \times \frac{1 + r^{USD}}{1 + r^{EUR}} = 1.10 \times \frac{1.05}{1.10} = 1.05$$

Hedged value today:

$$V_0^H = \text{EUR } 500{,}000 \times \frac{\text{USD}}{\text{EUR}}\, 1.05 \times \frac{1}{1 + 5\%} = \text{USD } 500{,}000$$

Hedging does not change the value!

This is not a coincidence — it is CIP at work. The forward rate adjusts so that hedged

Modigliani and Miller

The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 1985
Franco Modigliani

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Franco Modigliani - Facts

Franco Modigliani

Born: 18 June 1918, Rome, Italy

Died: 25 September 2003, Cambridge, MA, USA

Affiliation at the time of the award: Massachusetts Institute of Technology (MIT), Cambridge, MA, USA

Prize motivation: "for his pioneering analyses of saving and of financial markets"

Field: macroeconomics

Contribution: Developed sub models of private consumption and the financial sector, studied the consequences for household saving of changes in demography and economic growth, and laid the foundation for the field "corporate finance".

The Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 1990
Harry M. Markowitz, Merton H. Miller, William F. Sharpe

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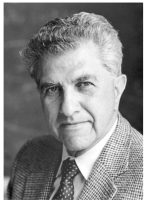
Merton H. Miller - Facts



Merton H. Miller

Born: 16 May 1923, Boston, MA, USA

Died: 3 June 2000, Chicago, IL, USA

Affiliation at the time of the award: University of Chicago, Chicago, IL, USA

Prize motivation: "for their pioneering work in the theory of financial economics"

Field: financial economics

Contribution: Important contributions in the field of corporate finance.

The M&M Irrelevance Theorem

The value of the firm is **independent of its hedging policy** when:

1. There are no taxes
2. There are no transaction costs in financial markets
3. Shareholders and firms have the same information
4. Shareholders and firms have equal access to financial markets
5. There are no costs of financial distress

Under these conditions, hedging cannot add value.

The M&M logic

- Hedging is a **purely financial decision**.
- Corporate managers cannot increase the value of the firm by undertaking financial transactions that shareholders can make themselves.
- If a firm decides not to hedge an exposure that shareholders dislike, shareholders can hedge it personally ("**home-made hedging**").

This shifts the hedging from the corporate level to the personal level, at no cost.

Same logic as capital structure irrelevance: financial policy doesn't matter in frictionless markets.

The diagnostic

$$\text{Value of firm} = \frac{E[\text{Cash Flows}]}{\text{Required Return}}$$

For hedging to increase firm value, it must:

- **Increase expected cash flows**, and/or
- **Decrease the required return** (discount rate)

Under MM, hedging does **neither**. The question becomes: which real-world frictions cause hedging to affect CFs or DR?

Violation channels

Hedging can increase firm value because:

1. **Costs of financial distress** — hedging reduces the probability and expected cost of distress
2. **Tax convexity** — hedging reduces expected tax liability when the tax function is convex
3. **Agency costs** — hedging reduces conflicts between managers, shareholders, and bondholders
4. **Information asymmetries** — “home-made” hedging is a poor substitute for corporate hedging

Channel 1: Costs of financial distress

Financial distress = income insufficient to cover fixed obligations.

Direct costs: Liquidation, legal fees, courts.

Indirect costs (often larger):

- Loss of customers who need after-sales service / warranties
- Suppliers demand cash payment or refuse to deliver
- Key employees leave for safer firms
- Loan covenants trigger accelerated repayment
- Forced asset sales at fire-sale prices

Hedging reduces CF volatility $\Rightarrow$ reduces probability of distress $\Rightarrow$ reduces expected

The Slite case

Slite — a Swedish shipping company running ferries between Sweden and Finland.

- Ordered a ship from a German shipbuilder. Payment in DEM.
- Decided **not to hedge** SEK/DEM exposure because:
  1. SEK was pegged to a basket in which DEM had a large weight
  2. DEM traded at a forward premium — hedging “seemed expensive”

Management confused the forward premium with the cost of hedging.

The Slite case: what happened

- **September 1992:** Sweden abandons the link between SEK and DEM.
- **By end of 1992:** SEK/DEM had depreciated by 30%.
- Slite could no longer afford the ship.
- The vessel was leased by a competitor (Silja).
- **Spring 1993:** Slite went bankrupt.

Lesson: Without hedging, a single adverse FX move destroyed the firm. The bankruptcy costs — liquidation, loss of business, competitor advantage — are exactly the distress costs that justify hedging.

Channel 2: Tax convexity

Progressive tax rates and loss limitations create a **convex tax function**:

- Profits are taxed at the full rate
- Losses are not fully deductible (carry-forward limitations, AMT)

With a convex tax function, **expected taxes are higher with volatile income** than with stable income (Jensen's inequality):

$$E[\text{Tax}(\tilde{\Pi})] > \text{Tax}(E[\tilde{\Pi}])$$

Hedging smooths income $\Rightarrow$ reduces expected tax liability $\Rightarrow$ increases after-tax cash flows.

Tax convexity: example

Setup:

- Invest USD 525,000
- Receive EUR 500,000 in 1 year
- $S_1 = 1.50$ or $S_1 = 0.60$ (equal prob.)
- Tax rate: $\tau = 21\%$
- **Losses are not tax-deductible**

Unhedged:

- Good state: $(500\text{K} \times 1.5 - 525\text{K})(1 - 0.21) = 171{,}150$
- Bad state: $(500\text{K} \times 0.6 - 525\text{K}) = -225{,}000$ (no tax offset)
- $E[\Pi^{UH}] = -26{,}925$

Hedged ($F = 1.05$): $\Pi^H = 500\text{K} \times 1.05 - 525\text{K} = 0$

Hedging increases value because the tax asymmetry penalizes volatility.

Channel 3: Agency costs

Manager vs. shareholder conflict:

- Managers have undiversified human capital tied to the firm
- Risk-averse managers may demand higher wages for bearing firm-specific risk
- Managers may reject positive-NPV risky projects to protect their positions
- Hedging aligns manager and shareholder incentives

Shareholder vs. bondholder conflict:

- Near distress, shareholders may gamble on risky projects (risk-shifting)
- Or they may underinvest (refuse to put in equity for safe projects that benefit bondholders)
- Hedging reduces this conflict $\Rightarrow$ increases debt capacity $\Rightarrow$ lowers cost of debt

Channel 4: Information asymmetries

M&M assumes shareholders can hedge themselves. But:

- Shareholders have **far less information** about firm exposures than managers. Home-made hedging is imprecise.
- Individuals face **higher transaction costs**, margin requirements, and short-sale constraints.
- **Economies of scale** allow firms to obtain better terms for forwards and swaps than individual shareholders.
- Forward positions may be prohibitively large for retail investors.

Home-made hedging is a **poor substitute** for corporate hedging.

CF vs. DR: how hedging adds value

Expected cash flow effects (primary):

- Reduces expected distress costs (Channel 1)
- Reduces expected tax liability (Channel 2)
- Improves investment decisions (Channel 3)

Discount rate effects (secondary):

- Lower CF volatility may reduce cost of debt
- Greater debt capacity can lower WACC
- Reducing distress risk may lower systematic risk

The CF channel is primary. When evaluating whether a firm should hedge, first ask: "Does hedging change expected cash flows?"

Hedging has costs

1. **Transaction costs:** Bid-ask spreads on forwards, option premia, commissions
2. **Cost of expertise:** Risk management staff, systems, monitoring
3. **Operational risk:** Hedging errors, unauthorized trading, model risk

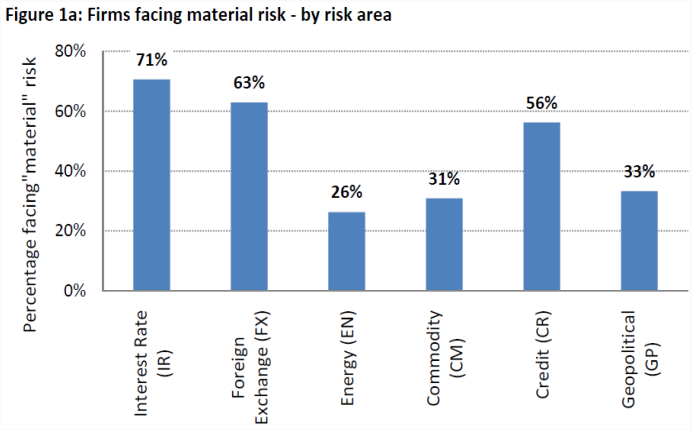
These costs must be weighed against the benefits. For most large firms with significant FX exposure, the benefits dominate.

Other concerns

- **Hedging operating exposure is difficult:** Long-term, uncertain amounts, competitive effects are hard to capture with financial instruments
- **Bad incentives:** Hedging programs can become speculative ("we'll hedge only when we think the rate is going against us")
- **Shareholder diversification:** Some investors may prefer unhedged exposure for portfolio diversification purposes
- **Signaling:** Hedging may signal to the market that the firm has significant exposure, drawing attention to risks

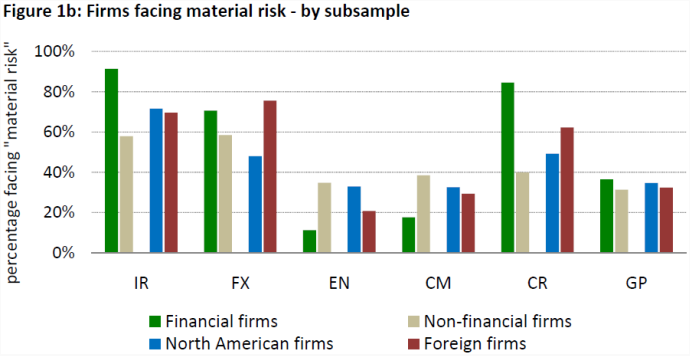
These are real concerns, but they argue for *careful* hedging, not for *no* hedging.

What risks do firms hedge?



Source: “Managing Risk Management” by Bodnar, Graham, Harvey, and Marston (2011).

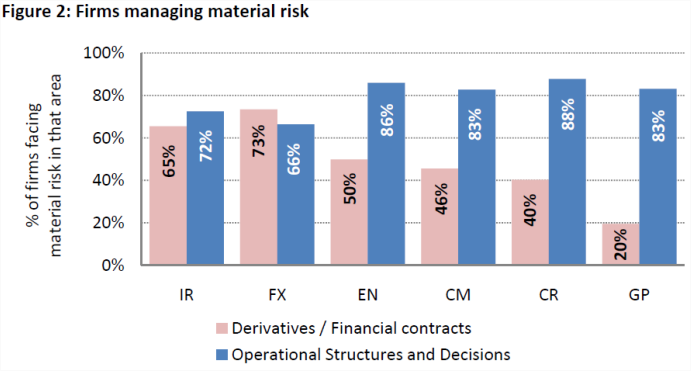
Derivative usage by firm size



Source: Bodnar, Graham, Harvey, and Marston (2011).

Which instruments?

Figure 2: Firms managing material risk



Source: Bodnar, Graham, Harvey, and Marston (2011).

Why do firms hedge?

Foreign Exchange (FX) Derivatives

Table 19: Use of various foreign currency contracts /positions to manage FX risk

Panel A: Use of foreign currency contracts /positions (as percentage of all respondents)	**All firms n = 427**	Financial firms n = 180	Non-financial firms n = 240	North American firms n = 140	Foreign firms n = 280
a. Forward contracts	64%	62%	66%	55%	69%
h. Cross currency swaps	38%	54%	27%	36%	40%
c. Futures contracts	32%	45%	23%	33%	32%
b. Money market deposits/loans	31%	39%	25%	19%	37%
i. Foreign currency debt financing	27%	29%	25%	27%	27%
f. Exchange-traded options	17%	24%	13%	16%	18%
g. Option combinations (e.g., caps, collars)	17%	22%	13%	17%	17%
e. OTC options	17%	26%	9%	9%	20%
d. Non deliverable forwards (NDFs)	15%	22%	10%	9%	18%

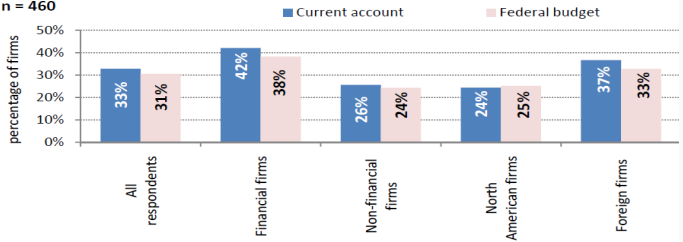
Source: Bodnar, Graham, Harvey, and Marston (2011).

Hedging objectives

Table 22: Importance of firm's market view in FX hedging decisions

Category of importance	All firms n = 454	Financial firms n = 183	Non-financial firms n = 263	North American firms n = 151	Foreign firms n = 287
Very important or Important	45%	40%	50%	58%	39%
Somewhat important or Not Important	55%	60%	50%	42%	61%

Figure 5: Does your country's current account or federal budget surplus/deficit affect the amount and timing of your FX hedging strategy? Yes responses n = 460



Source: Bodnar, Graham, Harvey, and Marston (2011).

Summary

- Under M&M, hedging does not affect firm value — shareholders can hedge themselves.
- In reality, frictions make hedging valuable:
  - **Costs of financial distress** (primary channel)
  - **Tax convexity** (progressive rates + loss limitations)
  - **Agency costs** (manager-shareholder, shareholder-bondholder)
  - **Information asymmetries** (home-made hedging fails)
- Hedging primarily increases $E[\text{CF}]$ (and may reduce the discount rate).
- The majority of firms hedge in practice. FX is the #1 risk managed with derivatives.

Next: How to *measure* exposure — transaction, translation, and operating — and how to