THE UNIVERSITY OF QUEENSLAND
AUSTRALIA
CREATE CHANGE

Lecture 4: Hedging Transaction Exposure

Reading: Eun & Resnick Ch. 8 (10th ed.)

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Introduction

Risks firms face include:

- Interest Rate risk
- Relative Price Risk
- Political/Geopolitical Risk
- Exchange rate risk – "is the variance of domestic-currency value of an asset, liability, or operating income that is attributable to *unanticipated* changes in exchange rates." (Adler and Dumas, 1983)

Types of Foreign Exchange Exposure

- Unexpected changes in exchange rates may affect a firm's cash flows and market value
  - either through its effect on existing contracts ⇒ **Transaction Exposure**
  - or through its impact on the future operating cash flows of the firm ⇒ **Operating Exposure (aka Economic Exposure)**
- Exchange rate changes may have an impact on accounting values
  - This is called Accounting Exposure or **Translation Exposure**

Transaction Exposure

- Transaction exposure measures gains or losses that arise from the settlement of existing financial obligations (e.g., account receivables, account payables) whose terms are stated in a foreign currency.

- A classic example of transaction exposure is a firm that has signed a contract to ship goods overseas at a fixed foreign currency price.

Transaction Exposure Example

- Suppose an Australian firm sells merchandise on open account to Belgian buyer for:
  - €1,800,000, payment to be made in 60 days.
  - S_0 = \$0.9000/€*
  - The Australian seller expects to exchange the €1,800,000 for \$1,620,000 when payment is received

*S_0 is the spot exchange rate at t = 0

Transaction Exposure Example

- *Transaction exposure arises because of the risk that the Australian seller will receive something other than* $1,620,000.
  - If the euro weakens to $0.8500/€, then the firm will receive $1,530,000
  - If the euro strengthens to $0.9600/€, then it will receive $1,728,000

- Thus, exposure is the chance of either a loss or a gain.

Sources of Transaction Exposure

- Transaction exposure arises from:
  - Purchasing or selling on credit goods or services whose prices are stated in foreign currencies;
  - Borrowing or lending funds when repayment is to be made in a foreign currency;
  - Being a party to an unperformed foreign exchange forward contract;
  - Otherwise acquiring assets or incurring liabilities denominated in foreign currencies.

Transaction Exposure: Inflows & Outflows

Inflows

- Accounts receivable denominated in a FC
- Long-term sales contracts denominated in a FC
- Deposits, bonds, or notes denominated in a FC
- Forward purchase of foreign currency

Outflows

- Accounts payable denominated in a FC
- Long-term purchase contracts denominated in a FC
- Loans, bonds, or notes due denominated in a FC
- Forward sales of a foreign currency

Net Exposure by currency and date =

Total Inflows – Total Outflows

Measuring Exposure: Value-at-Risk

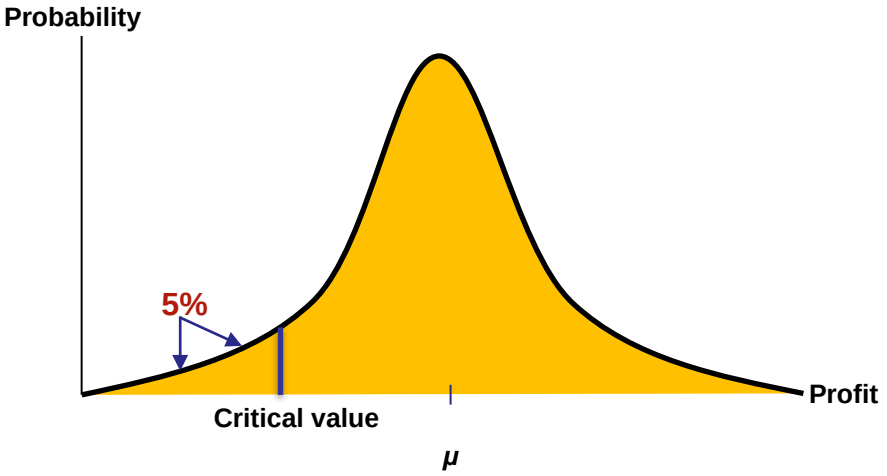
- Aim: To estimate the potential loss in value due to adverse exchange rate movements over a defined horizon with a specific confidence level.
  - Regulators use Value-at-Risk (VaR) to compute capital requirements for financial institutions (e.g., Basel II)
  - Typical confidence level is 99% or 95% focusing on the 1% or 5% worst case scenario.
- Blue Bossa Records has €10m receivable. The current spot rate is $1.20/€ in 30 days. What is its *VaR*?
  - Need to specify reference probability and horizon
  - Need an estimate of the distribution, **e.g., Normal distribution with μ = 0 and σ = 6% per month**

How are these estimated?

Measuring Exposure: Value-at-Risk

- With the normal distribution, the 5% tail probability of **adverse** move starts at 1.645 standard deviation *below* the mean.

$$X = \mu - 1.645 \times \sigma$$



  - So, μ – 1.645 × σ = 0 – 1.645 × 0.06 = -0.0987
  - For the $12m position, *VaR* is -0.0987 × $12m is: **–$1,184,400** [i.e., there is 5% chance of losing $1,184,400 over the next month].
  - $VaR = portfolio\ value \times critical\ value\ (1\ or\ 5\%) \times \sigma_{t+1}$

- Problems with *VaR*?

Hedging Transaction Exposure

- Transaction exposure can be managed by contractual, operating, and financial hedges:
  - **Contractual Hedges** employ the use of
    - Forwards/futures, Options, and Money Markets
  - **Operating and Financial Hedges** employ the use of
    - Risk-Sharing Agreements, Leads and Lags in Payment Terms, Swaps and Other Strategies

Contractual Hedging Techniques

- Forward/Futures Hedge
- Currency option hedge
  - A way to hedge contingent exposure
- Money Market hedge: Taking a money market position to hedge future receivables/payables
- Structuring the Hedge
  - exporters (sell FOREX, buy AUD) - receivables
  - importers (buy FOREX, sell AUD) - payables

Structuring Contractual Hedges

❖ ***Hedging FC Receivables***

- Sell futures or forward (Go short)
- Buy Put Option
- Money market hedge
  - borrow foreign currency to be received
  - convert to domestic currency
  - invest for future use

❖ ***Hedging FC Payables***

- Buy futures or forward (Go long)
- Buy Call Option
- Money market hedge
  - borrow home currency
  - convert to foreign currency
  - invest for future use

FC – Foreign Currency

Using Futures to Hedge

- You have sold widgets in February -- contracted to receive €250,000 in mid-March
  - What's the risk?
- Hedge by acquiring a *liability* whose value is **equivalent** to the value of the underlying *receivable*.
- The following prices are observed:

	Spot Rate	Futures Rate (March Contract)
February	$1.24/€	$1.23/€
March	$1.35/€	$1.35/€

The Futures Hedge

- Your company sells two (2) March futures contracts. (why?)
- The final cash flows in mid-March is
  - Sells the euro receivables in the spot market in March. The cash flow is

    €250,000 × $1.35/€ = $337,500
  - The futures contract has lost money as the € has appreciated.

    [($1.23/€) – ($1.35/€)] × €250,000 = -$30,000
  - The total cash flow from the € receivable:

    $337,000 – $30,000 = $307,500

The effective ex/r is $307,500/€250,000 = $1.23/€

Hedging with Options

- Recall, options give the option holder the **right, but not the obligation** to buy or sell a specified amount of the underlying asset (currency) at a pre-determined price.
  - ***Premium*** is **paid in advance** by the buyer to the seller.
- In the context of hedging, these contracts can be viewed as *exchange rate insurance* written against **adverse** exchange rate movements – options are written on the spot rate.
  - FOREX ***call*** options on spot can be used as insurance to establish a ceiling price on the home currency cost of foreign exchange.

    Ceiling Price = exercise price of call + call premium
  - FOREX ***put*** options on spot can be used as insurance to establish a floor price on the home currency cost of foreign exchange.

    Floor Price = exercise price of put – put premium

Options Example

- As an importer of Swiss watches and you have to pay in the exporter's currency (CHF).
- Payment of CHF750,000 is due on June 15. The following information is available
  - Spot rate: 71.42¢/CHF
  - Three-month forward rate: 71.14¢/CHF
  - Australian dollar three-month interest rate: 3.75%
  - Swiss Franc three-month interest rate: 5.33%
  - Option data for June contracts (¢/CHF):

Strike	Call	Put
70	2.55	1.42
72	1.55	2.40

Options Example (2)

- The concern is that CHF will strengthen against the $.

- Should you use call *or* put?
  - Buy the option that gives the right but ***not*** the obligation to buy CHF.

- Cash Flow ***today***: Pay option premium of

  CHF750,000 × $0.0155/CHF = $11,625

Options Example (3)

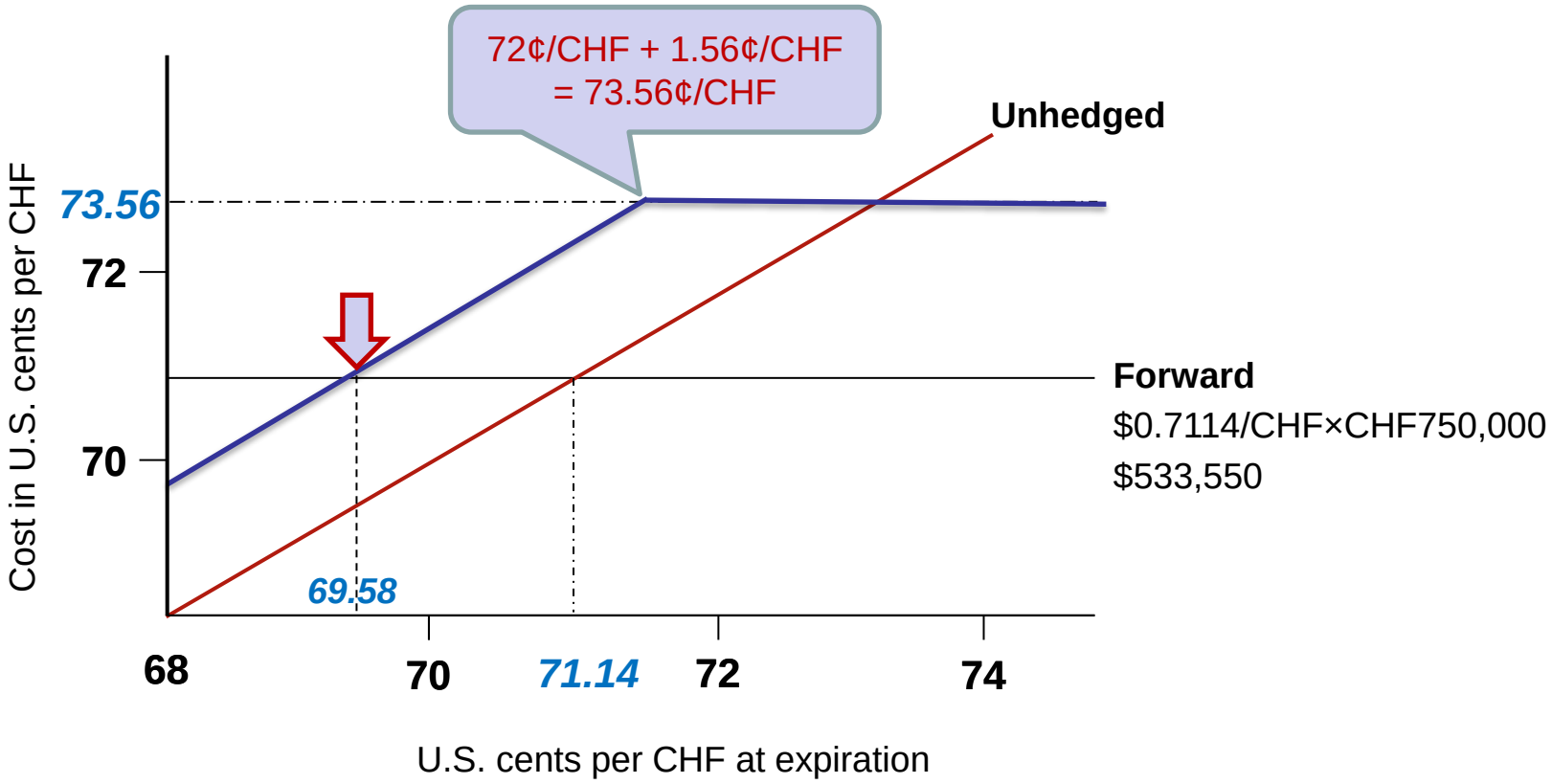
- The final cash flows in **mid-June** is

Working with the call with strike price of 72¢/CHF

  - If at maturity the CHF **≥** \$0.72/CHF, exercise option to buy CHF – CHF750,000 × \$0.72/CHF = \$540,000
  - If at maturity the CHF **<** \$0.72/CHF, buy CHF @ SPOT – CHF750,000 × ***S*** < \$540,000
  - Time value of premium: \$11,625 × (1+ $i_{\$}$) $3.75/100 \times 90/360$

    \$11,625 × (1.0094) = \$11,734.28
    - ***June*** cost of option is 1.55¢ × 1.0094 = 1.56¢
  - **Maximum cost of hedging**: \$540,000 + \$11,734.28 = \$551,734.28

Using Options to Hedge (3)



Finding S*, the future exchange rate, where the cost of both hedges are EQUAL

[S* + $1.56¢/CHF] = 71.14¢/CHF

S* = 71.14¢/CHF – $1.56¢/CHF = 69.58¢/CHF

Money Market Hedge

- Assume Boeing is expected to receive 10m GBP (£) in one year's time
- Available Information:
  - one-year forward rate: US$1.46/£
  - spot rate: US$1.50/£
  - put option on pounds with strike of US$1.46 has a premium of US$0.02 (i.e. 2¢)
  - interest rates:

    US: 6.10% per annum

    UK: 9.00% per annum

Note: This example is from the textbook.

Money Market Hedge (2)

- Money Market Hedge: Borrow (or lend) in the foreign currency to hedge its foreign currency receivables (payables) – match foreign currency assets & liabilities in the same currency

1. Borrow the PV of £10m $\left[\frac{£10m}{(1.09)} = £9{,}174{,}312\right]$
2. Convert £ into $ at $1.50/£ $(\$13{,}761{,}468)$
3. Invest $ in the US at 6.10% for one year $(\$13.761m \times (1.0610) = \mathbf{\$14{,}600{,}918})$
4. Collect £10m in one-year and repay the loan (the £ receivable offsets the loan)

Q: what parity condition have you used here?

Alternate Hedging Strategies

- Risk Shifting
- Leading and Lagging – used to manage net working capital needs of foreign affiliates
  - Leading is to accelerate timing of receivables/payables denominated in depreciating currency
  - Lagging is to delay timing of receivables/payables denominated in depreciating currency
- Currency Risk Sharing
- Cross-hedging
- Currency diversification

"Historically, Ford has managed foreign exchange risk associated with each currency exposure on an independent basis. Recently, we've developed a portfolio view of foreign exchange exposures across the company to assess and manage risk more holistically," says Schaaf. "In addition to supporting hedging strategies, this also provides a management framework to support longer-term strategic decisions that can influence the exposure profile over time. This framework, combined with scenario analysis capabilities, has enhanced foreign exchange understanding and integration into operating decisions."

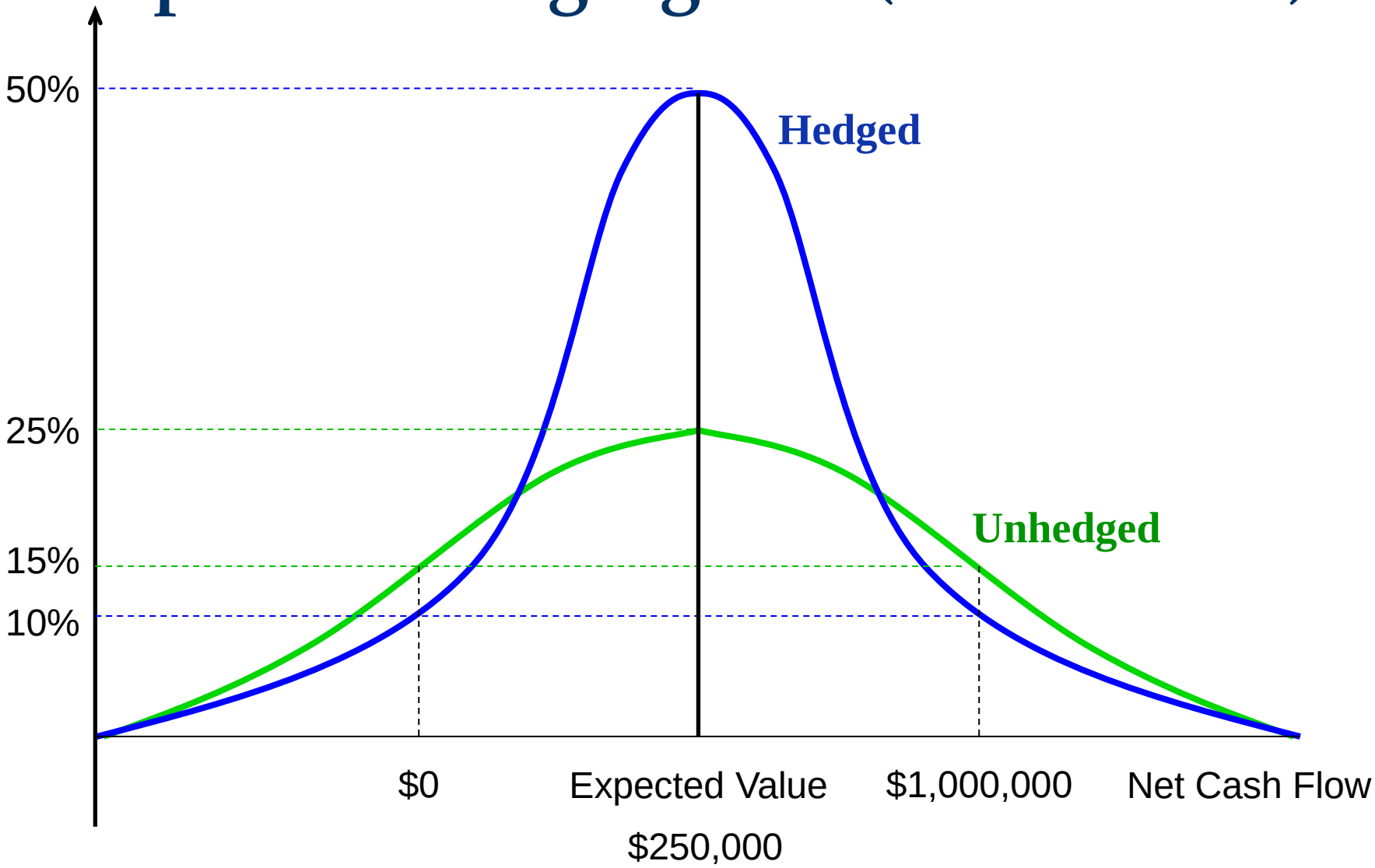
Risk.Net Corporate Risk Manager of the Year: Ford Motor Company 2016

Why Hedge?

- Hedging is the taking of a position, either acquiring a cash flow or an asset or a contract (including a forward contract) *that will rise (fall) in value* and *offset a drop (rise) in value* of an existing position.

- Hedging, therefore, protects the owner of the existing asset from loss (but it also eliminates any gain resulting from changes in exchange rates on the value of the exposure).

Impact of Hedging on E(Cash Flows)



Hedging reduces the variability of expected cash flows about the mean of the distribution. This reduction of distribution variance is a reduction of risk.

Adjusted NPV View of the World

- Reducing the uncertainty of future cash flows by hedging is problematic
- Adj. NPV = PV of E(FCFs) for an all-equity firm
  + PV of Future Interest Tax Shields
  + PV of Interest Subsidies
  - PV of Costs of Financial Distress
  - PV of Costs of issuing securities
  + PV of Real Options

Value of Equity = Adj. NPV - V_{DEBT}

- If **goal** is to maximize shareholder value, then hedging only makes sense if it INCREASES equity value

The Views on Hedging

Is the reduction of variability of cash flows then sufficient reason for currency risk management?

- ***Opponents*** of currency hedging commonly make the following arguments:
  - Stockholders are much more capable of diversifying currency risk than the management of the firm.
  - Currency risk management does *not* add value to the firm, and it incurs costs (i.e., it is costly).
  - Hedging might benefit corporate management more than shareholders.
  - Management's motivation to reduce variability is sometimes driven by accounting reasons.

The Views on Hedging (2)

- ***Proponents*** for currency hedging argue:

1. Risk Profile of Investments (Agency Costs)

$E = Max(0, V_{Firm} - D)$

   - Shareholders hold an *option* on the value of the firm and would prefer riskier projects.
     - Since, riskier projects reduce the value of bondholders' claims, bondholders are likely to require compensation in the form of a higher returns.
     - If shareholders can credibly commit not to unduly increase risks, a lower cost of debt financing could result.
   - Additional sources of agency costs come from managers' preference for less risky projects (job security).

The Views on Hedging (3)

2. Reduction of risk in future cash flows reduces the likelihood that the firm's cash flows will fall below a necessary minimum (and put the firm in financial distress).
3. Reduction of risk in future cash flows improves the planning capability of the firm.
   - If the firm can more accurately predict future cash flows, it may be able to undertake specific investments or activities that it might otherwise not consider.
4. Individuals and corporations do not have same access to hedging instruments or same cost.

Takeaways

- The definition of Forex and Transaction exposure
- Measuring transaction exposure
- Ways to hedge transaction exposure
  - Futures/Forwards
  - Options
  - Money market hedge
- Does it make sense to hedge?
  - Read the Merck case in the text