Lessons in Risk Management

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The Plan

Review of swaps

Case Studies:
  Procter and Gamble
  Orange County California
  Metallgesellschaft
  Codelco
  Barings
## Example of an Interest Rate Swap

<table>
<thead>
<tr>
<th></th>
<th>Company A</th>
<th>Company B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit Rating</td>
<td>AAA</td>
<td>BBB</td>
</tr>
<tr>
<td>Fixed Rate</td>
<td>10.80%</td>
<td>12.00%</td>
</tr>
<tr>
<td>Borrowing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable Rate</td>
<td>Libor plus 25bp</td>
<td>Libor plus 75bp</td>
</tr>
<tr>
<td>Borrowing Type</td>
<td>Floating</td>
<td>Fixed</td>
</tr>
<tr>
<td>Desired</td>
<td></td>
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</tr>
</tbody>
</table>

## LIBOR

LIBOR is the London Interbank Offer Rate.

It represents an average of interest rates on 90-day Certificates of Deposit for U.S. dollar bank accounts in London.

LIBOR is a world-wide standard interest rate used to calculate borrowing costs.
Example of an Interest Rate Swap

Company A

Borrows Fixed Rate @ 10.80%

Borrows Variable Rate @ Libor plus 75bp

Example of an Interest Rate Swap

Company A

Libor

10.80%

Borrows Fixed Rate @ 10.80%

Borrows Variable Rate @ Libor plus 75bp
Example of an Interest Rate Swap

Company A

Borrows Fixed Rate @ 10.80%

Libor

11.00%

Borrows Variable Rate @ Libor plus 75bp

Example of an Interest Rate Swap

Company A

10.80%

Libor

11.00%

Borrows Fixed Rate @ 10.80%

Borrows Variable Rate @ Libor plus 75bp
Results of Interest Rate Swap

Company A

Borrow Fixed: (10.80%)
Receive Fixed: 10.80%
Pay Variable: Libor
Net Borrowing Cost = Libor

Direct Variable Rate: Libor + 25bp
Savings = 25bp

Results of Interest Rate Swap

Company B

Borrow Variable: Libor plus 75bp
Receive Variable: Libor
Pay Fixed: 11%
Net Borrowing Cost: 11.75%

Direct Fixed Rate: 12%
Savings = 25bp
Results of Interest Rate Swap

Bank

Pay Fixed: (10.80%)
Receive Fixed: 11.00%
Receive Variable: Libor
Pay Variable: Libor
Profit = 20bp

NOTE: There is potentially some credit risk to the bank but active insurance market.

Example of a Currency Swap
Example of a Currency Swap

Initial Exchange of Principal

Example of a Currency Swap

Ongoing Exchange of Interest
Example of a Currency Swap
Re-Exchange of Principal

Derivative Mismanagement
- Procter & Gamble - $157 million loss
- Orange County California - at least $2 billion loss
- Metallgesellschaft - $1.3 billion loss
- Codelco - $200 million loss (0.5% of Chile's GNP)
- Barings - $1.3 billion loss
Procter & Gamble

- $157 million loss from two interest rate swaps.
- Entered both US & German interest rate swaps.
- P&G swapped fixed for floating rate.
- Paid a floating rate derived from a complicated formula involving the spread between short and long term interest rates. (This in effect was a put option given to Bankers Trust)

What was P&G doing?

- Procter & Gamble took the view that both US and German interest rates would continue to fall from their already low levels at the time when the swaps were entered.
- Therefore, they attempted to lower their interest costs by entering into these swaps.
- This was not a hedging strategy.
Floating Rate Formula
The formula derives the interest from the spread between the yield on 5 year & 30 year Treasuries. This in effect gave Bankers a series of put options. The put options gave Bankers the right to sell Treasuries to P&G at a fixed price.

What happens to the Value of the Put Options as Interest Rates Change?

- Rates Fall
  The value of the Treasury bonds would increase, therefore rendering the put option worthless to Bankers Trust. Therefore, P&G would have lowered their borrowing cost.

- Rates Rise
  The value of the Treasury bonds would decrease, therefore P&G would be forced to purchase the bonds from Banker's at much higher prices then the current market price.
Floating Rate Formula
The formula derives the interest from the spread between the yield on short and long term German Bunds. This in effect gave Bankers a series of put options. The put options gave Bankers the right to sell the Bunds to P&G at a fixed price.

What happens to the Value of the Put Options as Interest Rates Change?

- **Rates Fall**
The value of the German Bunds would increase, therefore rendering the put option worthless to Bankers Trust. Therefore, P&G would have lowered their borrowing cost.

- **Rates Rise**
The value of the German Bunds would decrease, therefore P&G would be forced to purchase the bonds from Banker's at much higher prices then the current market price.
Orange County California

- Estimated loss of $2.5 billion of its $7.8 billion investment portfolio.

- Irresponsibly risky investment strategy, in which the county treasurer borrowed short-term to make long-term investments.

- Invested in risk structured notes.

Financing Strategy

- Investment Strategy - Invest Long & Borrow Short.

- To put more money to work, the county leveraged the portfolio by borrowing $2 for every dollar it had. This is the same as investing on margin.

- The county used the repo market to borrow short term and then used the money to purchase long term government bonds.
The Repo Agreements

- The county used reverse repurchase agreements.

- In these reverse repurchase agreements, the county pledged the long term bonds it was purchasing as collateral to secure loans.

- These loans were then rolled over every three to six months. As interest rates began to rise the cost of the borrowings increased and the value of the long term bonds decreased.

The Structured Notes

- A structured notes is an invention of Wall Street, in which the issuer (usually a Government agency such as the Federal Home Loan Banks) pays interest rates that vary and are usually based on complex formulas.

- Orange County purchased two basic kinds of structured notes: inverse floaters and spreads between short-term and long-term rates (typically the rate is a fixed percentage plus a long-term interest rate minus a short-term rate).
Example of an Inverse Floater

- Issuer - Federal National Mortgage Association

- Interest Rate Formula - The first two years the bonds paid a fixed 7% interest rate. The next three years the rate was set quarterly at 10% minus the three-month Libor rate.

- As interest rates rose, the value of this bond deceased significantly as the variable interest rate it paid decreased (the coupon rate went from 7% in February 1994 to 3.9% in October 1994)

What was Orange County Doing?

- Orange County was betting that interest rates would remain low or even decrease some and that the spread between long-term and short-term rates would remain high.

- What happened as rates rose?
  - The cost of the short-term borrowings increased.
  - The value of the long-term bonds purchased decreased.
  - The rates on the inverse floaters fell.
  - The rates on the spread bonds fell as the yield curve flattened.
Metallgesellschaft

- $1.3 billion dollar loss

- MG Refining, the US subsidiary of the German conglomerate, had started an aggressive marketing strategy in the United States in 1991. It began offering small gas stations and fuel oil dealers fixed-price contracts for 5 to 10 years.

- MG Refining had entered into contracts to deliver 160 million barrels of oil over the next 10 years.

Hedging the Price Risk

- The fixed-price contract created a large exposure for Metallgesellschaft to the price of oil.

- In order to hedge this risk, MG Refining began a hedging strategy to protect itself against the possibility of oil prices rising above the selling price on the fixed-rate contracts.

- Therefore, MG Refining purchased oil futures contracts. These contracts were rolled over every three to six months.
How Did the Loss Occur

- Oil prices began to fall, so the value of the futures purchased decreased.

- The large losses on the futures contracts would be offset, over time by larger profits on the fixed-rate contracts. They had agreed to deliver oil at prices higher than the cost of the oil.

- Deutsche Bank (the company's advisor) panicked as the losses from the futures mounted and convinced Metallgesellschaft management to close out the position, thus causing the large loss.

How Did the Loss Occur

- There is some issue about the maturity of the hedging strategy. Firm was using short-term instrument to hedge a long-term exposure.

- The maturity mismatch could be considered at bet.
Codelco

- $207 million loss = 0.5% of the Chilean GDP.

- Codelco is the state-owned Chilean copper mining company.

- The loss occurred because of errors made by a trader who was using futures contracts to hedge Codelco's exposure to commodities prices.

How the Trader Lost $207 million

- The original error was when he incorrectly inputted futures transactions to sell in his computer as contracts to buy.

- This error allowed the trader to keep open positions which were losing money as prices moved against him. He thought that his positions were making money.

- The original loss from this error is estimated at $30 million. In an effort to cover this loss, the trader entered into huge positions to win the money back. This is where the remaining losses were realized.
**Baring Securities $1.3 Billion Loss**

- Baring's Singapore Office lost $1.3 billion in the period of three weeks trading futures and options on the Nikkei Index.

- Nick Leeson, Head of Futures trading, single-handedly was responsible to forcing the 223 year old investment bank out of business.

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**What Happened?**

- Leeson was speculating that the Nikkei Index would rally, after the Kobe Earthquake, so he amassed a $27 billion long position in Nikkei Index Futures.

- The Nikkei fell and Leeson sold put and call options on the Index to cover the margin calls. He was betting that the Index would trade in a range and he would therefore earn the premium from the contracts.

- He then deceived Baring's Officials to cover his $700 million margin call.
Barings' mistakes

- Barings did not have the controls in place to determine the risks that Leeson was taking.

- They allowed him to settle his own trades, therefore he was able to hide his large positions.

- The futures exchanges should not have allowed Leeson to take such large positions without approval from London.

Lessons to be Learned

- Understand the role of derivatives and swaps in the financial risk management of the company.

- A compete understanding of the risks of the products being entered into is essential (both upside and downside potential, demand scenario analysis)

- Don't allow unusually good results to go unquestioned.

- Have the proper controls in place to manage hedging positions.