SIM/NYU
The Job of the CFO

Swap Financing Techniques
Prof. Ian Giddy
New York University

Interest Rate and Currency Swaps

- Mechanics of swaps
- Valuation of swaps
- Credit risk of swaps
- Pricing swaps
- Hedging swaps
- The all-in cost of swap financing
- Currency swaps vs forwards
Swaps: Mechanics and Valuation

Periodic exchanges of interest payments are made during the life of the swap. Remember that the principal amount is not exchanged.

Interest-Rate Swap Example

Payments to Capital Markets

IC&Tel

Floating 6-Month LIBOR + 25

CIBC

Fixed 5.00%

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### Interest-Rate Swap Example

**Exchange of Interest Payments Every 6 Mo**

- **IC&Tel** (Floating 6-Month LIBOR + 25, BBB, Fixed 5.50%)
- **CIBC** (Floating 6-Month LIBOR Flat, AA, Fixed 5.00%)

**Cost of Funds After Swap:**
- Pay fixed 5.50%
- Receive LIBOR Flat
- Pay LIBOR + 25
- Net Cost: 5.75% Fixed

**Cost of Funds After Swap:**
- Pay 5.00% fixed
- Receive 5.50% fixed
- Pay 6-month LIBOR Flat
- Net Cost: 6-month LIBOR - 50

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### Swap Quotation Screen

<table>
<thead>
<tr>
<th>Tenor (yrs)</th>
<th>Cboe/PX</th>
<th>SwapPX US Medium Term Swaps vs 3M LIBOR</th>
<th>8/6/96</th>
</tr>
</thead>
<tbody>
<tr>
<td>2Y</td>
<td>6.250</td>
<td>6.143 /162</td>
<td>20.23</td>
</tr>
<tr>
<td>3Y</td>
<td>6.375</td>
<td>6.327 /333</td>
<td>22.92</td>
</tr>
<tr>
<td>4Y</td>
<td>6.022</td>
<td>6.460 /468</td>
<td>25.66</td>
</tr>
<tr>
<td>5Y</td>
<td>6.302</td>
<td>6.569 /580</td>
<td>26.31</td>
</tr>
<tr>
<td>6Y</td>
<td>6.351</td>
<td>6.648 /661</td>
<td>29.46</td>
</tr>
<tr>
<td>7Y</td>
<td>6.400</td>
<td>6.726 /740</td>
<td>32.47</td>
</tr>
<tr>
<td>8Y</td>
<td>6.449</td>
<td>6.781 /794</td>
<td>33.10</td>
</tr>
<tr>
<td>9Y</td>
<td>6.498</td>
<td>6.839 /853</td>
<td>34.16</td>
</tr>
<tr>
<td>10Y</td>
<td>7.000</td>
<td>6.893 /907</td>
<td>34.73</td>
</tr>
<tr>
<td>11Y</td>
<td>7.000</td>
<td>6.923 /947</td>
<td></td>
</tr>
<tr>
<td>12Y</td>
<td>6.569</td>
<td>6.953 /977</td>
<td></td>
</tr>
<tr>
<td>13Y</td>
<td>6.581</td>
<td>6.983 /997</td>
<td></td>
</tr>
<tr>
<td>14Y</td>
<td>6.592</td>
<td>7.023 /037</td>
<td></td>
</tr>
<tr>
<td>15Y</td>
<td>6.603</td>
<td>7.053 /067</td>
<td></td>
</tr>
<tr>
<td>20Y</td>
<td>6.659</td>
<td>7.113 /127</td>
<td></td>
</tr>
<tr>
<td>25Y</td>
<td>6.715</td>
<td>7.168 /182</td>
<td></td>
</tr>
<tr>
<td>30Y</td>
<td>6.000</td>
<td>7.212 /186</td>
<td></td>
</tr>
</tbody>
</table>

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A Currency Swap

Company issues dollar debt, but wants sterling financing so exchanges its dollars for sterling equivalent at today’s spot exchange rate.

Three Parts of a Currency Swap

- Fixed GBP 12%
- Floating USD Libor s.a.
- GBP 100
- USD 150
- GBP 100
- USD 150
- GBP 100
- USD 150
Swaps: Applications of Valuation

- Valuation
- Off-market swaps
- Cancellation
- Counterparty exposure
- Hedging swap positions

Valuation of an Interest Rate Swap

Valuation of the swap is based on discounting the cash flows over its life.

A receive-fixed, pay-floating swap:

\[
\text{Value of interest rate swap} = \text{Price of bond with } N \text{ years to run} - \text{Price of money market instrument with } M \text{ days to run}
\]
**Swap Valuation**

The value of a swap equals the "net worth" of the swap cash flows expressed as a balance sheet.

<table>
<thead>
<tr>
<th><strong>Labatt's</strong></th>
<th><strong>Bank</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed USD 9%</strong></td>
<td><strong>Floating USD Libor s.a.</strong></td>
</tr>
</tbody>
</table>

**ASSETS**
- Receiving floating 6-mo US$ Libor
- Semi-annual for 5 years
- Principal US$100m
- Like a 5-year US$ FRN

**LIABILITIES**
- Paying fixed 9%
- Annual for 5 years
- Principal US$100m
- Like a 5-year bond

Value=$100m

**At Inception, Standard Swap is Worth Zero**

Labatt's swap:
- Receive floating, pay fixed

<table>
<thead>
<tr>
<th><strong>&quot;ASSETS&quot;</strong></th>
<th><strong>&quot;LIABILITIES&quot;</strong></th>
</tr>
</thead>
</table>
| Receiving floating 6-mo US$ Libor | Paying fixed 9%
| Semi-annual for 5 years | Annual for 5 years
| Principal US$100m | Principal US$100m
| Like a 5-year US$ FRN | Like a 5-year bond

Value=$100m
Two Years Later, Rates Have Fallen...

Labatt's swap:
Receive floating, pay fixed

"ASSETS"
Receiving floating 6-mo US$ Libor Semi-annual for 3 years Principal US$100m
Like a 3-year US$ FRN

Value still $100m

"LIABILITIES"
Paying fixed 9% Annual for 3 years Principal US$100m
Like a 3-year bond

Swap rate = 6%
Value=$108m

Swap Valuation Spreadsheet
(This Uses the Zero-Coupon Approach)
Termination of Swaps

- Basic principle: cancel or neutralize all future swap cash flows
- What are the alternative ways in which this can be done?
  - Offsetting swap with same counterparty
  - Offsetting swap with new counterparty
  - Cancel swap
  - Reassign swap.

Default Risk in Swaps

- In-the-money swaps entail credit risk—the value of the swap is the amount owed
- At initiation, credit risk exposure is based on the potential value of the swap, which depends on potential changes in interest rates and currencies
- Credit risk can be mitigated by collateralization and by netting of bilateral exposure.
### How Swaps are Quoted

#### US$ Interest Rate Swaps

<table>
<thead>
<tr>
<th>Years</th>
<th>Treasury Curve Benchmark Semi-Annual Yields</th>
<th>Benchmark Treasury Curve Spread [b.p.] to AA Counterparties</th>
<th>DEM/USD Annual</th>
<th>JPY/USD Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>8.02</td>
<td>62-66</td>
<td>7.00-7.10</td>
<td>5.35-5.45</td>
</tr>
<tr>
<td>3</td>
<td>8.01</td>
<td>70-75</td>
<td>7.00-7.10</td>
<td>5.35-5.45</td>
</tr>
<tr>
<td>4</td>
<td>8.01</td>
<td>72-76</td>
<td>7.00-7.10</td>
<td>5.35-5.45</td>
</tr>
<tr>
<td>5</td>
<td>8.02</td>
<td>78-81</td>
<td>7.00-7.10</td>
<td>5.35-5.45</td>
</tr>
<tr>
<td>7</td>
<td>8.13</td>
<td>77-81</td>
<td>7.02-7.12</td>
<td>5.40-5.50</td>
</tr>
<tr>
<td>10</td>
<td>8.14</td>
<td>78-81</td>
<td>7.02-7.12</td>
<td>5.45-5.53</td>
</tr>
</tbody>
</table>

#### Currency Swaps

<table>
<thead>
<tr>
<th>Years</th>
<th>CHF/USD Annual</th>
<th>GBP/USD Annual</th>
<th>ECU/USD Annual</th>
<th>AUD/USD Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>6.05-6.10</td>
<td>11.90-12.00</td>
<td>9.10-9.20</td>
<td>15.15-15.30</td>
</tr>
<tr>
<td>5</td>
<td>6.00-6.10</td>
<td>11.75-11.85</td>
<td>9.05-9.15</td>
<td>14.78-15.13</td>
</tr>
<tr>
<td>7</td>
<td>5.95-6.05</td>
<td>11.50-11.60</td>
<td>9.05-9.15</td>
<td>NA</td>
</tr>
<tr>
<td>10</td>
<td>5.95-6.05</td>
<td>11.26-11.36</td>
<td>9.05-9.15</td>
<td>NA</td>
</tr>
</tbody>
</table>

#### Swap Spreads are Tied to TED Spreads

**Long Term**

- Swap spread
- Corporate bonds
- Interest rate swaps
- FRAs and futures
- Libor: E$ market

**Short Term**

- TED spread
- Treasury bonds
- Treasury bills
**FRAs and Friends**

- **FRA**: A contract to lock in a rate for a future period
- **Futures**: A daily recontracted FRA
- **Swap**: A strip of FRAs at a blended rate

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### Estimating the Cost of Funds in a Swap

**Problem**: Convert existing 4 year floating rate dollar sub-LIBOR funds into fixed rate sterling funds. Pay sterling fixed annually; receive dollar floating semi-annually.

**What is the all-in sterling cost?**

**Swap Quote Indication Sheet**

<table>
<thead>
<tr>
<th>Years</th>
<th>Treasury Yields</th>
<th>Spread [s.a.]</th>
<th>GBP/USD [ann]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>8.02</td>
<td>62-66</td>
<td>12.80-12.90</td>
</tr>
<tr>
<td>3</td>
<td>8.01</td>
<td>70-75</td>
<td>12.35-12.45</td>
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<tr>
<td>4</td>
<td>8.01</td>
<td>72-76</td>
<td>11.90-12.00</td>
</tr>
<tr>
<td>5</td>
<td>8.02</td>
<td>78-81</td>
<td>11.75-11.85</td>
</tr>
</tbody>
</table>

**Swap Quote**

For a conventional 4 year sterling/dollar swap quote would be sterling 11.90-12.00 against 6 month $ LIBOR flat. If client wants a non-standard swap such as sterling fixed against 6-month $ LIBOR-25, bank might quote: “You pay sterling 11.73% annual, we pay 6-mo LIBOR less 25.”
A Standard Currency Swap

- FMC to BANK: GBP 100, USD 150
- FMC to BANK: Fixed GBP 12%, Floating USD Libor s.a.
- BANK to FMC: GBP 100, USD 150
- BANK to FMC: Floating USD Libor s.a., -0.25%

Estimating the Cost of Funds in a Swap

- FMC to BANK: GBP 100, USD 150
- FMC to BANK: Fixed GBP 11.73%
- BANK to FMC: GBP 100, USD 150
- BANK to FMC: Floating USD Libor s.a., -0.25%
Estimating the Cost of Funds in a Swap

**Basis Point Conversion:**
The quote of Sterling 11.73% annual fixed payments against LIBOR - 25 required conversion from dollar basis points to sterling basis points.

**How to do this:**
1. Find present value of 25 U.S. dollar basis points paid semi-annually at 8.77% interest.

\[
P V [25 \text{bp}_\text{USD}] = \sum_{n=1}^{8} \frac{12.5}{(1+0.0877)^n} = 82.84 \text{bp}
\]

2. Find the sterling annuity equivalent of 82.84 at the sterling swap rate of 12.00% paid annually.

Annuity value of 82.84 @ 12% [annual] = 27.27bp\text{GBP}

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**Whose Zoo?**

- Kalamazoo needs $60 million.
- Receiving Euro, the European Currency unit.
- K’zoo could borrow five-year money at semi-annual LIBOR + 3/4%, and Dresdner agreed to enter into a currency swap with the company.
  - Diagram the swap with little boxes.
  - What would K’zoo’s cost of capital be if it did the swap? (US 5-yr swap rate = 10%)
  - Effect of a rise in ST & LT rate?
  - How would a 0.75% up front commitment fee affect K’zoo’s cost of capital?

<table>
<thead>
<tr>
<th>Years</th>
<th>Euro Fixed vs USD Libor sa</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>8.00 - 8.10</td>
</tr>
<tr>
<td>3</td>
<td>8.00 - 8.10</td>
</tr>
<tr>
<td>4</td>
<td>8.20 - 8.30</td>
</tr>
<tr>
<td>5</td>
<td>8.20 - 8.35</td>
</tr>
<tr>
<td>7</td>
<td>8.25 - 8.35</td>
</tr>
<tr>
<td>10</td>
<td>8.40 - 8.50</td>
</tr>
</tbody>
</table>
Kalamazoo

Fixed EURO 8.35%+0.73%=9.08%

Floating USD Libor +0.75%

K'ZOO

DRESDNER

Floating USD Libor +0.75%

+ 75bpUSD=73bpEuro; swapped cost is 9.08%
+ ST rate: no effect. LT rate rise: value of swap will change by duration. K’zoo gains, Dresdner loses.
+ Amortize the up-front fee of 0.75% over the period of the financing, and add it to swapped cost..

BP Conversion: Excel Spreadsheet

<table>
<thead>
<tr>
<th>Basis Point Conversion</th>
<th>Enter the blue numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>First currency</td>
<td></td>
</tr>
<tr>
<td>NUMBER OF BASIS POINTS (US$)</td>
<td>75</td>
</tr>
<tr>
<td>US$ INTEREST RATE</td>
<td>10.00%</td>
</tr>
<tr>
<td>NUMBER OF PAYMENT PERIODS PER YEAR</td>
<td>2</td>
</tr>
<tr>
<td>NUMBER OF YEARS</td>
<td>5</td>
</tr>
<tr>
<td>PRESENT VALUE OF BASIS POINTS (US$)</td>
<td>290</td>
</tr>
<tr>
<td>Second currency</td>
<td></td>
</tr>
<tr>
<td>Euro INTEREST RATE</td>
<td>8.35%</td>
</tr>
<tr>
<td>NUMBER OF PAYMENT PERIODS PER YEAR</td>
<td>1</td>
</tr>
<tr>
<td>NUMBER OF YEARS</td>
<td>5</td>
</tr>
<tr>
<td>NUMBER OF BASIS POINTS (Euro) (ANNUITY EQUIV)</td>
<td>73.2</td>
</tr>
</tbody>
</table>
**Asset Swaps: The Same Idea**

- Investor buys cheap fixed-rate bond
- But wants a floating-rate note.

Investor borrows £100m at 12.73% fixed.

**Fixed GBP 12.73%**

Investor buys a floating-rate note from the bank.

Floating USD Libor +0.75%

The bank pays the investor £100m at 12.73% fixed.

INVESTOR

BANK

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Swap Financing 31
Currency Swaps vs Long-dated Forwards

**LONG-DATED FORWARD**

SF $\rightarrow$ £

**SPOT RATE**

SF £ $\leftarrow$

**FORWARD RATE**

End-period exchange occurs at forward rate, which represents the spot rate plus the cumulative interest rate differential.

**CURRENCY SWAP**

SF $\rightarrow$ £

**SPOT RATE**

SF £ $\leftarrow$

**FORWARD RATE**

End-period exchange occurs at spot rate, since the cumulative interest rate differential is paid during interim periods.
A Basis Swap

Fuji makes a loan at Prime + Spread, but gets funding in the Eurodollar interbank market.

Fuji wants to lock in its spread, so does a basis swap with Citibank.
### Basis Swap Quotations

<table>
<thead>
<tr>
<th>Term</th>
<th>Pay Prime</th>
<th>Rec Prime</th>
<th>FF+</th>
<th>Prime 8.25</th>
<th>CP vs LIBOR</th>
<th>T-Bill vs LIBOR</th>
<th>GovPX/GGB</th>
<th>GovPX Index</th>
<th>Basis Swaps vs 3M LIBOR 8/6/96</th>
<th>Page 262</th>
</tr>
</thead>
<tbody>
<tr>
<td>1Y</td>
<td>P- 271</td>
<td>P- 267</td>
<td>FF+ 23 1/2</td>
<td>FF+ 21 1/2</td>
<td>CP+ 4 3/4</td>
<td>3 1/2 - 4 3/4</td>
<td>1M 5 7/16</td>
<td>1M 5 1/2</td>
<td>vs 3M LIBOR</td>
<td></td>
</tr>
<tr>
<td>2Y</td>
<td>P- 268</td>
<td>P- 264</td>
<td>FF+ 23 1/2</td>
<td>FF+ 21 1/2</td>
<td>CP+ 5</td>
<td>3 1/2 - 4 3/4</td>
<td>1M 5 1/2</td>
<td>1M 5 1/2</td>
<td>vs 3M LIBOR</td>
<td></td>
</tr>
<tr>
<td>3Y</td>
<td>P- 267</td>
<td>P- 263</td>
<td>FF+ 23 1/2</td>
<td>FF+ 21 1/2</td>
<td>CP+ 6</td>
<td>3 1/2 - 4 3/4</td>
<td>1M 5 1/2</td>
<td>1M 5 1/2</td>
<td>vs 3M LIBOR</td>
<td></td>
</tr>
<tr>
<td>4Y</td>
<td>P- 265</td>
<td>P- 261</td>
<td>FF+ 23 1/2</td>
<td>FF+ 21 1/2</td>
<td>CP+ 6</td>
<td>3 1/2 - 4 3/4</td>
<td>1M 5 1/2</td>
<td>1M 5 1/2</td>
<td>vs 3M LIBOR</td>
<td></td>
</tr>
<tr>
<td>5Y</td>
<td>P- 263</td>
<td>P- 259</td>
<td>FF+ 25 1/2</td>
<td>FF+ 23 1/2</td>
<td>CP+ 6</td>
<td>3 1/2 - 4 3/4</td>
<td>1M 5 1/2</td>
<td>1M 5 1/2</td>
<td>vs 3M LIBOR</td>
<td></td>
</tr>
<tr>
<td>7Y</td>
<td>P- 260</td>
<td>P- 255</td>
<td>FF+ 26</td>
<td>FF+ 24 1/2</td>
<td>CP+ 7</td>
<td>3 1/2 - 4 3/4</td>
<td>6M 5 11/16</td>
<td>3M 5 1/2</td>
<td>vs 3M LIBOR</td>
<td></td>
</tr>
<tr>
<td>10Y</td>
<td>P- 259</td>
<td>P- 254</td>
<td>FF+ 28</td>
<td>FF+ 25 1/2</td>
<td>CP+ 9</td>
<td>3 1/2 - 4 3/4</td>
<td>6M 5 11/16</td>
<td>3M 5 1/2</td>
<td>vs 3M LIBOR</td>
<td></td>
</tr>
</tbody>
</table>

### A Basis Swap

Fuji makes a 3-year loan at Prime + 1%, and swaps at P-2.63%

Fuji thus locks in a spread of 3.63%
Commodity Swap Example: Qantas

- **Passenger Revenues**
  - US$ LIBOR + 1/4%
  - Semiannual

- **Fuel Costs**

Example: Qantas

- **Passenger Revenues**
  - US$ LIBOR + 1/4%
  - Semiannual

- **Fuel Costs**

- **Qantas**

- **Paribas**
**Example: Qantas**

- **Qantas**: US$ LIBOR + 1/4% semiannual
- **Paribas**: US$ LIBOR + 1/4% semiannual
- **US$ Fixed 10% +/− $30 M × (1−%CH AW INDEX)**

**Summary**

- Mechanics of swaps
- Valuation of swaps
- Credit risk of swaps
- Pricing swaps
- Hedging swaps
- The all-in cost of swap financing
- Swap around the clock
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