Class Notes Topic 4
(Part 2)
Forwards, Futures, and Swaps

15.438 Fixed Income

Professor Deborah Lucas

Topic 4 Part 2 Overview

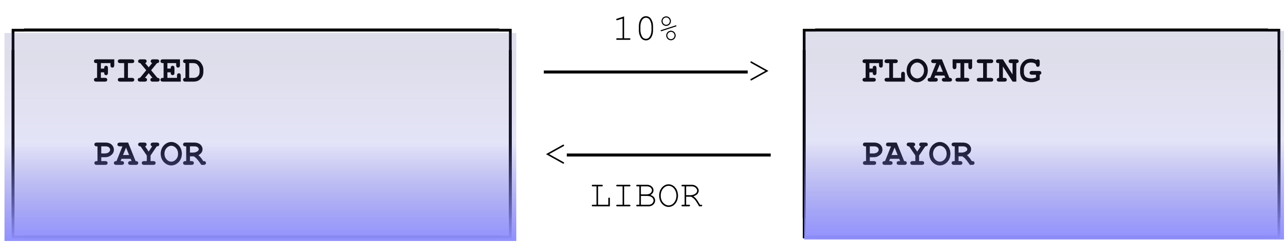
1. Interest Rate Swaps
   - Basic swap mechanics
   - Pricing
   - Uses of swaps
     - Maturity restructuring
     - Substitute for futures in hedging strategies
     - Looking for lower cost funding
   - Managing swap risk – the dealer perspective
2. Speculative Strategies
   - Speculating on spreads with RPs
   - The Proctor and Gamble bet

Goals for Swaps and Speculative Strategies

- Understand the basics of interest rate swap contracts
- Understand how to price fixed for floating swaps
- Know how to calculate a swap’s duration
- Understand the various uses of interest rate swaps
- Know how to use swap contracts in delta and gamma hedging strategies
- Know how to speculate on changes in interest rates and interest rate spreads using the spot market, forwards, futures and swaps

Structure of a "Plain Vanilla" Interest Rate Swap

- In the most common type of interest rate swap (fixed for floating), fixed interest rate payments are exchanged for floating interest rate payments at regular intervals over the life of the contract
- No principal is exchanged



Terminology

- **Notional Principal**
  - Amount of principal upon which the interest payments are based. This principal is never exchanged.
- **Counterparties**
  - The two participants in the swap.
- **Fixed Rate Payor**
  - The counterparty who pays a fixed rate, and receives a floating rate in the swap. *The fixed rate payor is said to have "bought the swap" or is long in the swap.*
- **Floating Rate Payor**
  - The counterparty who pays a floating rate, and receives a fixed rate in the swap. *The floating rate payor is said to have "sold the swap" or is short in the swap.*

Example: A Plain Vanilla Swap

Notional Principal Amount	$10,000,000
Maturity	May 15, 2027
Trade Date	May 8, 2020
Effective Date	May 15, 2020
Settlement Date	Effective Date
FIXED PAYMENT	
Fixed Coupon	6.50%
Payment Frequency	Semiannual
Day Count	30/360
Pricing Date	Trade Date
FLOATING PAYMENT	
Floating Index	Six-Month LIBOR
Spread	None
Payment Frequency	Semiannual
Day Count	Actual/360
Reset Frequency	Semiannual
First Coupon	Six-Month LIBOR quoted for value as of the Settlement Date
Determination Source	*Reuter Monitor Money Rates Service*

Example: Plain Vanilla Swap

Determination of fixed rate payment

The payment is constant each period at

.065(6)(30)($10,000,000)/360 = $325,000

Determination of floating rate payment

Suppose that six-month LIBOR is 4.75% on 5/15/20.

There are 184 days between 5/15/20 and 11/15/20. Then the payment on 11/15/20 will be

.0475(184)($10,000,000)/360 = $242,778

Swap Pricing

Swap valuation

- For floating rate payor, swap is initially equivalent to going long in a fixed rate bond priced at par, and going short in a floating rate bond priced at par
- For the fixed rate payor, the equivalent cash position is the opposite
- **In general, we price a swap by finding the difference between the present value of the fixed and floating rate payments.**

$+P_{float}$ $\quad -F(r_0)$ $\quad -F(r_1)$ $\quad -F(r_2)$ $\quad -F(r_3)$ $\quad \ldots$ $\quad -F(1+r_{N-1})$

0 $\quad$ 1

$-P_{fixed}$ $\quad +cF$ $\quad +cF$ $\quad +cF$ $\quad +cF$ $\quad \ldots$ $\quad +F(1+c)$

  - Note: the floating payments r_1, r_2, …, are stochastic.

- Standard swaps traditionally priced using term structure for LIBOR
  - The most direct no-arbitrage connection is with the Eurodollar futures market
  - OIS pricing is also relevant (see Tuckman on 2-curve discounting)

Swap Pricing: Valuing a Floating Rate Bond

- **<u>Fact:</u> Floating rate bonds always are priced at par at reset dates.**
  - *Assumes no credit spread an no change in risk over time*

- **Proof**: Let r_i be the one-period reset rate realized at time i.
- We find the price at time 0 by working backwards.
- At time N-1 there is one remaining payment of principal and interest, equal to $F(1 + r_{N-1})$. Its value at time N-1, P_{N-1}, is $F(1 + r_{N-1})/ (1 + r_{N-1}) = F$.
- Stepping back to time N-2, $P_{N-2} = (F(r_{N-2}) + P_{N-1})/ (1 + r_{N-2}) =$

  $F(1 + r_{N-2})/ (1 + r_{N-2}) = F$.
- Continuing in this way, it is clear that the price equals the face value on all reset dates, including at time 0

Swap Pricing: A No-Arbitrage Condition

- At swap initiation, the present value of the fixed and floating rate payments must be equal
  - *Why?*
- Because the present value of the floating payments equals the face value of the floating rate bond, the present value of the fixed rate payments also must equal the face value of the fixed rate bond
- Thus, **the fixed rate on the swap is determined by setting the present value of the future fixed rate payments equal to par**
  - *Related to homework problem on deriving the par yield curve*

Swap Pricing: Implementation

- Imagine that you have derived a spot yield curve Y_1, Y_2, …, Y_N that is appropriate for discounting fixed rate payments with LIBOR risk. Then the coupon rate on the swap solves:

$$F = \frac{cF}{(1+Y_1)^1} + \frac{cF}{(1+Y_2)^2} + \ldots + \frac{F(1+c)}{(1+Y_N)^N}$$

- Rearranging implies the fixed coupon rate is:

$$c = \frac{1 - \dfrac{1}{(1+Y_N)^N}}{\dfrac{1}{(1+Y_1)^1} + \dfrac{1}{(1+Y_2)^2} + \ldots + \dfrac{1}{(1+Y_N)^N}}$$

How Swaps are Quoted

- Swap banks regularly send out indication pricing schedules for dealers to use as a reference in pricing swaps. A typical schedule (with bid/ask spread) might look like*:

Maturity	Bank pays fixed rate	Bank receives fixed rate	Current TN rate
2 yrs	2 yr TN sa +20 bps	2 yr TN sa +30 bps	8.55%
3 yrs	3 yr TN sa +25 bps	3 yr TN sa +35 bps	8.72%
4 yrs	4 yr TN sa +28 bps	4 yr TN sa +38 bps	8.85%
5 yrs	5 yr TN sa +34 bps	5 yr TN sa +44 bps	8.92%
6 yrs	6 yr TN sa +38 bps	6 yr TN sa +49 bps	8.96%
7 yrs	7 yr TN sa +40 bps	7 yr TN sa +52 bps	9.00%
10 yrs	10 yr TN sa +50 bps	10 yr TN sa +64 bps	9.08%

- Rates change frequently with market conditions
- Poorer credit risks may be charged a higher spread, or have to post collateral, or obtain a third party credit guarantee
- Other features such as floors and caps or nonstandard payment frequencies will involve either front-end fees or higher rates

**from Understanding Swap Finance, by Jack Marshall and Ken Kapner.*

Swap Pricing: Implementation

- LIBOR-based swaps must be priced consistently with Eurodollar futures rates, which are based on a LIBOR index.
  - Recall that the Eurodollar futures contract is based on a 90-day loan, with interest quoted on an actual/360 day basis.

- The spot yield curve is based on the geometric averages of the product of successive one-period forward rates.
  - Let one period correspond to 90 days, and let f(0,k,k+1) denote the 90 day forward rate implied by prices in the futures market today, starting in k periods.

- Then we can derive the LIBOR spot yield curve as follows:

$$(1+Y_1) = (1+f(0,0,1))$$

$$(1+Y_2)^2 = (1+f(0,0,1))(1+f(0,1,2))$$

$$(1+Y_N)^N = (1+f(0,0,1))(1+f(0,1,2))\ldots(1+f(0,N-1,N))$$

- These rates can then be used in the equations above to price the fixed rate side of an interest rate swap.

Swap Pricing: Converting to a Spread over Treasury

- We saw that swap rates are related to the Eurodollar futures market by no-arbitrage conditions
- The resulting rates are often represented as a spread over the most actively traded Treasury bond with the same maturity.
  - This is simply a quotation convention
  - The quoted spread over Treasury yields results in the same present value of the fixed rate payments as from discounting at the LIBOR-based spot rates.

Example 4.12: Swap Pricing

Quotes from WSJ						
Constructing the swap curve from Eurodollar futures						
		Rate	Zero	Swap	T-Note yield	Difference
	Jun-97	5.97	0.98529	5.9700	5.2600	0.7100
	Sep-97	6.28	0.97006	6.1238	5.6700	0.4538
	Dec-97	6.57	0.95439	6.2701	5.8600	0.4101
	Mar-98	6.71	0.93864	6.3774	6.0200	0.3574
	Jun-98	6.83	0.92288	6.4650	6.1300	0.3350
	Sep-98	6.91	0.90721	6.5361	6.2600	0.2761
	Dec-98	7.00	0.89161	6.5990	6.4200	0.1790
	Mar-99	7.01	0.87625	6.6474	6.4200	0.2274
	Jun-99	7.05	0.86108	6.6891	6.4400	0.2491
	Sep-99	7.08	0.84610	6.7253	6.5100	0.2153
	Dec-99	7.14	0.83126	6.7598	6.5600	0.1998
	Mar-00	7.14	0.81668	6.7885	6.6000	0.1885
	Jun-00	7.18	0.80228	6.8156	6.6200	0.1956
	Sep-00	7.21	0.78808	6.8407	6.6600	0.1807
	Dec-00	7.28	0.77399	6.8665	6.6900	0.1765
	Mar-01	7.28	0.76016	6.8891	6.7100	0.1791
	Jun-01	7.32	0.74650	6.9110	6.7200	0.1910
	Sep-01	7.36	0.73301	6.9324	6.7400	0.1924
	Dec-01	7.43	0.71964	6.9546	6.7400	0.2146
	Mar-02	7.43	0.70652	6.9745	6.7500	0.2245
	Jun-02	7.47	0.69357	6.9941	6.7400	0.2541
	Sep-02	7.51	0.68078	7.0134	6.7600	0.2534
	Dec-02	7.58	0.66812	7.0335	6.7600	0.2735
	Mar-03	7.58	0.65570	7.0518	6.8400	0.2118
	Jun-03	7.62	0.64344	7.0700	6.8200	0.2500

Swap Pricing: Duration

- For a fixed rate receiver, a swap is like having a portfolio that is long a fixed rate bond and short a floating rate bond.
  - Initially the value of the long and short are equal to each other, and to the notional principal F
- The effective duration of a (pure) floating rate bond is the time until the next reset, divided by (1 + Y/k)
  - Y is the APR; k is the number of compounding periods in a year.
  - This is because the price of a floating rate bond between reset dates can vary with changes in short-term interest rates, but the price at the next reset date is fixed at par.
- The modified (and also effective) duration of the fixed rate bond can be calculated in the usual way.
- It follows that for the fixed rate receiver, **the dollar duration of a swap, -dP/dY is:**

+P(fixed) x D_m (fixed) - P(floating) x $D_{effective}$ (floating)

<u>Example 4.13</u>: Swap Duration

- Consider a new 5-year interest rate swap, offering a fixed rate of 6% (s.a.), and a floating rate of 6-mo LIBOR, with notional principal of $1m. Assume current 6-mo LIBOR is also 6%.
  - What is the dollar duration for the fixed rate receiver?
  - What is the dollar duration for the floating rate receiver?
- Using the duration calculator, a 5-year fixed rate bond with a 6% (s.a.) coupon selling at par has a modified duration of 4.265 years. The effective duration of the floating rate side is .5/(1.03) = .485 years. The difference is 3.78 years.
  - **The dollar duration of the swap is 3.78($1m)**
- The floating rate receiver's position is the negative of the fixed rate receiver's position.
  - **The dollar duration of the swap is -3.78($1m)**

Uses of Swaps

Swap Uses #1:
Maturity (or Duration) Restructuring

- Companies can inexpensively restructure debt using swaps
  - low bid/ask spread for a standard swap, and other associated costs small too
  - A company wishing to switch from fixed to floating debt will often find it cheaper to enter a swap than to buy back their fixed coupon bonds and seek new floating rate financing (or vice versa).
  - *Why would a company want to restructure its debt maturity?*

Swap Uses #2:
Alternative to FRAs or Futures Contracts

- Definition: A **forward rate agreement** (FRA) commits one party to pay a preset forward rate $f(0,t,t+1)$ on notional principal N at t+1 in exchange for a payment based on the realized one-period rate at time t.

- A swap is a package (or strip) of FRAs
- FRAs can also substitute for a strip of bond futures contracts:
  - Fixed rate payor has equivalent of shorting a strip of futures
  - Floating rate payor has equivalent of going long in a strip of futures

- Swaps may be preferred to futures for several reasons:
  - Swaps can be customized
  - Long-dated futures are illiquid
  - Lower transaction costs

Example 4.14: Hedging Balance Sheet Risk

- In December 2014, Southwest S&L expanded its holdings:
  - It funds \$1mm of new 10-year mortgages
  - The current mortgage rate is 10% per year, fixed.
  - The current 3-month rate on time deposits is 8%.
- If the mortgages are funded with 3-month time deposits (CDs), a profit of 2% is locked in over the first three months
- After that, the bank bears the risk that interest rates might rise. This risk can be hedged with Eurodollar **futures**, or more effectively, with an **interest rate swap**

Balance Sheet

Assets	Liabilities
10 year Mortgages	3 month time deposits
	Equity

Example 4.14: (*continued*)

Hedging with Eurodollar Futures

Eurodollar Futures Quotations
December, 2014

	Quoted Rate	Effective Rate (360 day basis)	Open Interest
March 2015	92.11	7.89%	282,867
June 2015	92.05	7.95%	158,974
Sept 2015	91.83	8.17%	102,620
Dec 2015	91.84	8.16%	65,656
March 2016	91.56	8.44%	33,065
June 2016	91.50	8.50%	27,220
Sept 2016	91.51	8.49%	24,899
Dec 2016	91.49	8.51%	15,108
March 2017	91.45	8.55%	12,763
June 2017	91.48	8.52%	21,028
Sept 2017	91.46	8.56%	10,832
Dec 2017	91.45	8.55%	2,532

Shorting one of each of these contracts locks in a **borrowing** rate on $1 million of funds as listed above over the next three years. This is called "shorting a strip of futures."

What are the drawbacks of this hedging strategy?

How else could Southwest hedge using futures?

<u>Example 4.14</u>: (*continued*)

- **Hedging with an Interest Rate Swap**
  - Imagine that Southwest can enter into an interest rate swap with the following terms:
    - **Maturity** = 10 years
    - **Fixed rate payor** = Southwest S&L.
    - **Fixed Rate** = 8.65%.
    - **Floating Rate** = LIBOR
    - **Payment Frequency** = Semiannual for both fixed and floating.
  - Now Southwest can use the fixed (10%) payments from the mortgages to meet their obligations in the swap.
  - The floating rate payments received in the swap will be used to pay interest on the deposits backing the mortgage.

Example 4.14: (*continued*)

- **The advantages over the strip of futures contracts include:**
  - only one contract
  - covers the entire 10 years
  - the timing is more flexible

- **But this swap is not a perfect hedge for Southwest:**
  - Mortgages are usually amortized over their lifetime, so that the principal balance is declining.
  - The frequency of the mortgage payments (often monthly) does not match the semiannual frequency of the fixed payments on a plain vanilla swap.
  - The three month rate paid to depositors does not match the six month LIBOR rate received in the swap.
  - Mortgages can usually be prepaid.

Customized Swap Contracts

- Those features, which make a plain vanilla swap a less-than-perfect hedge for Southwest, have led to a variety of more specialized swap products:
  - **Amortizing Swaps**
  - **Basis Swaps**
  - **Swaptions** (we'll return to these when we cover options)

- Specialized swaps can be more expensive because they require more paperwork and a counterparty may be harder to locate

Swap Uses #3
Seeking better borrowing terms

- Example 4.15:
  - Firm A and Firm B both seek financing for 5 years.
  - Firm A has a higher credit rating, and prefers to borrow at a floating rate.
  - Firm B seeks fixed rate financing.
  - Going directly to the market, the firms are offered these rates:

Best Attainable Market Rates

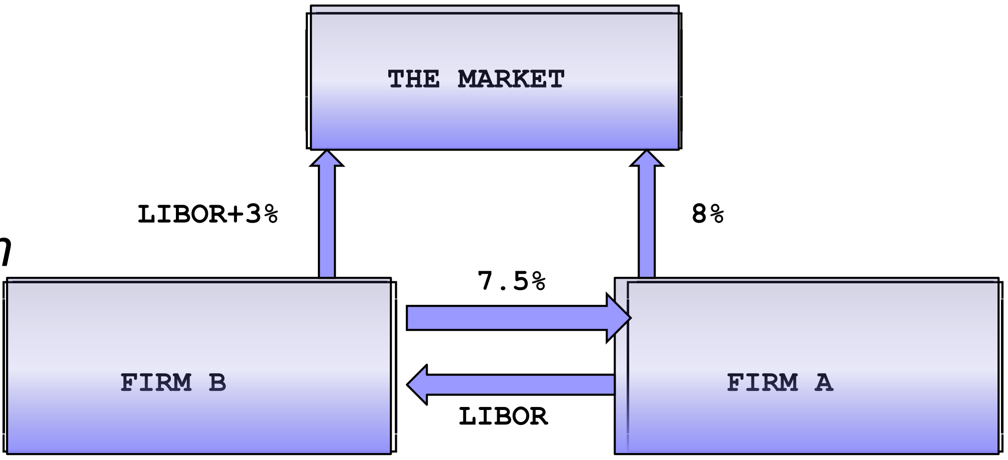
	Firm A	Firm B
Fixed	8%	11%
Floating	LIBOR+2%	LIBOR+3%

Example 4.15 (*continued*)

- *Here is an arrangement that is better for both…*
- Enter a 5-year swap with the following terms:
  - Firm A pays Firm B LIBOR
  - Firm B pays Firm A 7.5%

    (Note this is accomplished in practice via intermediaries)
- Borrow in the spot market:
  - Firm A borrows fixed at 8% in the market
  - Firm B borrows floating at LIBOR+3% in the market.

Diagram of Cash flows



Example 4.15 (*continued*)

Calculation of Net Borrowing Costs

Firm A		*Firm B*	
Pays to Market	8%	**Pays to Market**	LIBOR+3%
Pays to Firm B	LIBOR	**Pays to Firm A**	7.5%
Gets from Firm B	(7.5%)	**Gets from Firm A**	(LIBOR)
Net Rate Paid	**LIBOR+.5%**		**10.5%**
Savings:	1.5%		.5%

Both firms achieve lower cost borrowing than without the swap!

Example 4.15 (*continued*): Some general conclusions

- In general, if the difference between the market fixed rates and floating rates for two firms is not equal, there will be terms under which a swap **appears** to benefit both parties.
  - In this example:
    - the difference between the fixed rates is 3%
    - the difference between the floating rates is 1%
    - there is 3% - 1% = 2% to split.
- This could happen if swaps help to complete markets, e.g.,
  - Highly rated European companies can generally borrow at lower rates in the Eurobond market than little known American companies.
  - The American companies receive favorable floating rates from U.S. banks, and may be able to profitably swap payments with the European companies.

Example 4.15 *(continued)*: Some general conclusions

- **But beware risk differentials!**
  - Lower credit quality firms often borrow relatively cheaply at shorter maturities.
  - If one party defaults before the swap matures, the effective rate for the non-defaulting party can be substantially higher than what is predicted by this simple analysis.
  - In theory, if all primary market loans were fairly priced (in the sense of accurately reflecting the default risk of the borrowers), an interest rate swap benefits one party only at the expense of the other party – it is a zero sum game.

Hedging a Swap Portfolio with Forwards, Futures and Forward Swaps

- An intermediary with a portfolio of swaps can often hedge more efficiently by considering the risk of the portfolio rather than hedging individual swap positions.

- **Example 4.16**: Consider a dealer with the following swap obligations:
  (a) Receives four years of fixed rate payments from Firm A.
  (b) Receives three years of floating payments from Firm B.
- Treating each separately and using swaps to hedge, the dealer must find a four year floating rate payor, and a three year fixed rate payor.
- However, the two swaps are offsetting for the first three years. The only unmatched cash flow occurs from the fixed rate payor in the fourth year.
  - This can be hedged, for instance, with a forward swap with another bank, or using FRAs or futures

Practice Problem 4.4: Should the dealer hedge with a long or short position in an interest rate futures contract (e.g. Eurodollar futures)?

Basis Risk

- The risk that the cash price and futures price will not move perfectly in synch, or that the rates in two different markets will not move in synch, is called “**basis risk**”
- When an investor uses a futures contract in one security to hedge a position in a different security, it is called a **“cross hedge”**.
- Since rates on most fixed income securities move more or less in synch, investors often cross hedge
  - They use standard forward, futures and swap contracts to hedge other fixed income investments.
  - Using the most liquid market to hedge economizes on transaction costs, but can introduce basis risk

Speculative Strategies

Uncovered speculation on rate changes

- If you expect rates to rise you can:
  - shorten duration of portfolio
  - sell interest rate futures
  - enter swap as fixed rate payor
  - sell bond call options
  - buy bond put options
- If you expect rates to fall you can:
  - lengthen duration of portfolio
  - buy interest rate futures
  - enter swap as floating rate payor
  - buy bond call options
  - sell bond put options

Speculating on Spreads

- Less risky to bet on **relative rate movements,** which may be more predictable than broad market changes.
- “Normal" spreads are determined by intrinsic differences between securities in risk, liquidity, tax treatment, maturity, etc.
- Spreads change because of:
  - Transitory factors
  - Permanent factors
- The risk is in mistaking a persistent or permanent change for a transitory one

Speculating on Spreads

- General technique:

1. Set up a forward **long position in the relatively undervalued security**, with the intention of selling it at a later date.
2. Set up an offsetting **forward short position in the relatively overvalued security** with the intention of buying it to cover the short at a later date.

- *By buying and selling in appropriate proportions, you are protected from general movements in interest rates, and will earn a profit if the spread return to normal.*

Example 4.17: **Speculating on a narrowing spread between corporates and Treasury's with RPs**

- Say that the normal spread between 1 year AAA corporates and 1 year Treasuries is .5%.
- Currently it is at 1%.
- The Treasury yield curve is flat at 5.5%.
- The corporate yield curve is also flat.

How do you speculate on spreads returning to normal in six months?

- Go long 1-year AAA corporate.
- Go short 1-year Treasury.

(For simplicity, assume the discrepancy is on two zero coupon bonds)

Set up forward positions using term RPs:

Enter into a six month reverse RP with 18 month Treasury as collateral:

lend \$100,000
receive 18 month treasury
sell treasury into market for \$100,000
face = $\$100{,}000(1.0275)^3 = \$108{,}479$

Enter into a six month RP with 18 month corporate as collateral.

borrow \$100,000
use it to buy 18 month corporate
deliver corporate into RP
face = $\$100{,}000(1.0325)^3 = \$110{,}070$

Notice zero net cash flow in both transactions initially!

For simplicity, assume six month repo rate in both trades, “i”, is the same.

Six months later unwind positions:

- buy 1 year Treasury at current market price, P_T.
- receive \$100,000(1 + i) on reverse RP.
- deliver 1 year treasury in reverse RP

- pay \$100,000(1 + i) on RP.
- receive 1 year corporate.
- sell 1 year corporate at current market price P_C.

Profit or loss is P_C - P_T.

Note: It is more common to set up a short term (e.g., overnight) position and to roll it over until closing it out.

Analysis of Profit/Loss

Case 1: Spread returns to normal; Treasury rate rises to 6.5%.

P_T = $108,479/(1.0325)^2 = $101,757
P_C = $110,070/(1.035)^2 = $102,751
Profit = $994

Case 2: Spread returns to normal; Treasury rate falls to 4.5%.

P_T = $108,479/(1.0225)^2 = $103,757
P_C = $110,070/(1.025)^2 = $104,766
Profit = $1,009

Case 3: Spread widens to 2%. Treasury rate stays constant.

P_T = $108,479/(1.0275)^2 = $102,750
P_C = $110,070/(1.0375)^2 = $102,257
Loss = $493

Appendix (optional material)

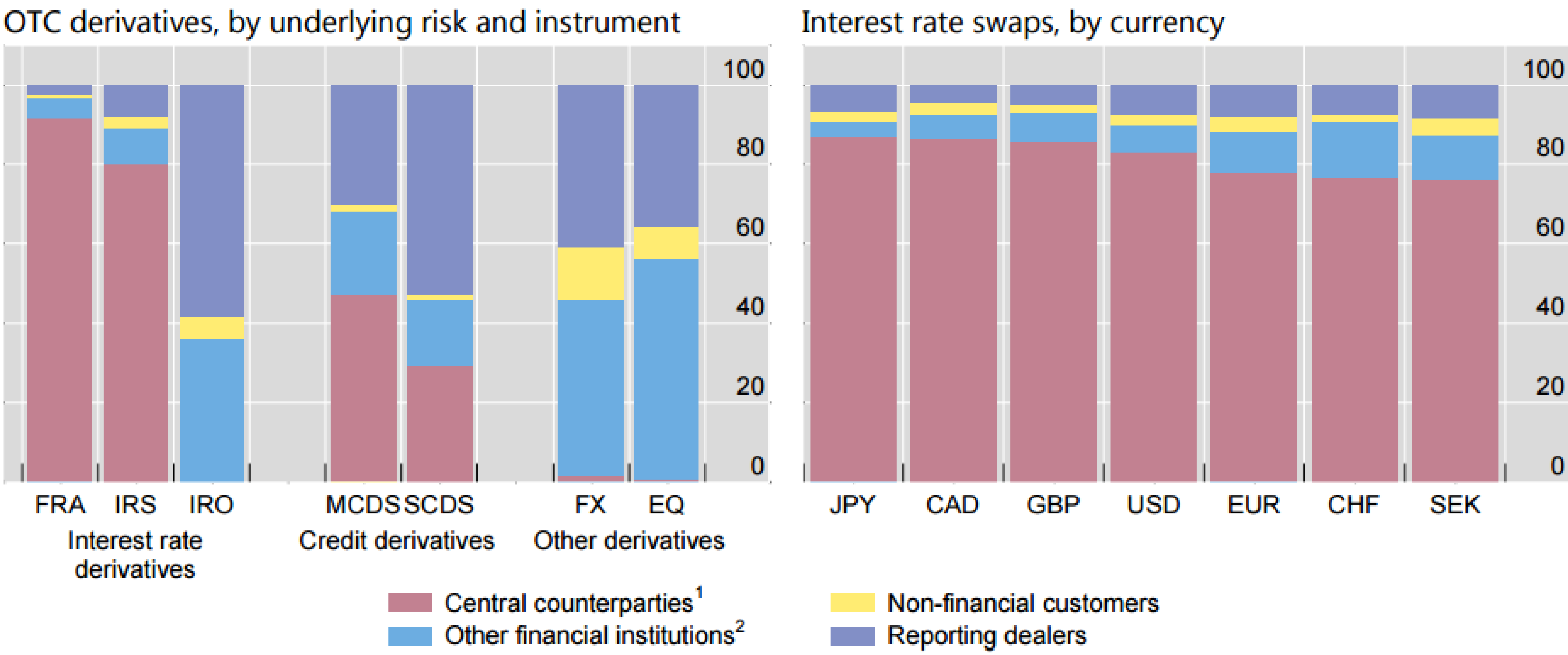
Evolving Swap Market Structure

Link to ISDA

- At the market's inception, contracts were specialized. Brokers arranged deals, but did not take a position.
- As the market grew, contracts became more standardized.
- Now there is a well-established dealer market, mostly commercial and investment banks. A majority of transactions are **intra**dealer.
- The market has broadened to include lower credit quality participants. Contracts are increasingly collateralized.
- Dodd Frank Act requires increased use of clearing and central counterparties to reduce systemic risk. The migration to cleared swaps is ongoing and massive.
- Current concern is orderly transition away from LIBOR and what will happen when contracts have inadequate provisions for a transition.

Significance of central clearing

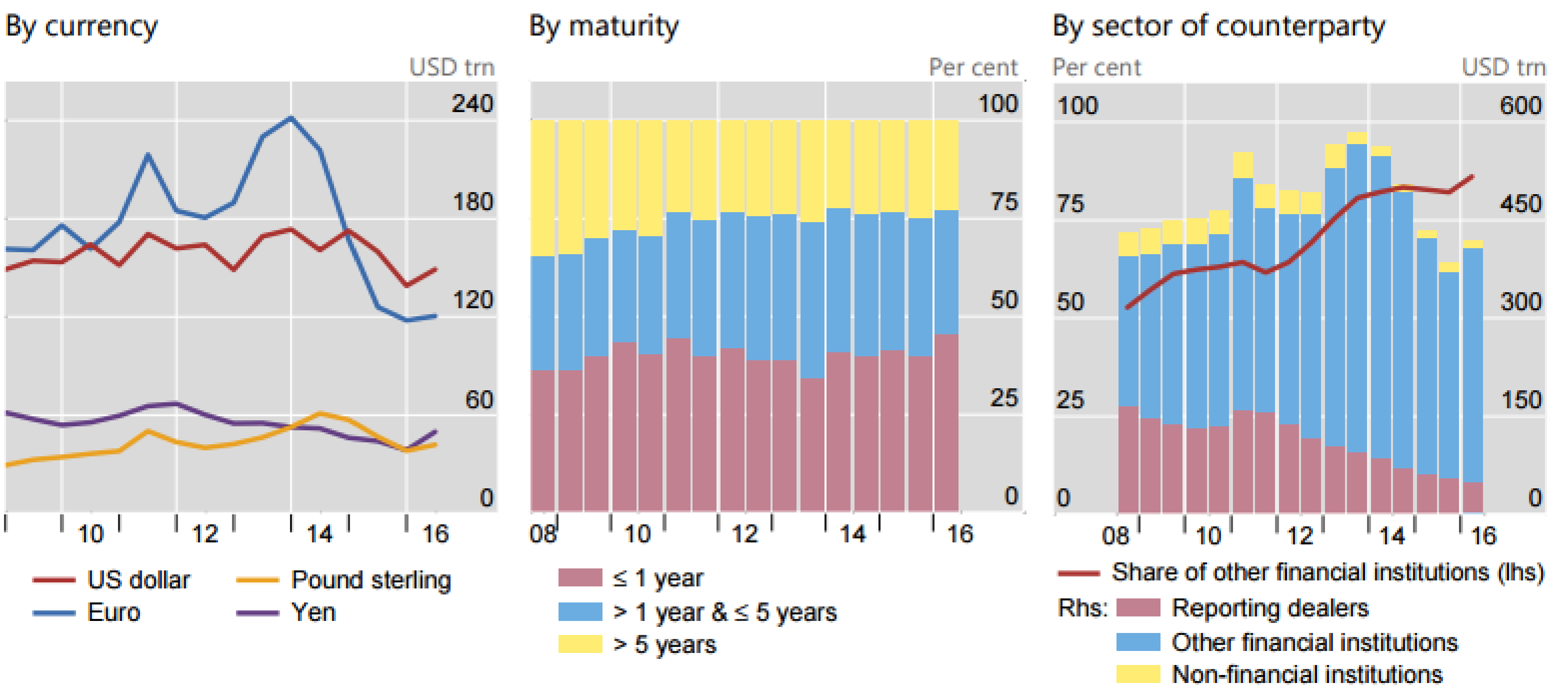
Types of counterparties, as a percentage of notional amounts outstanding at end-June 2016 Graph 2



FRA = forward rate agreements; FX = foreign exchange derivatives; IRS = interest rate swaps; IRO = interest rate options; EQ = equity-linked derivatives; MCDS = multi-name credit default swaps; SCDS = single-name credit default swaps.

OTC interest rate derivatives

Notional principal[1] Graph B3

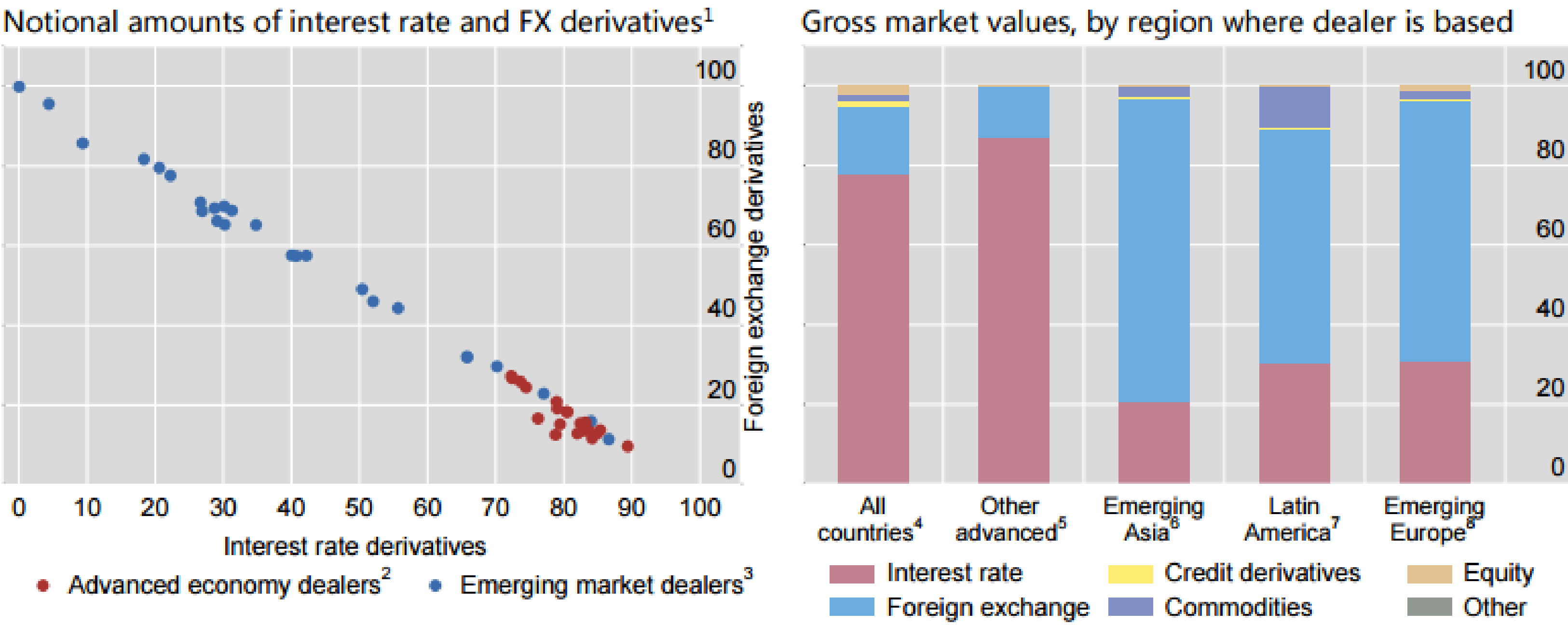


Further information on the BIS derivatives statistics is available at www.bis.org/statistics/derstats.htm.

[1] At half-year end (end-June and end-December). Amounts denominated in currencies other than the US dollar are converted to US dollars at the exchange rate prevailing on the reference date.

Risk composition of outstanding positions, by nationality of dealer

As a percentage of all OTC derivatives outstanding at end-June 2016 — Graph 3



[1] Dots show the risk composition of notional amounts reported by dealers headquartered in each country participating in the semiannual and Triennial surveys. For a list of participating countries, see Annex C. Dealers report their worldwide consolidated positions. [2] Dealers from AU, AT, BE, CA, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, JP, NL, NO, PT, SE and US. [3] Dealers from countries that participate in the Triennial Survey, excluding those listed in footnote 2. See Annex C. [4] All countries that participate in the semiannual and Triennial surveys. [5] AT, DK, FI, GR, IE, NO, PT. Excludes dealers from the 13 countries that participate in the semiannual survey. [6] CN, HK, ID, IN, KR, MY, PH, SG, TH, TW. [7] AR, BR, CL, CO, MX, PE. [8] HU, LV, PL, RO, RU, and TR, plus the Middle East (BH, IL, SA) and Africa (ZA).

Source: BIS Triennial Central Bank Survey. Further information is available at www.bis.org/publ/rpfx16.htm.

Managing Swap Risk: The Dealer Perspective

- **Default risk**
  - If a default occurs, the non-defaulting counterparty is released from the swap agreement.
  - Generally there is not a large cash loss. However, there can be a large present value cost when the swap is in the money
    - e.g., a default hits a fixed rate payor when interest rates have gone up

A Case Study in Speculation Gone Bad:

The Proctor and Gamble Swap (1994)

Transactions:

two six-month swaps
notional value = $100 million each
one on German Bund, one on US Dollar

Size of loss:

$157 million

Structure of US$ deal:

P&G agreed to pay a coupon of:

LIBOR +
$98 \times (5 \text{ yr CMT yield}/0.05 - 30 \text{ yr bond price}/100)$

in return for a fixed coupon payment that was "substantially above market."

Case 1:

Say 5 yr CMT yield is 5% and 30 yr bond price is 100. Then P&G pays LIBOR flat.

P&G expects to come out ahead because LIBOR is likely to be below the "substantially above market" coupon they receive.

Case 2: **Interest rates fall at all maturities**.

Say CMT yield goes from 5% to 4%.

Say 30 yr bond selling at par had a yield of 6.5%, and now has a yield of 5.5%.

Bond price per $100 increases to $114.61.

rate = LIBOR + 98(.04/.05 - 114.61/100) =

LIBOR - 33.92%.

and they laugh all the way to the bank, but...

Case 3: **Interest rates rise at all maturities**:

Say CMT yield goes from 5% to 6%.

Say 30 yr bond selling at par had a yield of 6.5%, and now has a yield of 7.5%.

Price per $100 falls to $88.13.

rate = LIBOR + 98(.06/.05 - 88.13/100) =

LIBOR + 31.2%.

time to call in some legal help!

Can decompose deal into:

(a) standard \$100 million swap

P&G receives fixed, pays floating

(b) \$100 million x 98 = \$9.8 billion basis swap where P&G is short the 5 yr CMT and long the 30 yr bond.