

# International Financial Markets Prices and Policies

Second Edition ©2001

Richard M. Levich



13C



## Currency and Interest Rate Swaps

### Overview

- ◆ The Pricing of Swaps
  - Price Quoting Conventions in the Swap Market
  - The Fundamental Determinants of Swap Prices

# The Pricing of Swaps

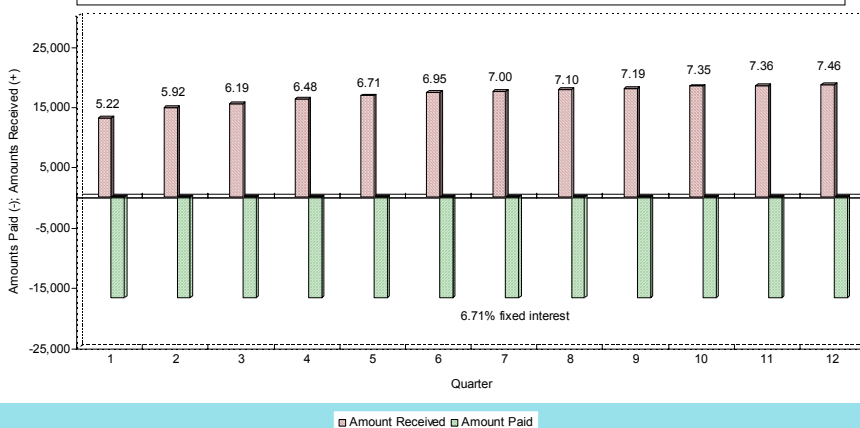
- ◆ The swap price should be based on the net present value of the expected future cash flows.
- ◆ In addition, numerous parity or arbitrage linkages among swap contracts aid in the determination of swap prices.

VALUING A SWAP OF CASH FLOWS BETWEEN TWO COUNTERPARTIES						
Net Present Value of Cash Flows When Receivables Vary But Payables are Fixed						
		Period	1	2	3	4
Market Interest Rates (Zero Coupon)			4.10%	4.15%	4.25%	4.50%
<b>Fixed Rate "Too Small"</b>						
Receive	Interest Rate		4.00%	4.50%	4.60%	5.20%
	Cash Flow		4	4.5	4.6	5.2
Pay	Interest Rate		4.00%	4.00%	4.00%	4.00%
	Cash Flow		4	4	4	4
	Time Value of Cash Flow		0.00	0.46	0.53	1.01
	Net PV		2.00			
<b>Fixed Rate "Too Big"</b>						
Receive	Interest Rate		4.00%	4.50%	4.60%	5.20%
	Cash Flow		4	4.5	4.6	5.2
Pay	Interest Rate		5.00%	5.00%	5.00%	5.00%
	Cash Flow		5	5	5	5
	Time Value of Cash Flow		-0.96	-0.46	-0.35	0.17
	Net PV		-1.61			
<b>Fixed Rate "Just Right"</b>						
Receive	Interest Rate		4.00%	4.50%	4.60%	5.20%
	Cash Flow		4	4.5	4.6	5.2
Pay	Interest Rate		4.5541%	4.5541%	4.5541%	4.5541%
	Cash Flow		4.5541	4.5541	4.5541	4.5541
	Time Value of Cash Flow		-0.53	-0.05	0.04	0.54
	Net PV		0.0000			

# The Fundamental Determinants of Swap Prices

- ◆ A fixed-floating interest rate swap is priced using arbitrage to equate the expected present value of the cash inflows and outflows.
- ◆ The expected values of the floating interest rate may be taken from the yield curve or from interest rate futures prices.
- ◆ The fixed rate is selected as the internal rate of return that equates the expected present values of the floating rate and fixed rate cash flows.

Anticipated Cash Flows for an Interest Rate Swap:  
Pay Fixed Rate, Receive Floating Rate



Notes: The above figure shows the anticipated cash flows for a hypothetical fixed-floating interest rate swap. The anticipated floating-rate is taken from the 3-month Eurodollar futures contract traded on the CME and reported in Table 11.6 of *International Financial Markets*, first edition, 1998. The first rate is 5.22%, then 5.92 % etc. The floating-rate receipts are shown as positive numbers and the fixed rate payments are shown as negative numbers. The example shows a par swap where the present value of payments and receipts are equal.

Appendix 13.1

Valuing the Cash Flows in an Interest Rate Swap

$$\sum_t \text{Floating Receipt}(t) / (1+i(t))^t = \sum_t \text{Fixed Payment}(t) / (1+i(t))^t$$

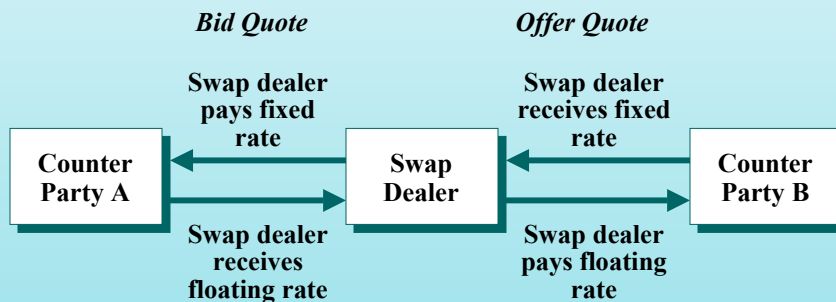
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Date	Variable 3-month Euro-\$ rate	Fixed Rate 6.709745	Amount Received Floating	Amount Paid Fixed	Amount Net	NPV Factor	NPV of Net Amount
Sep 94	5.22	6.710	13050.00	-16774.36	-3724.363	0.9838955	-3664.384
Dec 94	5.92	6.710	14800.00	-16774.36	-1974.363	0.9680504	-1911.282
Mar 95	6.19	6.710	15475.00	-16774.36	-1299.363	0.9524604	-1237.591
Jun 95	6.48	6.710	16200.00	-16774.36	-574.3625	0.9371215	-538.2475
Sep 95	6.71	6.710	16775.00	-16774.36	0.6375	0.9220297	0.5877939
Dec 95	6.95	6.710	17375.00	-16774.36	600.6375	0.9071809	544.88684
Mar 96	7.00	6.710	17500.00	-16774.36	725.6375	0.8925712	647.68311
Jun 96	7.10	6.710	17750.00	-16774.36	975.6375	0.8781968	856.8017
Sep 96	7.19	6.710	17975.00	-16774.36	1200.6375	0.8640539	1037.4155
Dec 96	7.35	6.710	18375.00	-16774.36	1600.6375	0.8501387	1360.7639
Mar 97	7.36	6.710	18400.00	-16774.36	1625.6375	0.8364477	1359.7607
Jun 97	7.46	6.710	18650.00	-16774.36	1875.6375	0.8229771	1543.6067

If U.S. Treasury is 6.41%, swap is quoted as "Treasury +30"

Sum = 0.001508

## Price Quoting Conventions in the Swap Market

### Swap Quotes



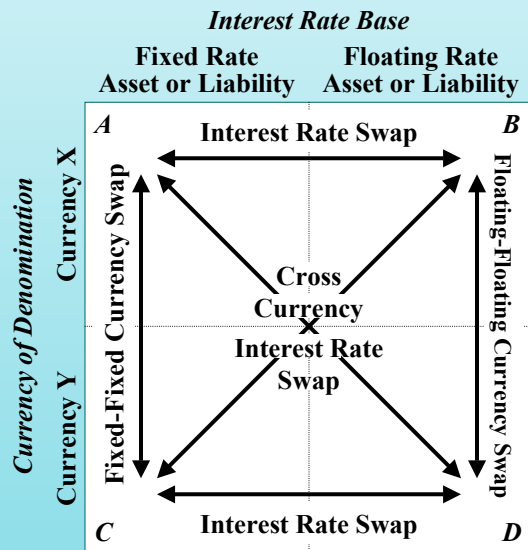
Quotes are given from the perspective of the swap dealer.  
 The convention is to quote only the fixed side of the swap.  
 All fixed quotes are against LIBOR unless otherwise stated.

# The Pricing of Swaps

Two currencies, X and Y, have both fixed-rate and floating-rate segments.

For example, with an interest rate swap in currency X (AB) and a fixed-fixed currency swap (AC), we can construct a cross currency interest rate swap (BC).

Similarly ...



## Summary + Conclusions

- ◆ Swaps are priced based on the net present value of the expected future cash flows.
- ◆ A “Par Swap” is a swap where the NPV of expected receipts and payments are equal
- ◆ Arbitrage insures that pricing of interest rate swaps and currency swaps align with the pricing of cross-currency interest rate swaps
- ◆ Expected future cash flows (on the floating side) may change, giving rise to a change in the value of a swap, and risk – our next topic.