

Replicating Cash Flows for a Fixed-Rate Payer in an Interest Rate Swap: A Simple Example

William L. Silber

Swap Terms for Fixed Rate Payer: Pay 6 percent fixed for 3 years, receive floating. Reset floating rate every 6 months. Notional principal amount = \$1000.

Replicating Portfolio: Sell short a 3-year security with a 6% coupon, priced at \$1000 (face value); Buy a 6-month security priced at \$1000 (face value). It carries a coupon equal to ½ the 6-month yield to maturity. Roll over the 6-month security every 6 months.

			Cash Flows for Fixed Rate Payer					
		Hypothetical Path of 6 Month Rate	Swap		Replicating Portfolio			
Time	Period		Pay (-)	Receive (+)	Short 3-Year Security		Long 6-Month Security	
					Face Value	Coupon	Face Value	Coupon
Start	0	2%	0	0	+\$1000		-\$1000	
+6 Mo	1	3%	\$30	\$10	–	-\$30	+\$1000 -\$1000	+\$10
+12 Mo	2	4%	\$30	\$15	–	-\$30	+\$1000 -\$1000	+\$15
+18 Mo	3	5%	\$30	\$20	–	-\$30	+\$1000 -\$1000	+\$20
+24 Mo	4	7%	\$30	\$25	–	-\$30	+\$1000 -\$1000	+\$25
+30 Mo	5	8%	\$30	\$35	–	-\$30	+\$1000 -\$1000	+\$35
+36 Mo	6		\$30	\$40	-\$1000	-\$30	+\$1000 –	+\$40

Notes on Replication:

- (1) Shorting a coupon-bearing security requires paying the coupon (every 6 months) to the person from whom you borrowed the bond (until you return the bond to them). For example, there is an outflow of \$30 every six months under the 'coupon' column below the "short 3-year security" heading because the 3-year security carries a 6% annual coupon (by assumptions given above the table).
- (2) Roll over means reinvesting the face value of the security (\$1000) in a newly issued security. For example, at the start (time period zero), purchasing the 6-month security leads to an initial cash outlay of \$1000 (note: this is financed by simultaneously shorting the 3-year security). At time period 1, the 6-month security matures and produces a cash flow of + \$1000. Those proceeds are used to buy a new 6-month security at par, hence the cash flow of - \$1000. At time period 1 there is also a \$10 coupon payment on the 6-month security because at time 0 we assumed that it had a 2% annual yield to maturity.