

Bilateral Credit Risk

Valuation of Interest Rate Swaps

- Bilateral ^{IRS} Forward Contracts as well

At inception, $IRS \text{ Value} = 0$

As time passes, market changes, the IRS becomes

- + for one counterparty
- for the other counterparty

Note that it is possible for the

- + to become -
- to become +

03

$$\text{Value}^{IRS} = VND - CVA + DVA$$

VND assumes no default

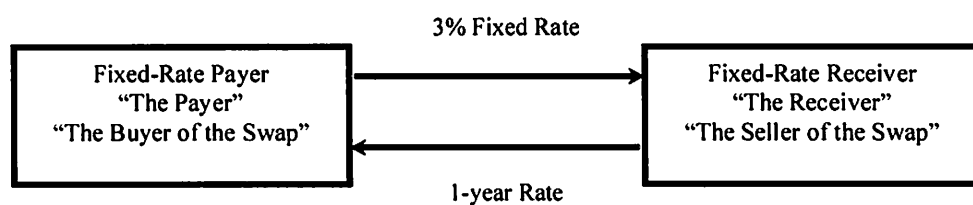
VND calculated by a binomial forward rate tree for the 1-year benchmark bonds

See Exhibit 18

Say that the 5-year, 3% IRS $N+1 = 100$ and has 5 annual net settlement payments paid in arrears.

Exhibit 18: A “Plain Vanilla” Fixed-for-Floating

Interest Rate Swap on the 1-Year Benchmark Bond Rate



if the 1-year rate = 1.75%, then
payer owes,

$$(0.0300 - 0.0175)100 = 1.25$$

if the 1-year rate = 3.5625% then
receiver pays

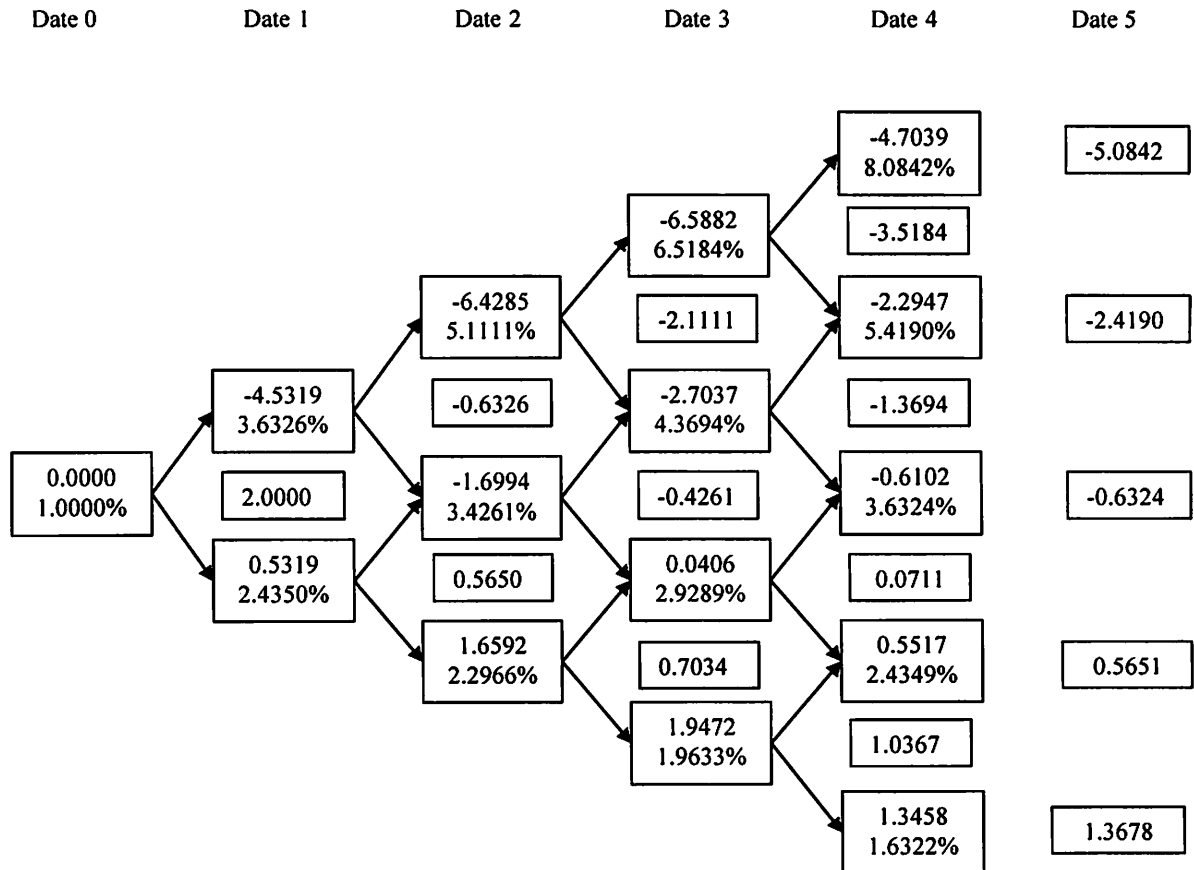
$$(0.035625 - 0.0300) \times 100 = 0.5625$$

Let's take a 5-year, 3% swap
see Exhibit 19, 20

on Exhibit 19, look at Node 2, middle node,

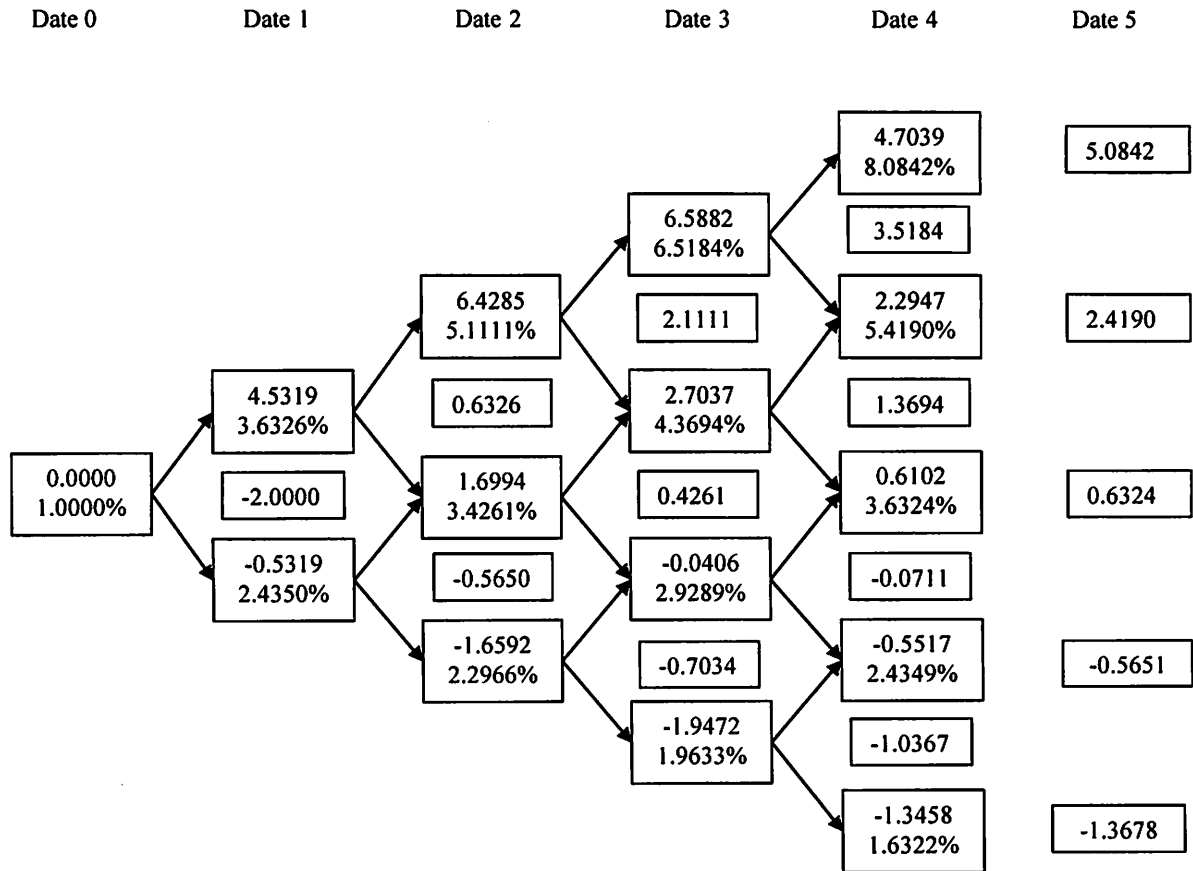
$$\begin{aligned} & \left[(0.034261 - 0.0300) + \frac{1}{2}(-2.7037) + \frac{1}{2}(0.0406) \right] / 1.034261 \\ & = -1.6994 \end{aligned}$$

**Exhibit 19: Valuation of a 3.00%, 5-Year,
Receive-Fixed Interest Rate Swap Assuming No Default**



perspective of the receiver

**Exhibit 20: Valuation of a 3.00%, 5-Year,
Pay-Fixed Interest Rate Swap Assuming No Default**



perspective of the payer

Exhibit 21: CVA and DVA Calculations on the 3.00%, 5-Year, Interest Rate Swap
Credit Risk of the Fixed-Rate Payer

	Expected Exposure	Loss Severity	Probability of Default	Discount Factor	CVA/DVA
Date 0					
Date 1	2.2660	90%	1.00%	0.990099	0.0202
Date 2	0.6973	90%	1.00%	0.960978	0.0060
Date 3	0.4345	90%	1.00%	0.928023	0.0036
Date 4	0.3783	90%	1.00%	0.894344	0.0030
Date 5	0.2268	90%	1.00%	0.860968	<u>0.0018</u>
					0.0347

Credit Risk of the Fixed-Rate Receiver

	Expected Exposure	Loss Severity	Probability of Default	Discount Factor	CVA/DVA
Date 0					
Date 1	2.2660	90%	1.00%	0.990099	0.0202
Date 2	2.7731	90%	1.00%	0.960978	0.0240
Date 3	2.5782	90%	1.00%	0.928023	0.0215
Date 4	2.0498	90%	1.00%	0.894344	0.0165
Date 5	1.1597	90%	1.00%	0.860968	<u>0.0090</u>
					0.0912