155) Since the notional amount is constant, we can use the formula

$$i = \frac{1-(v_5)^5}{v_1 + v_2^2 + v_3^3 + v_4^4 + v_5^5}$$

$$v_1 = \frac{1}{1.04} \quad \boxed{1}$$

$$v_2^2 = \frac{1}{1.045^2} \quad \boxed{2}$$

$$v_3^3 = 1.0525^{-3} \quad \boxed{3}$$

$$v_4^4 = 1.0625^{-4} \quad \boxed{4}$$

$$v_5^5 = 1.075^{-5} \quad \boxed{5}$$

$$\therefore \quad i = \frac{1-\boxed{5}}{\boxed{1}+\boxed{2}+\boxed{3}+\boxed{4}+\boxed{5}} = .07197\ldots$$

156) For year 2, $LIBOR = .04$

For the debt, ABC's payment $= 2000000(.045) = 90000$

Now consider the swap. The net swap payment is

$$2000000(.04 - .03) = 20000$$

So ABC receives (since positive) 20000.

$\therefore$ the net interest payment $= 90000 - 20000$

$$= 70,000$$

157) The reinsurance company is the receiver.
It receives the fixed payments

For year 1, $LIBOR = .01$

$\therefore$ the company pays $2000000(.015) = 30000$

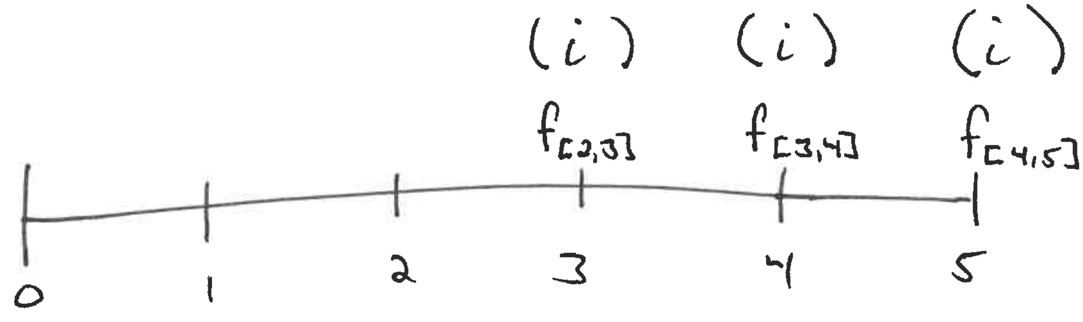
The swap spread is $+0.2\%$ on the 2% rate.

$\therefore$ the fixed interest rate is $.02 + .002 = .022$

$\therefore$ the company receives $2000000(.022) = 44000$

The net swap payment is $44000 - 30000 = 14000$.

158) Since no notional amount is given, assume it's constant.



<u>Note</u>:

$$
\begin{aligned}
f_{[2,3]} \cdot v_3^3 &= v_2^2 - v_3^3 \\
f_{[3,4]} \cdot v_4^4 &= v_3^3 - v_4^4 \\
+ \quad f_{[4,5]} \cdot v_5^5 &= v_4^4 - v_5^5 \\
\hline
&\ v_2^2 - v_5^5
\end{aligned}
$$

$$\therefore \quad i = \frac{v_2^2 - v_5^5}{v_3^3 + v_4^4 + v_5^5}$$

$$v_2^2 = (1.031)^{-2} \quad \boxed{2}$$

$$v_3^3 = (1.034)^{-3} \quad \boxed{3}$$

$$v_4^4 = (1.036)^{-4} \quad \boxed{4}$$

$$v_5^5 = (1.04)^{-5} \quad \boxed{5}$$

$$i = \frac{\boxed{2} - \boxed{5}}{\boxed{3} + \boxed{4} + \boxed{5}} = .0458\ldots$$

See SOA solution.

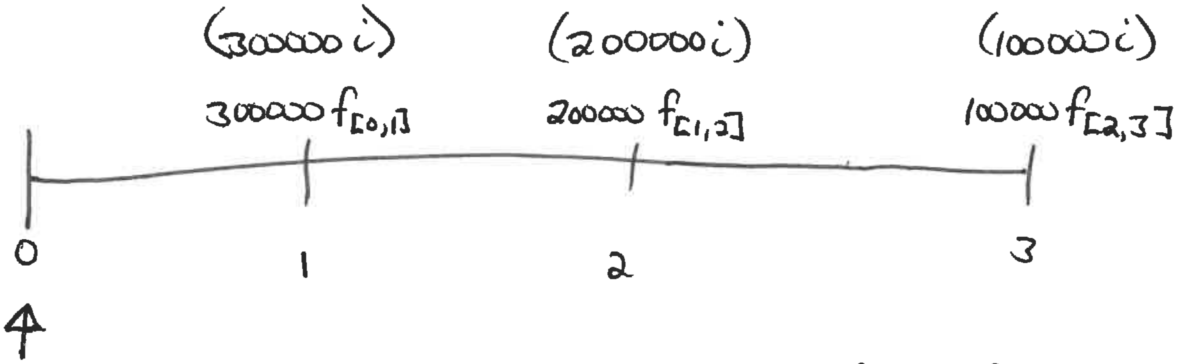
196) Katrina pays a fixed rate to Lily under the swap.

$\therefore$ Katrina is the payer under the swap.

Equivalently, Lily receives a fixed rate from Katrina under the swap

$\therefore$ Lily is the receiver under the swap.

197) This is an amortizing swap



Set the 2 PV's equal, and solve for i

$$\therefore\ 300000\, i \cdot v_1 + 200000\, i \cdot v_2^2 + 100000\, i \cdot v_3^3$$

$$= 300000\, \underbrace{f_{[0,1]} \cdot v_1}_{= 1 - v_1} + 200000\, \underbrace{f_{[1,2]} \cdot v_2^2}_{= v_1 - v_2^2} + 100000\, \underbrace{f_{[2,3]} \cdot v_3^3}_{= v_2^2 - v_3^3}$$

$$\therefore\ i = \frac{300000(1 - v_1) + 200000(v_1 - v_2^2) + 100000(v_2^2 - v_3^3)}{300000\, v_1 + 200000\, v_2^2 + 100000\, v_3^3}$$

$$v_1 = (1.043)^{-1} \qquad v_2^2 = (1.046)^{-2} \qquad v_3 = (1.051)^{-3}$$

$$\therefore\ i = .04777\ldots$$

198) (See #158; this is very similar!)

$$i = \frac{v_2^2 - v_5^5}{v_3^3 + v_4^4 + v_5^5}$$

$v_2^2 = (1.046)^{-2}$

$v_3^3 = (1.051)^{-3}$

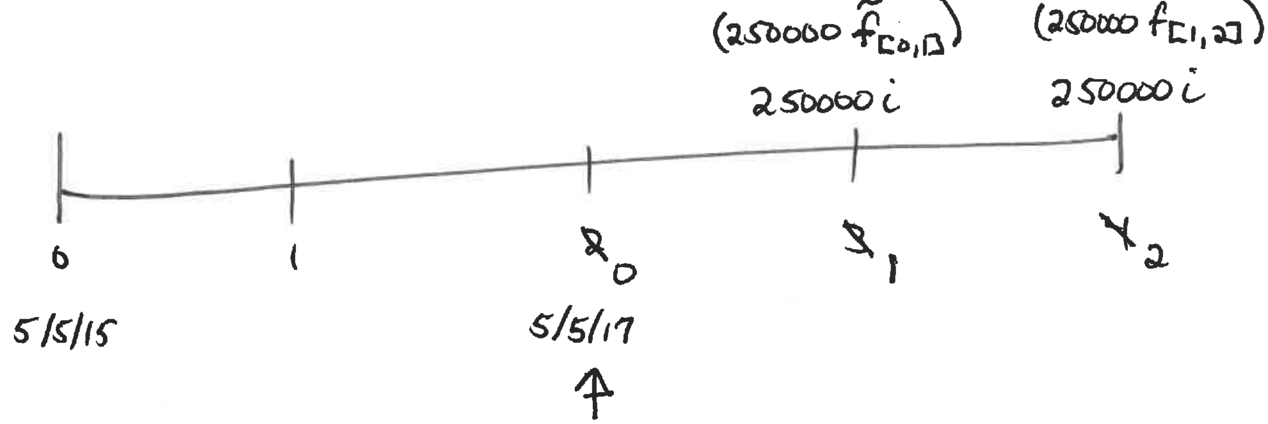
$v_4^4 = (1.054)^{-4}$

$v_5^5 = (1.056)^{-5}$

$\therefore\ i = .06265\ldots$

199) Miaogi is the receiver under the swap

$\therefore$ the timeline for Miaogi is



$$MV_2 = 250000\,i(\tilde{v}_1 + \tilde{v}_2^2) - 250000\left[\underbrace{\tilde{f}_{[0,1]}\cdot\tilde{v}_1}_{=1-\tilde{v}_1} + \underbrace{\tilde{f}_{[1,2]}\cdot\tilde{v}_2^2}_{=\tilde{v}_1-\tilde{v}_2^2}\right]$$

$$\therefore MV_2 = 250000\left[i(\tilde{v}_1 + \tilde{v}_2^2) - (1 - \tilde{v}_2^2)\right]$$

$$i = .04 \qquad \tilde{v}_1 = (1.038)^{-1} \qquad \tilde{v}_2^2 = (1.041)^{-2}$$

$$\therefore MV_2 = -443.085\ldots$$

<u>Remark</u>: The negative indicates that Miaogi would have to pay 443 in order to get out of the swap.

200) SOA is the payer under the swap.

$i = .0535 =$ swap rate

For year 3, $LIBOR = .056$

$\therefore$ SOA pays Bailey Bank $500000(.056 + .012) = 34000$

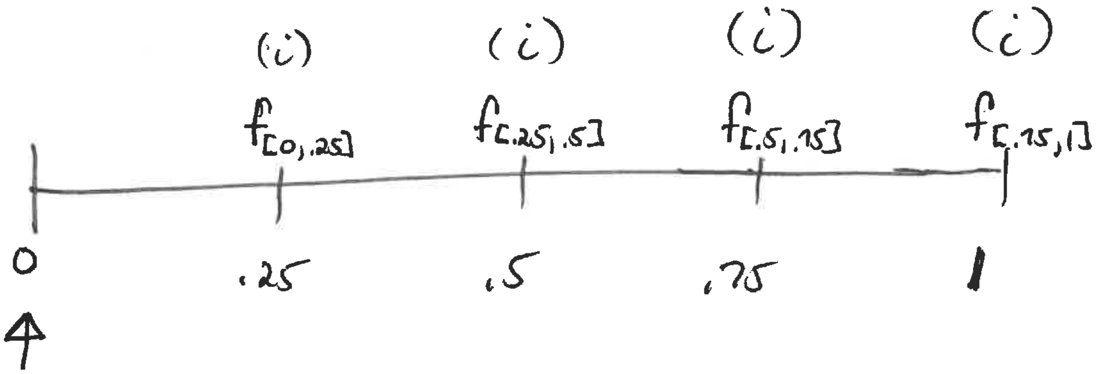
For the swap, the net swap payment is

$500000(.056 + .005) - 500000(.0535) = 3750$

$\therefore$ SOA receives 3750 from the counterparty under the swap

$\therefore$ net interest payment is $34000 - 3750 = 30250$

201)



$$i = \frac{1 - v_4^4}{v_1 + v_2^2 + v_3^3 + v_4^4}$$

$$v_1 = (1.015)^{-1/4}$$

$$v_2 = (1.0165)^{-1/2}$$

$$v_3 = (1.0179)^{-.75}$$

$$v_4 = (1.0192)^{-1}$$

$\therefore\ i = .00478\ldots$ qeir

202) Since the notional amount is constant, the swap rate is

$$i = \frac{1 - v_4^4}{v_1 + v_2^2 + v_3^3 + v_4^4}$$

From the data, $v_1 = .965$, $v_2^2 = .92$, $v_3^3 = .875$, and $v_4^4 = .825$

$$\therefore \; i = \frac{1 - .825}{.965 + .92 + .875 + .825} = .0488\cdots$$

Josh is the payer under the swap. His net swap payment at the end of the first year is

$$200000\,(f_{[0,1]} - i) \qquad f_{[0,1]} = v_1^{-1} - 1 = .036\cdots$$

$$\therefore \text{ net swap payment} = 200000\,(.036\cdots - .048\cdots) = -2509$$

$\therefore$ Josh <u>pays</u> 2509 to Phillip