

AN EXAMPLE OF FINANCIAL ENGINEERING:  
CONSTRUCTING A FORWARD LOAN FROM SPOT SECURITIES

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OBJECTIVE: You wish to guarantee that you will be able to lend the \$1,000,000 you will inherit at the beginning of next year from your rich aunt's estate at the attractive one year forward rate embedded in the following term structure:

$${}_tR_1 = 2\% \qquad \qquad \qquad {}_tR_2 = 3\%$$

The forward rate is:  ${}_{t+1}r_1 = \frac{(1.03)^2}{1.02} - 1 = .040098$

OBJECTIVE RESTATED: Set up a portfolio now contracting to lend \$1,000,000 in one year so that it will produce \$1,000,000 x 1.040098 = \$1,040,098.00 at the end of year 2.  
NB: You receive \$1,000,000 next year from your rich aunt.

SET UP THE FOLLOWING PORTFOLIO TODAY:

		Cash Flows
(1)	Buy a 2-year zero with a face value = \$1,040,098.00 Cost: \$1,040,098/(1.03) <sup>2</sup> =	-\$980,392
(2)	Sell short a 1-year zero with \$1,000,000 face value. (NB: Short sale requires borrowing 1 yr zero in order to deliver it. Use 2 yr zero as collateral against your borrowed securities) Proceeds: \$1,000,000/1.02 =	<u>+980,392</u>
	Total outlay today	\$0.0.

AT END OF YEAR ONE

(1)	Buy 1 yr zero that is now coming due (at face value) and return to lender of 1-year zero  Cash outlay:	-\$1,000,000
(2)	Take possession of your 2 yr zero that was used as collateral (it is now a 1 yr zero) NB: Assume borrowing cost of securities is <u>de minimus</u> !	

AT END OF YEAR TWO

(1)	Liquidate 2 yr security at face value  Proceeds:	+\$1,040,098
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CHECK ANNUAL RETURN EARNED FROM YEAR 1 TO YEAR 2

$$\frac{\$1,040,098}{1,000,000} - 1 = .040098$$

## ONE MORE THING: A NOTE ON REPURCHASE AGREEMENTS

It is possible to accomplish the objective of buying the two-year security under 'SET UP THE FOLLOWING PORTFOLIO TODAY' without laying out any money by entering into a repurchase agreement. In particular, step 2 would read "sell the two year security with an agreement to repurchase it after one year at a price of \$980,392j (1.02) = \$1,000,000 next year. This repurchase agreement brings in \$980,392 in cash today because you are actually selling the two-year security that you just purchased. But because you have simultaneously agreed to repurchase it next year at a fixed price you have effectively borrowed money at the one year interest rate of 2 per cent. Thus the repurchase agreement serves as a financing vehicle for the two-year security. At the end of one year, the first step would read as follows: ' Buy back the two-year security at the agreed upon price of \$1,000,000'. A repurchase agreement is a more efficient way of executing the transaction compared with a short sale of the one-year security.