Interest Rates: Term Structure

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Last Time

Interest Rates

- Interest rate quotes
- Non-annual cash flows and compounding

This Time

Interest Rates

- Term Structure
- Yield Curve



Thus far we have assumed discount rates are constant through time

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$$PV = \frac{CF_1}{(1+R)} + \frac{CF_2}{(1+R)^2} + \frac{CF_3}{(1+R)^3} + \dots$$

Same *R* ...

Home Mortgage Refinancing Rates

REFINANCE RATES AVERAGES						
Product	Rate	Change	Last week			
30 year fixed refi	4.12%	0.00	4.12%			
15 year fixed refi	3.19%	♠ 0.03	3.16%			
10 year fixed refi	3.23%	♠ 0.01	3.22%			

Fixed Term CD Rates

Fixed Term CD - Time Deposits & IRA/CESA CDs[†]

	Less than \$10,000		\$10,000-\$99,999		\$100,000 and over	
	Rate %	APY % [†]	Rate %	APY % [†]	Rate %	APY % [†]
28 - 179 Days*	0.03	0.03	0.03	0.03	0.03	0.03
06 - 11 Months	0.03	0.03	0.03	0.03	0.03	0.03
12 - 17 Months	0.05	0.05	0.05	0.05	0.05	0.05
18 - 23 Months	0.07	0.07	0.07	0.07	0.07	0.07
24 - 35 Months	0.10	0.10	0.10	0.10	0.10	0.10
36 - 47 Months	0.12	0.12	0.12	0.12	0.12	0.12
48 - 59 Months	0.15	0.15	0.15	0.15	0.15	0.15
60 - 119 Months	0.15	0.15	0.15	0.15	0.15	0.15
120 Months	0.15	0.15	0.15	0.15	0.15	0.15

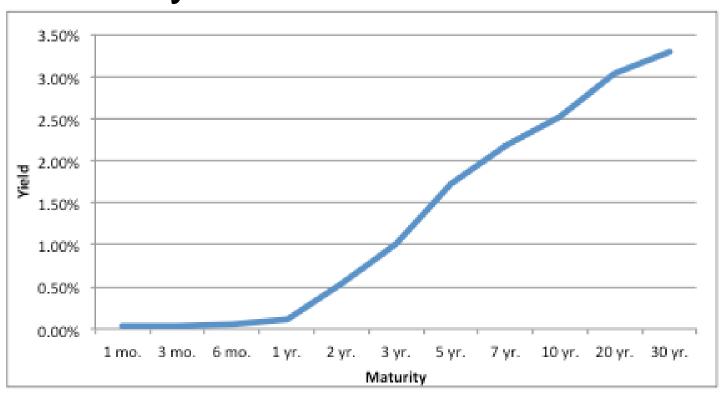
CD - Time Deposit Minimum to open: \$1,000

IRA/CESA CDs Minimum to open: \$1,000 IRAs / \$500 CESAs *IRA/CESA CDs are not available for a term less than 6 Months

The Term Structure is the relation between the investment term and the interest rate

The Yield Curve is a graph of the relation between the investment term and the interest rate

Treasury Yield Curve – 7/24/2014



What is a yield?

A yield, *y*, is the one discount rate that when applied to the promised cash flows of the security recover the price of the security.

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Price =
$$\frac{CF_1}{(1+y)} + \frac{CF_2}{(1+y)^2} + \frac{CF_3}{(1+y)^3} + ... + \frac{CF_T}{(1+y)^T}$$

To build the yield curve simply compute the yield for securities of different maturities..

$$P_{1} = \frac{CF_{1}}{(1+y_{1})}$$

$$P_{2} = \frac{CF_{1}}{(1+y_{2})} + \frac{CF_{2}}{(1+y_{2})^{2}}$$

$$\vdots$$

$$P_{T} = \frac{CF_{1}}{(1+y_{T})} + \frac{CF_{2}}{(1+y_{T})^{2}} + \frac{CF_{3}}{(1+y_{T})^{3}} + \dots + \frac{CF_{T}}{(1+y_{T})^{T}}$$

Same as computing the discount rate for securities with different maturities

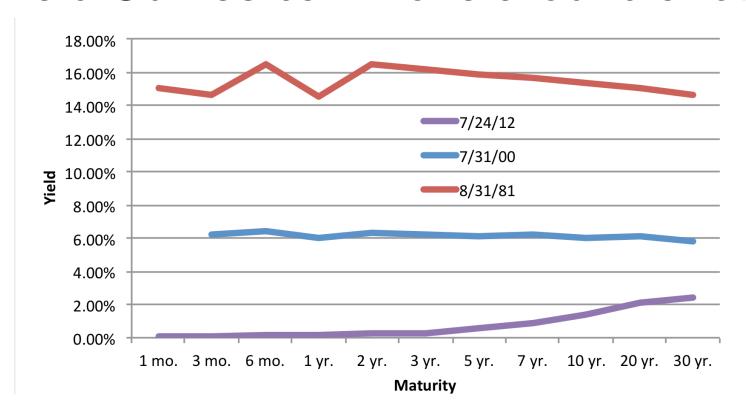
$$P_{1} = \frac{CF_{1}}{(1+R_{1})}$$

$$P_{2} = \frac{CF_{1}}{(1+R_{2})} + \frac{CF_{2}}{(1+R_{2})^{2}}$$

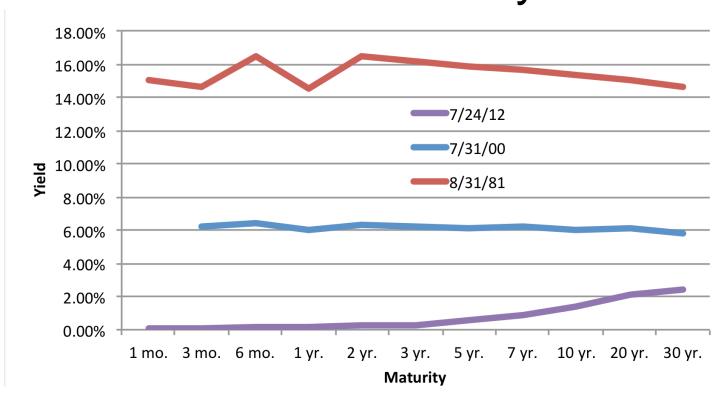
$$\vdots$$

$$P_{T} = \frac{CF_{1}}{(1+R_{T})} + \frac{CF_{2}}{(1+R_{T})^{2}} + \frac{CF_{3}}{(1+R_{T})^{3}} + \dots + \frac{CF_{T}}{(1+R_{T})^{T}}$$

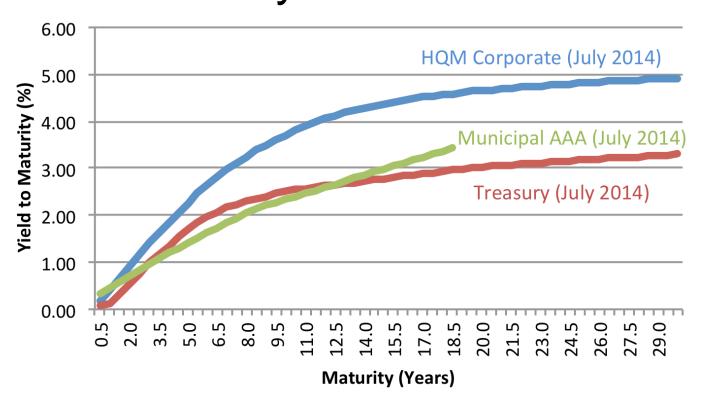
Yield Curves can move around a lot



Treasury Yield Curves graph the relation between interest rates on risk-free loans and loan maturity



Other yield curves graph the relation between interest rates on risky loans and loan maturity



Lesson: Yields vary by maturity and risk

ALL CORPORATES: YIELD BY CREDIT RATING AND MATURITY

(Median Yield For Previous Trading Day)

	1-2 Year	2-5 Year	5-10 Year	10 Year+
AAA	0.58	1.46	2.45	3.38
AA	0.47	1.54	2.70	3.89
Α	0.84	1.82	3.01	3.97
BBB	1.23	2.33	3.82	5.51

All of these interest rates are referred to as spot rates

The spot rate is the interest rate for a loan made today

Typically a different spot rate for loans of different maturities and risk

Punch line:

This is an approximation:

$$PV = \frac{CF_1}{(1+R)} + \frac{CF_2}{(1+R)^2} + \frac{CF_3}{(1+R)^3} + \dots$$

for

$$PV = \frac{CF_1}{(1+R_1)} + \frac{CF_2}{(1+R_2)^2} + \frac{CF_3}{(1+R_3)^3} + \dots$$



Lesson

- The term structure refers to the relation between interest rates and investment term
 - Loans (savings) of different maturities (terms)
 typically have different interest rates

Lesson

 The yield curve graphs the relation between interest rates and investment term

Interest rates vary by the risk of the investment

Lessons

 The spot rate is the interest rate for a loan made today

 The spot rate comes from the yield curve and there is typically a different spot rate for loans of different maturities (and risk)

Coming up next

- Discounted Cash Flow (DCF)
 - Time value of money in a corporate setting
 - Figure out how to derive (free) cash flows
 - -Capital budgeting is illustrative vehicle