Lecture 10: Debt Markets and Term Structure

Economics 252, Spring 2008

Prof. Robert Shiller, Yale University

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Historical Securities Search Results

Treasury Bills

Auction Dates: From: *Feb 8, 2008* **To:** *Feb 15, 2008*
Security Terms: *All*
Sorted By: *Auction Date* **in** *Descending* **order**

Security Term	Auction Date	Issue Date	Maturity Date	Discount Rate %	Investment Rate %	Price Per $100	CUSIP
60-DAY	02-14-2008	02-15-2008	04-15-2008	2.510	2.563	99.581667	912795UD1
63-DAY	02-13-2008	02-14-2008	04-17-2008	2.440	2.491	99.573000	912795D81
4-WEEK	02-12-2008	02-14-2008	03-13-2008	2.500	2.547	99.805556	912795D32
26-WEEK	02-11-2008	02-14-2008	08-14-2008	2.080	2.137	98.948444	912795F97
13-WEEK	02-11-2008	02-14-2008	05-15-2008	2.250	2.301	99.431250	912795E49

Discount Bonds Pricing

Term T, Yield to Maturity (YTM) r

$$P_t = \frac{1}{(1+r)^T}$$

$$P_t = \frac{1}{(1+r/2)^{2T}}$$

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Compound Interest

- If annual rate is r, compounding once per year, balance = $(1+r)^t$ after t years.
- If compounded twice per year, balance is $(1+r/2)^{2t}$ after t years.
- If compounded n times per year, balance is $(1+r/n)^{nt}$ after t years.
- Continuous compounding, balance is e^{rt}.

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Price & Yield on T-Bills

- For buyer, Price = 100-Discount
- Discount = Asked*(Days to Maturity/360). (Same as formula on page 295 of Fabozzi, where D=Discount, F=100, Y=Asked/100, t=Days)
- Yield = (Discount/Price)(365/(Days to Maturity)). (Unless maturity > 6 months, in which case quadratic formula using semi-annual compounding is required.)

Conventional Bonds Carry Coupons

- Conventional Bond Issued at par (100), coupons every six months.
- Term is time to maturity.

$$P_t = c\left(\frac{1}{r} - \frac{1}{(1+r)^T}\frac{1}{r}\right) + \frac{100}{(1+r)^T}$$

$$P_t = \frac{c}{2}\left(\frac{1}{r/2} - \frac{1}{(1+r/2)^{2T}}\frac{1}{r/2}\right) + \frac{100}{(1+r/2)^{2T}}$$

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Treasury Notes

Auction Dates: From: *Jan 1, 2008* **To:** *Feb 15, 2008*
Security Terms: *All*
Sorted By: *Auction Date* **in** *Descending* **order**

Security Term	Auction Date	Issue Date	Maturity Date	Interest Rate %	Yield %	Price Per $100	CUSIP
10-YEAR	02-06-2008	02-15-2008	02-15-2018	3.500	3.620	99.000685	912828HR4
5-YEAR	01-29-2008	01-31-2008	01-31-2013	2.875	2.909	99.842844	912828HQ6
2-YEAR	01-28-2008	01-31-2008	01-31-2010	2.125	2.237	99.782126	912828HP8
10-YEAR	01-10-2008	01-15-2008	01-15-2018	1.625	1.655	99.724557	912828HN3

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Treasury Bonds

Auction Dates: From: *Jan 1, 2008* **To:** *Feb 15, 2008*
Security Terms: *All*
Sorted By: *Auction Date* **in** *Descending* **order**

Security Term	Auction Date	Issue Date	Maturity Date	Interest Rate %	Yield %	Price Per $100	CUSIP
30-YEAR	02-07-2008	02-15-2008	02-15-2038	4.375	4.449	98.780998	912810PW2
20-YEAR	01-24-2008	01-31-2008	01-15-2028	1.750	1.807	99.351033	912810PV4

Forward Rates

J. R. Hicks *Value and Capital* 1939

$$(1+r_2)^2 = (1+r_1)(1+f_2)$$

$$(1+r_k)^k = (1+r_{k-1})^{k-1}(1+f_k)$$

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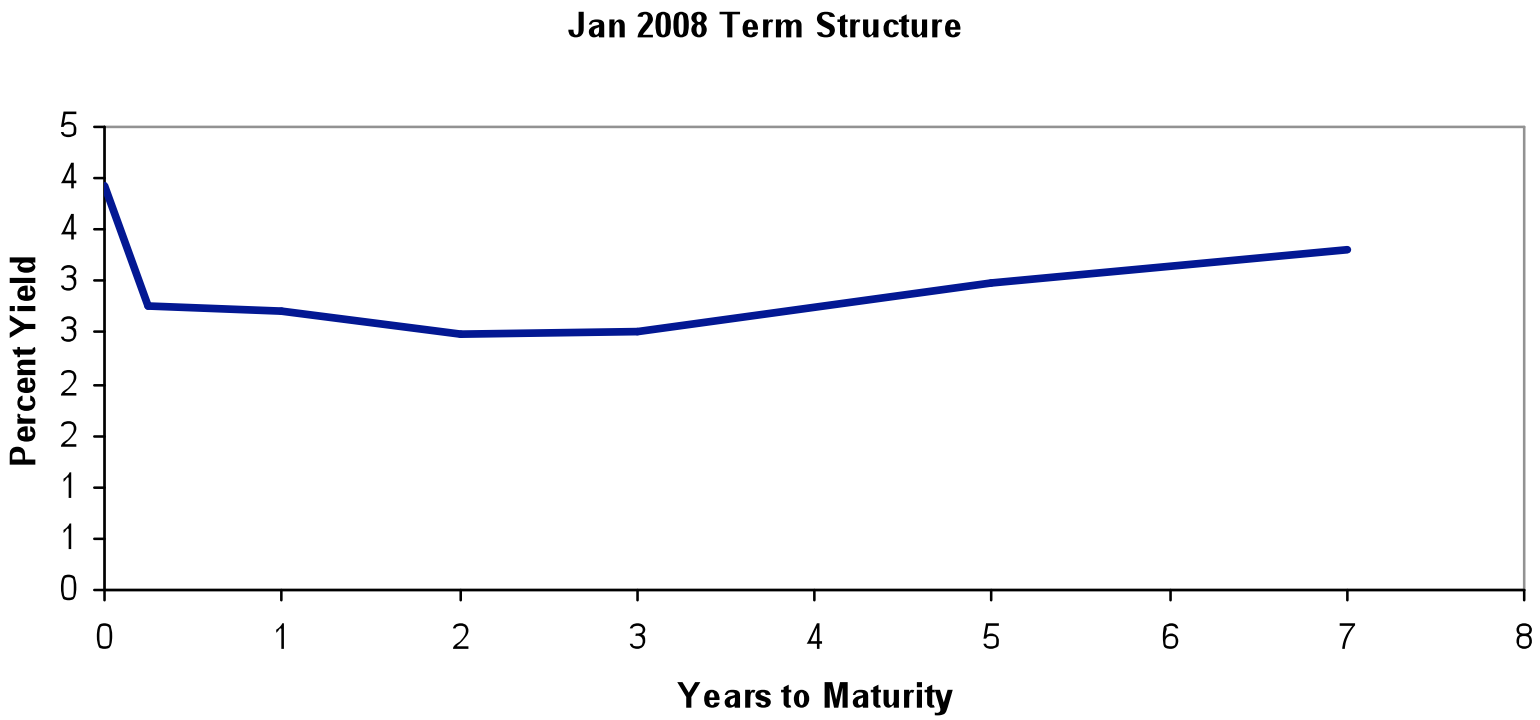

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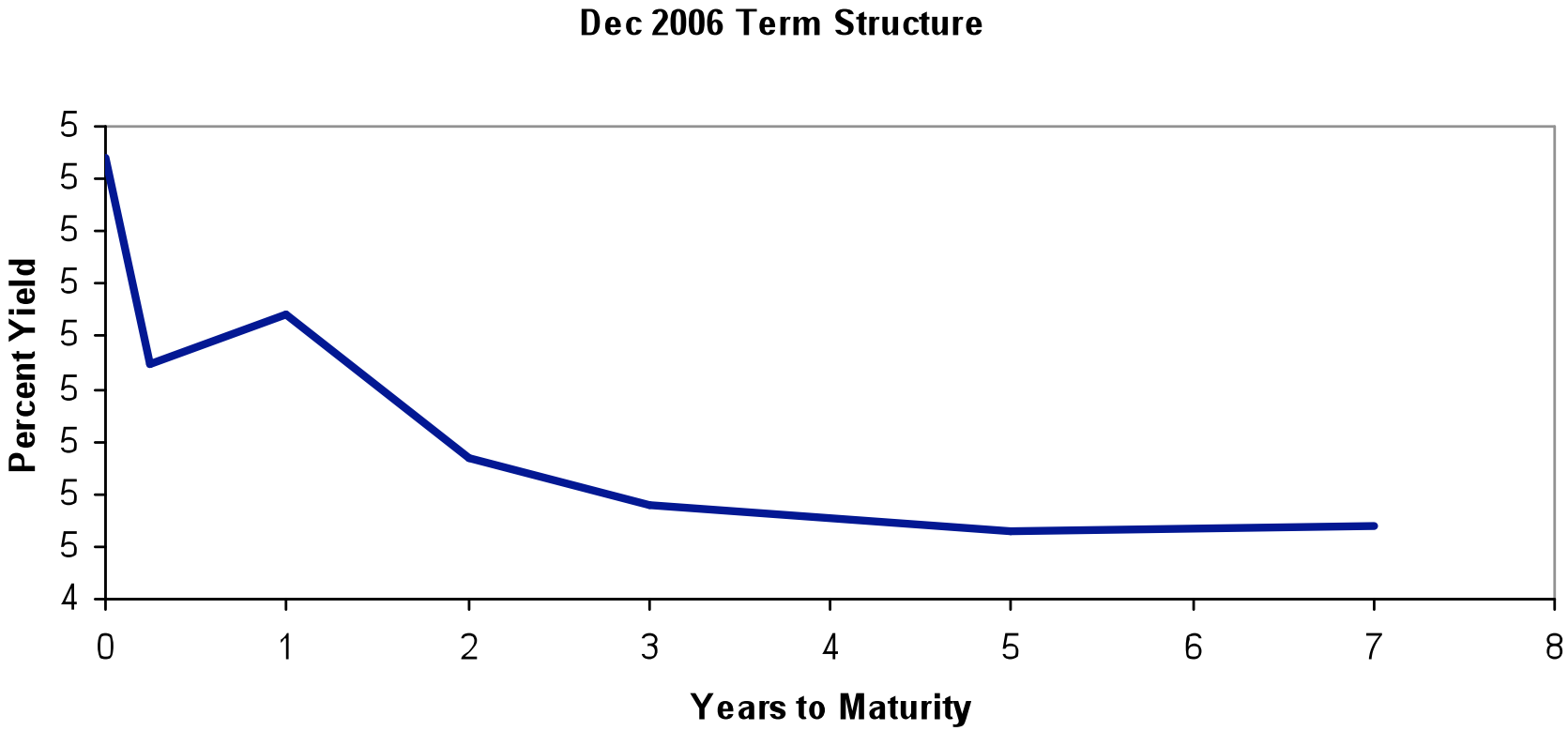

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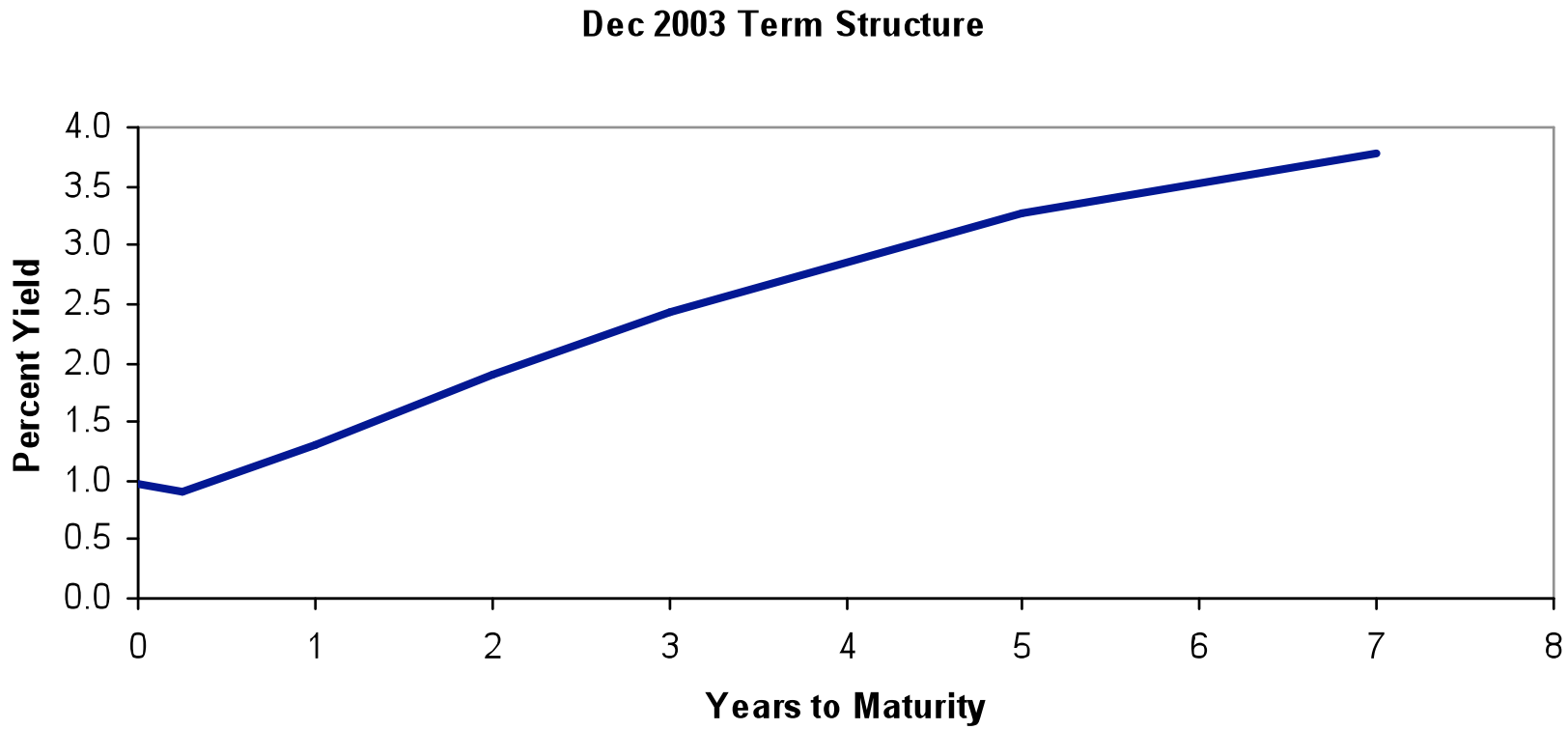

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Inflation and Interest Rates

- Nominal rate quoted in dollars, real rate quoted market baskets
- Nominal rate usually greater than real rate.

$$(1 + r_{money}) = (1 + r_{real})(1 + i)$$

$$r_{money} \cong r_{real} + i$$

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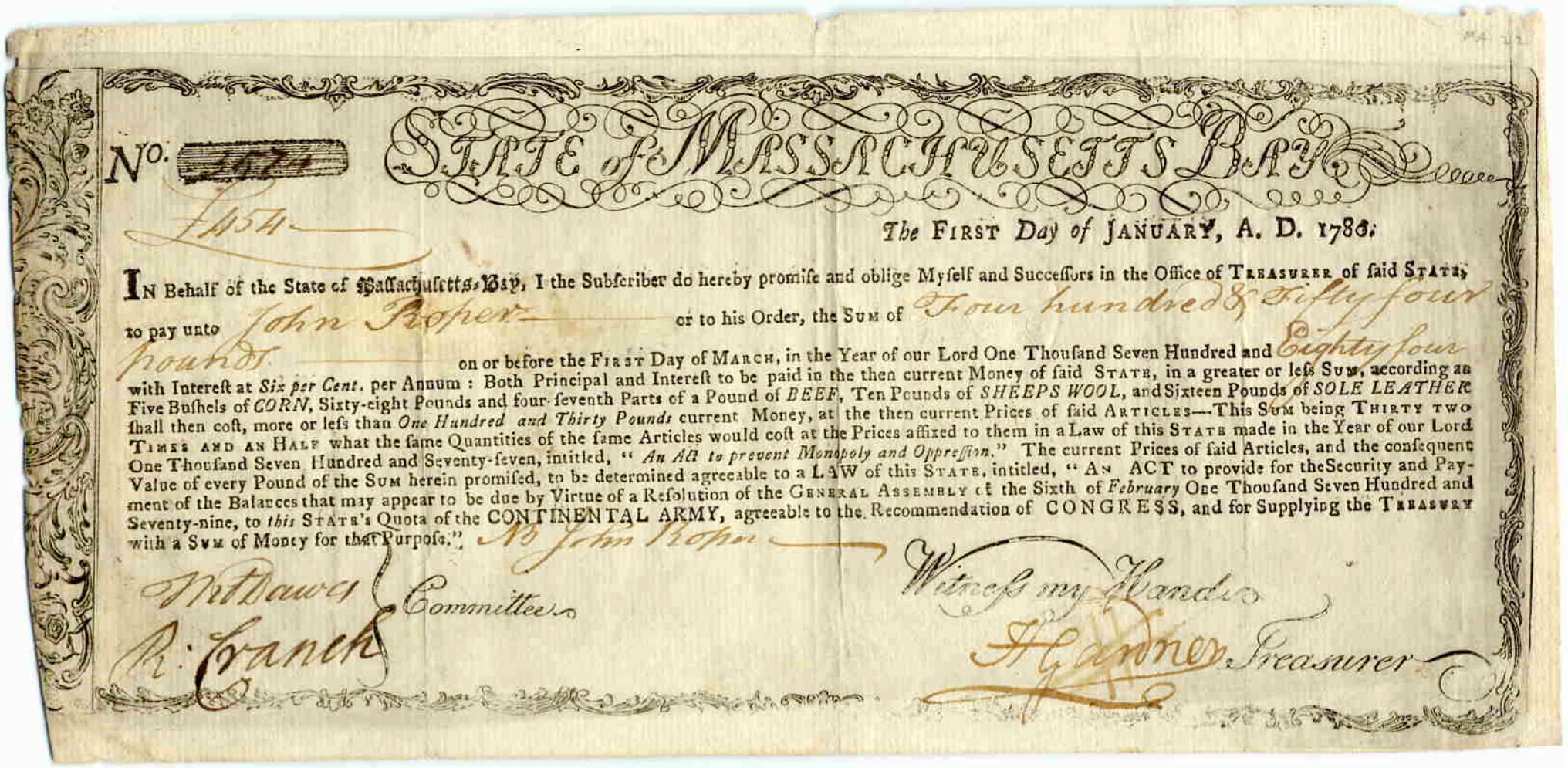

No. [redacted]

State of Massachusetts Bay.

The First Day of January, A. D. 1786.

In Behalf of the State of Massachusetts-Bay, I the Subscriber do hereby promise and oblige Myself and Successors in the Office of Treasurer of said State, to pay unto John Roper or to his Order, the Sum of Four hundred & fifty four pounds on or before the First Day of March, in the Year of our Lord One Thousand Seven Hundred and Eighty four with Interest at *Six per Cent.* per Annum: Both Principal and Interest to be paid in the then current Money of said State, in a greater or less Sum, according as Five Bushels of *CORN*, Sixty-eight Pounds and four-seventh Parts of a Pound of *BEEF*, Ten Pounds of *SHEEPS WOOL*, and Sixteen Pounds of *SOLE LEATHER* shall then cost, more or less than *One Hundred and Thirty Pounds* current Money, at the then current Prices of said Articles—This Sum being Thirty two Times and an Half what the same Quantities of the same Articles would cost at the Prices affixed to them in a Law of this State made in the Year of our Lord One Thousand Seven Hundred and Seventy-seven, intitled, "*An Act to prevent Monopoly and Oppression.*" The current Prices of said Articles, and the consequent Value of every Pound of the Sum herein promised, to be determined agreeable to a LAW of this State, intitled, "An ACT to provide for the Security and Payment of the Balances that may appear to be due by Virtue of a Resolution of the General Assembly of the Sixth of *February* One Thousand Seven Hundred and Seventy-nine, to *this* State's Quota of the CONTINENTAL ARMY, agreeable to the Recommendation of CONGRESS, and for Supplying the Treasury with a Sum of Money for that Purpose." No John Roper

Committee

Witness my Hand

Treasurer