UNIVERSITY
OF MIAMI

BUS 640
Prof. Burch
Finance 2

Outline

This set of slides will the following topics

1. Common stock & its valuation
2. Bonds & other fixed income securities, valuation
3. Preferred stock
4. Capital structure 1: Financial leverage
5. Term structure of interest rates

<u>Optional reading in text</u>
Sections 5.3-5.5, 6.1-6.4, 9.1-9.4, 14.1

Common Stock

- Represents residual ownership of the firm.
- Common stockholders have important voting rights.
- The issuer may pay dividends to common stockholders. However, it is not required to do so. Moreover, there is no pre-set dividend rate.
  - Future dividends are uncertain.
  - We need a way to forecast future dividends.
- Common stock does not have a maturity

What Gives a Stock Value? Dividends!

The fair value depends only on the stock's expected future cash flows, which are dividends and a future sale price.

So what is the value of a stock that *with certainty will never* pay a dividend or any other distribution?

-
- Such stocks do not exist. Those not paying dividends now are expected to do so in the future as the firm saturates its market opportunities and therefore begins to pay dividends. Of course, a company whose stock you own may also be acquired—either with cash (a large dividend!) or with the stock of the acquirer which itself would either pay dividends or be expected to eventually do so.

Each subsequent future selling price depends on the expected subsequent dividends.

Therefore, a stock's fair value can be expressed in terms of only the stock's expected future dividends.

Stock Valuation:
First, How Are Dividends Generated?

We concluded already that a stock's value derives from dividends it pays (or will eventually pay)…but how are dividends generated?

Dividends are paid *at the firm's discretion* out of net income (i.e., earnings) from the end of the income statement

– EPS = earnings per share; i.e., total earnings divided by the number of shares outstanding

The portion of earnings paid out in dividends is known as the *dividend payout rate.*

– Dividend = EPS x Dividend payout rate

The portion of earnings retained within the firm for reinvestment (*retained earnings)* is the *retention rate.*

– New investment = earnings x retention rate

The factors that determine the firm's choices with respect to dividends vs. retained earnings will be discussed in another course in the program.

Source of Dividend Growth

If the Payout Ratio (POR) is constant, growth in dividends depends on the growth in earnings.

The growth in earnings depends on:

- The amount of earnings retained (1 - POR), and
- The return earned on new investment, i

$$g = (1 - POR)\, i$$

Example of Dividend Growth

Suppose R-Tech's EPS was $6.00 this year, it pays out 40% of its earnings in dividends, and all its investments earn a 12.0% return. R-Tech has $50 in asset value per share.

What is next year's expected dividend, and what is the dividend growth rate?

This year's dividend (D_0) is

- EPS_0 (POR) = $6.00(0.40) = $2.40

The firm reinvests 60% (1-POR) of its EPS_0

- Amount reinvested = $6.00(0.60) = $3.60

Example of Dividend Growth

The firm retained \$3.60, so now it has \$53.60 in asset value per share. It will earn 12.0% on the reinvested \$3.60 **in addition to** the \$6.00 of earnings from assets already in place (\$50 worth of assets earning 12%).

EPS_1 = \$6.00 + \$3.60(12%) = \$6.43 (rounded)

or, EPS_1 = \$53.60(12%) = \$6.43

D_1 = \$6.43(0.40) = \$2.57

Note that both dividends and EPS grew by 7.2%, and note also that g = (1 - POR) i = (1 - 0.40) (12%) = 7.2%

Dividend Yields, Capital Gains, and Total Returns

A stock's total return can be split into the *dividend yield* and *capital gain rate.*

$$\text{Return} = \frac{(Div_1 + P_1) - P_0}{P_o} = \frac{Div_1}{P_o} + \frac{P_1 - P_0}{P_o}$$

For example, if a stock sells for $100 at t=0, pays a dividend of $2 at t = 1, and then sells for $108 after the dividend, the total return is 10% which consists of a 2% dividend yield and an 8% capital gain rate.

The Dividend Discount Model

The value of a share of stock is the present value of the expected dividends over the holding period plus the expected sale price at the end of the holding period.

$$P_0 = \frac{D_1}{(1+r)^1} + \frac{D_2}{(1+r)^2} + \frac{D_3}{(1+r)^3} + \cdots + \frac{D_n}{(1+r)^n} + \frac{P_n}{(1+r)^n}$$

The Dividend Discount Model

$$P_0 = \frac{D_1}{(1+r_E)} + \frac{D_2}{(1+r_E)^2} + \frac{D_3}{(1+r_E)^3} + \cdots + \frac{D_n}{(1+r_E)^n} + \frac{P_n}{(1+r_E)^n}$$

$$P_n = \frac{D_{n+1}}{(1+r_E)^1} + \frac{D_{n+2}}{(1+r_E)^2} + \frac{D_{n+3}}{(1+r_E)^3} + \cdots$$

$$P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r_E)^t}$$

We sometimes use "r_E" to denote the discount rate…it stands for the investors' required rate of return on equity.

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Constant Growth

Assume dividends are growing at a constant percentage rate of **g** per year.

$$D_2 = D_1(1+g)$$

$$D_3 = D_2(1+g) = D_1(1+g)(1+g) = D_1(1+g)^2$$

$$D_4 = D_1(1+g)^3$$

$$etc.$$

$$D_t = D_1(1+g)^{t-1}$$

Constant Growth

$$P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+r_E)^t} = \sum_{t=1}^{\infty} \frac{D_1(1+g)^{t-1}}{(1+r_E)^t}$$

$$P_0 = \frac{D_1}{(r_E - g)}$$

More generally, from any period with constant growth forever after time t:

$$P_{t-1} = \frac{D_t}{(r_E - g)}$$

Common Stock Dividends

Future Dividends depend on:

- The firm's earnings
- Dividend policy
  - Payout Rate = Dividends/Earnings

Common Stock Valuation

The per share annual dividend on a common stock is expected to be $2.00 one year from today. Stockholders require a 16% rate of return. Find the fair value of the stock for each of the following cases:

1. **Zero Growth**: dividends are constant every year.
2. **Six-Percent Constant Growth**: dividends are growing at a constant rate of 6% per year forever.
3. **Super-Normal Growth**: dividends will grow at 30% for 3 years and then at 6% per year forever.

Note: In real life, stocks usually pay *quarterly* dividends – the techniques you would apply are exactly the same, except that you would use a quarterly discount rate instead of an annual discount rate.

1. Zero Growth

With **g = 0**, the dividends of $2.00 per share form a perpetuity.

$$P_0 = \frac{D_1}{r_E} = \frac{\$2.00}{0.16} = \$12.50$$

We can fool our financial calculator by using a very large number of payments in an annuity calculation, because payments very far out in the future have negligible value!

N=10,000 i=16 PMT=-2 FV=0 **PV= 12.50**

2. Six-Percent Growth

Recall that D_1 = \$2.00; r_E = 16%; and g = 6%

$$P_0 = \frac{\$2.00}{(0.16 - 0.06)} = \$20.00$$

We can fool our financial calculator by using a very large number

N=10,000   i=16-6=10   PMT=-2   FV=0   **PV= 20.00**

Important Features of the Constant Growth Model

The growth rate in dividends (g) is always less than the required rate of return (r_E).

- Otherwise, the firm's growth would exceed the economy's growth **forever**, which is not possible.
- Also, the fair value would be negative or infinity, which makes no sense.

The growth rate in dividends is also the capital gains yield on the stock.

- The capital gains yield is the rate of price appreciation.

Important Features of the Constant Growth Model

Note as we have seen, the stock's total return is

- dividend yield ($=\frac{D_1}{P_0}$) plus
- capital gains yield (= g)

$$\frac{D_1}{P_0} + g = 2/20 + .06 = 0.16 = 16\%$$

3. Super-Normal Growth

Recall we had D_1 = \$2, then 3 years of growth at 30%, then growth at 6% thereafter:

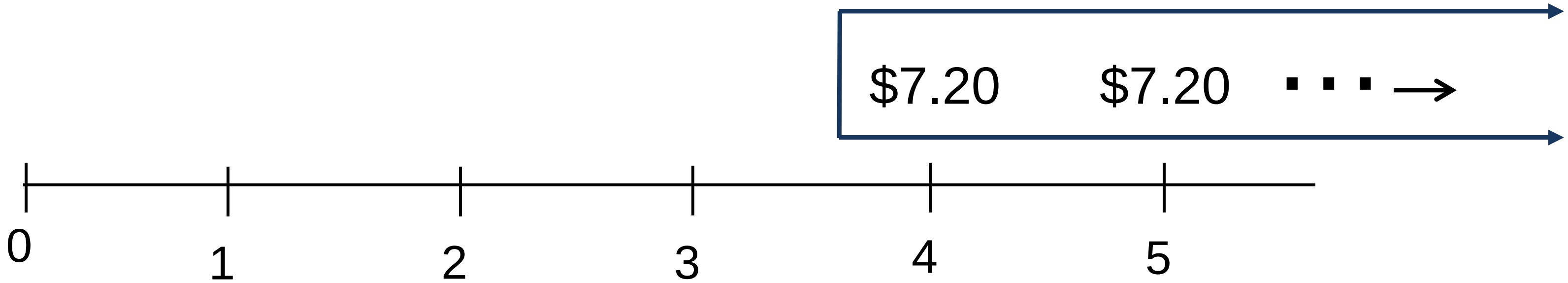
		$2 \times (1.30)$	$2 \times (1.30)^2$	$2 \times (1.30)^3$	$4.394 \times (1.06)$	
	\$2.00	\$2.60	\$3.38	\$4.3940	\$4.65764	
0	1	2	3	4	5	. . .

We've pretended partial penny dividends are possible, because our growth rate assumptions are simply to capture our best estimates of what is surely impossible to know precisely…we may we well use the growth rates accurately (we could also round each to the penny, but just grow each future dividend from the *unrounded* numbers – that would also be a reasonable choice.

The trick in valuing this is to identify where we can apply the constant growth model, and divide the cash flows accordingly.

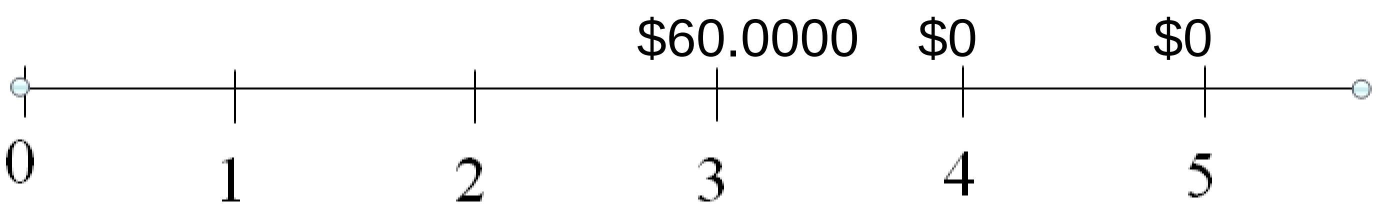
Deferred Perpetuity Example

Here is a reminder on a deferred perpetuity example (with a new example).



Suppose $r_E = 0.12$

Step 1: Use $P = pmt/r_E$ = 7.20/0.12 = \$60.0000 *as of t = 3* (It is valued one period before the first payment we used.)

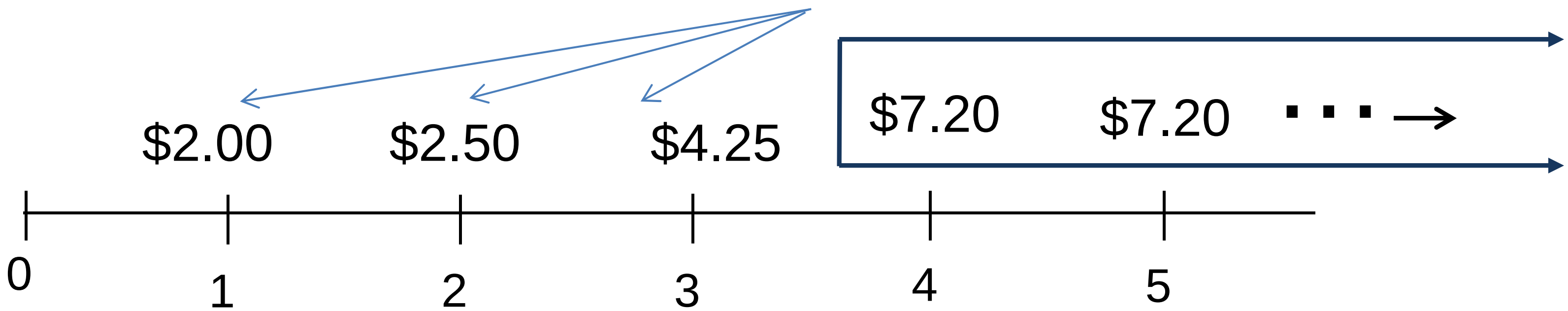


So, now we need to move the \$60 as of t = 3 back to t = 0:

$60 / (1.12)^3 =$ \$42.7068 (as of t = 0!)

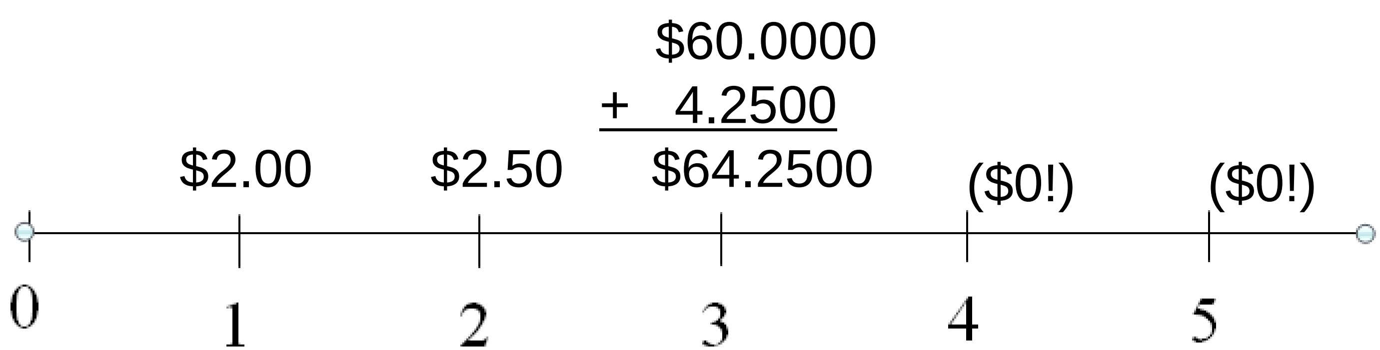
Deferred Perpetuity Example

So what if we had earlier cash flows.



Recall step 1: Use P = pmt/r_E = 7.20/0.12 = $60.0000 *as of t = 3.*

So, let's rewrite the problem as follows:

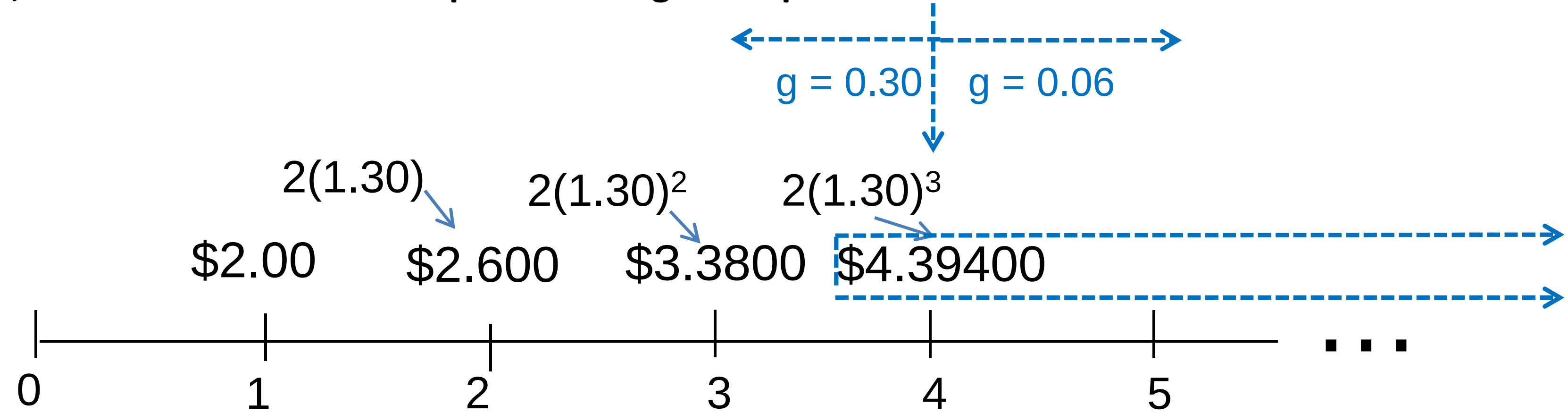


Step 2: Discount everything back to t =0

$$P_0 = \frac{2.00}{(1.12)} + \frac{2.50}{(1.12)^2} + \frac{64.2500}{(1.12)^3} = \$49.51$$

3. Super-Normal Growth

Now, let's do Case #3— the Super-Normal growth problem listed on an earlier slide.



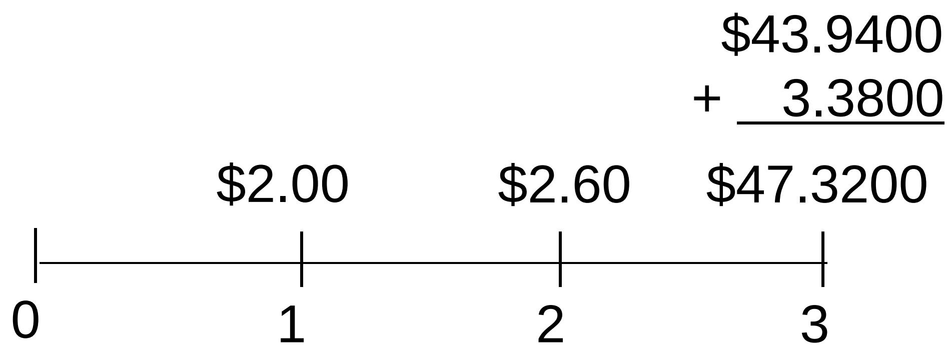
Step 1: Use D_4, from which "normal" growth begins, to find a value of D_4 and later dividends:

$$P_3 = \frac{D_4}{r_E - g} = \frac{\$4.39400}{0.16-.06} = \$43.9400 \qquad (as\,of\; t = 3!)$$

NOTE: We were strategic and careful in choosing D_4 specifically. It was not just some random choice! D_4 was the last dividend grown from earlier using 30%, and the first dividend from which future ones grow at 6%.

3. Super-Normal Growth

Now our problem becomes as follows:



$$P_0 = \frac{\$2.00}{1.16} + \frac{\$2.60}{(1.16)^2} + \frac{\$47.32}{(1.16)^3} = \$33.97$$

3. Super-Normal Growth

Or using TVM keys instead of algebra:

N=3   i=16   FV= -47.32   PMT=0   PV= 30.3159

N=2   i=16   FV= -2.60   PMT=0   PV= 1.9322

N=1   i=16   FV= -2.00   PMT=0   PV= 1.7241

30.3159 + 1.9322 + 1.7241 = **33.97**

Other Valuation Models

Total payout model: This is useful if the firm is repurchasing its stock as an occasional dividend substitute.

$$PV_0 = \frac{PV(\text{Future Total Dividends and Repurchases})}{\text{Shares Outstanding}_0}$$

Other Valuation Models

We can also use a *comparables approach* ("comps"), or "multiples approach," in which we impute a value based on (i) the firm's EBITDA, or Sales, or Book value of equity, or any other metric, and (ii) the ratio (or median of ratios across many firms) of another firm's market value to its metric being used.

Although the comps approach is particularly convenient when dividends are not yet being paid or they are otherwise difficult to forecast, be careful to note that accounting anomalies can render the comps approach misleading.

Comparables or Multiples Approach?

With the comps approach, what if the comp(s) being used is not priced fairly? What if there is pervasive under or over valuation?

In the late 1990s, many imputed the value of internet stocks using ratios of prices to web hits per day.

- Does this necessarily make economic sense?
- And it turned out the entire sector was overvalued (in hindsight, as considered by most observers).

Please be mindful of the possibility that the comps approach may provide a very misleading valuation!

Bonds

A bond is loan (from the investor to the firm or other entity borrowing money)

Bonds are issued (sold) by the borrower (a firm, the U.S. Treasury Department, a state or city, etc.) , and purchased by the investor (lender).

The legal contract underlying the loan is called a *bond indenture.*

A typical bond pays semi-annual coupons, and also a final par value, or face value at maturity.

Defaulting on promised bond payments allows the bondholders to take the firm into bankruptcy.

Basic Bond Terminology

Typical bonds pay semi-annual coupon payments and then a final payment at maturity equal to the *face value* (or *par value*) and one final coupon payment.

– Note that *maturity* refers to the time *remaining* until maturity (different from its "original" or "when-issued" maturity.

Par, or *Face Value* – the larger payment that will be paid at maturity along with a final coupon payment

– Par value = $1000 for the overwhelming majority

Basic Bond Terminology

Coupon – a periodic "interest" payment. Typically the size is fixed when the bond is originally issued by the firm and remains constant

- The majority of bonds pay coupons semiannually

Coupon rate – total dollar amount of coupons paid in one year divided by par value

- E.g., if each semi-annual coupon = $40, the CR = 2 x $40 / $1000 = 8.0%

Current yield – total dollar amount of coupons in a year / current price

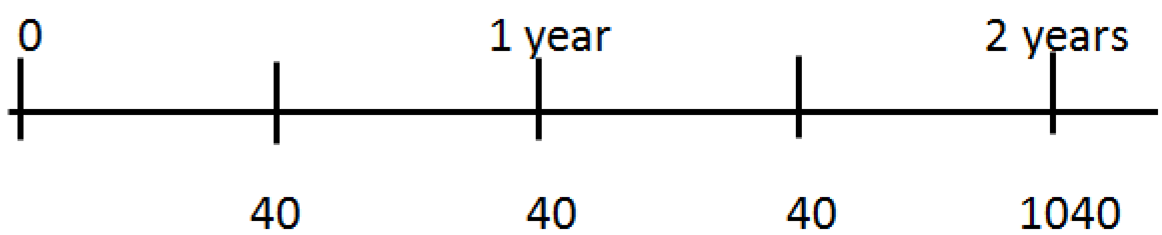
- Note that this ignores price appreciation or depreciation in the value of the bond as you move through time.
    - It is therefore *not* the investors true rate of return.

Bond Example

8% refers to the *Coupon Rate* which is expressed as the total dollar amount of coupons ($80 in this case) paid in one year divided by the *Face Value* (or *Par Value*)

Unless noted otherwise, ALWAYS assume:

- Semi-annual coupons (i.e., at years 0.50, 1.0, 1.5, 2.0, etc.)
- Unless told otherwise, we assume Face value (or par value) is $1000
  - This holds for the overwhelming majority of corporate bonds



Bond Features

Appendix I has more detail (for your interest) on the following features that bonds may have

- Callable
  - After a call protection period expires, the firm can "call the bond" which means paying bond holders one large (pre-specified) payment in lieu of the remaining coupons and par value
- Convertible
  - Bond holders can trade their bond in for a pre-specified number of shares of common stock (the number is adjusted over time for stock splits, stock issuances, etc.)
- Sinking fund
  - The firm is required to systematically buy back its bonds steadily over time, thus reducing the amount of total par value it will need to pay out when the stated maturity ends

Bond Features

- Serial bonds
  - Instead of all bonds being issued with a maturity of 10 years (for example), it issues bonds with different maturity buckets (or tranches) one-tenth of the total face amount with a maturity of 1 year, another one-tenth with a maturity of 2 years, etc.
- Subordination clause
  - Specifies any subsequent bonds the firms issues will have lower priority in the event the firm goes into bankruptcy
- Collateralized bond vs. debenture
  - A collateralized bond gives the bond holders property rights to something (e.g., a plant) if the firm defaults on the bonds. A debenture is a bond that has no such collateral.
- Dividend restriction
  - Restricts the size of dividends to stockholders so that the firm cannot pay a large special dividend instead of investing capital that will generate revenue to pay what is owed on debt

The U.S. Money Market

Money market securities are short-term securities (mature in less than a year) that are very liquid—in many respects these are considered cash equivalents and offer relatively low rates of interest. Just two examples (this is not an exhaustive list):

Treasury Bills

- The most widespread money market security. These are essentially short-term bonds issued by the Treasury Security that have no coupons, and are issued in maturities of 4, 13, 26, or 52 weeks.

Commercial Paper

- Commercial paper is an alternative to a bank loan for short-term borrowing by well-established firms.
- Commercial paper with a maturity of 270 days or less need not be registered with the SEC (consequently, the vast majority mature in less than 270 days), and, in practice, most commercial paper has a maturity of between 4 and 45 days.
- These instruments are usually issued in multiples of $100,000.

Non-Money Market Bonds

Securitized bonds

- Securitization is the packaging of financial assets into market tradable securities.
- The earliest securitized assets were home mortgages, mortgage-backed securities.
  - Banks used to make loans and hold them for decades until they matured. To make new loans, banks had to find new local deposits.
  - With securitization, banks sell loans to quasi-government agencies (Fannie Mae, Freddie Mac, and Ginnie Mae) that pool them into securities known as **mortgage-backed securities** and sell them to market investors.
  - Now, banks are often just the originators and servicers of loans and use their deposits to lend over and over.
  - Because the mortgage payments are passed through to the security holder, simple mortgage-backed securities are often called **pass-throughs**.
- Most any financial asset with familiar characteristics can be securitized:
  - Car loans, Collateralized Automobile Receivables (CARs)
  - Credit card debt
  - Student loans

The International Money Market

Eurodollars

- Eurodollars are US$ deposited outside the U.S. in foreign banks or foreign branches of U.S. banks.
- The name "Euro" comes from the fact that European banks were the first to take these deposits.
- The dollar-denominated accounts are not regulated by the U.S. Federal Reserve.
- Typically these are time deposits with maturities from 1 to 6 months.

Eurodollars may also be placed in Eurodollar CDs. The advantage of these CDs over domestic CDs is that they are negotiable. (They can be bought and sold.)

- Eurodollar CDs are riskier because they are issued by a non-U.S. bank/bank branch but consequently earn a higher return.

The International Bond Markets

Eurobonds

- The Eurobond market began in the late 1950s and early 1960s when European firms began to issue dollar-denominated bonds in Europe but outside their home countries.
- Now "Euro" is a prefix that means "traded in countries outside of the home country but in the home country's currency."
- The Eurobond markets are a major source of funding and a feasible alternative for many U.S. firms.
- The Eurobond market is unregulated and often a lower cost source of capital.

Example: An Australian firm issues bonds that are denominated in AUD$ but are traded in Japan and Korea. The firm has issued a Eurobond!

The International Bond Markets

Foreign Bonds

- If a firm issues bonds in a foreign market AND those bonds are denominated in the foreign currency, the firm has issued a **foreign bond**.
- For example, if an American firm issues Yen-denominated bonds in the Japanese market, these bonds would be foreign bonds.
- Some foreign bonds are give colorful names for bonds issued.
- **Examples:**
  - In Yen on the Japanese markets by non-Japanese firms are give the name **Samurai bonds**!
  - In US$ on the U.S. markets by non-U.S. firms (or by foreign governments) are given the name **Yankee bonds**!
  - In British pound sterling on the U.K. markets by non-U.K. firms are given the name **Bulldog bonds**!

Basic Bond Valuation

We can find the present value of any series of future cash flows by taking the present value of each and summing together.

$$\text{Present value} = \frac{CF_1}{(1+r)} + \frac{CF_2}{(1+r)^2} \ldots + \frac{CF_T}{(1+r)^T} = \sum_{t=1}^{T} \frac{CF_t}{(1+r)^t}$$

The typical bond promises to pay its owner a series of equal coupon payments and, at maturity, a "par value" (or "face value"). Hence, a bond with a maturity of T periods can be valued as follows:

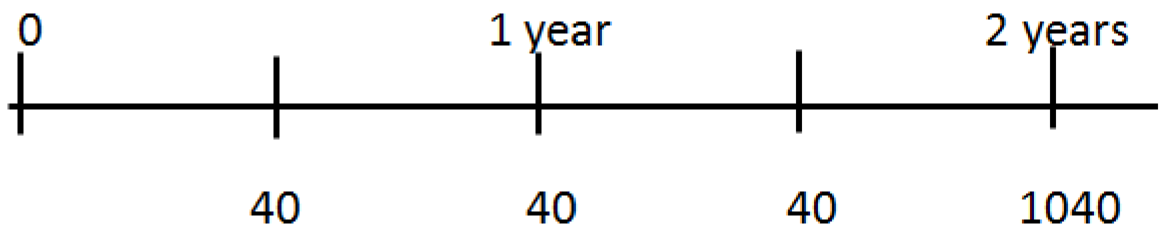
$$\text{Bond value} = \text{Present value of coupons} + \text{Present value of par value}$$

$$= \frac{Coupon}{(1+r)^1} + \frac{Coupon}{(1+r)^2} \ldots + \frac{Coupon}{(1+r)^T} + \frac{Par\,value}{(1+r)^T}$$

$$= \sum_{t=1}^{T} \frac{Coupon}{(1+r)^t} + \frac{Par\,value}{(1+r)^T}$$

Basic Bond Valuation

Consider the simple, 2-year 8% bond:



Suppose investors "demand" or have a "required rate of return" of 3.0% each six-month period.

This implies the price will be

$$\frac{40}{(1.03)} + \frac{40}{(1.03)^2} + \frac{40}{(1.03)^3} + \frac{1040}{(1.03)^4} = 1037.17$$

- The bond's discount rate is stated as its ***Yield to Maturity*** **(YTM)**: 2 x 3.0% = 6.0%.
- YTMs are nearly always expressed on an annual nominal basis like this.
- YTM is also known as the "bond equivalent yield."

Mechanics

What is the price of a 7% bond with 8 years to maturity if the YTM = 6%? What is the current yield? What is the EAR?

- We assume face value = par value = $1000 (because not told otherwise)
- We assume coupons are paid semiannually (because not told otherwise)
- Make sure your calculator is on "end" (not begin)
- Make sure your calculator has the number of payments per year set to 1
  - (Think of this as a setting for the number of payments per period)
- Price: N = 16, I = 3, PMT = 35, FV = 1000 ➔ PV = price = $1062.81
  - Algebraically, this price is calculated as

$$Price = \frac{35}{(1.03)} + \frac{35}{(1.03)^2} + \ldots \frac{35}{(1.03)^{16}} + \frac{1000}{(1.03)^{16}}$$

  - Note this bond sells at a premium, as CR > YTM predicts
- Current yield = 70 / 1062.81 = 6.586% (Current yield is defined earlier in the course)
- EAR =

Mechanics

What is the YTM of a 7% bond maturing in 8 years if the price is $1062.81?

- PV = -1062.81, N = 16, PMT = 35, FV = 1000 ➔ I = 3 ➔ x 2 for YTM = 6.000%
- Algebraically, this solves the equation below to find *i* = 0.03 (and then we would multiply by 2 to obtain 0.06 or 6.0%)

$$1062.81 = \frac{35}{(1+i)} + \frac{35}{(1+i)^2} + \ldots + \frac{35}{(1+i)^{16}} + \frac{1000}{(1+i)^{16}}$$

What is the coupon rate of a bond with 8 years to maturity if the price is $1062.81 and the YTM is 6%?

- PV = -1062.81, N = 16, FV = 1000, I = 3 ➔ PMT = 35
- Algebraically, this solves the equation further below to find *pmt* = 35
- So, CR =

$$1062.81 = \frac{pmt}{(1.03)} + \frac{pmt}{(1.03)^2} + \ldots + \frac{pmt}{(1.03)^{16}} + \frac{1000}{(1.03)^{16}}$$

Premiums and Discounts

Recall *Yield to maturity (YTM) =* the implied discount rate of the bond, stated as an annual *nominal* rate (also called the "bond equivalent yield")

Recall *Coupon Rate (CR)* = annual $ coupons paid in one year / face value of the bond

Premiums and *discounts*

- A bond trading above par is said to be trading at a premium, and one trading below par is trading at a discount
- CR > YTM ⇔ Trading at premium
- CR < YTM ⇔ Trading at discount
- CR = YTM ⇔ Trading at par

Quick Problem

Calculate effective annual rates (EARs) for the following two securities

- A three-month Treasury-bill selling at \$99,700 with a par value of \$100,000, and an 8% corporate coupon bond selling at par
- T-bill: PV = -99,700 FV = 100,000 N = 1
  - ➔ I = 0.3009%
  - Algebraically: 100,000 / 99,700 – 1 = 0.003009
  - EAR =
- Coupon bond:
  - We know YTM = CR = 8%. Why?
    - Because the bond is selling at par!
  - The semiannual rate is therefore 4% per 6 months
  - EAR =

Some Factors Affecting Bond Prices

As general interest rates (and risk-free rates in particular) in the economy increase or decrease, so too will investors' required rate of return.

- ↑ Interest rates ➔
- ↓ Interest rates ➔

– Macroeconomic news will affect interest rates and hence YTMs and bond prices.

– News that helps investors update their beliefs about default risk will also affect YTMs and bond prices.

As bond prices increase, so too do the returns that bondholders receive from holding bonds (and returns fall when prices drop).

More on debt ratings

Debt ratings help the bond markets determine their required rates of return by providing guidance in the risk premium that should be added to the appropriate risk free rate: r_D = risk free rate + risk premium

For example, a "matrix price" for a bond is commonly used when a recent transaction price cannot be found. The methodology is something along these lines (roughly speaking):

1. Use Moody's or some other service to find the firm's debt rating
2. Use recent market data on credit spreads to learn the risk premiums the markets are currently adding for a bond of this debt rating
3. Use the latest Treasury rates to determine the appropriate risk-free rate
4. Find the latest risk-free yield curve to find the appropriate risk-free rate (based on maturity, and add the risk premium from step 2 to determine the required rate of return
5. Price the bond accordingly

Multiple independent ratings agencies provide quality ratings on bonds.

- Moody's Investors Services, Standard and Poor's Corporation, Duff & Phelps, etc.
- These rating agencies use financial ratios and other analysis to determine their bond ratings.

Bond ratings

Bond Ratings								
	Very High Quality		High Quality		Speculative		Very Poor	
Standard & Poor's	AAA	AA	A	BBB	BB	B	CCC	D
Moody's	Aaa	Aa	A	Baa	Ba	B	Caa	C

At times both Moody's and Standard & Poor's have used adjustments to these ratings: S&P uses plus and minus signs: A + is the strongest A rating and A − the weakest. Moody's uses a 1, 2, or 3 designation, with 1 indicating the strongest.

Moody's	S&P	
Aaa	AAA	Debt rated Aaa and AAA has the highest rating. Capacity to pay interest and principal is extremely strong.
Aa	AA	Debt rated Aa and AA has a very strong capacity to pay interest and repay principal. Together with the highest rating, this group comprises the high-grade bond class.
A	A	Debt rated A has a strong capacity to pay interest and repay principal, although it is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than debt in higher-rated categories.
Baa	BBB	Debt rated Baa and BBB is regarded as having an adequate capacity to pay interest and repay principal. Whereas it normally exhibits adequate protection parameters, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity to pay interest and repay principal for debt in this category than in higher-rated categories. These bonds are medium-grade obligations.
Ba B Caa Ca	BB B CCC CC	Debt rated in these categories is regarded, on balance, as predominantly speculative with respect to capacity to pay interest and repay principal in accordance with the terms of the obligation. BB and Ba indicate the lowest degree of speculation, and CC and Ca the highest degree of speculation. Although such debt will likely have some quality and protective characteristics, these are outweighed by large uncertainties or major risk exposures to adverse conditions. Some issues may be in default.
C	C	This rating is reserved for income bonds on which no interest is being paid.
D	D	Debt rated D is in default, and payment of interest and/or repayment of principal is in arrears.

- Firms with higher ratings are in better financial condition and have lower default risks:
- Here are some median financial ratios firm firms classified by their S&P bond rating

	3-year (2002 to 2004) medians						
	AAA	**AA**	**A**	**BBB**	**BB**	**B**	**CCC**
A. EBIT interest coverage multiple	23.8	19.5	8.0	4.7	2.5	1.2	0.4
EBITDA interest coverage multiple	25.5	24.6	10.2	6.5	3.5	1.9	0.9
Funds from operations/total debt (%)	203.3	79.9	48.0	35.9	22.4	11.5	5.0
Free operating cash flow/total debt (%)	127.6	44.5	25.0	17.3	8.3	2.8	(2.1)
Total debt/EBITDA multiple	0.4	0.9	1.6	2.2	3.5	5.3	7.9
Return on capital (%)	27.6	27.0	17.5	13.4	11.3	8.7	3.2
Total debt/total debt + equity (%)	12.4	28.3	37.5	42.5	53.7	75.9	113.5
B. Historical default rate (%)	0.5	1.3	2.3	6.6	19.5	35.8	54.4

TABLE 14.3

Financial ratios and default risk by rating class, long-term debt

Note: EBITDA is earnings before interest, taxes, depreciation, and amortization

Source: *Panel A: Corporate Rating Criteria*, Standard & Poor's, 2006. *Panel B:* "Static Pools Cumulative Average Default Rates (%)," Standard & Poor's. Reproduced by permission of Standard & Poor's, a division of The McGraw-Hill Companies, Inc.

Yield spreads through time...

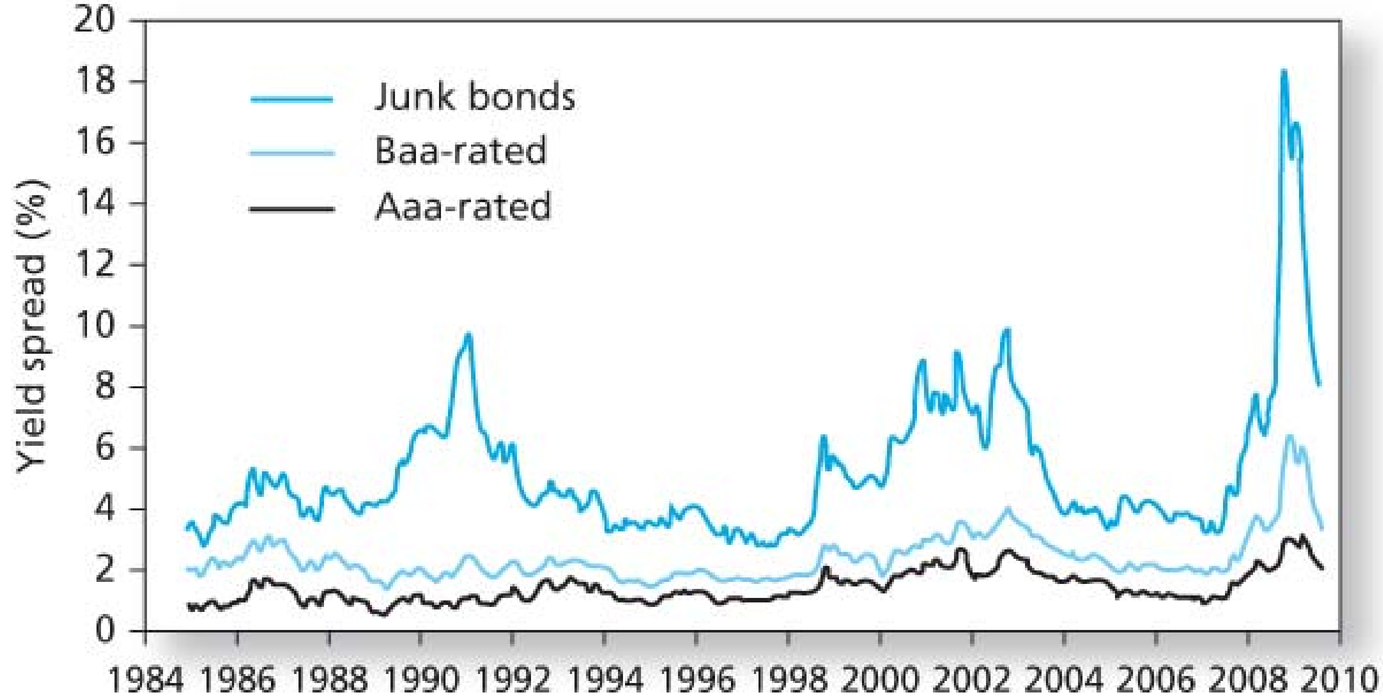


Figure 14.11 Yield spreads between corporate and 10-year Treasury bonds

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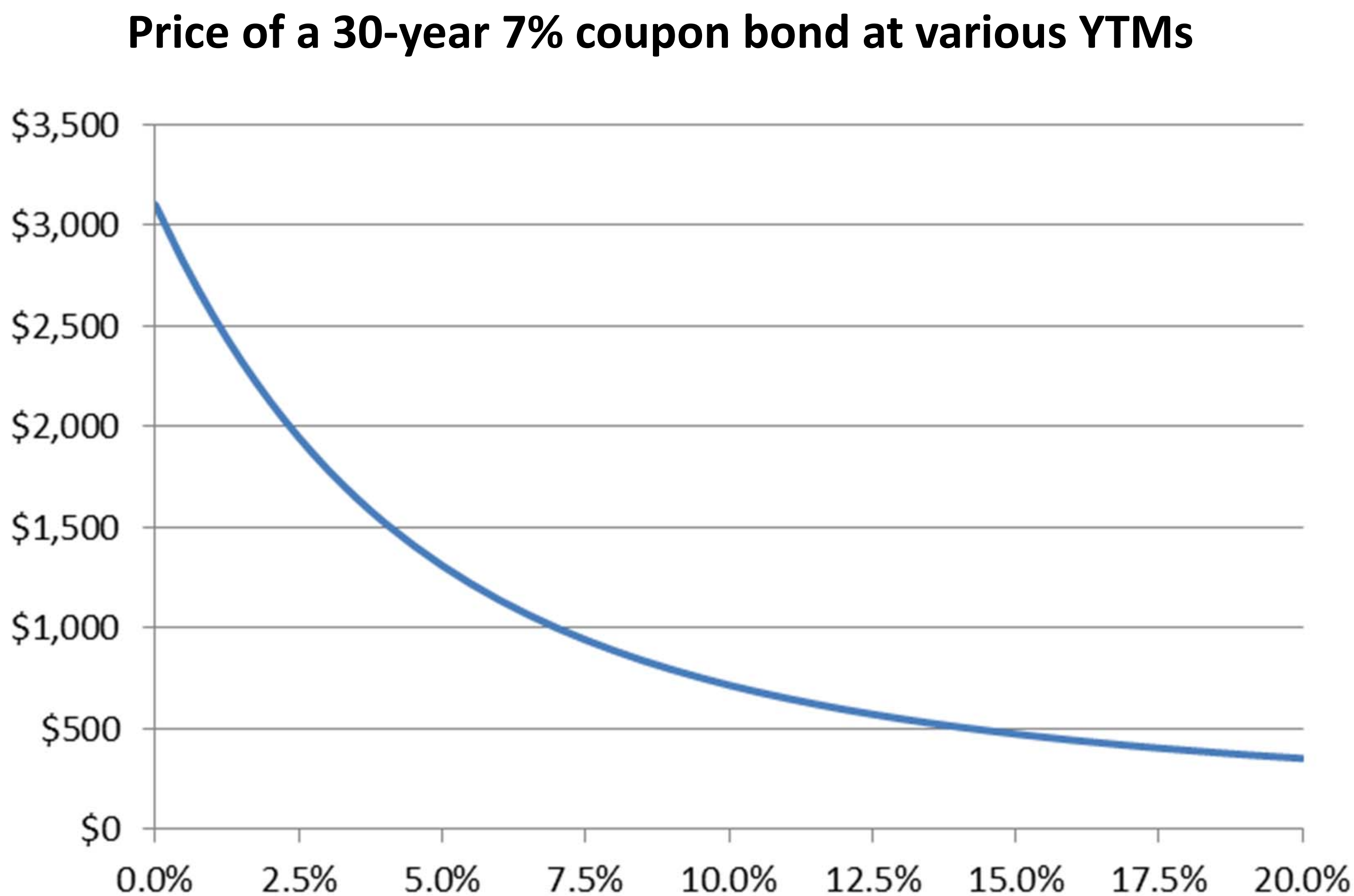
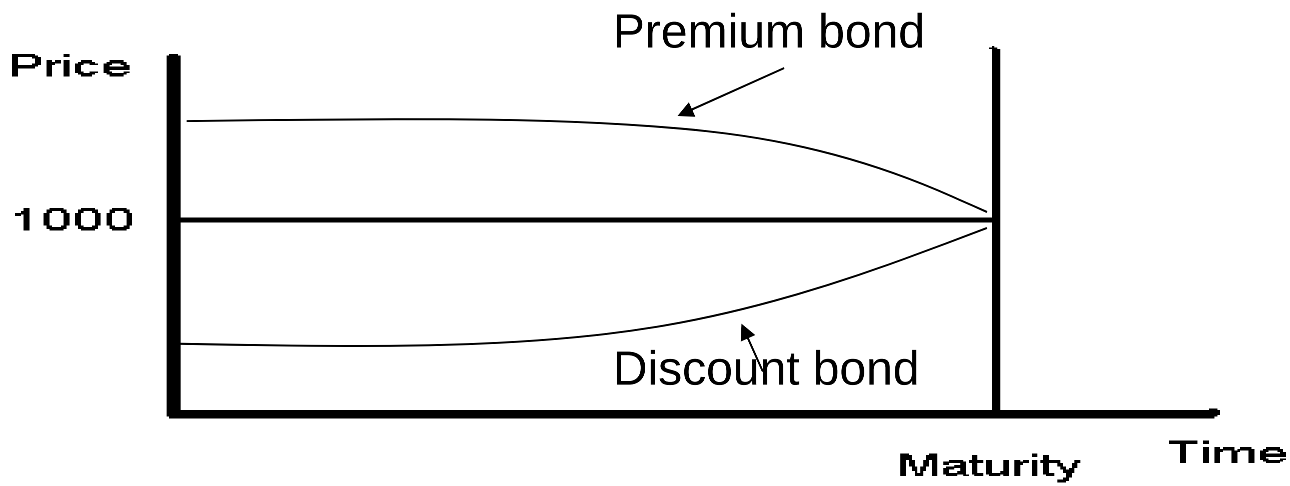
Bond Prices and Yields Are Inversely Related



Bond Prices and Yields Are Inversely Related

The mere passage of time will also affect the price of a bond as it moves closer to maturity.

- Bonds trading at premiums will see their premiums gradually decrease.
- Bonds trading at discounts will see their discounts gradually decrease.



- Of course, the price path will not be this "smooth" because changes in interest rates and default risk also affect a bond's price through time.

Yield to Call of a Callable Bond

Recall a *callable bond* is a bond that the firm can "call" after a call protection period (which means it will pay bondholders one large, pre-specified payment and none of the remaining normal payments)

The "Yield to Call" assumes that once the call protection period ends, the firm will call the bond.

Consider a 9% coupon, 12-year bond, selling for $1,254.03, with a 6% YTM.

Suppose the bond can be called in 5 years for $1,090.

Suppose you buy the bond for $1,254.03 and then in 5 years it is called. What rate of return would you have earned?

– I.e.; what is the yield to call?

Yield to Call Calculation

N=10   PV= -1,254.03   PMT=45   FV=1,090   i=2.416

- So YTC = 2(2.416) = 4.83%
- YTC < YTM
- If a callable bond has not yet been called but is expected to be called once the call protection period ends, the YTC become much more relevant to investors than the YTM.

Preferred Stock

Finally, here is a bit of information about preferred stock.

Despite its name, preferred stock is more like a bond than a stock.

Claims of preferred stockholders are junior to claims of debtholders, but senior to those of common stockholders.

Stockholders have Limited voting rights compared to common stock.

Preferred stock has a par value and a dividend rate.

Failure to pay the dividend <u>does not</u> force the issuing firm into bankruptcy.

Preferred stock tends to trade on the fixed income side of the business.

Most firms do not have preferred stock. It was more common several decades ago. Preferred stock is now more common for very old firms and also some financial firms.

- In the aftermath of the financial crisis, the U.S. government used TARP money to inject financial firms with cash in exchange for preferred stock that the financial firms issued.

Some preferred stock has a maturity, while other preferred stock is perpetual. Also, some preferred stock is convertible into common stock.

Preferred Stock

Despite its name, preferred stock is more like a bond than a stock, and it is rarely an attractive investment for individual investors.

Claims of preferred stockholders are junior to claims of debtholders, but senior to those of common stockholders.

Limited voting rights compared to common stock.

Preferred stock has a par value and a dividend rate.

Failure to pay the dividend does not force the issuing firm into bankruptcy.

Preferred Stock

Consider a $25 par value share of preferred stock with an 8% dividend rate (paid quarterly), and a 15-year life. The required return is 12% APR (compounded quarterly). Find the share's fair value today.

Value = PV(dividends) + PV(par value)

Because we are told dividend payments are quarterly, we will work in terms of quarters in our valuation.

Preferred Stock

N = 15(4) = 60

i = 12/4 = 3

PMT = Dividend = (.08)25/4 = 0.50

FV=25

N=60   i=3   PMT=0.50   FV=25   PV= -18.08

(Price = $18.08)

Preferred Stock

What if the stock had been perpetual?

Then the value of the stock would be:

$$0.5/0.03 = \$16.6667$$

Capital Structure Part I: Financial Leverage

In our discussion of financing the firm, we noted the mix of financing (debt and equity) is known as the firm's Capital Structure

Capital structure varies widely…

- Some median D/A ratios (debt / assets, which = D/(D+E)for selected industries
  - Building construction: 60%
  - Hotels and lodging: 55%
  - Paper: 28%
  - Health services: 15%
  - Drugs and chemicals: 5%
- Why might capital structure matter? Or, is the choice just random?
- **The Tradeoff Theory** says
  - On the plus side, debt provides a valuable tax shield (interest payments on debt come out of pre-tax income)
  - On the negative side, debt imposes a cost of potential financial distress

Capital Structure

Capital structure most commonly refers to the mix of debt and equity financing.

Consider two firms U (unleveraged, or unlevered) and L (leveraged, or levered).

	Firm U	Firm L
Assets	$8,000,000	$8,000,000
Debt	$0	$4,000,000
Equity	$8,000,000	$4,000,000
Debt/Equity Ratio	0	1
Shares Outstanding	400,000	200,000
Interest rate	10%	10%

Capital Structure

	Firm U's Income Statement		
	Bad news	Expected	Good news
EBIT	$500,000	$1,000,000	$1,500,000
Interest	0	0	0
Net Income	$500,000	$1,000,000	$1,500,000
ROE	6.25%	12.50%	18.75%
EPS	$1.25	$2.50	$3.75

	Firm L's Income Statement		
	Bad news	Expected	Good news
EBIT	$500,000	$1,000,000	$1,500,000
Interest	$400,000	$400,000	$400,000
Net Income	$100,000	$600,000	$1,100,000
ROE	2.50%	15.00%	27.50%
EPS	$0.50	$3.00	$5.50

Capital Structure

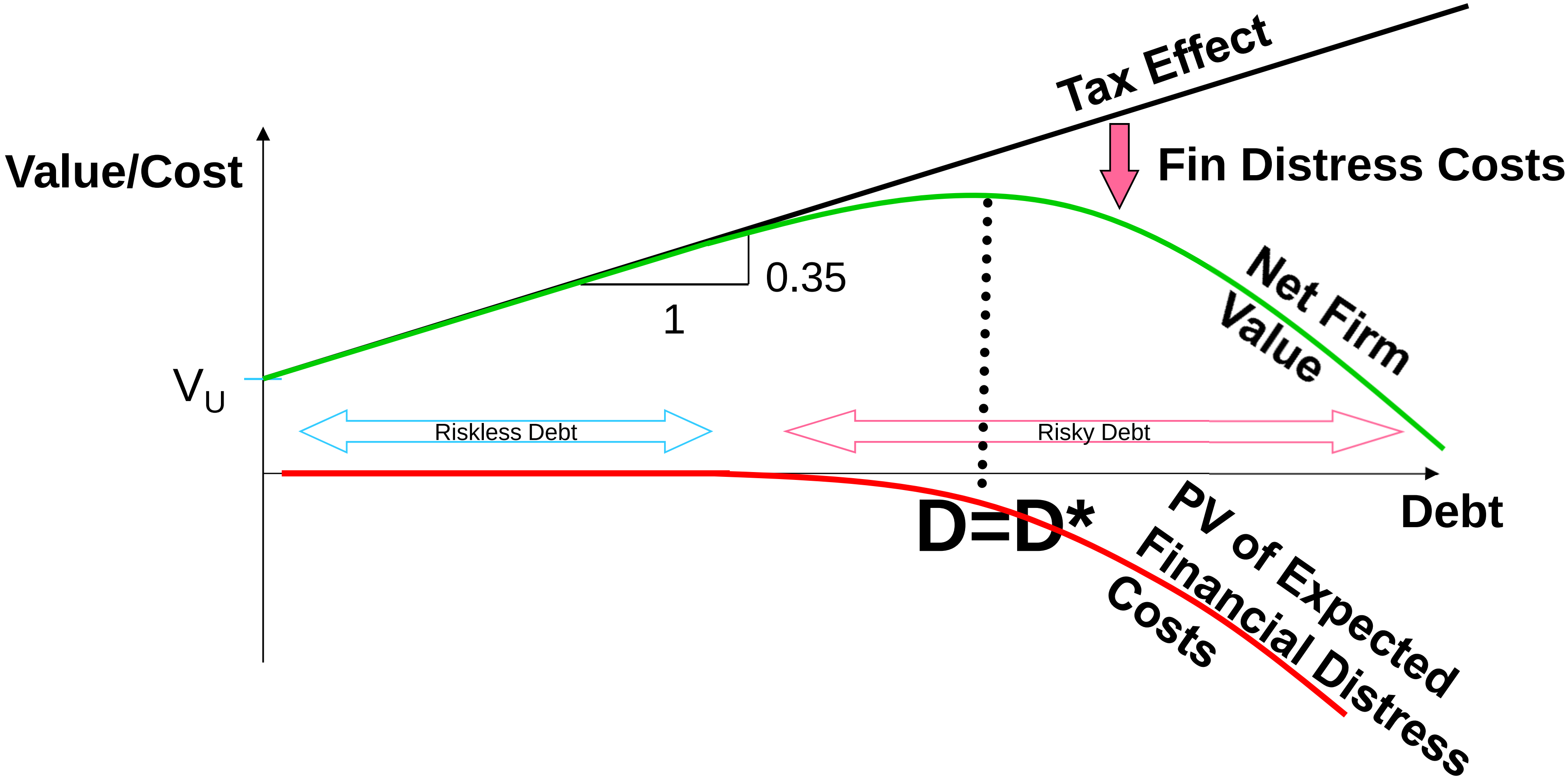
As we see, the levered firm has more volatile ROE (return on equity) and EPS (earnings per share).

In fact, more leveraged firms have higher betas!

We can decompose a leveraged firm's beta as follows:

$$\beta_L = \underbrace{\beta_U}_{\text{Beta of an “unlevered firm”…this measures the firm’s \textit{business risk}}} + \underbrace{\beta_U(1-t)(D/E)}_{\text{This term is the increase in beta due to the firm’s \textit{financial risk}}}$$

Summarizing the tradeoff theory



Costs of financial distress

- What are the costs of financial distress?
  - Lost supplier/customer contracts
  - Loss of key personnel to competitors
  - The managerial distraction
  - Competitors may engage in predatory pricing to squeeze a distressed firm out of business
  - Loss of consumer confidence
  - Lenders cut back on the firm's credit
  - If bankruptcy, lawyer and court fees
  - If a liquidation, there may be "fire sales"
- Need the firm actually go into bankruptcy to incur many of these costs? No! Even the threat of bankruptcy brings many of these costs!

Predictions from the tradeoff theory

- Firms will have higher bankruptcy costs and will therefore have lower optimal debt levels if they have
  - **A large proportion of Intangible Assets (the “Collateral Hypothesis”)**
    - Like R&D researchers in the pharmaceutical industry – the firm can’t just sell these highly valuable employees to generate cash in times of financial distress!
    - Or in general if there are few tangible assets, then there is little for debtholders to go after in the event of a bankruptcy
  - **Human capital investment unique to the firm**
  - **A large proportion of assets that have a use unique to that firm or otherwise illiquid in bankruptcy**
  - **Earnings that are volatile** / sensitive to the business cycle
  - **Non-diversified line(s) of business**—Higher Probability of Bankruptcy because no natural “coinsurance”

Agency Costs of Equity (too little debt)

- AGENCY COSTS OF EQUITY result from the stockholder-manager conflict of interest
  - The manager is the agent
  - Shareholders (the owners) are the principal
- Equity has few and relatively lenient deadlines for achieving a minimum level of financial performance:
  - Dividends are not mandatory
  - Original paid-in capital must never be refunded
- **What costly actions can result from too little debt?**
  - Overly consuming perquisites (Perks) such as company cars, expense accounts, lavish offices, corporate jets, tickets to sporting events
  - Shirking, that is, putting forth less effort to generate a profit, re-engineer/streamline operations, or restructure
  - Empire Building: e.g., acquiring assets to build the size of the firm without regard to the value effects, or the hiring of friends and cronies to build an organization that benefits the manager's social circle but provides little economic value added
  - These problems can be mitigated by adding debt!
    - Debt imposes recurrent financial deadlines
    - Bank debt: banks are generally better at monitoring than bond markets

Agency costs of debt (too little equity)

- AGENCY COSTS OF DEBT result from the debtholder-stockholder conflicts of interest
  - Here, we managers and shareholders are the agents to the extent that they collectively control the firm's decision-making process
  - Debtholders are the principal
- Debt tempts managers/shareholders to make different decisions than they would if their own wealth were solely at stake:
  - The manager/owner "expropriates" wealth from the debtholders (to the shareholders)
  - UNDERINVESTMENT (a.k.a. the Debt Overhang Problem)
    - Simple example: you borrow $10,000 to start a side business that is incorporated and you owe $11,000 in one year.
    - The only project you find involves a $10,000 investment and has and a projected payoff of $11,050 in one year but involves many hours of hard work and stress
    - Will you actually take-on this project?
  - RISK SHIFTING (a.k.a. the Overinvestment Problem)
    - Here, you are tempted to buy $10,000 worth of lottery tickets. This is a negative NPV project! Those who lent you the $10,000 will be very upset with this action!
    - Overinvestment by Investment Banks contributed to the Financial Crisis!
    - This is a large issue with investment banks, and played a part in the financial crisis: Investment banks are typically very highly leveraged…the "stress tests" and the "Volker Rule" of Dodd-Frank attempt to address this issue

Term Structure of Interest Rates

Interest rates form the superhighway that connect money and time.

First let's review tax effects and real vs. nominal rates, then we'll review some benchmark rates and transition into the term structure.

After-Tax Rates

We will not spend much time worrying about after-tax returns, because they will vary for investors based on their different marginal tax rates.

Markets do adjust to reflect that some investments are tax free.

- E.g., you do not pay federal income taxes on municipal bonds, and, as a result, they earn very low rates of return compared to taxable bonds.
- Treasury bills, notes, and bonds, by the way, *are* taxable at the federal level.

After-tax interest rate (we use the investor's *marginal* rate rate).

$$\boxed{r-(\tau\,x\,r)=r(1-\tau)}$$

If you earned 10% but your marginal tax rate was 30% on this income, your after-tax return was 0.1000(1-0.30) = 0.0700 or 7.00%

Real vs. Nominal Interest Rates

Nominal rate (r) – a rate we actually observe – how the "amount" of money grows

Real rate (r_r) -- the rate after considering the effects of inflation

Inflation rate (i) – often measured by the CPI or PPI

How are these related? $$\boxed{1+r_r = \frac{1+r}{1+i}}$$

$$\boxed{r_r \approx r - i}$$ (An approximation)

How good is the approximation?

– Note the precise relation above can be rewritten as $r_r = \dfrac{r-i}{1+i}$

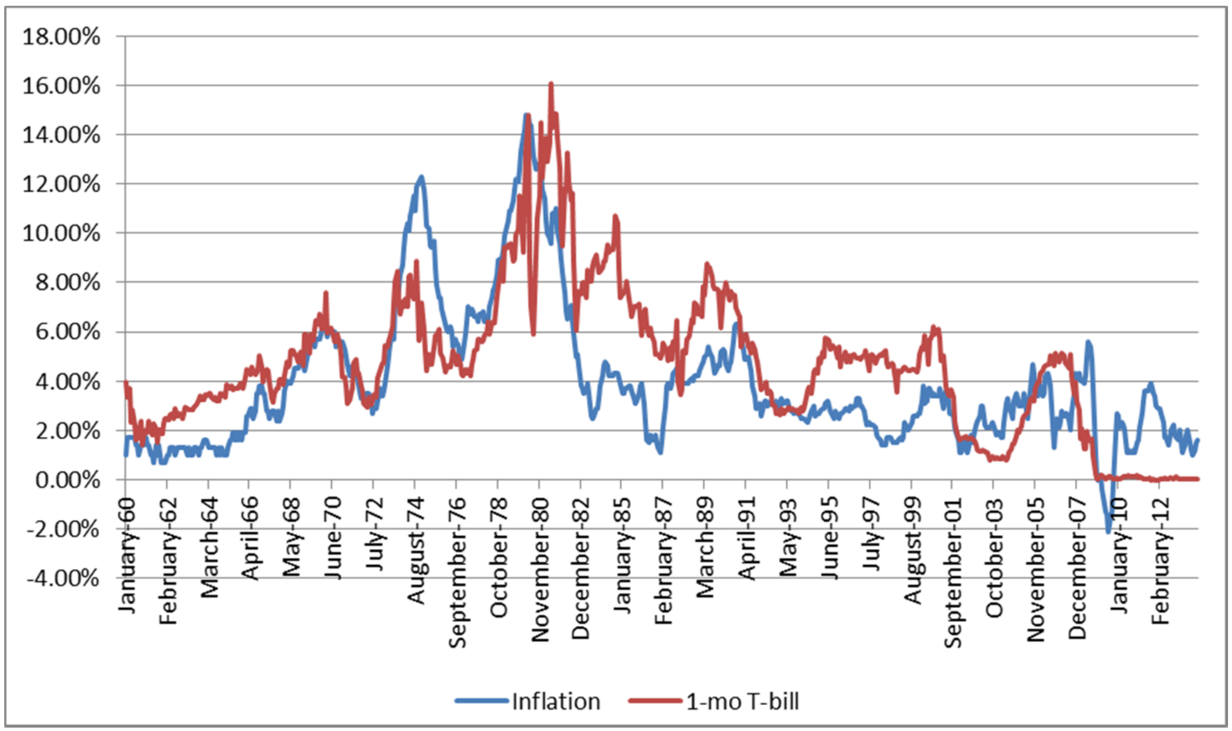
- So the approximation is good when inflation is low______ .

Fisher Equation

Irving Fisher (1930) argues that the nominal rate will equal the real rate plus the *expected inflation rate.*

Although the evidence does not strongly support this, nominal rates do seem to predict inflation about as well as any other method.

- We also do see that observed T-bill rates (which are nominal) tend to very roughly move with inflation (was not so true before the 1950s).



Inflation data from Bureau of Labor Statistics, T-bill rates from U.S. Treasury Department

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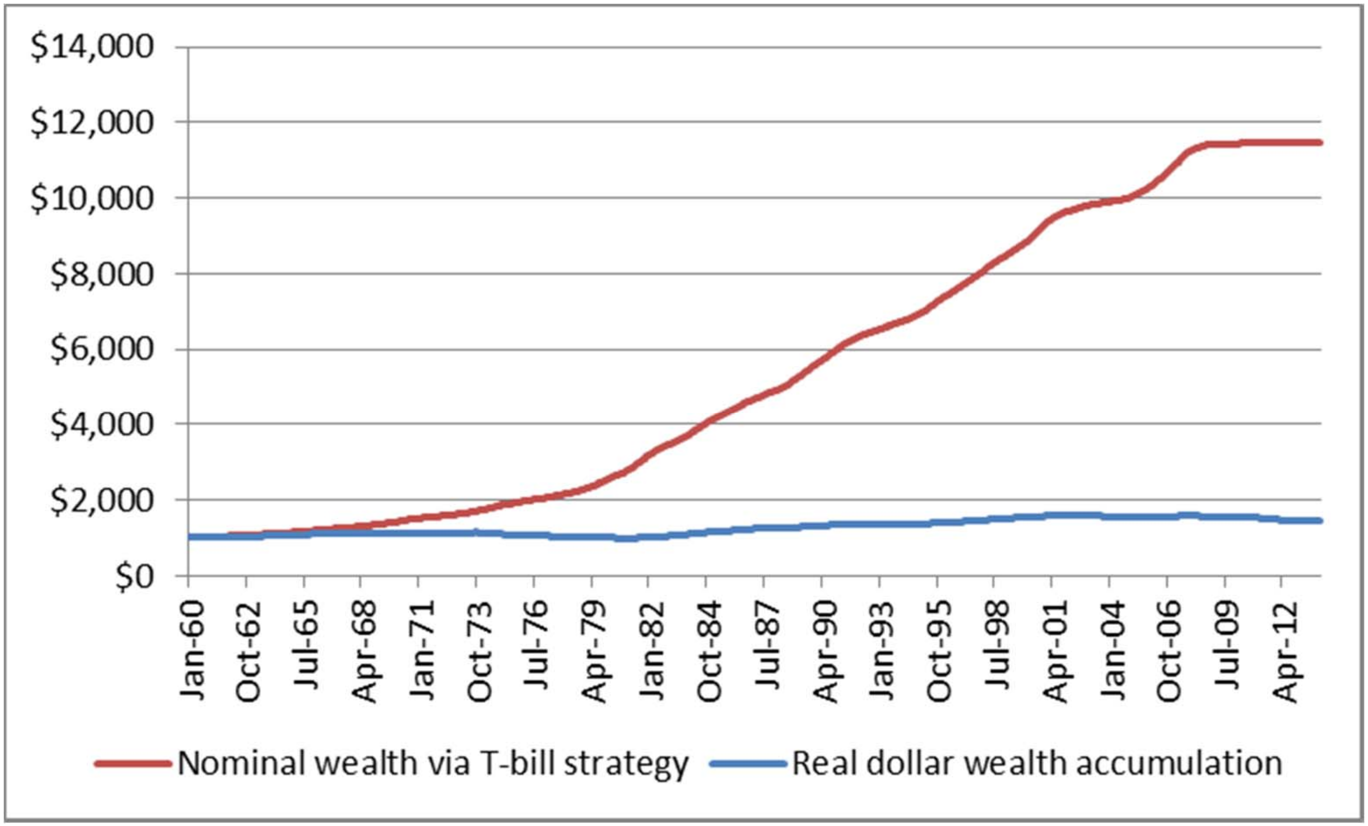
T-Bills

Over time, real and nominal rates differ vastly and you would accumulate little "real" wealth investing in T-bills! Suppose you invested $1000 in 1-month T-bills in the beginning of 1960 (again, this uses data from BLS and US Treasury Department).



So maybe T-bills, short-term CDs, etc., feel" safe, but in terms of **purchasing power** for *long-term* savings, do not expect actual growth!

Benchmark Interest Rates

Common benchmark rates:

Short-term rates on which governmental policies have substantial control or at least influence

- Federal Reserve (the "Fed" which is the central bank of the U.S.) sets the *Federal Funds Target Rate* —overnight borrowing and lending between banks (policy meetings 8 times a year plus it may call meetings outside the normal schedule).
- This rate, in turn, greatly impacts other short-term interest rates such as the *Prime Rate* — the average rate at which banks lend to favored (highly credit-worthy) customers, compiled by the *Wall Street Journal.*
    - Your credit card interest rate or home equity line rate might be tied to this
- *LIBOR – (London InterBank Offered Rate)* – This is similar to the Fed funds rate in spirit, but for maturities up to one year in the London interbank market. This is the worldwide premier reference rate when a short-term floating rate is needed—many Eurodollar contracts and interest rate swaps are tied to the LIBOR (e.g., LIBOR + a spread).

Benchmark Interest Rates

The most common longer-term term benchmark rate in the U.S. is the 10-year maturity Treasury Note rate (the "10 Year Treasury Rate").

- 30-year fixed rate mortgage rates are usually somehow tied to this, for example, because the average *life* of a 30-year mortgage is a little under 10 years.
  - People sell their property and pay off the loan (maybe with a new one), or they may also refinance or pay down the loan early. Relatively few 30-year mortgages actually live out their 30-year life!
- 10 years is a common maturity for corporate bonds (when issued) and their Coupon Rate (which is set when issued) would also be tied to the 10-year rate (plus a risk premium).
  - Why?
  - A: The firm typically wishes to set the coupon rate close to the YTM the market demands, so that the bonds will initially be issued for around par value.

The 30-year Treasury Bond rate is also a common benchmark rate (& 30-year corporate bonds are also common).

Of course, other obvious Treasury rates are also popular benchmarks

- 5-year, 15-year, 20-year, and 25-year

Benchmark Interest Rates

Because the Treasury Department does not issue bonds with more than 30-year maturity, in a wide array of financial situations you are not likely to often see an interest rate longer than 30 years.

- Why? Because people like to have a Treasury rate benchmark!
- The finance industry was not very happy with the U.S. Treasury Department when it stopped issuing 30-year Treasury Bonds in late 2001.
  - It resumed issuing these bonds in August of 2005.

When discussing interest rates you may encounter the terminology "basis point" from time to time.

- A *basis point* or "bp" is 1/100th of one percent
- 1 basis point is 0.0001
- 2.56% = 256 basis points

Benchmark Interest Rates

Treasury rates are very easy to find. Their most common rates are published *daily* by the U.S. Department of Treasury (the graphic that follows shortly is from www.treasury.gov).

The U.S. Treasury *interpolates* to calculate these rates, because they do not literally issue rates of all of these maturities every day.

- They take market prices of treasuries, calculate their implied YTMs using a technique that assumes away their coupons, and then use a cubic spline to interpolate the rates to publish.

Treasury Rates

Daily Treasury Yield Curve Rates

Get updates to this content.

XML These data are also available in XML format by clicking on the XML icon.

XSD The schema for the XML is available in XSD format by clicking on the XSD icon.

If you are having trouble viewing the above XML in your browser, click here.

To access interest rate data in the legacy XML format and the corresponding XSD schema, click here.

Select type of Interest Rate Data

Daily Treasury Yield Curve Rates ▼ Go

Select Time Period

Current Month ▼ Go

Date	1 Mo	3 Mo	6 Mo	1 Yr	2 Yr	3 Yr	5 Yr	7 Yr	10 Yr	20 Yr	30 Yr
09/02/14	0.02	0.03	0.05	0.10	0.53	0.99	1.69	2.11	2.42	2.91	3.17
09/03/14	0.02	0.03	0.05	0.11	0.52	0.99	1.69	2.11	2.41	2.90	3.15

Source: U.S. Treasury Department

The Term Structure of Interest Rates

Suppose you can invest now in a 1-year risk-free security and lock in 0.41%.

- Would you also be willing to invest in a 5-year risk-free security at 0.41% per year?
  - No! For one, you are worried that inflation will increase over time.
  - You also worry about an opportunity cost – you'd lock in at only 0.41% per year. In other words, rates might be (will be?) considerably higher in a few years!
    - Do you really expect that 4 years from today a one-year risk-free bond would only pay 0.41%?
- When very short-term rates are so low, investors will clearly demand higher rates for locking in for longer periods of time.

The Term Structure of Interest Rates

Let's examine some risk-free rate of returns that might be available to investors who purchase zero-coupon US Treasury bonds and hold them to maturity (these are actual rates that were in effect March 16, 2010).

- Maturity = 1 year: $\approx$ 0.41%
- Maturity = 2 years: $\approx$ 0.93%
- Maturity = 5 years: $\approx$ 2.37%
- Maturity = 10 years: $\approx$ 3.66%

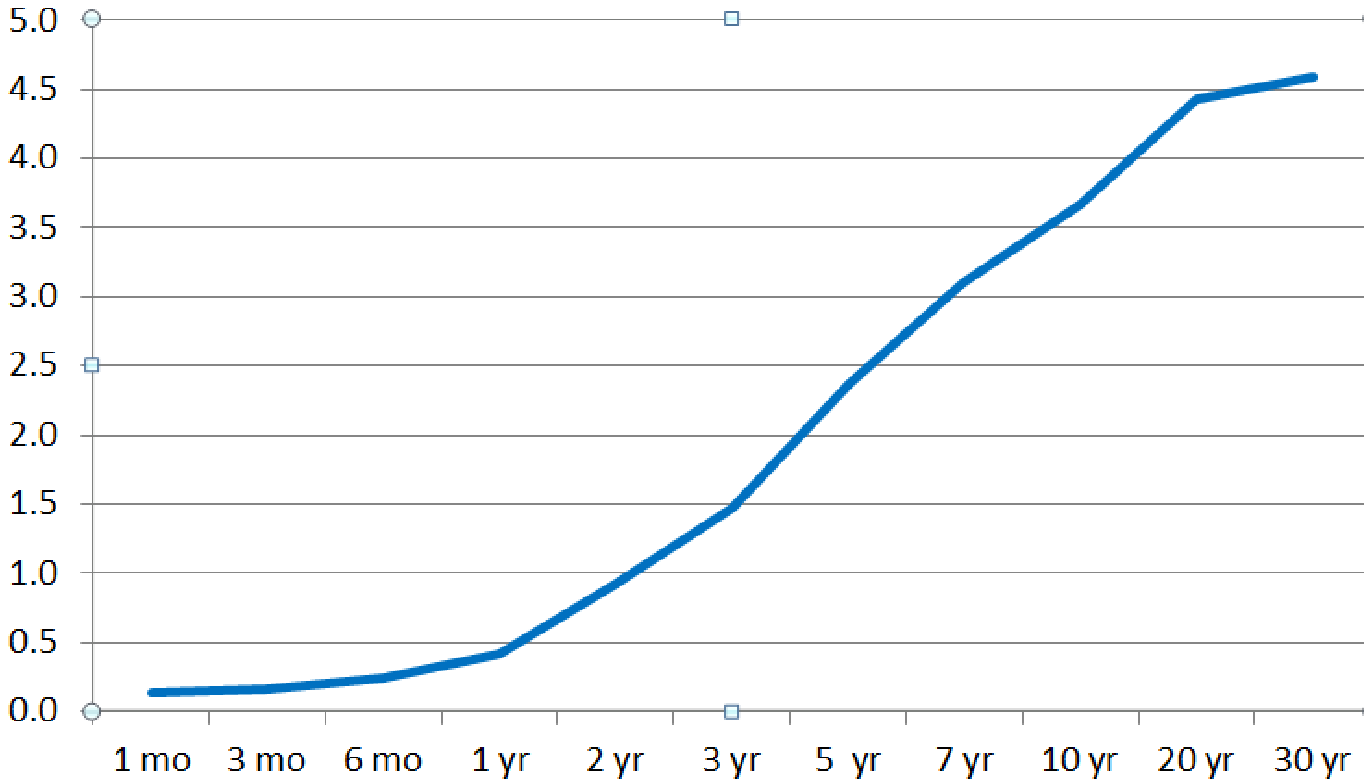
These "spot rates" are determined by market forces -- they are the rates of return investors demand for these various maturities. The Federal Reserve can only *influence* these rates!

The Term Structure of Interest Rates

The *term structure of interest rates* simply refers to the fact that rates of interest vary by the term (or maturity).

We can also see that the term structure can take a variety of shapes.

- For example, on March 16, 2010 the Treasury yield curve looked as follows:



The Term Structure of Interest Rates

Is this concept also important for risky bonds (e.g., corporate bonds & municipal bonds)?

•Yes – critically important!

•Remember that we can view the rate investors demand on a risky bond as simply adding a default risk premium to a risk-free rate.

We can plot yield curves for any type of fixed income securities we like, such as investment-grade corporate bonds, but yield curves for Treasuries are the most popular because Treasury rates are the building-block risk-free rates used for everything else!

Term Structure and Maturity

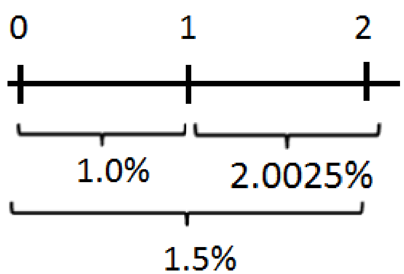
Why do rates differ by their maturity? Why a *term structure* ?

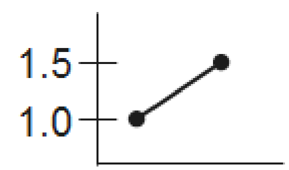
Consider an environment in which shorter-term rates are lower than longer-term rates. Why would this be the case?

- Principally, because investors expect that short-term rates of interest will increase in the future.
  - This can be for multiple reasons, including expectations about future inflation and future monetary policy by the Federal Reserve.

Let's consider a simple example

- A simple version of the term structure called "pure expectations" implies a simple relationship between today's rates of various maturities and future expected rates.
- For example, suppose today the one-year rate is 1.0% and the two-year rate is 1.5%
  - This is an upward sloping yield curve!





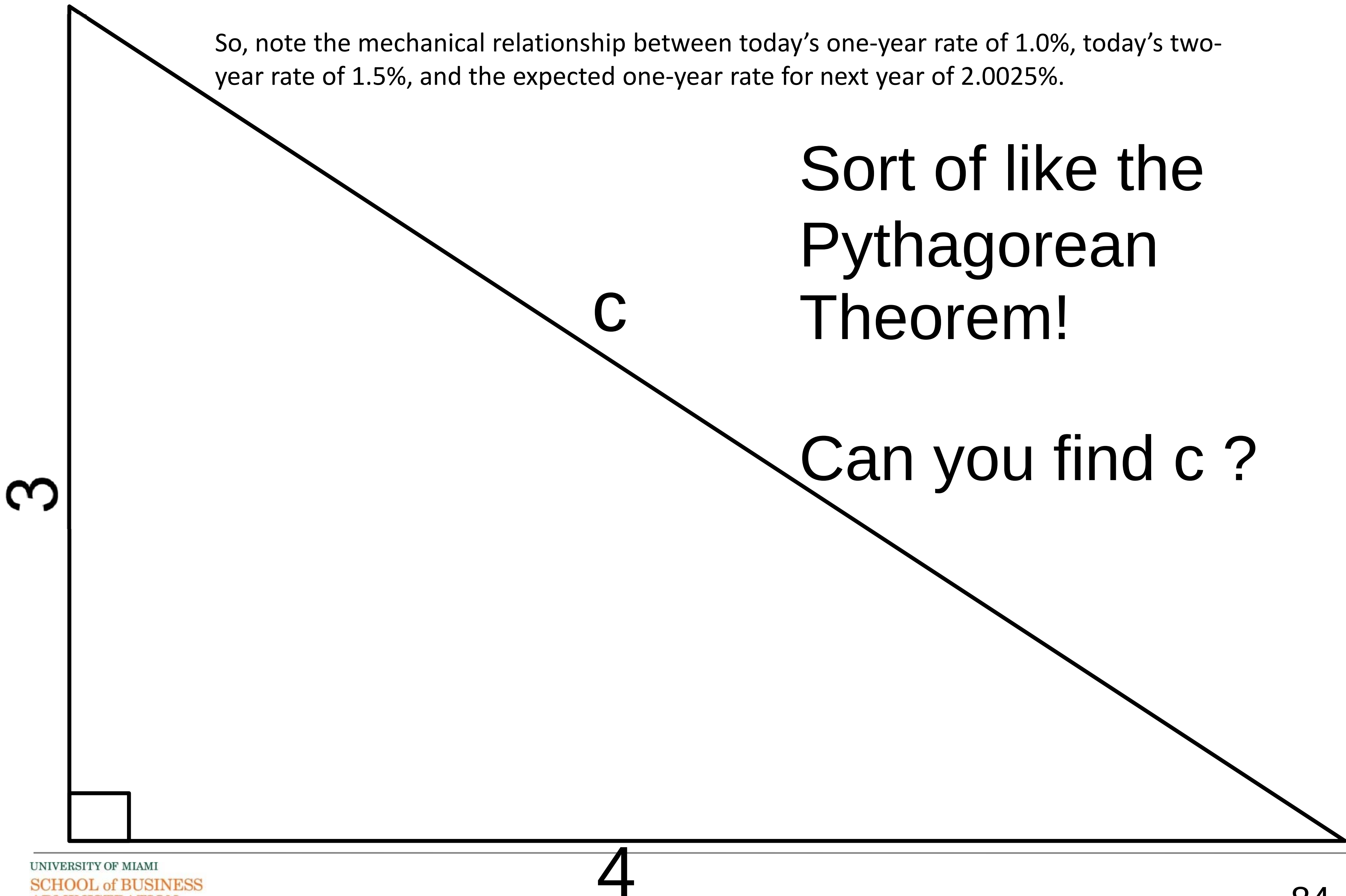
These rates seem to imply the expected one-year rate for next year, E(r) = 2.0025%

WHY? Because note that \$100(1.01)(1.020025) = \$100(1.015)(1.015)

(Investing at today's one-year rate then rolling over into next year's 1-year rate accumulates the same \$ as investing for two years at today's two-year rate!)

The Term Structure of Interest Rates

So, note the mechanical relationship between today's one-year rate of 1.0%, today's two-year rate of 1.5%, and the expected one-year rate for next year of 2.0025%.



Sort of like the Pythagorean Theorem!

Can you find c ?

Reviewing the Main Concept

The intuition we've developed above can be applied to the entire term structure

- When the fixed income markets expect future short-term rates to increase, this influences the yield curve to be *upward sloping*.
- So, when the fixed income markets expect future short-term rates to *decrease*, this influences the yield curve to be *downward sloping.*
- What would lead to a yield curve that is "hump" shaped: ⌢ ?
  - Answer: The market expects rates to increase initially, then later fall.
- We can observe all sorts of interesting shapes in the yield curve

Yield Curve and Macroeconomy

The slope of the yield curve, which embeds expectations about whether rates will rise or fall, is a widely used macroeconomic forecasting tool. Why?

Well, because short-term rates fall dramatically when WHAT is happening with the economy?

- Answer: When we are in a recession or trying to fight against a recession!
- The Federal Reserve slashes the Fed Funds rates to stimulate borrowing and investment, which in turn stimulates the economy.
- The Federal Reserve knows that other interest rates in the economy will be influenced by its actions.
- This is part of MONETARY POLICY!

Pricing a Coupon Bond Using the Term Structure

How can we obtain spot rates (YTMs for zero coupon bonds) from prices? Also, the treasury yield curve is for zero coupon bonds. How do we use it to price a Treasury Bond with coupons and how do we find the coupon bond's YTM?

Suppose you see the following:

Maturity	Price of zero-coupon T-bond	YTM
1 yrs	$980.392	
2 yrs	$953.674	

- Or, FV = 1000, N = 2, PV = -953.674 and solve for the interest rate!
- Now, what is the price of a 5% T-bond paying *annual* coupons with 2 years until maturity? What is its YTM?
- This bond is *essentially two zero coupon bonds*: one with FV=50, one with FV=1050

0	1	2
	50	1050

- We can solve for the price as follows:
- Solve for YTM: N = 2, PMT = 50, FV = 1000, PV = -1050.3776

➔ I = = YTM