

Review of FIN 300 topics (part 1)

FIN 300 – Principles of Finance

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Discussion Topics

- We will spend the time in class today going through key takeaways from the lectures that covered the topics in PowerPoint files 1 - 10.
- We won't have time to go into detail about everything, but our class discussion is intended to help you remember some of the key points from the first half of the semester.
- As part of our discussion, I will highlight the topics from these lectures that might appear on the final exam.

Example review questions related to PowerPoint file 1

1. What are the 4 types of firms we talked about in class?
2. What are some distinguishing characteristics of these types of firms?
3. What should be the overarching goal of a manager's decision making?
4. What is a "fiduciary duty"? Managers have a fiduciary duty to whom?
5. What is the relationship between real and nominal rates?
6. What is the CPI? How is it used to solve for inflation?
7. What types of conditions would lead the Fed to lower or increase interest rates?
8. What is the yield curve? Why do short-term rates change? What information does the shape provide?

Four types of firms

- **Sole Proprietorships**
- **Partnerships**
- **Limited Liability Companies**
- **Corporations**

Table 1.1: Characteristics of the Different Types of Firms

	Number of Owners	Liability for Firm's Debts	Owners Manage the Firm	Ownership Change Dissolves Firm	Taxation
Sole Proprietorship	One	Yes	Yes	Yes	Personal
Partnership	Unlimited	Yes; each partner is liable for the entire amount	Yes	Yes (firm ends with death or withdrawal of any partner*)	Personal
Limited Partnership	At least one general partner (GP), no limit on limited partners (LP)	GP-Yes LP-No	GP-Yes LP-No	GP-Yes LP-No	Personal

Table 1.1 (cont.): Characteristics of Different Types of Firms

	Number of Owners	Liability for Firm's Debts	Owners Manage the Firm	Ownership Change Dissolves Firm	Taxation
Limited Liability Company	Unlimited	No	Yes	No*	Personal
S Corporation	At most 100	No	No (but they legally may)	No	Personal
C Corporation	Unlimited	No	No (but they legally may)	No	Double

*However, most LLCs require the approval of the other members to transfer your ownership.

Information based on IRS data (Figure 1.1) Types of U.S. Firms

	Percent of Businesses	Percent of Revenue
Sole Proprietorships	72.0%	3.6%
Corporations	17.6%	81.6%
LLC	6.8%	8.6%
Partnerships	3.5%	6.2%

Inflation, nominal rates, real rates, CPI

CPI (Consumer Price Index) – Price index based on the price of basket of goods.

“Inflation” is calculated from year-to-year as $\frac{CPI_t - CPI_{t-1}}{CPI_{t-1}}$.

The nominal interest rate is affected by both real and inflation rates each period. The Fisher Equation shows how to relate the different rates.

$$(1 + \text{nominal rate}) = (1 + \text{real rate}) * (1 + \text{inflation rate})$$

CPI level across time.

The 1982-1984 CPI level was set to 100.

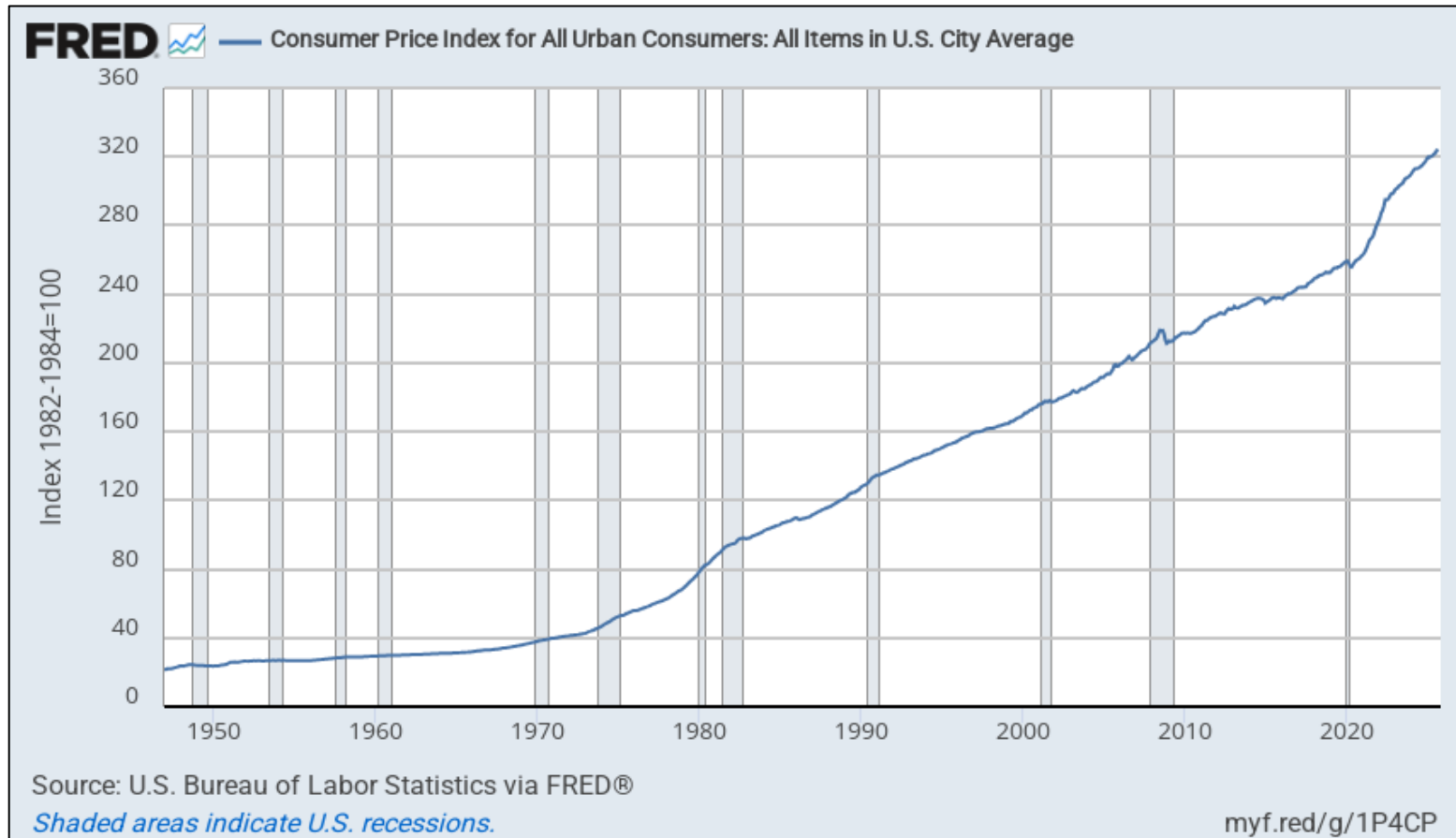
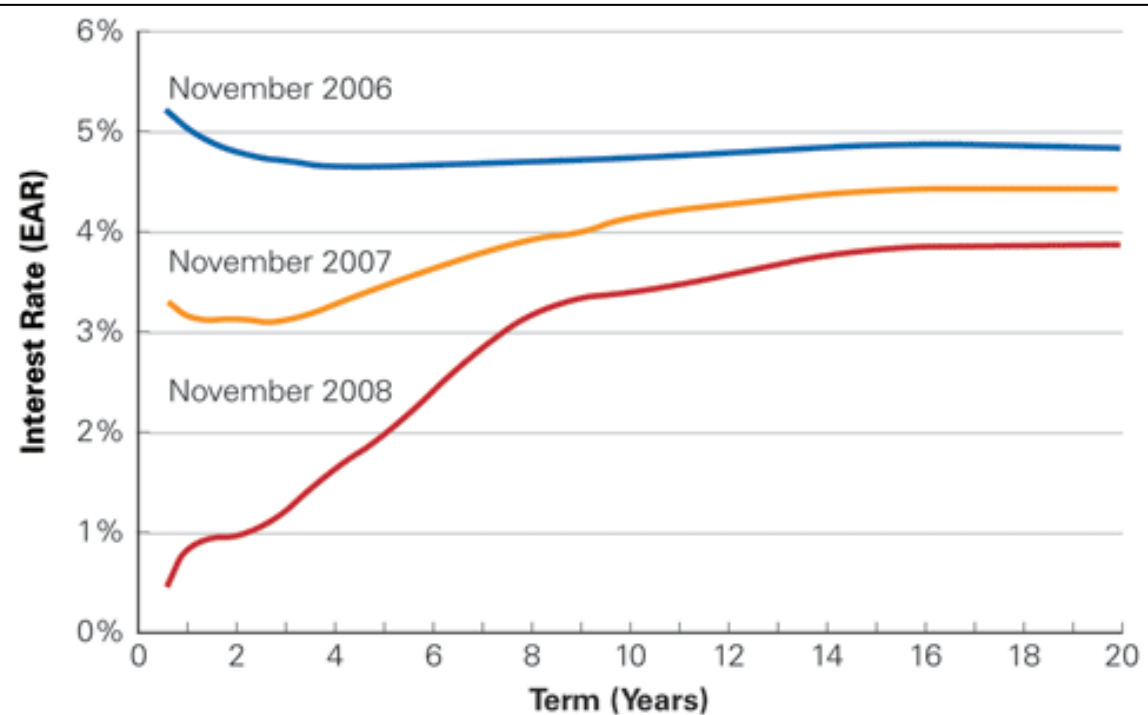


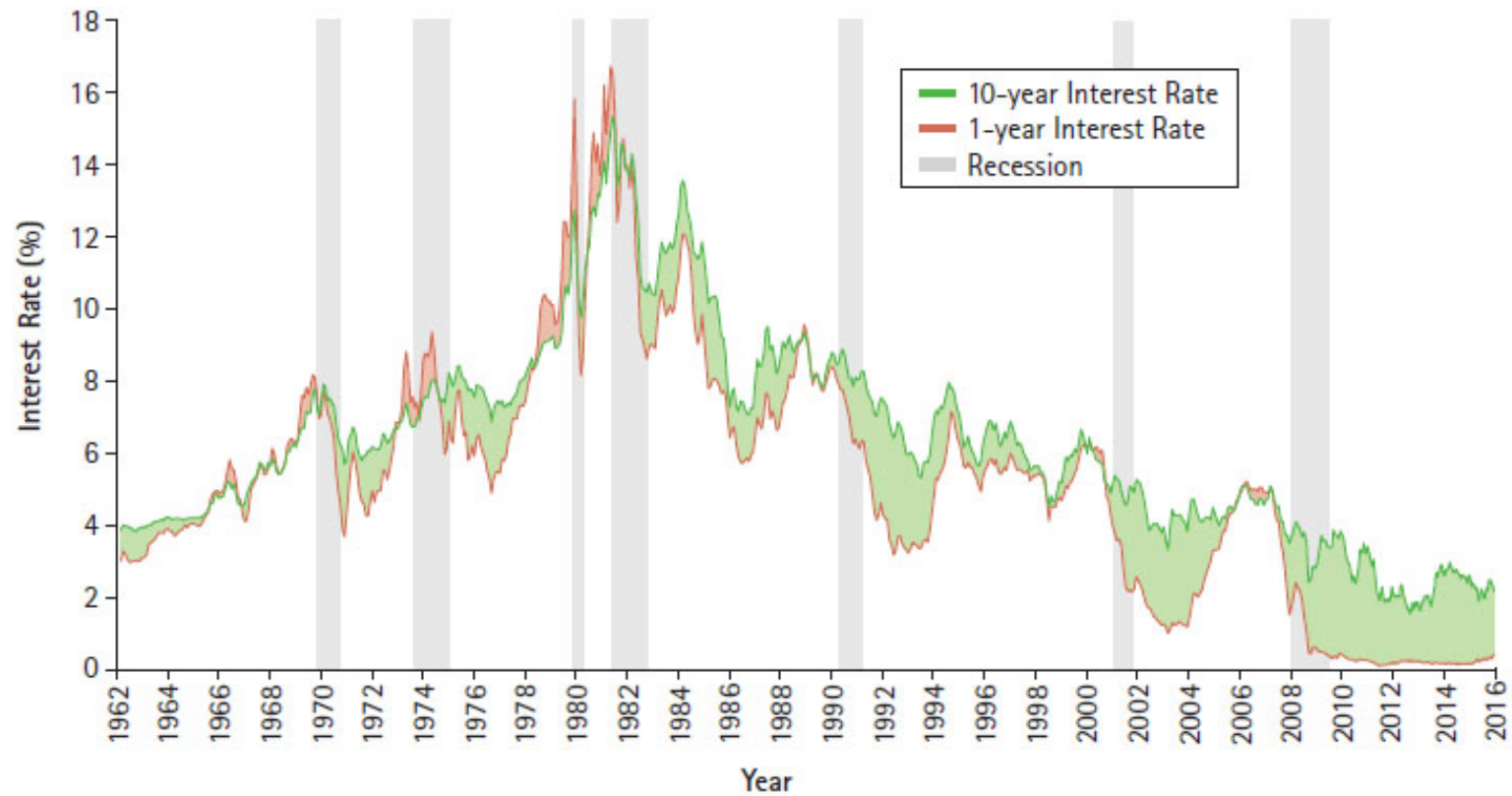
Figure 5.3 Term Structure of Risk-Free U.S. Interest Rates, November 2006, 2007, and 2008

Term (years)	Date		
	Nov-06	Nov-07	Nov-08
0.5	5.23%	3.32%	0.47%
1	4.99%	3.16%	0.91%
2	4.80%	3.16%	0.98%
3	4.72%	3.12%	1.26%
4	4.63%	3.34%	1.69%
5	4.64%	3.48%	2.01%
6	4.65%	3.63%	2.49%
7	4.66%	3.79%	2.90%
8	4.69%	3.96%	3.21%
9	4.70%	4.00%	3.38%
10	4.73%	4.18%	3.41%
15	4.89%	4.44%	3.86%
20	4.87%	4.45%	3.87%



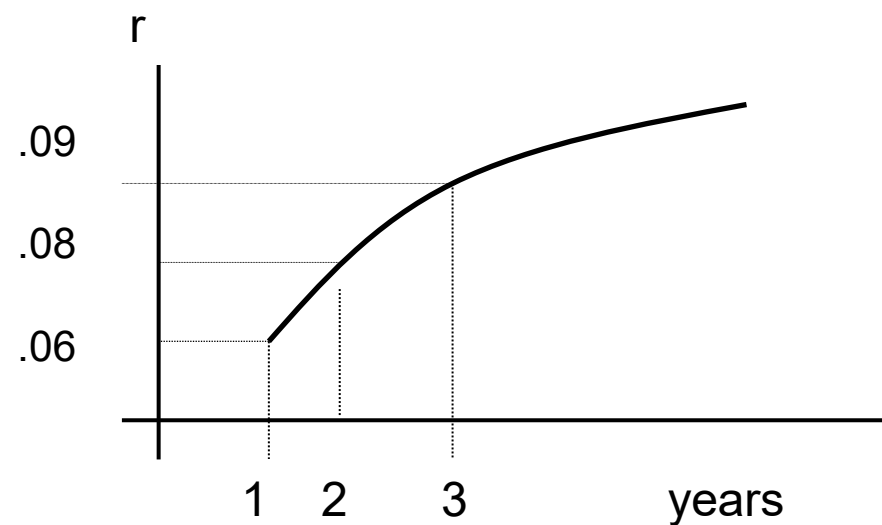
(Data from U.S. Treasury securities.)

Figure 5.5 Short- versus Long-Term U.S. Interest Rates and Recessions



Term structure of interest rates (or yield curve)

- The **term structure** is the set of interest rates for various maturities for a particular risk class of bonds.
- Example **yield curve**



Example review questions related to PowerPoint file 2

1. What is the difference between simple and compound interest?
2. What TVM formulas move single cash flows through time?
3. How do the above formulas change to accommodate interest that is assessed monthly?
4. Can you calculate the present value and/or future value of a cash flow?

TVM terminology (single cash flows)

“interest factor”

$$PV \cdot (1 + r)^n = FV$$

PV → current dollars can be invested and grow through time → FV

$$PV = FV \left(\frac{1}{(1 + r)^n} \right)$$

PV ← Future dollars are discounted given time value of money ← FV

“discount factor”

These formulas move a single cash flow through time.

PV = present value

FV = future value

r = annual interest rate

n = number of years

m = number of compounding intervals per year

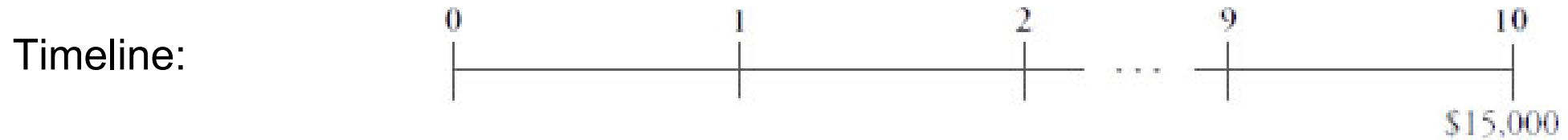
r/m = interest rate per compounding interval

If we assume $m = 1$ (annual compounding) then the formulas can be simplified as shown:

$$FV = PV \left(1 + \frac{r}{m}\right)^{m*n} = PV(1 + r)^n$$

$$PV = \frac{FV}{\left(1 + \frac{r}{m}\right)^{m*n}} = \frac{FV}{(1 + r)^n}$$

Example: You are considering investing in a savings bond that will pay \$15,000 in 10 years. If the interest rate is 6% per year, what is the bond worth today?



The correct formula: $PV = \frac{FV}{(1+r)^n} = \frac{15,000}{(1.06)^{10}} = \$8,375.92$

Calculator:

	N	I/Y	PV	PMT	FV
Given:	10	6		0	15,000
Solve for:			-8,375.92		

Excel Formula:

= PV(RATE,NPER, PMT, FV) = PV(0.06,10, 0,15000)

Example review questions related to PowerPoint file 3

1. What is the difference between an annuity, annuity due, and a perpetuity?
2. Which TVM formulas move streams of cash flows through time?
3. Can you calculate the present value and/or the future value of a stream of cash flows?

Terminology for streams of payments

Annuity – a series of identical fixed payments to be made for a specified number of years.

Perpetuity – a series of identical fixed payments to be made forever.

“Growing annuities” and “growing perpetuities” reflect streams of payments where each successive payment is a certain percentage higher than the prior payment.

TVM formulas for annuities and perpetuities

$$PV \text{ of annuity} = CF \left[\frac{1}{\frac{r}{m}} - \frac{1}{\left(\frac{r}{m}\right)\left(1+\frac{r}{m}\right)^{nm}} \right]$$

if there is annual compounding ($m=1$) then this formula simplifies to the following: $PV \text{ of annuity} = CF \left[\frac{1}{r} - \frac{1}{(r)(1+r)^n} \right]$

$$PV \text{ of perpetuity} = \frac{CF}{r}$$

$$PV \text{ of a growing perpetuity} = \frac{CF_1}{r-g}$$

In Excel: =FV(rate,nper,pmt) =FV(0.05,40,1000)

Future value of an annuity

Suppose you invest \$1,000 a year for the next 40 years at 5%. The first payment will be made in one year. How much will you have in your investment fund at the end of 40 years?

0	1	2	...	39	40
\$ 0	\$1,000	\$1,000	...	\$1,000	\$1,000

Suggested approach:

1. Use the PV of an annuity formula to calculate the PV of these CFs.
2. Then multiply by a 40-year interest factor

$$FV = 1000 \left[\frac{1}{r} - \frac{1}{r(1+r)^{40}} \right] * (1+r)^{40} = \$120,799.77$$

Example review questions related to PowerPoint file 4

1. How are APRs and EARs similar? How are they different?
2. How do you convert an APR to and EAR?

Two common ways to annualize returns: APRs and EARs

- Returns are quoted in a variety of ways. Annual percentage rates (**APRs**) ignore compounding and effective annual rates (**EARs**) include compounding.
- EARs represent actual growth rates while APRs do not. When a return is an actual growth rate, we call it an “**effective**” return. EARs are sometimes referred to as APYs.

Important intuition: An account that says pays a 10% APR will not actually grow your deposit by 10% over a year if there is compounding during that year.

Calculating EARs from APRs

Assume that you want to convert an APR to an EAR. Given an APR you would first divide by m to find the effective rate for a single compounding interval and then compound out this rate out across a 12-month period.

$$(1 + EAR) = \left(1 + \frac{APR}{m} \right)^m$$

$$EAR = \left(1 + \frac{APR}{m} \right)^m - 1$$

Example review questions related to PowerPoint file 5

1. Bond price as a DCF equation
2. Bond terminology: coupon payments, face value, coupon rates, yield to maturity, flat price, accrued interest
3. Bond ratings

The price of a bond can be modeled as a TVM/DCF problem.

The price of a bond is the present value of its cash flows. The interim payments are called **coupons**. The final payment is larger than the earlier cash flows and equals a coupon payment plus the **face value**.

$$\text{Bond Price} = PV = \frac{\text{Coupon}_1}{(1+r)^1} + \frac{\text{Coupon}_2}{(1+r)^2} + \dots + \frac{\text{Coupon}_n + \text{Face Value}_n}{(1+r)^n}$$

The discount rate that equates the bond price with the present value of the cash flows is the yield to maturity.

Coupon Payment Calculation

$$PMT = \frac{\textit{Coupon Rate}}{m} * \textit{Face Value}$$

where “m” represents the number of coupons paid each year.

Table 6.6 from the textbook
Bond Ratings and the Number of U.S. Public Firms with
Those Ratings in March 2016 --“Investment grade” bonds

Moody's	Standard & Poor's	Number of Public Firms	Description (Moody's)
Investment Grade Debt			
Aaa	AAA	3*	Judged to be of the best quality. They carry the smallest degree of investment risk and are generally referred to as “gilt edged.”
Aa	AA	29	Judged to be of high quality by all standards. Together with the Aaa group, they constitute what are generally known as high-grade bonds.
A	A	221	Possess many favorable investment attributes and are considered as upper-medium-grade obligations. Factors giving security to principal and interest are considered adequate at present, but may not remain that way.
Baa	BBB	515	Are considered as medium-grade obligations (i.e., they are neither highly protected nor poorly secured).



Table 6.6 from the textbook continued

“speculative”, “high-yield”, “junk” bonds

Moody's	Standard & Poor's	Number of Public Firms	Description (Moody's)
Ba	BB	363	Judged to have speculative elements; their future cannot be considered as well assured.
B	B	255	Generally lack characteristics of the desirable investment. Assurance of interest and principal payments over any long period may be small.
Caa	CCC	41	Are of poor standing. Such issues may be in default or there may be present elements of danger with respect to principal or interest.
Ca	CC	5	Are speculative to a high degree. Such issues are often in default or have other marked shortcomings.
C	C, D	10	Lowest-rated class of bonds, and issues so rated can be regarded as having extremely poor prospects of ever attaining any real investment standing.

Example review questions related to PowerPoint files 7, 8, and 9

1. Common decision tools used in making capital budgeting decisions: NPV, IRR, Payback
2. Which cash flows go into the calculations? How do you solve for FCFs using accounting numbers?
3. Which financial statements are useful in thinking about FCFs? Which financial ratios help you understand the financial situation at a firm?

Table 8.5 Summary of Decision Rules NPV

NPV	
Definition	<ul style="list-style-type: none">• The difference between the present value of an investment's benefits and the present value of its costs
Rule	<ul style="list-style-type: none">• Take any investment opportunity where the NPV is positive; turn down any opportunity where it is negative
Advantages	<ul style="list-style-type: none">• Corresponds directly to the impact of the project on the firm's value• Direct application of the Valuation Principle
Disadvantages	<ul style="list-style-type: none">• Relies on an accurate estimate of the discount rate• Can be time-consuming to compute

Table 8.5 Summary of Decision Rules IRR

IRR	
Definition	<ul style="list-style-type: none">• The interest rate that sets the net present value of the cash flows equal to zero; the average return of the investment
Rule	<ul style="list-style-type: none">• Take any investment opportunity where its IRR exceeds the opportunity cost of capital; turn down any opportunity where its IRR is less than the opportunity cost of capital
Advantages	<ul style="list-style-type: none">• Related to the NPV rule and usually yields the same (correct) decision
Disadvantages	<ul style="list-style-type: none">• Hard to compute• Multiple IRRs lead to ambiguity• Cannot be used to choose among projects• Can be misleading if inflows come before outflows

NPV and firm value

Firm value can be thought of as the present value of all future FCFs .

$$\text{Value of Firm} = \sum_{t=1}^{\infty} \frac{FCF_t}{(1+r)^t}$$

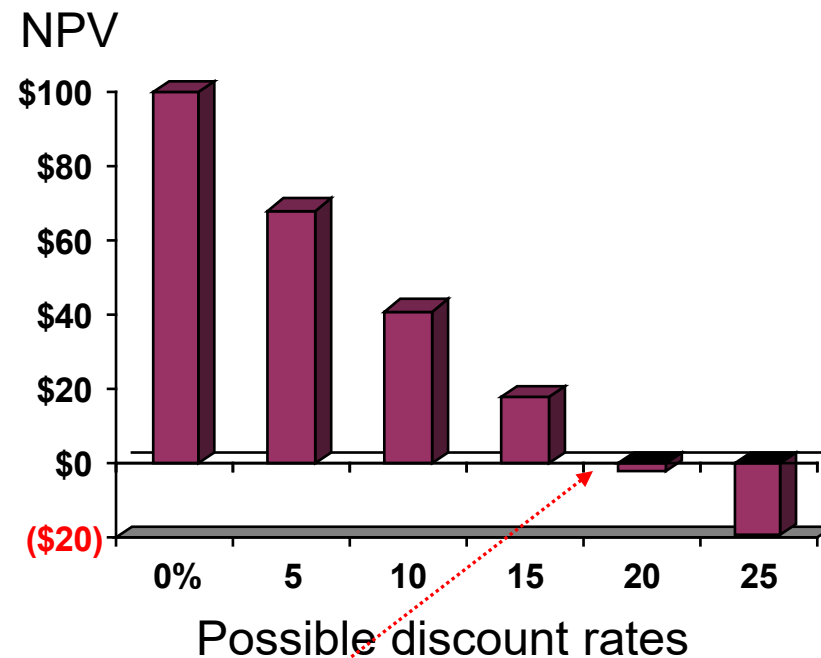
The NPV of a project is...

- (1) the change in firm value if the project is taken.
- (2) the present value of all cash flows incremental to the project.

$$\Delta(\text{Value of Firm}) = NPV = \sum_{t=1}^{\infty} \frac{\Delta FCF_t}{(1+r)^t}$$

Example net present value profile of an investment

r	NPV
0%	\$100
5	68
10	41
15	18
20	-2
25	-19



Remember, IRR is the rate at which the present value of the discounted cash flows equals 0. In this example IRR= .1944 (19.44%)

IRR

The **Internal Rate of Return** is the discount rate that implies a zero net present value for a series of cash flows. It is “internal” because it only depends on the cash flows and not outside market rates.

$$NPV = 0 = CF_0 + \frac{CF_1}{(1 + IRR)^1} + \frac{CF_2}{(1 + IRR)^2} + \dots + \frac{CF_t}{(1 + IRR)^t}$$

Table 8.5 Summary of Decision Rules Payback Period

Payback Period	
Definition	<ul style="list-style-type: none">• The amount of time it takes to pay back the initial investment
Rule	<ul style="list-style-type: none">• Accept the project if the payback period is less than a prespecified length of time—usually a few years; otherwise, turn it down
Advantages	<ul style="list-style-type: none">• Simple to compute• Favors liquidity
Disadvantages	<ul style="list-style-type: none">• No guidance as to correct payback cutoff• Ignores cash flows after the cutoff completely• Not necessarily consistent with maximizing shareholder wealth

Calculating FCFs

To find FCFs you need to adjust accounting numbers each year to get actual cash flows (FCFs) ...

$$\text{FCF} = \text{EBIT}(1-t) + \text{Depreciation \& Amortization} \\ - \text{Change in Net Working Capital} - \text{Capital Expenditure}$$

Intuition for FCFs --- Example income statement

		\$ millions
	Net sales	\$78,812
	Cost of goods sold	51,422
	Selling, general, and administrative expenses	16,585
	Depreciation	<u>1,627</u>
Not a cash outflow	Earnings before interest and income taxes (EBIT)	\$ 9,178
	Interest expense	<u>711</u>
	Taxable income	\$ 8,467
	Taxes	<u>3,082</u>
	Net income	\$ 5,385
	Allocation of net income	
	Dividends	\$ 2,243
	Addition to retained earnings	3,142

Net Income does not reflect the actual cash available each

period for several reasons: (1) **depreciation** was subtracted to get NI but depreciation is not an actual cash outflow, (2) **capital expenditures** and **investments in WC** are actual cash flows but are not included in the NI calculations

Incremental cash flows

$$\text{incremental cash flow} = \text{cash flow with project} - \text{cash flow without project}$$

Sunk costs are not incremental to a project – they do not belong in NPV calculations.

Profitability ratios

Ratio	Formula	Intuition
Gross Margin	$\frac{\text{Gross Profit}}{\text{Sales}}$	What percent of each dollar in sales becomes gross profit?
Operating Margin	$\frac{\text{Operating Income}}{\text{Sales}}$	What percent of each dollar in sales becomes operating profit?
Net Profit Margin	$\frac{\text{Net Income}}{\text{Sales}}$	What percent of each dollar in sales becomes net income?

Important Intuition: Higher margins mean higher profitability. Looking at the same firm's margins over time helps you see if the firm is becoming more or less profitable.

Liquidity ratios

Ratio	Formula	Intuition
Current Ratio	$\frac{\text{Current Assets}}{\text{Current Liabilities}}$	Can the firm pay all its current liabilities assuming all “current assets” can be converted to cash? (> 1 or 1.2)
Quick Ratio	$\frac{\text{Current Assets} - \text{Inventory}}{\text{Current Liabilities}}$	Can the firm pay all its current liabilities assuming all “current assets” (excluding inventory) can be converted to cash?
Cash Ratio	$\frac{\text{Cash}}{\text{Current Liabilities}}$	Can the firm pay all its current liabilities with just its cash?

Important Intuition: Low liquidity ratios can be an indication of possible near-term cash problems. Different types of firms tend to have higher (lower) liquidity ratios.

Efficiency and Working Capital Ratios

Ratio	Formula	Intuition
Accounts receivable days	$\frac{\text{Accounts Receivable}}{\text{Average Daily Sales}}$	How long are customer invoices outstanding before being collected?
Asset Turnover	$\frac{\text{Sales}}{\text{Assets}}$	How efficiently is the firm turning dollars of assets into sales?

Important Intuition: An accounts receivable days number of 8 would mean that on average the firm took 8 days to collect payment on customer purchases.

An asset turnover ratio of 6 tells you that each dollar of assets was converted into 6 dollars of sale.

Example review questions related to PowerPoint file 10

1. What is the difference between the primary and secondary markets?
2. What is an IPO? SEO?
3. What function do investment banks fulfill when issuing new securities?
4. What is the purpose of an IPO roadshow? How are IPO valuations done?



IPOs and SEOs (common stock)

New issues of common stock are classified as either

- initial public offerings (**IPOs**)
- Seasoned or secondary equity offerings (**SEOs**)

Taking your firm public: The IPO valuation

How much is a private firm worth? Interested investors might know annual revenue and earnings numbers but lack a total market valuation.

Underwriters work with the company to come up with a price range.

- Estimate the future cash flows and compute the present value (**DCF approach**)
- Use **market multiples** approach (this is where you look at how the market values other firms in the same industry and apply the same valuation to a private firm.)
- **Road Show (red herring → prospectus)**
- **Book Building**

Thank You



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