* Inventory is a component of current assets.
* Net working capital = Current Liabilities - Current Assets
* Net capital spending = net change in fixed assets
* Cashflow to stockholders = cash dividends + equity repurchases - new equity sold
* Sale of equity is NOT a use of NWC
* In terms of balance sheet model, firms value in financial markets = value of debt + value of equity
* Interest expense on funds borrowed to finance a project are not relevent to cash flow

Agency Costs:
* Include managerial perquisite consumption (cars, etc.), monitoring costs of shareholders, takeover defense fees
* Can not be reduced through antitakeover measures

Interest:

Compounding	stated vs. effective
1x year	=
>1x year	<

Total Cash Flow To Firm:
* Includes operating cash flow, additions to net working capital, capital spending
* Does not include cash dividends.

Capital Budget & Costs:
* Sunk - already occured. ignore it. It's gone.
* Opportunity - could be used elsewhere
* Erosion - side effect, cannibalism from other products/projects
* Change in fixed, variable costs & change in depreciation & overhead expense are all relavent in evaluation of new projects.
* Accounting earnings are not emphasised b/c do not consider risk or timing, do not measure all cashflows & they represent managers choice of allocation rules.

Sole Prop:
* Cheapest business, no charter, few gov't regulations
* No corporate income tax. Profits taxed as individual
* Unlimited liability
* Life of business = life of owner
* Equity limited to personal wealth

Partnership:
* General partners have unlimited liability
* Limited partners may sell out, general partnerships difficult to sell.
* Difficult to raise cash
* Profits taxed as individual income
* Mgmt. control resides with general partners

Corporation:
* Ownership readily transferred.
* Unlimited life
* Distinct legal entity
* Limited liability

Continuous Compounding:
C_0 = Initial Value
r = rate (annual) $C_0 \times e^{rT}$
T = years

Present Value using effective I:
P = Payment (21000)
r = rate (effective) (4%) $\frac{P}{r^T} = 18669$
T = years (3)

Bonds:
* Yield to maturity = market rate
* Coupon rate = bond rate
* if YTM < CR, bond sells at premium
* increases to YTM decrease premium
* Zero coupon bonds always sell at discount, have maturity, face value.
* Market price **shorter** maturity bonds fluctuates **less** compared with **longer** maturity bonds with change in I
* Pure discount bond = zero coupon bond. Pays no interest (coupon)
* Console pays interest in perpetuity
* Bond issued at par value: if market rate goes up, price of bond par value goes down.

Consol (perpetuity) value:
p = Interest payment $\frac{p}{r}$
r = rate (annual)

Zero Coupon/pure discount Bonds:
PV = Present Value
r = rate (annual) $PV = \frac{F}{(1+r)^T}$
T = years
F = Face Value

Level-Coupon Bonds:
PV = Present Value
r = rate (annual) $PV = C \times A^T_r + \frac{F}{(1+r)^T}$
T = # of payments
C = coupon payment
F = face value $A^T_r = \frac{1}{r} - \frac{1}{r \times (1+r)^T}$
A^T_r = See A^T_r

Total Annual return 1926 - 1999	mean	st. dev
common stock	13.3	20.1
small co. stock	17.6	33.6
long-term corp. bonds	5.9	8.7
long term gov't bonds	5.5	9.3
int'mdt gov't bonds	5.4	5.8
US T-Bills	3.8	3.2
Inflation	3.2	4.5
S&P		20%

P/E Ratio:
* Positively related to growth
* Negatively related to the discount rate
* Negatively related to stock risk

P/E Ratio:
PPS = Price Per Share
EPS = Earnings Per Share
r = rate
NPVGO = NPV Growth Opportunities
P = price of stock

$\frac{PPS}{EPS} = \frac{1}{r} + \frac{NPVGO}{EPS}$ $P = \frac{EPS}{(r-g)}$

$PPS = \frac{EPS}{r} + NPVGO$

Risk & Returns & Portfolios:
* Once a portfolio is diversified, risk remaining is: risk related to market portfolio, systemic risk, variance and **negligable unsystemic risk**.
* When stocks with same return are combined in a portfolio, the expected return of the portfolio is = avg. return of stocks.
* For a highly diversified **equally weighted** port. Variance of port. = average COV.
* Total # of varances and COV in a port. is N^2. # of COV = N^2 - N
* Risk premium = return - inflation.
* Total risk is measured by variance or st. dev. of return
* COV measured interrelationship between 2 securities in terms of both size and direction of return movements.
* as # of stocks increase, portfolio variance decreases.
* Portfolio variance depends more on avg. cov.
* Total risk = market risk - unsystemic risk

NPV Analysis:
* NPV = present value of future cash flows - initial costs
* Sensitivity & scenario analysis aid by: changing underlying assumptions on which decision is based, highlight areas of low data & provide picture of how an event can effect calculations.
* If NPV>0, invest. If NPV<0, reject
* Internal Rate of Return = discount rate that makes NPV cash flow = 0. IRR > discount rate, go. IRR <discount rate, reject
* Inflation is treated properly in NPV analysis by discounting nominal cash flows by a nominal rate & discounting real cash flows by a real rate.
* Real rate = Nominal rate - Inflation
* Shareholders depend on mgrs. to maximize value by following the NPV rule to choose investments
* A mutually exclusive project is one whose acceptance/rejection effects other projects.
* Total cash flow = cash flow - capital spending - NWC increases.
* Shortcomings of using accounting rate of return (ARR) are: use of net income instead of cash flows, pattern of income flows has no impact on ARR and there is no clear cut decision rule.
* Cash flows recognize the risk of and when cash flows occur.

Capital Budgeting I:

Smiley Inc. is considering an investment in leadership training courses. Financial projections for the investment are tabulated below. Cash flows are in thousands of dollars and the corporate tax rate is 40%. You may assume that the project will be shut down at the end of year four. The appropriate discount rate for the project is 12%. The projected market value of the $10,000 initial investment in fixed assets is $4,000 at the end of year four. Assume that initial working capital is deployed at the beginning of the first year and is recaptured at the end of year 4.

Description	Y0	Y1	Y2	Y3	Y4
Sales Revenue		8,000	8,000	8,000	8,000
Operating Costs		3,000	3,000	3,000	3,000
Investment in Fixed Assets	10,000				
Depreciation on Fixed Assets		2,000	2,000	2,000	2,000
Book Value of Fixed Assets	10,000	8,000	6,000	4,000	2,000
Net Working Capital (end of year balance)	200	200	200	200	0

Description	Y0	Y1	Y2	Y3	Y4
Cap. Inv.	-10,000				+4,000
Taxes					-800*
Working cap.	-200				+200
Sales		8,000	8,000	8,000	8,000
Op. Costs		-3,000	-3,000	-3,000	-3,000
Dep.		-2,000	-2,000	-2,000	-2,000
Engs b4 tax		3,000	3,000	3,000	3,000
Tax		1,200	1,200	1,200	1,200
Engs aftr tax		1,800	1,800	1,800	1,800
Add bck dep		2,000	2,000	2,000	2,000
Op. Cash Flow		3,800	3,800	3,800	3,800
Total cash flow	-10,200	3,800	3,800	3,800	7,200
Disc. factor (12%)	1.00	0.893	0.797	0.712	0.636
Present Value	-10,200	3,393	3,029	2,706	4,579

NPV = 3,507
* (4,000 - 2,000)*40%

Future Value of an Investment:
FV = Future Value
C_0 = Cash to be invesed at date 0
r = rate
T = # of periods $FV = C_0 \times (1+r)^T$

Future Value of an Investment (example):
$500 into savings account. 7%, compounded annually. How much at end of 3 years?
$FV = C_0 \times (1+r)^T$ $612.52 = \$500 \times (1+0.07)^3$

Present Value of an Investment:
PV = Present Value
C_T = Cash flow at date T
r = rate
T = # of periods $PV = \frac{C_T}{(1+r)^T}$

Present Value of an Investment (example):
$10,000 will be received in 3 years. Discount rate = 8%. What is the present value of the future cash flow?
$PV = \frac{C_T}{(1+r)^T}$ $\$7938 = \frac{10,000}{(1+0.08)^3}$

Compounding:
EOYW = End of Year Wealth
C_0 = Cash to be invesed at date 0
r = rate **$EOYW = C_0 \times (1+r/m)^m$**
m = # of periods

Compunding (example):
rate = 24%, compounded monthly on $1
$EOYW = C_0 \times (1+r/m)^m$
$\$1.2682 = \$1 \times (1+0.24/12)^{12}$

Effective Annual Interest Rate:
r = rate
m = # of periods/year
$EAIR = (1+r/m)^m - 1$

Effective Annual Interest Rate (example):
Stated rate = 8% & compounded quarterly. What is EAIR?
$8.24\% = (1+0.08/4)^4 - 1$

Compounding over many years:
FV = Future Value
C_0 = Cash invested at date 0
r = rate
m = # of periods/year
T = # of years $FV = C_0(1+r/m)^{mT}$

Compounding over many years (example):
$5,000 invested at stated r of 12%/year, compounded quarterly for 5 years. What is FV?
$\$9030.50 = \$5000(1+0.12/4)^{4(5)}$

PV of Growing Perpetuity:
C = Cash invested at date 0
r = rate
g = % growth $PV = C/(r - g)$

PV of Growing Perpetuity (example):
Co. just about to pay dividend of $3/share. Annual dividend will rise by 6%/year. Interest rate is 11%. What is price of stock today?
$\$66.60 = \$3.00 + \frac{(3 \times 1.06)}{(0.11 - 0.06)}$

PV of Annuity:
C = Cash invested at date 0
r = rate
T = periods (usually years)
$A^T_r \quad C\left[\frac{1}{r} - \frac{1}{r(1+r)^T}\right]$

FV of Annuity:
C = Cash invested at date 0
r = rate
T = periods (usually years)
$FV = C\left[\frac{(1+r)^T}{r} - \frac{1}{r}\right]$

PV of Growing Annuity:
C = Cash invested at date 0
r = rate
g = % growth
T = periods (usually years)
$PV = C\left[\frac{1}{r-g} - \frac{1}{r-g} \times \frac{(1+g)^T}{(1+r)^T}\right]$

Capital Budgeting II:

You have been asked by the president of your company to evaluate the proposed acquisition of a new spectrometer for the firm's R&D department. Should you buy the spectrometer?
* The equipment's base price is $80,000.
* The equipment will be depreciated using straight-line depreciation over the next 4 years
* At the end of three years, you plan to sell the equipment and believe you can get $30,000 for the equipment.
* Use of the equipment will require spare parts inventory of $4,000, which must be purchased immediately.
* The spectrometer would have no effect on revenues, but will save the firm $25,000 of operating costs (mainly labor) in each of the next three years.
* The firm's marginal tax rate is 40% and the project's cost of capital is 10%.

Description	Y0	Y1	Y2	Y3
Cap. Inv.	-80,000			+26,000*
Taxes				
Working cap.	-4,000			+4,000
Op. Costs		25,000	25,000	25,000
Dep.		-20,000	-20,000	-20,000
Engs b4 tax		5,000	5,000	5,000
Tax		2,000	2,000	2,000
Engs aftr tax		3,000	3,000	3,000
Add bck dep		20,000	20,000	20,000
Op. Cash Flow		23,000	23,000	23,000
Total cash flow	-84,000	23,000	23,000	53,000
Disc. factor (10%)	1.00	0.909	0.826	0.751
Present Value	-84,000	20,907	18,998	39,803

NPV = -4,292 -- don't buy the spectrometer.
* (30,000 salvage - 20,000 book value) * 40% tax rate = -4,000. Thus, the net cash flow from salvage is $30,000 less $4,000 or $26,000.

Net Present Value Analysis I:

You are planning to purchase a car. The car has a retail price of $30,000. The dealer is offering you a $2,000 rebate, so the final purchase price of the car is $28,000. You are able to finance the car at an effective annual interest rate of 8% over four years. (For simplicity, use the effective annual interest rate of 8% for all discounting in this problem.).

A If you finance the $28,000 using the 8% loan over four years, what are your monthly payments? Assume the first payment is made one month after you purchase the car.

679.90 Note that the monthly interest rate is $(1.08)^{1/12} - 1 = .006434$. Thus, the present value of your monthly payments must equal $28,000 = (C/.006434) * $(1-1/(1.006434)^{48})$. Solving for C yields 679.90.

B Assume that you can lease the car at a monthly lease rate of $500 for four years. There is no purchase option in the lease contract. If you purchase the car for $28,000 (after the rebate), you estimate that you will be able to sell it for $15,000 in four years. Insurance and maintenance costs are similar regardless of whether you purchase or lease the car. Should you lease or buy the car?

The cost of the lease option is $20,591 = (500/.006434) * $(1- 1/(1.006434)^{48})$.
The cost of the purchase option is $16,974 = 28,000 - 15,000/$(1.08)^4$.

C Assume that the dealer is offering a no-interest loan for four years in lieu of the rebate. Thus, if you use the no-interest loan, your monthly payment would be $625 per month. If you purchase the car, should you use the no-interest loan or the rebate?

The present value of the no interest loan is $25,739 = = (625/.006434) * $(1-1/(1.006434)^{48})$. This is less than $28,000. So, it makes sense to use the no interest loan rather than take the rebate.

Net Present Value Analysis II:

Your client is celebrating her 45th B-day today and plans to retire in 20 years. Average annual return will equal 10%. She wants an annual retirement income of $100,000 per year (in nominal dollars). Your client will make annual deposits to her retirement account beginning today and ending on her 65th B-day.

A How much must your client have invested in her retirement account as of today so that she is able to meet her stated retirement goal? Assume the first withdrawal is made on your client's 65th birthday and the last is made on her 100th birthday, for a total of 36 annual withdrawals of $100,000.

$158,219 On your client's 64th birthday, The 36 annual withdrawals of $100,000 are worth $100,000/0.10 * $(1-1/(1.10)^{36})$ = $967,651. Discounting this an additional 19 years to today (your client's 45th birthday), yields $158,219. Thus, your client needs to have this amount in her retirement account today to fund 36 annual withdrawals of $100,000 beginning 20 years from today.

B Assume your answer to part (A) is $150,000. If your client currently has no money in her retirement account, how much must your client deposit in each year to fund her retirement income through the age of 100? Assume the first deposit is made today and the last is made on your client's 65th birthday, for a total of 21 annual deposits.

$15,768 The present value of your client's deposits must equal the present value of the anticipated withdrawals ($150,000). Thus, $150,000 = D + D/0.10 * $(1-1/(1.10)^{20})$ = D + 8.513 * D = 9.513 * D. Thus, D = $15,768.

C Assume your answer to part (A) is $150,000. The most your client can afford to invest today is $10,000, but she is able to increase her deposits by 5% in each subsequent year (i.e., to $10,500 one year from today, $11,025 two years from today,etc.). Will she save enough or too much for retirement under this savings scheme?

Not enough. The present value of the 21 deposits growing at a rate of 5% is 10 + 10(1.05)/(0.10-0.05)*$(1 - (1.05)^{20}/(1.10)^{20})$ = $137,177. Thus, the present value of the deposits falls short of the present value of the retirement income. One could solve for the growth rate required by setting this equation equal to the present value of the anticipated withdrawals ($150,000) and solving for g: 10 + 10(1+g)/(0.10 - g) * $(1 - (1+g)^{20}/(1.10)^{20})$ = 150. Solving for g would yield 6.1% (i.e., the first deposit would be $10,000, the second $10,000*1.061=$10,610, the third $10,000*1.0612=$11,257, etc.)

Net Present Value Analysis III:

Client is saving for college education of her 2 kids. Kids are currently 4 and 6 years old. Tuition will cost $20,000/child/year for 4 years. 1st tuition payment for the 6-year old will be made 12 years from today, while the 4 year old will be made 14 years from today. Average annual return on investment will be 8%.

A How much must your client have invested today so that she is able to pay for the tuition of both children?

$52,768 The four-year tuition annuity is valued at $20,000/0.08 * $(1-1/(1.08)^4)$ = $66,243. Discounting this an additional 11 years for your six-year old and an additional 13 years for your four-year old yields: $66,243/$(1.08)^{11}$ + $66,243/$(1.08)^{13}$ = $52,768.

B Assume your answer to part (A) is $50,000. If your client currently has no money saved for her children's college, how much must she deposit in each year to fund their education? Assume the first deposit is made today and the last deposit is made 11 years from today, for a total of 12 annual deposits.

$6,143 The present value of your client's deposits must equal the present value of the anticipated withdrawals ($50,000). Thus, $50,000 = D + D/0.08 * $(1-1/(1.08)^{11})$ = D + 7.139 * D = 8.139 * D. Thus, D = $6,143.

C Assume your answer to part (A) is $50,000. Your client wants to deposit $4,000 today and is willing to grow that deposit amount by 10% in each of the next 11 years for a total of 12 deposits. (For example, next year's deposit will be $4,400.) If she follows this saving plan, will she have saved enough for her children's education?

Enough. The present value of the 12 deposits growing at a rate of 10% is:
4000 + 4400/(0.08-0.10)*$(1 - (1.10)^{11}/(1.08)^{11})$ = $53,204. Thus, the present value of the deposits is enough to cover the present value of the tuition payments.