15.535
Class #2
"Valuation Basics"

Homepage Address

http://mit.edu/wysockip/www

Or

("Click on "Analysts")

Check here for examples of projects from prior years.

Where Next?

- ## Readings for Class #2 (Today)
  - Review your Finance notes on DCF
  - Skim Section B of Course Pack: "Free Cash Flow to Equity Discount Models" (from Chapter 14 of *Investment Valuation* by Damodaran)

- ## Readings for Class #3 (Tuesday) – <u>Cash Flow Analysis</u>
  - Skim Section D of Course Pack: "Income versus Cashflow"

- ## Reminder to form teams for project

Recap From Last Class

- Market Efficiency

- Financial Statement Information used for:
  - Valuation
  - Contracting

- Today – lay the groundwork for valuation
  - Take "baby steps" – by end of class will have basic tools to do a full-blown valuation

Firm Value and Future Cash Flows

- The value of a firm (or shares in that firm) must be related to the (net) cash flows returned to owners of the firm.

  - If this is not true, then we have an *arbitrage* opportunity (money-making machine)

- Expected future cash flows versus actual future cash flows

What is the source of flows?

- As a first step, one must understand how firm will generate cash flows in the future!
  - Strategy, Economics, Marketing, Operations, etc.
- Must appreciate competitive market forces:
  - If a company has a great idea that will generate huge profits, competitors soon will follow!
  - Barriers to entry, first-mover advantage, monopoly
- How will Compaq generate its future sales, profits, cash flows?

DCF is fundamental to everything we will do in this course

- Must understand DCF analysis!
  - When we perform any type of valuation analysis … It will always boil down to DCF!
- P/E multiples, PEG ratios, price targets
  - These all are transformations of DCF.
- Other factors things like real options are just extensions to basic DCF model!

Baby Step #1: "Simple PV"

- Question: "How much would you be willing to pay to purchase 1 share in a company that will pay you a one-time cash flow of $100 to be paid (with no risk) in one year?"
  - PV = $CF_1/(1+r)$
    - (Obtain "r" from http://research.stlouisfed.org/fred/data/irates.html
  - PV = $100/(1+0.0136)
  - PV = $98.66

Present Value of Free Cash Flows

- If you could buy shares in this firm for less than $98.66, what would you do?

- If the price of the shares is more than $98.66, what would you do?

- People are greedy (which is good)! While markets may not be perfectly efficient, they are certainly competitive!

PV - Fundamental part of Valuation

- $PV_{Today}=E(CF_1)/(1+r)$
  - This simple version of general DCF analysis says it all … and it it really simple … all we need to do is:
    - 1) Estimate future cash flows
    - 2) Estimate discount rate (future risk)

- Where do we get future cash flows (crystal ball?) – Financial statements!

- Where do we get estimate of future risk?

Baby Step #2: Future CF and Risk

- What is the present value of a one-time riskless cash flow of $100 to be paid in two years (Assume r=1.36%)?
  - PV = CF/(1+r)^2 = 100/(1+0.0136)^2 = $97.33
- What if we are not certain that we will receive exactly $100 two years from now?
  - Use a higher discount rate

- Systematic risk is only relevant!
  - CAPM – Discount rate only determined by non-diversifiable risk.

Baby Step #3: Many CF's

- What if the firm will generate many cash flows at different times in the future?

  - $PV = CF_1/(1+r)+CF_2/(1+r)^2+CF_3/(1+r)^3+\ldots$

- <u>Example</u>: Calculate the present value of three $10 cash flows paid at end of year 1, year 2 and year 3. Assume discount rate of 10%.

  - $PV = 10/(1.10)+10/(1.10)^2+10/(1.10)^3$
  - $PV = 9.09 + 8.26 + 7.51 = \$24.86$

Baby Step #4: Perpetuity

- What if we received $10 a year indefinitely? Seems like a lot of work ....

  - $PV = CF_1/(1+r)+CF_2/(1+r)^2+CF_3/(1+r)^3+\ldots$
  - Formula for perpetuity: $PV = P = CF/r$
  - Check back of today's handouts for a "proof" of this nifty formula.

- Useful for calculating "terminal values"

Quick Aside: P/E ratios

- As a preview to topic on "Comparative Analysis" (Class #5), we can see that P/E Ratio is really just a DCF formula!

- As a first approximation, accounting can be thought of a proxy for net cash flows available to shareholders.

- What if firm will generate constant Earnings = Cashflows in the future?

P/E ratios example

- Perpetuity Formula:
  - $P = CF/r = E/r$
  - CF= Free Cash flows, E = Earnings
- Therefore, re-arrange to get:

  - $P/E = 1/r$

- What is the P/E ratio of a stock randomly picked from the S&P 500?

Baby Step #5: Growing Perpetuity

- It seems a little extreme to assume that cash flows will be constant forever.

- Why might cash flows grow in the future?
  - These are nominal amounts.
  - The discount rate also takes into account inflation.

Value of Growing Perpetuity

- <u>Example:</u> Calculate the present value of a cash flow stream that starts at $10 one year from today, and then grows at a rate of 5% per year thereafter. Assume discount rate of 12%.
  - PV = CF/(r-g)
  - PV = 10/(0.12-0.05)
  - PV = $142.86

- Warnings!!!

After just just 5 baby steps!

- ## Single cash flow:
  - PV = $CF_1/(1+r)$
- ## Single cash flow in "n" years from now:
  - PV = $CF_n/(1+r)^n$
- ## Multiple cash flows in future:
  - PV = $CF_1/(1+r)+CF_2/(1+r)^2+CF_3/(1+r)^3+\ldots$
- ## Perpetuity of fixed cash flows:
  - PV = CF/r   (1st CF is at the end of year 1!)
- ## Growing Perpetuity:
  - PV = CF/(r-g) (1st CF at end of year 1, then grow at g)
- ## Understanding P/E ratio (just restating DCF!)

Warnings!!!

- Always draw a time-line for yourself and label the cashflows!
  - Know when they occur (beginning/end of period)
  - Make sure discount rate and growth rates are reasonable!
  - Growing perpetuity:
    - Discount rate "r" must be larger than cash flow growth rate. Otherwise you will get garbage.

PV of what? Equity or Enterprise?

- Equityholders? (i.e. shareholders) Valuation goal is often to determine price of 1 share:
  - Equityholders are residual claimants.
  - They receive the "leftover" cash after paying who?
- All Investors? (Shareholders and Lenders)?
  - Known as "Enterprise Value"
- DCF looks the same: PV = CF/(1+r), but
  - CF's are usually different for equity versus enterprise.
  - Risk is different.

Valuation

- ## 1) Equity valuation:
  - Forecast free cash flows available to equity.
  - Discount expected cash flows by the cost of equity capital.

- ## 2) Enterprise (firm or asset) valuation:
  - Forecast cash flows available to *all providers of capital* (debt and equity).
  - Discount expected cash flows by weighted average cost of (debt and equity) capital
  - Can get equity value by subtracting value of debt.
  - Widely used in practice.

General Valuation Approach:

- <u>First</u>: Forecast cashflows over finite horizon (usually 5 to 10 years), final year is terminal year.

- <u>Second</u>: Forecast cashflows beyond terminal year (invoke assumptions)

- <u>Third</u>: Discount by appropriate cost of capital (if Enterprise, then WACC)

- <u>Fourth</u>: (if using Enterprise valuation): Subtract estimated market value of debt to get current estimate of equity value

Forecasting CF's

- Not as easy as it might appear! This is where analysts earn their keep!

- We will spend a whole class on this topic.

- Key issue is that we need to find "free cash flow" that is leftover for investors.

  - Some analysts forecast EBITDA to keep it simple, but this is a simply an approximation.

Examples: DCF Valuation

- "Back of the envelope" valuation of Compaq Computer using:

  1) Equity Valuation

     - Use analysts' estimates of earnings to help us get future cash flow estimates

     - Use CAPM to get estimate of "r"

  2) Enterprise valuation

     - Similar approach, but value CF's available to all investors.

Method #1: Equity Valuation

- <u>Step 1</u>: Forecast earnings for the future
  - Often difficult to directly forecast free cash flows.
  - Where can we get quick estimates of future CF's?
  - Let's forecast earnings: Analysts' forecast earnings
  - But, earnings are NOT cash flows!

- <u>Step 2</u>: Adjust earnings (net income) to get free cash flow to equity:

  Free Cash Flow to Equity = Net Income –
      (CapEx – Depreciation) – Working capital
      Accruals + (New debt issued – Debt Repayment)

Equity Valuation continued

- <u>Step 3</u>: Forecast capex, depreciation, working capital accruals, & debt transactions
  - PROBLEMS: Investment and debt issuance are often lumpy! What does depreciation tell us?
  - <u>A useful simplification for quick and dirty analysis:</u>
    - Assume future average CapEx=Depreciation
    - Assume constant average debt (Issue=Repay)
    - Steady state working capital accruals average to zero.
  - Therefore, Free Cash Flow to Equity = Net Income
  - In next class, we will spend time doing detailed calculation of projected free cash flow.

Equity Valuation Continued

- Step 4: Calculate the PV of equity cashflows:
  - Years 1-4 are easy!
  - Year 5 & beyond: Use our "special formulas".
  - PV = CF/r   OR   PV = CF/(r-g)
  - WARNING: This is the "present value standing in year 4"! This "terminal value" that must be discounted back to the present

Equity Valuation: Compaq Computer

- <u>Step 1</u>: Use analysts' earnings forecasts from Yahoo! Finance
  - EPS(Year ended Jan. 2003) = $1.78
  - EPS(Year ended Jan. 2004) = $2.04
  - 5 year average growth forecast = 14%
  - EPS(2005) = EPS(2004) *1.14 = $2.33
  - EPS(2006) = EPS(2005) *1.15 = $2.65
  - EPS(2007) = EPS(2006) *1.15 = $3.02
  - What about 2006 and beyond? Assume growth rate based on understanding of economics!

Equity Valuation: Compaq Computer

- ## Step 2: Adjust Earnings to get Free Cash Flow:
  - *Quick and dirty assumption 1*: Working Capital Accruals equals zero
  - *Quick and dirty assumption 2*: Depreciation equals long-run capital reinvestment
  - *Quick and dirty assumption 3*: Average debt issued = debt repayments
- ## Step 4: Calculate PV of all cash flows
  - Today, we will use CAPM

Enterprise Valuation: Compaq Computer

- The alternate method is Enterprise Valuation.

- If Firm has no debt, then just apply the straightforward equity valuation method.

- However, if firm has debt, then we want to create an "What if" scenario: "What if the firm had no debt?"

Enterprise Valuation: Compaq Computer

- RESULT: Steps 1 and 2 are the same.

- <u>New Step 3</u>: Forecast after-tax net interest payments.

- <u>New Step 4</u>: Calculate cash flows for unlevered firm.

- <u>New Step 5</u>: Discount cash flows using WACC.

Review Examples in Coursepack

- See example valuations in Coursepack (Section B – "Free Cash Flow to Equity Discount Models" – Ch 14 of Damodaran)
  - Singapore Airlines: Page 360-361
  - Nestle: Pages 365-367
  - Tsingtao Breweries: Pages 370-372
- Note that each case is just a based on the simple ideas we discussed in class today!
- Reading for next class: Skim pages 69-88 of Section D of Course Pack: "Income versus Cashflow" (from *Financial Reporting and Statement Analysis* Stickney and Brown)