Investment & Portfolio Management

Lecture 4: Security Valuation Principles.

Today's questions

- What are the major approaches to security valuation?
  - What are the specifics of the 3-step/top-down process?
- How to determine the values of
  - bonds and
  - preferred stock?

- What are the 2 main approaches to common stock valuation, & what are their strengths & weaknesses?
  - How is the DDM model derived & used?
  - How do relative valuation techniques work?
  - How can the DDM be combined with relative valuation?

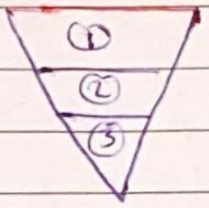
- What 2 variables need to be estimated in any valuation approach?
  - How is this done?

Overview of the valuation process

- Two general approaches
  1. Top-down, 3-step approach
  2. Bottom-up, stock picking approach
- Difference:
  - perceived importance of economic & industry
  - influence on individual firms & stocks.
- Both of these approaches can be implemented by either
  - fundamentalists or
  - technicians

Top-down process, The 3-step.

- Analysis of Alternative Economies & security Markets ①
  - Objective:
    - Decide how to allocate investment funds among countries
    - and within countries to bonds, stocks, & cash



- Analysis of Alternative Industries ②
  - Objective:
    - Based upon the economic & market analysis,
    - determine which industries will prosper & which
    - Industries will suffer on a global base & within countries.

- Analysis of Individual Companies & Stocks ③
  - Objective:
    - Following the analysis of the industries,
    - determine which companies within those industries
    - will prosper & which stocks are undervalued

1. Step One
   - Analyze general economic Influences:
     - Fiscal policy initiatives,
       - such as tax credits or tax cuts, can encourage spending,
       - while high taxes can discourage it
     - Monetary policy
       - controls money supply growth & interest rate;
       - affects all segments of an economy &
       - that economy's relationship with other economies
     - Inflation (unexpected)
       - changes the spending & savings behavior of
       - consumers & corporations
     - Effects of extraordinary events:
       - War - political upheavals - Currency devaluations.

2. Step two
- Explore industry influences:
  - Identify global industries
    - that will prosper or suffer on the long run or
    - during the expected near-term economic environment
  - Different industries have different responses to the business cycle:
    - Pro-cyclical: Construction, airlines, autos, luxury goods
    - Acyclical: Retail food, basic household products
    - Counter-cyclical: Pawn shops, payday credit providers
  - Different industries are influenced differentially by demographic factors:
    E.g. Aging population:
    - pharmaceuticals up,
    - childcare providers down.

3. Step three
- Analyze companies:
  - The purpose of company analysis is to identify the best companies in a promising industry
  - This involves examining
    - a firm's past performance, but more importantly,
    - its future prospects
  - It needs to compare the estimated intrinsic value
    - to the prevailing market price of the firm's stock &
    - decide whether its stock is a good investment.
  - The final goal
    - is to select the best stock within a desirable industry &
    - include it in your portfolio based on its
    - relationship (correlation) with all other assets in your portfolio.

Does the 3-step process work?

- studies indicate that most changes in an individual firm's earnings
  - can be attributed to change in aggregate corporate earnings and
  - changes in the firm's industry
- Studies have also found a relationship between
  - stock prices and
  - various economic series

such as employment, income, or production

- Most of the changes in rates of return
  - for individual stock could be explained by changes
  - in the rates of return
  - for the aggregate stock market and
  - the stock's industry.

Theory of Valuation

- The value of an asset is the discounted present value of its expected returns.
- To convert the estimated stream of returns to a value
  - for the security, you must discount this stream
  - at your required rate of return (adjusting for risk)
- This requires estimates of:
  - The stream of expected returns, and
  - The required rate of return on the investment

Expected returns

- Stream of expected returns:
- Form of returns:
  - Earnings - cash flows - Dividends - Interest payments.
  - Capital gains (increases in value)
- Time pattern & growth rate of returns:
  - When the returns (cash flows) occur
  - At what rate will the return grow.

Required rate of return

- Determined by the uncertainty of the return stream
- Components of the required rate of return:
  - economy's risk-free (real) rate of return
  - expected rate of inflation during the holding period
  - Risk premium, determined by:
    - business risk
    - financial risk
    - liquidity risk
    - exchange rate risk & country risk

Investment decision

- Investment decision process:
  - a comparison of estimated values & market prices.
- If Estimated Value > Market price, Buy (or Hold)
- If Estimated Value < Market Price, Don't Buy (or sell)

Valuation of various types of investment

- Bond valuation
- Preferred stock valuation
- Common stock valuation
  - Discounted cash flow techniques:
    - Divident Discount Models
    - Present Value of Operating Free Cash Flows
    - Present Value of Free Cash Flows to Equity.
  - Relative valuation techniques:
    - Ratios such as:
      - Price/Earnings
      - Price/Cash Flow
      - Price/Book Value &
      - Price/Sales

Valuation of bonds

- The cash flow of a bond with
  - par value P_p and
  - coupon rate c maturing in n years:
  - $2n$ semiannual payments of $\frac{C}{2} = \frac{cP_p}{2}$
  - One final payment of P_p after n years.

- Given a required rate of return of r_r,
  - the value of the bond is the present value
  - of its cash flow, compounded semiannually:

$$V = \sum_{t=1}^{2n} \frac{(cP_p)/2}{(1+r_r/2)^t} + \frac{P_p}{(1+r_r/2)^{2n}}$$

$$V = \frac{cP_p}{2}\left(\frac{1 - \frac{1}{(1+r_r/2)^{2n}}}{r_r/2}\right) + \frac{P_p}{(1+r_r/2)^{2n}}$$

Valuation of preferred stock

- Owner of preferred stock
  - receives a promise to pay a stated dividend (D),
  - usually quarterly, for perpetuity.
- Since payments are only made
  - after the firm meets its bond interest payments,
  - there is more uncertainty of returns
- Tax treatment of dividends
  - paid to corporation (80% tax-exempt) offsets the risk premium.

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Valuation of bonds

Example: [Page 17]

In 2014, a $10,000 par value bond due in 2029 with 10% coupon rate will make coupon payments every six months for its 15-year life. What is the value of the bond in 2014 if the required rate of return is 10%?

- Present value of the interest payment

$$V = \sum_{t=1}^{2n} \frac{(CP_p)/2}{(1+r_r/2)^t} + \frac{P_p}{(1+r_r/2)^{2n}} = \frac{cP_p}{2}\left[\frac{1-\frac{1}{(1+r_r/2)^{2n}}}{r_r/2}\right] + \frac{P_p}{(1+r_r/2)^{2n}}$$

where; P_p = par value bond

c = coupon rate maturing in n years.

$\frac{C}{2} = \frac{cP_p}{2}$ = $2n$ semiannual payments

r_r = rate of return

$n = 15$ years
$c = 10\%$ coupon rate
$P_p = \$10,000$ par value bond
$r_r = 10\%$ rate of return.

$$V = \frac{0.1 \times \$10,000}{2}\left[\frac{1-\frac{1}{(1+0.05)^{30}}}{0.05}\right] = \$500 \times 15.3725 = \$7686.23.$$

The present value of the principal

- $\frac{P_p}{(1+r_r/2)^{2n}} = \frac{\$10,000}{(1+0.05)^{30}} = \$10,000 \times 0.231377 = \$2,313.77$

- The bond value.

$\$7,686.23 + \$2,313.77 = \$10,000$

The $10,000 valuation is the amount that an investor should be willing to pay for this bond, given the required rate on a bond of 10%.

- If the required rate of return changes,
  - then bond value will change inversely.

Valuation of preferred stock

The value is - • If the required rate of return is r_r,

$$V = \sum_{t=1}^{\infty} \frac{D}{(1+r_r)^t} = \frac{D}{r_r}$$

where; D = stated dividend r_r = the required rate of return

Example:

Assume a preferred stock pays a dividend of $8 a year, and the required rate of return is 9 percent.

∴ The value is • $D = \$8$ a year

$$V = \frac{D}{r_r} = \frac{\$8}{0.09} = \$88.89$$ • $r_r = 9\%$

Discounted cash flow valuation techniques. (page 25)

• The general formula:

$$V_j = \sum_{t=1}^{n} \frac{CF_{j,t}}{(1+k_j)^t}$$

where;

V_j = value of stock j n = life of the asset $CF_{j,t}$ = cash flow in period t

k_j = the discount rate that is equal to the investor's required rate of return for asset j

The Dividend Discount Model (DDM)

- The value of a share of common stock is the present value.

$$V_j = \frac{D_{j,1}}{(1+k_j)} + \frac{D_{j,2}}{(1+k_j)^2} + \frac{D_{j,3}}{(1+k_j)^2} + \dots = \sum_{t=1}^{\infty} \frac{D_{j,t}}{(1+k_j)^t}$$

where.

V_j = value of common stock j

D_t = dividend during time period t

k_j = required rate of return on stock j

Valuation of common stock

- Two general approaches:

1. Discounted cash-flow techniques
   - Present value of some measure of cash flow, including
     - dividends,
     - operating cash flow, and
     - free cash flow
2. Relative valuation techniques
   - Value estimated based on its price relative to
   - significant variables, such as
     - earnings
     - book value, or
     - cash flow
     - sales.

- Both approaches have several common factors:
  - Valuation significantly affected
    - by Investor's required rate of return on the stock;
  - Valuation affected by
    - the estimated growth rate of the variable used in the valuation technique.

Features of the discounted cash flow approach

- Closest approach to the definition of value
- Various flavors differ in definition of cash flows:
  - Dividends
    - Discount rate: cost of equity
    - Difficult to apply when firms do not pay dividend during growth periods.
  - Operating free cash flow:
    - Net cash flow before any payments to capital suppliers
    - Discount rate: Weighted Average Cost of Capital (WACC)
  - Free cash flow to equity:
    - Operating free cash flow minus payments to debt holders
    - Discount rate: cost of equity.
- Difficulty: discount rates & growth rates of cash flows hard to estimate.

Features of relative valuation techniques

- Relative valuation techniques provide information on
  - how the market is currently valuing stocks:
    - aggregate market
    - alternative industries
    - individual stocks within industries
- Problem: no guidance as to whether valuations are appropriate
  - Relative valuation needs 2 conditions to hold:
    - Good set of comparable entities (similar firms)
    - Aggregate market & company's industry are not severely over-or-under valued

Constant-growth DDM & growth companies

- Growth companies
  - earn return on investments greater than
  - their required rates of return
- To exploit these opportunities,
  - these firms generally retain a high percentage of earnings for reinvestment, and
  - their earnings grow faster than those of a typical firm
- During the high periods where $g > k$,
  - this is inconsistent with the constant growth DDM assumptions.

- The N-period model
  - If the stock is held for only N periods & sold at the end of year N, the value would be:

$$V_j = \sum_{t=1}^{N} \frac{D_{j,t}}{(1+k_j)^t} + \frac{SP_{j,N}}{(1+k_j)^N}$$

- The expected selling price, $SP_{j,N}$, of stock j at the end of year N is crucial

- constant growth model
  - Assumes dividends of stock j grow at constant rate g_j, so that $D_{j,t} = (1+g_t)^t D_{j,0}$

$$V_j = \sum_{t=1}^{\infty} \frac{D_{j,0}(1+g_j)^t}{(1+k_j)^t}$$

where;
V_j = value of stock j
D_0 = dividend payment in the current period
g_j = the constant growth rate of dividends.
k_j = required rate of return on stock j

- Assumption of the constant-growth DDM
  - Dividends grow at a constant rate
  - The constant growth rate will continue indefinitely
  - The required rate of return (k_j) is greater than the infinite growth rate (g_j)
- Reduced-form DDM;
  - Since $k_j > g_j > 0$, we have $0 < \frac{1+g_j}{1+k_j} < 1$, so that

$$V_j = \sum_{t=1}^{\infty} \frac{D_{j,0}(1+g_j)^t}{(1+k_j)^t} = D_{j,0} \sum_{t=1}^{\infty} \left(\frac{1+g_j}{1+k_j}\right)^t = \frac{D_{j,0}\left(\frac{1+g_j}{1+k_j}\right)}{1-\frac{1+g_j}{1+k_j}}$$

$$= \frac{D_{j,0}(1+g_j)}{k_j - g_j} = \frac{D_{j,1}}{k_j - g_j}$$

Valuation with temporary supernormal growth.

Example: Assume at 14% required rate of return, a current dividend of $2 per share, and the following dividend growth pattern:

Year	Dividend Growth Rate
1-3	25%
4-6	20%
7-9	15%
10 on	9%

- The value of the company:

$$V_i = \frac{2.00(1.25)}{1.14} + \frac{2.00(1.25)^2}{1.14^2} + \frac{2.00(1.25)^3}{1.14^3}$$

$$+ \frac{2.00(1.25)^3(1.20)}{1.14^4} + \frac{2.00(1.25)^3(1.20)^2}{1.14^4} + 2$$

$$+ \frac{2(1.25)^3(1.20)^3}{1.14^6} + \frac{2.00(1.25)^3(1.20)^3(1.15)}{1.14^7}$$

$$+ \frac{2.00(1.25)^3(1.20)^3(1.15)^2}{1.14^8} + \frac{2.00(1.25)^3(1.20)^3(1.15)^3}{1.14^9}$$

$$+ \frac{2.00(1.25)^3(1.20)^3(1.15)^3(1.09)}{(0.14-0.09)(1.14)^9}$$

- First evaluate the years of supernormal growth and
  - then use the constant-growth DDM
  - to compute the remaining years at a sustainable rate.

Present value of operating free cash flows

- Derive the value of the total firm
  - by discounting the total operating cash flows prior
  - to the payment of interest to the debt-holders
- To estimate the value of the equity,
  - subtract the value of debt
  - from the estimate of the total value.
- For a mature firm,
  - a constant-growth version can be used,
  - like with the DDM
- Formula:

$$V_j = \sum_{t=1}^{\infty} \frac{OFCF_{j,t}}{(1+WACC_j)^t}$$

Where;
- V_j = value of common stock j
- $OFCF_{j,t}$ = firm j's operating free cash flow in period t
- $WACC_j$ = firm j's weighted average cost of capital

Present value of free cash flows to equity

- Free cash flows to equity are
  - derived after operating cash flows
  - have been adjusted for debt payments (interest & principal)
- These cash flows precede
  - dividend payments to the common stockholder.
- The discount rate used
  - is the firm's cost of equity (k_j) rather than WACC
- Formula:

$$V_j = \sum_{t=1}^{\infty} \frac{FCFE_{j,t}}{(1+k_j)^t}$$

Where;
- V_j = value of common stock j
- $FCFE_{j,t}$ = firm j's free cash flow to equity in period t
- k_j = firm j's cost of equity.

Relative valuation techniques

- Value can be determined by
  - comparing with similar stocks based on relative ratios
- Relative variables include
  - earnings - cash flow - book value & - sales
- Relative valuation ratios include
  - $\frac{\text{price}}{\text{earnings}}$ - $\frac{\text{price}}{\text{cash flow}}$ - $\frac{\text{price}}{\text{book value}}$ & $\frac{\text{price}}{\text{sales}}$.

- The most popular relative valuation technique is based on price to earnings
  - the P/E ratio

Earnings multiplier model

- P/E Ratio:
  - This values the stock based on expected annual earnings.

$$\frac{\text{Price}}{\text{Earnings Ratio}} = \text{Earning Multiplier} = \frac{\text{Current Market Price}}{\text{Expected 12-Month Earnings}}$$

- Expected 12-month earnings can be proxied by:
  - Past-12-months' earnings: trailing P/E ratio
  - Analysts' average estimate of next-12-months' earnings:
    - forward P/E ratio
  - Arguably, the latter is more appropriate,
    - albeit harder to implement
  - Empirical analysis of past P/E ratios
    - relies mostly on trailing values.
- A high P/E ratio (relative to other similar stocks)
  - means the market has high hopes for this stock
- Can combine the earnings multiplier model with
  - the constant-growth DDM to answer this
- key observation: If stock is properly priced,

$$P_j = V_j = \frac{D_{j,1}}{k_j - g_j}$$

Earnings multiplier model & the DDM

- Key observation: If the stock is properly priced,

$$P_j = V_j = \frac{D_{j,1}}{k_j - g_j}$$

- Dividing through by $E_{j,1}$,

$$\frac{P_j}{E_{j,1}} = \frac{D_{j,1}/E_{j,1}}{k_j - g_j}$$

- Thus, the predicted P/E ratio is determined by
  - Expected dividend payout ratio
  - Required rate of return on the stock (k_j)
  - Expected growth rate of dividends (g_j)
- Compare this predicted P/E value to the actual value calculated from the market price & earnings estimates
  - If the predicted P/E is higher, buy
  - If lower, don't

Example: Assume the following information for a company's stock:
1) Dividend payout = 50% of earnings;
2) Required return = 12%;
3) Expected growth = 8%

What should the stock's P/E ratio be?

$$\text{P/E ratio} = \frac{\text{Divident payout}}{(\text{Required return} - \text{Expected growth})}$$

$$= \frac{0.50}{(0.12 - 0.08)} = \frac{0.50}{0.04} = 12.5$$

What if the required rate of return were 13%?

$$P/E = \frac{0.50}{(0.13 - 0.08)} = \frac{0.50}{0.50} = 10.0$$

What if the growth rate were 9%

$$P/E = \frac{0.50}{0.12 - 0.09} = \frac{0.50}{0.03} = 16.7$$

The Price / Cash flow ratio

- Why Price / Cash flow ratio:
  - Companies can manipulate earnings, but cash flow is less prone to manipulation
  - Cash flow is important for fundamental valuation and in credit analysis
- The formula:

$$(P/CF)_{j,t} = \frac{P_{j,t}}{CF_{j,t+1}}$$

where;

- $(P/CF)_{j,t}$ = the price / cash flow ratio for firm j in period t
- $P_{j,t}$ = the price of the stock in period t
- $CF_{j,t+1}$ = expected cash flow per share for firm j

The Price / Book Value ratio:

- Why Price / Book value ratio:
  - widely used to measure bank values
  - Fama & French (1992) study indicated
    - inverse relationship between P/BV ratio &
    - excess return for a cross section of stocks
- The formula:

$$(P/BV)_{j,t} = \frac{P_{j,t}}{BV_{j,t+1}}$$

Where; • $(P/BV)_{j,t}$ = the price / book value ratio for firm j in period t

- $P_{j,t}$ = the price of the stock in period t
- $BV_{j,t+1}$ = estimated end-of-year book value per share for firm j

The Price/Sales ratio

- Why Price/Sales ratio:
  - Sales is subject to less manipulation than other financial data
- Caveat:
  - This ratio varies dramatically by industry
  - Relative comparisons using P/S ratio should be between firms in similar industries
- The formula:

$$(P/S)_{j,t} = \frac{P_{j,t}}{S_{j,t+1}}$$

where:

- $(P/S)_{j,t}$ = the price/sales ratio for firm j in period t
- $P_{j,t}$ = the price of the stock in period t
- $S_{j,t+1}$ = estimated sales per share for firm j

Implementing the relative valuation technique

- First step: Compare the valuation ratio for a company to
  - the comparable ratio for the market, for stock's industry
  - & to other stocks in the industry.
- Is it similar to these other P/Es (P/CFs, P/BVs, etc.)?
- Is it consistently at a premium or discount?

- Second step: Explain the relationship
  - Understand what factors determine the specific valuation ratio for the stock being valued.
  - Compare these factors Vs the same factors for the market, industry, and other stocks
  - May refer to a reference model, such as the DDM:
    - If the model's predicted ratio justifies a high ratio, buy

Estimating the inputs: k and g

- Valuation procedures are the same for securities around the world
- The 2 most important input variables are:
  1) The required rate of return (k)
  2) The expected growth rate of earnings & other valuation variables (g) such as
     - book value and - dividends
     - cash flow
- These two input variables differ among countries in the world
- The quality of these estimates is key

Required rate of return (k)

- The investor's required rate of return must estimated - regardless of the approach selected or technique applied
- This will be used as the discount rate & also affects relative valuation.
- 3 factors influence an investor's required rate of return:
  1) The economy's real risk-free rate (RRFR)
  2) The expected rate of inflation (I)
  3) The risk premium (RP)

Determinants of the required rate of return

- The economy's real risk-free rate (RRFR)
  - Minimum rate an investor should require
  - Depends on the real growth rate of the economy
    - (capital invested should grow at least as fast as the economy)
- The expected rate of inflation
  - Investors are interested in real rates of return that will allow them to increase their rate of consumption.
  - The investor's required nominal risk-free rate of return (NRFR) should be increased to reflect any expected inflation:

$$NRFR = [1 + RRFR][1 + E(I)] - 1,$$

where, E(I) is the expected inflation rate.

- The risk premium
  - Causes differences in required rates of return on alternative investments
  - Explains the difference in expected returns among securities
  - Changes over time, both in absolute yield spread & ratios of yields
  - Five key risks: 1) business 3) liquidity 5) country
    2) financial 4) exchange rate

Expected growth rate (g)

- Estimating growth from fundamentals
- Dividend growth:
  - Determined by:
    - the growth of earnings
    - the proportion of earnings paid in dividends.
  - In the short run, dividends can grow at a different rate than earnings if the firm changes its dividend payout ratio.

- Earnings growth: affected by earnings retention & return on equity (ROE)

$$g_{Earnings} = (\text{Retention Rate}) \times (\text{Return on Equity})$$

$$g = RR \times ROE$$

Breakdown of ROE

$$ROE = \frac{\text{Net Income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total Assets}} \times \frac{\text{Total Assets}}{\text{Common Equity}}$$

ROE = Profit Margin x Total Asset Turnover x Financial Leverage.

- Components of ROE:
  - The first operating ratio, net profit margin,
    - indicates the firm's profitability on sales.
    - net profit margin
      - indicates the firm's profitability on sale
    - Total asset turnover
      - is the indicator of operating efficiency & reflects the asset and capital requirements of business
    - Financial leverage
      - indicates how the management has decided to finance the firm

Estimating growth based on history

- Estimating growth based on history
  - Historical growth rates of
    - sales - earnings
    - cash flow and - dividends

- Three techniques:
  - Arithmetic or geometric average of annual percentage changes
  - Linear regression models
  - Log-linear regression models.