Week 6 – Equity Valuation 1

Overview of Valuation

The basic assumption of all these valuation models is that the future value of **all returns** can be discounted back to today's present value.

$$V_o = \Sigma\left[\frac{(expected\ future\ returns)_t}{(1+r)^t}\right]$$

$$V_o = \sum \frac{E(r)_t}{(1+r)^t}$$

Where t = time period, r = discount rate

Asset price = PV of all future cash flows

- But is the market price the same as the book value?
- Problems: **forecasts** of future returns and **estimate** of risk-adjusted discount rate

FP>MP	*undervalued*	*Buy*
FP=MP	*fairly valued*	*Hold*
FP<MP	*overvalued*	*Sell*

Dividend Discount Model (DDM) vs Cash Flow Valuation

Dividend Discount Model

- DDM can be used to value a company but periodic dividends:
  - Are arbitrary
  - Don't vary with performance
  - Aren't paid by young and growth firms
- Dividend forecasts can be very difficult

$$P_0 = \frac{D_1}{r-g}$$

Cash Flow Valuation

- Cash flow is equivalent since cash provides dividend paying capacity
- Free cash flow = the cash flow generated by the company's operations, less any reinvestment back into the business - cash that's free to be paid to shareholders
- **Rationale for cash:**
  - Ultimate source of value
  - Measurable common denominator (r – g)

3 measurements needed in a Cash-Flow based valuation

1. **Expected future free cash flows over the forecast horizon**
2. Expected free cash flow at the final period of the forecast horizon (continuing free cash flow) and a forecast of the long-run growth rate
3. Discount rate used to compute the present value of the future free cash flows

Expected future free cash flows over the forecast horizon

Measuring periodic free cash flows

- Free cash flow for the firm is different than what is paid to investors due to reinvestment (sustainable growth calculation)
- **But** if the return on reinvested cash is equal to the discount rate, then the value of the free cash flow doesn't change
    - Dividends are irrelevant if the reinvested cash earns as much as the discount rate

Nominal vs Real Cash Flows

- Real cash flows filter out changes in purchasing power due to inflation/deflation
- Doesn't matter which is used **if the discount rate is the nominal or real rate and is consistent with the cash flows**
- Nominal cash flows is more straightforward to use rather than adding another level of estimation (inflation) – inflation at 1 or 2% isn't influential

Pre-tax vs after-tax cash flows

- Debt payments are tax deductible
- Hard to combine debt and equity sources with pre-tax discount rate
- After-tax is easier to calculate

Framework for Free Cash Flow

A = L + E

Separate A and L into operating and financing

Operating activities: day to day operations

Financing activities: interest rate assets

OA + FA = OL + FL +E

Can rearrange into: OA – OL = FL – FA + E

Equal to: net OA = FL + E

➔ Net OA – net FL = SE

➔ PV of Net Cash Flows from Operations – PV of Net cash flows to Debt Financing = Present Value of Net Cash Flows to Shareholders Equity

Free cash flow measurement

- Two different possible free cash flow measure:
    - Free cash flows for all debt and equity holders
    - Free cash flows for common equity shareholders
- **Where do you start?**
- Take CF from operations from Statement of Cash Flows
- Calculated by starting with net income, adding back non-cash items, adjusting for net cash flows for operating activities

FCF for all debt and equity stakeholders (FCFF)

1. Add back CF for interest expense and deduct any CF from interest income
    a. Multiply net by (1 – marginal tax rax); basically Earnings Before Interest and Tax
2. Add or subtract any change in cash balance that the firm will require for operating liquidity
    a. Cash not available for distribution
3. Subtract purchases and add sales of assets used in productive activities
4. Add cash that is necessary to be held and cash that can distributed
5. Discount at **WACC**
6. Can deduct PV of debt to estimate common equity

$$FCFF = NI + Dep. + Interest(1 - t) - \Delta NWC - CAPEX$$

$$FCFF = EBIT(1 - t) + Dep. - \Delta NWC - CAPEX$$

$$FCFF = CFO + Interest(1 - t) - CAPEX$$

$$FCFF = CFO + Interest(1 - t) - CFI$$

CAPEX = Capital Expense

FCF for all common equity shareholders (FCFE)

- FCFE = the CF available after making all payments to debt holders and paying dividends to preferred stock shareholders.

$$FCFE = NI + Dep - \Delta NWC - CAPEX + Net\ borrowing$$

$$FCFE = CFO - CAPEX + Net\ borrowing$$

$$FCFE = CFO - CFI + Net\ borrowing$$

Summary of Calculations

Free cash flow for all debt and Equity

- FCF from operations
- + CF for net interest expense (1- tax rate)
- + / - Change in cash balance that the firm requires (not available for distribution)
- + / - sale or purchase of assets used in production.
- + excess cash available for distribution.
- = Free cash flow for all debt and equity.
- Discount at weighted average cost of capital
- Can deduct PV of debt to estimate common equity

Free cash flow for equity shareholders

- Free Cash flow for all debt and equity holders (same as previous calculation).
- + cash inflows from new borrowings and minus cash outflows from repayments of interest bearing loans.
- - cash outflows investments in cash s/t or l/t investment securities (not part of core operations)
- Add cash inflows from new issue of preferred stock or minus for retirement of pref stock and payment of divs.
- Discount at weighted average cost of **equity**

Which FCF should be used?

- FCFF
  - If objective is to value operating assets less operating liabilities
  - **Valuing the operations of a firm or a division**
- FCFE
  - If objective is to value common shareholders' equity of the firm
  - **Investors will use FCFE to value the equity of a firm**

Selecting a forecast horizon

- The number of years of projected future periodic FCF should be the expected life
- However, equity has an infinite life
- Financial analysts must estimate the FCF over an explicit horizon depending on
  - Industry
  - Maturity
  - Expected growth
  - Predictability of the FCF
- Following the forecast horizon, analysts then typically use general steady-state growth assumptions and growth rates to project future financial statements
- Difficult to make reliable forecast horizon projections for young, high-growth firms because their future operating performance is relatively more uncertain.

Expected free cash flow at the final period of the forecast horizon (continuing free cash flow) and a forecast of the long-run growth rate

Continuing value of future FCF (dividends)

- Using techniques to project FCF with steady-state growth rate continuing beyond the explicit forecast horizon and measure PV of continuing dividends
  - Called continuing dividends because they reflect the cash flows from the firm to the common equity shareholders continuing into the long-run future

Compute continuing value

- Derive Year T+1 by **multiplying dividends for Year T by (1+g)**

$$CV = \frac{continuing\ FCF\ for\ time\ T+1}{(R-g)}$$

R = appropriate risk-adjusted discount rate

g = projected steady-state growth rate

Discount rate used to compute the present value of the future free cash flows

- Discount rate should be a forecast of the required rate of return, conditional on the **expected future riskiness** of the firm
    - When calculating for equity shareholders, calculate rate of return on equity capital
    - When calculating for all debt and equity stake-holders, use WACC

Choosing the discount rate

- Historical rate is a good predictor if:
    - Current risk is same as expected future risk
    - Current interest rates are good indicators of future interest rates
    - Existing financial capital structure of firm is the same as the expected future capital structure
- If **any** of these conditions don't hold, then the analyst will have to project discount rates that captures the changes

How to calculate WACC

Weight each component and multiply by the appropriate interest rate

- Debt:
    - Use **after-tax** costs using the marginal tax
- Equity:
    - Preferred stock use dividend rate
    - Common stock use CAPM
      (Risk free rate + beta exposure to market risk)

$$\boldsymbol{CAPM} \qquad \boldsymbol{E(r) = r_f + \beta(r_m - r_f)}$$

Adjust beta if new capital structure

- Unlever the beta, then recalculate CAPM with new leverage

$$\beta^U = \frac{\beta^L}{1 + (1-t)\frac{D}{E}}$$

- EXAMPLE

Beta = 0.9 tax rate = 35% old D/E = 0.6

Riskfree rate (r_f) = 6% market risk premium (r_m) = 7%

New D/E = 1.4

0.9 = X*[1+(1 – 0.35) *(0.6)]

X = 0.65

New beta: 0.65*[1+(1 – 0.35) *(1.4)] = 1.24

Now substitute in CAPM: 6% + 1.24 * 7% = 14.68%

Value of equity

- Only look at the FCF to equity shareholders and discount by the required rate of return to equity

PV calculation refinements

- Mid-year discounting
  - Full year discounting will over discount, so could use mid-year $1/(1+r)^{0.5}$
  - Just add back a half year of discounting
- Partial year accumulation of value
  - If given a specific date, adjust the valuation by multiplying the value by (1+R) to the power of number of days/365
  - I.e. May 9 (day 129/365) → multiply by $(1+R)^{0.353}$

$$FV = PV(1+R)^{\frac{d}{365}}$$

Advantages and disadvantages of cash flow valuation method

- Advantages:
  - Focus on cash flows, which has more economic meaning than earnings - **CASH IS KING**
  - Must think through many future operating, investing and financing decision of firm
- Disadvantages:
  - Continuing value tends to dominate the total value but is sensitive to assumptions made about growth-rates
  - Projection of cash flows can be time-consuming

Earnings based valuation

Practical advantages of earnings based valuation

- The emphasis placed on earnings by market participants makes earnings a logical starting point for valuation.
  - Analysts, investors, capital markets, managers, boards and financial press focus on earnings forecasts and earnings reports rather than FCF forecasts and amounts.
- Allows for periodic performance measurements

- FCF estimations requires more computations and potential errors, while earnings based valuation can be taken from P&L or B/S.
- Earnings measure when the firm creates wealth, FCF measures when the firms recognises wealth in cash and dividends measure when the firm distributes wealth to shareholders.
- Over the life of the firm, the PV of future earnings, cash flows and dividends should be equal.

Earnings based valuation: residual income

- Foundation for residual income valuation is the dividends-based valuation modes in which the value of common shareholders' equity is the PV of all future dividends to shareholders over the life of the firm.
- Dividends over the life of the firm can be discounted back to today

$$V_0 = \sum \left[\frac{expected\ future\ dividends}{1 + r^t} \right]$$

Where t = time-period, r = discount rate

$$book\ value\ of\ equity: BV_t = BV_{t-1} + NI_t - D_t$$
$$rearrange: D = NI_t + BV_{t-1} - BV_t$$

Formula for Residual Income Model

$$V_0 = BV_0 + \sum \left(\frac{NI - (R_E * BV_{t-1})}{(1 + R_E)^t} \right)$$
$$V_0 = BV_0 + \sum \left(\frac{RI}{(1 + R_E)^t} \right)$$
$$RI = NI_t - (R_E \times BV_{t-1})$$

- Value of the common share-holders equity is equal to the book value of common equity plus the PV of all residual income
- Residual income is the amount which expected future earnings exceed the required earnings for the remaining life of firm.

Implied assumptions for questions

- For questions, it is implied that the total amount of earnings are being paid out to the shareholders
- So the **required return** doesn't change from year to year
- If payout isn't 100% of earnings, then the BV of shares will go up each year and the required return will also increase

Alterations and extension of RI

- Add growth to perpetuity
    - Analysts can forecast net income over a finite period, then the analyst expects the firm's growth pattern to settle into a steady **growth rate**
    - Residual income in this long-run steady state growth period is referred to as **continuing residual income**

    - Adjust perpetuity to include growth by dividing by [R-g]
- Determine the risk adjusted discount rate
    - Discount rate should be a forecast of the required rate of return, conditional of the **expected future riskiness** of the firm.