

OFFICE OF CAREER SERVICES

INTERVIEWS – FINANCIAL MODELING

Basic valuation concepts are among the most popular technical tasks you will be asked to discuss in investment banking and other finance interviews. There are several methods to approach valuation reviewed below: Discounted Cash Flow (DCF), Leveraged Buy-Out (LBO), Public Market Comparables and Precedent Transactions. Before we get into the models, however, we need to discuss two key inputs: the Free Cash Flow and the Weighted Average Cost of Capital (WACC).

I. Cash Flow Build-up

The Free Cash Flow (FCF) is the after-tax cash generated by a company's operations excluding the financial costs, or the money a company is able to generate after paying off all of its expenses, including investments. FCF is an indicator of a company's financial health and a fundamental input into the Discounted Cash Flow model.

Basic Formula:

EBIT

- Tax Expense on EBIT

NOP (Net Operating Profit)

+ Amortization/Depreciation

- Increase/ + Decrease in Working Capital (WC)

- Capital Expenditures (CapEx)

= **Free Cash Flow (FCF)**

Add back significant non-cash items (D&A) and subtract the investments made (CapEx—investments in plant and equipment, and increase in Working Capital).

Working Capital finances the cash conversion cycle of a company, or the net number of days from the outlay of cash for raw materials to the receipt of payment from the customer: $\text{Net WC} = \text{Current Assets} - \text{Current Liabilities}$. It is a measure of whether the company is able to pay off its short-term debt. Current Assets exclude cash because when building FCF you're trying to come up with the cash number the company generates. Since you're trying to measure what change in cash is, you would include in cash only things that affect the inherent operations of your business. Current Assets include Accounts Receivable and Inventory. Current Liabilities exclude debt and include Accounts Payable.

Don't forget to **subtract** an **increase** in Net WC because this is an outlay of cash.

II. Weighted Average Cost of Capital (WACC)

WACC measures the cost of each new dollar of capital raised, representing the average of both cost of equity and cost of debt weighed by their respective use. Taking a weighted average allows us to see how much cost the company must incur to finance its assets.

WACC is the minimum return that a company must earn on its existing asset base to satisfy its creditors, owners, and other providers of capital. It is thus used as the discount rate for evaluating cash flow to stakeholders (the discount rate used in DCF model). Riskier cash flows require higher rates of return.

Basic Formula:

$$\text{WACC} = \underbrace{r_d * (1 - t) * D/TC}_{\text{Debt}} + \underbrace{r_e * E/TC}_{\text{Equity}}$$

Where:

r_d = pre-tax cost of debt (required or expected return on borrowings)

r_e = cost of equity (required or expected return on equity). Calculated using CAPM (see below)

t = tax rate

D = market value of debt

E = market value of equity

$TC = D + E$ = total capital invested in the company

The market value of equity, E , for a publicly traded company, is equal to the price per share multiplied by the number of shares outstanding.

The market value of debt, D , is easily found if the company has publicly traded bonds. Frequently, companies also have a significant amount of bank loans, whose market value is not easily found. However, since the market value of debt tends to be pretty close to the book value (for companies that have not experienced significant changes in credit rating, at least), the book value of debt is usually used.

The cost of equity, r_e , is usually determined using the Capital Asset Pricing Model (see below).

The cost of debt, r_d , is the yield to maturity on the publicly traded bonds of the company. Failing availability of that, the rates of interest charged by the banks on recent loans to the company would also serve as a good cost of debt. This information can be found on Bloomberg or via the Debt Capital Markets department of the investment bank. WACC takes into consideration the fact that financing via debt has an important tax effect: interest payments on debt are tax deductible, which reduces the cost of debt for the company.

For forward-looking WACC, evaluate the company's target capital structure to determine the approximate weighting and cost of debt. The higher the debt, the more expensive it is to borrow.

Cost of Equity (r_e) is determined by the Capital Asset Pricing Model (CAPM)

Basic Formula:

$$r_e = r_f + \beta * (r_m - r_f)$$

Where:

r_f = Risk-free rate

β = Equity (levered) Beta

r_m = Market Risk

r_f is the interest rate on Treasury bonds for a period constant with the rest of analysis. For example, if cash projections are considered for a 10-year period, you would use a 10-year Treasury bond to compare.

Beta (β) is a measure of the company's relative market risk with respect to overall market volatility, where a beta above 1 is more volatile as opposed to a beta below one, which is less volatile than your benchmark equity market. Beta is not available for private companies, so for analysis you would typically use the average or median of comparable betas and adjust it so it reflects the capital structure of the company you're valuing.

How to lever and unlever betas:

Find some publicly traded comparables and look up their equity betas.

Unlever the betas for the comparables: i.e. find their **asset** beta from their equity beta. Equity beta is publicly available.

$$\beta_A = \beta_E \frac{1}{1 + (Debt/Equity)}$$

Average these to estimate the unlevered (asset) β for the analysis you are conducting (or use the median instead of averaging).

Relever the beta to reflect the leverage appropriate for your analysis.

$$\beta_E = \beta_A * (1 + (Debt/Equity))$$

Plug in the resulting β_E into the formula to compute the firm's estimated r_e . For an example, please see the attached illustrative DCF.

How to estimate r_m is debatable. The source is typically so-called Ibbotson reports. Generally, a value of 5% for $(r_m - r_f)$, the market risk premium, is used as a compromise between the estimates of academicians and practitioners. Note that for non-US companies, country risk may need to be addressed. Typical proxy is adding the sovereign spread to the WACC to evaluate the country risk premium.

III. Discounted Cash Flow (DCF) Model

DCF is a type of valuation method used to estimate the attractiveness of an investment opportunity. It uses free cash flow projections and discounts them (using the WACC) to arrive at a present value, which is used to either value the company or evaluate the potential for investment. If the value arrived at through DCF analysis is higher than the current cost of the investment, the opportunity may be a good one.

To arrive at the present value of a company, first you must project its cash flows for a given number of years in the future, most typically 5 or 10 years, and then decide on a perpetual constant growth rate after 10 years going forward. After projecting the first 10 years' performance, you must calculate the company's Terminal Value, which represents the present value of all the future cash flows after year 10.

Basic Formula:

Present Value (PV) of Cash Flows = PV (Future Cash Flows)+ PV (Terminal Value), or

$$DCF = \frac{FCF_1}{(1+WACC)^1} + \frac{FCF_2}{(1+WACC)^2} \dots + \frac{FCF_n}{(1+WACC)^n} + \frac{TV_n}{(1+WACC)^n}$$

Note that the value you obtain after adding the PV of future cash flows is the Enterprise Value (including debt and equity), not the Equity (Market) Value. To obtain the market value of equity, you need to subtract net debt from the enterprise value (net debt since assumption is you would use cash available to pay down debt outstanding).

Terminal Value (TV) can be calculated in one of two ways:

Growing Perpetuity Method: Take the last year, say year 10, and assume some constant growth rate after that, say 3%. This method should be used if it is assumed that the company will continue to grow organically after the last year of projected cash flows. The formula for terminal value in year 5 (assuming constant growth starts in year 5) is: $TV_5 = FCF_6 / (WACC - g)$, and the present value of that would be

$$PV_0 = PV(TV_5) = \frac{FCF_6 / (WACC - g)}{(1+WACC)^5}$$

OR

Exit Multiple Method: Take the earnings of the last year projected, i.e. year 10, and multiply it by relevant market multiple, i.e. 8x earnings. This method assumes the company is sold at the chosen multiple in the selected year. What multiple you use will depend on the company's industry (i.e. sales, EBIT or EBITDA) and will be based on the market and past transaction comparables.

Conventions: keep in mind that there are several conventions to take into consideration when calculating present value of cash flows, such as:

Partial Year Cash Flows, which applies when part of year 1 has already passed at the time of estimating cash flows for year 1.

Midyear Convention, which "spreads" cash flows evenly throughout the year to adjust for the fact that cash flows are not all received at the end of the year.

IV. Leveraged Buy-out (LBO)

An LBO models the acquisition of a company using debt over the target company to make the acquisition. The buyer will typically be a financial sponsor (private equity firm). The hold period has typically been around 4-6 years, and returns are generated primarily through the sale of the company down the road to another sponsor, a strategic buyer, or through an IPO.

In general, the greater the debt (and less equity) a financial buyer can structure into a transaction, the higher its ultimate returns (given initial investment will be lower). As such, the amount a financial buyer is willing to pay for a company is not only dependent on the company's projected performance, but also constrained by the capital structure that the buyer can impose. Debt is serviced by the company's operating performance. Therefore, the potential cash flows a company can generate are an essential factor in the value estimation since they will be used to sustain debt service from the acquisition. The question the model answers is: What price can be paid for a company and what total amount could be debt versus equity?

The LBO model incorporates assumptions for how much, and what types of leverage (senior, subordinated and/or mezzanine debt, etc.) can be supported by the company under current capital markets conditions. Taking these parameters into account, as well as an assumed "exit" value, the LBO determines the maximum valuation possible to achieve the required rate of return for each investor.

The LBO model is used to evaluate the feasibility of an LBO given credit characteristics: to understand how much debt a company can service, to determine the balance sheet and credit rating impact, and to determine EV by measuring the company's ability to generate cash flows to meet equity returns while complying with leverage parameters.

A relevant interview question is, "Who can pay more in an LBO, a corporation (strategic buyer) or a financial sponsor?" There is an array of answers, but attention should be drawn to the fact that a strategic buyer will find it cheaper to finance the acquisition since they normally get offered lower interest rates on financing, benefit from synergies, and typically aim to deliver a relatively lower ROIC (IRR) to equity holders (versus the higher rates required for investors in the case of PE firms).

Basic Formula:

$$\text{IRR} = \left(\frac{\text{Terminal Equity Value}}{\text{Initial Equity Investment}} \right)^{1/n} - 1$$

How to determine what makes a good LBO Candidate (this is a relevant interview question):

- Strong management team
- Steady Predictable CF
- Potential for margin growth
- Opportunities for rationalization: hidden assets, synergies with portfolio companies, WC
- High barriers to entry
- Low Capex requirements
- Limited WC requirements
- Low cyclical
- High market share
- Viable exit strategy
- Divestible assets over time

Source of financing (raised to buy out company):

- Equity
 - New Equity from Sponsor
 - Equity contribution from existing mgmt
- Debt
 - Senior debt (bank)
 - Subordinated debt (public market)
 - Mezzanine
- Bank Debt Advantages: Lower cost
- Bank Debt Disadvantages:
 - Includes covenants that restrict further acquisitions, limit the additional debt to be raised, or limit dividends to shareholders
 - Requires full amortization over period of loan – relies on significant use of cash flows to make principal payments

Uses of new debt:

- Purchase equity of the target (pay out equity holders)
- Retire existing debt (covenants on existing debt typically prohibit post-LBO leverage levels, so existing debt is refinanced)
- Pay transaction fees and expenses (depending on the company's credit rating and deal structure)

V. Public Market Comparables

Public Market Comparables are used to compare a company to similar publicly traded companies (peer set) in order to judge:

- The relative valuation comparison
- Whether the company trades appropriately relative to peers
- How a subsidiary might trade independently in public markets
- How a private company may trade if it were to go public
- What a private company's value may be in a merger

Key components include:

- Set of comparables
- Stock Prices
- Ratings
- Earnings Estimates
- Financial Statements

VI. Precedent Transactions

Precedent Transactions Comparables include a summary of acquisition/merger transactions in a particular industry that helps ascertain the value of a business in the merger market.

Precedent Comparables include:

- Acquisition of public or private companies
- Acquisition of divisions and subsidiaries
- Withdrawn and pending deals
- Minority stake investments (note: may not include control premium)
- Merger of Equals (note: may not include control premium)

Precedent Transactions are useful to the extent the deals included are comparable to target's major business activity.

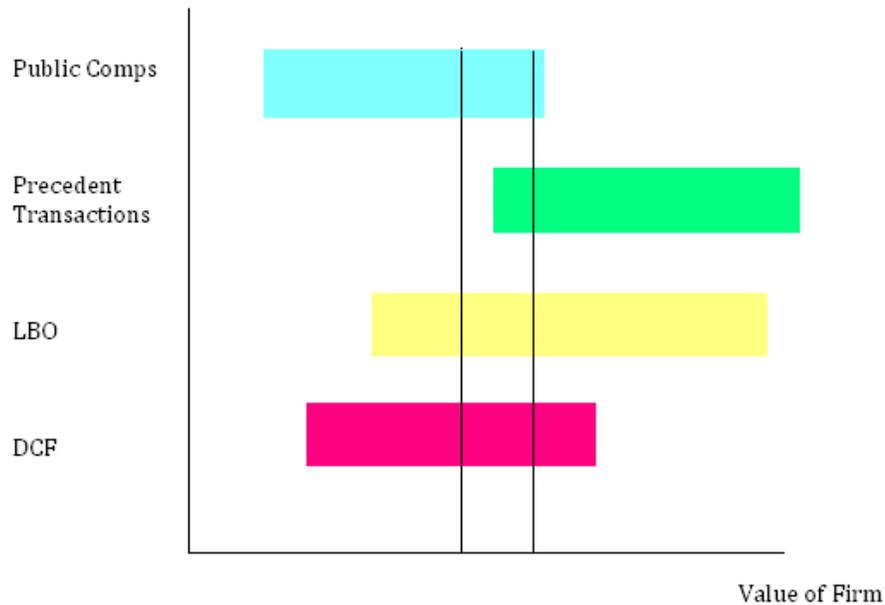
Pulling It All Together

For the discussed valuation metrics: Where would you expect a company will be valued higher / lower and why?

- DCF: value very much driven by WACC (this at times is a criticism in the industry). Value will look lower relative to other methodologies since it does not include acquisition premium.
- Market comps: Should result in a similar value to DCF, assuming peers trade relatively in line.
- Precedent Transactions: Will yield in higher values given acquisition premiums are included.
- LBO: Will result in higher values given purchase premium is accounted for.

Typically several different valuations will be performed when determining a company's value. This will produce a range of estimations for its value. This value comparison is called the "football field."

Illustrative "Football Field":



Other Sources:

- Vault guides
- Alumni
- Higgins, *Analysis for Financial Management*
- R.A. Brealey, S.C. Myers and A.J. Marcus, *Fundamentals of Corporate Finance* or R.A. Brealey, S.C. Myers and F. Allen, *Principles of Corporate Finance*
- McKinsey & Company, *Valuation*