

## **Discounted Cash Flow Questions and Answers – Basic (32 questions)**

### **116.Walk me through a DCF**

A DCF values a company based on the present value of its cash flows and the present value of its terminal value

First, you project out a company's financials using assumptions for revenue growth, expenses and working capital. Then you get down to free cash flow for each year, which you then sum up and discount to a NPV, based on your discount rate – usually the WACC

Once you have the present value of the cash flows, you determine the company's terminal value, using either the multiples method or the Gordon growth method ( $TV = FCF_1 / (WACC - g)$ ), and then also discount that back to its NPV using WACC. FCF1 is the first cash flow into perpetuity, so the last cash flow  $\times (1 + g)$

Finally, you add the two together to determine the company's enterprise value

### **117.Walk me through how you get from revenue to free cash flow in the projections**

Subtract COGS and operating expenses and D&A from revenue to get to operating income (EBIT). Then multiply by  $(1 - \text{tax rate } T)$ , add back depreciation and other non-cash charges, and subtract capex and the change in working capital

Note: This gets you to Unlevered Free Cash Flow since you went off EBIT rather than EBT. You should confirm that this is what the interviewer is asking for

UFCF when calculating EV and LFCF when calculating equity value.  $LFCF = CFO - \text{capex} - \text{mandatory debt repayments}$ ,  $UFCF = LFCF + \text{interest} \times (1 - T) + \text{mandatory debt repayments}$

### **118.What's an alternate way to calculate free cash flow aside from taking net income, adding back depreciation, and subtracting changes in operating assets / liabilities and capex?**

Take cash flow from operations and subtract capex and mandatory debt repayments. That gets you to levered cash flow. To get to unlevered cash flow, you then need to add back the tax-adjusted interest expense and subtract the tax-adjusted interest income

### **119.Why do you use 5 or 10 years for DCF projections?**

That's usually about as far as you can reasonably predict into the future. Less than 5 years would be too short to be useful, and over 10 years is too difficult to predict for most companies

### **120.What do you usually use for the discount rate?**

Normally you use WACC though you might also use cost of equity depending on how the DCF is set up

### **121. How do you evaluate WACC?**

Cost of equity \* (% equity) + cost of debt \* (% debt) \* (1 – tax rate) + cost of preferred \* (% preferred)

In all cases, the percentages refer to how much of the company's capital structure is taken up by each component

For cost of equity, you can use the capital asset pricing model CAPM and for the other you usually look at comparable companies/debt issuances and the interest rates and yields issued by similar companies to get estimates

### **122. How do you calculate the cost of equity?**

Cost of equity = risk free rate + Beta \* equity risk premium

The risk free rate represents how much a 10 or 20 year US treasury bond should yield. Beta is calculated based on the riskiness of comparable companies and the equity risk premium is the % by which stock are expected to out perform riskless assets

Normally you pull the equity risk premium from a publication called Ibbotson's

Note: this formula doesn't tell the whole story. Depending on the bank and how precise you want to be, you could also add in a size premium and industry premium to account for how much a company is expected to outperform its peers according to its market cap or industry

Small company stocks are expected to outperform large company stocks and certain industries are expected to outperform others. And these premiums reflect these expectations

### **123. How do you get to beta in the cost of equity calculation?**

You look up the beta for each comparable company (usually on bloomberg), unlever each one, take the median of the set and then lever it based on your company's capital structure. Then you use this levered beta in the cost of equity calculation

Un-Levered Beta = Levered Beta / (1 + ((1 - Tax Rate) x (Total Debt/Equity)))

Levered Beta = Un-Levered Beta x (1 + ((1 - Tax Rate) x (Total Debt/Equity)))

### **124. Why do you have to unlever and relever beta?**

Again the apples to apples theme. When you look up the betas on Bloomberg (or whatever source) they will be levered to reflect the debt already assumed by each company

But each company's capital structure is different and we want to look at how risky a company is regardless of what % debt or equity it has

To get that, we need to unlever beta each time

But at the end of the calculation, we need to relever it bc we want the beta used in the cost of equity calculation to reflect the true risk of our company, taking into account its capital structure at the time

**125. Would you expect a manufacturing company or a technology company to have a higher beta?**

A technology company, because tech is viewed as a riskier industry than manufacturing

**126. Let's say that you used levered free cash flow rather than unlevered free cash flow in your DCF – what is the effect?**

Levered free cash flow gives you equity value rather than enterprise value, since the cash flow is only available to equity investors (debt investors have already been paid with the interest payments)

**127. If you levered free cash flow, what should you use as the discount rate?**

You would use the cost of equity rather than WACC since we're not concerned with debt or preferred stock in this case – we're calculating equity value, not enterprise value

**128. How do you calculate the terminal value?**

You can either apply an exit multiple to the company's 5 year EBITDA, EBIT, or free cash flow (multiples method) or you can use the Gordon growth method to estimate its value based on its growth rate into perpetuity

The formula for terminal value using Gordon growth is:  $\text{terminal value} = \text{year 5 free cash flow} * (1 + \text{growth rate}) / (\text{discount rate} - \text{growth rate})$

**129. Why would you use the Gordon growth rather than the multiples method to calculate the terminal value?**

In banking, you almost always use the multiples method to calculate terminal value in a DCF. It's much easier to get appropriate data for exit multiples since they're based on comparable companies – picking a long term growth rate, by contrast, is always a shot in the dark

However, you might use Gordon growth if you have no good comparable companies or if you have reason to believe that multiples will change significantly in the industry several years down the road. For example, if an industry is very cyclical you might be better off using long term growth rates rather than exit multiples

**130. What's an appropriate growth rate to use when calculating the terminal value?**

Normally you use the country's long term GDP growth rate, the rate of inflation, or something similarly conservative

For companies in mature economies, a long term growth rate over 5% percent would be quite aggressive since most developed economies are growing at less than 5% per year

**131. How do you select the appropriate exit multiple when calculating terminal value?**

Normally, you look at the comparable companies and pick the median of the set, or something close to it

As with almost anything else in finance, you always show a range of exit multiples and what the terminal value looks like over that range rather than picking one specific number

So if the median EBITDA multiple of the set were 8x, you might show a range of values using multiples from 6x to 10x

The exit multiple is the multiple used to determine the value of a company at the end of an LBO or used to determine the terminal value of a company in a DCF

**132. Which method of calculating terminal value will give you a higher valuation?**

It's hard to generalize bc both are dependent on assumptions you make. In general, the multiples method will be more variable than the Gordon growth method bc exit multiples tend to span a wider range than possible long term growth rates

**133. What's the flaw with basing terminal multiples on what public company comparables are trading at?**

The median multiples may change greatly in the next 5-10 years so it may no longer be accurate by the end of the period you're looking at. This is why you normally look at a wide range of multiples and do a sensitivity analysis to see how the valuation changes over that range

This method is particularly problematic with cyclical industries (like semiconductors)

**134. How do you know if your DCF is too dependent on future assumptions?**

The standard answer: if significantly more than 50% of the company's enterprise value comes from its terminal value, your DCF is probably too dependent on future assumptions

In reality, almost all DCFs are "too dependent on future assumptions" – it's actually quite rare to see a case where the terminal value is less than 50% of the enterprise value

But when it gets to be in the 80-90% range, you know that you may need to rethink your assumptions

**135. Should cost of equity be higher for a \$5 billion or \$500 million market cap company?**

It should be higher for the \$500 million company, bc all else being equal, smaller companies are expected to outperform large companies in the stock market (and therefore be more risky). Using a size premium in your calculation would also ensure that cost of equity is higher for the \$500 million company

**136. What about WACC – will it be higher for a \$5 billion or \$500 million company?**

This is a bit of a trick question bc it depends on whether or not the capital structure is the same for both companies. If the capital structure is the same in terms of percentages and interest rates and such, then WACC should be higher for the \$500 million company for the same reasons mentioned above

If the capital structure is not the same, then it could go either way depending on how much debt/preferred stock each one has and what the interest rates are

**137. What's the relationship between debt and cost of equity?**

More debt means that the company is more risky, so the company's levered beta will be higher – all else being equal, additional debt would raise the cost of equity, and less debt would lower the cost of equity

Cite the equations levered beta  $BL = \text{unlevered beta } Bu * (1 + (1 - T) * D / E)$  and  $Re = rf + BL * MRP$

**138. Cost of equity tells us what kind of return an equity investor can expect for investing in a given company – but what about dividends? Shouldn't we factor dividend yield into the formula?**

Trick question. Dividend yields are already factored into the beta, bc beta describes returns in excess of the market as a whole – and those returns include dividends

**139. How can we calculate cost of equity without using CAPM?**

There is an alternate formula

Cost of equity = (dividends per share / share price) + growth rate of dividends

Cost of equity = dividends/\$ + growth rate of dividends

This is less common than the standard formula but sometimes you use it for companies where dividends are more important or when you lack proper information on beta and the other variables that go into calculating cost of equity with CAPM

**140. Two companies are exactly the same, but one has debt and the other does not – which one will have the higher WACC?**

The one without debt will generally have a higher WACC because debt is less expensive than equity. Why?

1. Interest on debt is tax deductible (hence the  $(1 - \text{tax rate})$  multiplication in the WACC formula)
2. Debt is senior to equity in a company's capital structure – debt holders would be paid first in a liquidation or bankruptcy scenario
3. Intuitively, interest rates on debt are usually lower than the cost of equity numbers you see (usually over 10%). As a result, the cost of debt portion of WACC will contribute less to the total figure than the cost of equity portion will

Theoretically if the company had a lot of debt, the cost of debt might increase and become greater than the cost of equity but that is extremely rare – the company without debt has a higher WACC in 99% of all cases

**141. Which has a greater impact on a company's DCF valuation – a 10% change in revenue or a 1% change in the discount rate?**

You should start by saying, "it depends" but most of the time 10% difference in revenue will have more of an impact. That change in revenue doesn't affect only the current year's revenue, but also the revenue/EBITDA far into the future and even the terminal value

**142. What about a 1% change in revenue vs a 1% change in discount rate?**

In this case the discount rate is likely to have a bigger impact on the valuation, though the correct answer should start with, "it could go either way, but most of the time..."

**143. How do you calculate WACC for a private company?**

This is problematic bc private companies don't have market caps for betas. In this case you would most likely just estimate WACC based on work done by auditors or valuations specialists, or based on what WACC for comparable companies is

Use comparable companies

**144. What should you do if you don't believe management's projections for a DCF model?**

You can take a few different approaches

1. You can create your own projections
2. You can modify management's projections downward to make them more conservative
3. You can show a sensitivity table based on different growth rates and margins and show the values assuming management's projections and assuming a more conservative set of numbers

In reality, you'd probably do all of these if you had unrealistic projections

**145. Why would you not use a DCF for a bank or other financial institutions?**

Banks use debt differently than other companies and do not re-invest it in the business – they use it to create their products – loans – instead. Also, interest is a critical part of banks' business models and changes in working capital can be much larger than a bank's NI – so traditional measures of cash flow don't tell you much

For financial institutions, it's more common to use a dividend discount model or residual income model instead of a DCF

**146. What types of sensitivity analyses would we look at in a DCF?**

Example sensitivities:

1. Revenue growth vs terminal multiple
2. EBITDA margin vs terminal multiple
3. Terminal multiple vs discount rate
4. Long term growth rate vs discount rate

And any combination of these (except terminal multiple vs long term growth rate, which would make no sense)

And they measure the enterprise value. 2 independent, chosen variables

**147. A company has a high debt load and is paying off a significant portion of its principal each year. How do you account for this in a DCF?**

Trick question, you don't account for this at all in an unlevered DCF bc paying off debt principal shows up in cash flow from financing on the cash flow statement – but we only

take into account  $EBIT * (1 - \text{tax rate})$ , and then a few items from cash flow from operations, and then subtract capex to get to unlevered free cash flow

If we were looking at levered free cash flow, then our interest expense would decline in future years due to the principal being paid off – the mandatory debt repayments would also reduce levered free cash flow (note: some people define Levered FCF differently, but if you think about it, repaying debt really does reduce the cash flow that can go to equity investors so it should be subtracted out here)