Finance Recruiting Interview Preparation

Discounted Cash Flows

Session #3

Introduction & Limestone Capital Offering

Finance Interview Preparation Workshops

- "Preparing for finance recruiting isn't just skimming The Vault anymore. Students should study for recruiting like a course and do their homework, because the final exam is the interview."

  – VP, Recruiter for Queen's
- Like a course, there should be:
  - "Homework:" regular readings are necessary
  - Practice (mock interviews)
  - Comprehensive, accessible resources for all interested students
- The most important "exam" of a finance student's life

Limestone Capital Offering

- **4 Sessions:** Customized curriculum to prepare you to answer any technical finance questions that recruiters may throw at you
  1. Accounting, Enterprise Value
  2. Comparable Analysis & Precedents
  3. Introduction to DCFs
  4. M&A & Leveraged Buyouts

Rationale

- Candidates differentiate themselves by knowing hard M&A and LBO questions
- Queen's needs to offer comprehensive resources to continue being competitive
- You will not learn the required knowledge from class
- It is insufficient to memorize an interview guide from WSO, WSP, M&I, Vault, walk into an interview, and hope you get the same questions
- Start early! Recruiting is being pushed up earlier every year

Agenda

1 Discounted Cash Flow

2 Cost of Capital

Discounted Cash Flow Analysis

DCF Overview

- In a discounted cash flow analysis, we typically use **unlevered free cash flow (UFCF)**
  - Cash flows available to all shareholders and bondholders
  - Cash flows before the effect of debt or equity financing
  - Does not include cash flows from debt issuances or retiring, dividends, equity issuances
- The fundamental basis for a DCF is the time value of money

Unlevered Free Cash Flow

- The value of a company is its cash flows discounted back to present value
- **Issues**
  - How long should we project for?
  - Which discount rate should we use?
  - How do we define cash flow?

$$UFCF = EBIT * (1 - Tc) + D\&A - \Delta NWC - CAPEX$$

$$UFCF = NI + D\&A + Interest\ Expense * (1 - Tc) - \Delta NWC - CAPEX$$

Unlevered Free Cash Flow Components

Depreciation, Amortization, Capital Expenditures

- Why do we add back D&A?
  - D&A is a non-cash expense
- Then why don't we just use EBITDA?
  - EBITDA does not account for the tax shield (benefit) of D&A
- Why do we subtract CAPEX?
  - Crucial part of cash flows
  - Maintenance CAPEX vs. Expansionary CAPEX

Change in Net Working Capital

- Why do we subtract increase in NWC?
- Increase in NWC = NWC current year - NWC previous year
- Increases in NWC could represent:
- Additional cash tied up in inventory, accounts receivable, prepaid expenses, etc.

AND / OR

- Less cash float from accounts payable, accrued liabilities, etc.
- More cash tied up / less cash float → less cash flow

Change in Net Working Capital

- Working capital is sometimes defined as: current assets – current liabilities
- However, for the purposes of calculating UFCF, we should think of working capital as **operating working capital**
- If we are calculating UFCF, we don't want to double count cash
- Current assets (for NWC purposes) = A / R + Inventories + Prepaid Expenses and Other
- Current liabilities (for NWC purposes) = A / P + Accrued Liabilities + Other Current Liabilities
- We generally do not include items that are not part of the core business since they are difficult to project
  - Therefore exclude **financial assets and liabilities** including cash, marketable securities, short/long-term debt, income tax payable etc.

Projected Changes in Net Working Capital

How do we project changes in NWC in theory?

- Usually look at historical Days Sales Outstanding (DSO), Days Inventory Held (DIH), Days Payable Outstanding (DPO)
- Carry these forward in projection period
- Fix other NWC items as a % of sales based on historical trends

How do we project changes in NWC in practice?

- Usually forecast as a percentage of the historical **change in revenue**
- NWC should be thought of as the funds required to run the day-to-day operations of the business
  - If sales are increasing, more funds are required to meet operating obligations

Days Sales Outstanding

$$\frac{Accounts\ Receivable}{Total\ Credit\ Sales} * \#\ of\ days$$

Days Inventory Held

$$\frac{Sales}{Inventory}\ OR\ \frac{COGS}{Avg\ Inventory}$$

Days Payable Outstanding

$$\frac{Accounts\ Payable}{Cost\ of\ Sales} * \#\ of\ days$$

Working Capital Schedule

Sample Working Capital Schedule for Microsoft (NASDAQ:MSFT)

				Forecast Period									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Income Statement Metrics													
Revenue	73,723	77,849	86,833	95,071	102,381	108,504	113,604	117,512	120,200	122,179	123,316	124,473	125,653
Cost of Goods Sold	17,530	20,249	26,934	25,608	27,577	29,226	30,600	31,653	32,377	32,910	33,216	33,528	33,845
Turnover Ratios													
A/R Turnover	4.7x	4.5x	4.4x	4.5x	4.5x	4.5x	4.5x	4.5x	4.5x	4.5x	4.5x	4.5x	4.5x
Inventory Turnover	15.4x	10.4x	10.1x	12.0x	12.0x	12.0x	12.0x	12.0x	12.0x	12.0x	12.0x	12.0x	12.0x
A/P Turnover	4.2x	4.2x	3.6x	4.0x	4.0x	4.0x	4.0x	4.0x	4.0x	4.0x	4.0x	4.0x	4.0x
Days Efficiency Ratios													
Day Sales Outstanding (DSO)	78.1 Days	82.0 Days	82.2 Days	80.7 Days	80.7 Days	80.7 Days	80.7 Days	80.7 Days	80.7 Days	80.7 Days	80.7 Days	80.7 Days	80.7 Days
Days Inventory Held (DIH)	23.7 Days	34.9 Days	36.0 Days	30.4 Days	30.4 Days	30.4 Days	30.4 Days	30.4 Days	30.4 Days	30.4 Days	30.4 Days	30.4 Days	30.4 Days
Days Payable Outstanding (DPO)	86.9 Days	87.0 Days	100.7 Days	91.1 Days	91.1 Days	91.1 Days	91.1 Days	91.1 Days	91.1 Days	91.1 Days	91.1 Days	91.1 Days	91.1 Days
Other Acticity Ratios													
Prepaid Expenses (% Sales)	-	-	-	-	-	-	-	-	-	-	-	-	-
Income Tax Payable (% Sales)	1.1%	0.8%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%
Accrued Expenses and Other (% Sales)	10.6%	10.7%	14.1%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%	11.8%
Short-Term Unearned Revenue (% Sales)	25.3%	26.5%	26.7%	26.2%	26.2%	26.2%	26.2%	26.2%	26.2%	26.2%	26.2%	26.2%	26.2%
Current Assets													
Accounts Receivable	15,780	17,486	19,544	21,023	22,639	23,993	25,121	25,985	26,579	27,017	27,268	27,524	27,785
Inventories	1,137	1,938	2,660	2,134	2,299	2,436	2,551	2,638	2,699	2,743	2,769	2,795	2,821
Prepaid Expenses	-	-	-	-	-	-	-	-	-	-	-	-	-
Deferred Income Tax Asset	2,035	1,632	1,941	1,941	1,941	1,941	1,941	1,941	1,941	1,941	1,941	1,941	1,941
Other Current Assets	3,092	3,388	4,392	4,392	4,392	4,392	4,392	4,392	4,392	4,392	4,392	4,392	4,392
Total Current Assets	**22,044**	**24,444**	**28,537**	**29,490**	**31,271**	**32,762**	**34,004**	**34,956**	**35,611**	**36,093**	**36,370**	**36,652**	**36,939**
Current Liabilities													
Accounts Payable	4,175	4,828	7,432	6,393	6,885	7,296	7,639	7,902	8,083	8,216	8,292	8,370	8,449
Income Tax Payable	789	592	782	866	932	988	1,034	1,070	1,094	1,112	1,123	1,133	1,144
Accrued Expenses and Other	7,840	8,359	12,261	11,248	12,112	12,837	13,440	13,902	14,221	14,455	14,589	14,726	14,866
Short-Term Unearned Revenue	18,653	20,639	23,150	24,869	26,781	28,382	29,716	30,739	31,442	31,959	32,257	32,560	32,868
Total Current Liabilities	**31,457**	**34,418**	**43,625**	**43,375**	**46,710**	**49,503**	**51,830**	**53,613**	**54,839**	**55,742**	**56,261**	**56,789**	**57,327**
Net Working Capital	(9,413)	(9,974)	(15,088)	(13,884)	(15,439)	(16,741)	(17,826)	(18,657)	(19,228)	(19,649)	(19,891)	(20,137)	(20,388)
Change in NWC	-	(561)	(5,114)	1,204	(1,555)	(1,302)	(1,084)	(831)	(572)	(421)	(242)	(246)	(251)

Projecting Income Statement Items

Project Revenues

- The accuracy and usefulness of a DCF depends largely on the **revenue model**
  - Most of the other assumptions in a DCF are driven by revenue to some degree
  - Typically include a **base**, **bear** and **bull case** for sensitivity analysis
- In ER, DCFs are based on complex revenue models. While there is no one correct way to build a revenue model, some approaches include:
  - Revenue is tied to some metric such as units sold, which is projected with avg. price per unit
  - Project growth/decline in stores based on management indications and use some metric (i.e. sales per sq. foot) to derive revenue
  - For large diversified businesses, make revenue growth estimates for each division individually
  - For international companies, project revenue by geographic location
  - Project the total size of the market and the expected % market share of the company

Projecting SG&A & Other OPEX

- SG&A is typically held constant as a % of sales based on historical trends

Projecting COGS

- In an IB model, first couple of projected years are usually based on analyst consensus estimates
- For remainder of projection period, typically held constant as a percentage of sales based on the most recent actual COGS margin
- In ER, COGS can be calculated based on historical trends or an expense model can be built
  - Historical trends: prior year margins, margins based on weighted moving average, exponential smoothing, etc.
  - Expense model: modeling expenses department by department, labour costs, material costs, etc.

D&A and CAPEX

- Sometimes projected as a % of sales based on historical trends moving towards some terminal ratio
- Can also build a PP&E schedule
- CAPEX can be maintenance or expansionary
- Maintenance CAPEX is typically just a % of PP&E
- Forecast CAPEX year-by-year based on project / expansion information provided by management
- Depreciation can be straight line, declining balance or double declining balance

Revenue Model

Sample Revenue Model for Sleep Country (TSE:ZZZ)

				Forecast Period									
	2015A	2016A	2017A	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E
Direct Product Lines													
Mattresses	366	420	475										
Base Case	366	420	475	520	561	595	628	659	689	711	725	740	755
Bear Case	366	420	475	515	551	579	605	629	651	670	687	701	711
Bull Case	366	420	475	524	572	612	651	690	728	752	767	783	798
Street Case	366	420	475	522	574	624	673	719	760	795	824	845	857
Indirect Product Lines													
Accesssories	91	103	113										
Base Case	91	103	113	132	146	159	170	181	190	197	203	209	213
Bear Case	91	103	113	130	143	155	164	172	179	185	188	192	194
Bull Case	91	103	113	133	149	163	177	189	198	206	212	219	223
Street Case	91	103	113	131	143	156	168	180	190	199	206	211	214
Total Revenue													
Base Case	456	524	588	651	707	754	798	840	878	908	928	949	968
Bear Case	456	524	588	645	694	733	769	801	830	855	875	893	905
Bull Case	456	524	588	657	720	775	828	879	927	958	980	1,001	1,021
Street Case	456	524	588	652	717	780	841	898	949	993	1,029	1,055	1,071
Total Revenue Growth Rate													
Base Case		14.8%	12.3%	10.8%	8.6%	6.6%	5.8%	5.2%	4.6%	3.4%	2.2%	2.2%	2.0%
Bear Case		14.8%	12.3%	9.8%	7.6%	5.6%	4.8%	4.2%	3.6%	3.0%	2.4%	2.0%	1.4%
Bull Case		14.8%	12.3%	11.8%	9.6%	7.6%	6.8%	6.2%	5.4%	3.4%	2.2%	2.2%	2.0%
Street Case		14.8%	12.3%	11.0%	9.9%	8.9%	7.8%	6.7%	5.7%	4.6%	3.6%	2.5%	1.5%

- Revenue is segmented into Direct Product Lines (Mattresses) and Indirect Product Lines (Accessories)
- A higher growth rate is assigned to Accessories as this is a newer and faster-growing business segment
- Total revenue growth converges towards a **terminal growth rate** of 2.0%
- Base, bull and bear cases are included for sensitivity analysis as well as a **street case** for comparison

UFCF Calculation

Sample UFCF Calculation for Sleep Country (TSE:ZZZ)

				Forecast Period										
	2015A	2016A	2017A	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	Terminal
Revenue	**456**	**524**	**588**	**651**	**707**	**754**	**798**	**840**	**878**	**908**	**928**	**949**	**968**	**987**
% Growth (Live)	*-*	*14.8%*	*12.3%*	*10.8%*	*8.6%*	*6.6%*	*5.8%*	*5.2%*	*4.6%*	*3.4%*	*2.2%*	*2.2%*	*2.0%*	*2.0%*
Adjusted EBITDA	**59**	**84**	**97**	**111**	**121**	**131**	**140**	**149**	**157**	**164**	**169**	**175**	**180**	**184**
% Margin (Live)				*17.0%*	*17.2%*	*17.3%*	*17.5%*	*17.7%*	*17.9%*	*18.0%*	*18.2%*	*18.4%*	*18.6%*	*18.6%*
(-) Depreciation & Amortization	(10)	(12)	(12)	(14)	(16)	(17)	(18)	(19)	(19)	(19)	(19)	(18)	(17)	(16)
% of CapEx	*78.0%*	*76.3%*	*48.6%*	*53.6%*	*58.5%*	*63.4%*	*68.4%*	*73.3%*	*78.3%*	*83.2%*	*88.1%*	*93.1%*	*98.0%*	*98.0%*
Adjusted EBIT	**49**	**72**	**85**	**96**	**106**	**114**	**122**	**130**	**138**	**145**	**150**	**157**	**163**	**167**
% Margin	*10.7%*	*13.7%*	*14.4%*	*14.8%*	*14.9%*	*15.1%*	*15.2%*	*15.4%*	*15.7%*	*15.9%*	*16.2%*	*16.5%*	*16.8%*	*16.9%*
% Growth		*47.0%*	*18.0%*	*14.2%*	*9.5%*	*7.6%*	*7.0%*	*6.6%*	*6.1%*	*5.1%*	*4.0%*	*4.1%*	*4.0%*	*2.6%*
(-) Cash Taxes	(20)	(17)	(32)	(27)	(30)	(32)	(34)	(36)	(39)	(40)	(42)	(44)	(46)	(47)
Tax rate (%)	*41.4%*	*24.0%*	*38.1%*	*28.0%*	*28.0%*	*28.0%*	*28.0%*	*28.0%*	*28.0%*	*28.0%*	*28.0%*	*28.0%*	*28.0%*	*28.0%*
NOPAT	**29**	**54**	**52**	**69**	**76**	**82**	**88**	**93**	**99**	**104**	**108**	**113**	**117**	**120**
(+) Depreciation & Amortization	10	12	12	14	16	17	18	19	19	19	19	18	17	16
(-) CapEx	(13)	(16)	(26)	(27)	(27)	(27)	(27)	(26)	(25)	(23)	(21)	(19)	(17)	(17)
% of Revenue	*2.9%*	*3.0%*	*4.3%*	*4.1%*	*3.8%*	*3.6%*	*3.3%*	*3.1%*	*2.8%*	*2.6%*	*2.3%*	*2.1%*	*1.8%*	*1.7%*
(-) Change in Net Working Capital	(9)	13	(11)	(11)	(9)	(6)	(5)	(4)	(3)	(2)	(1)	(0)	(0)	(0)
% of Change in Revenue		*(19.4%)*	*16.5%*	*17.6%*	*15.7%*	*13.8%*	*11.9%*	*10.0%*	*8.1%*	*6.2%*	*4.3%*	*2.4%*	*0.5%*	*0.5%*
Unlevered Free Cash Flows	**17**	**64**	**29**	**46**	**56**	**66**	**74**	**82**	**91**	**98**	**105**	**111**	**117**	**120**
Stub Period				0.22	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Discount Period				0.11	0.47	1.47	2.47	3.47	4.47	5.47	6.47	7.47	8.47	
WACC				9.4%	9.4%	9.4%	9.4%	9.4%	9.4%	9.4%	9.4%	9.4%	9.4%	
Discount Factor				99%	96%	88%	80%	73%	67%	61%	56%	51%	47%	
PV of Unlevered Free Cash Flows				**10**	**54**	**57**	**59**	**60**	**61**	**60**	**59**	**57**	**54**	

- In practice, forecasting UFCF is usually accomplished by assuming an **EBITDA margin** based on historical figures
  - Avoids forecasting complex operating expenses which may not have much transparency
- Depreciation and Amortization is often forecasted as a percentage of CapEx, scaling up to 98% by the terminal year
- Stub periods and half-year discounting are often used
  - Aim to more accurately reflect when the cash flows are received by the business
  - Traditional discounting assumes all cash flows come in at the end of the year

Levering Cash Flows

How do we get from LFCF to UFCF?

- Levered free cash flow represents the free cash flow going to equity holders
  - Accounts for the effects of debt
  - Does not account for cash flows from equity issuances, dividends, etc.
- **Why do we usually use UFCF instead of LFCF in a DCF?**
- **When would we build an intrinsic model based on LFCF?**

$$LFCF = NI + D\&A - \Delta NWC - CAPEX + Debt\ Issuances - Debt\ Repurchase$$

$$LFCF = UFCF - Interest * (1 - Tc) + Debt\ Issuances - Debt\ Repurchase$$

$$UFCF = LFCF + Interest * (1 - Tc) - Debt\ Issuances + Debt\ Repurchase$$

Steps to a DCF - Summary

Process

1) **Understand company and key drivers**
   - Revenue, COGS, SG&A, CAPEX drivers
2) **Forecast unlevered free cash flows for a projection period of 5 – 10 years**
   - Projection period is sometimes longer
3) **After projection period, find the "terminal value"**
   - Perpetuity method: UFCF grows at a perpetuity growth rate (usually 1.5% – 2.5%)
   - Exit multiple method: Apply exit multiple to appropriate metric, e.g. 8x EV/EBITDA to terminal year EBITDA
4) **Discount both the projected UFCFs and the terminal value by the Weighted Average Cost of Capital (WACC)**
5) **Arrive at an Enterprise Value, calculate the Equity Value and an implied share price (using fully diluted shares outstanding), perform sensitivity analysis**

Flagposting: Begin answering the DCF question with the five BOLDED main points. If your interviewer wants to know more, he/she will ask you to drill down. There are no bonus points for attempting to describe every little detail at once.

Discounting to find Cumulative Present Value of UFCF

Finding Terminal Value

- We assume the firm exists into perpetuity, and must find the present value of firm from the terminal year to perpetuity, as at the terminal year. There are two main ways to do this:

1. Gordon Growth Method

- **Step 1:** Grow terminal year UFCF out one year using perpetual growth rate
- **Step 2:** Discount future value of terminal year UFCF as a perpetuity back to the end of the terminal year
- **Step 3:** Discount the PV of terminal value to the present using the WACC

$$PV\ Terminal\ Value = \frac{UFCF_{Terminal} * (1+g)}{(r-g)(1+r)^t}$$

  - n = number of periods in forecast horizon
  - t = WACC
  - g = perpetual growth rate

2. Terminal Multiple Method

- Apply a terminal multiple to the corresponding metric from the terminal year
  - Usually an EV / EBITDA multiple applied to terminal year EBITDA
- Exit multiple is usually based on a median/average multiple from the comparable universe
- Exit multiple may be based on an industry average
  - Beyond the forecast horizon, the company has become mature, and will grow at a slower rate
  - Therefore, the company should be priced at a lower multiple

$$PV\ Terminal\ Value = \frac{EV/EBITDA * EBITDA_t}{(1+WACC)^t}$$

Sample DCF Output – Sleep Country

Valuation Summary

Cumulative PV of Free Cash Flow	**531**
% of Enterprise Value	*41.4%*
Terminal Value	
Terminal Year EBITDA	184
Terminal Year UFCF	120
Perpetuity Growth Rate	2.0%
Terminal Value	**1,612**
Terminal Value for EBITDA Multiple	1,687
Implied EV / EBITDA Multiple	9.2x
Implied EV / UFCF Multiple	14.1x
PV of Terminal Value	**752**
% of Enterprise Value	*58.6%*
Enterprise Value	**1,282**
(-) Short Term Debt	-
(-) Long Term Debt	(113)
(-) Minority Interest	-
(+) Cash	17
(+) Investments in Associates	-
Equity Value	**1,186**
Basic Shares	37.01
(+) Diluted Securities	0.35
Fully Diluted Shares Outstanding	37.36
Implied Share Price	**$31.76**
Current Share Price	$27.77
Premium to Current Share Price	**14.4%**

Issues

- How to find the perpetual growth rate?
- Why is it so low?
- What is “% of Enterprise Value”?
- How do we forecast terminal multiple?
  - Difficult to do, which is why this methodology is often ignored in practice

Calculating Implied Terminal Multiples

- An implied terminal multiple can be used to sanity check the terminal growth rate
- Implied terminal multiple = Terminal Value / Terminal Year Metric (i.e. EBITDA, UFCF)
- The implied terminal multiple should make sense in the context of the current multiple of the company and its comparable universe

Source: Bloomberg, SEC Filings

Sensitivity Analysis

Sample Sensitivity Analysis for Sleep Country (TSE:ZZZ)

Equity Value Per Share

Discount rate	Terminal growth 1.0%	1.5%	2.0%	2.5%	3.0%
8.4%	$33.74	$35.38	$37.28	$39.49	$42.11
8.9%	$31.35	$32.73	$34.32	$36.15	$38.29
9.4%	$29.24	$30.42	$31.76	$33.29	$35.06
9.9%	$27.38	$28.39	$29.53	$30.82	$32.30
10.4%	$25.71	$26.59	$27.56	$28.67	$29.92

Implied Return

Discount rate	Terminal growth 1.0%	1.5%	2.0%	2.5%	3.0%
8.4%	21.5%	27.4%	34.2%	42.2%	51.6%
8.9%	12.9%	17.9%	23.6%	30.2%	37.9%
9.4%	5.3%	9.5%	14.4%	19.9%	26.2%
9.9%	(1.4%)	2.2%	6.3%	11.0%	16.3%
10.4%	(7.4%)	(4.3%)	(0.7%)	3.2%	7.7%

Equity Value Per Share

Margin Sensitivity	Revenue Growth Sensitivity (1.0%)	(0.5%)	0.0%	0.5%	1.0%
(2.0%)	$25.09	$26.21	$27.38	$28.60	$29.87
(1.0%)	$27.11	$28.31	$29.57	$30.88	$32.25
0.0%	$29.13	$30.42	$31.76	$33.16	$34.62
1.0%	$31.15	$32.52	$33.95	$35.44	$36.99
2.0%	$33.17	$34.62	$36.14	$37.72	$39.37

Implied Return

Margin Sensitivity	Revenue Growth Sensitivity (1.0%)	(0.5%)	0.0%	0.5%	1.0%
(2.0%)	(9.7%)	(5.6%)	(1.4%)	3.0%	7.6%
(1.0%)	(2.4%)	2.0%	6.5%	11.2%	16.1%
0.0%	4.9%	9.5%	14.4%	19.4%	24.7%
1.0%	12.2%	17.1%	22.2%	27.6%	33.2%
2.0%	19.5%	24.7%	30.1%	35.8%	41.8%

Agenda

1 Discounted Cash Flow

2 Cost of Capital

Weighted Average Cost of Capital

Formula

$$WACC = \frac{B}{B+S+P} * r_B * (1 - T_C) + \frac{S}{B+S+P} * r_S + \frac{P}{B+S+P} * r_P$$

WACC

- Capital structure is based on target capital structure
  - What the firm hopes to achieve in the long run (steady-state capital structure)
  - The DCF is a forward looking analysis, it does not make sense to use past years' capital structure in the future if we have reason to believe that it will change
- Don't forget to account for the tax shield of debt
- We discount UFCF by WACC because UFCF represents cash flows to the entire firm
  - WACC represents the weighted average cost of ALL capital (shareholders, bondholders, and investors in preferred shares
- **What rate would you use to discount if LFCF were used in the DCF?**

Cost of Equity

- We use the Capital Asset Pricing Model (CAPM) to calculate cost of equity

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

- R_f = Risk Free Rate
  - Typically the 10-year interpolated U.S. treasury
  - Use 10-year Canada Government Bond if company is Canadian
- We always use the interpolated risk-free rate
  - Most recently issued and most liquid
  - Older issues are referred to as off-the-run and tend to trade at a discount

CAPM & Beta

Perfect Capital Markets Assumptions of CAPM

All investors;

1. Aim to maximize economic utility
2. Are rational and risk-averse
3. Are broadly diversified across a range of investments, such that current holdings already have unsystematic risk diversified away, and any incremental risk from a new investment is purely systematic and not diversifiable
4. Are price takers
5. Can lend and borrow unlimited amounts under the risk free rate of interest
6. Can trade without transaction or taxation cost
7. Deal with securities that are infinitely divisible
8. Assume all information is available at the same time to all investors, and that they react homogenously and unbiasedly to said information

What is Beta?

- Systematic Risk
- Beta can be pulled from Bloomberg, Capital IQ, Factset
- Beta is the slope of a regression between the excess returns of the stock versus the returns of the market
- Excess returns defined as actual returns less the risk-free rate

Calculating Beta

Formula Based Approach

$$\beta = \frac{cov(R_i, R_m)}{var(R_m)}$$

- Beta can also be calculated as the covariance between the stock and the market divided by the variance of the market
- Covariance can be found from the correlation formula:

$$cov(R_j, Rm) = corr(R_j, Rm) * \text{var}(R_j) * \text{var}(R_m)$$

For betas to be comparable, we have to unlever the betas of comparable companies and then relever them at the target's capital structure

Private Companies

- Sometimes, we can't find beta with any of these methods
- E.g. private company without publically traded stock
- When you can't find something specifically for that company, you can typically use comparable companies as a proxy
- However, must account for different capital structures of comparable companies

Capital Structure Considerations

- Beta is a function of both operational risk and financial risk; all else equal the more debt a company has, the higher its beta
- Levered beta will be greater than unlevered beta
- Effects of leverage:
  - E(EPS) is higher
  - G(EPS) is higher
  - V(EPS) is higher
  - Bankruptcy risk is higher
  - Beta is higher

Beta Comparables

Sample Beta Comparables for Acuity Brands (NYSE:AYI)

			Levered Beta				Unlevered Beta	
	Equity Value	Total Debt	Raw	Adjusted	B/S	Tax Rate	Raw	Adjusted
Lightning Companies								
Hubbell Incorporated	7,365	1,055	0.909	0.939	0.143	25%	0.821	0.848
Cree	3,793	145	1.622	1.415	0.038	25%	1.577	1.375
Johnson Controls	35,210	13,572	1.282	1.188	0.385	25%	0.994	0.922
Emerson Electric	46,398	4,656	1.256	1.171	0.100	25%	1.168	1.089
Comfort Systems USA	1,534	61	1.122	1.081	0.039	25%	1.090	1.050
Lennox Intl	8,552	1,004	0.886	0.924	0.117	25%	0.814	0.849
LSI Industries Inc.	210	50	1.356	1.237	0.237	25%	1.152	1.051
Traditional Software Adj. Average					0.152		1.088	1.026
Conglomerates with Lightning Division								
Valmont Industries, Inc.	3,431	755	1.162	1.108	0.220	25%	0.997	0.951
Eaton Corporation plc	36,076	7,751	1.309	1.206	0.215	25%	1.127	1.039
Stanley Black & Decker, Inc.	24,506	3,832	1.030	1.020	0.156	25%	0.922	0.913
Large Cap Tech Adj. Average					0.197		1.016	0.968
Overall Adjusted Average					0.174		1.052	0.997

Unlevered Adjusted Avg. Beta	0.997
Target Gearing	0.174
Tax Rate	25.0%
Relevered Beta	**1.127**

- First, we unlever each comparable company's beta using the first formula
- We find the average of these unlevered betas
- We relever the average unlevered beta using the second formula with the company's target capital structure
- We use this beta for our CAPM calculations

$$\beta_U = \frac{\beta_L}{1 + (1 - T_C) * \left(\frac{B}{S}\right)} \longleftrightarrow \beta_L = \beta_U * 1 + (1 - T_C) * \left(\frac{B}{S}\right))$$

Calculating Cost of Debt

Calculation of Cost of Debt

- If company has bonds in the market, find bonds with a similar duration to the projection period
  - E.g. use the yield to maturity on the 10-year corporate bond
- If no bonds, use the YTMs of comparable companies' bonds
- If no comparable bonds, find credit rating of company from S&P, Moody's
  - Apply spread over risk free rate based on credit rating
- If no credit rating, build a synthetic credit rating based on the company's credit and liquidity ratios

WACC

10-Year U.S. Treasury	3.2%
Market Risk Premium	5.4%
Beta	1.25
Size Premium	-
Cost of Equity	**9.9%**
Cost of Debt	3.0%
Tax Rate	24.0%
After-Tax Cost of Debt	**2.3%**
Target Debt/Capitalization	12.3%
WACC	**9.0%**

Debt Tranche Analysis (NYSE: DIS)

Debt Tranches

(USD millions)	Face Value	Effective Interest Rate
DIS Float 06/05/20	500	2.51%
DIS 2.45 03/04/22	500	2.45%
DIS Float 03/04/22	500	2.71%
DIS Float 01/08/19	400	2.66%
DIS 1 ½ 09/17/18	500	1.50%
DIS 2.15 09/17/20	750	2.15%
DIS 3.15 09/17/25	750	3.15%
DIS Float 03/04/20	400	2.45%
DIS 1.95 03/04/20	600	1.95%
DIS 5 ½ 03/15/19	500	5.50%
DIS 1.65 01/08/19	350	1.65%
DIS 2.3 02/12/21	750	2.30%
DIS 3 02/13/26	1,000	3.00%
DIS 3.7 12/01/42	500	3.70%
DIS 2.35 12/01/22	1,000	2.35%
DIS 7.55 07/15/93	300	7.55%
DIS Float 04/01/39	25	2.09%
DIS Float 08/15/57	25	2.02%
DIS 4 ⅛ 12/01/41	600	4.13%
DIS 2.55 02/15/22	400	2.55%
DIS 1.85 05/30/19	750	1.85%
DIS 4 ⅛ 06/01/44	1,000	4.13%
DIS Float 05/30/19	250	2.63%
DIS 2 ¾ 08/16/21	750	2.75%
DIS 4 ⅜ 08/16/41	350	4.38%
DIS 3 ¾ 06/01/21	500	3.75%
DIS 0 ⅞ 07/12/19	500	0.88%
DIS 1.85 07/30/26	1,000	1.85%
DIS 3 07/30/46	500	3.00%
DIS 7 03/01/32	500	7.00%
Weighted Average		**2.97%**

Calculating Implied Share Price

Calculation of Implied Share Price

- Calculate Equity Value using EV from DCF Output
  - **EV = Equity Value + Preferred Equity + Minority Interest + Debt - Cash**
  - **Equity Value = EV – Preferred Equity – Minority Interest – Debt + Cash**
- Divide Equity Value by Fully Diluted Shares Outstanding (FDSO)
  - FDSO calculation is based on the implied share price, implying **circular logic**
  - Typically requires the use of **circular references** in Microsoft Excel

Enterprise Value	**179,673**
(-) Short Term Debt	(2,772)
(-) Long Term Debt	(22,519)
(-) Minority Interest	(4,837)
(+) Cash	4,017
(+) Investments in Associates	-
Equity Value	**153,562**
Basic Shares	1,487
(+) Diluted Securities	15
Fully Diluted Shares Outstanding	1,502
Implied Share Price	**$102.22**

Fully Diluted Shares Outstanding (FDSO)

- Need to account for options in addition to basic shares outstanding
  - Companies often issue options to executives and employees as part of compensation plans; these could potentially become new shares if they are “in-the-money”
- To calculate FDSO, use the **Treasury Stock Method**
  - This assumes any “in-the-money” options are exercised and the proceeds are used to buy back shares
  - **If Share Price > Exercise Price:**
    - Number of Options * (Share Price – Exercise Price) / Share Price
  - **Otherwise: 0**
  - Result of this calculation is added to the basic shares outstanding to determine FDSO

Fully Diluted Shares Outstanding			
Tranche	**Quantity**	**Strike**	**Dilution**
Stock options	24.000	$76.68	5.997
RSU's	9.000	$0.00	9.000
Total			**14.997**