Chapter 17
VALUATION ANALYSIS

This chapter will cover eight different methods of valuating the firm's worth. These are methods that are currently used on Wall Street to determine the values for both the private and publicly traded companies.

Learning Objectives

After reading this chapter, students will be able:

- To prioritize the sections of the financial statement to be used for building projections and determining the value of the company.
- To learn the eight different methods to value a company.
- To learn the difference between the Discount Cash Flow (DCF) and LBO methods for analyzing privately owned companies.
- Use the Black-Scholes Option Pricing model to determine a value of the equity and the firm when the company is in distress or bankruptcy.

Valuation Overview

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AUTHOR'S NOTES:
Valuating the company or the investor's equity will be highly subjective. There is a lot of interpretation of the data used for the valuation methods. Though they are a lot of methods that are used to value a company, the valuation is both art and science. There is some judgement that goes in choosing the data. Naturally, the buyer has a different prospective than the seller and therefore the valuation assessment could be derived differently.
As a junior analyst working for Bank of America in the late 80's, I consulted many times with the Mergers & Acquisition Department on various companies that our private equity client wanted to acquire. One of my favorite stories on valuations is when I asked one of my colleagues to help me value a company. He asked me if I wanted the three-day analysis, the one-day analysis or the one-second analysis. He went on "the 3-day valuation analysis involves an extensive comparable data analysis of many of their company's piers……". Before he continued I stopped him I said: "Ok. I see. Just curious, what is the one-second analysis?". He turned and said: "six times EBITDA" – referring to the multiple of the company's reported Earnings Before Interest Taxes, Depreciation and Amortization. Most manufacturing companies at the time were quoted trading at 6.0x their EBITDA and that was the basis to start your valuation. The point is that we can spend hours and days analyzing the value of the company but at the end of the day the value of anything is what someone is willing to pay.

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KEY TAKEAWAYS:

- *There are many methods for valuing the firm and the results could be very different.*
- *Ultimately, the value of the firm is the price that a buyer is willing to pay and not necessarily what the seller is asking.*
- *Typically, different acquirers focus on valuing the target company using different sections of the of the firm's income statement:*
    - *The strategic buyer is focusing more on the firm's **top line revenues –** interested in acquiring new customers and implementing their own structure;*
    - *The private equity buyer is focused more on the firm's **Earnings Before Interest Taxes Depreciation and Amortization (EBITDA)** – interested in acquiring the firm's cash flow; and*
    - *The public investors are investing by buying the stock of the company care more about the firm's **Net Income –** a number that is used for valuing the stock price like Earnings Per Share (EPS) or Price Earnings Multiple (PE Multiple)*

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The chapter will introduce the following eight methods of valuating the company's enterprise value:

Method 1: Using the current stock price as a basis of valuation
Method 2: Intrinsic value & Capital Asset Pricing Model (CAPM)
Method 3: Dividend Discount Model (DDM)
Method 4: Comparable method using Trading EBITDA Multiples
Method 5: Comparable method using Acquisition EBITDA Multiples
Method 6: Discount Cash Flow Method (DCF)
Method 7: Leveraged Buyout Private Equity Expectation Model (LBO)
Method 8: Using Black-Scholes Option Pricing Model

All the eight methods listed above are currently used on Wall Street by various investors (sophisticated and unsophisticated), financial analysts, mergers and acquisition specialists and advisors, and creditors. Each of the methods mentioned above is more relevant depending who is analyzing the company. For publicly traded companies for example, the investor who is interested in buying the stock and wants to assess whether the current stock price is fair he or she could use methods 1-6. The investment banker who is interested in pricing a private company that is issuing shares through an Initial Public Offering is very common to use methods 4-6 in their assessment of that initial market value. For private equity firms who are in the process of buying 100% of a publicly traded company's shares or buying a privately-owned company (private-to-private) they will be using methods 4-7, especially method 7 that attempts to derive value from their equity return expectation. For an existing shareholder of the company that is going through restructuring or reorganization on pre or post-bankruptcy stages can use method 8 to find some value of their equity in the future, similar of pricing an equity option. The chapter will first focus on how to value a publicly traded company using the first 6 methods. The Chapter, then will cover extensively methods 6 and 7 valuing a privately held company using the projections described in

the last chapter (Chapter 17). The Chapter will then conclude with method 8 which is a unique way to measure the enterprise value of a company when the company is in default of its debt obligations or going through restructuring and reorganization.

Methods 1-6: Valuation of Public Traded Companies

Method 1: Using the Stock Price as the basis of valuation.

The stock price represents the value of the company. The price of the stock trades every minute of the day as investors buy and sell their holdings. Scholars over the years have spent a lot of time writing about this continuous movement in stock price. How can the price of a stock go up and down when there is little to no information given about the company on a minute by minute basis? **The company issues financial statements every three months and other non-financial information as it comes up, so how does the stock price behave like this? It is said that the stock price moves based on technical, fundamental and behavioral reasons and there are plenty of analytical approaches that back each of these three reasons**. To simplify our approach to value, we will start with the current price of the stock as our basis of value, called Method 1. All other methods that follow are attempting to test if the traded price of the stock is fair. The formula to value the firm or the enterprise value (EV) is as follows:

$$\mathbf{EV = MVE + D - C,}$$

where EV is Enterprise Value, MVE is the Market Value of the Equity, D is the total Debt Outstanding and C is the Cash and cash equivalents of the company.

The stock price that represents the market value of each share when multiplied by the shares outstanding will give us the market value of the equity.

$$\mathbf{MVE = (SP + SO),}$$

where MVE is the Market Value of the Equity, SP is the Stock Price and SO is the Shares Outstanding.

The shares outstanding represent all the shares that a publicly traded company has issued since its initial public offering including any follow-up secondary offerings. In figure 17.1 below shows Hyatt Hotels current stock market that translates to the company's enterprise value. The current stock price of $77.93, when multiplied by its 117.4 million shares outstanding, gives a market value of equity of $9.2 billion. Finally, adding the equity to the last reported debt minus the last reported cash results in an enterprise value of $9.7 billion

INSERT 17.1 FIGURE

Hyatt Hotels Corporation

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METHOD #1 - Market Value / Using the Stock Price

Calculations →		SP	SO	SP * SO = EQ	D	C	EQ + D - C = EV
Company	Symbol	Stock Price (as of 9/21/2018)	Stocks Outstanding ($000)	Equity Value ($000)	Debt (ST&LT) 6/30/2018 ($000)	Cash 6/30/2018 ($000)	Enterprise Value ($000)
Hyatt	H	$ 77.93	117,448	9,152,748	1,440,000	879,000	9,713,748

Figure 17.1

Method 2: Intrinsic Value and CAPM:

One of the first technical methods to value a firm is measuring the future stock price based on return expectation and apply basic time value techniques. We conduct this method in order to value the stock price and enterprise value today. For example, if you expect the stock to be a $100 in a year, at what price do you need to buy it today when the expected return is 10%? Using Finance 101 where $PV = FV / (1+r)^t$, where PV is present value, FV is future value, r is the return and t is time, the stock should have been at $90 or $90 = 100 / (1+ 0.10)^1$. The expected return is calculated by applying the Capital Asset Pricing Model (CAPM) as illustrated below:

$$\mathbf{E_r = Rf_r + \beta\ (M_r - Rf_r)}$$

where E_r is the Expected Return, Rf_r is the Risk-Free Rate, β is the Beta of the company that is analyzed and M_r is Market Return.

The stock price expectation is based on various analysts' stock predictions. These can be found on various financial websites including finance.yahoo.com.

The formula for today's Intrinsic Value is:

$$v_0 = \frac{D_1 + \rho_1}{1 + k}$$

Where D_1 is the dividend expected to receive within a year, P_1 is the expected stock price a year from now and k is the discount rate or Expected rate of return per the formula above.

Figure 17.2 below shows that the stock price using the intrinsic value and CAPM method is estimated at $83.10. To calculate the stock price using this method, we first need to calculate the expected equity return. This expected rate of 12.9% using CAPM is based on Hyatt's stock beta of 1.18x, Risk Free rate of 2.25% and a given market premium of 9.0%. Then the P

INSERT 17.2 FIGURE

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METHOD #2- Intrinsic Value

Using CAPM = k = Rf + (Beta * Premium)		Intrinsic Value = V0 = [E(D1) + E (P1)] / (1+k)		
Risk Free =	2.25%	D1=	$1.80	
Beta =	1.18x	Analyst Est.	$1.64	(Average Earnings per share)
Premium=	9.00%	PE Multiple	15.75x	
Market Return (Rf + Premium)=	11.25%	Exp (P1)=	$92.00	(Avg Target by Analysts for 9/19)
		k=	12.9%	
RoR =	**12.9%**	**V0=**	**$ 83.10**	
Hyatt's Enteprise Value	**10,321,479**			

Figure 17.2

Method 3: Dividend Discount Model (DDM)

This second technical method for valuing the company can only be used if the company is a frequent payer of dividends. The value of the stock is basically the present value of the dividend to be received at the end of the first year – assuming the buyer will hold the stock for a year. To calculate such value using the DDM method, the analyst needs the expected price of the stock a year from now, the expected dividend per share paid within the year and a discount rate which derived using the Capital Asset Pricing Model (CAPM) discussed above.

$$V = \frac{D1}{k - g}$$

Where D_1 is the expected Dividend, k is the discount rate, and g is the expected growth rate.

Figure 17.3 below shows that the stock price is valued at $68.99. The price is calculated assuming a dividend of $1.80 per share, a 12.8% discount rate using CAPM method #2 above

INSERT 17.3 FIGURE

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METHOD #3- Dividend Discount Model (DDM)

Constant-Growth DDM (Gordon Model) V0 = D1 / (k-g)			Expected HPR = E 9r) = [E (d1) + (E(p1) - P0) / P0		
D1 =		$1.80	Dividend (d1)	$1.80	(No growth)
Expected Equity Return (k)=		12.9%	P1 = P0+D	$79.73	
Expected Growth (g) =		10.0%	P0	$ 77.93	
V0=	**$**	**68.99**	**Exp. HPR=**	**4.62%**	
Hyatt's Enteprise Value		**8,663,706**			

Figure 17.3

Method 4: Using Comparable Trading EBITDA Multiples:

This method, most commonly used by mergers & acquisitions professional, looks at the ratio of the Enterprise Value to Earnings Before Interest, Taxes, Depreciation and Amortization (EV /EBITDA) for each of the pier companies and applies the average to measure the company's value. The average multiple provides a benchmark which the analyst can establish as the basis for valuating both private and publicly traded companies. The basic idea is that as the company increases its earnings based on either favorable economic conditions or management decisions from year to year, then the value should also follow at a relatively consistent way. In general, industries with higher growth characteristics enjoy higher multiples of earnings. Similar companies that compete with the company that is being valued given the similar business and financial characteristics.

In figure 17.4 below, the average EBITDA multiple, after taking out the high and low as outliers, is 15.67x representing about 1.0x higher than Hyatt's current EBITDA multiple of 14.8x. Using the 15.67 times Hyatt's last reported EBITDA, Hyatt's enterprise value is calculated at $10.3 billion.

INSERT 17.4 FIGURE

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METHOD #4 -Average EBITDA Industry Trading Multiples

		SP	SO	SP * SO = EQ	D	C	Q + D - C = E	E	EV / E	
Company	Symbol	Stock Price (as of 9/21/2018)	Stocks Outstanding ($000)	Equity Value ($000)	Debt (ST&LT) ($000)	Cash ($000)	Enterprise Value ($000)	EBITDA ($mm)	EBITDA Multiple	Beta
Choice Hotels International	CHH	$ 83.20	56,572	4,706,804	796,200	37,150	5,465,854	335,560	16.29x	1.13x
Hilton Worldwide Holdings Inc.	HLT	$ 80.96	298,190	24,141,462	7,580,000	423,000	31,298,462	1,760,000	17.78x	1.45x
Intercontinental Hotel	IHG	$ 62.58	190,000	11,890,200	2,040,000	233,000	13,697,200	843,000	16.25x	1.59x
Marcus Corporation	MCS	$ 40.80	19,680	802,944	317,420	18,070	1,102,294	139,930	7.88x	0.32x
Marriott International	MAR	$ 130.90	346,990	45,420,991	8,990,000	366,000	54,044,991	2,850,000	18.96x	1.36x
Park Hotels & Resorts Inc.	PK	$ 32.89	201,180	6,616,810	3,080,000	421,000	9,275,810	734,000	12.64x	
Belmond (A/K Orient Express Hotels Ltd)	BEL	$ 17.00	102,960	1,750,320	785,170	162,010	2,373,480	103,750	22.88x	1.51x
Wyndham Worldwide	WYN	$ 136.73	108,640	14,854,347	8,310,000	1,500,000	21,664,347	1,790,000	12.10x	1.33x
Hyatt	HOT	$ 77.93	117,448	9,152,748	1,440,000	879,000	9,713,748	657,000	14.79x	1.18x

EBITDA * Average Multiple	657,000	15.67x	Average	15.60x	1.23x
			Outliers	15.67x	
Hyatt's Enteprise Value	10,295,586				

Figure 17.4

Method 5: Using Comparable Acquisition EBITDA Multiples:

Like the trading multiples for method 4 explained above, method 5 establishes a similar bench mark to what the companies in the same industry are being bought based on multiples of their EBITDA. This method is very similar to what the real estate professional use. To determine what the selling price of someone's home, the real estate agent researches other similar in size homes that are sold in the neighborhood. Like the real estate method, corporate values using this method are determined based on other companies in the same business that are recently sold to either strategic investors or private equity firms. The mergers & acquisition professional search for other companies in the same business that were sold to either strategic investors or private equity firms and establishes a bench mark based on average multiples over time. That average acquisition multiple of the purchase price to EBITDA is then used as a measurement to value the company in question.

Figure 17.5 below shows that the average acquisition EBITDA multiples for the hotel sector is 13.19x (after the high and low multiples are taken out). Using the 13.19x multiple results to Hyatt's enterprise value of $8.7 billion.

INSERT 17.5 FIGURE

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METHOD #5 - Using Averge EBITDA Transaction Multiples (M&A Comparable Method)

Calculations	AP	SO	AP * SO = EQ	ND	EQ + ND = EV	E	EV / E

Target	Acquirer	Acquisition Price /Share	Shares Outstanding	Equity Value ($mm)	Total Net Debt ($mm)	Enterprise Value (EV)	EBITDA (last reported)	EBITDA Multiple
Hilton Hotels	Blackstone Group	$ 47.50	390,400,000	$ 18,544.00	$ 6,180.00	$ 24,724.00	$ 1,680.00	14.72x
Four Seasons*	Kingtom Hotels Int'l / Gates' Cascade	$ 82.00	33,078,000	$ 3,300.00	$ 278.68	$ 3,578.68	$ 112.18	31.90x
Fairmont/Rafles	Kingtom Hotels Int'l	$ 45.00	73,333,333	$ 3,300.00	$ 123.50	$ 3,423.50	$ 187.20	18.29x
Hilton International	Hilton Hotels Corp.			$ 5,578.00	$ -	$ 5,578.00	$ 504.00	11.07x
Starwood Hotels	Host Marriott					$ 4,096.00	$ 315.08	13.00x
La-Quinta Corp	Blackstone Group	$ 12.22	203	$ 2,474.00	$ 925.71	$ 3,400.00	$ 229.70	14.80x
Wynham Int'l	Blackstone Group	$ 1.15	172,053,000	$ 197.86	$ 2,681.96	$ 2,879.82	$ 275.18	10.47x
John Q. Hammons Hotels	JQH Acquisition LLC	$ 24.00	19,583	$ 470.00	$ 765.20	$ 1,235.00	$ 123.07	10.00x
Societe du Louvre	Starwood Capital					$ 1,028.90	$ 91.05	11.30x
Intercontinental Hotels	LRG					$ 981.00	$ 106.63	9.20x
Boca Resorts	Blackstone Group	$ 24.00	40,284,000	$ 966.82	$ 217.29	$ 1,184.11	$ 90.07	13.15x
Prime Hospitality	Blackstone Group	$ 12.25	44,808,000	$ 548.90	$ 243.60	$ 792.50	$ 55.12	14.38x
Extended Stay	Blackstone Group	$ 19.93	95,077,000	$ 1,894.88	$ 1,231.50	$ 3,126.38	$ 224.85	13.90x
							Average	**14.32x**
Haytt's Enteprise Value	**8,664,384**			657,000	13.19x		Adjust. Out	**13.19x**

Figure 17.5

Method 6: Using the Discount Cash Flow Method (DCF):

This method is the most fundamental method that is used to value many types of companies, especially companies that are tough to find any trading and acquisition multiple comparables. This method called the DCF method that is broadly used by many investors, advisors, banks and academics is premised on the principal that the value of a company can be derived by the present value of its projected free cash flow (FCF). We will learn later that this FCF is derived from various assumptions, starting from Revenue and subtracting operating and capital costs.

To value the company using the DCF method the analyst needs to derive the following four items:

I. Setting up a stream of cash flows
II. Identifying an exit year.
III. Calculating the value at exit year (Terminal Value)
IV. Using the appropriate discount rate to value the present value of the firm.

- **Stream of Cash Flows**: **The first requirement for valuating a privately own company is to calculate the projected equity cash flow of the company**. The spreadsheet is based on certain information from the income statement, cash flow and balance sheet. Following last chapter where we learn how to build projections, we continue to apply this projection to value the company using this method. In Figure 17.11 from previous chapter shows the projections starting from revenues, subtracting cost of revenues and operating expenses to get to EBITDA. After the EBITDA is set, we subtract Depreciation, Amortization and Interest so we can recalculate the tax expense and then add back those items to get to a cash flow before other cash outflows including working capital expense and capital expenditures. The cash flow of the firm before debt services represents the first line of the

cash outflow assuming the company is unlevered – an important line for calculating the terminal value – described later. The Free Cash Flow (FCF) represents the equity cash flow after the debt service obligations, including the payments of principal and interest. Then, this stream of cash flow is used for calculating the present value of the equity and the company.

- **Exit Year**: Once the stream of cash flows is determined, we then need to choose an exit year. To complete the DCF method, the analyst must assume that there is an exit strategy set up, so the value of the firm will include a value at the exit year even if the investor is not planning to sell the company in 4 or 5 years. This is to artificially establish a realization or return on investment. Typically, the exit year is between 4-6 years.

- **Terminal Value**: The third item that the analyst needs to quantify is the terminal value of the firm at the exit year. This value is basically the expected enterprise value or the value that the current owner is expected to sell the company in 4-6 years from today. There are many methods to calculate the terminal value. The most common ones used on Wall Street are the EBITDA Multiple and Perpetuity Growth methods. These will be described in detailed in the "Valuation for Publicly Traded Companies" section. Our example for Hyatt (Figure 18.8) assumes a terminal value using the current EBITDA Multiple bench mark of 15.3x multiplied by company's Exit year's EBITDA resulting to approximately $[] billion. The second method to calculate the terminal value, as shown on Figure 18.8, shows a terminal value of $4.8 billion. The formula of this method, using the Perpetuity Growth method is by taking next year's cash flow before debt service and divided it by the difference of the firm's discount rate and growth rate. The discount rate used is the Weighted Average Capital Cost (WACC).

- **Discount Rate**: The fourth item that the analyst needs to quantify after the stream of cash flow is established, the exit year is determined, and the terminal value is being calculated is the discount rate. The combined amounts of the yearly future free cash flows and terminal value after the outstanding debt is subtracted in the exit year, represents the expected equity cash flow, or the cash flow that the investor is projecting to receive while owning the company. The present value of these cash flows is based on what the equity is expecting to return on its initial investment.

Figure 17.6 below shows the calculation of the four items including the stream of cash flows, the exit year, the terminal value and the discount rate. The average terminal value at the exit year is approximately $17 billion derived by the two methods of EBITDA multiples and Perpetuity. Using the 10.2% WACC as a discount rate as calculated below, Hyatt's Enterprise Value using this method is estimated at $10.6 billion.

INSERT 17.6 FIGURE

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METHOD #6 - Discount Cash Flow Valuation Analysis

Discout Cash Flow Valuation Analysis	Historical Assumptions	Projected Assumptions	Input Actual 6/30/2018	year = 1 12/31/2018	2 12/31/2019	3 12/30/2020	4 12/31/2021	5 EXIT YEAR 12/31/2022	6 12/31/2023
Revenues			2,613,000	2,691,390	2,825,960	2,967,257	3,115,620	3,271,401	3,434,971
Revenue Growth				3.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Cost of Revenues (CoGS)	61.0%	60.0%	(1,594,000)	(1,614,834)	(1,695,576)	(1,780,354)	(1,869,372)	(1,962,841)	(2,060,983)
Operating Expenses (Excl. Non-rec.)	27.0%	26.0%	(705,000)	(699,761)	(734,749)	(771,487)	(810,061)	(850,564)	(893,093)
EBIT			314,000	376,795	395,634	415,416	436,187	457,996	480,896
Less Taxes (tax rate x of EBIT)		36.0%	-	(135,646)	(142,428)	(149,550)	(157,027)	(164,879)	(173,123)
Plus Depreciation	13.1%	10.0%	343,000	269,139	282,596	296,726	311,562	327,140	343,497
Less Working Capital	0.0%	0.0%		-	-	-	-	-	-
Less Capex	10.9%	6.0%	(286,000)	(161,483)	(169,558)	(178,035)	(186,937)	(196,284)	(206,098)
Cash Flow			371,000	348,804	366,244	384,557	403,784	423,974	445,172
EBITDA			657,000	645,934	678,230	712,142	747,749	785,136	824,393
Debt (assuming 5% reduction of intial principal per year)			1,440,000	1,368,000	1,296,000	1,224,000	1,152,000	1,080,000	1,008,000

Terminal Value	Assumptions	Growth		
EBITDA Multiple Method	15.67x		(EBITDA x EBITDA Multiple)	12,303,560
Perpetuity Method	10.25%	8.20%	Next Year's Cash Flow / (Discount Rate - Growth)	21,725,257
Average		(80% of WACC)		17,014,408
Less Debt Outstanding (at Exit)				(1,080,000)
Plus Cash (at Exit)				-
Equity Value at Terminal				15,934,408

		PV (for $1)						
Equity Cash Flows	12.9%			348,804	366,244	384,557	403,784	16,358,382
	PV (1) =	0.8859750	$309,032					
	PV (2) =	0.7849517	$287,484					
	PV (3) =	0.6954476	$267,439					
	PV (4) =	0.6161492	$248,791					
	PV (5) =	0.5458928	$8,929,923					
	PV=		$10,042,669					

Enterprise Value =	PV of Equity + PV of Debt
PV of Equity =	$10,042,669
+ PV of Debt =	1,440,000
+ PV of Cash =	(879,000)
Hyatt's Enterprise Value	10,603,669

Cost of Equity Calc	
Risk Free Rate (5 year)	2.25%
Premium based on MC =	9.00%
Hyatt Beta =	1.18x
Expected Equity Return =	12.9%

Interest 6/18 LTM ($ 000s)
79,000
5.49% Rate

WACC Calc:		% Cap	AT RoR	WACC
Debt	1,440,000	28.0%	3.511%	0.985%
BV Equity	3,695,000	72.0%	12.870%	9.261%
		100.0%		10.246%

Figure 17.6

Method 7: Using the Leveraged Buyout Model (LBO) Method:

This method is very similar to method 6 (DCF method) which is based on future free cash flows except the projected debt, WACC and expected return. While the DCF analysis is used for determining today's value of the company based on future cash flows, **the value of the company using this LBO method is determined based on investor expectation which is return determines the acquisition price of the firm**. In other words, the analyst needs to determine first the equity expected rate of return and then back into a present value of the firm that meets that expectation. The equity investment amount is determined after assuming that most of the financing will be via debt. This method is unique because it uses the capital markets to engineer the financing of the buyout, so the equity return expectation is met via the use of leverage. This method starts step by step starting first with the maximum debt the private equity can raise based on the target's cash flow. These steps are highlighted below staring with the debt and equity financing to running the company's projections including servicing this new debt to ultimately calculating the return. If the return is not met using the current market price, then the company is overvalued. If the return is more than the expectation, then the stock price will be adjusted to determine the level that it can be bought at to meet such expectation. The expected return of the investor which is based on the projections determines the intrinsic value per share. This is the value that the private equity is willing to pay for the company. The difference between this intrinsic value and the current trading value of the stock is called premium. This is expressed as percentage of the current price of the stock. This premium sets the level of negotiation that the investor announces the tendering offer to

acquire 100% of the stock.

- **Building the Transactions Sources and Uses:**
    - **Transaction Sources:**
        - **Calculating Debt Capacity: Typically, in an LBO transaction the debt comprised between 60-70% of the transaction and the remaining 30-40% is equity.** The most common measurement of how much debt a transaction can handle is based on the ability of the borrower to service such debt. In a traditional LBO where the borrower has relatively stable cash flow, there is an ability to raise debt up to 6-7 times the company's EBITDA, though it has varied based on credit cycles. In building the LBO valuation case, the analyst needs first to calculate the maximum debt capacity in order to determine the expected equity needed to invest and complete the hypothetical leveraged buyout of the publicly traded company. Figure 18.8 shows that both the source of debt including bank loan and corporate bonds allowed leverage or total debt to EBITDA multiple up to 6.0x or total debt made of the bank loan at 3.5x and corporate bonds at 2.5x EBITDA.
        - **Equity makes the balance of the transaction sources:** Since the Debt Capacity is at 6.0x for Hyatt then the rest of the capital that needed to be raised to cover the current trading enterprise value is Equity or 10.7x.
    - **Transaction Uses:**
        - The current stock price when multiplied by the shares outstanding to calculate the market cap and then add the debt and estimated transaction expenses, the implied purchase price of the company divided by the company's EBITDA represent the acquisition multiple. In figure 18.8, the acquisition cost is $10.96 billion or 16.6 times last reported EBITDA multiple. The LBO model first assumes that the private equity buys Hyatt for $10.96 billion with 0% premium over the current stock.

- **Setting up the Debt Schedules:** The debt raised for the LBO includes the amount which is calculated based on maximum capacity; the interest rate representing the cost of borrowing; and the scheduled amortization that is given by the banker or the corporate bond holder. These scheduled principal payments represent the contractual repayment or reduction of the outstanding debt over the life of the loan. The bank loan tends to have a set annual schedule amortization and the bonds are structured to have a balloon payment at the last year of maturity. Figure 18.8 shows the scheduled payments.

- **Calculating the Expected Equity Return:** Typically, if the PE firm does not have a set expectation as part of their investment policy, for example the policy might say that minimum expected return is 25%, then the expected return could be measured by using the Capital Asset Pricing Model (CAPM). The CAPM formula, as mentioned in method #2 above is as follows:

$$E_r = Rf_r + \beta\ (M_r - Rf_r)$$

where E_r is the Expected Return, Rf_r is the Risk-Free Rate, β is the Beta of the company that is analyzed and M_r is Market Return.

In Figure 17.7 shows that the expected return is calculated at 12.9% based on risk free rate of 2.25%, Marker Return Premium of 9.0% and Company Beta of 1.18x.

INSERT 17.7 FIGURE

Hyatt Hotels Corporation
CORPORATE VALUATIONS

METHOD #7 - Leveraged Buyout (LBO) Analysis

Transactions Uses	Current Stock Price	Premium	Purchase Stock Price	Shares Outstanding (millions)	Total Amount ($ 000's)	% Total Uses	EBITDA Multiple
Purchase of 100% Shares	$ 77.93	0%	$ 77.93	117,448	**9,152,748**	83.48%	13.93x
Refinance Short-Term & Long Term Debt					**1,440,000**	13.13%	2.19x
Transaxtion Fees & Expenses	3.50%				**370,746**	3.38%	0.56x
Total Cost of Transaction (Uses)					**10,963,494**	100.00%	16.69x

Transactions Sources	EBITDA Multiple (Capacity)	Interest Rate / Expected Return	After Tax Interest Rate Adjustments	WACC Calc	Total Amount ($ 000's)	% Capital
Bank Loan	3.50x	5.0%	3.20%	0.671%	**2,299,500**	20.97%
Corporate Bonds	2.50x	8.0%	5.12%	0.767%	**1,642,500**	14.98%
Total Debt	6.00x				**3,942,000**	35.96%
Equity	10.69x	12.9%	12.9%	8.243%	**7,021,494**	64.04%
Total Sources	16.69x			9.681%	**10,963,494**	100.00%

Cost of Equity Calc	
Risk Free Rate (5 year)	**2.25%**
Premium based on MC =	**9.00%**
Hyatt Beta =	**1.18x**
Expected Equity Return =	**12.9%**

Debt Schedule	Years	Rate	6/30/2018	LTM 12/31/2018	12/31/2019	12/31/2020	12/31/2021	12/31/2022	12/31/2023	12/31/2024	12/31/2025
Bank Loan	7	5.0%									
Outstanding			2,299,500	2,299,500	2,199,500	2,074,500	1,924,500	1,724,500	1,474,500	1,124,500	-
Scheduled Principal Payments (P)				-	100,000	125,000	150,000	200,000	250,000	350,000	1,124,500
Interest Payments (I)				114,975	114,975	109,975	103,725	96,225	86,225	73,725	56,225
Total Payments (P+I)				114,975	214,975	234,975	253,725	296,225	336,225	423,725	1,180,725
Corporate Bonds	10	8.0%									
Outstanding			1,642,500	1,642,500	1,642,500	1,642,500	1,642,500	1,642,500	1,642,500	1,642,500	1,642,500
Scheduled Principal Payments (P)				-	-	-	-	-	-	-	-
Interest Payments (I)				131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400
Total Payments (P+I)				131,400	131,400	131,400	131,400	131,400	131,400	131,400	131,400
Total Debt Payments				246,375	346,375	366,375	385,125	427,625	467,625	555,125	1,312,125
Total Debt Outstanding				3,942,000	3,842,000	3,717,000	3,567,000	3,367,000	3,117,000	2,767,000	1,642,500

Figure 17.7

- **Running Projections:** The projections are basically the same as method 6. Starting with the Revenue growth rates and building the cost assumptions based on revenue. The only main difference is that the projections under the LBO method uses the new debt raised to buy the target company. In figure 17.8 below the stream of free cash flows are calculated based on Revenue growth of approximately 10% per year and the costs are set flat as percentage of revenue. The debt service including the interest and principal payment are then laid (see Figure 17.7) to determine the final free cash flows. Sometimes, the private equity firm that is interested in buying the target company might run their own set of projections based on their equity plan which could include cost savings or revenue enhancements.

- **Determining the Terminal Value:** The Terminal value is derived similarly as in method 6 – using two methods including the EBITDA trading method and perpetuity method. In figure 17.8 below, the EBITDA multiple used is 15.67x (as determined Method 4 – average pier multiple). The Perpetuity method for determining the terminal value uses a 9.68% WACC and 7.74% growth rate representing 80% of WACC (rule of thumb concept where the WACC is highly correlated to the growth of the company).

- **Determining the Value of the Firm:** Since the Equity return expectation is set, the future cash flows are then present-valued back using the minimum equity return as described above. In figure 17.8 the minimum equity return is 12.9%. Using 12.9% as the discount rate on the future free cash flow and terminal value, the value of Hyatt is estimated at $10.1 billion

INSERT 17.8 FIGURE

Hyatt Hotels Corporation
CORPORATE VALUATIONS

METHOD #7 - Leveraged Buyout (LBO) Analysis

			year =	1	2	3	4	5	6
Discout Cash Flow Valuation Analysis	Historical Assumptions	Projected Assumptions	Input Actual	LTM				EXIT YEAR	
			6/30/2018	12/31/2018	12/31/2019	12/31/2020	12/31/2021	12/31/2022	#
Revenues			2,613,000	2,874,300	3,161,730	3,319,817	3,485,807	3,660,098	
Revenue Growth				10.0%	10.0%	5.0%	5.0%	5.0%	#
Cost of Revenues (CoGS)	58.0%	58.0%	(1,594,000)	(1,667,094)	(1,833,803)	(1,925,494)	(2,021,768)	(2,122,857)	
Operating Expenses (Excl. Non-rec.)	25.0%	25.0%	(705,000)	(718,575)	(790,433)	(829,954)	(871,452)	(915,024)	
EBIT			314,000	488,631	537,494	564,369	592,587	622,217	
Less Interest				(246,375)	(246,375)	(241,375)	(235,125)	(227,625)	
EBT			314,000	242,256	291,119	322,994	357,462	394,592	
Less Taxes (tax rate x of EBIT)		36.0%	-	(87,212)	(104,803)	(116,278)	(128,686)	(142,053)	
Net Income			314,000	155,044	186,316	206,716	228,776	252,539	
Plus Depreciation	10.0%	10.0%	343,000	287,430	316,173	331,982	348,581	366,010	
Plus Amortization		7 Years		52,964	52,964	52,964	52,964	158,891	
Less Working Capital	0.0%	0.0%		-	-	-	-	-	
Less Capex	6.0%	6.0%	(286,000)	(172,458)	(189,704)	(199,189)	(209,148)	(219,606)	
Cash Flow Before Principal Payment			**371,000**	**322,980**	**365,749**	**392,472**	**421,172**	**557,834**	
Debt Principal Payment				-	(100,000)	(125,000)	(150,000)	(200,000)	
Equity Cash Flows			371,000	322,980	265,749	267,472	271,172	357,834	
EBITDA			**657,000**	**776,061**	**853,667**	**896,350**	**941,168**	**988,226**	
Debt			**1,440,000**	**3,942,000**	**3,842,000**	**3,717,000**	**3,567,000**	**3,367,000**	

Terminal Value	**Assumptions**		**Growth**		
EBITDA Multiple Method	15.67x			(EBITDA x EBITDA Multiple)	15,486,103
Perpetuity Method	9.68%		7.74%	Next Year's Cash Flow / (Discount Rate - Growth)	22,341,996
Average			(80% of WACC)		18,914,049
Less Debt Outstanding (at Exit)					(3,367,000)
Plus Cash (at Exit)					-
Equity Value at Terminal					15,547,049

		PV (for $1)						
Equity Cash Flows	**12.9%**			**322,980**	**265,749**	**267,472**	**271,172**	**15,904,883**
	PV (1) =	**0.8859750**	**$286,152**					
	PV (2) =	**0.7849517**	**$208,600**					
	PV (3) =	**0.6954476**	**$186,013**					
	PV (4) =	**0.6161492**	**$167,082**					
	PV (5) =	**0.5458928**	**$8,682,361**					
	PV=		**$9,530,209**					

Enterprise Value =	**PV of Equity + PV of Debt**
PV of Equity =	**$9,530,209**
+ PV of Debt =	**1,440,000**
+ PV of Cash =	**(879,000)**
Hyatt's Enterprise Value	**10,091,209**

Figure 17.8

Putting all the values together:

Taking all the Enterprise values for methods 1-7 and calculate the per share price will give the analyst a range of the value per share to compare to the current market price and book value price. Figure 17.9 below shows that method 4 and methods 6 and 7 (intrinsic values) results to the stock price higher than the currently traded price of $77.93. This will result to a "BUY" recommendation if these are the only methods used.

INSERT 17.9 FIGURE

Hyatt Hotels Corporation
CORPORATE VALUATIONS

ENTERPRISE VALUATION ANALYSIS	EV	Debt	Cash	Eq Value	Shares Outs	Stock Price
Book Value Equity	4,256,000	1,440,000	879,000	3,695,000	117,448	$ 31.46
METHOD #1 - Market Value / Using the Stock Price	9,713,748	1,440,000	879,000	9,152,748	117,448	$ 77.93
METHOD #2- Intrinsic Value	10,321,479	1,440,000	879,000	9,760,479	117,448	$ 83.10
METHOD #3- Dividend Discount Model (DDM)	8,663,706	1,440,000	879,000	8,102,706	117,448	$ 68.99
METHOD #4 -Average EBITDA Industry Trading Multiples	10,295,586	1,440,000	879,000	9,734,586	117,448	$ 82.88
METHOD #5 - Using Averge EBITDA Transaction Multiples	8,664,384	1,440,000	879,000	8,103,384	117,448	$ 69.00
METHOD #6 - Discount Cash Flow Valuation Analysis	10,603,669	1,440,000	879,000	10,042,669	117,448	$ 85.51
METHOD #7 - LBO Analysis	10,091,209	1,440,000	879,000	9,530,209	117,448	$ 81.14
Average of other methods	**9,710,429**	**1,440,000**	**879,000**	**9,149,429**		**$ 72.50**

Figure 17.9

Methods 6-7: Valuation of Private Companies

The same of valuing the publicly traded companies, there are also multiple methods of calculating privately held companies. Methods 4 and 5 of valuing the company based on EBITDA multiples of comparable publicly traded companies and companies that have been acquired, respectively are very common methods. These methods can be found in the offering memorandum or prospectus of an IPO – basically, the investment bank gives an opinion what the value of the private to public should be based on other comparable companies. The most effective methods for valuing a private company though is finding the intrinsic value by using the methods 6 and 7 described earlier in the chapter. These methods are both based on the company's future cash flow. Method 6, the Discount Cash Flow and method and method 7, the Leveraged Buyout (LBO) method are described below:

Method 6: Discount Cash Flow Method for Private Companies

One of the most effective ways to value a private company is to dive into the company's projections, change the assumptions based on the investor's view how the revenue will grow and at what cost. Since there is no stock price that trades which gives the investor a direct indication of what the company is worth (Market Value), an important method that is used by professional is the Discount Cash Flow (DCF) method which measures the company's intrinsic value. This method that is broadly used by investors, advisors, banks and academics is premised on the principal that the value of a company can be derived by the present value of its projected cash flow. The conduction of this method, as it was discussed earlier in the chapter, is to calculate the first the equity cash flows; identify the exit year; estimate the terminal value in the exit year; and use the expected equity return as the discount rate.

In Fig 17.10 below shows the valuation of the Celerity Technology Inc. is approximately $3 billion or 7.0x current EBITDA based on projections found in Chapter 16. The cash flows were built on the base case projections including a modest growth and flat operating costs as percentage of revenues and other expenses including working capital and capital expenditures. The terminal value is calculated based on two methods: 1. Using 7.5x EBITDA multiple; and 2. Using the perpetuity method (Next Year's Cash Flow / (Discount Rate – Growth)). The discount rate used is 10% and growth of 5% - these are basic "rule of thumb" levels but a more comprehensive approach

will include a discount rate as the Weighted Average Cost of Capital (WACC) and historical growth rate.

INSERT 17.10 FIGURE

Celerity Technogy Inc. ("CTI")
Discount Cash Flow Valuation Method (000's)

			PROJECTED				
						EXIT YEAR	
	Year -1	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Revenues	960,000	1,110,000	1,228,140	1,344,200	1,442,919	1,529,268	1,605,161
Cost of Revenues	(345,000)	(420,000)	(463,078)	(506,823)	(544,053)	(576,709)	(605,474)
Operating Expenses	(230,000)	(257,000)	(271,501)	(289,448)	(306,442)	(322,900)	(338,999)
EBITDA	**385,000**	**433,000**	**493,561**	**547,928**	**592,424**	**629,659**	**660,688**
Less Depreciation & Amortization	(60,000)	(65,000)	(73,688)	(80,652)	(86,575)	(91,756)	(96,310)
EBIT	325,000	368,000	**419,872**	**467,276**	**505,849**	**537,902**	**564,378**
Less Taxes			(129,769)	(147,070)	(156,960)	(158,461)	(162,851)
EAT			**290,103**	**320,206**	**348,889**	**379,441**	**401,527**
Plus Depreciation & Amortization			73,688	80,652	86,575	91,756	96,310
Less Working Capital			2,870	(4,548)	(3,869)	(3,384)	(2,974)
Less Capital Expenditures and Investments			(193,626)	(211,923)	(227,487)	(241,101)	(253,066)
Cash Before Financing Payments			**173,036**	**184,386**	**204,109**	**226,713**	**241,796**
Less Debt Service (Principal + Interest)			(125,450)	(129,600)	(153,450)	(201,750)	(237,250)
Free Cash Flow			**47,586**	**54,786**	**50,659**	**24,963**	**4,546**
TERMINAL VALUE (TV)	**TV Assumptions**						
Terminal Value using EBITDA Multiple Method	EBITDA Multiple = **7.5x**					4,722,439	
Terminal Value using Perpetuity Method	Discount Rate = **10%**					4,835,926	
Average Terminal Value	Growth = **5%**					4,779,182	
Less Debt						(1,030,000)	
Equity Value at Exit Year						3,749,182	
Equity Cash Flows	Equity Expected Return = **20%**		47,586	54,786	50,659	3,774,145	
Present Value of Equity		1,927,111	39,655	38,046	29,316	1,820,093	
Plus Debt		1,190,000					
Less Cash		(65,800)					
Firm Enterprise value		**3,051,311**					
Enteprise Value / EBITDA		7.0x					

Figure 17.10

Method 7: Leveraged Buyout (LBO) Method for Private Companies

Similar to valuing a publicly traded company where the valuation analysis starts from what the investor is willing to pay to acquire the company, privately owned companies can be valued using this same exact method as well. The equity expectation or rate of return is estimated based on the company's business – determining the risk premium the investor is seeking. For example, buying a technology company might require higher expected return as compared to a manufacturing company. The stability of cash flow should dictate the equity return expectation. The rate of return is also determined based on the acquisition structure – basically how much debt the business can finance. Debt capacity is typically derived as multiple of current EBITDA. The new debt level and its debt service laid in the company's projections is the first step to determine the valuation of the company.

In Figure 17.11 below it shows that the valuation for Celerity Technology Inc, using the LBO valuation method is approximately $4 billion or 10x EBITDA. In this case the private equity expects 25% return in its investment after the debt capacity is in bedded in the capital structure – at this time the debt is structured at 6.0x EBITDA.

INSERT 17.11 FIGURE

Celerity Technogy Inc. ("CTI")
LBO Method (000's)

TRANSACTION SOURCES & USES

Sources	Capacity EBITDA x	Amount	% Capital	Inter. / Exp. Ret.	WACC	Uses		Purchase EBITDA Multiple	Amount
Bank Loan	3.5x	1,515,500	33.8%	5.0%	1.1%	Purchase Enteprise Value		10.0x	4,330,000
Corporate Bonds	2.5x	1,082,500	24.2%	8.0%	1.2%	Fees (% EV)	3.50%		151,550
Total Debt	6.0x	2,598,000	58.0%		0.0%				
Equity		1,883,550	42.0%	25.0%	10.5%				
Total Sources		4,481,550	100.0%		**10.5%**				4,481,550

Tax Rate = 36%

DEBT SCHEDULES

	Years	Interest	Year 0	Year 1	Year 2	Year 3	EXIT YEAR Year 4	Year 5
Bank Loal - Outstanding	5	5.0%	1,515,500	1,363,950	1,212,400	1,060,850	909,300	-
Bank Loan - Principal Incr./Decr.				151,550	151,550	151,550	151,550	909,300
Bank Loan - Interst Payment				75,775	68,198	60,620	53,043	45,465
Bonds - Outstanding	10	8.0%	1,082,500	1,082,500	1,082,500	1,082,500	1,082,500	1,082,500
Bonds - Principal Incr./Decr.				-	-	-	-	-
Bonds - Interst Payment				86,600	86,600	86,600	86,600	86,600

CASH FLOW PROJECTIONS

	Year -1	Year 0	Year 1	Year 2	Year 3	EXIT YEAR Year 4	Year 5
Revenues	960,000	1,110,000	1,228,140	1,344,200	1,442,919	1,529,268	1,605,161
Cost of Revenues	(345,000)	(420,000)	(463,078)	(506,823)	(544,053)	(576,709)	(605,474)
Operating Expenses	(230,000)	(257,000)	(271,501)	(289,448)	(306,442)	(322,900)	(338,999)
EBITDA	**385,000**	**433,000**	**493,561**	**547,928**	**592,424**	**629,659**	**660,688**
Less Depreciation	(60,000)	(65,000)	(73,688)	(80,652)	(86,575)	(91,756)	(96,310)
Less Amortization			(30,310)	(30,310)	(30,310)	(30,310)	(30,310)
EBIT	325,000	368,000	**389,562**	**436,966**	**475,539**	**507,592**	**534,068**
Less Taxes			(140,242)	(157,308)	(171,194)	(182,733)	(192,265)
EAT			**249,320**	**279,658**	**304,345**	**324,859**	**341,804**
Plus Depreciation & Amortization			103,998	110,962	116,885	122,066	126,620
Less Working Capital			2,870	(4,548)	(3,869)	(3,384)	(2,974)
Less Capital Expenditures and Investments			(193,626)	(211,923)	(227,487)	(241,101)	(253,066)
Cash Before Financing Payments			**162,563**	**174,149**	**189,874**	**202,441**	**212,383**
Less Debt Service (Principal + Interest)			(125,450)	(129,600)	(153,450)	(201,750)	(237,250)
Free Cash Flow			**37,113**	**44,549**	**36,424**	**691**	**(24,867)**

TERMINAL VALUE (TV)	**TV Assumptions**						
Terminal Value using EBITDA Multiple Method	EBITDA Multiple =	**10.0x**				6,296,585	
Terminal Value using Perpetuity Method	Discount Rate =	**10.5%**				3,856,429	
Average Terminal Value	Growth =	**5.0%**				5,076,507	
Less Debt						(1,030,000)	
Equity Value at Exit Year						4,046,507	
Equity Cash Flows	Equity Expected Return =	**25%**	37,113	44,549	36,424	4,047,197	
Present Value of Equity	1,734,583		29,690	28,511	18,649	1,657,732	
Plus Debt	2,598,000						
Less Cash	-						
Firm Enterprise value	**4,332,583**						
Enteprise Value / EBITDA	10.0x						

Figure 17.11

Methods 8: Valuation of Distress Firms

Out of the traditional methods 1-7 discussed in detailed earlier in this chapter the DCF analysis is the one that can be closely related to Method 8. The DCF valuation is based on the present value of the future cash flows at a pre-determined discount rate that will provide an estimate of the

value of the equity or the firm. Method 8 is unique because it uses option pricing model such the Black-Scholes to value the equity for a company that is currently either distress or in bankruptcy. Of course, the equity value in a company that is in bankruptcy is expected to be close to zero or negative as the Liabilities reported are higher than the assets of the company. The option pricing theory values the present value of the equity and enterprise based on future cash flows post-bankruptcy.

Option Pricing Model Framework:

In option pricing and specifically in call options the Payoff formula or Intrinsic Value of the option is:

$$\textbf{Option Payoff = Max (0, S – X)}$$

where S is the Stock price and X is the exercise price.

To calculate the Enterprise Value:

$$\textbf{EV = E + D – C} \quad \textbf{or} \quad \textbf{EV = E + net D}$$

Where EV is the Enterprise Value of the firm, E is the Equity Value, D is the Debt and C is Cash. The net D is referred to as Debt minus Cash implied that the current debt could be paid with cash on hand.

Solving for Equity:

$$\textbf{E = EV – net D}$$

Where E is the Equity, EV is the Enterprise Value and net D is the net Debt.

The equity in a firm is the residual value after the company defaults. That is, the equity is at the bottom of the waterfall from any proceeds from selling the firm. These proceeds are used to pay the debt and other financial claims first and anything that is left over goes towards the equity. Payoff to equity on liquidation is the value minus the debt.

The Black-Scholes formula is:

$$\boldsymbol{C\ option\ Payoff = Se^{-\delta.t}\ .N\ (d1) - Xe^{-i.t}.N\ (d2)}$$

Where S is the stock price, δ is the dividend yield, t is time until expiration, X is the option exercise price, i is the risk-free interest rate, N is the Normal Distribution.

$$\boldsymbol{d1 = \frac{\left[\ln\left(\frac{S}{X}\right)+\left(i-\delta+\frac{\sigma^2}{2}\right).t\right]}{\sigma\sqrt{t}}} \textbf{ and } \boldsymbol{d2 = d1 - \sigma\sqrt{t}}$$

Where S is the current stock price, the X is the contractual exercise price, i is the free risk interest rate, δ is the dividend yield, σ is the standard deviation and t is time to expiration.

Putting it all together

To calculate the present value of the equity or the firm during distress time where the current equity most likely is out of the money, that is the debt is higher than the enterprise value or in option terms the $S - X < 0$, the analyst can use the Black-Scholes model to determine the present value based on future cash flows post-debt restructuring or bankruptcy.

The equity can be viewed as a call option (C) premium, the debt and other financial claims can be viewed as the exercise price (X) and the enterprise value can be viewed as the current stock price (S). Since the debt of the firm has a maturity date, the equity investors can liquidate the firm at a time prior to the maturity, similar to exercise the option any time before the option expires.

For example, let us assume that the assets of the firm are valued at $1 Billion and that the standard deviation of this asset is 20%. Also assume that the book value or face value of the 5-year debt is $1,200 million. If the 5-year risk free bond rate is 3.0%, how much is he equity worth? In applying the Black-Scholes option pricing model the answer is as follows:

INPUT:
S = Value of the firm = $1 billion
X = Exercise Price = Debt Value = $1,200 million
σ = The Standard Deviation of the Asset = 20%
t = time = term of the bond = 5 years
i = the risk-free rate = 3.0%
δ = Dividends = cash flow paying the equity = $0
C = Equity Value = E = ?

FORMULAS & OUTPUT:
using the formula to determine the deviations d1 and d2:

$$\boldsymbol{d1} = \frac{\left[\ln\left(\frac{S}{X}\right)+\left(i-\delta+\frac{\sigma^2}{2}\right).t\right]}{\sigma\sqrt{t}} \text{ and } \boldsymbol{d2} = \boldsymbol{d1} - \boldsymbol{\sigma\sqrt{t}}$$

$$\boldsymbol{d1} = .\mathbf{7671} \text{ and } \boldsymbol{N(d1)} = .\mathbf{7785}$$

$$\boldsymbol{d2} = .\mathbf{5678} \text{ and } \boldsymbol{N(d2)} = .\mathbf{7149}$$

Using the Black Sholes formula:

$$\boldsymbol{C = Se^{-\delta.t}.N(d1) - Xe^{-i.t}.N(d2)}$$

$$\boldsymbol{C = \$152.0\,million}$$

Despite the value of the current equity is negative $200 million (Asset of $1,000 million – Debt $1,2000 million) indicating that is out of the money, the value of equity until maturity on a present value basis is at $152 million. Subtracting from $152 million equity value from the $1,000 million asset value results to $848 million of current debt value).

Therefore, the interest rate of the debt is $\left(\frac{\$1200}{\$848}\right)^{\frac{1}{5}} - 1 = 0.0719\ or\ 7.19\%$

Case Study: AB Air Co.

Figure 17.12 shows a real-life example of AB Air Co. (changed the name and figures to protect the private information), an airline company, that entered in bankruptcy in 1990. At the time of the filing, the Debt outstanding, representing the exercise price X was at $600 million with a remaining life or duration of 5 years. To establish the value of equity, the enterprise value needs to be calculated. The management puts together a business plan including 5 years of projections. In the first year, the company is planning to spend more money - representing restructuring costs and downsizing. Based on the 5 years projections the equity analyst could calculate the present value of the future cash flows, an estimated terminal value and an assumed discount rate using the Weighted Average Cost of Capital of 10.5%.

The DCF Analysis yields an enterprise value or the value of S of $934 million. Obviously with S=$934 million and X= $600 million the equity is "in the money". Using the Black-Scholes option pricing model the equity or the call option C is calculated at $575 million after taking into consideration the combined variance for both debt and equity using the following formula:

$$\boldsymbol{\sigma sb^2 = Ws^2.\sigma s^2 + Wb^2.\sigma b^2 + 2\,(Ws.Wb.\sigma s.\sigma b).\rho}$$

Where σsb^2 is the combined variance of bonds and stocks, Ws is the percentage of stocks to total capitalization, the σs^2 is the stock price variance prior to bankruptcy, Wb is the bond outstanding as percentage of total capitalization, σb^2 is the bond price variance prior to bankruptcy, and ρ is the correlation between the stock and bond prices.

INSERT 17.12 FIGURE

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CASE STUDY: AB Air Co.

File for Bankruptcy 1990

DEBT ASSUMPTIONS		**VALUE ASSUMPTIONS (Pre-bankrupcy)**	
Debt Outstanding =	600	Stock Montly Var. (1985 - 1990) =	3.15%
Weighted Average Duration=	5 years	Bonds Monthly Var. (1985 - 1990) =	2.16%
Weighted Average maturity=	8.7 years	Correlation between Stock/Bond	0.25
WACC=	10.0%	Debt proportion (1987 - 1991) =	88.30%
Tax Rate =	36.0%		

Discount Cash Flow Analysis ($ millions)		**1991**	**1992**	**1993**	**1994**	**1995**	
Revenue		1,250.0	1,137.5	1,114.8	1,159.3	1,205.7	
CoGS		(980.0)	(810.0)	(668.0)	(695.6)	(723.4)	
Oper. Exp.		(720.0)	(210.0)	(205.8)	(214.0)	(222.6)	
EBIT		**(450.0)**	**117.5**	**241.0**	**249.7**	**259.7**	
EBIT (t)		**(162.0)**	**42.3**	**86.8**	**89.9**	**93.5**	
EBIT (i-t)		**(288.0)**	**75.2**	**154.2**	**159.8**	**166.2**	
Less Maintenance Capex (offset by Depreciation)		-	-	-	-	-	-
Less W/C (assumiung $0)		-	-	-	-	-	
Cash Flow		(288.0)	75.2	154.2	159.8	166.2	
Terminal Value assumption	5.0x EBIT					1,298.5	
EV (PV) of the firm	**$934.8**	**(288.0)**	**75.2**	**154.2**	**159.8**	**1,464.7**	

Step 1 - Find the annualized in stock and bond prices:

Annualized Variance in Stock Price σ^2 =	0.37812 (annual)	St. Dev.=	0.6149146
Annualized Variance in Bond Price σ^2 =	0.2592 (annual)	St. Dev.=	0.5091169

Step 2 - Find the annualized variance in firm value

(we^2 x σe^2) + (wb^2 x σb^2) + 2. (we x wd x ped x σe x σd). C

We=	11.70%	C=	0.25
Wd=	88.30%		

Annualized Variance in firm value 0.211314

The five-year bond rate (corresponding to the weighted average duration of 5.1 years) is 6.0%

Stet 3 - Find the value of call based upon the following parameters of equity as a call option

Value of the underlying asset = S = Value of the firm =	$934.8
Exercise Price = X = Face Value of outstanding debt =	$600.0
Life of the option = t = Weighted average duration of debt=	5 years
Variance in the value of the underlying asset = σ^2 =	0.2113143
Riskless Rate = I = T-Bond for option life =	6.00%

d1=	1.23721	N (d1) =	0.8919954
d2=	0.209313	N (d2) =	0.5828981

Value of the call (Equity) = 574.5364

Figure 17.12

CASE STUDY AND PRACTICE CASES

1. Based on the information below, complete the projected spreadsheet. (access spreadsheet www.professordrou.com)

   TO BE PROVIDED LATER

References (Chapter 17)

TO BE PROVIDED LATER