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Valuation and DCF Analysis

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Agenda

- The Big Idea Behind DCF Analysis and Valuation

- DCF – How to Project Free Cash Flow

- DCF – Discount Rates and WACC

- DCF – Terminal Value

- How Different Factors Affect the DCF

- Comparable Public Companies (Public Comps)

- Precedent Transactions (M&A Comps)

- How to Put Together and Use a Full Valuation

- Trade-Offs of Different Methodologies

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Key Rule #1: The Big Idea Behind DCF Analysis and Valuation

- Reminder: Company Value = Cash Flow/ (Discount rate - Cash Flow Growth Rate)
  - This formula is useful if the discount rate and cash flow growth stay the same over time
- However, since the discount rate and cash flow rate change over time, valuation is more complicated than this simple formula
- Two main ways to reflect the economic reality accurately
  - 1. Project company's cash flows and discount rate in detail over the next 5,10,15 years (near term) and assume the cash flow growth rate and discount rate stay the same after that in the terminal period, and value the company in the terminal period using the formula above
  - 2. Use valuation multiples for the companies near term financial results - the next year or two - and don't rely on cash flows or projections at all

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Method #1: The Discounted Cash Flow Analysis (DCF)

- Intrinsic Method: valuing company based on its cash flows as opposed to external factors

- For example, you project companies cash flows over next 10 years, and conclude that the Present Value is $1,200 at a Discount Rate of 10%. The present value of cash flows in the terminal period is $1,500 and the implied value is $2,700

  - Implied Value= Present Value of Cash Flows in Near Term + Present Value of Cash Flows and Terminal Period

  - $1,200+ $1,500= $2,700

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Method 2: Relative Valuation

- Collect set of comparable companies and M&A transactions, calculate their valuation multiples, and then apply those multiples to the company you're valuing

- For example, similar companies in the sector trade at EV/EBITDA multiples between 10x and 12x

  - Your company has EBITDA of $200, so its Implied Enterprise Value should be between $2,000 and $2,400

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Application of DCF and Relative Valuation

- Once you have valued company using relative and intrinsic valuation, you can see how it's Implied Value compares with its Current Value

- For example, maybe the company's current Enterprise Value is **$2,000,** but the DCF produced an Implied Value of **$2,700**, and comparable companies showed an Implied Value between **$2,000 and $2,400**

  - Therefore, the company seems **undervalued**

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Key Rule #2: How to Project Free Cash Flow

- The first step in the DCF is project company's cash flows in explicit forecast period (usually next 5-10 years)

- You use **unlevered free cash flow** in all DCF analyses

- Must project all items that are non-recurring or relate only to specific investor groups rather than all investors

  - 1. Revenue

  - 2. COGS/Operating expenses

  - 3. Taxes

  - 4. Depreciation and Amortization

  - 5. Change in working capital

  - 6. CapEx

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Unlevered Free Cash Flow

- Unlevered free cash flow is recurring business cash flow available to all investors
- **Unlevered free cash flow = NOPAT + Non cash adjustments + Change in working capital - CapEx**
  - Note: do not include all non-cash adjustment, just include depreciation and amortization
    - Most non-cash adjustments outside D+A are non-recurring
    - Stock based compensation, which creates additional shares and dilutes existing investors, and other common recurring non-cash adjustments are not real cash expenses and should not be added back to calculate free cash flow
- Now you must make actual projections for unlevered free cash flow

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Intro to Projections

Net sales			
Unrelated parties	$ 7,407,233	$ 8,481,567	$ 7,087,101
Related parties	187,178	274,385	285,823
Total net sales	7,594,411	8,755,952	7,372,924
Costs of goods sold	6,862,693	7,789,741	6,653,780
Gross profit	731,718	966,211	719,144
Selling, general and administrative expenses	327,626	316,214	272,777
Profit sharing	23,064	42,126	27,764
Amortization of intangible assets	25,312	27,551	31,770
Asset impairment charges	428,500	260,000	308
Operating income (loss)	(72,784)	320,320	386,525
Interest expense, net of capitalized interest	153,950	137,263	127,728
Other (income) expense, net	15,383	18,254	(4,033)
Income (loss) before income taxes	(242,117)	164,803	262,830
Income tax expense (benefit)	(96,947)	73,153	99,314
Net income (loss)	(145,170)	91,650	163,516
Net loss attributable to noncontrolling interests	14,859	65,374	25,798
Net income (loss) attributable to Steel Dynamics, Inc.	$ (130,311)	$ 157,024	$ 189,314

You always need to project all of these items (Revenue, COGS, and OpEx), but note that Amortization and Depreciation are often *embedded* within other line items such as COGS.

Don't project this! Impairments, Write-Downs, Gains/Losses, etc. are all non-recurring.

These items shouldn't be a part of *Unlevered* FCF since they relate to debt investors and non-core-business Assets.

You do project Taxes in Unlevered FCF, but

And then on the Cash Flow Statement:

perating activities:			
Net income (loss)	$ (145,170)	$ 91,650	$ 163,516
Adjustments to reconcile net income (loss) to net cash provided by operating activities:			
Depreciation and amortization	294,595	263,325	230,928
Impairment charges	428,500	260,000	308
Equity-based compensation	22,604	14,016	15,504
Deferred income taxes	(99,323)	(25,042)	30,737
Loss on disposal of assets	9,763	5,561	1,082
Changes in certain assets and liabilities:			
Accounts receivable	311,302	(2,191)	(78,237)
Inventories	488,003	68,730	(108,025)
Other assets	3,284	3,064	13,705
Accounts payable	(227,092)	(76,141)	40,141
Income taxes receivable/payable	12,706	(22,086)	(12,494)
Accrued expenses	(60,689)	36,686	15,010
Net cash provided by operating activities	1,038,483	617,572	312,175

Use NOPAT rather than Net Income.

You always project D&A.

Leave these out; non-recurring or not "real" non-cash expenses.

You can project Deferred Income Taxes but make them decrease over time.

Leave this out; non-recurring.

Include all these Working Capital line items.

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Projections

- #1: Revenue
  - Can use several approaches to project revenue depending on amount and detail you need in DCF
  - Approaches
    - 1. Simple Percent Growth Rate (assume revenue grows at 5% rate per year)
    - 2. Units Sold * Average Selling Price
    - 3. Market Shares * Market Size
- #2: Assume Operating (EBIT) Margin or Project COGS and CapEx
  - Simplest approach is to make company's operating income or EBIT a percent of revenue and make it grow or decline overtime to reflect business trends
  - You could also project expenses based on individual employees and major categories like rent and marketing

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Projections Cont.

- #3: Calculate NOPAT (Net Operating Profit After Taxes)
  - Use company's effective tax rate: EBIT * (1-tax rate)
    - Note: taxes should not reflect tax benefits on debt
- #4: Project Depreciation and Amortization and other possible non-cash adjustments
  - Project depreciation and amortization as a percentage of revenue and use the average percent historically or make it decrease overtime as CapEx falls
  - Deferred income taxes as a percentage of income statement taxes that should decrease over time because they represent timing differences
  - For recurring items in this section, use historical percentage of revenue to make these items decrease over time

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Projecting Depreciation and Amortization

Steel Dynamics Inc. - FCF Projections:	Units:	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25
						Projected					
Revenue:	$ M	$ 7,716.0	$ 8,406.2	$ 9,259.3	$ 10,127.2	$ 11,006.6	$ 11,881.3	$ 12,850.7	$ 13,435.9	$ 13,914.3	$ 14,301.6
Revenue Growth Rate:	%	1.6%	8.9%	10.1%	9.4%	8.7%	7.9%	8.2%	4.6%	3.6%	2.8%
Operating Income (EBIT):	$ M	379.4	461.2	566.3	660.0	789.2	903.0	1,002.4	1,051.8	1,093.2	1,125.6
Operating Margin:	%	4.9%	5.5%	6.1%	6.5%	7.2%	7.6%	7.8%	7.8%	7.9%	7.9%
Growth Rate:	%	6.7%	21.6%	22.8%	16.5%	19.6%	14.4%	11.0%	4.9%	3.9%	3.0%
(-) Taxes, Excluding Effect of Interest:	$ M	(151.8)	(184.5)	(226.5)	(264.0)	(315.7)	(361.2)	(400.9)	(420.7)	(437.3)	(450.3)
Net Operating Profit After Taxes (NOPAT):	$ M	227.7	276.7	339.8	396.0	473.5	541.8	601.4	631.1	655.9	675.4
Adjustments for Non-Cash Charges:											
(+) Depreciation & Amortization:	$ M	246.9	=+K99*K86	268.5	293.7	308.2	332.7	347.0	362.8	375.7	386.1
% Revenue:	%	3.2%	3.2%	2.9%	2.9%	2.8%	2.8%	2.7%	2.7%	2.7%	2.7%
(+) Deferred Income Taxes:	$ M	37.9	36.9	34.0	26.4	31.6	18.1	20.0	21.0	21.9	22.5
% Income Statement Taxes:	%	25.0%	20.0%	15.0%	10.0%	10.0%	5.0%	5.0%	5.0%	5.0%	5.0%

The percentage is decreasing slightly over time since CapEx as a % of Revenue also falls.

Historically, Deferred Taxes as a % of Income Taxes have been very high. But we don't want them to be a major value driver, so we greatly decrease the percentages over time.

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Projections Continued

- #5: Percent Change in Working Capital

  - Build 3-statement projection model for company

  - If not, recommend simplifying it and projecting the change in working capital as a percentage of change in revenue or as a percentage change in revenue

- #6: Capital Expenditures

  - CapEx must linked to company's sales growth

  - Some model assume CapEx drives revenue, but doesn't always work that way

    - Cap Ex grows as revenue grows, but it doesn't drive revenue

  - Make CapEx a percent of revenue as that refers to company's ongoing maintenance requirements

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CapEx Grows as Revenue Grows

- If a company is growing, D+A as a percentage of revenue and CapEx as a percentage of revenue should not be equal

CapEx is a simple % of Revenue, and it always stays ahead of D&A.

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Projections Continued

- #7: Calculate Unlevered Free Cash Flow

  - Take NOPAT factor in non-cash adjustments, change in working capital, and CapEx to calculate unlevered free cash flow

  - Remember that the point of the DCF is that company's FCF growth eventually slows down and starts growing at about same rate- the terminal growth rate- into perpetuity

  - Your analysis must reflect these slowing growth rates by end of explicit forecast period

  - If not, your growth rates will be much higher than GDP growth rate or the rate of inflation

							Projected				
Steel Dynamics Inc. - FCF Projections:	Units:	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25
Revenue:	$ M	$ 7,716.0	$ 8,406.2	$ 9,259.3	$ 10,127.2	$ 11,006.6	$ 11,881.3	$ 12,850.7	$ 13,435.9	$ 13,914.3	$ 14,301.6
Revenue Growth Rate:	%	1.6%	8.9%	10.1%	9.4%	8.7%	7.9%	8.2%	4.6%	3.6%	2.8%
Unlevered Free Cash Flow:	$ M	$ 236.4	$ 253.9	$ 303.3	$ 348.6	$ 428.1	$ 480.5	$ 534.4	$ 582.6	$ 612.1	$ 635.6
Growth Rate:	%	(71.2%)	7.4%	19.4%	14.9%	22.8%	12.2%	11.2%	9.0%	5.1%	3.8%
EBITDA:	$ M	$ 626.4	$ 730.2	$ 834.8	$ 953.7	$ 1,097.4	$ 1,235.7	$ 1,349.3	$ 1,414.6	$ 1,468.9	$ 1,511.8
Growth Rate:	%	(3.7%)	16.6%	14.3%	14.2%	15.1%	12.6%	9.2%	4.8%	3.8%	2.9%

Notice how **ALL** of these growth rates slow down over time and approach the expected long-term GDP growth rate or rate of inflation by the end of the 10-year forecast period. That's what we want to see!

If we didn't see both of those, we'd have to go back and revisit the assumptions or possibly extend the forecast period.

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Key Rule #3: DCF- Discount Rates & WACC

- Once you have projected Unlevered FCF in forecast period, you have to discount it back at the appropriate discount rate
- Discount rate is the opportunity cost for investors- what he/she could earn each year by investing in other, similar companies
  - Higher discount rate: risk and potential returns are higher, company is less valuable because it means investors have better opportunities elsewhere
  - Lower discount rate: risk and potential returns lower

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WACC Overview

- You use WACC (weighted average cost of capital) for the discount rate with Unlevered FCF because they both represent all investors in the company

- **WACC = (cost of equity * % equity) + (cost of debt * (1-tax rate) * % debt) + (cost of preferred stock * % preferred stock)**

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Cost of Debt and Preferred Stock

- The cost of debt and preferred stock are rates the company would pay if issued additional debt or preferred stock
    - We don't know these rates, but can make approximations using current coupon rates of company's debt and preferred stock
- Method #1: Coupon Rate Method
    - For example, a company has $1,000 of bonds and the coupon rate is 5%, that is the company's pre-tax cost of debt. Interest paid on debt is tax deductible, so multiply by (1-tax rate) to get cost of debt
    - If company has $1,000 in preferred stock and issues $100 dividends per year, the cost of preferred stock is 10%

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Cost of Debt and Preferred Stock cont.

- Method #2: Look at yield to maturity on debt, which reflects its current market price

    - Basic idea: if a company's bonds trade at at a discount to par value (for example they were issued at $1,000 but can now buy them for $990), the yield is higher than the coupon rate of bond.

        - You can purchase bonds for $990 and get back $1,000 in end, so while the stated coupon rate is 5% the actual yield rate is closer to 5.2% over a 5 year period

    - The opposite applies to bonds trading at a premium to par value: the yield you receive will be less than the coupon rate on bond since you get less upon maturity

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Cost of Debt and Preferred Stock Cont.

- Method #3: Risk Free Rate: the coupon rate on government bonds in the country and add a default spread based on company's credit rating
  - For example, if company's EBITDA/Interest is currently 2x and is expected to remain below 2.5x, that might imply a BB+ credit rating, companies with BB+ credit rating may pay on average 2.5% above risk free rate on debt issued
- The only difference between cost of preferred debt and stock is that preferred debt is tax deductible and must be multiplied by (1-tax rate)

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Cost of Equity

- Cost of equity is how much company's stock should return, on average, over the long term, also factoring in dividends and stock repurchases
- Use Capital Asset Pricing Model (CapM) to determine cost of equity
  - **Cost of equity= risk free rate + equity risk premium * levered Beta**
  - Risk free rate: what you could earn on safe government bonds denominated in same currency as company's cash flows
  - Levered Beta: how volatile this stock is relative to the market at a whole, factoring in both intrinsic business risk and risk introduced by leverage (debt)
    - If beta is 1.0 $\Rightarrow$ if the market goes up by 10%, the stock price goes up by 10%
  - Equity risk premium: represents % the stock market will return each year on average, above and beyond the rate of safe government bonds
    - Tend to use 6-8% in U.S.

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The Process of Calculating Cost of Equity (Beta)

- The point of valuation is to determine a company's implied valuation (what is should be)

- You could use historical Beta in Cost of Equity calculation and leave it as that

  - Using company's past performance for Beta

- As a result, it is superior to look at peer companies and use the median figure from those

- But, Beta has two risks: inherent business risks and risks from leverage

  - Each company you compare has different capital structure, so risk from leverage will be different

  - To remove risk from leverage and isolate inherent business risk you have to unlever Beta then relever Beta to make it reflect the risk from leverage of company you are valuing

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The Process of Calculating Cost of Equity: Unlevering Beta

- **Unlevered Beta= levered Beta/ 1 + debt/equity ratio * (1- tax rate)**
  - For example, if levered Beta for a peer company is one and company has $500 in debt and an equity value of $1,000 and the tax rate is 40%
  - Unlevered Beta= 1/ (1 + 500/1000 * (1- 40%)
- If there is preferred stock the formula become Unlevered Beta= **levered Beta/ (1+ debt/equity ratio * (1-tax rate) + preferred stock/equity ratio**
- Note: unlevering or levering Beta has nothing to do with unlevered or levered free cash flow

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The Process of Calculating the Cost of Equity: Relevering Beta

- You relever Beta by flipping around the formula

- When you relever Beta, you factor in risk from debt

- **Levered Beta= unlevered Beta * (1 + debt/equity ratio * (1-tax rate) + preferred equity ratio)**

  - For example, the median unlevered Beta in peer companies is 0.80. Our company has $800 in debt, an equity value of $2,000, no preferred stock and a tax rate of 40%

  - Levered Beta= 0.80* (1+$800/$200 (1-40%))=0.992

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The Process of Calculating the Cost of Equity: Relevering Beta

- Relever Beta Meaning: if we ignore the risk of company's debt, its stock price is about 80% correlated with stock market as a whole. But once, we factor in risk from debt, its stock price is nearly 100% correlated

Comparable Companies - Unlevered Beta Calculation:

Name	Ticker	Levered Beta	Debt	% Debt	Preferred Stock	% Preferred	Equity Value	% Equity	Tax Rate	Unlevered
United States Steel Corp.	X	2.49	$ 3,140.0	50.1%	$ -	–	$ 3,130.1	49.9%	40.0%	=D15/(1+(E15/I15)*(1-K15)+G15/I15)
Nucor Corporation	NUE	1.50	4,357.5	21.8%	-	–	15,609.0	78.2%	29.7%	1.25
Commercial Metals Company	CMC	1.58	1,080.0	37.8%	-	–	1,776.7	62.2%	32.6%	1.12
AK Steel Holding Corporation	AKS	2.57	2,078.1	66.7%	-	–	1,036.2	33.3%	40.0%	1.17
Worthington Industries, Inc.	WOR	1.53	584.0	17.6%	-	–	2,732.3	82.4%	27.1%	1.32
Reliance Steel & Aluminum Co.	RS	1.59	2,169.4	29.2%	-	–	5,259.1	70.8%	31.8%	1.24
Median:		1.59	$ 2,123.8	33.5%	$ -	–	$ 2,931.2	66.5%	32.2%	1.25

Notice how Unlevered Beta is always **less than or equal to** Levered Beta. That's because Levered Beta reflects 2 "risks": Risk from Debt and Inherent Business Risk, while Unlevered Beta just reflects Inherent Business Risk.

If a company had **no Debt**, Unlevered and Levered Beta would be the same.

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The Process of Calculating Cost of Equity

- Now, we can calculate cost of equity

  - For example, if our risk free rate is 2.5%, the equity risk premium is 7%, and the levered beta is 0.992

  - Cost of equity= 2.5% + 7% * 0.992 = 9.44%

- However, there is a small problem: you do not want to use company's current capital structure to calculate cost of equity, when our goal is to calculate a company's implied value and see how it compares with current value

- When you unlever beta and relever it, it moves you closer to implied value, now you must do something similar with capital structure

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The Process of Calculating Cost of Equity (capital structure)

- Method #1: Optimal capital structure→ mix of debt, equity, and preferred stock that minimizes WACC, but it is impossible to calculate
- Method #2: Median capital structure→ use median capital structure from peer companies and apply those percentages to your company to determine its optimal structure
  - For example, peer companies have $800 in debt and an equity value of $2,000. The median debt/total capital was 20%, and the median equity/total capital was 80%
  - If our company has total capital of $2,800, these number tell us that it should have 20% * 2,800, or $560 in debt, and 80% * $2,800, or $2,240 in equity
  - As a result both levered and unlevered Beta change
  - Levered Beta= .80 * (1+$560/$2,240*(1-40%))=0.92
  - Cost of equity = 2.5% + 7% * 0.92=8.94%
- Since the company should have less debt in future, the risk from leverage will be lower, making levered Beta and cost of equity lower than calculating on previous page
- If use company's current capital structure, use historical Beta

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There are multiple ways to calculate cost of equity

Discount Rate Calculations - Assumptions:

Risk-Free Rate:	1.55%
Equity Risk Premium:	7.00%
Pre-Tax Cost of Debt:	4.91%
Cost of Preferred Stock:	–

Comparable Companies - Unlevered Beta Calculation:

Name	Ticker	Levered Beta	Debt	% Debt	Preferred Stock	% Preferred	Equity Value	% Equity	Tax Rate	Unlevered Beta
United States Steel Corp.	X	2.49	$ 3,140.0	50.1%	$ -	–	$ 3,130.1	49.9%	40.0%	1.55
Nucor Corporation	NUE	1.50	4,357.5	21.8%	-	–	15,609.0	78.2%	29.7%	1.25
Commercial Metals Company	CMC	1.58	1,080.0	37.8%	-	–	1,776.7	62.2%	32.6%	1.12
AK Steel Holding Corporation	AKS	2.57	2,078.1	66.7%	-	–	1,036.2	33.3%	40.0%	1.17
Worthington Industries, Inc.	WOR	1.53	584.0	17.6%	-	–	2,732.3	82.4%	27.1%	1.32
Reliance Steel & Aluminum Co.	RS	1.59	2,169.4	29.2%	-	–	5,259.1	70.8%	31.8%	1.24
Median:		**1.59**	**$ 2,123.8**	**33.5%**	**$ -**	**–**	**$ 2,931.2**	**66.5%**	**32.2%**	**1.25**
Steel Dynamics Inc.	**STLD**	**1.72**								

Steel Dynamics Inc. - Levered Beta & WACC Calculation

	Ticker	Unlevered Beta	Debt	% Debt	Preferred Stock	% Preferred	Equity Value	% Equity	Tax Rate	Levered Beta
Current Capital Structure:	STLD	1.25	$ 2,591.2	30.0%	$ -	–	$ 6,043.2	70.0%	40.0%	1.57
"Optimal" Capital Structure:	STLD	1.25	2,892.9	33.5%	-	–	5,741.5	66.5%	40.0%	1.62

Cost of Equity Based on Comparables, Current Capital Structure:	**12.53%**
Cost of Equity Based on Comparables, "Optimal" Capital Structure:	**12.92%**
Cost of Equity Based on Historical Beta:	**13.59%**

There isn't necessarily one single "correct" way to calculate Cost of Equity, which is why we look at multiple methods here (Current vs. Optimal Capital Structure vs. Historical Beta).

Our **conclusion** is that Cost of Equity is most likely between 12.5% and 13.5%.

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Putting it all together to calculator WACC

- WACC= (cost of equity * % cost of equity) + (cost of debt (1-tax rate) * % debt) + (cost of preferred stock * % preferred stock)
  - Use company's current capital structure of optimal target structure for the percentages
  - Different approaches to calculate cost of equity- including unlevering and relevering Beta
  - No one agrees on approach to calculate equity risk premium
  - Different approaches to get cost of preferred and cost of debt

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Discounting the Cash Flows

- Once you have WACC, you go back to your Free Cash Flow projections and discount FCF each year to its present value
- **Present Value= cash flow/ ((1+ discount rate)^year #)**
- Do you use same discount rate each year?
  - If company's changing significantly over forecast period, you should change the discount rate
    - Assume company's long term discount rate is closer to rate for mature companies in the industry
  - Can use same WACC when company is mature and is not expected to change in future and when other mature companies have WACCs in similar ranges
- **Use discount rate each year, discount cash flows to their present value and sum everything up**
- Now you have the present value of company's unlevered future cash flows in forecast period

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Key Rule 4: Terminal Value, Gordon Growth Method

- Terminal Value is company's value in far-future period (Terminal Period)

    ○ Assume Discount Rate and Cash Flow Growth Rate remain same

- Terminal Value = Unlevered FCF/(WACC-Terminal Unlevered FCF GR)

    ○ Unlevered FCF is first Free Cash Flow generated in Terminal Period

    ○ Sometimes calculated with Final Year CF * (1+Terminal FCF GR)

    ○ Referred to as Gordon Growth Method

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Terminal Free Cash Flow Growth Rate

- Terminal FCF growth rate is low

  - Below GDP growth rate of the country

  - In-line with inflation rates

- Even with high initial growth rate, company growth will always slow

  - Developed markets such as US, UK and Canada $\cong$ 1-3%

  - Emerging markets such as China and India $\cong$ 3-4%

  - *Much lower rates than explicit period*

- Final FCF growth rate should be close to Terminal FCF growth rate

  - Extend period if needed

  - Change projections if needed

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Multiples Method

- Terminal Value can be calculated with Multiples

- Terminal Value = Terminal EBITDA/EBIT/NOPAT/FCF Multiple *
corresponding metric

  - Multiples commonly based on publicly traded peer companies

    - Discounted substantially as Multiples decrease over time

- Implications

  - Given steady DR, higher multiple = higher growth rate

    - Young, fast growing company tend to trade at higher multiples

  - DR will decline over time, expected growth rate will decline by more

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Advantages, Disadvantages and Cross-Checking

- Neither method is better, each offers advantages and disadvantages
    - If no public comparables, Multiples Method is useless
    - If long-term GDP growth is uncertain, Gordon Growth Method may be less reliable
- Gordon Growth Model to Multiples
    - Step 1: Estimate Terminal FCF growth rate, DR
    - Step 2: Project Terminal Value using Terminal FCF growth rate, DR
    - Step 3: Calculate metric multiple (EBITDA/EBIT/NOPAT)
    - Step 4: Compare to peer companies' multiples and determine feasibility

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Cross Checking cont.

- Multiples method to growth rates

  - Step 1: Determine proper multiple using public comparables

  - Step 2: Project Terminal Value

  - Step 3: Manipulate Gordon Growth Method equation to calculate Terminal FCF Growth Rate

  - Step 4: Evaluate result and determine accuracy

- If assumptions are not reasonable

  - Manipulate Multiple or growth rate

  - Change length of forecast period

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Examples

Terminal Value - Multiples Method:

Median EV / EBITDA of Comps:	6.5 x
Baseline Terminal EBITDA Multiple:	6.0 x
Baseline Terminal Value:	$ 9,070.6
Implied Terminal FCF Growth Rate:	2.7%

Reasonable discount, given that the 6.5x is the median *Year 2* EV / EBITDA multiple of the comps.

Terminal Value - Perpetuity Growth Method:

Expected Long-Term GDP Growth:	3.0%
Baseline Terminal FCF Growth Rate:	2.5%
Baseline Terminal Value:	$ 8,833.0
Implied Terminal EBITDA Multiple:	5.8 x

Not only is the slight discount to long-term GDP growth reasonable, but it's decently close to the 3.8% FCF growth rate in the final projected year.

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Discounting and Summing Present Value

- Once Terminal Value is calculated, must discount it back to Present Value
  - Use Present Value = Terminal Value/((1 + Discount Rate)^Year #)
  - Add PV of Terminal Value to PV of Free Cash Flows
- **In Unlevered DCF, gives Implied Enterprise Value**

Terminal Value - Multiples Method:		
Median EV / EBITDA of Comps:		6.5 x
Baseline Terminal EBITDA Multiple:		6.0 x
Baseline Terminal Value:	$	9,070.6
Implied Terminal FCF Growth Rate:		2.7%
(+) PV of Terminal Value:		3,536.8
(+) Sum of PV of Free Cash Flows:		2,494.4
Implied Enterprise Value:	**$**	**6,031.3**

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Implied Enterprise Value to Implied Equity Value

- If private, stop with Implied Enterprise Value

- If public, continue with Implied Equity Value and Implied Share Price
  - Add non-core business assets
  - Subtract Liability and Equity line items representing Other Investor Groups (Implied Equity Value)
  - Divide by company's diluted share count* (Implied Share Price)
  - Compare to current values

Terminal Value - Perpetuity Growth Method:	
Expected Long-Term GDP Growth:	3.0%
Baseline Terminal FCF Growth Rate:	2.5%
Baseline Terminal Value:	$ 8,833.0
Implied Terminal EBITDA Multiple:	5.8 x
(+) PV of Terminal Value:	3,444.2
(+) Sum of PV of Free Cash Flows:	2,494.4
Implied Enterprise Value:	$ 5,938.6
% of Implied EV from Terminal Value:	58.0%
(+) Cash & Cash-Equivalents:	$ 1,052.7
(+) Equity Investments:	-
(+) Other Non-Core Assets, Net:	8.3
(+) Net Operating Losses:	61.1
(-) Total Debt:	(2,591.2)
(-) Preferred Stock:	-
(-) Noncontrolling Interests:	11.2
(-) Unfunded Pension Obligations:	-
(-) Capital Leases:	-
(-) Restructuring & Other Liabilities:	-
Implied Equity Value:	4,480.7
Diluted Shares Outstanding:	242.017
Implied Share Price from DCF:	$ 18.51
Premium / (Discount) to Current:	(25.9%)

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Proper Calculation Practices

- **Do not double count items**
- If an expense is included within FCF, exclude corresponding Asset or Liability when moving from Implied Enterprise Value to Implied Equity Value, vice versa
- Ex. 1- Rental Expense
  - FCF includes Rental Expense in Operating Expenses, do not capitalize operating leases and subtract from Implied Enterprise Value as a debt-like item
- Ex. 2- Unfunded Pensions
  - Exclude interest expenses, Amortization of Net Losses/Gains and other adjustments from FCF, subtract these when converting to Implied Equity Value

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Revelations

- Implied Enterprise Value, Implied Equity Value and Implied Share Price

- Can determine whether company is overvalued, undervalued or properly valued

  - Based off assumptions, good for determining significant mispricing (20-50-100%)

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Main Determinants of the DCF

- Discount Rate and Terminal Value have biggest impact on DCF output

  - Discount Rate changes *everything*

  - PV of the Terminal Value often represents over 50% of Implied Value

  - Changes in revenue growth, operating margins and CapEx can make an impact, changes need to be much larger

  - Ex. Changing Discount Rate from 8-9% will have much larger impact than changing revenue Growth from 8-9%

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Secondary Determinants

- Country Size and Geography
  - Smaller companies tend to be riskier- high ceiling, low floor
    - *Tend to have higher Costs of Equity and Debt and higher WACC than larger companies*
  - Companies in emerging markets tend to be riskier, higher growth potential with high instability
    - *Tend to have higher Costs of Equity and Debt and higher WACC than companies in established markets, Implied Value will be lower*

Secondary Determinants

- Debt and Equity
  - More Debt makes company riskier as chance of bankruptcy rises
    - *As company uses more Debt, its Cost of Debt and Equity will both increase*
  - Debt is initially cheaper than Equity, heavy debt-leverage will change that
    - *With increases in Debt, WACC will initially decrease as a result but eventually increase once Cost of Debt increases enough*

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Debt and Equity diagram

Debt / Total Capital:	Debt / Equity:	Relevered Beta:	Risk Spread:	Cost of Debt: Pre-Tax:	Cost of Debt: After-Tax:	Cost of Equity:	Implied WACC:	"Accounting" Enterprise Value:	Implied Enterprise Value:
–	–	0.72	1.0%	3.6%	2.2%	7.7%	7.7%	$ 10,770.6	$ 10,413.3
10.0%	11.1%	0.77	1.5%	4.1%	2.5%	8.0%	7.4%	10,770.6	10,576.3
20.0%	25.0%	0.83	2.0%	4.6%	2.8%	8.4%	7.3%	10,770.6	10,696.1
30.0%	42.9%	0.90	2.5%	5.1%	3.1%	8.9%	7.2%	10,770.6	10,770.6
40.0%	66.7%	1.01	5.0%	7.6%	4.6%	9.7%	7.6%	10,770.6	10,431.4
50.0%	100.0%	1.15	6.0%	8.6%	5.2%	10.7%	7.9%	10,770.6	10,214.3
60.0%	150.0%	1.37	7.0%	9.6%	5.8%	12.2%	8.3%	10,770.6	9,918.1
70.0%	233.3%	1.73	8.0%	10.6%	6.4%	14.7%	8.9%	10,770.6	9,552.0
80.0%	400.0%	2.44	9.0%	11.6%	7.0%	19.7%	9.5%	10,770.6	9,126.8
90.0%	900.0%	4.60	10.0%	12.6%	7.6%	34.8%	10.3%	10,770.6	8,654.4

The company gets riskier and riskier for *all* investors as it takes on more Debt.

Initially, the Discount Rate decreases as the company uses more Debt, but past a certain point, more Debt starts *increasing* risk and therefore *increasing* the Discount Rate.

If you pretend that the Discount Rate does NOT change as the company uses more Debt, you get these results.

But in reality, the Discount Rate WILL change, so these results are more accurate.

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Secondary Determinants

- Risk-Free Rate (government bond rate)

  - Higher Risk-Free rate, investors demand higher rates on corporate bonds, stock market expects to return more,

    - *Cost of Equity, Debt and WACC increase, better options around*

    - *Implied Value declines, vice versa*

- Equity Risk Premium

  - Higher Equity Risk premium signals higher percentage stock market returns over Risk-Free rate

    - *Increases Cost of Equity and WACC, no change to Cost of Debt*

    - *Implied Value declines, vice versa*

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Secondary Determinants

- Beta
    - Higher Beta means more stock price volatility and therefore increased expectations for stock growth
        - *Increases Cost of Equity and WACC, no change to Cost of Debt*
        - *Implied Value declines, vice versa*
- Tax Rate
    - Higher tax rate increases tax benefits of debt, decreases re-levered beta
        - *Decreases Cost of Equity, Debt and WACC*
        - *Implied Value likely decreases, higher tax rates negatively affect FCF*

Key Rule 7: Comparable Public Companies (Public Comps)

- "Valuation" refers to DCF; other methodologies like comparable public comps and precedent transactions (next section) are just shorthand

- Instead of projecting/analyzing future cash flows, you compare them to similar companies and use valuation multiples to from those companies to value the company you are looking at

- Process of public comps is as follows:

  - Select appropriate set of comparable companies

  - Determine the metrics and multiples you want to use

  - Calculate the metrics and multiples for all the companies

  - Apply median (or 25th, 75th percentile, or other) multiples to your company, to estimate implied EV and implied equity value

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Step 1: Select Set of Appropriate Companies

- Normally start with a broad set of companies and then narrow it based on industry, geography, and size

- A set of 5-10 companies is a good target. To get down to 5-10 companies, screen by geography, industry, and size to get a similar set. If you can't get enough companies, expand your criteria. If you get too many, narrow them

- This screen is important to find companies with similar discount rates. This is because when companies are similar, but one trades at higher multiples, its expected cash flow growth rate is higher

- Avoid screening both financial metrics and equity value or EV, because then you're artificially constraining the multiples, so its best to creates screens based on metrics like revenue, EBITDA, or FCF

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Step 2: Determine the Metrics and Multiples You Want to Use

- In most industries, look at 1 sales-based metric and multiple and 2 profitability-based metrics and multiples. For example the following:

    - Revenue, EV/Revenue, and revenue growth

    - EBITDA, EV/EBITDA, and EBITDA growth and margins

    - Net Income, P/E, and net income growth and margins

- May vary by industries with significantly different metrics and multiples.

- Time periods matter a lot, so use a mix of historical and projected metrics, often 1 historical and 2 projected versions of each metric. For example, you might use the 3 following metrics for revenue:

    - Last Twelve Months (LTM) Revenue

    - Current Year Projected Revenue

    - Next Year Projected Revenue

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Step 3: Calculate the Metrics and Multiples for All the Companies

- Calculate current equity value and current enterprise value based on current share prices, shares outstanding, and more recent balance sheets

- Add back non-recurring charges, like restructuring, legal expenses, etc.

- Don't make your own projections for each comparable company, because you want **current** valuation multiples. Instead use what the market as a whole thinks about each company, eg. equity research reports, consensus estimates etc.

- "Calendarize" comparable companies that have fiscal years ending on different dates by adjusting financial metrics to match companies in the set

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Step 3 cont.

Final note: Always use a company's current equity value and current enterprise value, because a company's share price already reflects historical and expectations for future performance. Its multiples should decline into the future

Notice how the multiples **DECLINE** over time because we use the same Equity Value and Enterprise Value, but the company's Revenue and EBITDA grow each year.

If the multiples do **not** decline, it means the underlying metrics have stayed the same or shrunk.

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Step 4: Apply the Multiples to Your Company

- Calculate the minimum, minimum, 25th percentile, median, 75th percentile, and maximum for each version of each multiple, and then apply those multiples to your company to value it

- Example: The median LTM EV / EBITDA multiple for the comparable companies is 12x. The LTM EBITDA for the company you are valuing is $500 million. Therefore, your company's implied enterprise value based on the LTM EV / EBITDA of the public comps is 12 * $500 million, or $6 billion

- Repeat this process for all multiples, and then back into a company's implied equity value and implied share price (for public companies) for each one

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Step 4 cont.

Valuation Summary - Steel Dynamics Inc.	Steel Dynamics Inc. - Range of Valuation Multiples / Premiums						Steel Dynamics Inc. - Implied Per Share Value Range				
Methodology Name	Maximum Multiple	75th Percentile Multiple	Median Multiple	25th Percentile Multiple	Minimum Multiple	Applicable Company Figure	Minimum Multiple	25th Percentile Multiple	Median Multiple	75th Percentile Multiple	Maximum Multiple
Public Company Comparables:											
LTM EV / Revenue:	1.2 x	1.1 x	0.7 x	0.5 x	0.5 x	$ 7,307.2	$ 8.86	$ 10.07	$ 15.03	$ 26.39	$ 29.94
FY 16 EV / Revenue:	1.2 x	1.0 x	0.7 x	0.5 x	0.5 x	7,716.0	10.13	10.91	16.28	26.33	31.01
FY 17 EV / Revenue:	1.1 x	1.0 x	0.7 x	0.5 x	0.5 x	8,406.2	10.13	11.80	17.45	28.49	33.24
LTM EV / EBITDA:	14.0 x	9.4 x	9.1 x	6.3 x	5.5 x	862.8	11.56	16.37	26.47	27.33	43.89
FY 16 EV / EBITDA:	11.9 x	8.5 x	8.0 x	7.5 x	6.5 x	626.4	10.69	13.27	14.58	15.95	24.85
FY 17 EV / EBITDA:	10.4 x	7.7 x	6.5 x	5.9 x	5.6 x	730.2	10.90	11.83	13.59	17.20	25.25
LTM P / E:	33.2 x	22.6 x	17.9 x	16.0 x	13.7 x	12.1	0.69	0.80	0.90	1.13	1.66
FY 16 P / E:	19.1 x	18.1 x	15.4 x	13.9 x	13.5 x	170.7	9.51	9.84	10.87	12.76	13.46
FY 17 P / E:	15.6 x	12.3 x	11.1 x	9.6 x	8.0 x	205.8	6.84	8.18	9.47	10.44	13.26

To calculate Steel Dynamics' Implied Share Price at the 25th percentile LTM EV / Revenue multiple, you multiply 0.5x by $7,307.2, its LTM Revenue. That gives you its Implied Enterprise Value of $3,895.4.

Then, you back into the Implied Equity Value by adding non-core-business Assets and subtracting L&E items that represent different investor groups, and you divide by the share count to calculate the company's Implied Share Price.

Important process to get a range of implied values for the company. The big idea is that the market as a whole explains this implied value. As a result, public comps are a "relative valuation method." The market could be completely wrong, and so relative valuation methods are "supplemental" to DCFs

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Key Rule 8: Precedent Transactions (M&A Comps)

- The main difference between precedent transactions and public comps is that you calculate valuation multiples based on what acquirers have paid to acquire other companies, and not on those companies' current share prices

- Key differences in this methodology include:

  - Screening criteria: Still screen by industry, geography, and size, but based on seller. Additionally, screen for time and transactions from only the past 2-3 years (to account for M&A market changes), and transaction size rather than revenue or EBITDA.

  - Metrics and Multiples: Still look at sales-based and profitability-based metrics and multiples, but focus on historical metrics/multiples, like LTM revenue and LTM EBITDA, LTM EV/Revenue, and EV/EBITDA

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Precedent Transactions (M&A Comps) cont.

- Additional Difference:
  - Calculations of Metrics and Multiples: With Precedent Transactions, everything is based on the purchase price as of the announcement date of the deal, so LTM figures are based on the data available at the time the deal was announced
  - Output: Data is less consistent because companies are acquired for very different reasons (strategic acquirer vs. private equity). Often, the multiples produced are higher than public comps because of the control premium built into M&A deals, typically between 10%-30% (but premiums could be priced much differently for private markets)

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Precedent Transactions (M&A Comps) cont.

- Transaction Structures and Other Points: Ideally, M&A comps will only use real acquisitions (where one company buys 100% of another company) in the valuation. But in many cases where that is not possible, use acquisitions of less than 100% of the other company.
  - Don't mix and match minority and majority stake deals because the dynamics are very different depending on the the size of the stake purchased
  - Also the varying structure can create differences, such as earn-outs and cash vs. stock purchases
- Bottom Line: Precedent transactions are useful for valuing companies that lack good public comps or have unpredictable cash flows. However they are often less reliable and consistent

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Key Rule 10: How to Put Together and Use a Full Valuation

- Once the DCF, Public Comps, and Precedent Transactions are complete, compare each method's multiples with each other on the same sheet
  - Example:

Valuation Summary - Steel Dynamics Inc.	Steel Dynamics Inc. - Range of Valuation Multiples / Premiums					
Methodology Name	Maximum Multiple	75th Percentile Multiple	Median Multiple	25th Percentile Multiple	Minimum Multiple	Applicable Company Figure
Public Company Comparables:						
LTM EV / Revenue:	1.2 x	1.1 x	0.7 x	0.5 x	0.5 x	$ 7,307.2
FY 16 EV / Revenue:	1.2 x	1.0 x	0.7 x	0.5 x	0.5 x	7,716.0
FY 17 EV / Revenue:	1.1 x	1.0 x	0.7 x	0.5 x	0.5 x	8,406.2
LTM EV / EBITDA:	14.0 x	9.4 x	9.1 x	6.3 x	5.5 x	862.8
FY 16 EV / EBITDA:	11.9 x	8.5 x	8.0 x	7.5 x	6.5 x	626.4
FY 17 EV / EBITDA:	10.4 x	7.7 x	6.5 x	5.9 x	5.6 x	730.2
LTM P / E:	33.2 x	22.6 x	17.9 x	16.0 x	13.7 x	12.1
FY 16 P / E:	19.1 x	18.1 x	15.4 x	13.9 x	13.5 x	170.7
FY 17 P / E:	15.6 x	12.3 x	11.1 x	9.6 x	8.0 x	205.8
Precedent Transactions:						
LTM EV / Revenue:	3.6 x	1.2 x	0.8 x	0.7 x	0.4 x	7,307.2
LTM EV / EBITDA:	29.4 x	19.2 x	12.5 x	8.4 x	8.0 x	862.8
Discounted Cash Flow Analysis:						
9.50% - 10.50% WACC, 2.30% - 2.70% Terminal FCF Growth Rate:						

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Key Rule 10: How to Put Together and Use a Full Valuation

- Next, calculate the Implied EV and Implied EqV based on each multiple

  - Example:

    - LTM EV / Revenue multiple is 2.0x

    - Revenue is $1,000

    - LTM EV / Revenue * Revenue = Implied Enterprise Value

    - Implied Enterprise Value = $2,000

- If you are analyzing a private company, your job is done

Key Rule 10: How to Put Together and Use a Full Valuation

- For public companies, take Implied EqV and add non core business Assets, subtract liability and equity items that represent other investor groups.

- Then you divide by the company's share count to get Implied Share Price

 - Repeat this process for all the multiples so you get a range of Implied Share Price.

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Key Rule 10: How to Put Together and Use a Full Valuation

- Sensitivity Analysis:

						Weighted Average Cost of Capital (WACC):						
			8.75%	9.00%	9.25%	9.50%	9.75%	10.00%	10.25%	10.50%	10.75%	11.00%	11.25%
Terminal FCF	2.80%	$	24.52 $	23.16 $	21.91 $	20.75 $	19.67 $	18.67 $	17.74 $	16.88 $	16.06 $	15.30 $	14.59
Growth Rate	2.70%		24.18	22.85	21.63	20.49	19.44	18.46	17.55	16.70	15.90	15.15	14.45
(Terminal	2.60%		23.85	22.55	21.35	20.25	19.21	18.26	17.36	16.52	15.74	15.00	14.31
Value	2.50%		23.53	22.26	21.09	20.00	19.00	18.06	17.18	16.35	15.58	14.86	14.18
Calculated	2.40%		23.22	21.98	20.83	19.77	18.78	17.86	17.00	16.19	15.43	14.72	14.05
Using the	2.30%		22.92	21.71	20.59	19.54	18.57	17.67	16.82	16.03	15.28	14.58	13.92
Gordon	2.20%		22.62	21.44	20.34	19.32	18.37	17.48	16.65	15.87	15.14	14.45	13.80
Growth	2.10%		22.34	21.18	20.11	19.11	18.18	17.30	16.49	15.72	15.00	14.32	13.68
Method):	2.00%		22.06	20.93	19.88	18.90	17.98	17.13	16.32	15.57	14.86	14.19	13.56

Key Rule 10: How to Put Together and Use a Full Valuation

● Football Field:

Steel Dynamics Valuation - Range of Implied Share Prices

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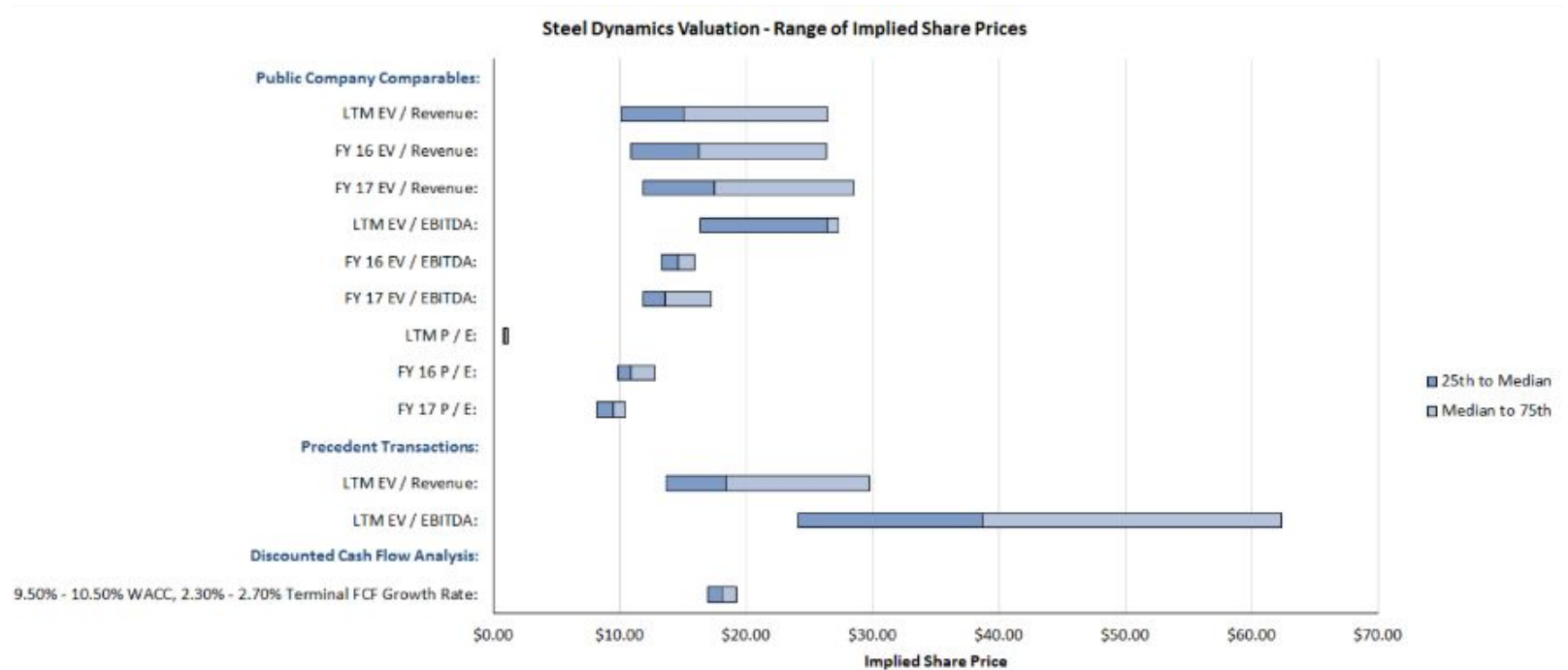
Key Rule 10: How to Put Together and Use a Full Valuation

- Conclusions:
  - Implied Value
    - Look the DCF output, as well as Public Comps to see where the where the Company's Implied Value lies.
    - Compare that to the Company's current share price to see if it is overvalued, undervalued, or accurately valued.
  - Useless Methodologies and Multiples
    - If there are outliers among the multiples or if a method seems far off from everything else, remove it from the analysis and do not pay much attention to it.

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Key Rule 10: How to Put Together and Use a Full Valuation

- Purpose of the Deal:
  - If you're working for an Investment Bank:
    - Company Value: Understand what the company's 'real value' is and provide a price per share range
    - Potential Time to Sell: If the company's trading at a premium to it's 'real value', and you can find the right buyers, it might be a positive move to sell.
    - Potential Time to Raise Equity: Companies benefit from raising equity when they are trading at higher multiples because they can raise the same amount of capital while issuing less stock in the process.
  - If you're working for a Hedge Fund or Private Equity Firm:
    - Buying a company: Only would purchase a company when it is 'undervalued'
    - Shorting: If a company is overvalued and you believe it's share price could decline in the near future, firms often short a stock which allows them to profit when the share price declines

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Key Rule 11: Trade-Offs of Different Methodologies

- Advantages and Disadvantages of Different Methodologies:

Methodology Name:	Public Comps	Precedent Transactions	Discounted Cash Flow Analysis
Advantages:	• Based on **real market data**. • **Less** dependent on future assumptions. • **Quick** to calculate and easy to understand/explain.	• Based on what real companies have **actually** paid for other companies. • May show **industry trends** more effectively than Public Comps.	• **Not** as subject to market fluctuations/conditions. • Most "correct" methodology according to **finance theory**. • Better reflects **company-specific** factors and scenarios/stages.
Disadvantages:	• There may not be **true** comparables. • Less accurate for thinly traded stocks or **volatile** companies. • May **undervalue** companies' long-term potential. • The market might be **wrong**!	• **Data** can be limited and misleading. • There may not be **truly comparable** transactions. • Multiples don't capture **all the aspects** of a deal. • Specific **market conditions** can greatly impact output.	• Very dependent on **far-in-the-future** assumptions. • Bankers are notoriously **bad** at making reasonable assumptions. • Widespread **disagreement** on how to estimate figures like Cost of Equity and WACC.

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Key Rule 11: Trade-Offs of Different Methodologies

- Comparing Expected Values from Different Methodologies:

  - Precedent Transactions vs. Public Comps:

    - Transactions usually provide higher Implied Values due to the control premium.

  - Discounted Cash Flow:

    - More dependent on your assumptions than any other methodology

  - Liquidation Valuation:

    - Provides LOWEST value because it looks strictly at the balance sheet, and companies are worth more than just what their balance sheets tell us.

  - LBO Valuation:

    - Lower-end value because it tells you the maximum a firm can pay to achieve a certain IRR. Sets a 'floor' on the valuation.

- There are many exceptions to these guidelines, so do not think they are 100% accurate for every case.

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