

# CAPITAL EXPENDITURES, DEPRECIATION AND AMORTIZATION IN THE GORDON GROWTH MODEL

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This presentation is based on my article,  
“Capital Expenditures, Depreciation and  
Amortization in the Gordon Growth Model,”  
*Business Valuation Review*, Winter 2014.

# MOST PRACTITIONERS ASSUME THAT DEPRECIATION = CAPEX

- In a 2013 survey published by Jim Hitchner, valuers were asked:

*How do you typically handle depreciation and cap ex when calculating cash flows?*

- The responses were:
  - The same or very similar – 68%
  - Capex less than depreciation – 4%
  - Capex greater than depreciation – 28%

## TWO COMMON ERRORS

- When calculating terminal value in the Gordon growth model, it has been common practice for valuers to assume that depreciation equals capital expenditures in perpetuity
  - In fact, due to growth and inflation, ***capex must be greater than depreciation*** in a growth model
- Another common error is to project growth in amortization
  - Amortization has a limited life and its impact on future cash flow should appropriately analyzed
- Both of these errors result in overstated values

# THE GORDON GROWTH MODEL

- The formula applied for calculating terminal value in the Gordon growth model is:

$$TV = F(1+g)/(k-g)$$

TV = terminal value

F = normalized free cash flow (FCF) in the terminal year

g = expected long-term annual growth rate

k = the cost of capital

- The formula is based on the assumption that FCF is expected to grow at a constant rate in perpetuity

## FCF FOR TERMINAL VALUE SHOULD BE NORMALIZED

- The analyst should examine projected capex and depreciation in the terminal year to determine whether normalizing adjustments to FCF are needed
- Although capital expenditures in any given year can be less than depreciation, a growing company's *normalized* capex should exceed its depreciation
  - Equipment costs and evolving technology costs may affect the relationship of the depreciation rate to the growth rate
    - To the extent that new equipment is cheaper to manufacture or more efficient in use, the ratio of capex to depreciation may decrease
  - If a single-facility company built and equipped a factory, depreciation could exceed capex until major new investments were required

# 5-YEAR STRAIGHT LINE DEPRECIATION

- Example: a company depreciates its assets on a straight-line basis over a five-year period to zero residual value and is growing at 5% annually
  - Capex in year 6 is 112.7% of depreciation [ $1,276.3 \div 1,132.8$ ]

5 Year Straight Line Depreciation with 5% Growth			
<u>Year Purchased</u>	<u>Capital Expenditures</u>	<u>Depreciated in 2021</u>	
		<u>%</u>	<u>Amount</u>
2016	1,000.0	10%	100.0
2017	1,050.0	20%	210.0
2021	1,102.5	20%	220.5
2019	1,157.6	20%	231.5
2020	1,215.5	20%	243.1
2021	1,276.3	10%	<u>127.6</u>
			<u>1,132.8</u>

# 5-YEAR DOUBLE DECLINING DEPRECIATION

- Five-year double declining depreciation to zero residual value

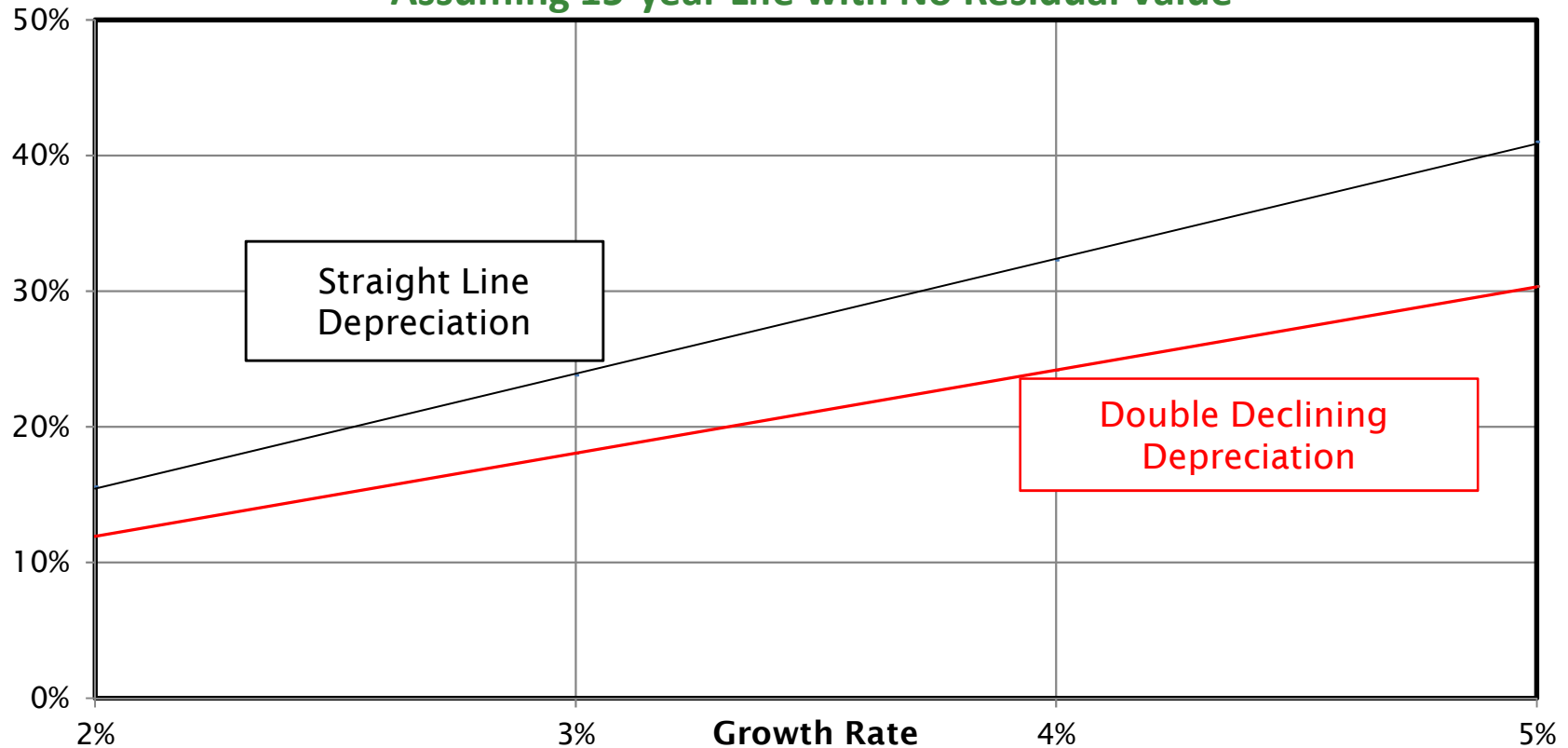
5 Year Double Declining Depreciation with 2% to 5% Growth								
	<u>2% Growth</u>		<u>3% Growth</u>		<u>4% Growth</u>		<u>5% Growth</u>	
<u>Year</u>	<u>Capex</u>	<u>Depreciated in 2021</u>	<u>Capex</u>	<u>Depreciated in 2021</u>	<u>Capex</u>	<u>Depreciated in 2021</u>	<u>Capex</u>	<u>Depreciated in 2021</u>
2016	1,000	57.6	1,000	57.6	1,000	57.6	1,000	57.6
2017	1,020	117.5	1,030	118.7	1,040	119.8	1,050	121.0
2018	1,040	119.9	1,061	122.2	1,082	124.6	1,103	127.0
2019	1,061	203.8	1,093	209.8	1,125	216.0	1,158	222.3
2020	1,082	346.4	1,126	360.2	1,170	374.4	1,216	389.0
2021	1,104	<u>220.8</u>	<u>1,159</u>	<u>231.9</u>	<u>1,217</u>	<u>243.3</u>	<u>1,276</u>	<u>255.3</u>
Depreciation in 2021		<u>1,065.9</u>		<u>1,100.3</u>		<u>1,135.7</u>		<u>1,172.1</u>
Capex in 2021		1,104.1		1,159.3		1,216.7		1,276.3
Difference		38.2		59.0		81.0		104.2
Capex as % of Depreciation		103.6%		105.4%		107.1%		108.9%



# EFFECT OF 15-YEAR DEPRECIATION

- With a 15-year depreciable life, capex is always materially greater than depreciation

Excess of Capital Expenditures over Depreciation,  
Assuming 15-year Life with No Residual Value



# A SUMMARY TABLE

- The table below summarizes the relationships between capex and depreciation for different lives, growth rates, and depreciation methods (zero residual value)

<b>Excess of Capital Expenditures Over Depreciation</b>					
	<b>Depreciation Method</b>	<b>Growth rate:</b>			
		<b><u>2%</u></b>	<b><u>3%</u></b>	<b><u>4%</u></b>	<b><u>5%</u></b>
<b>5 year life</b>	<b>Straight line</b>	<b>5.03%</b>	<b>7.56%</b>	<b>10.11%</b>	<b>12.67%</b>
	<b>Double declining</b>	<b>3.58%</b>	<b>5.36%</b>	<b>7.13%</b>	<b>8.89%</b>
	<b>Sum of the digits</b>	<b>3.66%</b>	<b>5.49%</b>	<b>7.31%</b>	<b>9.12%</b>
<b>10 year life</b>	<b>Straight line</b>	<b>10.22%</b>	<b>15.50%</b>	<b>20.87%</b>	<b>26.35%</b>
	<b>Double declining</b>	<b>7.73%</b>	<b>11.62%</b>	<b>15.52%</b>	<b>19.43%</b>
	<b>Sum of the digits</b>	<b>7.05%</b>	<b>10.60%</b>	<b>14.17%</b>	<b>17.76%</b>
<b>15 year life</b>	<b>Straight line</b>	<b>15.58%</b>	<b>23.79%</b>	<b>32.27%</b>	<b>40.99%</b>
	<b>Double declining</b>	<b>11.95%</b>	<b>18.03%</b>	<b>24.16%</b>	<b>30.34%</b>
	<b>Sum of the digits</b>	<b>10.48%</b>	<b>15.83%</b>	<b>21.24%</b>	<b>26.69%</b>

## SOME COURTS HAVE ACCEPTED CAPEX GREATER THAN DEPRECIATION

- Some U.S. and Delaware court decisions have accepted DCF valuations in which depreciation exceeded capital expenditures, *e.g.*:

*Kleinwort Benson Ltd. v. Silgan Corp.*, 1995 Del. Ch. LEXIS 75 (June 15, 1995)

*Estate of Simplot v. Commissioner*, 112 T.C. 130, 164 (U.S. Tax Ct., 1999), *rev'd on other grounds*, 249 F.3d 1191 (9th Cir., 2001)

*Prescott Group Small Cap, L.P. v. Coleman Co.*, 2004 Del. Ch. LEXIS 131 (Sept. 8, 2004)

*Albert Trostel & Sons Co. v. Notz*, 2010 U.S. Dist. LEXIS 108778 (E.D. Wisc., Sept 28, 2010)

## SOME COURTS HAVE ACCEPTED CAPEX EQUAL TO DEPRECIATION

- However, other U.S. and Delaware court decisions have accepted DCF valuations in which depreciation equaled capital expenditures, *e.g.*:

*Salomon Brothers Inc. v. Interstate Bakeries Corp.*, 1992 Del. Ch. LEXIS 100 (May 1, 1992)

*Cede & Co. v. Technicolor, Inc.*, 2003 Del. Ch. LEXIS 146 (July 11, 2003)

*In re: Nanovation Technologies, Inc.*, 364 B.R. 308; 2007 Bankr. LEXIS 1862 (Bankr. N.D. Ill., May 7, 2007).

*In re Greater Southeast Community Hospital Corp.*, 2012 Bankr. LEXIS 618 (Bankr. D.D.C., Feb. 21, 2012)

*In re Orchard Enterprises, Inc.*, 2012 Del. Ch. LEXIS 165 (July 18, 2012)

## SOME COURTS HAVE ACCEPTED CAPEX LESS THAN DEPRECIATION!

- Two Delaware decisions have accepted DCF valuations where capital expenditures were *less than half* of depreciation!
  - Depreciation was more than 4x capital expenditures in *Lane v. Cancer Treatment Centers of America, Inc.*, 2004 Del. Ch. LEXIS 108 (July 30, 2004)
  - Depreciation was almost 2½ times capital expenditures in *In re Emerging Communications, Inc. Shareholders Litigation*, 2004 Del. Ch. LEXIS 70 (May 3, 2004)

# AMORTIZATION

- Amortization and depreciation are both *non-cash* charges that reduce reported income
- Tax-deductible amortization is similar to depreciation in that it reduces both reported net income and taxes
  - Non-tax-deductible amortization only reduces net income
- Most amortizable intangible assets are created through acquisitions or intellectual property
  - In taxable stock acquisitions, if a C Corp acquires another C Corp, the acquiror may make an election under §338 of the Internal Revenue Code and, under certain conditions, elect to create a depreciable intangible asset (goodwill) by writing up the assets in the same manner as in an asset purchase

## AMORTIZATION HAS A LIMITED LIFE

- There is an important difference between amortization and depreciation that must be recognized by valuers when calculating terminal value
- Intangible assets such as goodwill are not systematically replaced in the ordinary course of business
- Therefore, amortization has a limited life
- Since amortization, unlike depreciation, does not grow in perpetuity, it should be separately valued in terminal value calculations

## AMORTIZATION MUST BE SEPARATED FROM DEPRECIATION IN D&A

- Companies customarily report depreciation and amortization (“D&A”) as a single line item in their income and cash flow statements
- Because of the substantive differences between amortization and depreciation, valuers should determine how much of the projected D&A is amortization



## **THE VALUE OF AMORTIZATION IS THE PRESENT VALUE OF FUTURE TAX BENEFITS**

- Even though amortization should be excluded from the computation of terminal value, any tax benefit it generates has value and should be included in enterprise value
- The appropriate manner to value amortization subsequent to the projection period is to determine the present value of the future tax benefits of the remaining amortization

## OTHER NORMALIZING ADJUSTMENTS

- FCF must be also be normalized to exclude any other items that will not be growing over time or which have a finite term, such as tax-loss carryforwards, limited-life royalties, and non-compete agreements
- The present value of future cash flows after the projection period from amortization, tax-loss carryforwards, and other limited-life items should be included in enterprise value
  - The value of tax-loss carryforwards is the present value of future tax benefits
  - The value of future limited-life income streams is the present value of the income net of taxes
  - The value of future limited-life obligations is the negative present value of the expense net of taxes

## A SIMPLE FORMULA

- These adjustments are achieved by adding the present value of these net cash flows after the terminal year to enterprise value, as shown in the following equation:

$$EV = PV_F + PV_{TV} + PV_A$$

EV = enterprise value at the valuation date;

PV<sub>F</sub> = present value of free cash flows from the valuation date through the terminal year of the projection;

PV<sub>TV</sub> = present value of terminal value based on normalized FCF

PV<sub>A</sub> = present value of net benefits (costs) of amortization, tax-loss carryforwards, and limited-life income and expense items after the terminal year of the projection

# ERRONEOUS TREATMENT OF AMORTIZATION BY EXPERTS IN COURT

- An example of the erroneous treatment of amortization in a DCF analysis is the 2007 *Dr Pepper Bottling* decision\*
- Annual tax-deductible amortization of \$5.4 million was included as a non-cash charge in the Court's valuation model
- Since amortization was part of the free cash flow that the testifying experts used in their growth models, they effectively assumed that the amortization was perpetual, leading to an overstated valuation by the Court

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\* *Crescent/Mach I Partnership, L.P. v. Dr Pepper Bottling Co. of Texas*, 2007 Del. Ch. LEXIS 63 (May 2, 2007)

## A SANITY CHECK

- The practitioner who determines terminal value using a growth model should examine the multiples of EBITDA and net income that are implied by the calculated result
- If the multiples of calculated terminal value are materially inconsistent with projected multiples of guideline companies and/or guideline transactions, the practitioner should reexamine the assumptions used – the growth rate, the discount rate, the relationship between capital expenditures and depreciation, and other adjustments

## CONCLUSION

- As a general rule, capital expenditures should be greater than depreciation in a terminal value calculation
- The relationship is a function of depreciation rates, company growth rates and technological innovation
- Amortization of intangible assets, loss carryforwards, and other limited-life assets (and liabilities) should be excluded from normalized FCF in terminal value and should be separately valued
- Since data supplied by management often lumps depreciation and amortization together, the valuator must obtain the granular information necessary for an appropriate analysis

## **Sample Calculations of Relationship between Capital Expenditures and Depreciation**

3% Growth – 10 Year Straight Line Depreciation								
Year	Capital Expenditures	2026	2027	2028	2029	2030	2031	2032
2016	1,000.0	50.0						
2017	1,030.0	103.0	51.5					
2018	1,060.9	106.1	106.1	53.0				
2019	1,092.7	109.3	109.3	109.3	54.6			
2020	1,125.5	112.6	112.6	112.6	112.6	56.3		
2021	1,159.3	115.9	115.9	115.9	115.9	115.9	58.0	
2022	1,194.1	119.4	119.4	119.4	119.4	119.4	119.4	59.7
2023	1,229.9	123.0	123.0	123.0	123.0	123.0	123.0	123.0
2024	1,266.8	126.7	126.7	126.7	126.7	126.7	126.7	126.7
2025	1,304.8	130.5	130.5	130.5	130.5	130.5	130.5	130.5
2026	1,343.9	67.2	134.4	134.4	134.4	134.4	134.4	134.4
2027	1,384.2		69.2	138.4	138.4	138.4	138.4	138.4
2028	1,425.8			71.3	142.6	142.6	142.6	142.6
2029	1,468.5				73.4	146.9	146.9	146.9
2030	1,512.6					75.6	151.3	151.3
2031	1,558.0						77.9	155.8
2032	1,604.7							80.2
<b>Annual Depreciation</b>		<b>1,163.6</b>	<b>1,198.5</b>	<b>1,234.4</b>	<b>1,271.5</b>	<b>1,309.6</b>	<b>1,348.9</b>	<b>1,389.4</b>
<b>Capital Expenditures</b>		<b>1,343.9</b>	<b>1,384.2</b>	<b>1,425.8</b>	<b>1,468.5</b>	<b>1,512.6</b>	<b>1,558.0</b>	<b>1,604.7</b>
<b>Capital Expenditures in Excess of Depreciation</b>		<b>180.3</b>	<b>185.7</b>	<b>191.3</b>	<b>197.1</b>	<b>203.0</b>	<b>209.1</b>	<b>215.3</b>
<b>Difference in %</b>		<b>15.50%</b>	<b>15.50%</b>	<b>15.50%</b>	<b>15.50%</b>	<b>15.50%</b>	<b>15.50%</b>	<b>15.50%</b>



### 3% Growth – 10 Year Double Declining Depreciation

Year	Capital Expenditures	2026	2027	2028	2029	2030	2031	2032
2016	1,000.0	32.8						
2017	1,030.0	67.5	33.8					
2018	1,060.9	69.5	69.5	34.8				
2019	1,092.7	71.6	71.6	71.6	35.8			
2020	1,125.5	73.8	73.8	73.8	73.8	36.9		
2021	1,159.3	85.5	76.0	76.0	76.0	76.0	38.0	
2022	1,194.1	110.0	88.0	78.3	78.3	78.3	78.3	39.1
2023	1,229.9	141.7	113.3	90.7	80.6	80.6	80.6	80.6
2024	1,266.8	182.4	145.9	116.7	93.4	83.0	83.0	83.0
2025	1,304.8	234.9	187.9	150.3	120.2	96.2	85.5	85.5
2026	1,343.9	134.4	241.9	193.5	154.8	123.9	99.1	88.1
2027	1,384.2		138.4	249.2	199.3	159.5	127.6	102.1
2028	1,425.8			142.6	256.6	205.3	164.2	131.4
2029	1,468.5				146.9	264.3	211.5	169.2
2030	1,512.6					151.3	272.3	217.8
2031	1,558.0						155.8	280.4
2032	1,604.7							160.5
<b>Annual Depreciation</b>		<b>1,204.10</b>	<b>1,240.10</b>	<b>1,277.50</b>	<b>1,315.70</b>	<b>1,355.30</b>	<b>1,395.90</b>	<b>1,437.70</b>
<b>Capital Expenditures</b>		<b>1,343.90</b>	<b>1,384.20</b>	<b>1,425.80</b>	<b>1,468.50</b>	<b>1,512.60</b>	<b>1,558.00</b>	<b>1,604.70</b>
<b>Capital Expenditures in Excess of Depreciation</b>		<b>139.80</b>	<b>144.10</b>	<b>148.30</b>	<b>152.80</b>	<b>157.30</b>	<b>162.10</b>	<b>167.00</b>
<b>Difference in %</b>		<b>11.62%</b>	<b>11.62%</b>	<b>11.62%</b>	<b>11.62%</b>	<b>11.62%</b>	<b>11.62%</b>	<b>11.62%</b>

### 3% Growth – 10 Year Sum-of-the-Digits Depreciation

Year	Capital Expenditures	2026	2027	2028	2029	2030	2031	2032
2016	1,000.0	9.1						
2017	1,030.0	28.1	9.4					
2018	1,060.9	48.2	28.9	9.6				
2019	1,092.7	69.5	49.7	29.8	9.9			
2020	1,125.5	92.1	71.6	51.2	30.7	10.2		
2021	1,159.3	115.9	94.8	73.8	52.7	31.6	10.5	
2022	1,194.1	141.1	119.4	97.7	76.0	54.3	32.6	10.9
2023	1,229.9	167.7	145.3	123.0	100.6	78.3	55.9	33.5
2024	1,266.8	195.8	172.7	149.7	126.7	103.6	80.6	57.6
2025	1,304.8	225.4	201.6	177.9	154.2	130.5	106.8	83.0
2026	1,343.9	122.2	232.1	207.7	183.3	158.8	134.4	110.0
2027	1,384.2		125.8	239.1	213.9	188.8	163.6	138.4
2028	1,425.8			129.6	246.3	220.3	194.4	168.5
2029	1,468.5				133.5	253.7	227.0	200.3
2030	1,512.6					137.5	261.3	233.8
2031	1,558.0						141.6	269.1
2032	1,604.7							145.9
<b>Annual Depreciation</b>		<b>1,215.1</b>	<b>1,251.6</b>	<b>1,289.1</b>	<b>1,327.8</b>	<b>1,367.6</b>	<b>1,408.6</b>	<b>1,450.9</b>
<b>Capital Expenditures</b>		<b>1,343.9</b>	<b>1,384.2</b>	<b>1,425.8</b>	<b>1,468.5</b>	<b>1,512.6</b>	<b>1,558.0</b>	<b>1,604.7</b>
<b>Capital Expenditures in Excess of Depreciation</b>		<b>128.8</b>	<b>132.7</b>	<b>136.7</b>	<b>140.8</b>	<b>145.0</b>	<b>149.3</b>	<b>153.8</b>
<b>Difference in %</b>		<b>10.60%</b>	<b>10.60%</b>	<b>10.60%</b>	<b>10.60%</b>	<b>10.60%</b>	<b>10.60%</b>	<b>10.60%</b>