

Depreciation



Car Values

If a \$20,000 car depreciates \$2,500 a year, how much is it worth after 2 years (assume \$0 salvage value)?

$$\$20,000 - \$2,500 - \$2,500 = \$15,000$$

Million Dollar Machine

Purchased in 2005



Million Dollar Machine

Depreciation Expense

- ▶ No money exchanges hands
- ▶ Why Calculate it?

Balance Sheet, December 2008

$$\begin{array}{l} \text{Assets} \\ 1,000,000 \end{array} = \begin{array}{l} \text{Liabilities} \\ 700,000 \end{array} + \begin{array}{l} \text{Owner's Equity} \\ 300,000 \end{array}$$

BUT the EREMA is NOT worth 1,000,000

$$\begin{array}{l} \text{Assets} \\ 800,000 \end{array} = \begin{array}{l} \text{Liabilities} \\ 700,000 \end{array} + \begin{array}{l} \text{Owner's Equity} \\ 100,000 \end{array}$$

According to

<http://www.smbiz.com/sbrl001.html#ci>

50,000	15%
50,000-75,000	25%
75,000-100,000	34%
100,000-335,000	39%

Income Statement 2008

No Depreciation Expense

- ▶ Net Income \$200,000 (Before Taxes)
- ▶ Taxes—39%--\$78,000

With Depreciation Expense

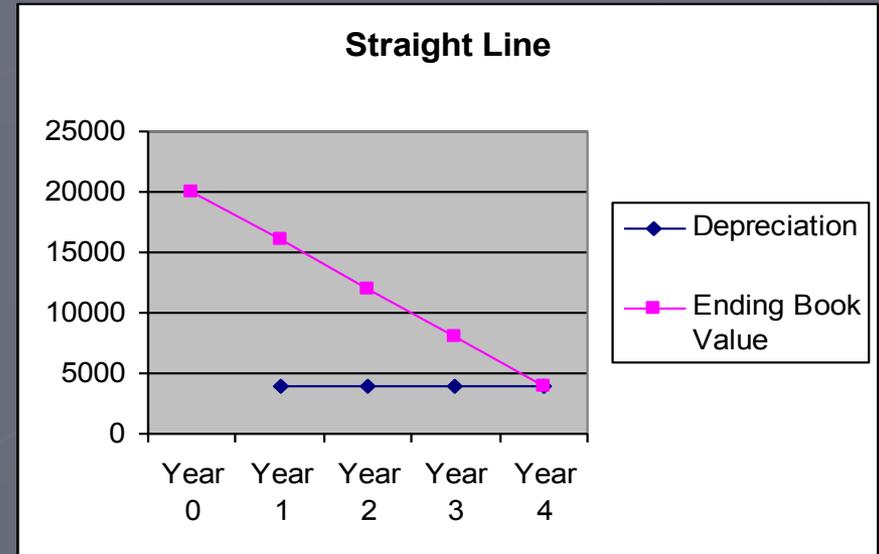
- ▶ Net Income \$99,000 (Before Taxes)
- ▶ Taxes—34%--\$33,660

Another Car—Review Straight Line

- ▶ \$20,000 Original Value
- ▶ Useful Life (years we intend to use) 4
- ▶ \$4,000 Salvage Value (what it should be worth at the end of the useful life)
- ▶ $(\text{Original} - \text{Salvage}) / \text{Years of Useful Life} =$
Annual Depreciation
 $(\$20000 - 4000) / 4 \text{ years} = \$4,000$

Graph the Book Value

Years	Depreciation	Ending Book Value
Year 0		20000
Year 1	4000	16000
Year 2	4000	12000
Year 3	4000	8000
Year 4	4000	4000



What is the slope of the pink line?

Negative \$4,000 per year

How to Calculate Double Declining

- ▶ \$500 Asset, 25% double declining rate
- ▶ Rate is twice the straight line rate
- ▶ Example:
 - 8 years useful life
 - ▶ $100 / 8 = 12.5\%$ straight line rate
 - ▶ Double declining is $12.5\% \cdot 2 = 25\%$

Original Value • Double Declining Rate = Year 1
Depreciation

$\$500 \cdot .25 = \125 Depreciation Year 1

Book Value

$\$500 \cdot .25 = \125 Depreciation Year 1

$\$500 - \$125 = \$375$ Book Value at the end of Year 1

Original Val. - (Original • Depr. rate in decimal) = Book Value

OR

$\$500 (1.00 - .25) = \text{Book Value}$

1.00 is 100%, Original Value

$\$500 \cdot .75 = \375 Book Value Year 1

Year 2

$\$375 \cdot .75 = \281

Depreciation for the Life of the Asset

Life of the \$500 Asset



Year	Year 3	Year 2	Year 1
Year 4	Begin. Book Value	Begin. Book Value	Begin Book Value
Begin Book Value	\$281 (.75) = \$210.75	\$375(.75) = \$281	\$500
(\$210.75) (.75) = \$158.06	Depr. \$70.25	Depreciation \$93.75	Depreciation \$125
Depr. \$52.69			

Geometric Sequence

Values declining by the same **percentage**

- ▶ \$10,000 Asset
- ▶ Salvage Value 500
- ▶ Useful Life 10 years
- ▶ Calculate the Rate
- ▶ $(100 / 10) \cdot 2 = 20\%$

Year	Depreciation	Book Value
0	$10000 \cdot .20 = 2,000$	10000
1	$8000 \cdot .20 = 1600$	8000
2	$6400 \cdot .20 = 1280$	6400
3		5120
4		4096
5		3276.8
6		2621.44
7		2097.15
8		1677.72
9		1342.18
10		1073.74

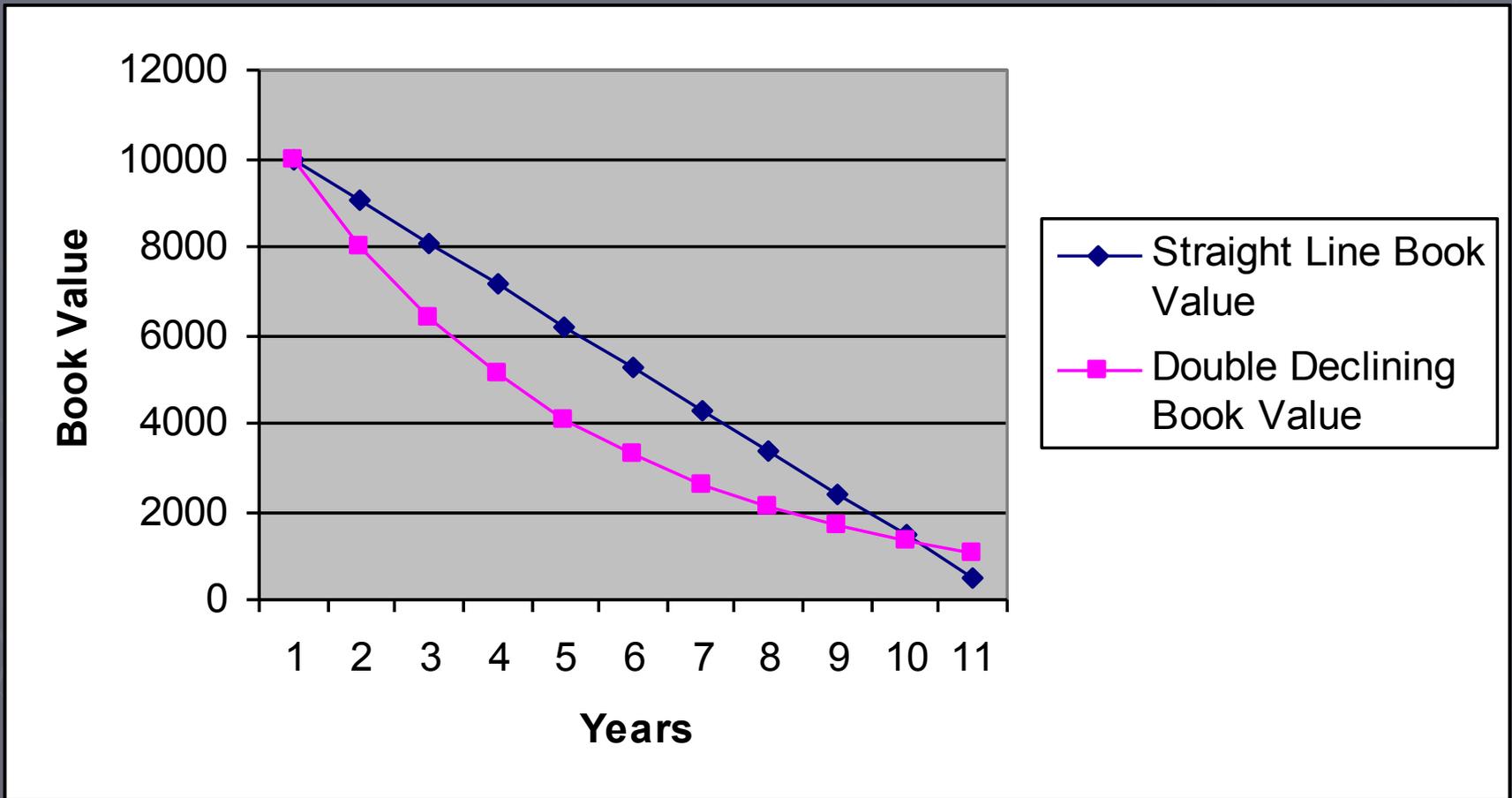
Example

- ▶ If you have an asset (car) worth \$10,000, salvage value is \$500
- ▶ Calculate the Rate:
 - Declining Balance Rate = $(100\% / \# \text{ of years}) \times 2$
 - So a useful life of **10** years:
 - $(100/10\text{years}) \times 2 = 20\%$
- ▶ Calculate depreciation and book value for five years:

Compare Straight Line and Double Declining

Year	Straight Line Book Value	Double Declining Book Value
Original	10000	10000
1	9050	8000
2	8100	6400
3	7150	5120
4	6200	4096
5	5250	3276.8
6	4300	2621.44
7	3350	2097.15
8	2400	1677.72
9	1450	1342.18
10	500	1073.74

Compare on a Graph



Double Declining is an Example of Exponential Decay

► Depreciation Formula:

Original Value • (1.00 - rate in decimal) = Book Value

► Exponential Decay:

$$A = P(1-r)^t$$

A = Amount after t years

P = Principal or original amount

r = rate or percent of depreciation

t = time (years)

Related Math Example

- ▶ (Worksheet is labeled *Double Declining Depreciation*)

Year	Rate	Depreciation	Book Value
1	16.66%	1332.80	6667.20
2	16.66%	1110.76	5556.44
3	16.66%	925.70	4630.74
4	16.66%	771.48	3859.26
5	16.66%	642.95	3216.31
6	16.66%	535.84	2680.47
7	16.66%	446.57	2233.90
8	16.66%	372.17	1861.74
9	16.66%	310.17	1551.57
10	16.66%	258.49	1293.08
11	16.66%	215.43	1077.65
12	16.66%	77.65	1000

Traditional Math Example

- ▶ A population of 500 students in a high school decreases by 10% each year. How many students are in the high school after 7 years?

$$500 (1.00 - .10)^7$$

$$500 (.90)^7$$

$$500 \cdot .9 \cdot .9 \cdot .9 \cdot .9 \cdot .9 \cdot .9 \cdot .9$$

$$239.19$$

239 students (you cannot have a part of a student)

Traditional Math Example 2

- ▶ After taking 325 milligrams of aspirin, the amount of aspirin in the body decreases by 28% each hour. How many milligrams of aspirin remain in the person's body after 4 hours?

$$325 (.72)^4$$

87.34 milligrams

Your Turn

- ▶ You purchased a display case at the beginning of the year for \$1600. You estimate a useful life of 8 years and a salvage value of \$200. You have decided to use the double declining balance method to calculate depreciation.
- ▶ Use a formula to calculate the book value after 5 years.