ACC575: Data Analytics for Accounting

LN8: Excel Application - Part II

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Background: DuPont Analysis

DuPont Analysis

- A framework for analyzing the return on equity (ROE).
- Decomposes ROE into three components: profit margin, asset turnover, and financial leverage.
- A useful tool for financial analysis.

Decomposition

- ROE = Profit Margin * Asset Turnover * Financial Leverage
    - Profit Margin = Net Income / Sales
    - Asset Turnover = Sales / Total Assets
    - Financial Leverage = Total Assets / Total Equity

Implications

- Higher profit margin: Company is more efficient at generating profits from sales.
- Higher asset turnover: Company is more efficient at using its assets to generate sales.
- Higher financial leverage: Company is more efficient at using its debt to generate profits.

Lab 6-4 DuPont Analysis

Lab 6-4: DuPont Analysis

Purpose: Decompose ROE into three components.[a]

1. Make columns: AssetTurnover (in); ProfitMargin; FinancialLeverage. Then, make a column ROE using the three ratios.

[a]Prework: Convert each dataset for HSY and SJM to Table; Name each as HSY and SJM respectively.

Data Preview

	A	B	C	D	E
1	HSY	($ thousands)			
2	Year	Sales Revenue	Net Income	Assets	Stockholder's Equity
3	2020	$8,149,719	$1,278,708	$9,131,845	$2,234,352
4	2019	$7,986,252	$1,149,692	$8,140,395	$1,739,222
5	2018	$7,791,069	$1,177,562	$7,703,020	$1,398,721
6	2017	$7,515,426	$756,537	$5,553,726	$931,565
7	2016	$7,440,181	$720,044	$5,524,333	$827,687
8	2015	$7,386,626	$512,951	$5,344,371	$1,047,462
9					
10	SJM	($ thousands)			
11	Year	Sales Revenue	Net Income	Assets	Stockholder's Equity
12	2020	$8,002,700	$872,600	$16,284,200	$8,124,800
13	2019	$7,801,000	$775,100	$16,970,400	$8,190,900
14	2018	$7,838,000	$511,800	$16,711,300	$7,970,500
15	2017	$7,357,100	$1,338,600	$15,301,200	$7,891,100
16	2016	$7,392,300	$592,300	$15,639,700	$6,850,200
17	2015	$7,811,200	$688,700	$15,984,100	$7,008,500

1. Make columns: AssetTurnover (in); ProfitMargin; FinancialLeverage. Then, make a column ROE using the three ratios.

How?

1. Make the three columns:
   - ▶ AssetTurnover: How efficiently assets are used to generate sales.
   - ▶ ProfitMargin: Net Income / Sales Revenue
   - ▶ FinancialLeverage: How efficiently the company is able to use debt to generate Revenues.
2. Multiply the three columns to get ROE.

HSY ($ thousands)

Year	Sales Revenue	Net Income	Assets	Stockholder's Equity	ProfitMa	AssetTur	Financial	ROE
2020	$8,149,719	$1,278,708	$9,131,845	$2,234,352	15.7%	89.2%	408.7%	57.2%
2019	$7,986,252	$1,149,692	$8,140,395	$1,739,222	14.4%	98.1%	468.0%	66.1%
2018	$7,791,069	$1,177,562	$7,703,020	$1,398,721	15.1%	101.1%	550.7%	84.2%
2017	$7,515,426	$756,537	$5,553,726	$931,565	10.1%	135.3%	596.2%	81.2%
2016	$7,440,181	$720,044	$5,524,333	$827,687	9.7%	134.7%	667.4%	87.0%
2015	$7,386,626	$512,951	$5,344,371	$1,047,462	6.9%	138.2%	510.2%	49.0%

SJM ($ thousands)

Year	Sales Revenue	Net Income	Assets	Stockholder's Equity	ProfitMa	AssetTur	Financial	ROE
2020	$8,002,700	$872,600	$16,284,200	$8,124,800	10.9%	49.1%	200.4%	10.7%
2019	$7,801,000	$775,100	$16,970,400	$8,190,900	9.9%	46.0%	207.2%	9.5%
2018	$7,838,000	$511,800	$16,711,300	$7,970,500	6.5%	46.9%	209.7%	6.4%
2017	$7,357,100	$1,338,600	$15,301,200	$7,891,100	18.2%	48.1%	193.9%	17.0%
2016	$7,392,300	$592,300	$15,639,700	$6,850,200	8.0%	47.3%	228.3%	8.6%
2015	$7,811,200	$688,700	$15,984,100	$7,008,500	8.8%	48.9%	228.1%	9.8%

Interpretation

- ROE: HSY' is much higher than SJM's.
- HSY's ROE is mainly driven by higher Financial Leverage.

HSY	($ thousands)							
Year	Sales Revenue	Net Income	Assets	Stockholder's Equity	ProfitMar	AssetTurn	Financial	ROE
2020	$8,149,719	$1,278,708	$9,131,845	$2,234,352	15.7%	89.2%	408.7%	57.2%
2019	$7,986,252	$1,149,692	$8,140,395	$1,739,222	14.4%	98.1%	468.0%	66.1%
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2016	$7,392,300	$592,300	$15,639,700	$6,850,200	8.0%	47.3%	228.3%	8.6%
2015	$7,811,200	$688,700	$15,984,100	$7,008,500	8.8%	48.9%	228.1%	9.8%

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Background: Depreciation

Depreciation

- The process of allocating the cost of a tangible asset over its useful life.
- A non-cash expense that reduces the company's taxable income.

Common Methods

- Straight-line method (SLN): Allocate the cost evenly over the asset's useful life.
- Declining balance method (DDB): Allocate more of the cost in the early years.
- Sum-of-the-years' digits method (SYD): Allocate the cost based on the asset's usage.

Lab 1-2 Depreciation

Lab 1-2: Depreciation

Purpose: Compare depreciation expenses using the three methods.

1. Calculate the depreciation expense using the three methods.
2. Compare the three methods.

Data Preview

	A	B	C	D	E
1	Current Year	2025			
2				Original	
3	Year Placed in Service	Useful Life	Description	Cost	Salvage Value
4	2022	5	Shovel	50	10
5	2024	5	Garden fork	50	10
6	2022	5	Rake	50	10
7	2022	5	Dutch hoe	50	10
8	2023	5	Garden fork	50	10

1. Calculate the depreciation expense using the three methods.

> **How?**
>
> ❶ Make the three columns:
>
> - ▶ SLN: =SLN(Cost, Salvage, Life)
> - ▶ DDB: =DDB(Cost, Salvage, Life, Period, Factor)
> - ▶ SYD: =SYD(Cost, Salvage, Life, Period)
>
> ❷ Consider the following arguments:
>
> - ▶ Cost: The initial cost of the asset.
> - ▶ Salvage: The value of the asset at the end of its useful life.
> - ▶ Life: The number of years the asset is expected to be used.
> - ▶ Period: The year of the depreciation.

	A	B	C	D	E	F	G	H	I	J
1				=SLN([@[Original Cost]],[@[Salvage Value]],[@[Useful Life]])						
2	Current Year	2025		=DDB([@[Original Cost]],[@[Salvage Value]],[@[Useful Life]],$B$2-[@[Year Placed in Service]])						
3				=SYD([@[Original Cost]],[@[Salvage Value]],[@[Useful Life]],$B$2-[@[Year Placed in Service]])						
4	Year Placed in Service	Useful Life	Description	Original Cost	Salvage Value	SLN	DDB	SYD		
5	2022	5	Shovel	50	10	$8.00	$7.20	$8.00		
6	2024	5	Garden fork	50	10	$8.00	$20.00	$13.33		
7	2022	5	Rake	50	10	$8.00	$7.20	$8.00		

2. Compare the three methods.

How?

① Calculate the total depreciation expense using the three methods.

Year Placed in Service	Useful Life	Description	Original Cost	Salvage Value	SLN	DDB	SYD
2022	5	Shovel	50	10	$8.00	$7.20	$8.00
2024	5	Garden fork	50	10	$8.00	$20.00	$13.33
2022	5	Rake	50	10	$8.00	$7.20	$8.00
2022	5	Dutch hoe	50	10	$8.00	$7.20	$8.00
2023	5	Garden fork	50	10	$8.00	$12.00	$10.67
2021	7	Lawn Shears	20	5	$2.14	$2.08	$2.14
2019	7	Pruners	80	10	$10.00	$4.25	$5.00
2022	5	Trowel	20	5	$3.00	$2.20	$3.00
2023	5	Chain Saw	650	50	$120.00	$156.00	$160.00
2022	5	Power Trimmer	650	50	$120.00	$93.60	$120.00
2020	10	Trailer for Equipment	2,000	200	$180.00	$163.84	$196.36
2023	5	Push Lawnmower 1	1,100	150	$190.00	$264.00	$253.33
2022	7	Dump Trailer	15,000	3,500	$1,642.86	$2,186.59	$2,053.57
2022	5	Truck 1	35,000	3,000	$6,400.00	$5,040.00	$6,400.00
2024	5	Truck 2	35,000	3,000	$6,400.00	$14,000.00	$10,666.67
2023	5	Riding Lawnmover	4,500	500	$800.00	$1,080.00	$1,066.67
2023	5	Push Lawnmower 2	500	100	$80.00	$120.00	$106.67
					$15,988.00	$23,166.16	$21,081.41

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Background: Mortgage Amortization Schedule

Mortgage Amortization Schedule

- The principal is the amount of money that is borrowed.
- 30 years is the most common term.
- The interest rate is usually fixed for the entire term.
- Mortage is usually paid monthly. Equal amount.
- So monthly interest rate should be considered for monthly payment.

Lab 1-3 Mortgage Amortization Schedule

Lab 1-3: Mortgage Amortization Schedule

Purpose: Create a mortgage amortization schedule.

1. Fill basic information.
2. Calculate the monthly payment.
3. Complete row 1.
4. Complete row 2.
5. Complete the rest of the table.
6. Calculate the total interest paid. Visualize how monthly payments are allocated to interest and principal over time.

Data Preview

No data provided.

1. Fill basic information.

How?

1. Fill basic information.
   - ▶ Annual Interest Rate: 6%
   - ▶ How much monthly rate?
   - ▶ Loan Term: 30 years
   - ▶ How many months?
   - ▶ Loan Amount: $200,000

	A	B	C
1	Annual Interest Rate	6%	
2	Monthly Interest Rate	0.005	=B1/12
3	Years	30	
4	Number of Periods	360	=B3*12
5	Amount of Loan (PV)	200000	

2. Calculate the monthly payment.

> **How?**
> ① Calculate the monthly payment.
> ② PMT(Rate, Nper, PV)
>   ▶ Rate: The monthly interest rate.
>   ▶ Nper: The number of months.
>   ▶ PV: The loan amount.
> ③ Multiply it by (-1) so that the output is positive.

	A	B	C	D
1	Annual Interest Rate	6%		
2	Monthly Interest Rate	0.005	=B1/12	
3	Years	30		
4	Number of Periods	360	=B3*12	
5	Amount of Loan (PV)	200000		
6	Monthly Payment	$1,199.10	=PMT(B2,B4,B5) * (-1)	

3. Complete row 1.

How?

1. Complete row 1 as shown below.
2. Cell B9: It should take the Amount of Loan.

	A	B	C	D	E	F
1	Annual Interest Rate	6%				
2	Monthly Interest Rate	0.005	=B1/12			
3	Years	30				
4	Number of Periods	360	=B3*12			
5	Amount of Loan (PV)	200000				
6	Monthly Payment	$1,199.10	=PMT(B2,B4,B5) * (-1)			
7						
8	Monthly Payment Number	Beginning Principal	Monthly Payment	Towards Interest	Towards Principal	Ending Principal
9	1	200000	$1,199.10	1000	$199.10	$199,800.90
10		=B5	=$B$6	=B9*$B$2	=C9-D9	=B9-E9

4. Complete row 2.

How?

1. Complete row 2 as shown below.

2. Cell B11: It should take the ending Principal from row 1.

	A	B	C	D	E	F
1	Annual Interest Rate	6%				
2	Monthly Interest Rate	0.005	=B1/12			
3	Years	30				
4	Number of Periods	360	=B3*12			
5	Amount of Loan (PV)	200000				
6	Monthly Payment	$1,199.10	=PMT(B2,B4,B5) * (-1)			
7						
8	Monthly Payment Number	Beginning Principal	Monthly Payment	Towards Interest	Towards Principal	Ending Principal
9		1	200000	$1,199.10	1000	$199.10	$199,800.90
10		2	$199,800.90	$1,199.10	999.0044947	$200.10	$199,600.80
11			=B5	=$B$6	=B9*$B$2	=C9-D9	=B9-E9

5. Complete the rest of the table.

① Complete the rest of the table by dragging the formula down.

	A	B	C	D	E	F
1	Annual Interest Rate	6%				
2	Monthly Interest Rate	0.005	=B1/12			
3	Years	30				
4	Number of Periods	360	=B3*12			
5	Amount of Loan (PV)	200000				
6	Monthly Payment	$1,199.10	=PMT(B2,B4,B5) * (-1)			
7						
8	Monthly Payment Number	Beginning Principal	Monthly Payment	Towards Interest	Towards Principal	Ending Principal
9	1	200000	$1,199.10	1000	$199.10	$199,800.90
10	2	$199,800.90	$1,199.10	999.0044947	$200.10	$199,600.80
11	3	$199,600.80	$1,199.10	998.004012	$201.10	$199,399.71
12	4	$199,399.71	$1,199.10	996.9985268	$202.10	$199,197.60
13	5	$199,197.60	$1,199.10	995.9880142	$203.11	$198,994.49

6. Calculate the total interest paid.

How?
① Calculate the total interest paid.
② Calculate the total amount paid (including interest and principal).
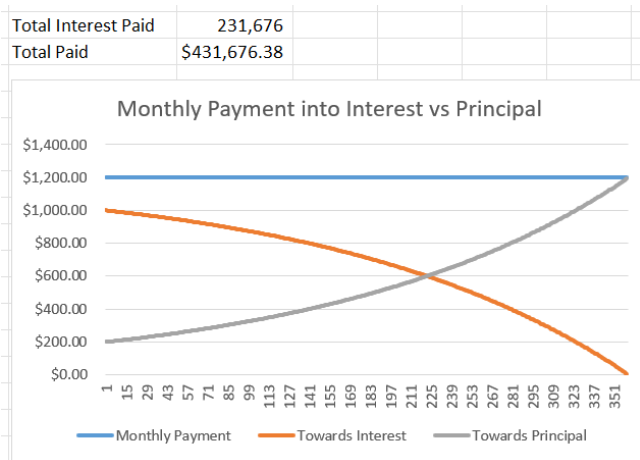③ Visualize the composition of the monthly payment (interest and principal).

| Total Interest Paid | 231,676 |
| Total Paid | $431,676.38 |

Monthly Payment into Interest vs Principal

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Background: NPV

Time Value of Money

- $1 today is worth more than $1 tomorrow.
- If interest rate is 5%, then $1 today is worth $1.05 tomorrow.
- $1.05 tomorrow is worth $1 today. This is called the time value of money.

Cost of capital

- The cost of capital is the interest rate used to discount the future cash inflows.
- It is also called the required rate of return.
- Investment with high risk should have a high cost of capital (i.e., high risk, high return).
- Cost of Capital= risk-free rate + risk premium.

FV() - Future Value

PV() - Present Value

NPV() - Net Present Value

Lab 9-2 NPV of Investment

Lab 9-2: NPV of Investment

Purple: Choose the best investment.

1. Calculate Present Value of future cash inflows.
2. Calculate NPV of each investment considering the initial cost.

Data Preview

	B	C	D	E	F
1	Cash Flow	Investment	Investment	Investment	Investment
2	Description	1	2	3	4
3	Buy Stock	(20,000)	(20,000)	(20,000)	(20,000)
4	Dividends	2,000	-	-	3,000
5	Dividends	2,000	-	-	-
6	Dividends	2,000	-	-	-
7	Dividends	2,000	-	3,000	-
8	Sell Stock	20,000	28,000	25,000	25,000

1. Calculate Present Value of future cash inflows.

How?
1. Assume 5% cost of capital.
2. Use NPV() to calculate the present value of future cash inflows for each investment.
3. NPV(Rate, Value1, Value2, ...)
   - Rate: The cost of capital.
   - Value1, Value2, ...: The future cash inflows.

	A	B	C	D	E	F	G
1		Cash Flow	Investment	Investment	Investment	Investment	Cost of Capital
2	Year	Description	1	2	3	4	5%
3	Year 0 (today)	Buy Stock	(20,000)	(20,000)	(20,000)	(20,000)	
4	Year 1	Dividends	2,000	-	-	3,000	
5	Year 2	Dividends	2,000	-	-	-	
6	Year 3	Dividends	2,000	-	-	-	
7	Year 4	Dividends	2,000	-	3,000	-	
8	Year 5	Sell Stock	20,000	28,000	25,000	25,000	
9							
10			=NPV($G$2,C4:C8)				
11	**Present Value of Expected Future Cash Inflows**		$22,762.42	$21,938.73	$22,056.26	$22,445.30	

2. Calculate NPV of each investment considering the initial cost.

How?

1. Consider the initial cost of each investment.
2. Calculate the NPV of each investment considering the initial cost.
3. Use Conditional Formatting to highlight the investment with the highest NPV.

	A	B	C	D	E	F	G
		Cash Flow	Investment	Investment	Investment	Investment	Cost of Capital
1							
2	Year	Description	1	2	3	4	5%
3	Year 0 (today)	Buy Stock	(20,000)	(20,000)	(20,000)	(20,000)	
4	Year 1	Dividends	2,000	-	-	3,000	
5	Year 2	Dividends	2,000	-	-	-	
6	Year 3	Dividends	2,000	-	-	-	
7	Year 4	Dividends	2,000	-	3,000	-	
8	Year 5	Sell Stock	20,000	28,000	25,000	25,000	
9							
10			=NPV($G$2,C4:C8)				
11	**Present Value of Expected Future Cash Inflows**		$22,762.42	$21,938.73	$22,056.26	$22,445.30	
12	**Initial Outlay**		(20,000)	(20,000)	(20,000)	(20,000)	
13	**Net Present Value (NPV) of Investment**		$2,762.42	$1,938.73	$2,056.26	$2,445.30	

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Breakeven Point

- The point at which the total revenue equals the total cost.
- It is the point at which the company starts to make a profit.

Lab 9-7 Breakeven Point

Data Preview

	A	B	C	D	E	F	G	H	I	J	K	L	M
1		Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
2	Price	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
3	Unit of sales	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00
4	Unit cost	4.50	3.80	3.80	3.80	3.50	3.50	3.00	3.00	3.00	4.00	4.50	4.50
5	Fixed cost	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00
6	Variable cost												
7	Total cost												
8	Sales revenue												
9	Net income												

1. Given **Unit of Sales** being 400, calculate **Costs**, **Sales**, and **Net Income** for each month.

How?
1. Calculate **Costs**, **Sales**, and **Net Income** for each month.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1		Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	
2	Price	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	
3	Unit of sales	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	
4	Unit cost	4.50	3.80	3.80	3.80	3.50	3.50	3.00	3.00	3.00	4.00	4.50	4.50	
5	Fixed cost	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	
6	Variable cost	1350.00	1140.00	1140.00	1140.00	1050.00	1050.00	900.00	900.00	900.00	1200.00	1350.00	1350.00	=M4*M3
7	Total cost	2350.00	2140.00	2140.00	2140.00	2050.00	2050.00	1900.00	1900.00	1900.00	2200.00	2350.00	2350.00	=SUM(M5:M6)
8	Sales revenue	2100.00	2100.00	2100.00	2100.00	2100.00	2100.00	2100.00	2100.00	2100.00	2100.00	2100.00	2100.00	=M3*M2
9	Net income	-250.00	-40.00	-40.00	-40.00	50.00	50.00	200.00	200.00	200.00	-100.00	-250.00	-250.00	=M8-M7

2. Find the breakeven point for **Unit of Sales** where the **Net Income** is 0 for each month.

How?

❶ Data tab > What-If Analysis > Goal Seek.

❷ We'll let Excel find the Unit of Sales that makes the Net Income 0.

  ▸ Set Cell: Net Income Cell.
  ▸ To Value: 0 (breakeven point).
  ▸ By changing cell: Unit of Sales Cell.

	A	B	C	D	E	F	G	H	I	J	
		Jan	Feb	March	April	May	June	July	Aug	Sep	Oct
2	Price	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	
3	Unit of sales	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	
4	Unit cost	4.50	3.80	3.80	3.80	3.50	3.50	3.00	3.00	3.00	4.00	4.50	4.50
5	Fixed cost	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00
6	Variable cost	1350.00	1140.00	1140.00	1140.00	1050.00	1050.00	900.00	900.00	900.00	1200.00	1350.00	1350.00 =M4*M3
7	Total cost	2350.00	2140.00	2140.00	2140.00	2050.00	2050.00	1900.00	1900.00	1900.00	2200.00	2350.00	2350.00 =SUM(M5:M6)
8	Sales revenue	2100.00	2100.00	2100.00	2100.00	2100.00	2100.00	2100.00	2100.00	2100.00	2100.00	2100.00 =M3*M2
9	Net income	-250.00	-40.00	-40.00	-40.00	50.00	50.00	200.00	200.00	200.00	-100.00	-250.00	-250.00 =M8-M7

Interpretation

In the January column:

- Unit of Sales required to breakeven is 400.
- Net Income is shown as 0 at the breakeven point.

* We need to repeat the same process for each month.

	A	B	C	D
1		**Jan**	**Feb**	**March**
2	**Price**	7.00	7.00	7.00
3	**Unit of sales**	400.00	300.00	300.00
4	**Unit cost**	4.50	3.80	3.80
5	**Fixed cost**	1000.00	1000.00	1000.00
6	**Variable cost**	1800.00	1140.00	1140.00
7	**Total cost**	2800.00	2140.00	2140.00
8	**Sales revenue**	2800.00	2100.00	2100.00
9	**Net income**	0.00	-40.00	-40.00

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Lab 9-8 Final Grade

Lab 9-8: Final Grade

Purpose: The final exam score to get 90% of the final grade?

1. Calculate 90% of the final grade.
2. Use What-if Scenario to find the final exam score to get 90% of the final grade.

Data Preview

	A	B	C	D	E	F	G	H
1		Points						
2	Grade Breakdown	Possible	Alan	Bob	Chris	David	Ethan	Frank
3	Quizzes	100	85	89	90	100	94	83
4	Homework	100	95	90	90	94	95	99
5	Midterms	200	170	167	171	177	190	187
6	Project	200	175	182	179	160	185	190
7	Final	200						
8	Sum of Points	800	525	528	530	531	564	559

1. Calculate 90% of the final grade.

How?
1. Calculate 90% of the final grade.

Grade Breakdown	Points Possible	Alan	Bob	Chris	David	Ethan	Frank
Quizzes	100	85	89	90	100	94	83
Homework	100	95	90	90	94	95	99
Midterms	200	170	167	171	177	190	187
Project	200	175	182	179	160	185	190
Final	200						
Sum of Points	800	525	528	530	531	564	559
Required Points for Desired Grade		720	720	720	720	720	720
		=$B$8*0.9					

2. Use What-if Scenario to find the final exam score to get 90% of the final grade.

How?

1. We'll let Excel find the final exam score that makes the final grade 90%.
   - ▶ Set Cell: Net Income Cell.
   - ▶ To Value: 0 (breakeven point).
   - ▶ By changing cell: Unit of Sales Cell.

- For Alan - The final exam score to get 90% of the final grade is 195.

	A	B	C	D	E	F	G	H
1		Points						
2	Grade Breakdown	Possible	Alan	Bob	Chris	David	Ethan	Frank
3	Quizzes	100	85	89	90	100	94	83
4	Homework	100	95	90	90	94	95	99
5	Midterms	200	170	167	171	177	190	187
6	Project	200	175	182	179	160	185	190
7	Final	200	195					
8	Sum of Points	800	720	528	530	531	564	559
9								
10	Required Points for Desired Grade		720	720	720	720	720	720
11			=$B$8*0.9					

* We need to repeat the same process for each student.

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Scenario Manager

- A tool that allows you to create and manage what-if scenarios.
- It is a useful tool for financial analysis.

Background: Expected Value

Expected Value
- The expected value is the weighted average of all possible outcomes.

EX 1. Our company expects that its net income next year might be $100 or $150 with a 50% chance of each outcome.
- The expected value of net income is $125.

EX 2. Our company expects that its net income next year might be $100, $150, or $200 with a 33% chance of each outcome.
- The expected value of net income is $150.

EX 3. Our company expects that its net income next year might be $100 (25% chance) or $200 (75% chance).
- The expected value of net income is $175.

Lab 9-9: Tax Rates

Purpose: Our company expects that effective income tax rates and pretax income might vary next year. So we need to create a what-if scenario to understand the impact of these variations on the net income. Income tax rates would be either 3%, 5%, or 7%. Pretax income would be either +5%, no change, or -5%. Our baseline scanerio is 7% income tax rate and no change in pretax income.

- Calculate the expected change in taxes under each scenario.
- Estimate the probability of each scenario occurring.
- Calculate the expected net income under each scenario. Then calculate the expected impact of these variations on the net income.

	A	B	C	D	E
1	**Taxes owed under each scenario**				
2			If Tax Rate is:	If Tax Rate is:	If Tax Rate is:
3	Income Scenarios	Taxable Income	7%	5%	3%
4	Income Increases by 5%	2,100,000	147,000	105,000	63,000
5	Income Remains the Same	2,000,000	140,000	100,000	60,000
6	Income Decreases by 5%	1,900,000	133,000	95,000	57,000

1. Calculate the expected change in taxes under each scenario.

How?
1. Define Cell C5 as "base".
2. Calculate the difference with base for each scenario.

1	Taxes owed under each scenario				
2			If Tax Rate is:	If Tax Rate is:	If Tax Rate is:
3	Income Scenarios	Taxable Income	7%	5%	3%
4	Income Increases by 5%	2,100,000	147,000	105,000	63,000
5	Income Remains the Same	2,000,000	140,000	100,000	60,000
6	Income Decreases by 5%	1,900,000	133,000	95,000	57,000
7					
8					
9	The change in taxes based on scenario above:				
10					
11			If Tax Rate is:	If Tax Rate is:	If Tax Rate is:
12	Income Scenarios	Taxable Income	7%	5%	3%
13	Income Increases by 5%	2,100,000	7,000	(35,000)	(77,000)
14	Income Remains the Same	2,000,000	-	(40,000)	(80,000)
15	Income Decreases by 5%	1,900,000	(7,000)	(45,000)	(83,000) =E6-base

2. Estimate the probability of each scenario occurring.

① Estimate the probability of each scenario occurring. It is given in the textbook. Type the below table manually.

	Probability of the scenario occurring:					
17	**Probability of the scenario occurring:**					
18			If Tax Rate is:	If Tax Rate is:	If Tax Rate is:	
19	Income Scenarios	Taxable Income	7%	5%	3%	Sum
20	Income Increases by 5%	2100000	0.05	0.10	0.15	0.30
21	Income Remains the Same	2000000	0.15	0.20	0.15	0.50
22	Income Decreases by 5%	1900000	0.10	0.05	0.05	0.20
23	Sum		0.30	0.35	0.35	1.00

3. Calculate the expected net income under each scenario. Then calculate the expected impact of these variations on the net income.

How?

❶ Calculate the expected net income under each scenario.

❷ Calculate the expected impact of these variations on the net income.

25	Expected impact of changes in tax rates and taxable income					
26			If Tax Rate is:	If Tax Rate is:	If Tax Rate is:	
27	Income Scenarios	Taxable Income	7%	5%	3%	Sum of Expected Savings
28	Income Increases by 5%	2,100,000	350	(3,500)	(11,550)	(14,700)
29	Income Remains the Same	2,000,000	-	(8,000)	(12,000)	(20,000)
30	Income Decreases by 5%	1,900,000	(700)	(2,250)	(4,150)	(7,100)
31	Sum of Expected Savings		(350)	(13,750)	(27,700)	(41,800)

Interpretation:
- We expect that tax rates are most likely lower than this year.
- Under most of the scenarios, the expected taxes are lower than this year.
- The combined effect (i.e., expected taxes) indicates that taxes will be lower by $41,800.
- Note: the tax might be higher if our income increases by 5% with the same tax rate.

	A	B	C	D	E	F
1	Taxes owed under each scenario					
2			If Tax Rate is:	If Tax Rate is:	If Tax Rate is:	
3	Income Scenarios	Taxable Income	7%	5%	3%	
4	Income Increases by 5%	2,100,000	147,000	105,000	63,000	
5	Income Remains the Same	2,000,000	140,000	100,000	60,000	
6	Income Decreases by 5%	1,900,000	133,000	95,000	57,000	
7						
8						
9	The change in taxes based on scenario above:					
10						
11			If Tax Rate is:	If Tax Rate is:	If Tax Rate is:	
12	Income Scenarios	Taxable Income	7%	5%	3%	
13	Income Increases by 5%	2,100,000	7,000	(35,000)	(77,000)	
14	Income Remains the Same	2,000,000	-	(40,000)	(80,000)	
15	Income Decreases by 5%	1,900,000	(7,000)	(45,000)	(83,000)	=E6-base
16						
17	Probability of the scenario occurring:					
18			If Tax Rate is:	If Tax Rate is:	If Tax Rate is:	
19	Income Scenarios	Taxable Income	7%	5%	3%	Sum
20	Income Increases by 5%	2100000	0.05	0.10	0.15	0.30
21	Income Remains the Same	2000000	0.15	0.20	0.15	0.50
22	Income Decreases by 5%	1900000	0.10	0.05	0.05	0.20
23	Sum		0.30	0.35	0.35	1.00
24						
25	Expected impact of changes in tax rates and taxable income					
26			If Tax Rate is:	If Tax Rate is:	If Tax Rate is:	
27	Income Scenarios	Taxable Income	7%	5%	3%	Sum of Expected Savings
28	Income Increases by 5%	2,100,000	350	(3,500)	(11,550)	(14,700)
29	Income Remains the Same	2,000,000	-	(8,000)	(12,000)	(20,000)
30	Income Decreases by 5%	1,900,000	(700)	(2,250)	(4,150)	(7,100)
31	Sum of Expected Savings		(350)	(13,750)	(27,700)	(41,800)