Unit Code: MGMT220
Unit Name: Fundamentals of Business Analytics
Assignment Number: 3
Assignment Name: Data Tables/ Scenarios & Optimization
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Task 1: Data Tables/ Scenarios

Net Profit Scenario Summary 1

Figure 1

Figure 2

Interpretation:
The use of scenario manager in Microsoft Excel allows us to simulate the net profit of a property development project by varying the construction costs. Net profit can be calculated by subtracting the revenue of the project and the costs of the project. As seen in figure 1, some of the costs include stamp duty and construction cost. The results generated by the scenario manager and the graph in figure 2 suggest that 60% of construction cost perhaps is not feasible as it records a loss of approximately 2.5 million. While the property developer will be able to make a profit when the construction cost is 40-55%. Nonetheless, it is important to acknowledge the fact that the strata selling price does not vary in such a scenario.
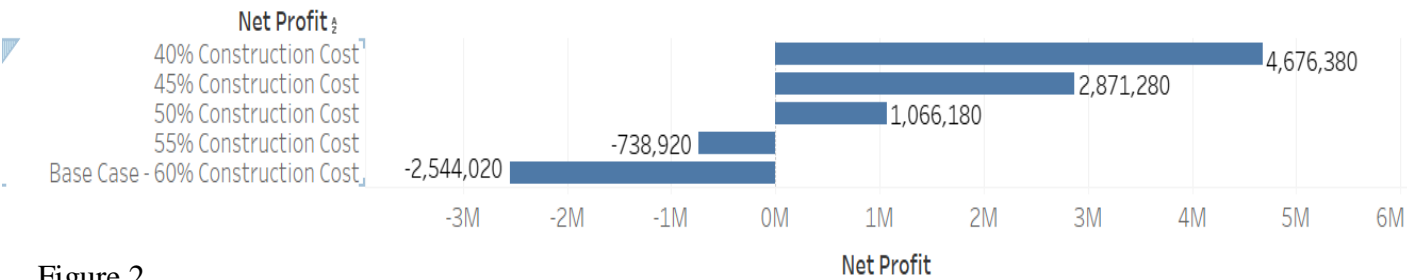
Net Profit Scenario Summary 2

Figure 3

Figure 4

Interpretation:
In this scenario, we are simulating scenarios where we vary both construction costs and the strata selling price. From the assignment guidelines, we acknowledged that strata prices could drop as much as 20% as well as a jump by 15% within the time frame. Therefore it will important to take these factors into account when calculating our net profit. By looking the bar chart in figure 4, it is evident to say that, when the construction costs of the project are 40% and strata selling price (either strata prices increases/decreases by 15%/20%), the property developer will able to generate a positive net profit. This scenario also applies when the construction cost is 50% and the selling price increases by 15%. On the other hand, the other scenarios will lead to negative net profit.
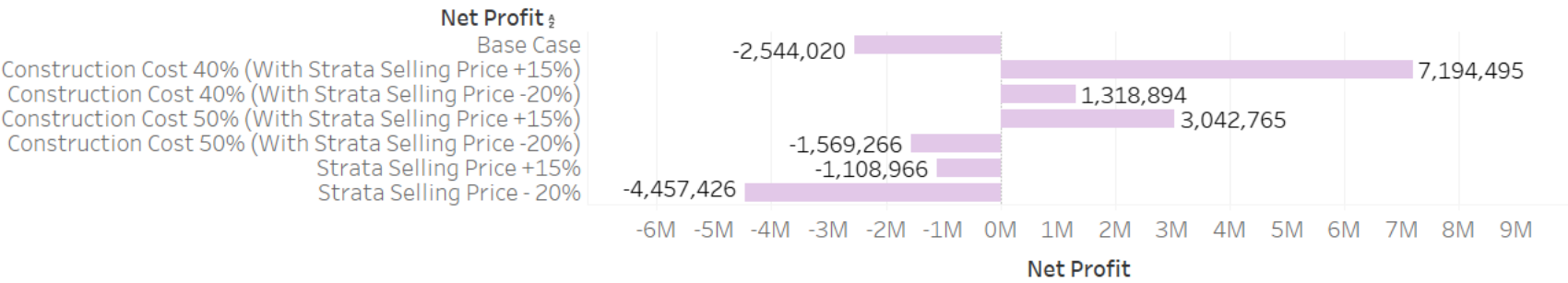
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Return on Investment (ROI) Scenario Summary 1

Scenario Summary		Base Case: 60% Construction Cost	50% Construction Cost	40% Construction Cost	45% Construction Cost	55% Construction Cost
Changing Cells:						
	Stamp Duty	3.50%	3.50%	3.50%	3.50%	3.50%
	Construction Cost	60%	50%	40%	45%	55%
	Misc Cost	10%	10%	10%	10%	10%
	Number of Apartments Being Built	40	40	40	40	40
	Number of Non-Strata Buildings Need to Bought	5	5	5	5	5
	Strata Selling Price	$902,550.00	$902,550.00	$902,550.00	$902,550.00	$902,550.00
	Non Strata Selling	$2,422,210.00	$2,422,210.00	$2,422,210.00	$2,422,210.00	$2,422,210.00
Result Cells:						
	Return on Investment (ROI)	-6.58%	3.04%	14.88%	8.64%	-2.01%

Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created. Changing cells for each scenario are highlighted in gray.

Figure 5

Figure 6

Interpretation:

Besides net profit, we are also required to calculate the return on investment (ROI) of the project. Return on investment can be used to measure the efficiency of the project – i.e. whether the property developer is benefiting from the project. It can be calculated by dividing the return of the project over the cost of the project from both figures 5 and 6, we are able to comprehend that it is inefficient to develop a property project in both the base cases (-6.58% ROI) and when the construction cost is at 55% (-2.01% ROI). On the other hand, such scenarios were drawn when the prices of both strata and non-strata remain the same. The scenarios below will be used to illustrate such impacts.

Return on Investment (ROI) Scenario Summary 2

Scenario Summary		Base Case (60% Construction Cost)	Strata Selling Price - 20%	Strata Selling Price +15%	Construction Cost 50% (With Strata Selling Price -20%)	Construction Cost 50% (With Strata Selling Price +15%)	Construction Cost 40% (With Strata Selling Price -20%)	Construction Cost 40% (With Strata Selling Price + 15%)
Changing Cells:								
	Stamp Duty	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%
	Construction Cost	60%	60%	60%	50%	50%	40%	40%
	Misc Cost	10%	10%	10%	10%	10%	10%	10%
	Number of Apartments Being Built	40	40	40	40	40	40	40
	Number of Non-Strata Buildings Need to Bou	5	5	5	5	5	5	5
	Strata Selling Price	$902,550.00	$722,040.00	$1,037,932.50	$722,040.00	$1,037,932.50	$722,040.00	$1,037,932.50
	Non Strata Selling	$2,422,210.00	$2,422,210.00	$2,422,210.00	$2,422,210.00	$2,422,210.00	$2,422,210.00	$2,422,210.00
Result Cells:								
	Return on Investment (ROI)	-6.58%	-13.37%	-2.60%	-5.15%	7.91%	4.79%	20.96%

Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created. Changing cells for each scenario are highlighted in gray.
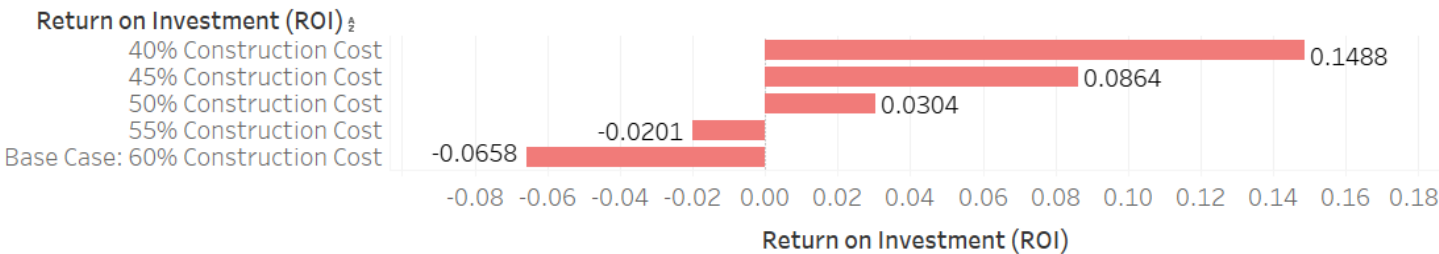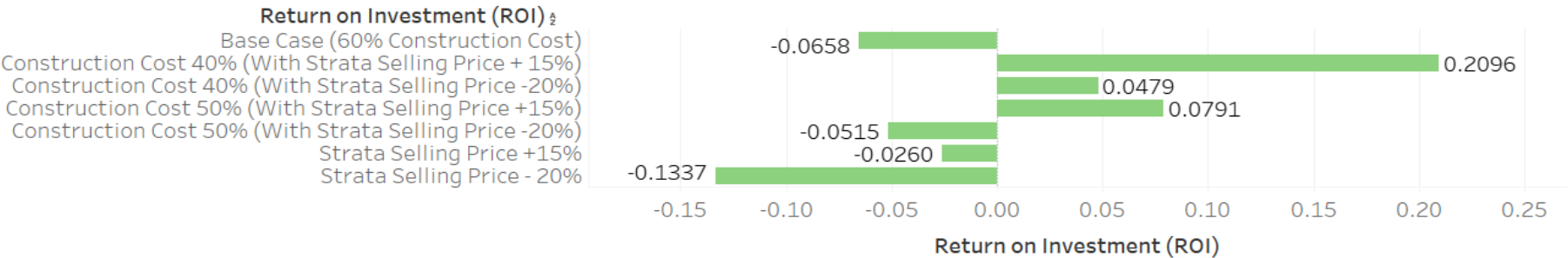
Figure 7

Figure 8

Interpretation:

Similarly to net profit scenario summary 2, we need to take the variation of construction cost and strata selling price to get a 'complete picture' of the best and worst-case scenarios. As a result, the scenarios between these two will be similar. By looking at both figure 7 and 8, we can notice that only 3 scenarios out 7 can yield a positive ROI. More importantly, they are most likely to occur when the construction cost 40%. Even so, we will not able to control such cost as it will likely vary every month, therefore, property developers always need to pay attention to such changes before investing in a property project.

Task 2: Optimization

In this task, we are required to find the optimum number of apartments and floors for the development, assuming stable prices for apartments. Therefore, we do not take account the variation of prices (+15%/-20% strata prices) like we did in task 1 of this assignment.

Additionally, we need to compute a couple values before solving this problem. They are:

- Cost of purchase (which can calculated by multiplying the price of non-strata dwelling in our LGA, 1.45 (as we summed the percentage of costs – 30% for the council required fees and another 15% for the purchase of houses) and 12 (house worth of land).
- Saes revenue (The product between prices and the number of apartments being built)
- We are required to examine the impacts of variation of construction cost (40%, 50% and 60%)

In order to solve such problem, we can use linear integer programming to do so. As mentioned earlier, the objective of such problem is to maximise the net profit by changing levels and apartment number. Such problem must satisfy the following constraints:

- All floors should have a minimum 18 and a maximum 25 apartments.
- The number of apartments should be an integer (i.e. there should be no half/a quarter of a building being built)

A screenshot is attached to demonstrate how the optimisation models going to operate.

Task 2						
Cost of purchase						
$42,146,454.00						
	Price	**Number of Apartments**	**Total**			
Sales Revenue	$902,550.00	125	$112,818,750.00			
Construction Cost	40.00%					
Model						
Floor #	**Number**	**Cost Per Apartment**	**Cost Per Floor**	**Min Number Apartments**	**Max Number Apartments**	
Floor 1	25	$361,020.00	$9,025,500.00	18	25	
Floor 2	25	$361,020.00	$9,025,500.00	18	25	
Floor 3	25	$451,275.00	$11,281,875.00	18	25	
Floor 4	25	$564,093.75	$14,102,343.75	18	25	
Floor 5	25	$705,117.19	$17,627,929.69	18	25	
Floor 6	0	$881,396.48	$0.00	18	25	
Floor 7	0	$1,101,745.61	$0.00	18	25	
Total			$61,063,148.44			
Purchase Cost	-$42,146,454.00					
Total Cost Construction	-$61,063,148.44					
Revenue	$112,818,750.00					
Net Profit	$9,609,147.56					

Interpretation:

In this situation, we are using 40% construction cost. By using the Solver tool in Excel, it appears that we are able to build 125 apartments based on this case. Additionally, the net profit is maximised at $9,609,147.56. More scenarios will be tested by varying the amount of construction cost.

Screenshot 1

On the other hand, the construction costs increased from 40% to 50% or 60% (while we keep the number of apartment being built) then, we will record a negative net profit; which is not acceptable. This can be shown in the following screenshot.

Task 2						
Cost of purchase						
$42,146,454.00						
	Price	**Number of Apartments**	**Total**			
Sales Revenue	$902,550.00	125	$112,818,750.00			
Construction Cost	50.00%					
Model						
Floor #	**Number**	**Cost Per Apartment**	**Cost Per Floor**	**Min Number Apartments**	**Max Number Apartments**	
Floor 1	25	$451,275.00	$11,281,875.00	18	25	
Floor 2	25	$451,275.00	$11,281,875.00	18	25	
Floor 3	25	$564,093.75	$14,102,343.75	18	25	
Floor 4	25	$705,117.19	$17,627,929.69	18	25	
Floor 5	25	$881,396.48	$22,034,912.11	18	25	
Floor 6	0	$1,101,745.61	$0.00	18	25	
Floor 7	0	$1,377,182.01	$0.00	18	25	
Total			$76,328,935.55			
Purchase Cost	-$42,146,454.00					
Total Cost Construction	-$76,328,935.55					
Revenue	$112,818,750.00					
Net Profit	-$5,656,639.55					

Screenshot 2

Task 2						
Cost of purchase						
$42,146,454.00						
	Price	**Number of Apartments**	**Total**			
Sales Revenue	$902,550.00	125	$112,818,750.00			
Construction Cost	60.00%					
Model						
Floor #	**Number**	**Cost Per Apartment**	**Cost Per Floor**	**Min Number Apartments**	**Max Number Apartments**	
Floor 1	25	$541,530.00	$13,538,250.00	18	25	
Floor 2	25	$541,530.00	$13,538,250.00	18	25	
Floor 3	25	$676,912.50	$16,922,812.50	18	25	
Floor 4	25	$846,140.63	$21,153,515.63	18	25	
Floor 5	25	$1,057,675.78	$26,441,894.53	18	25	
Floor 6	0	$1,322,094.73	$0.00	18	25	
Floor 7	0	$1,652,618.41	$0.00	18	25	
Total			$91,594,722.66			
Purchase Cost	-$42,146,454.00					
Total Cost Construction	-$91,594,722.66					
Revenue	$112,818,750.00					
Net Profit	-$20,922,426.66					

Screenshot 3

Conclusion:

We are able to conclude that the optimum level of apartments being built at 40% construction cost is 125 apartments. On the other hand, if the construction costs increases, the number of being apartment should decreased.