



MACQUARIE
University
SYDNEY • AUSTRALIA

MGMT220 FUNDAMENTALS OF BUSINESS ANALYTICS

ASSIGNMENT #3: DATA TABLES/SCENARIOS & OPTIMISATION

NAME: CHRIS JERYLLE VARGAS OIDEM

STUDENT ID: 45476624

ALLOCATED LGA: BOTANY BAY

DUE DATE: FRIDAY, 25 OCTOBER 2019, 11:55PM

BACKGROUND:

Two of my managers have reconciled their differences and they have learned a valuable lesson from my reports: It's rarely a good idea to base decisions only on what you'd like the world to be. Now they want me to give a much more realistic assessment of the viability of my suburb as an area for buying houses and then building and selling apartments.

Managers have noted that, even after accounting for inflation, prices for both houses and apartments in my suburb have fluctuated somewhat. They also know that the cost of building can vary depending on the nature of the land, local council requirements, labour availability and more.

TASK #1:

DATA TABLES / SCENARIOS

Considering the variability in price fluctuations for both strata & non-strata properties in Botany Bay, & variability in construction costs (40%, 50% and 60%), the following report shows the results of the expected net profit and return on investment (ROI) for all three scenarios – base case, best case and worst case.

Assumption: The quantity (number of apartments) ranges from 2 to 8 in increments of 2.

1.1 Net Profit – Botany Bay

Scenario Summary - Net Profit				
		Current Values:	Strata Selling Price Up 15%	Strata Selling Price Down 20%
Changing Cells:				
Stamp Duty		3.50%	3.50%	3.50%
Construction Cost		70%	70%	70%
Miscellaneous Cost		5%	5%	5%
Strata (Apartment) Price	\$	846,265.00	\$ 973,204.75	\$ 677,012.00
Non-Strata (House) Price	\$	1,524,328.00	\$ 1,524,328.00	\$ 1,524,328.00
Result Cells:				
Net Profit	\$	53,798.30	\$ 85,533.24	\$ 11,485.05

1.2 Base Case Scenario – Strata Selling Price Remains the Same

NO. OF APARTMENTS	CONSTRUCTION COST			
	\$ 53,798.30	40%	50%	60%
2	-\$ 323,393.99	-\$ 408,020.49	-\$ 492,646.99	
4	\$ 71,025.88	-\$ 13,600.62	-\$ 98,227.12	
6	\$ 202,499.17	\$ 117,872.67	\$ 33,246.17	
8	\$ 268,235.82	\$ 183,609.32	\$ 98,982.81	

1.3 Best Case Scenario – Strata Selling Price Up 15%

NO. OF APARTMENTS	CONSTRUCTION COST			
	\$ 85,533.24	40%	50%	60%
2	-\$ 253,577.13	-\$ 350,897.60	-\$ 448,218.08	
4	\$ 140,842.74	\$ 43,522.27	-\$ 53,798.21	
6	\$ 272,316.03	\$ 174,995.56	\$ 77,675.08	
8	\$ 338,052.68	\$ 240,732.20	\$ 143,411.73	

1.4 Worst Case Scenario – Strata Selling Price Down 20%

NO. OF APARTMENTS	CONSTRUCTION COST			
	\$ 11,485.05	40%	50%	60%
2	-\$ 416,483.14	-\$ 484,184.34	-\$ 551,885.54	
4	-\$ 22,063.27	-\$ 89,764.47	-\$ 157,465.67	
6	\$ 109,410.02	\$ 41,708.82	-\$ 25,992.38	
8	\$ 175,146.67	\$ 107,445.47	\$ 39,744.27	

Results & Explanation

Looking at table 1.1 above, it shows the net profit for a 15% increase and 20% drop in strata selling price, while holding the other variables constant. In tables 1.2 to 1.4, it shows how the net profit changes for each scenario due to variations in construction costs (row) and number of apartments (column). Analysing Botany Bay, we need to build at least 6 apartments to return any form of profit for all scenarios.

1.5 Return on Investment – Botany Bay

Scenario Summary - Return on Investment				
		Current Values:	Strata Selling Price Up 15%	Strata Selling Price Down 20%
Changing Cells:				
Stamp Duty	3.50%	3.50%	3.50%	3.50%
Construction Cost	70%	70%	70%	70%
Miscellaneous Cost	5%	5%	5%	5%
Strata (Apartment) Price	\$ 846,265.00	\$ 973,204.75	\$ 677,012.00	
Non-Strata (House) Price	\$ 1,524,328.00	\$ 1,524,328.00	\$ 1,524,328.00	
Result Cells:				
Return on Investment	6.79%	9.64%	1.73%	

1.6 Base Case Scenario – Strata Selling Price Remains the Same

		CONSTRUCTION COST			
NO. OF APARTMENTS	6.79%	40%	50%	60%	
	2	-28%	-33%	-37%	
	4	9%	-2%	-10%	
	6	31%	16%	4%	
	8	46%	28%	13%	

1.7 Best Case Scenario – Strata Selling Price Up 15%

		CONSTRUCTION COST			
NO. OF APARTMENTS	9.64%	40%	50%	60%	
	2	-21%	-27%	-32%	
	4	17%	5%	-5%	
	6	39%	22%	9%	
	8	53%	33%	17%	

1.8 Worst Case Scenario – Strata Selling Price Down 20%

		CONSTRUCTION COST			
NO. OF APARTMENTS	1.73%	40%	50%	60%	
	2	-38%	-42%	-45%	
	4	-3%	-12%	-19%	
	6	19%	7%	-4%	
	8	35%	19%	6%	

Results & Explanation

Table 1.5 above shows the ROI in Botany Bay for the three scenarios. Tables 1.6 to 1.8 focuses on every scenario; where we can see the range for the number of apartments for different percentages of construction cost that results in a negative ROI.

Recommendation

Analysis of the above data is conclusive of a consistent result from both net profit and ROI. Depending on the effects of recent banking scandals and market conditions, we have covered all possibilities for the variation in apartment prices – from a 20% drop to a 15% increase, and the current situation.

In the **base** case and **best**-case scenario, building less than 6 apartments per one house block will give us a negative profit of as low as -\$492,646.99 (-37% ROI) & -\$448,218.08 (-32% ROI) respectively.

In the **worst**-case scenario, building anything below 8 apartments for one house block will give us a negative profit of -\$551,885.54 (45% ROI).

TASK #2:

OPTIMISATION

Given the task of purchasing 12 adjacent non-strata houses, we need to calculate the optimum number of apartments and floors for the development of a multi-story apartment building in Botany Bay.

Assumption: Costs are calculated per house unit acquired.

My analysis of Task 2 starts by using Scenario Manager to calculate the net profit (\$B\$21) by varying the construction costs in the range of 40%, 50% and 60% as shown in table 2.1 below.

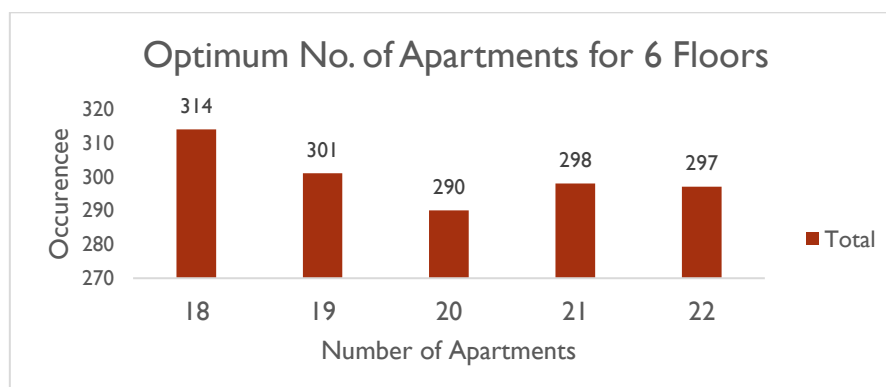
2.1 Net Profit – Botany Bay

Scenario Summary				
Current Values: Construction Cost - 40% Construction Cost - 50% Construction Cost - 60%				
Changing Cells:				
\$B\$4	3.50%	3.50%	3.50%	3.50%
\$B\$5	70%	40%	50%	60%
\$B\$6	5%	5%	5%	5%
\$B\$7	\$ 846,265.00	\$ 846,265.00	\$ 846,265.00	\$ 846,265.00
\$B\$8	\$ 1,524,328.00	\$ 1,524,328.00	\$ 1,524,328.00	\$ 1,524,328.00
Result Cells:				
\$B\$24	\$ 62,092.96	\$ 315,972.46	\$ 231,345.96	\$ 146,719.46

After assessing the net profit for the different construction costs, I have used an Evolutionary Model with input parameters of number of apartments and number of floors to find the optimum combination for each scenario and comparing the best output as the parameters are changed (tables 2.2 to 2.4).

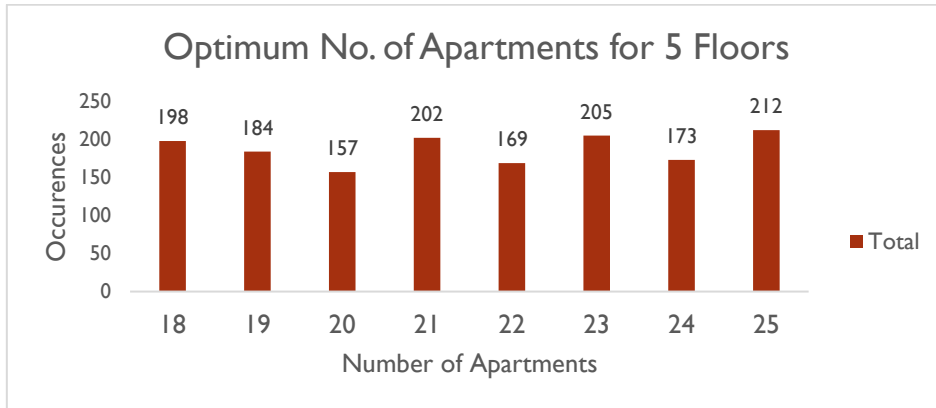
2.2 Construction Cost – 40%

	NUMBER OF FLOORS							
	\$ 315,972.46	1	2	3	4	5	6	7
NUMBER OF APARTMENTS ON EACH FLOOR	18	\$ 315,972.46	\$ 297,972.46	\$ 266,472.46	\$ 221,436.46	\$ 158,202.46	\$ 70,344.46	-\$ 50,579.54
	19	\$ 314,972.46	\$ 295,972.46	\$ 262,722.46	\$ 215,184.46	\$ 148,437.46	\$ 55,698.46	-\$ 71,943.54
	20	\$ 313,972.46	\$ 293,972.46	\$ 258,972.46	\$ 208,932.46	\$ 138,672.46	\$ 41,052.46	-\$ 93,307.54
	21	\$ 312,972.46	\$ 291,972.46	\$ 255,222.46	\$ 202,680.46	\$ 128,907.46	\$ 26,406.46	-\$ 114,671.54
	22	\$ 311,972.46	\$ 289,972.46	\$ 251,472.46	\$ 196,428.46	\$ 119,142.46	\$ 11,760.46	-\$ 136,035.54
	23	\$ 310,972.46	\$ 287,972.46	\$ 247,722.46	\$ 190,176.46	\$ 109,377.46	-\$ 2,885.54	-\$ 157,399.54
	24	\$ 309,972.46	\$ 285,972.46	\$ 243,972.46	\$ 183,924.46	\$ 99,612.46	-\$ 17,531.54	-\$ 178,763.54
	25	\$ 308,972.46	\$ 283,972.46	\$ 240,222.46	\$ 177,672.46	\$ 89,847.46	-\$ 32,177.54	-\$ 200,127.54



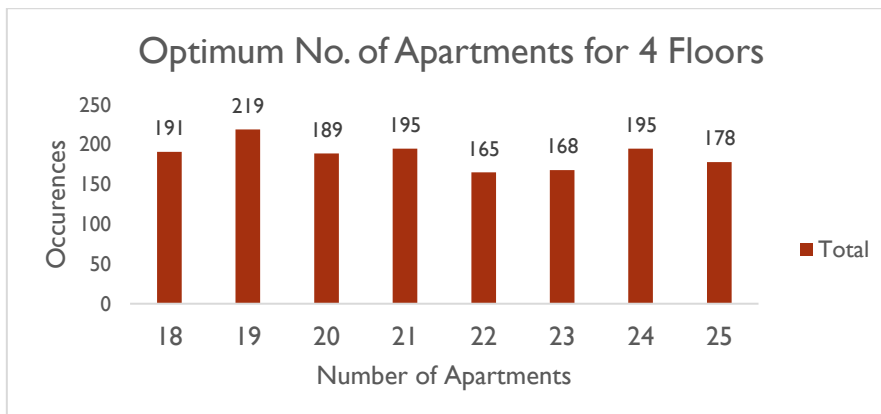
2.3 Construction Cost – 50%

NUMBER OF APARTMENTS ON EACH FLOOR	NUMBER OF FLOORS							
	\$ 231,345.96	1	2	3	4	5	6	7
	18	\$ 231,345.96	\$ 213,345.96	\$ 181,845.96	\$ 136,809.96	\$ 73,575.96	-\$ 14,282.04	-\$ 135,206.04
	19	\$ 230,345.96	\$ 211,345.96	\$ 178,095.96	\$ 130,557.96	\$ 63,810.96	-\$ 28,928.04	-\$ 156,570.04
	20	\$ 229,345.96	\$ 209,345.96	\$ 174,345.96	\$ 124,305.96	\$ 54,045.96	-\$ 43,574.04	-\$ 177,934.04
	21	\$ 228,345.96	\$ 207,345.96	\$ 170,595.96	\$ 118,053.96	\$ 44,280.96	-\$ 58,220.04	-\$ 199,298.04
	22	\$ 227,345.96	\$ 205,345.96	\$ 166,845.96	\$ 111,801.96	\$ 34,515.96	-\$ 72,866.04	-\$ 220,662.04
	23	\$ 226,345.96	\$ 203,345.96	\$ 163,095.96	\$ 105,549.96	\$ 24,750.96	-\$ 87,512.04	-\$ 242,026.04
	24	\$ 225,345.96	\$ 201,345.96	\$ 159,345.96	\$ 99,297.96	\$ 14,985.96	-\$ 102,158.04	-\$ 263,390.04
	25	\$ 224,345.96	\$ 199,345.96	\$ 155,595.96	\$ 93,045.96	\$ 5,220.96	-\$ 116,804.04	-\$ 284,754.04



2.4 Construction Cost – 60%

NUMBER OF APARTMENTS ON EACH FLOOR	NUMBER OF FLOORS							
	\$ 146,719.46	1	2	3	4	5	6	7
	18	\$ 146,719.46	\$ 128,719.46	\$ 97,219.46	\$ 52,183.46	-\$ 11,050.54	-\$ 98,908.54	-\$ 219,832.54
	19	\$ 145,719.46	\$ 126,719.46	\$ 93,469.46	\$ 45,931.46	-\$ 20,815.54	-\$ 113,554.54	-\$ 241,196.54
	20	\$ 144,719.46	\$ 124,719.46	\$ 89,719.46	\$ 39,679.46	-\$ 30,580.54	-\$ 128,200.54	-\$ 262,560.54
	21	\$ 143,719.46	\$ 122,719.46	\$ 85,969.46	\$ 33,427.46	-\$ 40,345.54	-\$ 142,846.54	-\$ 283,924.54
	22	\$ 142,719.46	\$ 120,719.46	\$ 82,219.46	\$ 27,175.46	-\$ 50,110.54	-\$ 157,492.54	-\$ 305,288.54
	23	\$ 141,719.46	\$ 118,719.46	\$ 78,469.46	\$ 20,923.46	-\$ 59,875.54	-\$ 172,138.54	-\$ 326,652.54
	24	\$ 140,719.46	\$ 116,719.46	\$ 74,719.46	\$ 14,671.46	-\$ 69,640.54	-\$ 186,784.54	-\$ 348,016.54
	25	\$ 139,719.46	\$ 114,719.46	\$ 70,969.46	\$ 8,419.46	-\$ 79,405.54	-\$ 201,430.54	-\$ 369,380.54



I then used the Monte Carlo simulation to find the optimum number of apartments for each scenario. In the first scenario with 40% construction cost, the optimum number is 6 floors with 18 apartments on each level. As for the second scenario with 50% construction cost, the optimum number is 5 floors with 25 apartments on each level. Construction costs of 60% would need 4 floors with 19 apartments on each level to reach its optimum.

APPENDICES

Appendix I – Current Parameters & Model

PARAMETERS	
TAX (STAMP DUTY)	3.50%
CONSTRUCTION COST PER APARTMENT	70%
MISCELLANEOUS COST (MARKETING COSTS + CONVEYANCING + SITE COSTS)	5%
STRATA PROPERTY PRICE (SELLING PRICE)	\$846,265.00
NON-STRATA DWELLING (AVERAGE)	\$1,524,328.00
MODEL	
NUMBER OF APARTMENTS BEING BUILT	10
TOTAL REVENUE	\$846,265.00
TAX (STAMP DUTY)	\$5,335.15
MISCELLANEOUS COST	\$42,313.25
COST OF ACQUIRING	\$152,432.80
APARTMENT CONSTRUCTION COST	\$592,385.50
TOTAL COST	\$792,466.70
TOTAL NET PROFIT	\$53,798.30
RETURN ON INVESTMENT	6.79%

Appendix 2 – Strata Property Price Down 20% Parameters & Model

PARAMETERS	
TAX (STAMP DUTY)	3.50%
CONSTRUCTION COST PER APARTMENT	70%
MISCELLANEOUS COST (MARKETING COSTS + CONVEYANCING + SITE COSTS)	5%
STRATA PROPERTY PRICE (SELLING PRICE)	\$ 677,012.00
NON-STRATA DWELLING (AVERAGE)	\$ 1,524,328.00
MODEL	
NUMBER OF APARTMENTS BEING BUILT	10
TOTAL REVENUE	\$ 677,012.00
TAX (STAMP DUTY)	\$ 5,335.15
MISCELLANEOUS COST	\$ 33,850.60
COST OF ACQUIRING	\$ 152,432.80
APARTMENT CONSTRUCTION COST	\$ 473,908.40
TOTAL COST	\$ 665,526.95
TOTAL NET PROFIT	\$ 11,485.05
RETURN ON INVESTMENT	1.73%

Appendix 3 – Strata Property Price Down 15% Parameters & Model

PARAMETERS	
TAX (STAMP DUTY)	3.50%
CONSTRUCTION COST PER APARTMENT	70%
MISCELLANEOUS COST (MARKETING COSTS + CONVEYANCING + SITE COSTS)	5%
STRATA PROPERTY PRICE (SELLING PRICE)	\$ 973,204.75
NON-STRATA DWELLING (AVERAGE)	\$ 1,524,328.00
MODEL	
NUMBER OF APARTMENTS BEING BUILT	10
TOTAL REVENUE	\$ 973,204.75
TAX (STAMP DUTY)	\$ 5,335.15
MISCELLANEOUS COST	\$ 48,660.24
COST OF ACQUIRING	\$ 152,432.80
APARTMENT CONSTRUCTION COST	\$ 681,243.33
TOTAL COST	\$ 887,671.51
TOTAL NET PROFIT	\$ 85,533.24
RETURN ON INVESTMENT	9.64%