

Make or Buy Decision

Question # 1:

Part (a)

The Break even analysis for the make & buy options is given in the following figure:



Figure 1

$$B_{cost}(Q) = B_{fc} + B_{vc} * Q$$

$$M_{cost}(Q) = M_{fc} + M_{vc} * Q$$

From the above graph, we may observe that the break even point lies approximately around 6000. Calculating Accurately by equating the buy and make equations, we get the exact point:

$$B/E \text{ Point} = 60000$$

Total cost at this point is:

$$Cost@BE = 1025000$$

Part (b)

Given a requirement of 150,000, the make option is cheaper as compared to the make option (refer to figure 1).

The cost savings would be defined as:

$$savings = B_{cost}(150,000) - M_{cost}(150,000)$$

$$savings = 180,000$$



Question # 2

Make option:

$$\begin{aligned} \text{fixed cost} &= \$50,000 \\ \text{variable cost} &= \$25 \end{aligned}$$

Buy option:

$$\begin{aligned} \text{fixed cost} &= \$1000 \\ \text{variable cost} &= ? \end{aligned}$$

Solution:

The criterion is defined as follows:

$$(\text{fixed cost})_{\text{buy}} + 20000 * (\text{variable cost})_{\text{buy}} < (\text{fixed cost})_{\text{make}} + 20000 * (\text{variable cost})_{\text{make}}$$

Then,

$$(\text{variable cost})_{\text{buy}} < ((\text{fixed cost})_{\text{make}} + Q * (\text{variable cost})_{\text{make}} - (\text{fixed cost})_{\text{buy}}) / Q$$

Substituting values,

$$(\text{variable cost})_{\text{buy}} < \$27.4500$$

Hence the maximum cost is \$27.45.

Other criterions to look for: As discussed in the lectures, the firm should look at the seller's standing in the market and work on developing good long terms relationships with them. In the above analysis, this factor is not accounted for.

Q

uestion # 3

$$Q = 20,000 \text{ units}$$

Make option:

$$\text{fixed cost} = \$50,000$$

$$\text{variable cost} = \$8$$

Buy option:

$$\text{fixed cost} = \$600$$

$$\text{variable cost} = \$10$$

Part (a)

The breakeven plot for both buy & make is given below:

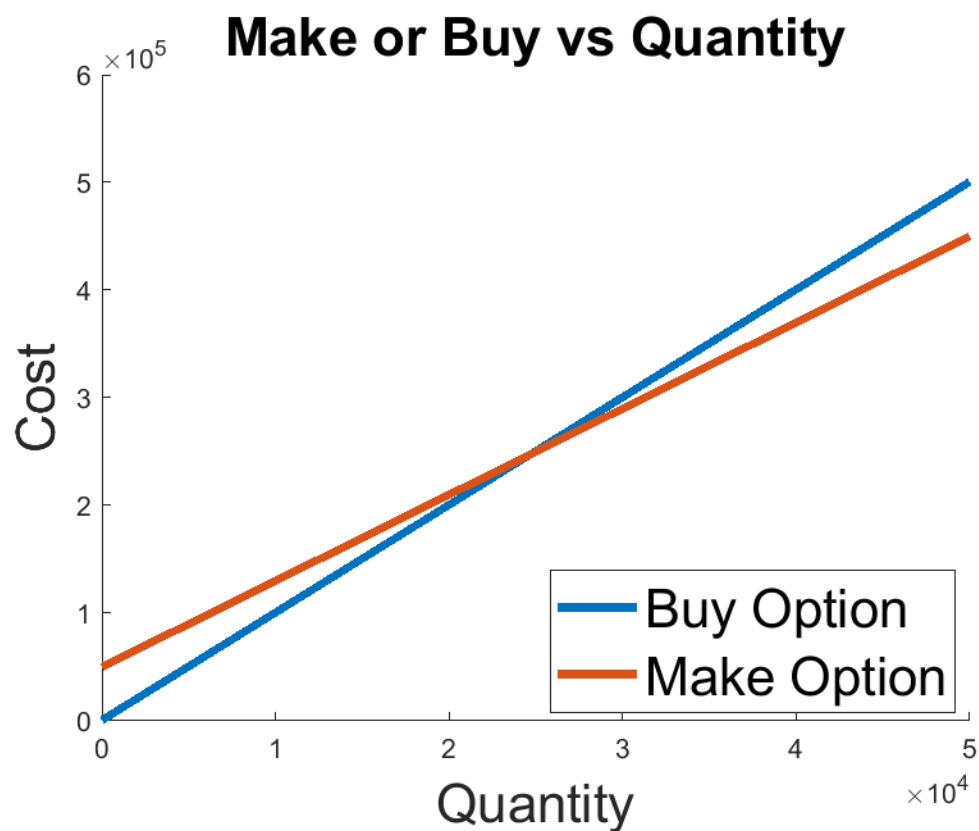


Figure 3

As is being observed, the breakeven point lies at 24,700 units. Since the requirement is only of 20,000 units, the buy option would be cheaper (refer to figure 3).

The total cost at the breakeven point is given as follows:

$$Total\ Cost\ @\ BE = M_{cost} = B_{cost}(@24,700) = B_{fc} + B_{vc} * 24700$$

$$Total\ Cost\ @\ BE = \$247,600$$

Part (b)

Total cost for both options is given below:

$$Cost_{buy\ option} = \$200600$$

$$Cost_{make\ option} = \$210000$$

As evident, the buy option is cheaper (as was suggested in the previous part). The total savings would be:

$$\begin{aligned} savings &= make\ cost - buy\ cost \\ savings &= \$9400 \end{aligned}$$

Total Cost of Ownership

Q

uestion # 1

The total cost analysis can be found in the attached excel file [*sheet-name: Q1*]. The overall costs are:

Total Cost of Ownership	Supplier 1	6,578,017		Supplier 2	7,038,983
-------------------------	------------	-----------	--	------------	-----------

It can be seen that cost of supplier 1 is less than that of supplier 2. Hence we should go with supplier 1.

Q

uestion # 2

The total cost analysis can be found in the attached excel file [*sheet-name: Q2*]. The overall costs are:

Total Cost of Ownership	Supplier 1	50,414,600	Supplier 2	49,506,400	Supplier 3	52,895,000
-------------------------	------------	------------	------------	------------	------------	------------

It can be observed that the cheapest option to go with is supplier 2.

*Notes

*The complete folder with all files can be found at: <https://github.com/mehhdiii/Total-cost-of-ownership-analysis>

The following MATLAB script was used in obtaining the graphs/solution:

Question # 1[(a and b)]

```
Q = 1: 160000;  
Bfc = 5000; Bvc = 17; %buying fixed cost (Bfc) and variable cost (Bvc)  
Mfc = 125000; Mvc = 15; %Making fixed cost (Mfc) and variable cost (Mvc)  
  
B = Bfc + Bvc*Q;  
M = Mfc + Mvc*Q;  
hold on  
fs = 20  
plot(Q, B, 'linewidth', 3)  
plot(Q, M, 'linewidth', 3)  
title('Make or Buy vs Quantity', 'fontsize', fs)  
xlabel('Quantity', 'fontsize', fs)  
ylabel('Cost', 'fontsize', fs)  
legend('Buy Option', 'Make Option', 'fontsize', fs, 'location', 'best')  
hold off  
print -dpng ql.png  
BE = (B==M);  
BE = find(BE)  
B(BE)  
savings = B(150000) - M(150000)
```

Question # 2:

```
fc_make = 50000; vc_make = 25;  
Q = 20000;  
fc_buy = 1000;  
variable_buy = (fc_make + Q*vc_make - fc_buy)/Q
```


Question # 3:

```
Q = 1:50000;
Bfc = 600; Bvc = 10;
Mfc = 50000; Mvc = 8;
B = Bfc + Bvc*Q;
M = Mfc + Mvc*Q;

hold on
fs = 20
plot(Q, B, 'linewidth', 3)
plot(Q, M, 'linewidth', 3)
title('Make or Buy vs Quantity', 'fontsize', fs)
xlabel('Quantity', 'fontsize', fs)
ylabel('Cost', 'fontsize', fs)
legend('Buy Option', 'Make Option', 'fontsize', fs, 'location', 'best')
hold off
print -dpng q3.png
BE = (B==M);
BE = find(BE) %find break even point's index
price_at_BE = B(BE) %check cost @ BE point

%part b
price_buy_option = B(20000)
price_make_option = M(20000)
savings = price_make_option - price_buy_option
```

Question # 4 (Total Cost of ownership):

Find attached excel sheet in the submission files.

Cost Heads	Supplier 1	Cost (\$)		Supplier 2	Cost (\$)
Total Engine Cost		5,880,000			5,820,000
Cash Discount					
n/30		49,000			48,500
1/10					(132,567)
2/10		(133,933)			
Tooling Cost		12,000			10,000
Transportation Cost (LTL)		140,250			112,200
Ordering Cost		15,000			15,000
Carrying Cost		4,900			4,850
Quality Cost		117,600			116,400
Delivery Rating					
Back Orders (40%)		7,200			14,400
Lost Sales (60%)		486,000			972,000
Total Cost of Ownership	Supplier 1	6,578,017		Supplier 2	6,980,783

Question # 2 (Total Cost of ownership):

Find attached excel sheet in the submission.

S.No.	Cost Heads	Supplier 1	Cost (\$)	Supplier 2	Cost (\$)	Supplier 3	Cost (\$)
1	Total Engine Cost		46,800,000		45,600,000		46,080,000
2	Cash Discount						
	n/30		390,000		380,000		256,000
	1/10				(646,000)		(588,800)
	2/10		(1,066,000)				
3	Tooling Cost		12,000		10,000		15,000
4	Transportation Cost (LTL)		547,200		456,000		684,000
5	Ordering Cost		24,000		24,000		24,000
6	Carrying Cost		39,000		38,000		38,400
7	Quality Cost		936,000		912,000		921,600
8	Delivery Rating						
	Back Orders (30%)		86,400		86,400		172,800
	Lost Sales (70%)		2,646,000		2,646,000		5,292,000
	Total Cost of Ownership	Supplier 1	50,414,600	Supplier 2	49,506,400	Supplier 3	52,895,000