Managerial and Cost Accounting Exercises II

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Problem 1

Brian Snow is a river guide on the Columbia River. Typically brian takes tourists around 30 to 80 miles upriver. Round trip takes anywhere from 2 to 8 hours before returning to dock. Brian has noted that overall fuel costs vary based on "miles upriver" and he is considering changing his guide fee to separately charge customers for estimated fuel costs. Below Brian's log for 15 typical days showing "miles upriver" and "total fuel cost".

Day	Miles Upriver	Fuel Cost
1	55	$129
2	61	139
3	33	109
4	42	120
5	73	148
6	37	111
7	49	127
8	55	130
9	66	139
10	36	115
11	43	120
12	67	144
13	52	124
14	54	130
15	46	120
Total	$ 769	$ 1,905

a) Use the high-low method to determine the "fixed fuel cost" associated with the trolling time, and the "variable fuel cost" associated with running up and down the river.
b) If the sole objective of the fuel charge is to approximately recover actual costs incurred each day, would "$2.50 per mile upriver" be a fair formula? What alternative formula might you suggest?

Worksheet 1

a)

	MILES RUN	COST

	HIGH	LOW

b)

Solution 1

a)

	MILES RUN	COST
Highest Level	73	$ 148.00
Lowest Level	33	109.00
Difference	40	$ 39.00

Variable cost per mile upriver – ($39/40 miles): $0.975

	HIGH	LOW
Total Cost	$ 148.00	$ 109.00
Less: Variable Cost ($0.963 per mile X miles upriver)	71.18	32.18
Fixed Cost	$ 76.83	$ 76.83

b) Although the idea of charging $2.50 per mile would seem to average out about right ($1,905/769 miles = $2.48), it would not be a fair day-by-day charge. Some days would be overpriced (e.g., 75 miles @ $2.50 would recover $187.50 – more than the actual expected cost), and other days would be underpriced (e.g., 30 miles @ $2.50 would recover only $75 – far less than the actual expected cost). A simple and fair formula might be a $75 flat fee (for trolling time), plus $1.00 per mile upriver.

Problem 2

Jakob Loos recently graduated from medical school. He is considering opening his own family practice doctor office. A doctor's office is a high-fixed cost business, as it requires considerable expenditures for facilities, labor, and equipment, no matter how many families are served. Assume the annual fixed cost of operations is $400,000. Further assume that the only significant variable cost relates to patients served. An average patient served costs $250. Jakob's banker has asked a variety of questions in contemplation of providing a loan for this business.

a) If the average family is charged $475 for services, how many families must be served to clear the break-even point?
b) If the banker believes Jakob will only serve 1,000 families during the first year in business, how much will the business lose during its first year of operation?
c) If Jakob believes his profits will be at least $100,000 during the first year, how much is he anticipating for total revenue?
d) The banker has suggested that Jakob can reduce his fixed costs by $100,000 if he will not purchase certain equipment. Jakob can instead lease or rent this equipment as needed. The variable cost of leasing this equipment is $55 per family served. Will this suggestion help Jakob reach the break-even point sooner?

Worksheet 2

a) Break-Even Point in Patients =

b)

c) Sales for a Target Income =

d) New Break-Even Point in Patients =

Solution 2

a)

Break-Even Point in Patients = Total Fixed Costs / Contribution Margin Per Unit

1,777.78 patients = $400,000 ÷ ($475 – $250)

1,778 patients must be served

b)

1,000 patients × $475 = $475,000 total revenue

$475,000 – $400,000 fixed costs – (1,000 × $250 variable costs) = **$175,000 loss**

c)

Sales for a Target Income = (Fixed Costs + Income) / Contribution Margin Ratio

$1,055,556 = ($400,000 + $100,000) ÷ ($225/$475)

d)

New Break-Even Point in Patients = Total Fixed Costs / Contribution Margin Per Unit

1,538.46 patients = $300,000 ÷ ($475 – $225 – $55)

1,539 patients must be served

(this approach does reduce the breakeven point)

Problem 3

Warwick Corporation's controller is preparing a business plan for 20X9. The anticipated level of business activity consists of the following key cost factors:

Total fixed costs	$ 800,000
Total variable costs	700,000
Total revenues	2,500,000

Warwick's Bank has issued an economic advisory report suggesting that companies should anticipate a severe economic downturn during 20X9.

a) Determine the level of volume reduction that Warwick can absorb before becoming unprofitable.
b) Distinguish between committed fixed costs and discretionary fixed costs. What is the importance of this distinction in planning for business cycles?

Worksheet 3

a)

b)

Solution 3

a)

The contribution margin ratio is 0.72 (($2,500,000 – $700,000)/$2,500,000)

Break-Even Point in Revenues = Total Fixed Costs / Contribution Margin Ratio

$1,111,111 = $800,000 ÷ 0.72

The company can absorb a 55.56% reduction ($1,388,889) in sales:

(($2,500,000 – $1,111,111) ÷ $2,500,000) = 55.56%

b) Committed fixed costs are generally unavoidable. Discretionary fixed costs can be reduced with adequate planning. If the company is expecting a greater than 55.56% reduction in volume, and desires to remain profitable, the fixed cost structure should reviewed to determine elements that might be reduced or avoided.

Problem 4

Super Sharp manufactures and sells two products. The first product is a disposable shaving razor blade that lasts about 7 days. The second product is shaving cream. Customers of the first product use one bottle of shaving cream every 28 days. As a result, razor blades outsell shaving cream by a 4:1 ratio. Shaving Cream sells for $8 per bottle, and has a contribution margin ratio of 50%. The razor blades sell for $3 per blade, but only generates variable costs of $1.50. The company's total fixed costs are $3,500,000.

a) What level of total sales is necessary to achieve break even?
b) If a competitor began selling razors that forced Super Sharp to reduce the price for its razors to $2.50 (to maintain market share and the 4:1 ratio of razors to shaving cream), how many Razor sets must be sold for the company to break even?

Worksheet 4

a)

b)

Solution 4

"Unit" Contribution = ($8 × 50%) + (4 razors × ($3 – $1.5))

"Unit" Contribution = $10

Note that a ""Unit"" consists of one bottel of shaving cream and 4 razors blades.

Break-Even Point in Units = Total Fixed Costs / Contribution Margin Per "Unit"

350,000 Units = $3,500,000 ÷ $10

Total Sales at Break-Even Level =

350,000 units × ($8 + (4 × $3)) = **$7,000,000 Total Sales to Break Even**

Alternatively:

	Product Sales to Total Sales Ratio (mix)		Product Contribution Margin Ratio		Weighted Average Ratio
Razor (4 @ $3)	$12/$20	X	$1.5/$3	=	0.3000
Shaving Cream (1 @ $8)	$8/$20	X	$4/$8	=	0.2000
					0.5000

$3,500,000 ÷ 0.5 = $7,000,000 totals sales to break even

"Unit" Contribution = ($8 × 50%) + (4 razors × ($2.50 – $1.50))
"Unit" Contribution = $8"

"Break-Even Point in Units = Total Fixed Costs / Contribution Margin Per "Unit"
437,500 Units = $3,500,000 ÷ $8

Problem 5

Big R Ranch Cattle Company has gathered the following information about operations for the past three years. Big R has been expanding herd size and is frustrated that profits have not shown consistent growth.

	Year 1	Year 2	Year 3
Cow herd size	180	210	270
Revenues from sale of calves	$ 229,500	$ 267,750	$ 344,250
Feed	40,500	47,250	60,750
Labor (1 cowboy per 180 cows)	54,000	108,000	108,000
Cow depreciation	33,750	39,375	50,625
Bull depreciation (1 bull per 30 cows)	3,750	4,688	5,625
Medications/vaccinations	6,750	7,875	10,125
Land lease	22,500	22,500	22,500
Operating income	68,250	38,063	86,625

a) Determine which costs are variable, fixed, and "step" fixed. Complete the "per unit" cost table on the preprinted worksheet.
b) How much is the per-cow contribution margin?
c) How do the "step" costs explain the struggle to achieve consistent growth in profits? What strategy should Big R undertake to maximize profit potential for his operation?
d) Assuming Big R's land will support a herd of 360 cows, project anticipated profits. Why is the profit more than twice as much as the amount that is earned on a herd size of 180 cows?

Worksheet 5

a)

Variable Costs	Per Unit Cost

Fixed Costs (not step)	"Per Unit Cost (@ 180 cows)"	"Per Unit Cost (@ 210 cows)"	"Per Unit Cost (@ 270 cows)"

Fixed Costs (step)	"Per Unit Cost (@ 180 cows)"	"Per Unit Cost (@ 210 cows)"	"Per Unit Cost (@ 270 cows)"

b)

Average revenue per cow	$ -
Variable costs ($225 + $188 + $38)	-
Contribution margin per cow	$ -

c)

d)

Revenues from sale of calves	$ 204,000
Feed	
Labor (1 cowboy per 180 cows)	
Cow depreciation	
Bull depreciation (1 bull per 30 cows)	
Medications/vaccinations	
Land lease	
Operating income	

Solution 5

a)

Variable Costs	Per Unit Cost
Feed	$ 225.00
Cow depreciation	188.00
Medications/vaccinations	38.00

Fixed Costs (not step)	"Per Unit Cost (@ 180 cows)"	"Per Unit Cost (@ 210 cows)"	"Per Unit Cost (@ 270 cows)"
Land lease	$ 125.00	$ 107.14	$ 83.33

Fixed Costs (step)	"Per Unit Cost (@ 180 cows)"	"Per Unit Cost (@ 210 cows)"	"Per Unit Cost (@ 270 cows)"
Labor (1 cowboy per 180 cows)	$ 300.00	$ 514.29	$ 400.00
Bull depreciation (1 bull per 30 cows)	$ 20.83	$ 22.32	$ 20.83

b)

Average revenue per cow	$ 1,275
Variable costs ($225 + $188 + $38)	$451
Contribution margin per cow	$ 824

c) The step costs increase in increments. Particularly significant is the addition of a second cowboy once the herd size increases beyond 180 cows. This actually resulted in less profit for 210 cows than for 180 cows. The ideal operating environment is to spread fixed costs over larger units of production by operating at the "right" edge of each step. For cowboys, this would be 180 or 270 cows.

d)

Revenues from sale of calves	$	459,000	
Feed		81,000	
Labor (1 cowboy per 180 cows)		108,000	
Cow depreciation		67,680	
Bull depreciation (1 bull per 30 cows)		7,500	
Medications/vaccinations		13,680	Doubling production more than doubled profit, as there was no additional land cost.
Land lease		22,500	
Operating income		158,640	

Problem 6

Harrison Research manufactures and sells specialized titanium rods used in medical equipment. The product is manufactured and sold in 0.25 meter long "sticks." The product is generally produced and sold to match customer demand, and there is not a significant amount of finished goods inventory at any point in time. Summary information for 20X4 is as follows:

Sales were $5,000,000, consisting of 200,000 sticks.
Total variable costs were $3,500,000.
Total fixed costs were $1,250,000.
Net income was $250,000.

Due to deteriorating general economic conditions there is some concern about a reduction in sales volume. The following questions should each be answered independent of one another.

a) What is the company's break-even point in "sticks?" Can the company sustain a 30% reduction in total volume, and remain profitable?
b) The company's sole shareholder, Chem Harrison, generally lives off of dividends paid by the business. The business typically declares and pays a dividend equal to 25% of net income. If Chem needs to receive $150,000 in dividends for normal living expenses, what total revenues must Harrison Research produce in 20X4?
c) If total volume is expected to decrease by 20%, and the company wishes to continue to produce a $250,000 net income by raising the per unit selling price, what revised per stick price must be imposed? Will this strategy necessarily work?
d) If the company expects a drop in raw material prices to reduce total variable costs to $15 per stick, but all other revenue and cost factors to be unaffected, what will be the revised break-even point in sales and units?

Worksheet 6

a)

b)

c)

d)

Solution 6

a)

Break-Even Point in Sticks = Total Fixed Costs / Contribution Margin Per Unit

166,667 sticks = $1,250,000 ÷ (($5,000,000 – $3,500,000) ÷ 200,000 units)

The company would suffer a loss if volume were reduced to 140,000 units (a 30% reduction from the 200,000 unit level)

b)

Sales for a Target Income = (Fixed Costs + Income) / Contribution Margin Ratio

Note: The target income is $600,000 ($150,000 ÷ 0.25)
Note: The contribution margin ratio is 0.30 ($1,500,000 ÷ $5,000,000)

$6,166,667 = ($1,250,000 + $600,000) ÷ 0.30

Revenues need to be at least $6,166,667 to sustain the dividend policy.

c)

Note: The revised volume is 160,000 sticks (80% of 200,000)

Note: The company needs a total contribution margin of $1,500,000 ($1,250,000 fixed costs + $250,000 target income)

Note: Variable cost per unit is $17.50 ($3,500,000 ÷ 200,000 units)

$1,500,000 total contribution margin ÷ 160,000 sticks = $9.375 per unit margin

Variable Cost Per Unit ($17.50) + Per Unit Margin ($9.375) = $26.875 Sale Price

Increasing the per unit selling price can reduce the number of units sold, so the strategy may not work as hoped.

d)

Break-Even Point = Total Fixed Costs / Contribution Margin Ratio

Note: The revised contribution margin ratio is 0.40 (($25 – $15) ÷ $25)

$3,125,000 = $1,250,000 ÷ 0.40

$3,125,000 ÷ $25 per unit = **125,000 units**

Problem 7

Uwe Hagen company is operating at full capacity. Annual revenues are $30,000,000. Total costs are $27,000,000, of which 30% is fixed and 70% is variable. In considering the following scenarios, assume each is independent of the others.

a) The company is considering expanding capacity. The additional capacity will add $10,000,000 in annual fixed costs. The contribution margin rate will not be impacted. How much in additional sales will be necessary to justify the added capacity?
b) The company is considering automation of certain production processes. Productive capacity will not be increased, but the contribution margin ratio will increase by 5% of sales via a reduction in direct labor. The automated equipment will cost $3,000,000 per year to operate. Should the equipment be purchased?
c) The company is considering increasing the sales price per unit by 10%. The fixed costs and variable per unit cost will not be affected, but total sales volume (in units) will be reduced by 10%. Will the company be more or less profitable if they engage this pricing strategy?
d) Assume a flood has reduced production and increased total variable costs by an additional 10% of sales. Competitive pressures prevent Hagen from raising sales prices. Will the company remain profitable?

Worksheet 7

a)

b)

c)

d)

Solution 7

a) Total variable costs are $18,900,000 ($27,000,000 × 70%). The contribution margin rate is 37% ($30,000,000 – $18,900,000 = $11,100,000; $11,100,000 ÷ $30,000,000 = 37%). Additional sales of $15,873,016 must be generated to recover $10,000,000 in added fixed costs ($10,000,000 ÷ 0.63).

b) No. Annual savings of $1,500,000 (direct labor cost reduction equal to 5% of the $50,000,000 in annual sales) will not justify the $3,000,000 of added cost.

c) The company is currently making $3,000,000.
Under the revised plan, total sales will equal $29,700,000 (($30,000,000 × .90) × 110%). Total variable costs will equal $17,010,000 ($18,900,000 × .90), and total fixed costs will remain at $8,100,000. The revised profit will increase to $4,590,000 ($29,700,000 – $17,010,000 – $8,100,000).

d) The contribution margin rate is reduced to 27%. Total fixed costs of $8,100,000 ($27,000,000 × 30%), divided by the contribution margin ratio (0.27), is exactly $30,000,000. The break-even sales level of $30,000,000 is the anticipated revenue. As a result, the expectation is that Uwe Hagen Company will just break even.