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SRCSPS Karivena Effects in Application of Breakeven Analysis for Strategic Pricing Advanced Applications in Breakeven Applications

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Abstract:

The breakeven analysis is confined to determination of Breakeven Point and mostly for studying the effects of changes in volume/value of sales on costs and profits in value. The expressions of the effects of changes in value often mislead the inference/interpretations. Ex. Comparing the NPV values in capital budgeting, demand elasticity analysis in economics where it is proved that only the proportions give accurate results i.e. measuring the changes in proportions than in value/volume. Though the theorems/theoretical efforts have been made, in both in economics cost and management accounting but formulations and efforts on calculative formulae are not derived. This may be chiefly because of the BEA concentrating purely on volume/value effects on value of profit and there are no clue regarding proportional effects. Once after my work published in two papers i.e. in May and June 2016 helped to develop a constructive calculative tool/formulae for the theoretical explanations/expressions elaborated in the past. This work extends the applications of BEA for strategic cost and pricing of products in the most effective way.

In extensions to our innovative formulae developed and published in May and June 2016 issues in IRJBM for calculating the rate of profit on sales together with using the existing formulae in an innovative way for price variations apart from an innovative formula for determining the target rate pricing. This is the research paper innovated the application of the Break Even Analysis for initial pricing and variations in costs as well as prices under strategic considerations as recourse for withstanding to the effects of changes in environmental changes.

1. Introduction

The breakeven analysis is confined to determination of Breakeven Point and mostly for studying the effects of changes in volume/value of sales on costs and profits. This is the analysis which considers the existing or revised price and costs in the study. Further at present the purpose of strategic pricing and price changes are made mostly under the economic analysis which is in different dimension in assessment of costs and profits when compared to cost and management accounting systems. The BEA is the tool which has bearing/roots in both the systems and has the ability to interlink these two systems. The strategic implications of cost and pricing invariably need interlinking of both the systems in analysis. Several economists and financial analysts have theoretically explained in their respective way in experimenting under the BEA but no major breakthroughs have evolved.

In the entire span of applications the concept of deciding/determination of price for the products or making strategic changes in prices of products under different market/demand/economic conditions to ensure sustenance/over powering the competition on one hand and optimizing/ maximizing the profitability under the favorable/normal market/demand/economic conditions and minimizing the losses in operating under difficult conditions and sustain under any type of conditions needs strategic cost structure and pricing of products. This needs the integration of both the systems in use and available in this regard.

Though there is a progress in respect of using the BEA as a tool for pricing and strategic changes in its cost structure and till date a constructive simplified common formula fitted under the BEA is not developed. In consideration of the BEA have roots in both the systems, this is the innovative formulation that helps to determine the price for the products initially under normal conditions in one way and be a useful tool for strategic cost and price changes on the other. It hopefully avoids the use of multi system economic and cost and management accounting applications for strategic needs of pricing and with no proper integration in strategic pricing and changes in costs and prices under strategic considerations.

2. Objectives

1. Application of BEA for determination of target price for the products.
2. Application of BEA for strategic considerations through changes in costs and pricing.
3. Prescription of common formulae for the above.
4. Ensuring the BEA as an analytical tool for strategic cost and pricing model.
5. Ensuring the study of effects of changes in VC/FC/SP and sales volume individually and in combination on rate of profit with respect to initial planned levels with simple calculations.

3. Methodology

Innovative formulations with existing concepts and extended application of BEA

4. Limitation

1. Here only the hypothetical example is used and no live example is used.
2. It considers and works on the theme of usual inconsistent economic/demand/marketing environment effects.
3. Though it serves for all favorable, normal and difficult constraint conditions, it is to explain the strategic implications i.e. the difficult constraint conditions in the example.

5. Literature Review

The concepts used in BEA:

Sales(S): sales or selling price.

Variable costs (V): unit cost / proportional variable total cost.

Fixed costs (F): total fixed cost irrespective of level of output.

Contribution margin: it is the amount calculated with the following: $C = S - V$

P/V Ratio (Profit Volume ratio) it is the ratio of between the contribution and sales.

P/V Ratio: $C/S \times 100$

All formulas of BEA ring around the following equation: $S - V = C = F + P$

$$\frac{S-V}{S} = \frac{C}{S} = \frac{F+P}{S}$$

5.1. Existing other Formulas in Breakeven Analysis for Profit Planning

Calculation of Breakeven Point (BEP) I units: F/C_{pu}

In sales value/revenue: $F/p/v$ Ratio.

Determination of sales required to get a profit of Rs. P

Required sales {in units}: $F + \text{desired } P$

C_{pu}

Required sales {in units}: $F + \text{desired } P$

P/V Ratio

Amount of profit (P) when sales are S units: $P = (S \times C_{pu}) - F$

Amount of profit (P) when target sales are 'S' rupees: $P = (S \times P/V \text{ Ratio}) - F$

Calculation of safety margin sales SM/MS/SMS:

$SMS = TS - BEP$ (in units or value)

SMS in units: P / C_{pu}

SMS in value: $P / (P/V \text{ Ratio})$

Accessible from all the cost and management accounting text books

Further formula to calculate percentage of profit on sale: PV Ratio- (PV Ratio*BEP Ratio) drawn from and bettered as "PV Ratio (1-BEP Ratio)" my earlier papers published.

6. Analysis**6.1. Innovative Formulation**

The following hypotheses helps to determine possible different rates of selling price at Different levels of activity that ensures the same rate or % of profit on sales. The sales in units/volume and not as value implication because the pricing is for units and not for total value.

With the simple hypotheses that:

1. Sales (TS) = TC+ TP or -TL and profit as a percentage of sales moves in proportion to the sales (volume/value) alike of variable cost in BEA.

2. In the light of past observations in many occasions in costing/ accounting processes that it is possible to convert the % of profit on sales to cost and vice versa.

3. The % of profit on cost carries for both the parts of TC in BEA i.e. fixed and variable and hence by adding the element of profit that given/converted as a percentage on cost from sales as the case may be, be add at their levels of constant for both fixed at total and variable at per unit costs in formulations.

4. Should with stand to the rules of BEA i.e. Fixed cost or profits are a charge to the contribution and not concern of the variable costs. Proportionally variable part of profit is naturally applied to contribution/ contribution ratio in formulation and calculations.

Simplified formula used as: $C = S - V$ then

Required $S = V + (C \text{ required})$

Req. $C = [(\% \text{ of req. } P \text{ on } Vc) + \{F + (\% \text{ of } P \text{ on } F)\} / \text{level of activity (units)}]$

Therefore, $S = V + C$

It can be understood with the following example:

Determine the selling price that ensures a constant 20% of profit on sales at different levels of capacity utilization/ sales as given below as;

Units of output and sales: 5000units/8000units/10000units

When variable cost Rs.6 pu, Fixed cost Rs. 8000/-

$V = \text{Rs. } 6/-$

$F = \text{Rs. } 8000/-$

req. $P = 20\% \text{ of sales}$

➤ Solution:

Under the condition when sales are Rs.100 the profit will be Rs. 20 and hence the cost will be $S - P = 100 - 20 = 80/-$ therefore profit is either 20% on sales or 25% of total cost i.e. $(20/80 * 100)$

Minimum contribution required for profit per unit on variable part of cost (25% on variable cost) = $V \times 25\% = 6 * 25/100 = P \text{ on } V = \text{Rs. } 1.5$

Fixed cost part of Profit to be added to fixed cost (25% on fixed cost) = $F + (25\% \text{ of } F) = 8000 + (8000 * 25\%) = \text{Rs. } 8000 + 2000/- = 10000/-$

Hence $F + FP \text{ or } (F + FP) = 8000 + 2000/- = \text{Rs. } 10000/-$

The additional contribution required per unit apart from P on V (Rs. 1.5) for $F + FP$

At different level of activity given:

As the given levels of activity are: 5000, 8000 & 10000 units

Contribution required for $F + FP$:

→ At 5000 units of output and sales = $\text{Rs. } 10000/5000 \text{ units} = \text{Rs. } 2/- \text{ pu}$

→ At 8000 units of output and sales = $\text{Rs. } 10000/8000 \text{ units} = \text{Rs. } 1.25/- \text{ pu}$

→ At 10000 units of output and sales = $\text{Rs. } 10000/10000 \text{ units} = \text{Rs. } 1. /- \text{ pu}$

Therefore, the total contribution required at the present level of cost structure:

→ Required contribution per unit at 5000 units of sale = $1.5 + 2 = \text{Rs } 3.5/- \text{ pu}$

→ Required contribution per unit at 8000 units of sale = $1.5 + 1.25 = \text{Rs } 2.75/- \text{ pu}$

→ Required contribution per unit at 10000 units of sale = $1.5 + 1 = \text{Rs } 2.5/- \text{ pu}$

Selling price that ensures the same rate (20% on sales) of profit at different levels of activity is arrived as:

$V \text{ pu} + \text{Req. contribution pu}$

SP at 5000 units of sale = $6 + 3.5 = \text{Rs } 9.5/- \text{ pu}$

SP at 8000 units of sale = $6 + 2.75 = \text{Rs } 8.75/- \text{ pu}$

SP at 10000 units of sale = $6 + 2.5 = \text{Rs } 8.50/- \text{ pu}$

Units of Sale	5000		8000		10000	
	Per Unit	Total	Per Unit	Total	Per Unit	Total
SP/sales	9.5	47500	8.75	70000	8.5	85000
VC	6	30000	6	48000	6	60000
C	3.5	17500	2.75	22000	2.5	25000
F		8000		8000		8000
P		9500		14000		17000
% OF P ON S		20		20		20

Table 1: Verification of results

➤ Validation:

These formulas ensure thematically overcoming the limitation of considers only the variable cost than total cost for the fixation of selling price.

Every firm concerns more on the rate of profit rather than the volume of profit. Ensuring calculation of rate of profit with simplified formulae gives more flavors to the analysis because evidently the rate of profit has more applicability & importance than the volume of profit.

Further at different levels of activity what would be the price and rate of profit?

This also helps to check at different levels of activity what varied price the same rate of profit is possible to attain on one hand and on the other whether the varied price enable the volume of sales at that level of activity can be assessed based on economic/ market /demand trends.

This innovation, alike of other costing systems helps to determine the rate of profit on cost apart from the rate of profit on sales.

With the help of finding the minimum selling price required to get the target rate of profit at different levels of activity helps to understand:

- a. Whether the price is possible to attain at that level of output and sales or not.
 - a. If the price is attainable then the rate of profit is possible to attain.
 - b. If not what would be the other real price and the maximum rate of profit at that level of selling price can be determined with simple calculations.
 - c. This further pays the way for strategic cost & pricing models.

6.2. *The Innovations Enable the Breakeven Analysis as an Analytical Tool for Strategic Cost and Pricing Model*

The strategic implications always project in to the environmental factors those effects operations of a firm. The sustenance, survivability and growth of a firm depends on effective assessment of effects of the changes in environmental factors on operations of the firm on one hand and the effective decision in countering the adverse effects and grabbing/extracting the maximum of favoring is an essential feature of an effective management.

The timely assessment of the effects and quick and prompt decisions in recourse is an essential factor of effective strategic planning. This requires effective tool for assessment of effects of the changes in environmental factors. Hopefully the BEA with the innovative simple formulations designed here and published in my earlier papers helps to provide the analytical information with accurate measurement of effects of changes in environment on performance of the firm i.e. profits and profitability. This invariably forms as the most effective basis for fixation of price of the products and services and more importantly forms as the best basis for strategic changes in price and cost structure of the products/services.

Following is the example helps to understand how the BEA helps to measure the effects of changes in environment on costs and price of the products and designing of the very basis the best possible recourse in their respect i.e. cost structure and price structure.

➤ Example:

Particulars	Rs.
sp	10
VC	6
F	24000

Table 2: Present level of sales 10000 units

- i. Calculate the PV ratio, BEP and present rate of profit on sales.
- ii. Further evaluate the flowing situations and provide the information for strategically pricing the products.
 - a. If the variable cost and fixed costs increased by 10% each what would be the % of profit/loss on sales at present.
 - b. at what level of price the firm stays on breakeven at present level of sales under the condition that the variable costs and fixed costs likely increased by 10% and selling price is in falling.
 - c. What would be the percentage of profit/loss when selling price fell by 15% to attain the present level of sales in the above increased cost condition?
 - d. Further if it is expected that sales will be doubled at 20% reduction in selling price instead of accepting 15% fall in SP. Suggest which option is effective i.e. accepting 15% fall or reducing 20% in SP.
 - e. If the second option is better, at what level of sales both the potions give same results.

PARTICULARS	Rs. /%/units
Present Units of sale	10000 units
Present value of sales	Rs. 100000/-
CPU (S-V) = (10-4)	Rs. 4
PV RATIO= (C/S*100)	(4/10*100) =40%
VC RATIO(V/S*100)	(6/10*100) =60%
BEP UNITS	6000 units
BEP RS	Rs.60000 /-
BEP Ratio (BEP/TS*100)	(6000/10000*100) =60%

Table 3: Solution: for point No: 1

% of profit on sales {PV ratio (1-BEP Ratio)} = $40(1 - 60/100) = 40 * 40/100 = 16\%$

Therefore, the profit on sales at present = 16%.

6.2.1. Solution for the point No: 2 (a)

the costs are increasing and the price are falling if the firm wants to attain at least the breakeven at the present level of sales, what would be the minimum selling price when both fixed and variable costs are likely be increased by 10% each. Also calculate the profit or loss at present selling price. What is the rate of profit or loss when selling price needs to reduce by 15% to attain the present level of sales at increased costs?

Present rate of profit: 16%

Effect of change in VC on PV ratio/ profit: where VC ratio is 60% i.e. (6/10*100)

As increase in VC by 10% its effect on P= (VC ratio x rate of increase) $(60 * 10/100) = 6\%$

As increase in FC by 10% its effect on BEP is also 10% therefore the effect on BEP = $60 * 10/100 = 6\%$

Therefore, effect of change in FC/BEP on profit= (PV Ratio * % change in BEP) $40 * 6/100 = 2.4\%$

Total impact of increase in costs on profit = $6\% + 2.4\% = - 8.4\%$

VERIFICATION:	10000		
NEW SP	10		100000
VC (6+10% OF)	6.6	66000	
F (24000+10% OF 24000)		26400	
		92400	92400
			7600
% profit on present level			7.6

Table 4: The net profit at present level of sales after the increase in costs = $16 - 8.4 = 7.6\%$

6.2.2. Solution for the point No: 2 (b)

Therefore, in the falling selling price condition the minimum selling price to attain BEP at the target sales of present level {initial price (1- profit%)} = $10(1 - 7.6\%) = 10 * 92.4 = \text{Rs.} 9.24/-$

VERIFICATION:	10000		
NEW SP	9.24		92400
VC (6+10% OF)	6.6	66000	
F (24000+10% OF 24000)		26400	
		92400	92400
Profit/loss			0

Table 5: Verification of BEP at present level of sales

6.2.3. Solution for the point No: 2 (c)

Calculation of % of profit or loss at the reduced selling price and increased costs:

New Selling price: PS (1- change %) $10(1 - 15/100) = 10 * 85/100 = \text{Rs.} 8.5/-$

% of Profit or loss in the changed condition = % of profit before change - change effect in % on profits $16 - (15 + 8.4) = 16 - 23.4 = - 7.4\%$

Therefore, it is clear that the firm sufferer a loss of 7.4% on sales at the present level.

Verification of profit or loss in the changed condition of increase in costs and 15% reduced selling price to attain the Present level of sales:

VERIFICATION:	10000		
NEW SP	8.5		85000
VC (6+10% OF)	6.6	66000	
F (24000+10% OF 24000)		26400	
		92400	92400
Net loss			-7400
% of loss on initial planned sales:	(7400/100000*100)		-7.4

Table 6

Further if it is expected that sales will be doubled at 20% reduction in selling price. What would be the % of profit or loss at 20% reduction in selling price? Suggest which option is effective. If the second option is better, at what level of sales both the options give same results.

6.2.4. Solution for the point No: 2 (d)/1

Solution for study the effect on profit for 20% reduction in SP and double the quantity of sale as in the case using:

A. The present/base values as the basis:

1. Present rate of profit: 16%
2. Impact of reduction of Sp by 20% to Rs. 8/- on P/V Ratio or on profit is always the same in full 20%. This is because the rate or % of profit or the P/V Ratio and the rate or % of change are on the same value of sales.
 - a. Therefore, Impact of change in selling price on profit = 20% decrease.
 - b. Therefore, Impact of change in selling price on P/V Ratio = 20% decrease
 - c. BEP Ratio after the effect from change in SP= (new p/v ratio- new P%)/P/V Ratio
 - i. New pv ratio= base P/V Ratio -change effect = 40-20 =20%
 - ii. New P = base P- change effect =16-20 = -4 %
 - iii. Therefore, new BEP ratio = (20 - -4)/ 20% = 24/20*100= 120% (when the change is only in PS)
3. Effect of change in VC on PV ratio/ profit: where VC ratio is (6/10*100) = 60%
 - a. The effect of change in VC is same in rate on VC ratio P/V ratio and on profit ratio. Because all are on the same sales/SP = 6% decrease
 - b. As increase in VC by 10% the effect on VC Ratio = (6*10/100) = 6% increase in VC
 - c. its effect on P = 6% decrease therefore profit after the change in VC = 16 - 6 =10%
 - d. Its impact on P/V Ratio is also 6% decrease. Therefore, P/V Ratio after the effect of change in VC =40-6=34% (when the change is only in VC)
 - e. BEP Ratio after the effect of change in VC on (when the change is only in VC) =
 - i. (P/V Ratio-Profit ratio) P/V Ratio = (34-20)/34*100 = 24*100/34 =70.588%
4. Impact of increase in volume w.e.f 20% reduction in SP i.e. 20000 units from 10000 units Volume impact on BEP:
 - a. % change in volume on new sales {(20000-10000)/20000*100} =50%
 - b. % Change in BEP at new volume = present BEP ratio * % change in volume on new sales= 60*50/100= 30%

Therefore, new BEP=60-30 =30% of sales on base price/costs or when the change is only in volume

 - c. Effect of change in BEP ratio on % of profit (w.e.f change in volume) = PV ratio* % change in BEP) =40*30/100 =40*30/100= 12% increase.
 - d. Volume Effect on profit =12% increase (when the change is only in volume)
5. As increase in FC by 10% its effect on BEP is also 10%
 - a. When the change is only in FC its impact on BEP and Profits is;
 - i. the effect on BEP = 60*10/100=6% increase
 - ii. BEP ratio after the changes is 60+6 =66%
 - iii. change in FC on profit= (PV Ratio * % change in BEP w.e.f FC) 40*6/100= 2.4% decrease inP
 - b. When the change of FC on BEP and profits at the changed scenario of changed volume and Profits is;
 - i. effect on BEP = 30*10/100=3% increase
 - ii. effect of change in FC on profit = (PV Ratio * % change in BEP w.e.f FC and volume) 40*3/100= 1.2% decrease on profit

The measurements of changes in volume of sales and Fixed Costs on profits are always being calculated through the BEP ratio. Therefore, to measure the impact of them on profits needs the BEP Ratio at the changed scenario. As the measurement of effect of changes in Selling price and variable costs on profits is directly related, the BEP calculations is not necessary. However, if wish to know the value, it can be calculated as given above.

6. Total effect: present profit +/- volume effect +/- VC change effect +/- effect of FC +/- effect of selling price change.
7. The % profit at the changed scenario = $(16+12) - (6+1.2+20) = 29.2-28.4 = .8\%$ on base planned rates & prices.
 - a. Verification at base rates:
 - i. Base SP=10/-
 - ii. Volume of sales: 20000 units
 - iii. Sales value ;20000*10 = Rs. 200000/-
 - iv. Therefore, profit: 200000*.8% =Rs1600/-
 - b. The % of profit at new volume and selling price after the changes = (profit at base SP*100/100+-% change in price) = $.8*100 / (100-80) = 08*100/80 = 1\%$

This helps to evaluate the effects of changes in environment factors on performance without altering the basic planned values or figures except the volume.

(or)

B. With the changed scenario values:

New sp after 20% reduction = $10 * 80\% = \text{Rs. } 8/-$

Expected sales 20000units (2*10000 units)

New variable cost after 10% increase $6*110/100 = \text{Rs. } 6.6/-$

New fixed cost after 10% increase $24000*110/100 = 26400/-$

New Cpu = $8-6.6 = \text{Rs. } 1.4/-$

New Pv Ratio = $1.4/8*100 = 17.5\%$

New Bep = $26400/1.4 = 18857$ units (rounded to nearest unit)

% of BEP in expected sales = $\text{BEP/sales} * 100 = 18857/20000 * 100 = 94.285$

% profit /loss = PV Ratio (1- BEP ratio) = $17.5 (1 - 94.285/100) = 17.5*5.715/100 = 1\%$

Units of Sales 20000	PU Rs.	Total Rs.
sp	8	160000
vc	6.6	132000
C	1.4	28000
F		26400
P		1600
% of P at new SP		1

Table 7: Verification of profit

It is clear that option two is better.

6.2.5. Solution for the point No: 2 (e)

Minimum required sales: at 20% reduction to Rs. 8/- pu to attain the max loss of Rs. 7400/- that would arise due to expected fall in price by 15% to Rs. 8.5 to attain the present level of sales i.e. 10000 units.

Min units of sales required at 20% reduction in SP = $(F-L)/Cpu = (26400-7400)/1.4 = 13571.429$ units or 13572 units (approx.)

If the quantity of sales possible to exceed 13572 with 20 reduction option of Sp to Rs. 8/- is effective, if not the option of SP Rs. 8.5 (15% reduction) is better.

VERIFICATION:	10000			13572		
NEW SP	8.5		85000	8.0		108576
VC (6+10% OF)	6.6	66000		6.6	89576	
F (24000+10% OF 24000)		26400		26400	26400	
		92400	92400		115976	115976
Net loss			-7400			-7400
% of loss on initial planned sales: (10000*10)			-7.4%			-7.4%

Table 8

7. Conclusion

It is hoped that the above innovative concept invariably provides the data for taking decisions on changing the cost structure, deciding the price changes /cost changes with intent or that arises due to changes in economic environment or cost effectiveness of sales promotion activity for strategic purposes on one hand and evaluates the capacity to withstand to the changing environmental effects on costs and prices. It further guides to take firm and timely decisions for best possible recourse including the options of sales promotion

aspects apart from changes in price under difficult conditions. Under the favorable conditions it helps to decide the best possible recourse for maximizing the profitability.

8. References

- i. S.P Jain & K.L Narang, Cost accounting principles and practice, 22nd Revised Edition (2011), Kalyani Publishers.
- ii. M.N Arora, A Textbook of Cost and Management Accounting, 10/e , Vikas Publishing.
- iii. Chandra Sreedhara Ramesh & Banana Krishna (June, 2016) Innovative Formulations and Enhanced Scope of Break Even Analysis. IRJBM ,Volume – IX (Issue – 6).
- iv. Chandra Sreedhara Ramesh & Banana Krishna (May, 2016) Innovative Formulations and Enhanced Additional Applications of Break Even Analysis. IRJBM, Volume – IX (Issue – 5).