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NEW IPPPA TOOLS FOR LONG RUN IMPLIED PROFITABILITY PLANNING UNDER CVP/BEA- A FITTED SOLUTION FOR A COMPLEX CASE ANALYSIS

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ABSTRACT

The cost volume profit (CVP) analysis is the most popular system for short run profit planning. The Return on sales (ROS)/ return on investment (ROI) are the techniques for long run profit planning and performance appraisal. The ROS & ROI are able to provide the assessment of profitability where as the CVP is limited to profit planning and not suitable for profitability analysis. Further the CVP confined to several assumptions of consistency and not suitable for planning under changing values of variables other than the volume. Further, though the ROS & ROI techniques are able to measure the effects of changes in all the variables they are unable to imply the effects of short run consistency effects of costs and price. Due to non availability of simplified applicable formulae the CVP Break-even analysis (BEA) is not suited for profitability i.e. planning in terms of ROS/ROI and ineffective for long run planning. The innovation of two sets of integrated formulae by the author has paved the way for providing the Profitability planning under CVP/BEA with the following derived additional formulae from the IPPPA tools. it has enabled to provide a fitted solution for profitability planning under CVP. The formulae were used to provide a fitted solution for the Case study of IIM Ahmadabad (IIMA/F&A0071 revised in 1968).

1. INTRODUCTION:

Any system used for profit planning and performance appraisal purposes should consider the all the variables and in terms of possible all parameters. The commonly used financial performance appraisal systems are the ratio analysis, fund flow analysis, cash flow analysis, common size statement, and comparative balance sheet analysis. The popular profit planning techniques are the BEA/CVP and the leverages for planning & appraisal for short run. And percentage methods are used for the same in the long run. Though these systems are effective in their respective applications they were independent and have no inter relation/integration as a result the gap between the planning and the performance appraisal either for short or long run become eternal. The successful realization of the fruits of plans needs continuous effective monitoring, management and control of the operations on one hand and effective measurement / appraisal of the results during the course on the other are essential. It is imperative that development / innovation of a system of analysis that interlink the chain between the BEA/CVP and percentages i.e. profit planning and performance appraisal techniques of short and long run. This needs integration of operational analysis or the cost analysis and financial analysis i.e. the ratio analysis. The recent innovations published in different journals of the same authors paved the way for the development of the IPPPA (integrated profit planning and performance appraisal analysis) as a substitute/complementary to BEA/CVP/leverages and present state of percentages analysis. The IPPPA analysis is termed as the analysis of integrated profit planning and performance appraisal of short and long run paving the way for medium period analysis. It can aptly be mean as the advance CVP analysis. The CVP analysis is one of the important and the simplest techniques of profit planning. The chief limitation of this analysis is that it is confines to evaluate the profit under changes only in volume i.e. at different levels of volume under constant price and costs. If it is possible to evaluate the profits and profitability under the conditions of changes in values of all the variables applicable for both planning and appraisal of performance of short and long run, it becomes more accurate and effective. The IPPPA technique is developed as the advance CVP to serve the purpose with an extended base of variables and presentation of results with projection of optimization. The following additional formulae derived for providing a fitted solution for the case of IIM Ahmadabad (IIMA/F&A0071 revised in 1968).

The present innovated formulae for extended applications of BEA for profitability planning with the effects of changes in the values of variables are as follows:

On the concept of above invented Formulae: to calculate required sales to get profit as a percentage on sales:

Where: $PR = PVR * (1 - BER)$

Then: $PR / PVR = 1 - BER$

$BER = 1 - (PR / PVR)$

Where: $BER = BEP / S$

Then: $S = BEP / BER$

Therefore:

The Present Innovated Formulae-5: $S = BEP / (1 - (PR / PVR))$ to get the S in units take the BEP in units and if required in value take the BEP in Value. OR the direct formulae are:

Formula-1a: Formula to calculate S in units:

$$S = BEP / (1 - (PR / PVR))$$

$$S = F / C * 1 / (1 - (PR / PVR)) \text{ OR}$$

$$S = F / (SP - V) * 1 / (1 - (PR / ((SP - V) / SP))) \text{ OR}$$

$$S = F / C * 1 / (1 - (PR * SP / C))$$

$$S = F / C * 1 / (1 - (PR * SP / C))$$

$$S = F / (C - (PR * SP))$$

Formula-1b: Calculation of S in value:

$$S = F / PVR * 1 / (1 - (PR / PVR)) \text{ OR}$$

$$S = F / ((SP - V) / SP) * 1 / (1 - (PR / ((SP - V) / SP))) \text{ OR}$$

$$S = (F * SP / C) * 1 / (1 - (PR / (C / SP))) \text{ OR}$$

$$S = (F * SP) / (C - (PR * SP))$$

Formula to calculate revised/adjusted/required /maximum permissible fixed costs to get a target rate of profit on sales under the conditions exploring the changes possible/needed in the fixed costs:

Formula-2a required or permissible F:

When the innovated formula to calculate required S in units is: $S = F / (C - (PR * SP))$

Then required or permissible $F = S * (C - (PR * SP))$

Formula-2b: required or permissible F:

When the innovated formula to calculate required S in money value is: $S = (F * SP) / (C - (PR * SP))$

Then required or permissible $F = S / SP * (C - (PR * SP))$

Apart from the IPPPA formula, the derivation of the above innovated formulae 1a, & 1b, and 2a & 2b are instrumental developed for the purpose of providing ample solution for the IIMA 1965/revised 1968 case study on BEA/CVP.

2. Methodology:

Innovative solution for the good old Case F&A0071 of IIMA on CVP/BEA through innovative formulae.

3. Objective:

it is to provide a optimum solution for profitability planning with ROS & ROI under CVP/BEA.

4. LITERATURE REVIEW

Based on the reviews of literature the relevant concepts and formulae were drawn and noted here under for the case analysis.

A comparative statement on the Concepts and variable used in CVP and IPPPA

Variables

Sl. No.	CVP	IPPPA
1.	Selling price	Selling price
2.	Total Sales	Total Sales
3.	Variable cost per unit/total	Variable cost per unit/total
4.	Total Fixed cost	Total Fixed cost
5	Contribution	Contribution
.6	Contribution ratio	Contribution ratio
7.	Break even sales	Break even sales
8.	Safety margin sales	Semi Fixed/semi variable cost
9.	Amount of profit	Return on Sales (rate)
10.	Amount of tax	Tax rate
11.	Amount of interest	Initial & incremental Weighted average Cost of debt
12.		Economic cost of equity(implicit/opportunity cost of equity)
13.		Average and marginal Rate of profit on sales(ROI/ROIBIT)
14.		Average and marginal ROIAIBT
15.		Average and marginal ROIAIBT
16		Average and marginal ROIAIT
17.		Initial & incremental Investment/long term investment
18		Initial & incremental Debt
19.		Initial & incremental Equity
20		Initial & incremental Debt to investment ratio
21.		Initial & incremental ROE

Objectives of analysis:

	CVP	IPPPA
1	Determination of BEP	To measure the performance in tune with the plans
2	Planning for short run profits as an Amount of Profit at different levels of sales in units and value	To monitoring the results in progression from initial planning all through the period to till the end.
3	SMS in units and value	Optimization of results.
4	Static value based make or buy decisions	Short period to medium period to long period in progression

Apart from the following CVP formulae:

1. Contribution margin: it is the amount calculated with the following: $C = S - V$
2. P/V Ratio: $C/S * 100$ i.e. contribution/sales*100
3. Breakeven Point (BEP) I units: F/C_{pu} In sales value/revenue: $F/p/v$ Ratio.

Generally accessible from any text book of cost and management accounting and drawn from the references

The core formula of IPPPA:

The simplified effective formula for ROS:

The recent invented simple and direct formula with the existing concepts is **% of P on sales = P/V Ratio (1-BEP Ratio) or P/V Ratio- (P/V Ratio*BEP Ratio) or p/v ratio*SMS ratio.**

Sreedhara Ramesh Chandra & Banana Krishna (June, 2016) Innovative Formulations and Enhanced Scope of Break Even Analysis. IRJBM, Volume – IX (Issue – 6).

Formula-1: $C = ((ROI * I) + F) / Q$ and $S_p = V + C$

Formula-2: $C/S * (1 - BEP \text{ RATIO})$ OR $PV \text{ RATIO} * (1 - BEP \text{ RATIO})$ OR $SMS \text{ RATIO} * PV \text{ RATIO}$

Formulae-3: the simplified formulae for calculation of returns on sales and investments

Concept of profit (form operating profit to profit on equity)	Amount of profit through physical values(needs all physical values)	Amount of profit through proportions (needs at least one values and one proportion)	Proportion rate through proportions no need of physical value (innovation)
Return on sales	Operating profit/sales	S*R on S	ROS= p/v Ratio*(1-BER)
operating profit on sales to investment PBIT to INV	(Sales –operating exp.)/investment	(S* P on S)/investment	ROI = ROS*ITR (DuPont's ROI)
Profit after interest but before taxes(PAIBIT)	PBIT-INT	PAIBT*(1-IR)	<u>Innovation:</u> ROIAIBT =ROI or ROIBIT - (WKd *DIR)
Profit after interest and taxes (PAIT) on investment	PAIBT - TAX	PAIBT*(1-TR)	<u>Innovation:</u> ROIAIT=ROIAIBT*(1-TR)
Profit after interest and taxes (PAIT) on equity	PAIBT - TAX	PAIBT*(1-TR)	<u>Innovation:</u> ROE= ROIAIT /(1-DIR)

The case analyses are presented as follows:

Source of data: the case details of **IIM Ahmadabad (IIMA/F&A0071 revised in 1968):**

As per the details available the Mr. Dhanjay Bose the proprietor Shilpi Automobile Services follows the % on sales method of planning for profits.

He got the profits Rs. 14400 @2.5% on a sales revenue of Rs 580000/- with a sales of 7250000 ltrs of petrol 1963.

He wish to get at least 3.5% on a sales revenue of Rs 660000/- with expected sales of 8250000 ltrs of petrol in 1964.

He assessed that at 725000 ltrs of sale of petrol by means of just a matter of increase in sales of petrol by 100000 ltrs. Would ensure an increase in profit by only Rs. 2000/- $(100000 * .8 * 2.5 / 100)$ to Rs. 16400/-

Believed that without reducing the costs it is not possible get the desired 3.5% of profit on Rs. 660000/- i.e. Rs. 23100/- .

And the possibility of savings in costs by 2640/- $(1680 + 960)$ given below and gap of profit between 2.5% and the 3.5% $(14400 \& 23100 = 8700/-)$ it is too difficult to cover.

1. Eliminating two bill collectors average salary Rs. 70pm)= $140 * 12 = 1680/-$
2. Avoidance of non realization of accounts receivables (debtor) through stringent credit policy that leads to a fall in sale of 7000 ltrs p.m. or 84000 Ltrs. P.a. leads to fall of Rs. 5032/- in contribution.
3. Removal of one pump attendant in afternoon shift ensures a saving of Rs. 80 p.m. or Rs. 960 p.a.

He Felt that it is not a possibility in the context of present rate of profit of 2.5% to 3.5 % from possible cost savings i.e. reduction of man power comes only to Rs. 1680+960= Rs. 2640/- and the expected profit from additional sales of Rs. 80000*25/1000 = Rs. 2000/-being unaware of BEA. He is thoughtless on what else he is able to do to attain the solution.

He noticed the BEA as a new analytical system in planning for profits in a tread journal. He classified the costs to apply the method. He was not able derive the solution for want of a formula to solve the cause of his concern.

Apart from the conventional formula of BEA the innovated formulae- 1a, 1b, 2a and 2b above ensured the researcher to solve the concerns of Mr. Dhanjay Bose.

With the case details available for studying the effects of ways and means of alternatives for ensuring the possibilities for attaining the min required/projected profit of 3.5 % on sales at a turnover of Rs. 660000 by sale of 825000 liters of petrol in 1964. With the basic information of profit attained 2.5% on sales of 725000 liters of petrol are in 1963.

Sales: 725000 ltrs.(1963)

Selling price: Rs. 0.80

Fixed costs: Rs. 28400/- (exhibit-iv of the case)

Variable costs: 0.735+0.0051 i.e (Rs. 3700/725000=0.0051) = Rs. 0.7401 (exhibit-iv of the case)

{Purchase price: Rs. 0.735 & Other total variable costs: Rs.(3700/725000) = Rs. 0.0051}

Contribution per ltr = .8 -.7401 = Rs. 0.0599

(PV Ratio)PVR =0.0599/0.8 = 0.07487 or 7.487%

BEP in ltrs = F/C = 28400/0.0599 = 474150.8 ltrs.

BEP in ltrs = F/PVR = 28400/0.07487 = Rs. 379320.7.

BER = BEP/S =474150.8/725000 = .65 OR 65% OF SALES

% of profit on sales: PVR*(1-BER) = 0.07487*(1-.65) =0.0259 OR 2.59%

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BEP in amounts = F/PVR = 28400/0.07487 = Rs. 379320.7.

BER = 474150.8/825000 = .5747 OR 57.47%

% of profit on sales: PVR*(1-BER) = 0.07487*(1-.5747) =0.0318 OR 3.18% as it disclosed the % of profit though not as low as predicted 2.59% and it is below the desired mark of 3.5%. It gave the hope for consideration of the ways explored for reduction of the fixed costs.

Before the decision on the cost reduction measure it is better to decide the exact amount of cost reduction to attain the target profit.

It is possible to calculate the maximum allowable fixed cost with the following:

Innovated formula: $F = S*(SP-V)*(1-(PR/PVR))$

$$F = 825000*(0.8-0.7401)*(1-(3.5/0.07487)) = \text{Rs. } 26315/-$$

Verification :

Required BEP in ltrs. =F/C = 26315/0.0599 =439346 ltrs.

$$\text{BER} = \text{BEP}/S = 439346/825000 = .5325 \text{ OR } 53.25\%$$

$$\text{Req. PR} = \text{PVR}*(1-\text{BER}) = 0.07487*(1-.5325) = 0.035 \text{ or } 3.5\%$$

The minimum reduction required in fixed costs is:

Present F = Rs. 28400 – permissible F Rs. 26315= Rs. 2085/-

Further the likely sales required to get the desire 3.5% of profit on sales without any change in the current state of operators.

Required S = $F/(SP-V) * 1/(1-(PR/((SP-V)/SP)))$

Required sales = $28400/(.8-.7401)*1/(1-.035/((.8-.7401)/.8)) = 890368$ ltrs.

As per the available details it is possible to reduce only the fixed costs in salaries of the staff.

In consideration of the possibilities explored.

He explored the possibilities for reduction of cost by reducing the staff as:

1. Eliminating two bill collectors average salary Rs. 70pm) = $140*12=1680/-$
2. Removal of one pump attendant in afternoon shift ensures a saving of Rs. 80 p.m. or Rs. 960 p.a.

The cost savings together from 1 & 3 above comes to Rs. 2640/- the actual required is only Rs. 2085. The surplus savings of Rs. 555 (2640-2085) can be used for the staff who would share the burden of the removed staff members to encourage them for more commitment.

3. Avoidance of non realization of accounts receivables (debtor) through stringent credit policy that leads to a fall in sale of 7000 ltrs p.m. or 84000 Ltrs. P.a. leads to fall of Rs. 5032/- in contribution.

The option of stringent credit policy can be judiciously applied to avoid the immediate fall in sales. As the details of Bad debts burden is not given, a situational advice is that if the delayed collections do not turn in to bad debts, the current policy can be continued up to 1965. If the possibility of bad debt is below the level of Rs 5032 (7000*0.0599*12) or 6.6% of outstanding debts the current credit policy can be continued up to 1965.

Further possibility of enhancing the sales by other means to the extent of 4500 ltrs P.m. by restricting the credit allowed period to one month that reduces investment needs by Rs. 30000/- in debtors and ensures saving of Rs. 1800/- in interest and matches the needs of minimum remedy ($12*4500*0.0599=3235 +1800=5035$).

Further on the basis of the observed trends in sales from 1962, 1963, 1964 as 600000, 725000, 825000 ltrs respectively indicates the forecasted sales in 1965 would likely be a minimum of 900000 ltrs.(an increase in sale of 75000 ltrs) In the light of this and the increasing state of demand it may not be difficult to cover the immediate fall in sales by 84000 ltrs (7000 x 12) even under the stringent credit policy in 1965. And with a stringent credit policy the sales in 1965 may the same as of 1964 and the savings in interest charges would be the right choice instead of reducing the manpower.

Furthermore the increasing trend in sales indicates the needs of man power more in future and a reduction in it would lead to shortage of man power services that leads to loss of customers due to improper/insufficient services.

Further with the help of the analysis the attainment of 3.5% on sale of petrol is not that much difficult in the forthcoming year of 1965. It may be a reality in the year 1965 by just attainment of sales of petrol to the tune of 890368 ltrs. And ensuring the profit rise to Rs. 24930/- producing the desired rate without any changes in the operators (man power). Details are given in the following table

With the application of breakeven analysis it is identified the following:

	rate	year 1963		year 1964		1965 to	
		qty ltrs	amount	qty ltrs	amount	qty ltrs	Amount
Sales	0.800	725000	580000	825000	660000	890368	712294
purchase cost	0.7350	725000					
other variable cost (3700/725000)	0.0051	725000					
total variable cost	0.7401	725000	536575	825000	610585	890368	658964
contribution	0.0599						
P/V ratio	0.0749						
total contribution			43425		49415		53330
fixed costs	28400		28400		26315		28400
BEP in ltrs			474150.8	439340.8		474150.8	
BEP in revenue			379320.7		351472.7		379320.7
% BEP on sales			0.65	53.2534		0.532534	
% of P on sales			0.0259		0.035		0.035
profit on sale of petrol			15025		23100		24930
less incidental legal charges			-600		-		-
net operating profit on sale of petrol			14425		23100		24930

Furthermore the point ignored here in determination of actual or expected profits is that all the expenses were assigned / absorbed to the cost of petrol, as the firm is engaged in operation of other products and a relevant share of expense burden has to be borne by the by products viz. the diesel lubricants etc. or the profits must be measure in combination in total and not in isolation. Ignorance of this had given the impression that petrol alone is less profitable which is not correct. By adopting the multiple products approach in BEA it is possible to get the accurate rate of profit of each of the products i.e. the petrol and the others.

As per the details available in the case:

Particulars	Per unit Rs.	1963	
		Petrol	Diesel & etc.
Sales in ltrs (qty)		725000	
Sales (Rs)	0.8000	580000	
Purchase (PC) (Rs)	0.7350	532875	
Other variable cost		3700	
Total fixed cost	28400	28400	
Profit margin on value of sale of petrol		2.5%	2.5%

The profit margin of diesel and others expected to move in proportion to the changes in volume and value of sales of petrol hence they consistently yield the 2.5% on sales of petrol.

The nearest possibility for sharing of costs among petrol and diesel & etc. is their margin.

Contribution margin of petrol (SP-purchase cost or PC)= 0.80-.735 = 0.065

Contribution margin of diesel & etc: (580000*2.5/100)/725000 = 0.020

Therefore the other variable costs will be shared in proportion of the contribution i.e. .065: .020 or 76.5% and 23.5% respectively for petrol and diesel & etc.

Therefore assignable share of other Variable costs to petrol = 3700*0.765 = 2830

Therefore assignable share of other Variable costs to diesel tec. = 3700*0.235 = 870

Calculation of product wise PV Ratio of i.e. the petrol and the diesel etc: in 1963

	Petrol		Diesel etc.		combined on takings of petrol
	per unit	total	per unit	total	
contribution before the additional variable costs:	0.065	47125	0.02	14500	
less segregated VC	0.003903	2830	0.0012	870	
net contribution	0.061097	44295	0.0188	13630	0.0799
PV ratio	0.0764	0.0764	0.0235	0.0235	0.0999
combined contribution					57925
less combined fixed costs					28400
total earnings before taxes					29525
less incidental legal exp					600
total net earnings before taxes					28925
Profit earned by the products determined in proportion to contribution margin ratio(.765:.235)					
profit on petrol	(28925*.765)				22119
profit on diesel etc.	(28925*.235)				6806
% of profit earned on the takings of petrol by the products:					
Petrol (22119/580000*100)					3.81%
Diesel etc. (6806/580000*100)					1.17%

Therefore the petrol is already producing the earnings more than the desired 3.5% even at the sales of 725000 ltrs.

Calculation of PV Ratio product wise i.e. the petrol and the diesel etc: in 1964(sales of Rs. 660000)

particulars	Petrol		diesel		combined on takings of petrol
	per unit	total	per unit	total	
contribution before the additional variable costs:	0.065	47125	0.02	14500	
less segregated VC	0.003903	2830	0.0012	870	
net contribution	0.061097	44295	0.0188	13630	0.0799
PV ratio	0.0764	0.0764	0.0235	0.0235	0.0999
combine contribution					65915
less combine fixed costs					28400
total net earnings before taxes					37515
Profit earned by the products determined in proportion to contribution margin ratio(.765:.235)					
profit on petrol	(37515*.765)				28687
profit on diesel etc.	(37515*.235)				8827
% of profit earned on the taings of petrol by the products:					
Petrol (28687/660000*100)					4.35%
Diesel etc. (8827/660000*100)					1.34%

Innovative formulae derived from the *operating and financial equilibrium concept of analysis for price output decision-making* as simplified analysis for profits and profitability planning under changing conditions of operations in the context of behavioral direct/variable and indirect/fixed cost classification based of breakeven/CVP. The case analysis of the following reference is instrumental for deriving the applicable formulae in solving the case study analysis.

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