Cost Adjustment of Fertilizer (Urea) Against Production Expenditure by Using Mathematical Methods of Operation Research Specific Linearity Control Bias-Slope Adjustment (OR-LSB)

Abdul Mannan[1]*, Nasir uddin Khan[2], Mushtaq Hussain[3], Sumaira Yousuf[4]

[1*]Research Fellow and Corresponding Author, Department of Mathematics, University of Karachi, Karachi, Pakistan
E-mail: mannan.maths@gmail.com
(*Corresponding Author)
[2]Department of Mathematics, University of Karachi, Karachi, Pakistan
[3]Dean of Sciences, Newport University, Karachi, Pakistan
[4]Research fellow, Department of Mathematics, University of Karachi, Karachi, Pakistan

Abstract- The price factor is a direct index of profitability for any process which produced the items the cost adjustment is a mathematical technique which when implemented gives a better return an investment by keeping extra cost away from main process costing the mathematical method used in this paper is a system of equation relating fixed parameters of structural expenditure like machinery, transport, raw storage material extras with the main variable parameters like raw material such as natural gas produced from fertilizer.

Index Terms- Cost adjustment, prices index variable, cost parameter, fixed cost parameter, profitability index, and modified system.

I. Introduction

This research paper is core study of local fertilizer company producing urea from natural gas. The cost of infrastructure and other accessories was initially very high due to imported items required for erection and installation of manufacturing plant. The management of the investment group was working on a feasibility of previous working group with an estimated cost of 4.5 billion Pak rupees. The return of investment with design production capability was expected in 10 years as maximum of 45%. So it was a profitable project with coat of merits. Such as availability of the fertilizer within vicinity of field farmers Fauji Fertilizer Company Limited (FFC) district Sadiqabad Mirpur Mathailo, Fatima Fertilizer (FF) Sadiqabad, Rahim Yar Khan. At present the factory is producing huge quantity of urea but the cost of manufacture is beyond the price factor of a local market which is badly disturbed by the Indian and Chinese products

II. Method and Methodology

The mathematical model of the process is by furcated into main key operator modules governed by the specific relation expressed as mathematical expressions

$$\sum_{i=0}^{r} = np^{\mathrm{r}} + ka \quad (1)$$

$$\sum_{i=0}^{s} = mq^{s} + k_b \quad (2)$$

$$\sum_{i=0}^{r+s} = nq^{r+s} + k_c \quad (3)$$

$$\sum_{i=0}^{r-s} = mp^{r-s} + k_d \quad (4)$$

Where k_a, k_b, k_c, k_d are the fixed cost factor and *n*, *m* and *r* the coefficient of the productivity and p and q are the essential manufacturing cost *r* and *s* the frequency of the repeat cycle.

The solution of all four equations is the final index for price adjustment by calculating the hidden parameters in manufacturing process mathematical illustration of the main model.

When a process starts with a lateral frequency of repetition say *r* times then for every cycle starting from r_0 up to r_r
Hence:

$$r_0 , r_1 , r_2 , r_3 , r_4 , r_5 \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots r_r$$

Then the actual cost of the process will be reduced for every cycle by an amount of a coefficient *n* likewise *m* is the coefficient of increase in term of variable of expenditures like salaries, utilities and material cost for each cycle say *s* times then for every cycle starting for from s_0 to s_s

$$s_0 , s_1 , s_2 , s_3 , s_4 , s_5 \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots s_s$$

The main process cost p which a direct cost index of the raw material an accessories and the q is the indirect cost of production like utilities electricity, water, gas and salaries etcetera.

The first equation is the material equation, second equation is the labor equation (services), third equation is the effect of material over services and fourth equation is the effect of service over material (provision)

III. Mathematical Workout

For a given time where r and s are different like in three shifts only one production cycle (s = 3, r = 1) and likewise if four cycle of production with two shift (s = 2, r = 4) the actual rate of change between any two parameters can be estimated by using differentiated in time keeping in main equation.

Quantum as α and t is the process cycle (time) where t =1, t = 2, t = 3 and t = 4

$$\alpha_1 = \frac{d\alpha}{dt} = \frac{\mathrm{d}}{\mathrm{dt}}\ (np^r + ka) \quad (5)$$

$$\alpha_2 = \frac{d\alpha}{dt} = \frac{\mathrm{d}}{\mathrm{dt}}\ (mq^s + k_b) \quad (6)$$

$$\alpha_3 = \frac{d\alpha}{dt} = \frac{\mathrm{d}}{\mathrm{dt}}\ (nq^{r+s} + k_c) \quad (7)$$

$$\alpha_4 = \frac{d\alpha}{dt} = \frac{\mathrm{d}}{\mathrm{dt}}\ (mp^{r-s} + k_d) \quad (8)$$

IV. Formula Extraction

In the scenario of production and material cost variation during one cycle of operation the change in the in the services value and non-productive cost on various entities like management transportation medical facilities and supporting services make the formula structure as an average of ratio between two essential cost and the two non-essential cost the summation the primary cost per cycle is summed up to nearest possible factor closed to the highest value in the data table after the normalization of data per α Column per year the average value is formulated by a factor of variability labeled as α it has four value coefficient like $\alpha_0, \alpha_1, \alpha_2, \alpha_3$ and α_4, where α_1 and α_2 are the essential cost it cannot be changed for one cycle but α_3 and α_4 can be adjusted by the reducing the structural cost or fixed cost in this scenario on the actual cost will be vary closed to profitability factor the design factor of adjustment profitability factor is below

$$p_F = \frac{\alpha_1 + \alpha_2}{\alpha_3 - \alpha_4}$$

Table-1
COST MANUFACTURING QUARTERLY
(ALL PRICES ARE IN BILLION PKR)

Year	Cycle (C_1)	Cycle (C_2)	Cycle (C_3)	$C_1 + C_2 + C_3$
2005	6.2	10.1	9.8	26.1
2006	7.2	9.1	9.6	25.9
2007	7.8	9.5	10.2	27.5
2008	8.3	10.1	9.7	28.1
2009	9.4	10.7	9.7	29.8
2010	10.1	9.9	9.8	29.8
2011	11.4	9.4	9.9	30.7
2012	12.9	10.2	10.0	33.1

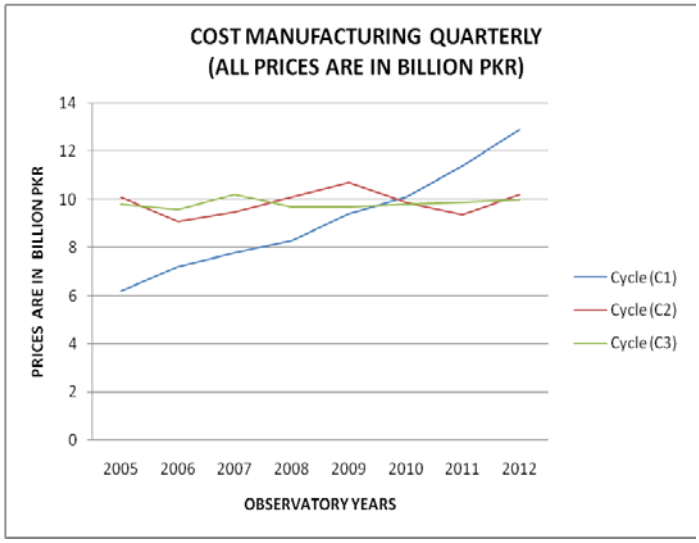


Table-2
NON PRODUCTIVE EXPENDITURE COST
QUARTERLY (ALL PRICES ARE IN BILLION PKR)

Year	Cycle (C_1)	Cycle (C_2)	Cycle (C_3)	$C_1 + C_2 + C_3$
2005	4.2	4.5	9.6	18.3
2006	4.6	4.1	8.4	17.1
2007	4.7	4.4	9.2	18.3
2008	4.7	4.5	9.1	18.3
2009	4.9	4.9	9.2	19.0
2010	5.6	5.5	9.6	20.7
2011	5.9	5.9	9.9	21.7
2012	6.2	6.4	10.4	23.0

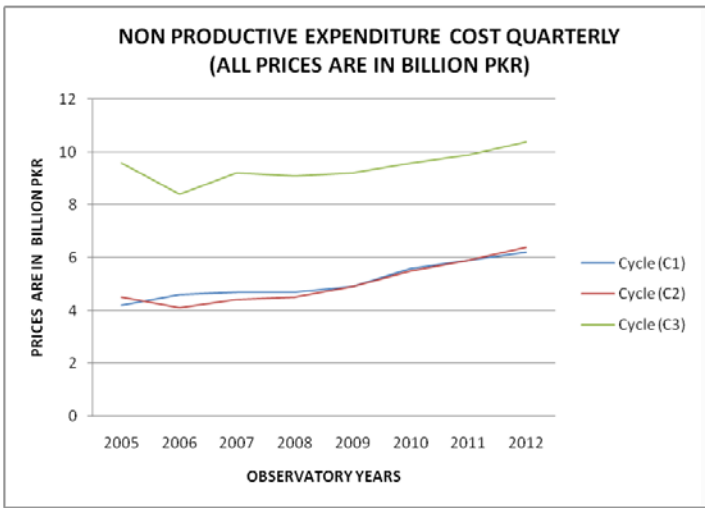


Table-3
PRODUCTION SERVICES COST QUARTERLY
(ALL PRICES ARE IN BILLION PKR)

Year	Cycle (C_1)	Cycle (C_2)	Cycle (C_3)	$C_1 + C_2 + C_3$
2005	7.2	9.2	11.2	27.6
2006	8.9	11.1	12.4	32.4
2007	11.2	11.7	12.4	35.3
2008	12.9	12.0	13.9	38.8
2009	12.4	11.9	14.1	38.4
2010	13.3	12.1	13.9	39.3
2011	13.7	13.1	13.8	40.6
2012	15.5	13.7	13.4	42.6

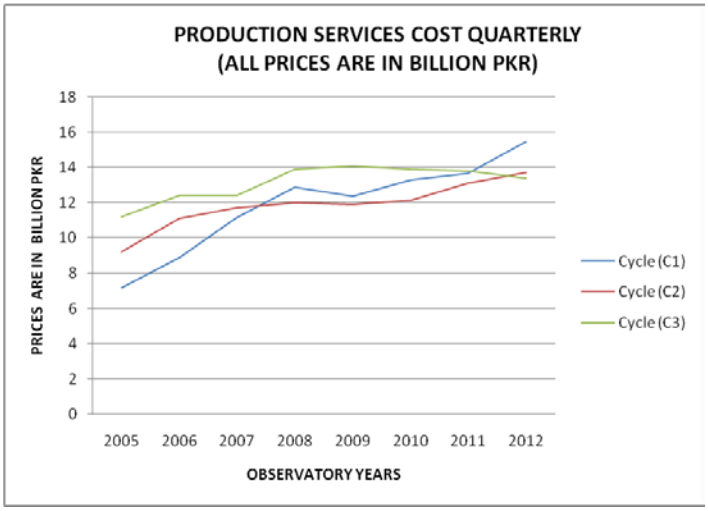
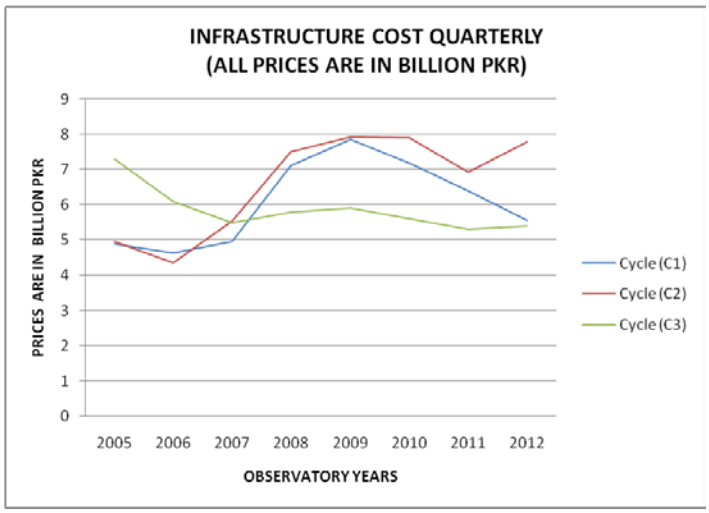


Table-4
INFRASTRUCTURE COST QUARTERLY
(ALL PRICES ARE IN BILLION PKR)

Year	Cycle (C_1)	Cycle (C_2)	Cycle (C_3)	$C_1 + C_2 + C_3$
2005	4.89	4.97	7.3	17.16
2006	4.63	4.36	6.1	15.09
2007	4.95	5.55	5.5	16.00
2008	7.11	7.51	5.8	20.42
2009	7.85	7.93	5.9	21.68
2010	7.19	7.91	5.6	20.7
2011	6.39	6.94	5.3	18.63
2012	5.57	7.8	5.4	18.77



V. Result Extraction P_F

For all three cumulative cycles the mean value will indicate the actual index per year and median of the five year of the production cost will represent the actual production cost.

If the P_F value of the index is ($0.9 < P_F = 1$) then model is fit for profitability over price of fertilizer and if this index is ($P_F \leq 0.9$) fertilizer costing not fit for profit.

VI. Result & Discussion

The calculation of the price adjustments using the simple mathematical models is successful in third world countries like Pakistan where value added pricing is not applied and is not predicted the major portion of our working class the salary paid and the farmers other agricultural operative entities are not included in the tax structure but the agricultural product is highly dependent upon fertilizer then for the price structure of the fertilizer is a deciding factor of productivity the main objective of the price adjustment of the major group of fertilizer is the controlled price implemented by government authorities. The agriculture showing season the dealer price of fertilizer is under the control structure of the supplier to the manufacturer like FFC, FF and ENGRO. Our mathematical model adjust the cost over price structure such that no gap between primary expenditure and find production of the fertilizer by providing essential index is in

such a way that all four parameters are well adjusted for the utility and cycling backs the process.

VII. Conclusion

The above designed mathematical model works affectively without any changing the commercial activity or productive capability or the available cost of fertilizer in commercial market the main reason for this performing of the model is its sample formulation considering cost factor on production and its distribution. The price of fertilizer against the cost of product the biggest problem of fertilizer increasing the cost production and low distribution profile in commercial market

References

[1] Fertilizer Advisory, Development and Information Network for Asia and the Pacific (FADINAP)

[2] Timmer, C. Peter. “The Demand for Fertilizer in Developing Countries” Food Research Institute Studies. Vol. XIII, No. 3. 1974.

[3] Fertilizer policy (2001)

[4] Munir Ahmad, M.Ghafar Chaudry and Ghulam Mustafa Chaudhry. “Non-price Explanatory Variables in Fertilizer” The Pakistan Development Review. 39:4 Part II (Winter 2000) pp.477-486

[5] USDA (US department of agriculture) “Increasing Production Cost.

[6] National Fertilizer Development Center “Pakistan Fertilizer Statistics” Islamabad NFDC

[7] Huang, Wen-yuan (b). “Impact of Rising Fertilizer Prices on Cash Returns for Major Crops, 2000-2007,” Paper presented at CASE/NAREA Conference, Quebec City, Quebec, Canada, June 30-July 2, 2008.

[8] Chauhan, Meena. Personal communication with market analyst - Sulphur/Agriculture, Fertecon Ltd., October 15, 2008.

[9] "About Operations Research". INFORMS.org. Retrieved 7 January 2012.

[10] "Operations Research (Industrial Engineering) :: History – Britannica Online Encyclopedia". Britannica.com. Retrieved 13 November 2011.

[11] Kirby, p. 117, ^ Kirby, pp. 91–94, ^ Kirby, p. 96,109, ^ Kirby, p. 96

[12] A. C. Gaur, Handbook of Organic Farming and Biofertilizers, Ambica Book Publication, Jaipur, India, 2006.

[13] K. Thanunathan, S. Natarajan, R. Sentikumar, and K. Asulmurogan, “Effect of different sources of organic amendments on growth and yield of onion in mine spoil,” Madras Agricultural Journal, vol. 84, no. 7, pp. 382–384, 1997. View at Google Scholar.

Authors

First Author (Correspondence Author) – Abdul Mannan, MSc (Industrial & Business Mathematics), MA (Mathematics with Applied and Pure Subject), Department of Mathematics, University of Karachi, Karachi, Pakistan
E-mail: mannan.maths@gmail.com
Second Author – Nasir uddin Khan, PhD (Mathematics), Department of Mathematics, University of Karachi, Karachi, Pakistan
Third Author – Mushtaq Hussain, PhD (Mathematics), Department of Mathematics, University of Karachi, Dean of Sciences, Newport University, Karachi, Pakistan
Fourth Author–Sumaira Yousuf, MSc(Mathematics), Department of Mathematics, University of Karachi, Karachi, Pakistan