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An Application of Regression Analysis to identify the relationship between production and cost of yogurt

Abstract

The main objective in any factory is to maximize profit but the main constraints facing them are the rise in cost of operation. The study aims to critically examine and evaluate the application of cost control and cost reduction in a factory by adding the production in the Kurdistan Region of Iraq. The city of Erbil's Dairy Factory gathered 115 cases during 24 months. To test the study's objectives, SPSS Version 28 was utilized together with One Way ANOVA and Linear Regression Analysis. Based on the findings, Activia FF 180 ml has the highest mean of production. Regression Coefficient of all production together shows that increasing one ton will reduce the cost by 9.467. Activia LF 180 ml has the greatest model among all types of yogurt production followed by Shanina 200 ml and FF 850 ml.

Key words: ANOVA; Cost control; Cost reduction; Dairy Factory; Performance; Profit; Regression.

Introduction

Iraq has been in political conflicts since early 2000's. This conflict has led to a noticeable retreat in all industrial sectors, especially food production have been heavily affected. According to the most recent demographic survey conducted in 2023, there are 41,266,109 people living in Iraq, and at least 90% of them drink dairy products (CIA, 2023). Iraq's dairy needs are primarily met by imports from neighboring nations including Saudi Arabia, Iran, and Turkey rather than by national dairy production, as the country's dairy company's capacity to produce fresh milk could not keep up with demand. The internal utilization of all the dairy factories was estimated as 20% (242 Ton/Day) which is around 88000 Ton/Year, from a study conducted by UNIDO on 17 biggest dairy factories in Iraq (UNIDO, 2010). Based on the FAO

organization report, the total imported dairy was declined in 476000 to 283000 tons from 2000 to 2003 because of the wars and economic crises in Iraq (FAOSTAT, 2012). Food manufacturing industries are conventionally classified into three categories: supply oriented industries, demand-oriented industries and footloose industries. Supply oriented industries are typically located in rural areas while demand oriented industries have a habit of locating their establishments in urban areas. The footloose industries are working in the production of multiple products and items. Agricultural input costs and transportation; distribution costs are not determinants of their location decisions (Conner, 2003).

Materials and Methods

A- The aims of this study

The main purpose of this paper is reducing the total cost (Per Ton) by adding the quantity of production (Per Ton), which means, the higher demand will be the lower of the cost of production. The sub purpose of this paper includes four parts:

1- To investigate the relationship between total cost (Per Ton) and production (Per Ton) in general for all five types of yogurt together.

2- To determine relationship between total cost (Per Ton) and production (Per Ton) for each product separately.

3- To find out which product is having less cost compare with others.

4- Compare the mean of all five types of production

B- Method of data analysis

Many research questions are focused on predicting one dependent response variable based on a collection of independent predictor variables. These variables are thought to exert some influence over the predicted outcome of the response variable (Tabachnick and Fidell 2001). Regression analysis is a technique used in statistics for investigating and modeling the

relationship between variables (Aroian et al. 2017; Montgomery *et al*, 2012; Blbas and Kahwachi, 2021). To be precise, regression helps a researcher understand to what extent the change of the value of the dependent variable causes the change in the value of the independent variables, while other independent variables are held unchanged. In simple linear regression, the outcome or dependent variable (Y) is predicted by only one independent or predictive variable (X).

The equation of Simple Linear Regression model can be expressed as:

$$Y_i = \beta_0 + \beta_1 X_i + e_i$$

Where; the intercept β_0 and the slope β_1 are unknown constants and e is a random error component.

R-squared is always between (0 and 1), 0 identify that the model explains none of the variability of the response data around its mean and 1 indicates that the model explains all the variability of the response data around its mean. Generally, the higher the R-squared, the better the model fits the data (Frost, 2013).

A statistical method called analysis of variance (ANOVA) compares the means of many samples that can be viewed as an extension of two independent samples. Post hoc comparisons between pairs of treatments are therefore required. A process that considers the entire range of possible comparisons is necessary to do one or more of these pairwise comparisons. For instance, Tukey's method, Scheffé's method, or Bonferroni's correction could be applied (Armitage et al, 2002).

C- Date Collection

Cross sectional study was used to collect data through the direct and genuine (real) data in Dairy Factory in Erbil –Kurdistan from January, 2023 to the end of December 2024 (24 months). The factory has five different types of production which four of them are drinkable yoghurt such as Activia laban full fat 180 ml (FF 180 ml), Activia Laban Low Fat 180 ml (LF

180 ml), Activia laban full fat 850 ml (FF 850 ml), and Shanina 200 ml except Activia Stirred Yoghurt 120 g is a yogurt. The total production amounts in ton were monitored along with the total cost of production monthly. The advantage of a cross sectional study design is that it tolerates researchers to compare multiple variables at the same time. In this paper, I would like to identify the behavior of one output in comparison to four others at the same time.

In general, the independent variable is total produced monthly for different types of yogurt (Per Ton/$) and dependent variable is cost (Per Ton/$) as explained in below:

A. Fixed costs mentioned as depreciation that stands for all the initial land cost, facilities cost, legal fees, initial environmental tests for the location, water wells and governmental electricity facilitation costs.
B. Consumables cost represents the monthly amounts of generators fuel consumed, chemicals used for cleaning and sanitation of all the lines, lubrications for the lines & utilities.
C. Manufacturing costs which represent the cost for generating heat and chilled water, spare parts and maintenance costs.
D. Labor Costs: the labor force required producing these size of Tons, I should emphasize that the company was hiring temporary labors based on work load demand, which means if production amount of tons increased will lead to raise the working labor force. Plus permanent staff cost of the plant will increase as longer working period requirement means overtime payment.
E. Raw material costs: the plant is importing raw materials from plastic, nylon, bottles, caps, glue, cartoon, milk, butter, vitamins, salt, and yoghurt culture.

Results

Table (1) shows the descriptive statistics for all types of production separately. Activia FF 180 ml has the highest mean of production (299.46 tons) followed by Activia Stirred 120 gr

(147.79), Shanina 200 ml (131.73), Activia FF 850 ml (118.48), and Activia LF 180 ml (28.16) respectively.

Table (1) Descriptive Statistics for five types of production

Types of production	N	Mean	Std. Deviation	95% Confidence Interval for Mean		Minimum	Maximum
				Lower Bound	Upper Bound		
Activia FF 180 ml	24	299.46	100.724	256.93	341.99	156	532
Activia FF 850 ml	24	118.48	70.533	88.70	148.26	30	315
Activia LF 180 ml	19	28.16	15.738	20.57	35.74	11	67
Activia Stirred 120 gr	24	147.79	40.834	130.55	165.03	62	217
Shanina 200 ml	24	131.73	61.396	105.80	157.65	26	260
Total	115	150.21	107.907	130.28	170.14	11	532

FF: Full Fat and LF: Low Fat

In table (2) there is a significant difference between the mean productions for five different types of yogurt and Laban based on (F=48.9841, Sig. =0.001) which means, there is a sufficient evidence to suggest that at least one of the means is different form one of the others.

The same table represents the highest significant difference between FF 180 ml and LF 180 ml (271.30) followed by FF 180 ml and FF 850 ml (180.98), FF 180 ml and Shanina 200 (167.73), FF 180 ml and Stirred 120 gr (151.67), LF 180 ml and Stirred 120 gr (119.63) respectively while the lowest two significant difference between LF 180 ml and Shanina 200 (103.57) and FF 850 ml and LF 180 ml (90.32) consequently.

Table (2) Multiple Comparisons between types of yogurt productions

Types of production		Difference Between Means	Sig.	F	P-Value
Activia FF 180 ml	Activia FF 850 ml	180.979**	0.001	48.984	0.001
Activia FF 180 ml	Activia LF 180 ml	271.300**	0.001		
Activia FF 180 ml	Activia Stirred 120 gr	151.667**	0.001		
Activia FF 180 ml	Shanina 200	167.729**	0.001		
Activia FF 850 ml	Activia LF 180 ml	90.321**	0.001		
Activia LF 180 ml	Activia Stirred 120 gr	119.634**	0.001		
Activia LF 180 ml	Shanina 200	103.571**	0.001		

*The mean difference is significant at the 0.05 level
**The mean difference is significant at the 0.01 level

Table (3) represents the Pearson Correlation between types of productions and their costs. These is a strong negative correlation between Activia Stirred 120 gr (-0.656), Activia FF 850 ml (-0.651), all productions together (-0.630) and their costs consequently while there is weak negative correlation between Shanina (-0.548), Activia LF 180 ml (-0.521), Activia FF 180 ml (-0.410) and their costs. In addition, negative correlation, means, increasing the quantity of productions will decrease cost of them which satisfy the purpose of study.

Table (3) Correlation Coefficient between five types of production (Per Ton/$) and cost of them (Per Ton/$)

Types of production	Correlation	P-Value
All productions together (Ton) (n=115)	-0.630	0.001**
Activia FF 180 ml (n=24)	-0.410	0.046*
Activia FF 850 ml (n=24)	-0.651	0.001**
Activia LF 180 ml (n=19)	-0.521	0.022*
Activia Stirred 120 gr (n=24)	-0.656	0.001**
Shanina 200 ml (n=24)	-0.548	0.006**

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Table (4) shows the ANOVA table for checking the goodness of fit for each kind production of yogurt separately. First, we have a good model for all production together (in general) based on (F=74.209 and Sig. =0.001). Regression Coefficient (B) for all production together is -9.467, which means, increasing one ton of all production together will reduce the cost by 9.467.Determination of Coefficient (R^2) reflects that 40.6% of the variation of cost is determined by the quantity of production. Second, among all types of yogurt production, LF 180 ml has the greatest model based on (F=6.345 and Sig. =0.022). Regression Coefficient (B) for LF 180 is -17.249, which means, increasing one ton of LF 180 will decline the cost by 17.249.Determination of Coefficient (R^2) reflects that 27.2% of the variation of cost is determined by the quantity of production. Third, Shanina 200 ml and FF 850 ml have the second greatest model based on (F=9.430, Sig=0.006 and F=20.851, Sig. =0.001). Regression Coefficient (B) for Shanina 200 ml and FF 850 ml are -9.996 and -7.795 respectively, which

means, increasing one ton of Shanina 200 ml and FF 850 ml will decline the cost by 9.996 and 7.795 consequently. All of the above are proven the purpose of research. Last, the mode is not fit for FF 180 ml based on (F=3.201 and Sig. =0.061) we can decide independent variable (FF 180 ml) does not effect on dependent variable called cost (Per/Ton/$).

Table (4): ANOVA and Coefficients between production (Per Ton/$) and Cost (Per Ton/$)

Types of production	Constant	B	F	R^2
All production together (ton)	3315.129 t(16.334) (0.001)**	-9.467 t(-8.614) (0.001)**	74.209 (0.001)**	40.6%
Activia FF 180 ml	1120.495 t(8.042) (0.001)**	-0.934 t(-1.811) (0.061)	3.201 (0.061)	16.4%
Activia FF 850 ml	2684.128 t(11.466) (0.001)**	-7.795 t(-4.566) (0.001)**	20.851 (0.001)**	48.7%
Activia LF 180 ml	5123.947 t(10.075) (0.001)**	-17.249 t(-2.519) (0.022)*	6.345 (0.022)*	27.2%
Activia Stirred 120 gr	3810.922 t(7.771) (0.001)**	-13.294 t(-4.080) (0.001)**	16.792 (0.001)**	43.3%
Shanina 200 ml	2958.288 t(5.825) (0.001)**	-9.996 t(-3.071) (0.006)**	9.430 (0.006)**	30.5%

Conclusion

The relevance of this research is to analyze the importance of cost control or cost reduction techniques on organizational performance in a highly competitive environment. From the finding of this research, it was evident that cost control has a positive impact on organizational performance. Activia FF 180 ml has the highest mean of production which around 300 tons. Depending on Regression Coefficient increasing one ton of all production together will reduce the cost by 9.467.According to F=6.345, Activia LF 180 ml has the greatest model among all types of yogurt production and it will decrease 17.249 of the cost of production by increasing

one ton of production. In addition, increasing one ton of Shanina 200 ml and FF 850 ml will decline the cost by 9.996 and 7.795 consequently.

Contributions

After getting data from the Factory, I was entered data in new form, cleaning data, analyzing data, and writing the first draft. Finally, I was hardly worked to finish the last version of manuscript.

References

1. Armitage P, Berry G, Matthews J. 2002. Statistical Methods in Medical Research 4th edition. Oxford: Blackwell Science
2. Aroian, K., Uddin, N. and Blbas, H., 2017. Longitudinal study of stress, social support, and depression in married Arab immigrant women. Health care for women international, 38(2), pp.100-117.
3. CIA. 2023. World Fact Book. Retrieved July 10, 2016, from CIA Library Publications https://www.cia.gov/the-world-factbook/about/archives/2023/countries/iraq
4. Montgomery D., Peck, E., & Vinning, G. 2012. Introduction to Linear Regression Analysis, 5th edition, Wiley
5. FAOSTAT. 2012. Feeding the World. Asia: FAO Organization.
6. Frost, J. 2013. Regression Analysis: How Do I Interpret R-squared and Assess the Goodness-of-Fit? Retrieved from
7. Conner J. 2003. The Changing Structure of Global Food Markets: Dimensions, Effects, and Policy Implications: The food policy issue (pp. 1-14). The Hague: The Hague University, SSRN Electronic Journal. doi: 10.2139/ssrn.1711925

8. Tabachnick, B. G., and Fidell, L. S. 2001. Using Multivariate Statistics Fourth edition, Allyn and Bacon Sydney
9. UNIDO. 2010. Independent Evaluation Report. Vienna: United Nations Industrial Development Organization
10. Blbas, H.T. and Kahwachi, W.T., 2021. A Comparison Between New Modification of ANWK and Classical ANWK Methods in Nonparametric Regression. Cihan University-Erbil Scientific Journal, 5(2), pp.32-37.

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