



Statistics Assignment | Sample Homework | www.expertsmind.com

Probability

3DP, a Luxembourg-based company plans to develop and sell highly specialized 3D printers. The cost of product development is estimated at EUR 50,000.-, irrespective of whether or not the product is finally marketed. The company owners put the odds of a successful product launch at 70%.

The market for such a sophisticated piece of equipment is rather limited: the number of orders is assumed to follow a binominal distribution. In the first quarter will definitely not exceed 20, and the probability of placing a single order is evaluated at 30%. The variable cost would amount to EUR 3,300.- and the final price tag would be set at EUR 15,500.-

As the company owners have secured the patent for their innovative technology, a viable alternative to launching the production is simply to sell the license. USAin3D, a U.S.-based company is a potential buyer offering USD 7,800.- (non-negotiable) and 3DP owners must take the final decision before three months.

By that time, of course, the EUR/USD exchange rate will surely change. A friend of 3DP owners, who happens to be a financial analyst, estimates that in three months' time the EUR/USD exchange rate will fall by not more than -10.504% with the probability of 2.5%. To make this estimate, he assumed that the percentage change of the EUR/USD exchange rate follows a normal distribution with (three-month) volatility of 5.9535%. The current (*spot*) EUR/USD exchange rate is equal 1.3684 (dollars per one euro).

Questions:

1. Estimate the Expected Monetary Value (EMV) of the two options: product launch and selling the license. What should be the decision by the 3DP owners based solely on financial considerations? Is it a strong decision from the business point of view?
2. How would the EUR/USD exchange rate need to change in order for the 3DP owners to change their mind? What is the probability associated with such a fx movement?

Calculate the answers and present them in a short PowerPoint presentation

Regression

The following table presents the monthly data on the sales volume (col 2) and promotional spending (col 3) of a company. Column (4) shows an index of economic activity in the local economy.

Time	Sales (EUR 1000's)	Promotion (EUR 1000's)	Economic activity index
2010-01-31	163,27	25	105,10
2010-02-28	202,40	35	102,45
2010-03-31	207,29	42	92,63
2010-04-30	160,22	15	106,98
2010-05-31	127,68	25	107,09
2010-06-30	175,10	13	111,77
2010-07-31	105,16	8	113,23
2010-08-31	71,44	0	122,39
2010-09-30	99,25	27	131,12
2010-10-31	191,19	39	118,42
2010-11-30	373,24	84	115,32
2010-12-31	432,68	123	123,15
2011-01-31	220,85	36	127,09
2011-02-28	55,90	23	122,17
2011-03-31	82,12	17	134,00
2011-04-30	130,88	24	137,13
2011-05-31	138,84	16	143,44
2011-06-30	113,97	9	142,03
2011-07-31	41,92	12	137,50
2011-08-31	23,24	6	138,44
2011-09-30	149,37	18	132,41
2011-10-31	190,14	36	127,69
2011-11-30	282,89	57	123,81
2011-12-31	330,81	93	124,17

Answer the following questions:

- What is the correlation between:
 - sales volume and the promotional spending?
 - sales volume and the economic activity index?
 - promotional spending and the economic activity index?

Given the sizes of correlation, do you think there is a valid case for running a regression? Logically, which variable would you consider as dependent?



- Using excel (either *reglinp* or Analysis ToolPak), run the regression of sales volume (dependent variable) on a constant (intercept) and promotional spending. Write down explicitly the regression equation, setting out the estimated coefficients as well as the associated standard errors.
 - What is the interpretation of the coefficients?
 - How about their signs? Do they make intuitive sense?
 - Are they statistically significant?
 - (Optional) What is the forecast sales volume assuming that the promotional spending amounts to EUR 150,000? What is the 95% confidence interval around this point forecast (hint: use formulas on p. 396 of the textbook).
- Run another regression, this time adding index of economic activity as the second explanatory variable. What are the results now? Write down explicitly the regression equation, setting out the estimated coefficients as well as the associated standard errors.



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- Has the quality of fit improved substantially?
- Purely from statistical (not business) perspective, is there a strong case for adding the index of economic activity as one of the explanatory variables? Why?

Q.2 Solution

- a) Correlation coefficient between sales volume and promotional spending is 0.9244
- b) Correlation coefficient between sales volume and economic activity index is – 0.2918
- c) Correlation coefficient between promotional spending and economic activity index is
- 0.1698

Q.3 solution

The regression equation is

$$y = 6581.382 + 318.0483 * x$$

where y = sales volume x= the promotional spending

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.924442
R Square	0.854593
Adjusted R Square	0.847984
Standard Error	3986.267
Observations	24

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	1	2.05E+09	2.05E+09	129.299911	1.10996E-10	
Residual	22	3.5E+08	15890321			
Total	23	2.4E+09				

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	6581.3816	1222.619174	5.383018	2.094E-05	4045.824658	9116.938591
Promotion	318.04833	27.97009901	11.37101	1.11E-10	260.0418935	376.054763

- a) Interpretation of regression coefficient:
Expected change in the value of Y (sales) for the unit change in the value of independent variable x.
- b) Since coefficient is positive it means that X and Y change in the same direction. If X increases, then Y increases.
- c) Since P-value corresponding to coefficients intercept and promotion is less than 0.05 it means that the coefficients are statistically significant.

Q.4 solution

The regression equation is

$$y = 19636.49204 + 309.9691647 * x_1 - 1.044373301 * x_2$$

where

y=sales volume

x₁= the promotional spending

x₂= Economy activity index

Regression Statistics

Multiple R	0.93443355
R Square	0.873166059
Adjusted R Square	0.861086636
Standard Error	3810.603587
Observations	24

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	2	2.1E+09	1.05E+09	72.28541	3.836E-10
Residual	21	3.05E+08	14520700		
Total	23	2.4E+09			



	<i>Coefficients</i>	<i>SE</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	19636.49204	7535.964	2.605704	0.016508	3964.597221	35308.39
Promotion	309.9691647	27.13158	11.42467	1.79E-10	253.545965	366.3924
Economy activity index	-1.044373301	0.595562	-1.75359	0.094086	2.282913066	0.194166

- a) Since the value of adjusted R-square has increased as compared to the previous model from 84 % to 86 %so we can say that quality of fit has improved.
- b) Even if the value of adjusted R-square has increased but the p-value corresponding to the regression coefficient of the index of economic activity is greater than 0.05 which means that it is not statistically significant.