

Using probability concepts to formulate a decision making for abc

[Science](#), [Statistics](#)



Probability Introduction Corn production is affected by extreme weather conditions as corn requires warm weather when it is sown. In the past few years farmers have experienced severe weather conditions in the planting and growing season. This has resulted in a lower yield per acre and has affected the price of corn. This has resulted in the futures price for corn in December 2013 varying between 5.63 and 7.43. The lower yield means higher prices for producers and in some cases losses or lower profitability levels. Decision Making for ABC ABC Ltd currently produces corn, the majority of which (approximately 95%) is supplied to a major customer. The cost of production is currently close to the contracted price and ABC Ltd is considering the possibility of sourcing the product at a cheaper price as there is a 0.85 probability that the price will be higher than \$6.46. There is a 0.9 probability that it can be sourced in another State. However, Michigan State University (2013) indicates that there is a 0.5 probability that the futures price will be less than or equal to \$6.46 - the price above which ABC would not consider purchasing corn. ABC needs to know what the best option will be as the company will go out of business if the cost of production is not reduced. If ABC cannot deliver based on the contract there is a penalty attached. Additionally, ABC may not be able to find any additional customers as the market is very competitive. Bayes's Theorem can be used to solve this problem. Bayes's Theorem provides a method that uses probabilities to arrive at new information (Doane and Seaward 2007; McClave et al 2013). In this scenario the joint probabilities are calculated as shown in the Tree Diagram in Appendix 1 and Bayes's Theorem is then used to determine the best option. Tree Diagrams are very useful in illustrating conditional and joint

probabilities (Mason and Lind 1997). The diagram shows the prior probability of sourcing corn instead of manufacturing it. The prior probability is the initial probability which is based on the information gathered in the initial stages and which does not have an empirical basis (Mason and Lind 1997). The conditional probability is so termed because its value is dependent on whether the price is high (expensive) or low (cheap). In this case a high price is greater than \$6.46 and a low price is less than or equal to \$6.46. The joint probability is product of the Prior and Conditional Probability. It is calculated as 0.45 and 0.015 respectively. The posterior probability can then be calculated using Bayes's Theorem. It is a revised probability which is based on the additional information received. The additional information was the price of corn futures. (See information from Michigan State University 2013). In applying Bayes's Theorem, the probability that corn can be sourced cheaply is given by the following: $P(S/C) = \frac{[P(C/S)P(S)]}{[P(C/S)P(S)] + [P(C/M)P(M)]} = \frac{(0.5)(0.9)}{(0.5)(0.9) + (0.15)(0.1)} = \frac{0.45}{0.45 + 0.015} = \frac{0.45}{0.465} = 0.97$ This result indicates that the probability of sourcing corn cheaply is 0.97. The probability of obtaining a cheap price sourced or manufactured is summarized in the table below.

Event A	Prior Probability, P(A1)	Conditional Probability (B1/A1)	Joint Probability P(A1 and B1)	Posterior Probability Sourced
Sourced	.90	0.50	0.45	$0.45/0.465 = 0.97$
Manufactured	.10	0.15	0.015	$0.015/0.465 = 0.03$
				$P(B1) = 0.465$

1.000

Table - Summary of Probabilities This Table has similar information to that contained in the Tree Diagram in the Appendix. It is proof that the calculation is correct as the posterior probability of both events equate to 1.000. Conclusion Bayes's Theorem is a means of using probability theory to

solve problems and make important decisions for businesses. In ABC's case it has provided a means by which decisions can be informed. The information generally reveals that there is a high probability - 0.97% of obtaining corn cheaply. This is especially so if the corn is sourced in another state rather than being manufactured. Therefore, ABC will face a very slim chance of incurring a high cost in sourcing corn for the company's main customer. The probability of manufacturing corn cheaply is a mere 0.03 and should no longer be considered a viable option. ABC needs to source its corn in order to supply customers. This is the only way that the company will be able to stay in business and retain customers. In doing business customers take factors such as the ability of a firm to continue in business into consideration. This information is used in deciding whether to continue business with them. Customers want to be assured that they will be able to receive inputs for production or simply goods to sell when they need them. A struggling firm may not be able to provide this assurance. ABC needs to move quickly to source corn from another State. Appendix Tree Diagram of the problem

References Doane, D. P and Seward, L. E. (2007). Applied Statistics in Business and Economics. USA: McGraw Hill/Irwin Mason, R. D and Lind, D. A. (1997). Statistical Techniques in Business and Economics. 11th ed. USA: Irwin McGraw-Hill McClave, J. T., Benson, P. G and Sincich, T. (2013). Statistics for Business and Economics. 11th ed. USA: Pearson/Prentice Hall Michigan State University. (2013). Probabilistic Price Forecasts for Corn. Retrieved from <https://www.msu.edu/user/hilker/crnfut.htm>