MANAGEMENT ACCOUNTING – DECISION MANAGEMENT

Ian Janes offers his guide to a problem area for P2 candidates: the approaches that managers can take when faced with 'risky' decisions.

Several decision-making techniques are available to a manager facing a range of possible outcomes from a course of action. Generally, the technique chosen will depend largely upon the manager's level of knowledge about the likelihood of their occurrence and also upon the number of areas of uncertainty concerned (a topic that I will address in a future article).

In discussions about decision-making problems, the words "risk" and "uncertainty" are often used interchangeably, but students need to be aware of the key difference between them. "Uncertainty" refers to situations where we cannot predict with statistical confidence whether events will occur or not. "Risky" decisions concern situations where we can predict whether events will occur or not, based on past records or other statistical calculations.

If the probabilities of the various outcomes are known, and are likely to be repeated over and over again, then we can use expected values to inform our decision.

Consider the example of a market stallholder, Mr Jenkins. He trades a highly perishable commodity that can be sold on the retail market for £5 per carton. Each carton costs him £2.50 to buy from the wholesale market and is suitable for sale at his retail market for only 24 hours after purchase. After this, it's sold for farm animal food at £0.50 per carton.

Jenkins has kept records of the commodity's sales over the past 100 days (*see table 1*).

For problems such as this, it can be useful to construct a table where each "x" denotes the daily forecast net margin for each combination of decision and outcome (*see table 2*).

1 Jenkins' 100-day sales record

Daily sales (cartons)	Days sold
100	30
200	50
300	20

2 Combining decisions and possible outcomes

	Course of action			
Uncertain event	Decision 1	Decision 2	Decision 3	And so on
Outcome 1	x	x	x	x
Outcome 2	x	x	x	x
Outcome 3	x	x	x	x
And so on	x	x	x	x

3 Daily forecast net margin (£)

Outcome	Action (order size at £2.50 per carton)		
(demand in cartons)	100	200	300
100	250	50	-150
200	250	500	300
300	250	500	750

Jenkins has three possible courses of action and there are three possible outcomes according to previous records, so nine combinations are possible in this case (*see table 3*). For example, if he buys 300 cartons but sells only 200, his cost will be: 300 x £2.50 = £750. His income will be: (200 x £5) + (100 x £0.50) = £1,050. This would leave a net margin of £300.

Maximax and maximin

Jenkins' decision on how many cartons to take to market could, of course, be made without reference to his previous records of daily sales.

If, like the ever-bullish Del Trotter from *Only Fools and Horses*, he always gets drawn to the best possible outcome (the maximax criterion) in the belief that this time next year he'll be a millionaire, he will take 300 cartons to market every day, because the net margin could be £750. In effect, this "risk seeker" will ignore the possibility of a £150 loss.

If, on the other hand, he has Rodney Trotter's outlook – ie, whatever choice is taken, the worst possible outcome will happen (the maximin criterion) – he will seek sanctuary in the 100-cartons-a-day option. This offers a steady £250 net margin, with no loss apparently possible.

Expected values

Of course, the point about having access to past daily demand figures is that it can inform your decision through the use of probabilities. Because the action of taking the cartons to market is a repeated event, we can conclude, albeit rather simplistically, that there is:

- A 30 per cent (0.3) chance that daily sales will be 100 cartons.
- A 50 per cent (0.5) chance that daily sales will be 200 cartons.
- A 20 per cent (0.2) chance that daily sales will be 300 cartons.

The expected value of taking 100 cartons to market, therefore, is calculated as follows: (0.3 x 250) + (0.5 x 250) + (0.2 x 250) = £250.

So the expected value of 200 cartons is: (0.3 x 50) + (0.5 x 500) + (0.2 x 500) = £365.

And the expected value of 300 cartons is: (0.3 x -150) + (0.5 x 300) + (0.2 x 750) = £255.

Therefore, if Jenkins uses expected values as the basis for his decision, he will choose

"You know it makes sense, Rodney." Del Trotter advocates the maximax approach.

the middle path of ordering 200 cartons for his day's trading.

This decision reflects the "risk-neutral" nature of using expected values, in that the technique weighs up the balance of the probabilities. In other words, all possible outcomes – profits and losses in this example – are taken into account and contribute to the expected value according to the likelihood of their occurrence.

Perfect information

Clearly, what any market trader really wants is certain knowledge, in advance, of the level of demand on any given market day. This is rarely possible in practice, but sellers will use their experience of market conditions, possibly even the weather or day of the week, to make that judgment.

Nonetheless, P2 exams usually pose a question along the lines of: "How much would the trader be prepared to pay for certain knowledge of the daily demand?" The value of this perfect information can be expressed as the expected value with perfect information minus the expected value without perfect information.

The effect of perfect information, in terms of the nine possible outcomes in Jenkins' table, is to make redundant the six incorrect choices, leaving only the three correct ones. (This naturally assumes rational behaviour from the trader.) So, if Jenkins is told that the demand will be for 100 cartons, he will order 100 cartons, earning £250. There's a 30 per cent chance that this will happen: 0.3 x £250 = £75.

If told that demand will be for 200 cartons, Jenkins will order 200 cartons, earning £500. There's a 50 per cent chance that this will happen: 0.5 x £500 = £250,

If told that demand is for 300 cartons, Jenkins will order 300 cartons, earning £750. There's a 20 per cent chance that this will happen: 0.2 x £750 = £150.

Therefore, the expected profit with perfect information is: £75 + £250 + £150 = £475.

This exceeds the expected profit without perfect information by: £475 – £365 = £110.

So it's worthwhile for Jenkins to pay up to £110 a day for perfect information about the level of demand for his product.

It's clear from these approaches that decision-making criteria exist which reflect the individual's attitude to risk. A risk seeker would use maximax, a risk avoider would use maximin and the risk-neutral decision-maker would use expected values. In effect, they are concerned with the most likely outcome, as the expected value is calculated by weighing up the possible outcomes by their probabilities and summing the result.

The value of perfect information, which will eliminate the possibility of making the incorrect choice, is the increase in the expected value of the action once that information has been made available.

Ian Janes is senior lecturer in accounting at Newport Business School.

P2 further reading

J Avis, L Burke and C Wilks, *Management Accounting – Decision Management CIMA Official Learning System* (2009 edition), CIMA Publishing, 2008.
C Drury, *Management and Cost Accounting*, International Thomson Business Press, 2000.
C Horngren, A Bhimani, G Foster and S Datar, *Management and Cost Accounting*, FT/Prentice Hall, 2002.