Tips for teaching the mechanics of decision trees

OCR Applied GCE in Business

Unit F248 (Unit 9): Strategic decision-making

Underpinning knowledge:

A decision tree can be used when there are at least 2 options to compare (it does not have to be 3).

For each option under consideration probabilities of success and failure will be given. These could be given in decimals (totalling 1) or in percentages (totalling 100).

Expected levels of return will be given for each option. Success and failure returns may be positive or negative.

Any costs incurred by taking an option will be shown along the branches and will need deducting at the appropriate point.

Decision trees are worked from right to left.

The purpose of a decision tree is to find the option which gives the highest expected value.

Mechanics:

Once grasped, decision trees become a matter of routine. Bigger decision trees are no more difficult than smaller ones; they simply involve more calculations and take longer. Candidates need to know how to handle:

- Chance nodes
- Decision nodes

Chance nodes are represented by circles and require a calculation to work out the expected value:
Return if successful x probability of being successful PLUS
Return if unsuccessful x probability of being unsuccessful.

Values should always be added. Success and failure returns can be positive or negative – this may mean the addition of a negative number. Special attention should be given as to whether the expected return is positive or negative.

Decision nodes are represented by squares. The option with the highest expected return should be chosen and the remaining option(s) pruned by striking through the branches with a cross. Costs incurred (if given on the branch) should be deducted before comparing the expected returns.

The final square (furthest left) is always a decision node. Once costs have been deducted from the expected values the option with the highest expected value can be identified. The highest expected value should be written inside the square with pruned branches showing the rejected options.

Reinforcement:

It is recommended that candidates work through lots of examples to develop confidence in handling decision trees. Examples can be found in a wide range of text books. Candidates could also be encouraged to set their own question for homework which the rest of the class could tackle in pairs at a later session in class.

Finally, in preparation for the examination examples from past papers should be worked through in timed conditions (approximately 1 minute per mark). Worked solutions to OCR Applied Business decision tree questions from past papers are given below to assist you (these should be used alongside the appropriate question paper and mark scheme).

F248 June 2007 Q3a
(To be used alongside question paper and mark scheme)

Option 1

(£40,000 x 0.8) + (-£10,000 x 0.2) = £32,000 + -£2,000 = £30,000 (2 marks)

Option 2

(£48,000 x 0.5) + (-£20,000 x 0.5) = £24,000 + -£10,000 = £14,000 (2 marks)

Option 3

(£20,000 x 0.6) + (£10,000 x 0.4) = £12,000 + -£4,000 = £8,000 (2 marks)

Final decision node:

Option 1 £30,000 - £20,000 = £10,000

Option 2 £14,000 - £30,000 = -£16,000

Option 3 £ £8,000 - £14,000 = -£6,000

Since Option 1 £10,000 is the only positive expected value and therefore greater than both -£16,000 and -£6000 prune Option 2 and Option 3. Option 1 £10,000 has the highest expected value (3 marks).

F248 June 2008 Q4a

Option 1

(£750,000 x 75%) + (£400,000 x 25%) = £662,500 (1 mark)

'yes' £662,500 - £100,000 = £562,500
'yes ' = £562,500 'no' = £500,000
Since £562,500 > £500,000 'no' is pruned and 'yes' = £562,500 (1 mark)

(£562,000 x 90%) + (£20,000 x 10%) = £508,250 (1 mark)

Option 2

(£400,000 x 50%) + (£90,000 x 50%) = £245,000 (1 mark)

Option 3

(£2,500,000 x 70%) + (£1,300,000 x 30%) = £2,140,000 (1 mark)

'yes' £2,140,000 - £600,000 = £1,540,000
'yes' = £1,540,000 'no' = £2,200,000
Since £2,200,000 > £1,540,000 'yes' is pruned and 'no' = £2,200,000 (1 mark)

(£2,200,000 x 40%) + (£600,000 x 60%) = £1,240,000 (1 mark)

Final decision node:

Option 1 £508,250 - £282,000 = £226,250

Option 2 £245,000 - £45,000 = £200,000

Option 3 £ £1,240,000 - £750,000 = £490,000

Since £490,000 is greater than both £226,250 and £200,000 prune Option 1 and Option 2. Option 3 £490,000 has the highest expected value (1 mark).

F248 January 2009 Q4a

Option 1

(£2.1m x 80%) + (£0.2m x 20%) = £1.68m + £0.04 m = £1.72m (2 marks)

Option 2

(£2.35m x 80%) + (£0x 20%) = £1.88m (2 marks)

‘yes’ £1.88m - £1m = £0.88m
‘yes’ = £0.88m ’no’ = £0.8m
Since £0.88m > £0.8m ‘no’ is pruned and ‘yes’ = £0.88m (2 marks)

(£0.88m x 70%) + (£0.3m x 30%) = £0.616m +£0.09m = £0.706m (2 marks)

Option 3

(£1.3 m x 60%) + (-0.1m x 40%) = £0.78m + -£0.04m = £0.74m (2 marks)

Comparison

Option 1 £1.72m - £1.2m = £0.52m

Option 2 £0.706m - £0.2m = £0.506m

Option 3 £ £0.74m - £0.5m = £0.24m

Since £0.52m is greater than both £0.506m and £0.24m prune Option 2 and Option 3. Option 1 £0.52m has the highest expected value (2 marks).