Crosswind Learning

Crosswind Success Series:
PMP® Exam Bootcamp Manual

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14.5.3. Probability Distributions

Continuous probability distributions graphically represent uncertainty in schedule and cost values and are used extensively in modeling and simulation.

The three most common types of probability distribution functions are normal distribution, beta distribution, and triangular distribution.

Normal distribution is typically used for statistical or scientific computing.

Beta distribution is used to model events that must take place within an interval that has a minimum and maximum value. Beta distribution, along with triangular distribution, is commonly used with PERT and CPM.

Triangular distribution is the most common distribution used in business modeling because its parameters (minimum, most likely, and maximum) are understood even by those unfamiliar with risk analysis.
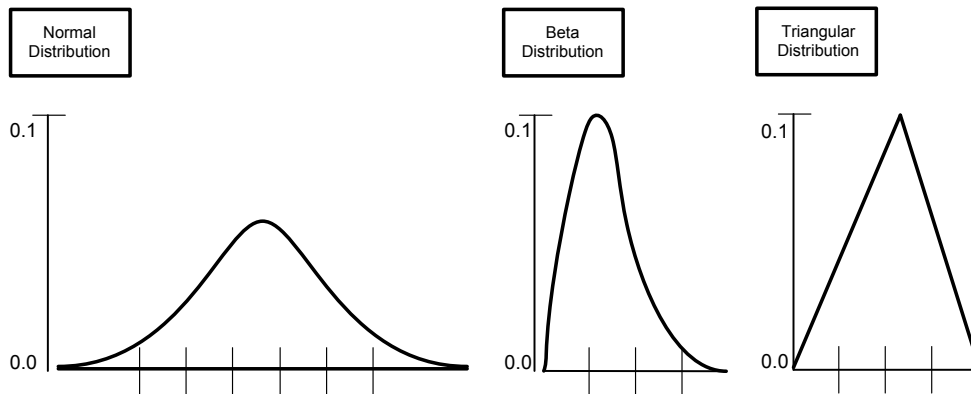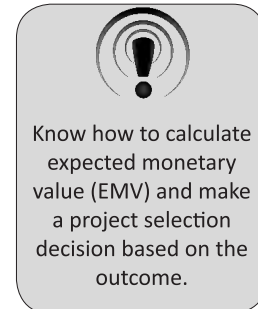

Normal Distribution | Beta Distribution | Triangular Distribution

Figure 14-10: Probability Distributions

14.5.4. Decision Trees and Expected Monetary Value (EMV)

Decision tree analysis is based on an analysis of the probability and impact of all potential decisions to determine the potential expected monetary value (EMV), or expected risk value, of the opportunity as a whole.

This is accomplished by multiplying the probabilities and the impact (minus any costs) , then totaling the results for each project or opportunity. Note that the sum of all probabilities must equal 1.0 (or 100%).

Know how to calculate expected monetary value (EMV) and make a project selection decision based on the outcome.

For example, an organization wishes to create a specific product and currently does not have the capacity to do so. The organization must decide if it will purchase a new company that currently has the capability of creating the product or if it will retool a current company so that it will have the capacity to create the product. The organization uses a decision tree to compare the EMV of purchasing against the EMV of retooling. Reference Figure 14-11: Decision Tree.
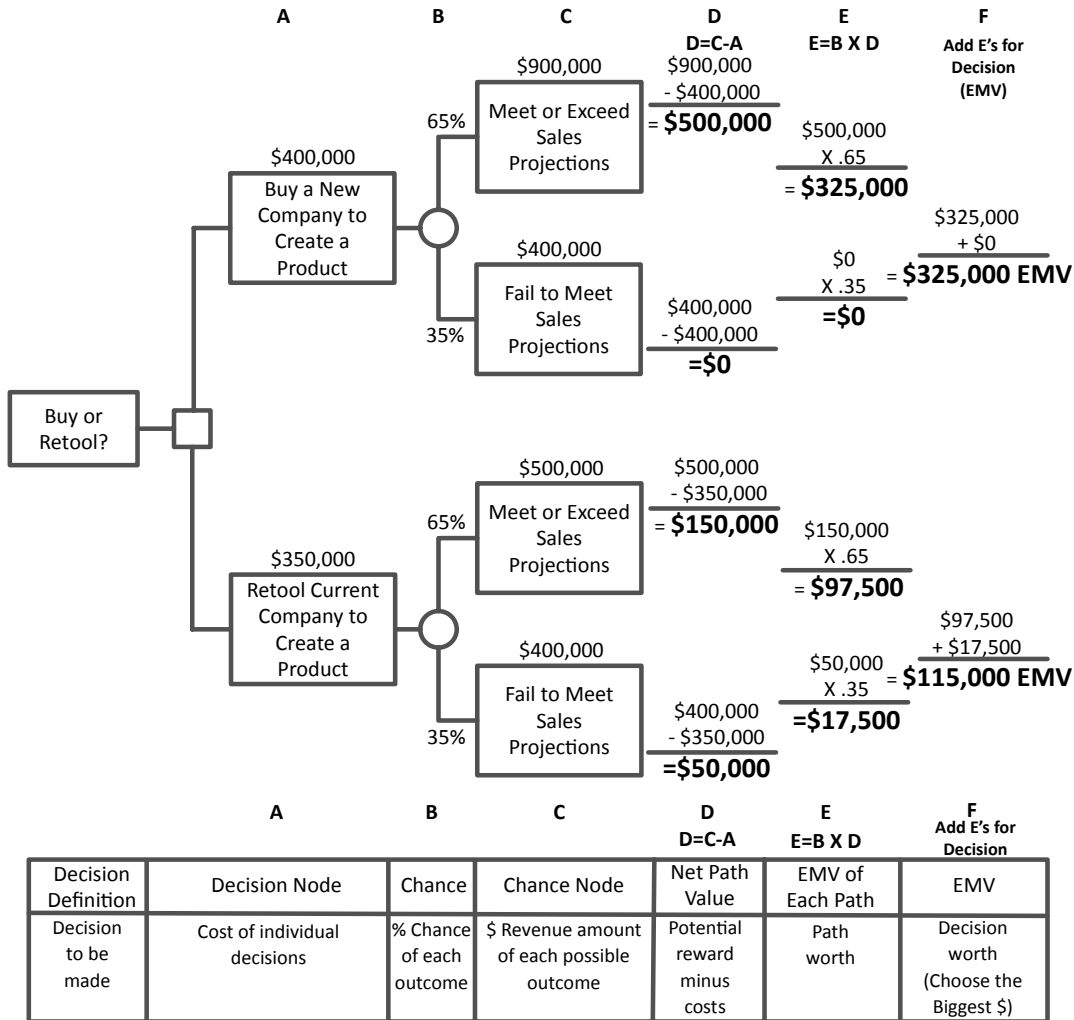
A	B	C	D D=C-A	E E=B X D	F Add E's for Decision (EMV)

$900,000

65% → Meet or Exceed Sales Projections

D: $900,000 - $400,000 = **$500,000**

E: $500,000 X .65 = **$325,000**

$400,000 — Buy a New Company to Create a Product

$400,000

35% → Fail to Meet Sales Projections

D: $400,000 - $400,000 = **$0**

E: $0 X .35 = **$0**

F: $325,000 + $0 = **$325,000 EMV**

Buy or Retool?

$500,000

65% → Meet or Exceed Sales Projections

D: $500,000 - $350,000 = **$150,000**

E: $150,000 X .65 = **$97,500**

$350,000 — Retool Current Company to Create a Product

$400,000

35% → Fail to Meet Sales Projections

D: $400,000 - $350,000 = **$50,000**

E: $50,000 X .35 = **$17,500**

F: $97,500 + $17,500 = **$115,000 EMV**

A	B	C	D D=C-A	E E=B X D	F Add E's for Decision
Decision Definition	Decision Node	Chance	Chance Node	Net Path Value	EMV of Each Path	EMV
Decision to be made	Cost of individual decisions	% Chance of each outcome	$ Revenue amount of each possible outcome	Potential reward minus costs	Path worth	Decision worth (Choose the Biggest $)

Figure 14-11: Decision Tree

The source for the above figure is the Project Management Institute, *A Guide to the Project Management Body of Knowledge*, (*PMBOK® Guide*) – Sixth Edition, Project Management Institute Inc., 2017, Figure 11-15, Page 435

Figure 14-11: Decision Tree shows that purchasing a new company makes more sense than retooling, since the EMV for retooling is $115,000 compared to the EMV of $325,000 for purchasing a new company.

Note that in the exam, if only one percentage value is referenced in a question, the other value can be determined by subtracting the referenced value from 100%. For example: if a value of 70% is the only value referenced in the question, the other value is 30% (100% - 70%).

14.5.5.   Monte Carlo

Monte Carlo is a mock-up technique that uses software to simulate project characteristics in order to determine the possible outcome. While the simulation is typically applied to scheduling in order to determine the necessary schedule reserve, it can be used in other areas of the project.

Know what a Monte Carlo simulation does.