

M4L3. Expected Value

Slide #1

The slide features a dark background on the left with the Texas A&M University Engineering logo at the top. Below the logo, the title "Expected Value" is displayed in a large, white, sans-serif font. Underneath the title, the name "Dr. Xiaomin Yang" is written in a smaller, white, sans-serif font. At the bottom left, the course code "TCMT 612" is shown in a bold, yellow, sans-serif font, followed by a vertical line and the text "Technical Management Decision Making" in a smaller, white, sans-serif font. A red horizontal bar at the very bottom contains the text "MASTERS OF ENGINEERING TECHNICAL MANAGEMENT" in a white, sans-serif font. On the right side of the slide, there is a large, light-colored image of a person standing with their back to the camera, looking at a large, glowing, spherical network of nodes and lines. To the right of the sphere, there are several hexagonal icons containing various data visualizations, including bar charts, line graphs, and network diagrams.

In this topic, we will discuss the concept of expected value, using the data from the biodiesel business case.

Slide #2

Popular analysis of business decisions under uncertainty based on *expected value* concept.

An expected value is a weighted average of all possible outcomes of different scenarios.

It is obtained by multiplying the **value** of each possible outcome, x
by the **probability** of that outcome, p
and **summing** the result.

A popular analysis of business decisions under uncertainty is based on the expected value concept.

An expected value is a weighted average of all possible outcomes of different scenarios.

In other words, it is obtained by multiplying the value of each possible outcome by the probability of that outcome, and summing the result.

Slide #3

Market Condition	Probability	Cost-Leadership Strategy		Differentiation Strategy	
		Impact (\$M)	EV	Impact (\$M)	EV
Exceptional Demand	10%	\$40.0	\$40MX0.1	\$35.0	\$35MX0.1
High Demand	25%	\$30.0	\$30MX0.25	\$25.0	\$25MX0.25
Moderate Demand	10%	\$20.0	\$20MX0.1	\$16.0	\$16MX0.1
Weak Demand	35%	\$7.5	\$7.5MX0.35	\$5.0	\$5MX0.35
Market Downturn	20%	(\$10.0)	\$-10MX0.2	\$0.0	\$0MX0.2
		\$14.1		\$13.1	

$$EV (\text{option 1}) = 40 \times 10\% + 30 \times 25\% + 20 \times 10\% + 7.5 \times 35\% + (-10) \times 10\% = 14.1 (\$m)$$

$$EV (\text{option 2}) = 35 \times 10\% + 25 \times 25\% + 16 \times 10\% + 5 \times 35\% + 0 \times 10\% = 13.1 (\$m)$$

Through the expected value method, the renewable company can determine the expected financial returns from its renewable energy project options considering the probabilities and values of different market scenarios.

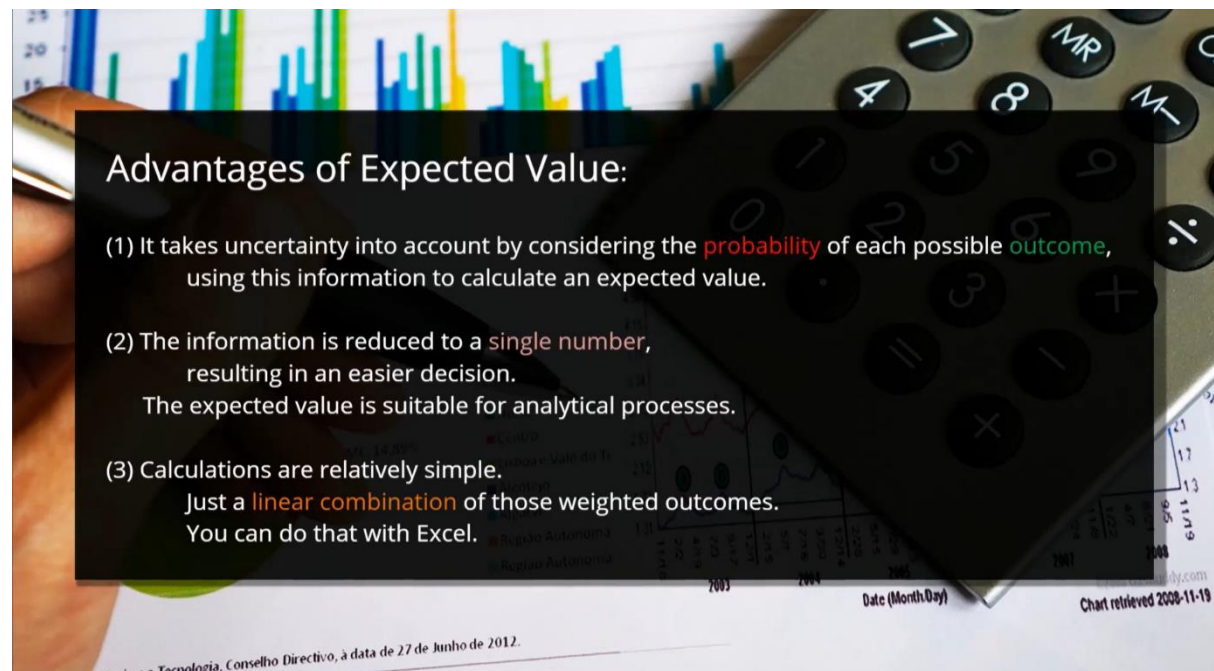
The method enables the company to make well informed decisions by choosing the strategy that offers the highest potential monetary benefits while considering the associated uncertainties.

In this case, the first option, which involves building a new plant with a minimum cost technology solution, leads to an expected value of 14.1 million dollars.

This value is seven percent greater than that of the plant using technologies that maximize flexibility.

Based on this expected value analysis, the renewable energy company should opt for the cost leadership technology strategy, as it promises a 7% higher financial return on investment compared to the maximum flexibility technology option.

Slide #4



The expected value method has obvious advantages and disadvantages.

The advantages of the expected value are.

First, it takes uncertainty into account by considering the probability of each possible outcome and using this information to calculate an expected value.

The expected value represents a weighted average of all possible outcomes.

Second, the information is reduced to a single number, resulting in an easier decision.

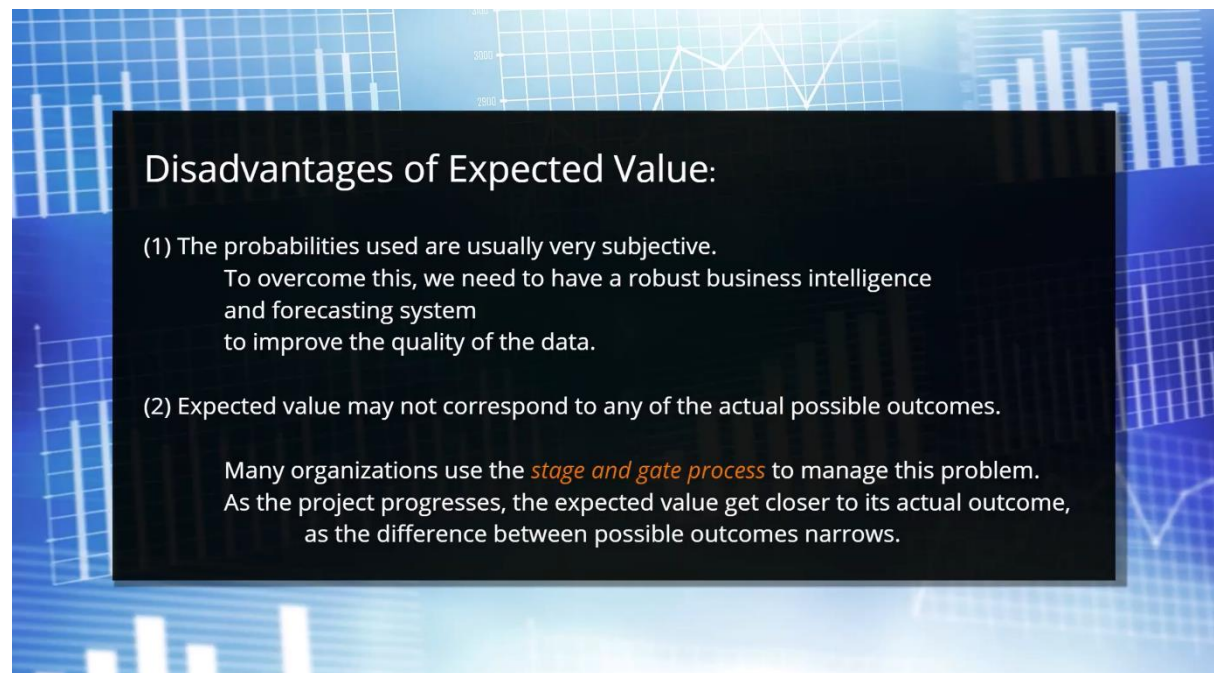
The expected value is suitable for analytical processes.

Third, the calculations are relatively simple.

It is just a linear combination of those weighted outcomes.

You can do that with Excel.

Slide #5



The disadvantages of expected value are, first, the probabilities used are usually very subjective.

To overcome this, we need to have a robust business intelligence and forecasting system to improve the quality of the data.

The second disadvantage of expected value is that it may not correspond to any of the actual possible outcomes.

Many organizations use stage and gate process to manage this problem.

As the project progresses, the expected value gets closer to its actual outcome and the difference between possible outcomes narrows.