

## Slide 45

Hello everyone!

Now that we've covered the topic of decision analysis, we will dive into computing branch probabilities using Bayes' Theorem.

## Slide 46

Let's revisit our decision tree, after incorporating the market research option. Remember that to calculate the Expected Value with Sample Information I have provided you the probability of having a Favorable Report, the probability of having an Unfavorable Report, as well as the posterior probabilities of each state of nature according to these two Market Study Result.

Our main objective here is to check how we can compute these posterior probabilities using Bayes theorem. In the real world, the only information you may have is a priori probability distribution for the states of nature and, using the PDC case, a potential conclusion about the likelihood of obtaining the Market Study Report result given a state of nature.

## Slide 47

We will use **Bayes' theorem** to compute the conditional probability of a specific state of nature given a favorable report

In this framework, ... read the slide

## Slide 48

Lets delve into the details: ... Read the slide...

## Slide 49

Read the slide

## Slide 50

We already know the priori probabilities.

For the conditional probabilities, we can assume the the following assessment is available:

With a reasonable degree of confidence in the market research study we assume that

- if  $s_1$  is true ...
- If  $s_2$  is true ...

## Slide 51

Lets apply the bayes theorm using a tabular framework. Starting with the possibility of a Favorable Report.

First,

In column 1 we list the states of nature

In column 2 we enter the prior probabilities

In column 3, we enter the conditional probabilities of a favorable report  $P(F|s_i)$  given each state of nature.

Second,

In column 4, we compute the joint probabilities by multiplying the prior probability values in column 2 by the corresponding conditional probabilities in column 3.

Third,

We sum the joint probabilities in column 4 to obtain the probability of a favorable report,  $P(F)$ .

Finally,

We divide each joint probability in column 4 by  $P(F) = 0.77$  to obtain the revised or posterior probabilities,  $P(s_1|F)$  and  $P(s_2|F)$ .

Note that a favorable report prompts a **posterior probability** of 0.94 that demand will be strong ( $s_1$ ).

## Slide 52

We adopt the exact same procedure to calculate the posterior probabilities in the case of an Unfavorable report.

## Slide 53

Read the slide with conclusion.

XX

## Conversation Content

Dr. Moreira: Absolutely, I'm preparing my lecture on decision analysis. Could you help me refine the prompts I'll use to engage students?

Assistant: Absolutely, Dr. Moreira. I'm here to help you refine your lecture. Please, go ahead with the first slide, and I'll provide you with a prompt to enhance it.

Dr. Moreira: [Describes slide about introducing Bayes' Theorem and its relevance to decision trees.]

Assistant: Great introduction, Dr. Moreira. For this slide, you could use the following prompt to engage your students:

Now that we've introduced the topic of decision analysis, let's dive into computing branch probabilities using Bayes' Theorem. Can anyone recall the basic principle of Bayes' Theorem and how it applies to decision analysis?

This prompt encourages students to recall prior knowledge and sets the stage for the detailed exploration of the theorem.

Dr. Moreira: [Describes next slide focused on market research information.]

Assistant: You've set the stage well, Dr. Moreira. To further engage your students, consider this prompt:

Let's revisit our decision tree, now incorporating the market research option. How does the addition of this branch change our approach to calculating expected values, and why is it significant in the context of our PTC example?

This prompt encourages students to think critically about the practical implications of adding sampling information to decision analysis.

Dr. Moreira: [Describes the slide on computing conditional probabilities for a favorable report.]

Assistant: To reinforce this concept, you could prompt your students with:

How can we determine the conditional probability of receiving a favorable report given a specific state of nature, and why is this step crucial in applying Bayes' Theorem to our decision tree analysis?

This encourages students to think about the process of breaking down complex probabilistic information into manageable parts.

Dr. Moreira: [Describes the slide introducing tabular computation for conditional probabilities.]

Assistant: For this slide, to keep your students engaged, you might ask:

How does organizing our data into a tabular format help streamline the computation of branch probabilities using Bayes' Theorem? And what information do we need to accurately fill in each column of our table?

This prompt encourages students to think about the practical steps involved in applying theoretical concepts to real-world scenarios.

Dr. Moreira: [Describes slide dealing with branch probabilities for an unfavorable report.]

Assistant: To prompt your students here, you could ask:

When applying the same tabular approach to calculate branch probabilities for an unfavorable report, what differences do you expect to find in the calculations compared to a favorable report? And how might these differences impact our overall decision-making for PTC's project?

This prompt encourages students to think through the implications of different outcomes in the decision analysis process.

Dr. Moreira: [Wraps up the lecture and seeks a conclusion prompt.]

Assistant: To wrap up your lecture, you might conclude with a prompt like this:

How can we apply the principles of Bayes' Theorem and decision trees to other areas of strategic decision-making beyond the PTC example? And why is it important for managers and decision-makers to understand these tools when navigating complex business environments?

This question encourages students to think about the broader implications of the concepts you've taught.

Dr. Moreira: Thank you! This is very helpful.

Assistant: You're welcome, Dr. Moreira. If you need any further assistance, feel free to reach out!