

305 Lecture 9.2 - States and Choices

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Plan

- In this lecture we'll talk about how to formulate decision problems.
- And we'll talk about one simple way to analyse these problems, using so-called dominance reasoning.

Associated Reading

Odds and Ends, Chapter 12

States and Choices

- We're interested in what to do when the outcomes of your actions depend on some external facts about which you are uncertain, e.g.,

	State 1	State 2
Choice 1	a	b
Choice 2	c	d

States and Choices

- The **choices** are the options you can take.
- The **states** are the ways the world can be that affect how good an outcome you'll get.
- A choice plus a state determines an **outcome**
- And the variables, a , b , c and d are numbers measuring how good those outcomes are.
- We'll call this the **utility** of the outcome.
- The higher the number, the better.

What is Utility

- The book spends one chapter (11) on cases where value is easy to measure - it's something like dollars won or lost, or time spent.
- Then it spends the next chapter (i.e., 12) on cases where value is more abstract.
- I'm not going to carve things up this way.
- But I will start with a case where the values are fairly clear.

An Example

- It's a Sunday afternoon in Fall, and your friend, who is a big Packers fan, has the choice between watching the Packers game and finishing a paper due on Monday.
- It will be a little painful for them to do the paper after the football, but not impossible.
- It will be fun to watch football, at least if the Packers wins.
- But if the Packers lose they'll have spent the afternoon watching them lose, and still have the paper to write.
- On the other hand, your friend will feel bad if they skip the game and the Packers win. So we might have the decision table on the next slide.

Decision Table for the Example

	Packers Win	Packers Lose
Watch Football	4	1
Work on Paper	3	2

- The numbers come from the preferences.
- We're assuming (for now) that what one wants is better for one.
- That assumption could get either conceptual backing (utility is defined in terms of preference) or empirical backing.

Changing Preferences

- The numbers would be different if your friend had different preferences.
- Perhaps their desire to watch football is simply stronger than their desire to finish the paper.
- In that case the table might look like this.

	Packers Win	Packers Lose
Watch Football	4	2
Work on Paper	3	1

Dominance Reasoning

- The simplest rule we can use for decision making is **never choose dominated options**.
- There is a stronger and a weaker version of this rule.

Weak and Strong Dominance

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Weak and Strong Dominance

- An option A **strongly dominates** another option B no matter which state is actual, A leads to better outcomes than B.
- A **weakly dominates** B if in every state, A leads to at least as good an outcome as B, and in some states it leads to a better outcome.

Dominance Principles

- Principle 1: If A strongly dominates B, don't choose B.
- Principle 2: If A weakly dominates B, don't choose B.
- The second principle is slightly **stronger**; it rules out more things.
- As such, it is slightly more controversial.

Using Dominance Principles

- Dominance principles seem very intuitive when applied to everyday decision cases.
- Consider, for example, a revised version of our case about choosing whether to watch football or work on a term paper.
- Imagine that your friend will do very badly on the term paper if they leave it to the last minute.
- And imagine that the term paper is vitally important for something that matters to their future.
- Then we might set up the decision table as on the next slide.

Football Example with Dominance

	Packers Win	Packers Lose
Watch Football	3	1
Work on Paper	4	2

- They are better off working on the paper if the Packers win.
- And they are better off working on the paper if the Packers lose.
- So either way, they should work on the paper!

For Next Time

- We will look at how to think about decisions where dominance reasoning doesn't apply.