

MULTI-ATTRIBUTE UTILITY THEORY (MAUT)

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Introduction

- **Conflicting Objectives and Tradeoffs in Decision Problems**
 - e.g. higher returns vs. lower risks in investment, better performance vs. lower price of computer
- **Objectives with Incomparable Attribute Scales**
 - “Attribute” refers to the quantity used to measure the accomplishment of an objective
 - e.g. maximize profits vs. minimize impacts on environments
- **Multi-Attribute Decision Making (MADM)**
 - A study of methods and procedures that handle multiple attributes
 - Usages
 - Identify a single most preferred alternative
 - Rank alternatives
 - Shortlist a limited number of alternatives for subsequent detailed appraisal
 - Distinguish acceptable from unacceptable possibilities

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Introduction (Cont'd)

- Types of MADM Techniques
 - Multiattribute scoring model (in Chapter 4)
 - Convert attribute scales to comparable scales
 - Assign weights to these attributes and then calculate the weighted average of each consequence set as an overall score
 - Compare alternatives using the overall score
 - Multi-Attribute Utility Theory (MAUT)
 - Use utility functions to convert numerical attribute scales to utility unit scales
 - Assign weights to these attributes and then calculate the weighted average of each consequence set as an overall utility score
 - Compare alternatives using the overall utility score
 - ...

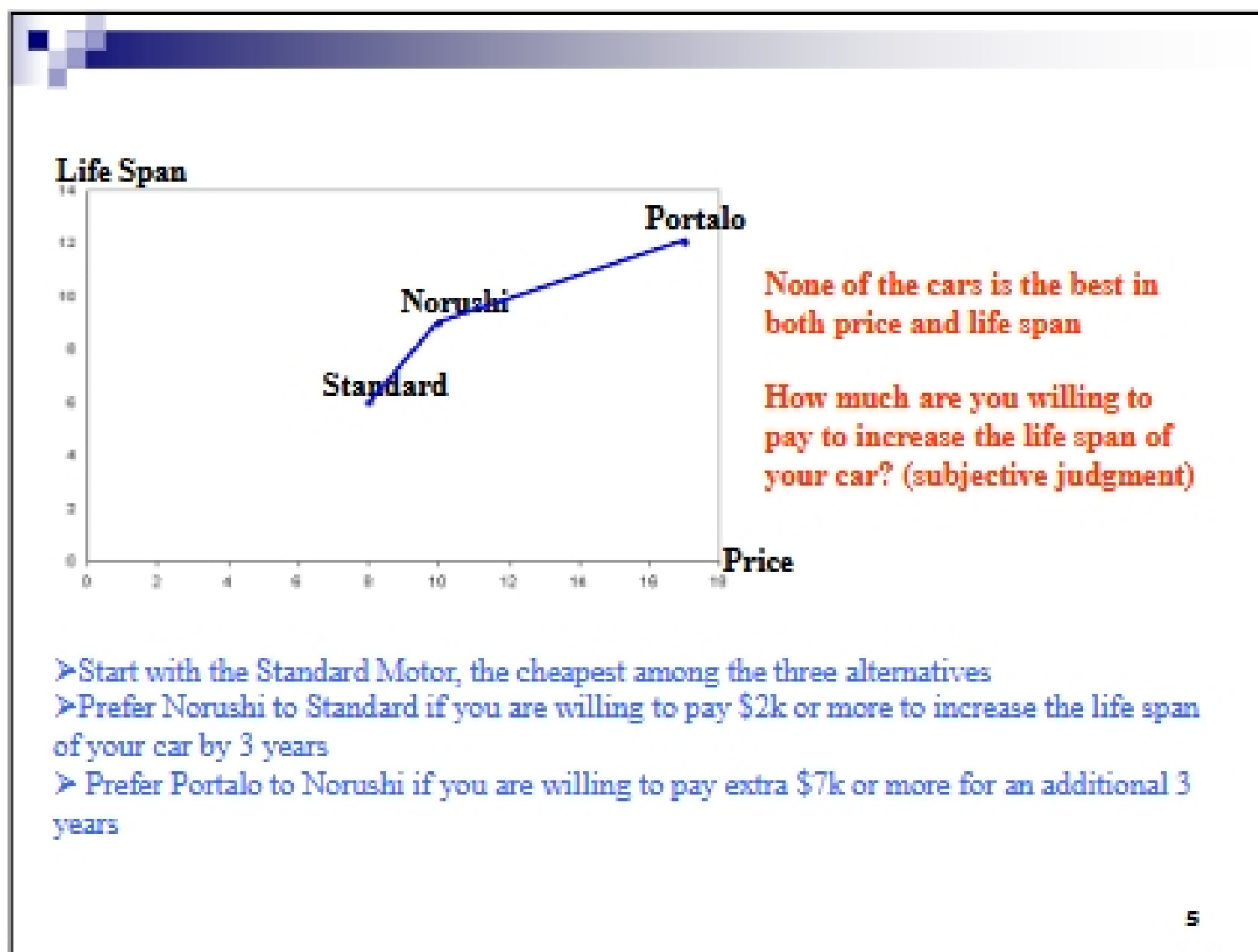
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Automobile Example

You want to buy a car with a long expected life span and a low price. You have narrowed down your choices to three alternatives: the Portalo (a relatively expensive sedan with a reputation for longevity), the Norushi (renowned for its reliability), and the Standard Motors car (a relatively inexpensive domestic automobile). You have done some research and evaluated these three cars on both attributes, as follows.

Attributes	Alternatives		
	Portalo	Norushi	Standard Motors
Price (\$k)	17 Worst	10	8 Best
Life Spans (Years)	12 Best	9	6 Worst

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Trading Off Conflicting Objectives

- Need Systematic Techniques to Handle Any Decision Situation Efficiently
 - Three or more objectives
 - Objectives with incomparable attribute scales
- Issues to be addressed
 - Construct a quantitative model of preferences to compare alternatives
 - Numerical weight must be assessed for each attribute

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