Introduction to Decision Making

prof. dr. Audrius Kabašinskas

Green Digital Finance - Training Week

KTU, 30 June – 04 July 2025

Outline

1. Decision making

2. Multi-criteria decision making techniques

3. Explainability

Decision making

Questions to discuss:

- When decisions are made?
- How can decisions be made?
- Who make decisions?
- How to assess if the decision made was good?
- Why exactly was such a decision made?

Decision making

When decisions are made?

- Deciding to invest
- Collecting spare money

Decision making

When decisions are made during the investment process?

- Deciding to invest

Decision making

When decisions are made during the investment process?

- Deciding to invest
- Collecting spare money
- Choosing investment platform (open account for trading)
- Selecting investment assets

Decision making

When decisions are made during the investment process?

- Deciding to invest
- Collecting spare money
- Choosing investment platform (open account for trading)
- Selecting investment object
- Choosing when to buy/sell the asset

Decision making

When decisions are made during the investment process?

- Deciding to invest
- Collecting spare money
- Choosing investment platform (open account for trading)
- Selecting investment object
- Choosing selection criteria for assets

Decision making

When decisions are made during the investment process?

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- Choosing selection criteria for assets
- Optimizing weights of assets
- ...

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- Optimizing weights of assets
- etc.

Decision making

How can decisions be made?

- Ask advice

- Read books / investor almanacs

- Hire someone as our assistant

To make rational decisions, you need some rules and techniques = math

Decision making

How can rational decisions be made?

- Ask advice
- Read books / investor almanacs
- Have course at uni/coursera
- ...

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Decision making

So, what do you need to make a rational decision?

- Objective (task)
- Constraints (limitations)
- Variants (cases)

Decision making

So, what do you need to make a rational decision?

- Objective (task)
- Constraints (limitations)
- Variables (assets)
- System performance[?]

Decision making

So, what do you need to make a rational decision?

- Objective (task)
- Constraints (limitations)
- Variables (assets)
- System (performance [s.])

Decision making

So, what do you need to make a rational decision?

- Objective (task)
- Constraints (limitations)
- Variables (assets)
- Solver (technical side)

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Decision making

Who make decisions? Decision maker! Who is the decision
maker?

- a single person (mostly books)

Decision making

Who make decisions? Decision maker! Who is the decision
maker?

- Single person (money holder)

- Group of experts

Decision making

Who make decisions? Decision maker! Who is the decision maker?

- Single person (money holder)
- Group of experts
- Person + experts

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Decision making

How to assess if the decision made was good?

Performance analytics depending on your objectives:

- Back-testing (in-sample analysis)

- Out-of-sample testing (using unseen data)

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Decision making

Why exactly was such a decision made?

- Trace back all your decisions if all decisions were transparent
- Use explainability techniques to explain black/gray box decisions

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2. **Multi-criteria decision making techniques**

3. Explainability

Multi-criteria decision making techniques

What is Multi-criteria decision making?

- consists of constructing a global preference relation for a set of alternatives evaluated using several criteria

- selection of the best actions from a set of alternatives, each of which is evaluated against multiple, and often conflicting criteria.

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Multi-criteria decision making techniques

Problem solving steps:

1. Establish the decision context, the decision objectives (goals), and identify the decision maker(s).

2. Identify the alternatives.

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Multi-criteria decision making techniques

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2. Identify the alternatives.

3. Identify the criteria (attributes) that are relevant to the decision problem.

4. For each of the alternatives, measure by representing the preferences of the alternatives against each of these and transform set evaluation (soft)... (associated an optimal matrix or a decision table).

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1. Establish the decision context, the decision objectives (goals), and identify the decision maker(s).

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Multi-criteria decision making techniques

Problem solving steps (cont.):

⑤ Standardize the raw scores to generate a priority scores matrix or decision table.

⑥ Determine a weight for each criterion to reflect how important it is to the overall decision.

⑦ Use appropriate five-step rational decision model or computer-assisted qualitative research to rank each alternative by combining the weights and priority scores.

Multi-criteria decision making techniques

Problem solving steps (cont.):

5. Standardize the raw scores to generate a priority scores matrix or decision table.

6. Determine a weight for each criterion to reflect how important it is to the overall decision.

7. Use aggregation functions (also called decision rules) to compute an overall assessment measure for each decision alternative by combining the weights and priority scores.

8. Evaluate and identify solutions to assess the robustness of the problem's outcome for changes in the criteria weights and in the assumed samples.

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7. Use aggregation functions (also called decision rules) to compute an overall assessment measure for each decision alternative by combining the weights and priority scores.

8. Perform a sensitivity analysis to assess the robustness of the preference ranking to changes in the criteria scores and/or the assigned weights.

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Multi-criteria decision making techniques

Criteria characteristics:

- **Completeness:** It is important to ensure that all of the important criteria are included.

- **Redundancy:** In principle, criteria that have been judged relatively unimportant or to be duplicates should be removed at a very early stage.

- **Operationality:** It is important that each alternative can be judged against the criteria.

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Criteria characteristics (cont.):

- **Mutual independence of criteria:** Straightforward applications of MCDM require that preferences associated with the consequences of the alternatives are independent of each other from one criterion to the next.

- **Number of criteria:** An excessive number of criteria leads to extra analytical effort in assessing input data and can make communication of the results of the analysis more difficult.

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Multi-criteria decision making techniques: Problem solving techniques

Some problem solving techniques are:

- SAW (Simple Additive Weighting)
- TOPSIS (Technique for Order Preference by Similarity to the Ideal Solution)
- ELECTRE (Elimination и Choice Translating Reality)

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