Aalto-yliopisto
Perustieteiden
korkeakoulu

Optimal forest rotation under carbon pricing and multiple age-dependent forest damage risks

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10.05.2021

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Background

- Landowner's perspective:
  - longer forest rotation → the income is gained later
  - longer forest rotation → greater risk of damage → lost income
- Climate's perspective:
  - longer forest rotation → the stored carbon stays out of the atmosphere longer and more carbon will be stored
  - longer forest rotation → greater risk of damages where carbon is released
- Probabilities of some forest damages are dependent of the age of the forest

Goal

- Calculate optimal forest rotation time to maximize the discounted expected net revenue under age-dependent risks and carbon pricing over infinite chain of rotations
- Examine if age-dependent risk has a distinct effect on the optimal rotation from an age-independent risk

Restrictions

- The prices for wood and carbon are constant
- Only two types of damage are considered
  - Storm damage
  - Game animal damages
- Fraction of carbon stored after a damage is constant
- Fraction of carbon stored after a harvest is constant

Data sources

- There are limited sources of usable data about forest damages
  - how often they occur
  - what aged forests they affect the most
- Assumptions about the probability of a damage
- No standard price for carbon
- Sensitivity analysis of how an age-dependent risk would affect the optimal rotation

Methods

- Justifiable assumptions about the probability distribution of forest damage
- Form a formula for expected value with
  - Bare land value using Faustmann formula
  - Risk of damage
  - Carbon pricing (compensation and tax)
  - And form a chain of infinite rotation
- Using this formula, calculate the optimal time of rotation
  - Numerical optimization with R

Schedule

- 05/2021 presenting the topic
- 05/2021 forming probability distributions and adjusting the optimization
- 05-06/2021 writing the thesis
- Presentation of thesis 06/2021 or 08/2021