Cointegration analysis of Austrian wood and bioenergy markets

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Bioenergy in Austria

- Wood: important energy source in Austria

Energy consumption in 2019

Data source: BMK, 2020
Competition for woody biomass: energy vs. material

- Wood end utilization 2018: 42.9 million m³ roundwood equivalent
  - about 60% bioenergy and 40% wood products
- Austrian legislation „Erneuerbaren-Ausbau-Gesetz“ (EAG)
  - increase the power consumption from biomass by 3.6 PJ until 2030
- New technologies are likely to enter bioenergy markets, for example wood gasification + synthesis to BioSNG or Fischer Tropsch liquids
By-product utilization

- Increasing demand for wood as raw material
  - by energy and material sector
  - intensification of competition
  - stimulation of by-product utilization

- What are the implications on raw material and product prices?
- How are prices interlinked?
Research objectives

- to investigate price cointegration in Austrian wood and bioenergy markets
- with a focus on sawmill by-product, wood pellet and particle board markets
- in order to identify price transmission pathways
- and provide empirical evidence for recent price developments and a basis for future assessments
Data and methods

- Monthly price data from January 2005 to November 2019
  - roundwood: sawlogs, pulpwood
  - sawmill by-products: wood chips, sawdust
  - products: wood pellets, particle board
  - fossil resources: crude oil

- Statistical analysis in R:
  - Johansen Cointegration Test
    - Co-movement of prices, long-term relationship
  - Granger Causality Test
    - Direction of causality (price-leading markets)
  - Vector Error Correction Model
    - Estimate long- and short-run behaviour of cointegrated prices
Results – price developments

- Wood pellets
- Particle board
- Sawmill by-products
- Pulpwood
- Sawlogs
Results – price cointegration

Diagram showing connections between different forest products and crude oil.
Results - Vector Error Correction Models

- **Sawdust prices**: modelled with wood pellet prices
  - adapt faster to the long-term balance after short-term deviations
    - 23.5 % of the balance regained each month

- **Wood chip prices** are cointegrated in several ways and thus affected by several markets (roundwood, pellets, particle board)
  - adapt slower after deviations
    - 7.9 % of the balance regained each month
Results – summary & implications

- Complex cointegration within wood markets, but independent from crude oil market

- **Wood pellets**
  - politically promoted by RED & national policies
  - residential heating sector not dependent on general economic developments
  - less affected by economic crises
  - price decisive for sawmill by-products

- **Sawdust**
  - mainly determined by wood pellet prices, thus effects of Covid-19 crisis better mitigated

- **Wood chips**
  - important for material and energy markets
  - cointegrated with several markets, thus stronger affected by the crisis
  - need more time to recover from price shocks
Conclusion

- Cointegration approach: allows to provide empirical evidence about price cointegration and price transmissions within wood and bioenergy markets and thus
  - helps to assess effects of policies and market shocks in the bioenergy sector
  - supports the efficient design of policies
- Raw material markets can benefit from the promotion of products
  - wood pellet market is less affected by the Covid-19 crisis and thus can have a stabilizing effect on sawdust market
- Complex interlinkages and price transmissions can both alleviate and reinforce effects like price shocks to the forest-based sector in total
Thank you for your attention!

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