



Aalto-yliopisto
Perustieteiden
korkeakoulu

Identifying determinants of district heating prices for forecasting (topic presentation)

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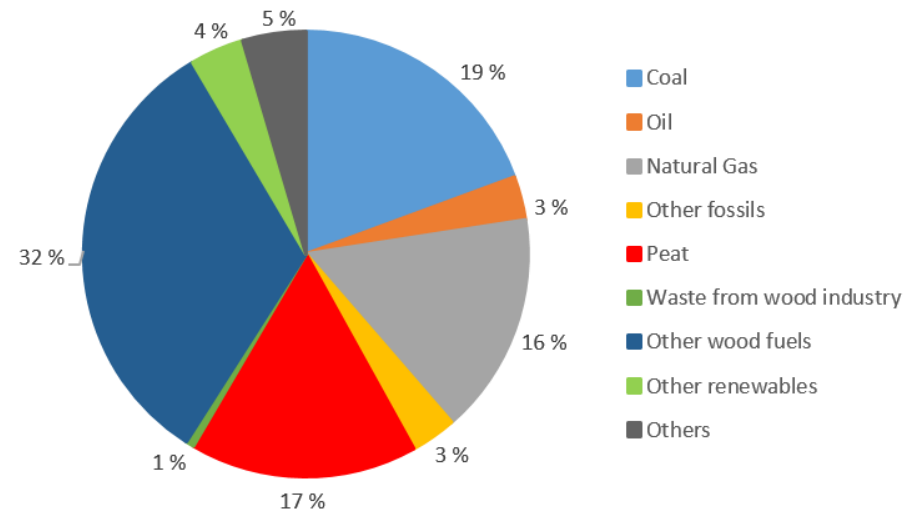
Työn saa tallentaa ja julkistaa Aalto-yliopiston avoimilla verkkosivuilla. Muilta osin kaikki oikeudet pidätetään.

Background (1/2)

- Heating sources stand for approximately 67 % of the total energy consumption in buildings
- Nearly 50 % of all buildings are heated with district heating (DH)
- The Finnish heating market is unregulated and competitive
 - Pricing of DH is supervised by the competition authorities and based on the antitrust legislation
 - In some areas customers are obliged to connect to the DH network

Background (2/2)

- The price of DH varies in different municipalities depending on factors such as:
 - Size of DH system
 - Investments made
 - Age of production facility
 - Structure of municipality
 - Fuels used



Fuels used in DH production in 2015.
Data source: Tilastokeskus

Objective

1. Study factors influencing the DH price
2. Make a short-term forecast of the DH price
3. Compare different methods for making the forecast

Methods

- Methods

- Multiple linear regression model

$$y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki}$$

- ARIMA(p,d,q) model

$$\Phi(B)\Delta^d y_t = \delta + \theta(B)\varepsilon_t, \text{ where}$$

$$\Phi(B) = 1 - \Phi_1 B - \Phi_2 B^2 - \dots - \Phi_p B^p \text{ and}$$

$$\theta(B) = \theta_1 B - \theta_2 B^2 - \dots - \theta_q B^q$$

- Naive method

$$y_{t+h|t} = y_t$$

- Software

- Excel and R

Data sources

- DH price data: material bank of Finnish Energy
 - 1.1.1999-1.1.2017, data for every half year
- Data of fuel prices: webpages of Tilastokeskus
 - Peat: 1.9.1999-1.3.2017, every third month
 - Woodchips: 1.3.2007-1.3.2017, every third month
 - Imported fuels (coal and natural gas): 1.1.1990-1.6.2017, every month
- Electricity price data: webpages of the Energy Authority
 - 1.1.1997-1.9.2017, every month

Schedule

- 6/2017 studying the subject
- 10/2017 presenting the topic
- 12/2017 presenting the complete study