

Statistical analysis of energy efficiency data

Your report on the following exercise forms part of the assessment for this course. The report should be in PDF format, and be prepared using \LaTeX . It should be of no more than 5 sides, and should be submitted by 12 noon on Wednesday 6 November (Week 8): a PDF version ONLY should be submitted using the Learn page for the course.

The UK Department of Energy and Climate Change published data from its National Energy Efficiency Data-Framework (NEED) listing the energy consumption and attributes (such as age and size) of dwellings in England and Wales. The dwellings included in the dataset were selected to be representative of the housing stock. [The current data available for Scotland is less precise because the attributes are based on postcodes rather than information on individual properties.]

The file `NEED.NE.txt` contains data on dwellings in the North-East of England that had cavity-wall construction and also had gas as the main heating fuel. The following variables are included in the file.

Gas.cons: annual gas consumption for the dwelling (in kWh) from October 2011 to September 2012 (weather-corrected and rounded).

Age.band: year of construction, shown as bands numbered 1 to 6, corresponding respectively to the intervals before 1930, 1930–49, 1950–66, 1967–82, 1983–95 and after 1995.

Type: shown as Detached, Semi-detached, End-terrace, Mid-terrace, Bungalow or Flat.

Floor.area.band: classified as up to 50, 51–100, 101–150 or over 150 m².

Loft.depth: depth of loft insulation, classified as greater than or equal to 150 mm (Gr) or less than 150 mm (Le).

Cavity.wall.ins: Y if cavity-wall insulation has been installed through a Government scheme; otherwise N.

New.boiler: Y if a new boiler has been installed through a Government scheme or registered through the official list of gas engineers; otherwise N.

CONSULTANCY PROBLEM

Investigate how the gas consumption depends on the age, type and floor area of the dwellings.

Also examine how consumption is related to loft insulation, cavity-wall insulation and the presence of a new boiler, with and without taking account of age, type and floor area. You should present plots of the data as well as fitting statistical models, and examine the fit of the models you consider.