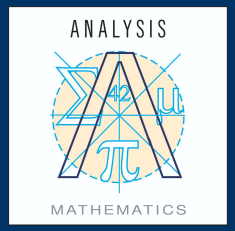

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Always Take the Weather (Data) With You

Alex Maund

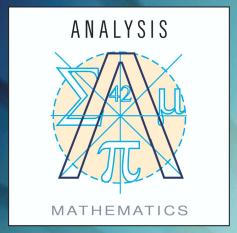
ASC 2010

Outline

- Application Areas
- Weather Data
- The DAA Approach
- Some Examples
- Single Index
- Weather Station Moves
- Closing Remarks

Application Areas

- **For the Utilities**
  - Water, electricity, gas
  - Residential vs. Business
- **For Industry**
  - Energy use optimisation
- **For Agriculture**
  - Quality & Yield



Weather Data

- **Source: BoM**
- **Typical Variables**
  - Temperature
  - Rainfall
  - Humidity
- **Other variables**
  - Hot days
  - Pre- and post observations
  - Non linear terms (^½, ^2, ^3, etc.)

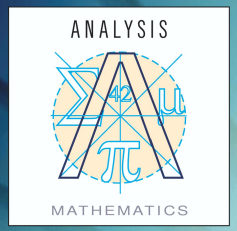
The Data Analysis Australia Approach

- **Daily or Time of Use models**
  - Modelling household or business consumption
  - Use daily observations
- **Aggregated models**
  - Modelling consumption over longer periods
  - Use aggregated observations
    - Rainfall (easy)
      - Total rainfall in the period
      - Number of rain days
    - Temperature (bit more thought):
      - Number of hot days (>30°C)
      - Cumulative degrees >35°C

The Data Analysis Australia Approach

→Seasonality & other patterns

- →Use Fourier terms to model cyclic patterns
- →Can be used beyond annual cycles
  - Weekly cycles
  - Daily cycles
- →Interact these terms with weather terms to give seasonal variation in weather observations



Some Examples

- **Water Consumption**
  - Effect of daylight savings
  - Waterwise Rebate Scheme
- **Electricity Consumption**
  - Day ahead forecasting
  - Market rules
- **Gas Consumption**
  - Modelling gas temperature and flow (based on air temperature)

Single Index

- **Weather stations**
  - Observations from one weather station
  - How do we use multiple stations across a region?
- **Single Indices were developed**
  - Calculated a weighting for each station
  - Weights optimised (using optim() in R) to minimise sums of squares
  - Bickley seems important in Perth Metro region!
- **Why?**
  - Significant model improvements

Weather Station Moves

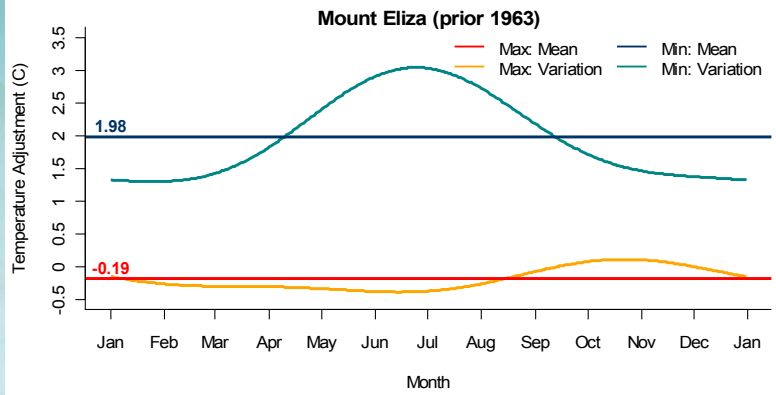
- **BoM: Habit of moving stations**
  - Perth Metro has had 5 locations since WWII
  - Perth Airport has had 2 locations since WWII
- **Effect?**
  - Not a single time series – a combination of time series
- **Solution?**
  - Model the effect of the moves to create a single time series for use in analysis

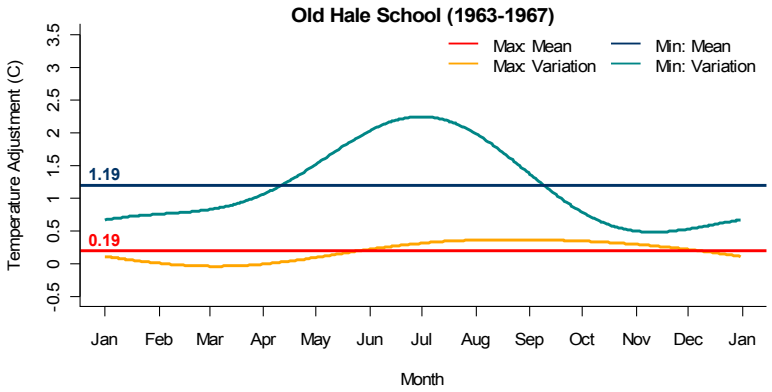
Weather Station Moves

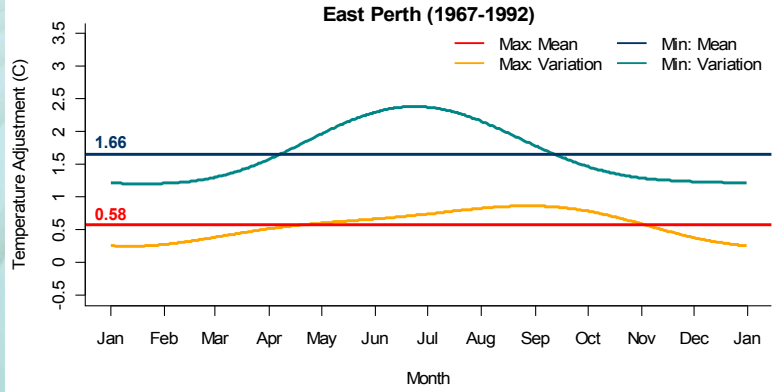
- **Problem**
  - Want to adjust previous maxima and minima for Perth Metro taking into account weather station moves
- **The DAA Approach**
  - Model the difference between Metro and Airport maxima and minima (i.e. 2 models)
  - Use current location (Mt Lawley) as a baseline
  - Incorporate seasonality terms and rainfall
  - Estimate average differences and variations throughout the year

Weather Station Moves

➔Results



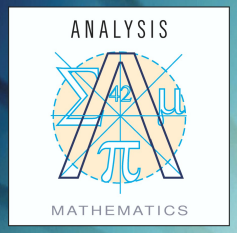




Weather Station Moves

→What next?

- →Between 1992-93 Metro readings taken from Airport so no estimate for this time period
- →Use a third weather station
  - Much more complicated



Concluding Remarks

- **Weather is often a big driver**
  - Particularly in consumption variation
- **Seasonality an important issue**
  - Hotter weather = higher consumption
- **Aggregated models require more thought on variables to use**
- **Use single indices?**
- **Weather station moves an issue?**

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Thank You

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