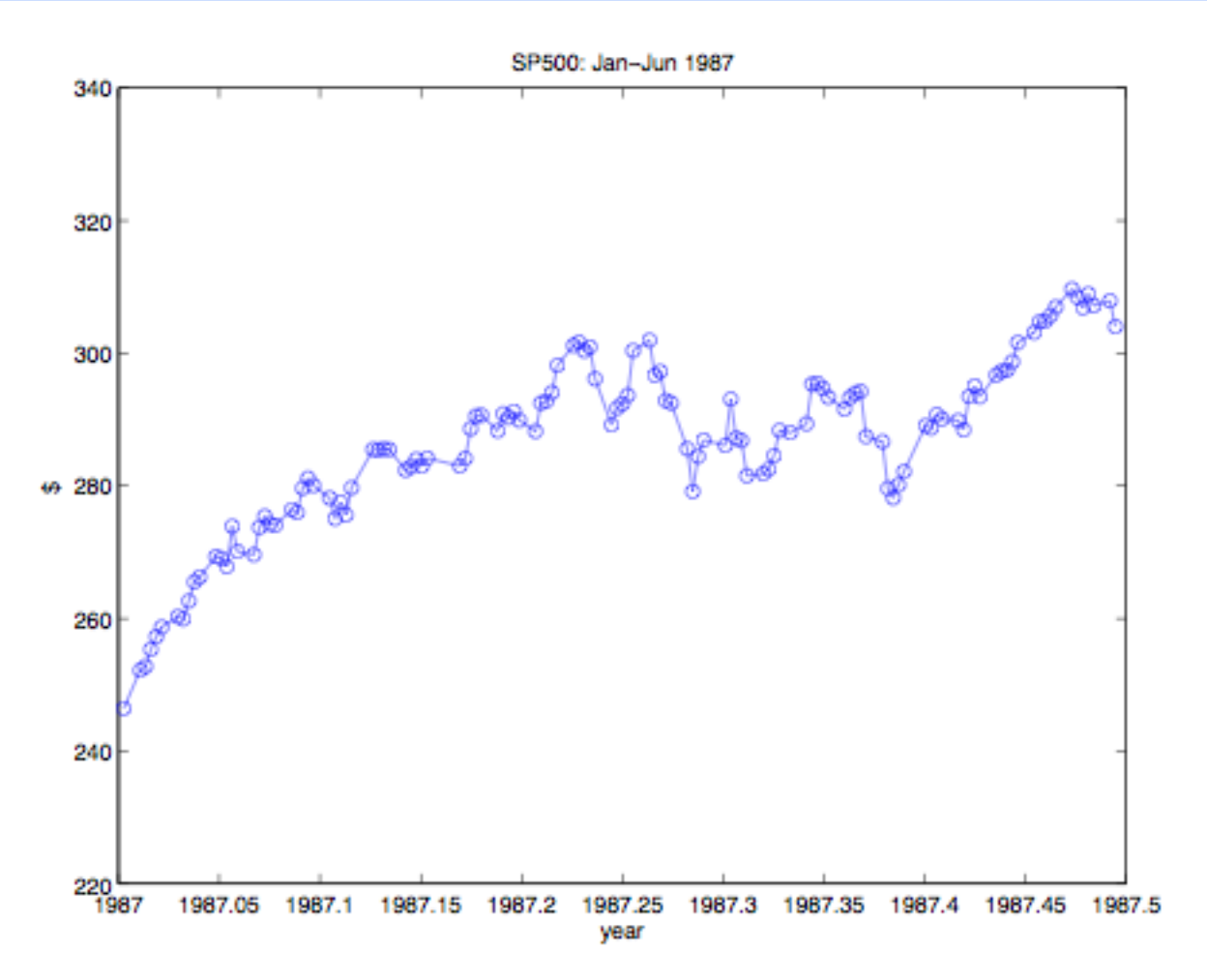
Quantitative Finance

Lecture 2

Example


SP500: Jan–Jun 1987
340
320
300
280
260
240
220
1987
1987.05
1987.1
1987.15
1987.2
1987.25
1987.3
1987.35
1987.4
1987.45
1987.5
year

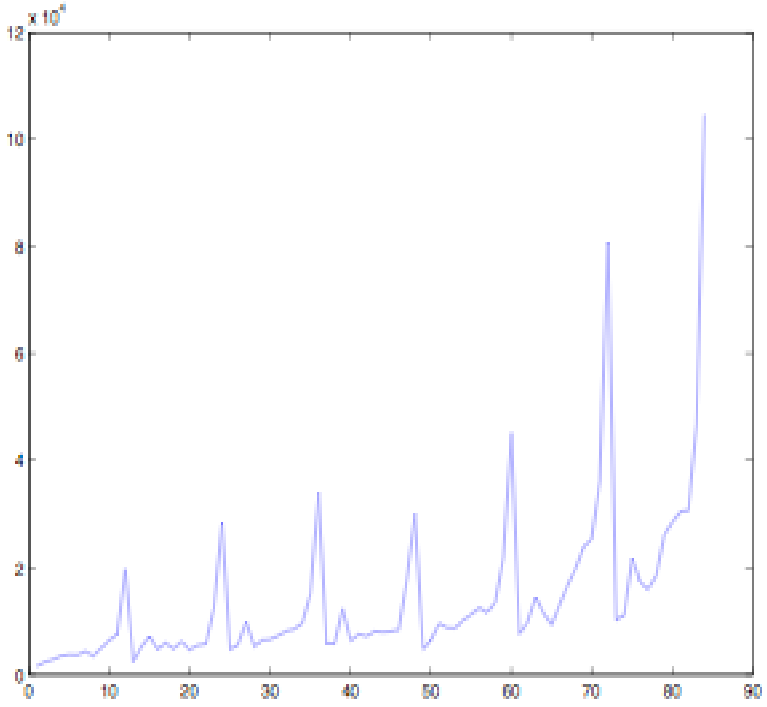
Objectives of time series analysis

1. Compact description of data.
2. Interpretation.
3. Forecasting.
4. Control.
5. Hypothesis testing.
6. Simulation.

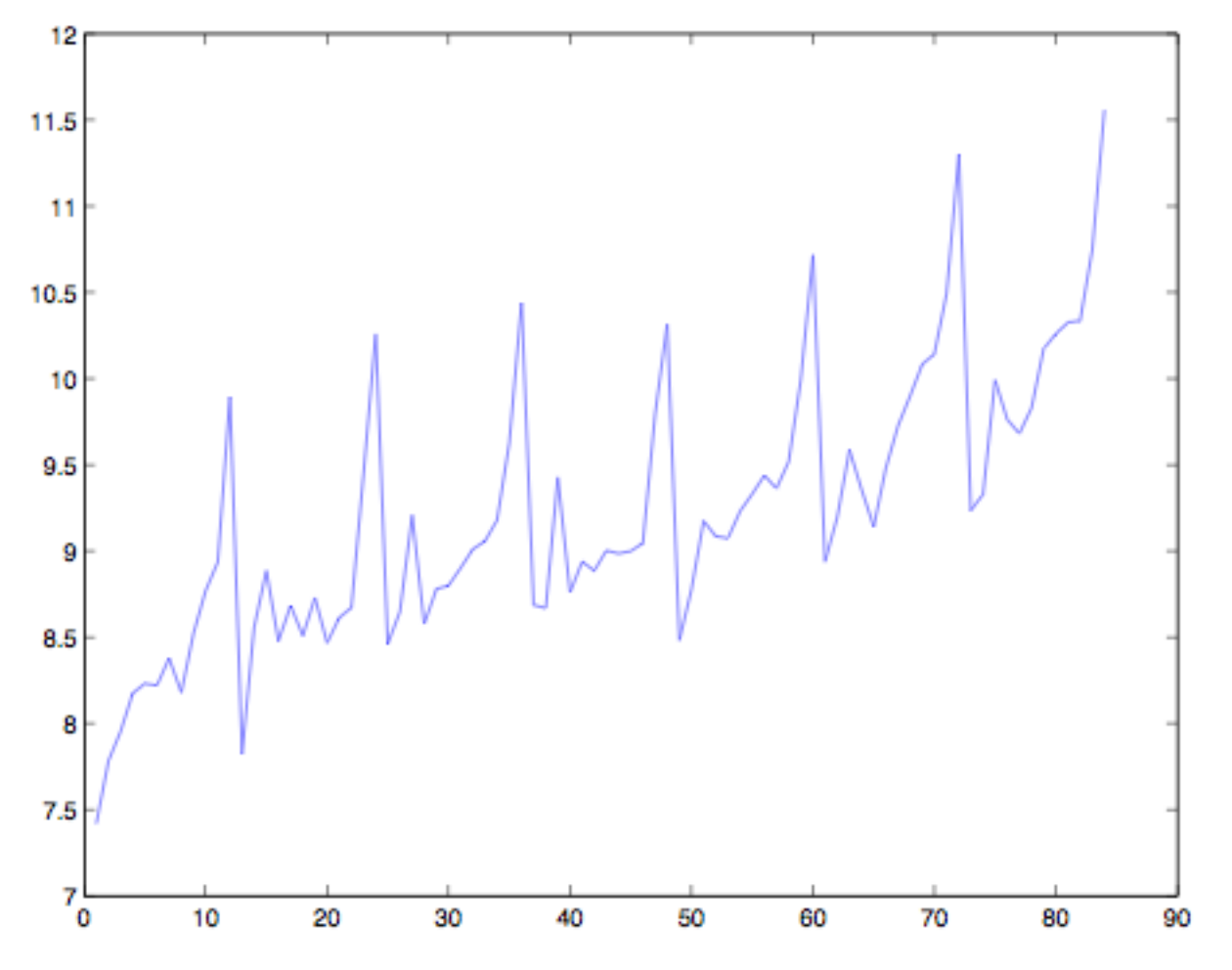
Classical decomposition: An example

Monthly sales for a souvenir shop at a beach resort town in Queensland.

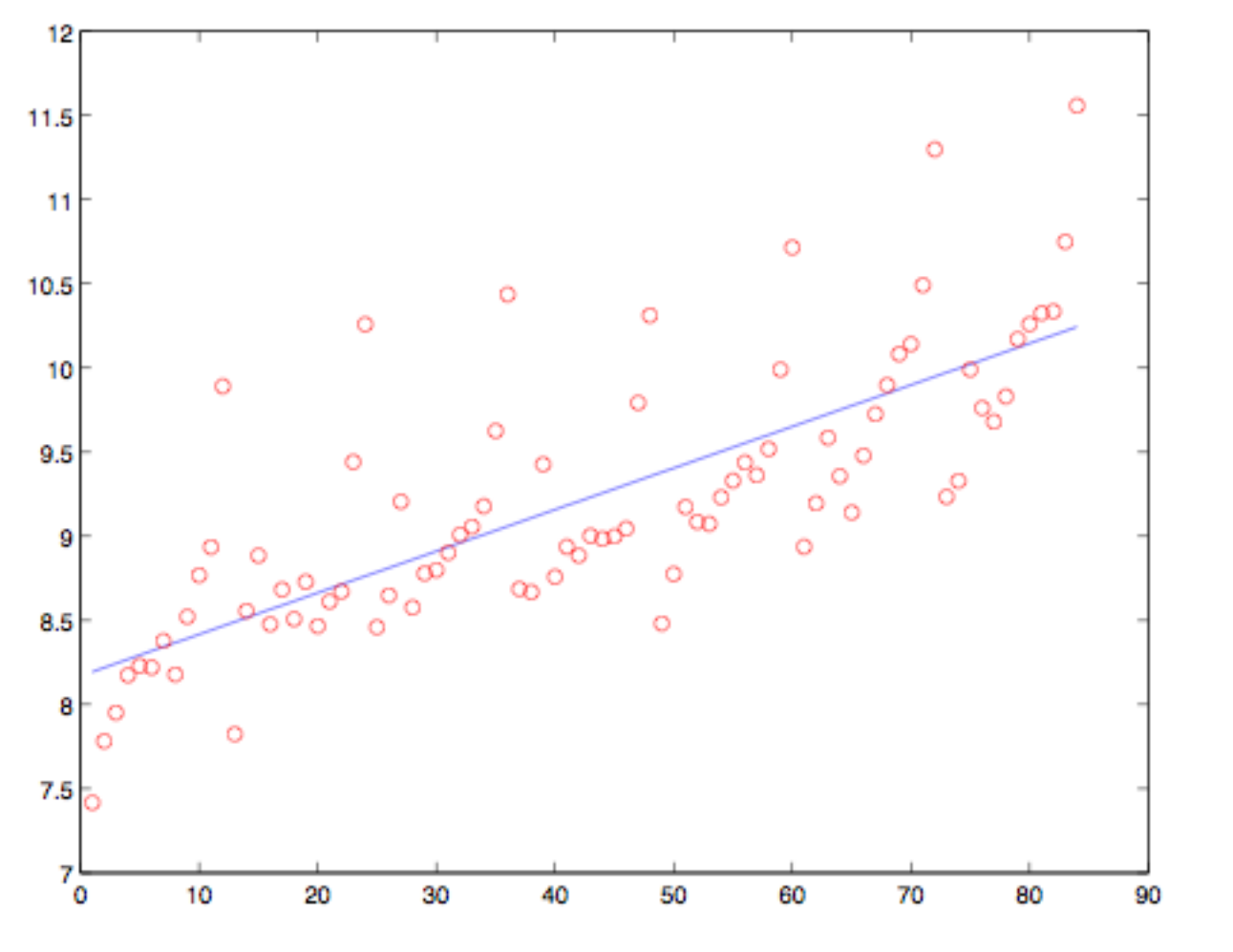
(Makridakis, Wheelwright and Hyndman, 1998)



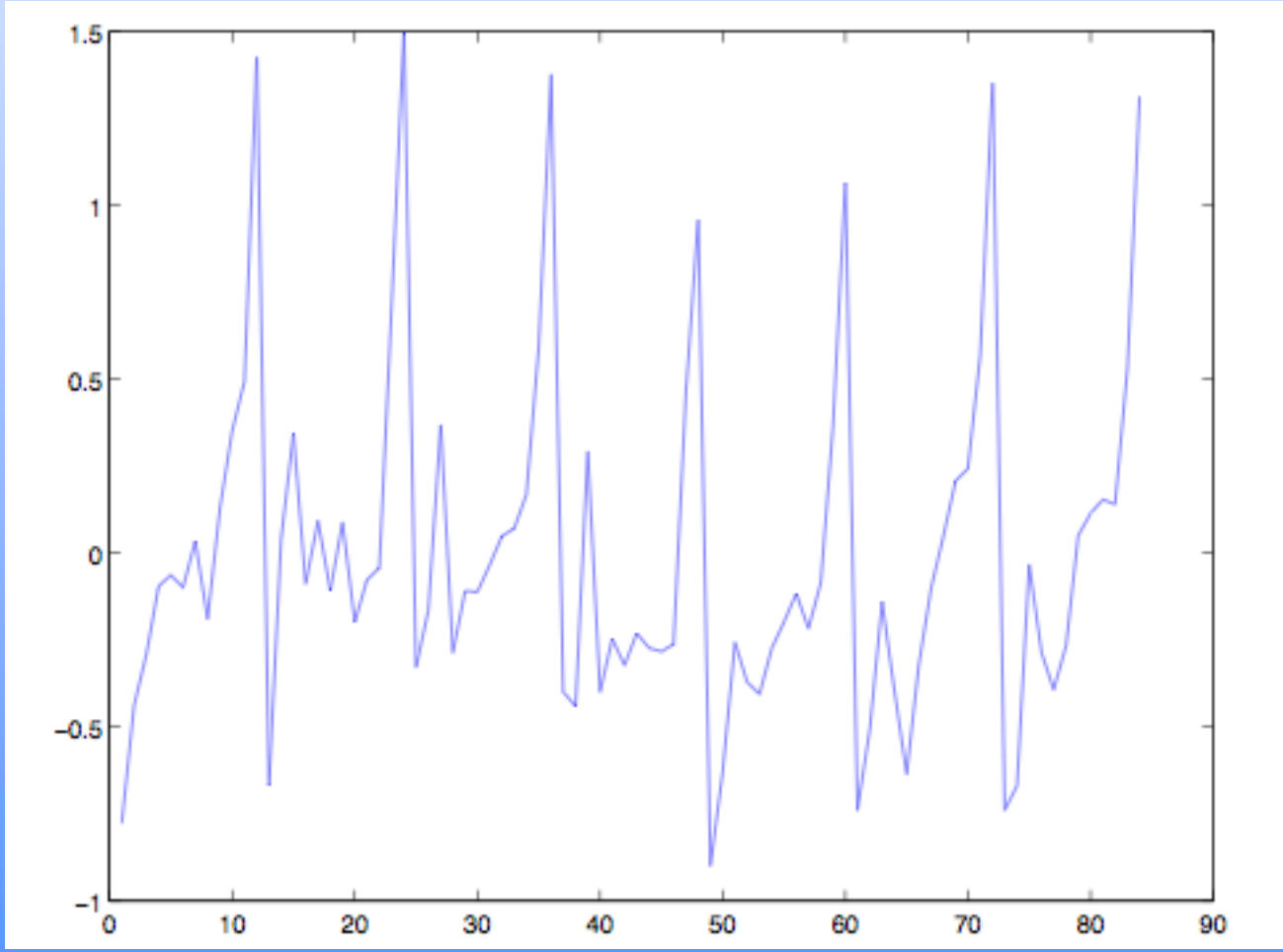
Transformed data



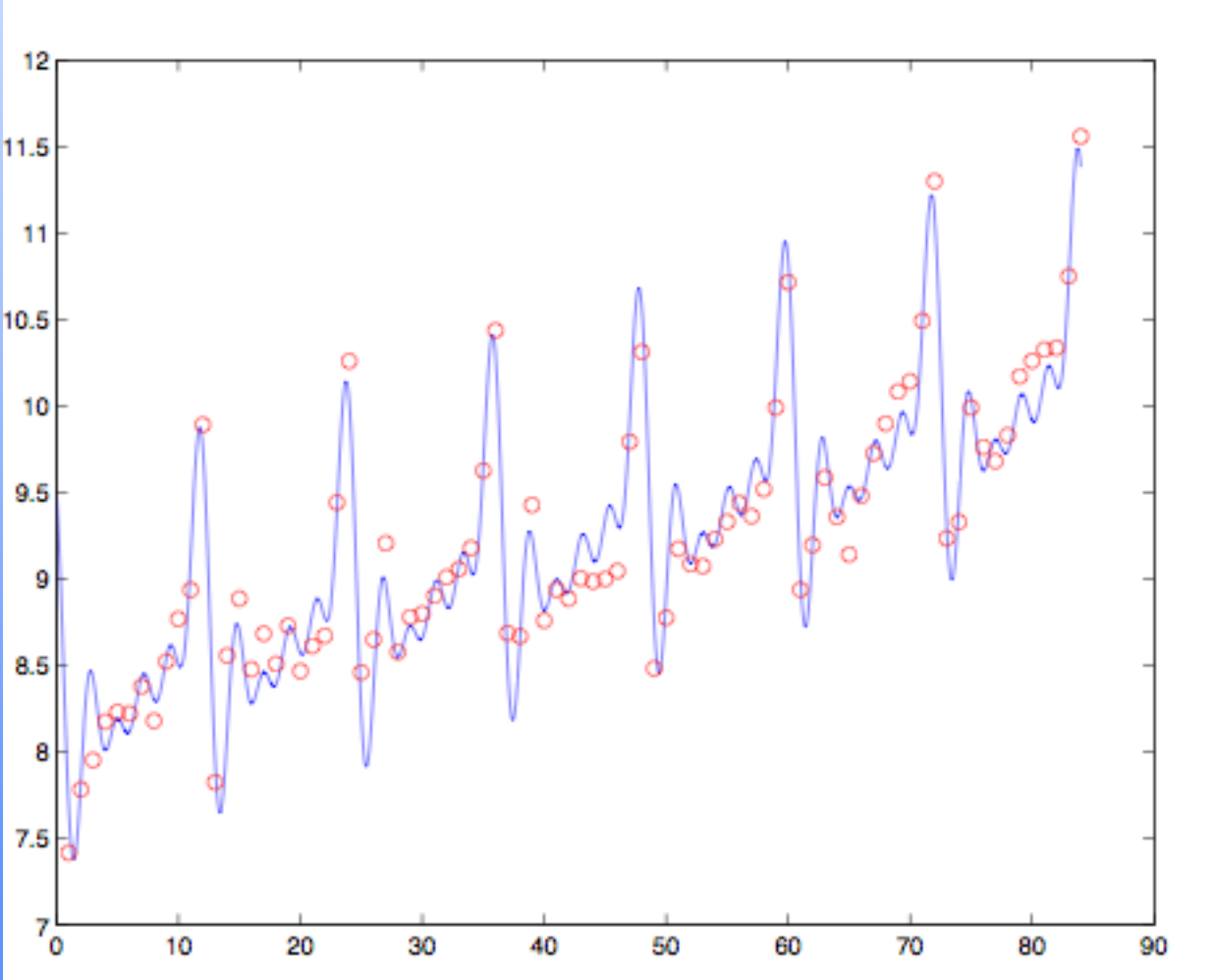
Trend



Residuals



Trend and seasonal variation

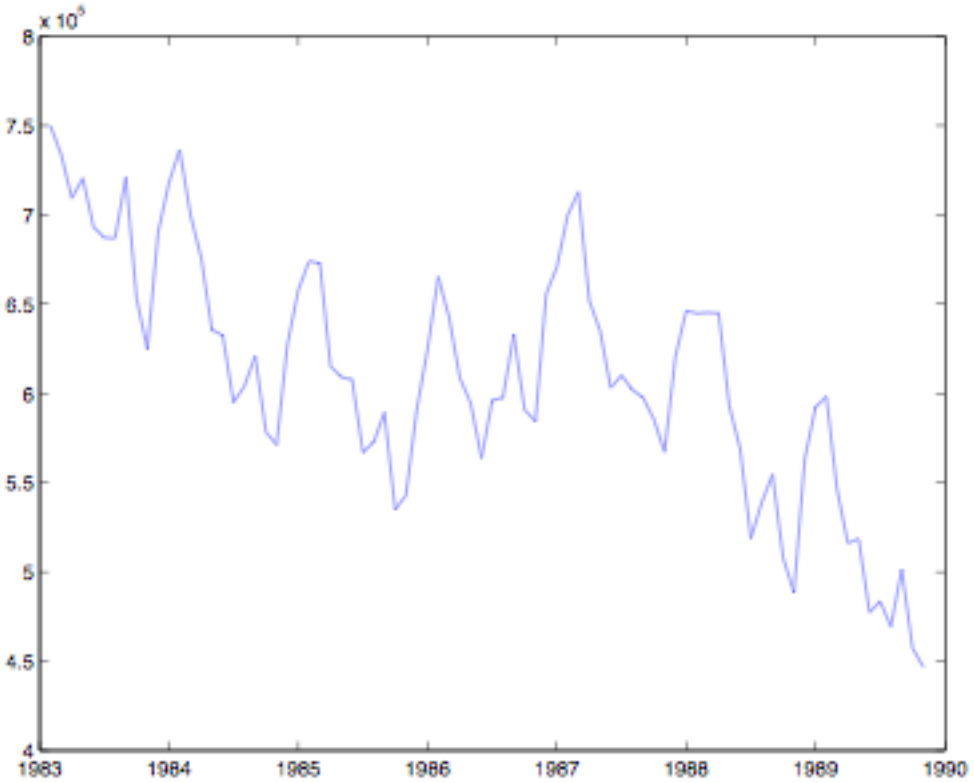


Objectives of time series analysis

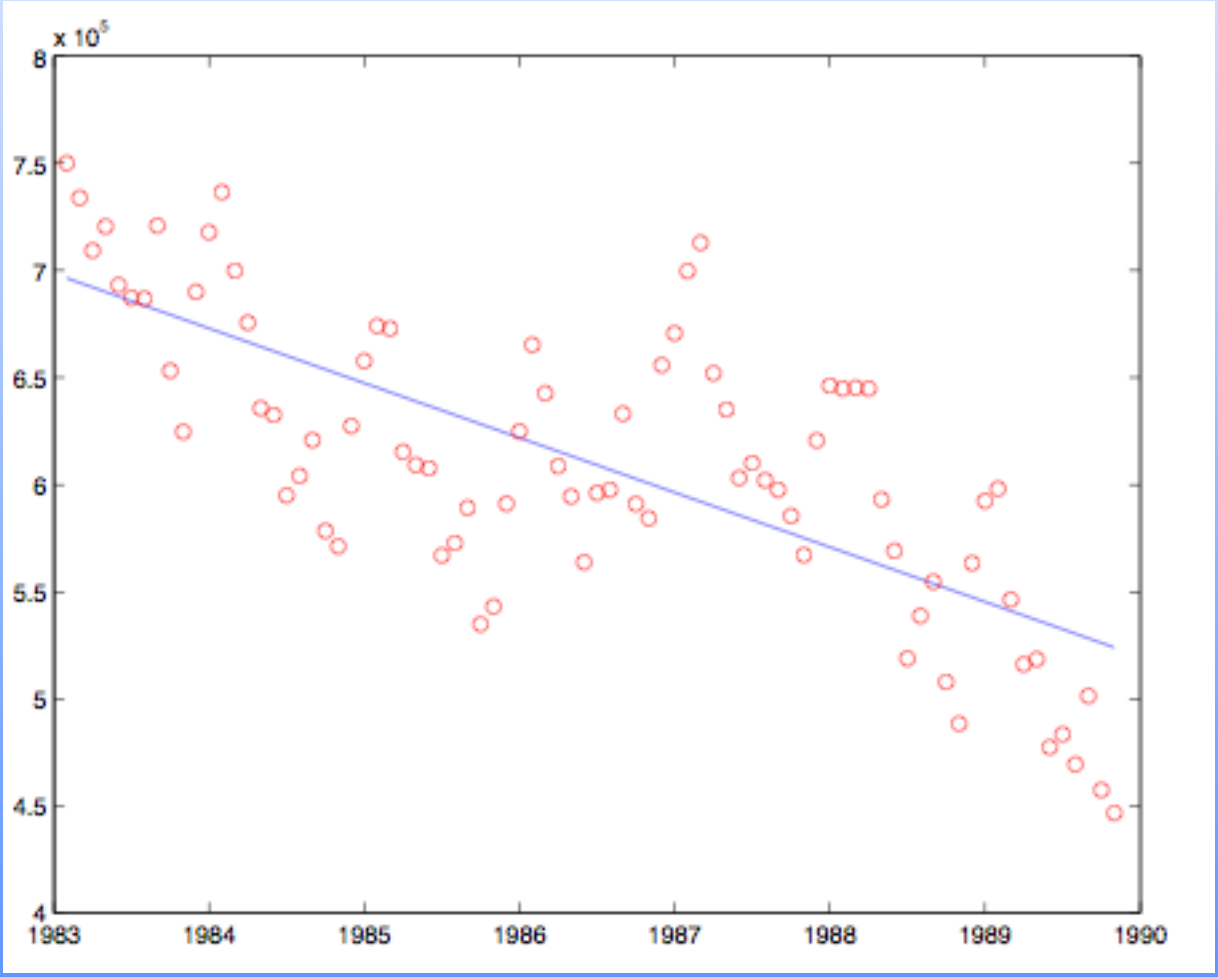
1. Compact description of data.
   Example: Classical decomposition: $X_t = T_t + S_t + Y_t$.
2. Interpretation. Example: Seasonal adjustment.
3. Forecasting. Example: Predict sales.
4. Control.
5. Hypothesis testing.
6. Simulation.

Unemployment data

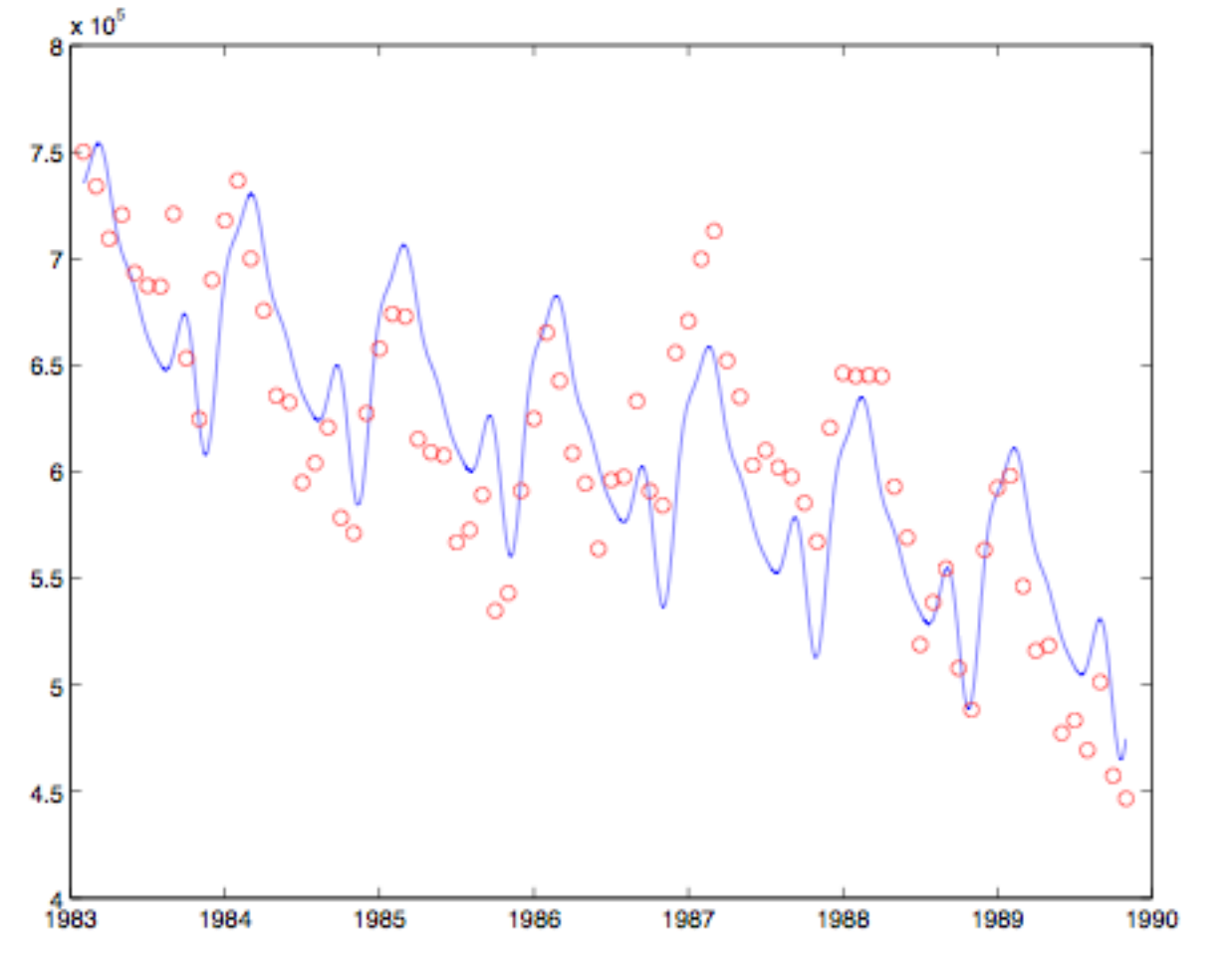
Monthly number of unemployed people in Australia. (Hipel and McLeod, 1994)



Trend



Trend plus seasonal variation



Objectives of time series analysis

1. Compact description of data:

$$X_t = T_t + S_t + f(Y_t) + W_t.$$

2. Interpretation. Example: Seasonal adjustment.
3. Forecasting. Example: Predict unemployment.
4. Control. Example: Impact of monetary policy on unemployment.
5. Hypothesis testing. Example: Global warming.
6. Simulation. Example: Estimate probability of catastrophic events.