FEC 522:
Financial Econometrics II

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About These Slides

- The present slides are not self-contained; they need to be explained and discussed.

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- The slides were produced using LaTeX (www.latex-project.org) and R (the R project; www.R-project.org) on a GNU/Linux system.

- R files used for this course are available upon request.

Chapter 1:

Introduction

1.1 About This Course

Goals and Objectives.

- Explore the dynamics of markets.
  (Stock markets, commodity markets, . . .)
- Explore stochastic models for markets.
- Relate market observations to stochastic models.

1.1 About This Course

Goals and Objectives.

We shall use methods and tools from:

- stochastic models: probability distributions, discrete and continuous stochastic processes
- simulation
- descriptive and inductive statistics
- free and open-source software

1.2 Software

Free and Open-Source Software.

- **We do not tolerate the use of unlicensed software.**
- For research purposes, there is usually
  - free and open source software
  - software under the GNU General Public License

  available with the desired functionality.
- For statistical analysis, we recommend: R. Please visit:

www.R-project.org

1.3 Data

Data are needed for empirical research.

Some aspects:

- Check definitions and concepts. Do they match your aims?
- Look into your data. In particular:
  - Data entry mistakes?
  - Treatment of missing values?
  - Date and time format?
- Display your data!
- Consult and compare different data sources, if available.

1.3 Data

Example 1: Hypothetical, but realistic.

- In the following table:
  - q_t = quantity in period t,
  - change over the previous period:

$$r_t = \frac{q_t - q_{t-1}}{q_{t-1}} \cdot 100\%$$

- There is a slight inconsistency in the series.
- How can the series (q_t) be re-constructed?

t	1	2	3	4	5	6
q_t	100	120	100	120		
r_t		+20%	−25%	+20%	+25%	+20%

1.3 Data

Example 2: Also hypothetical, again realistic.

- In the following table:
  - q_t = quantity in quarter t,
  - change over the same quarter of the previous year:

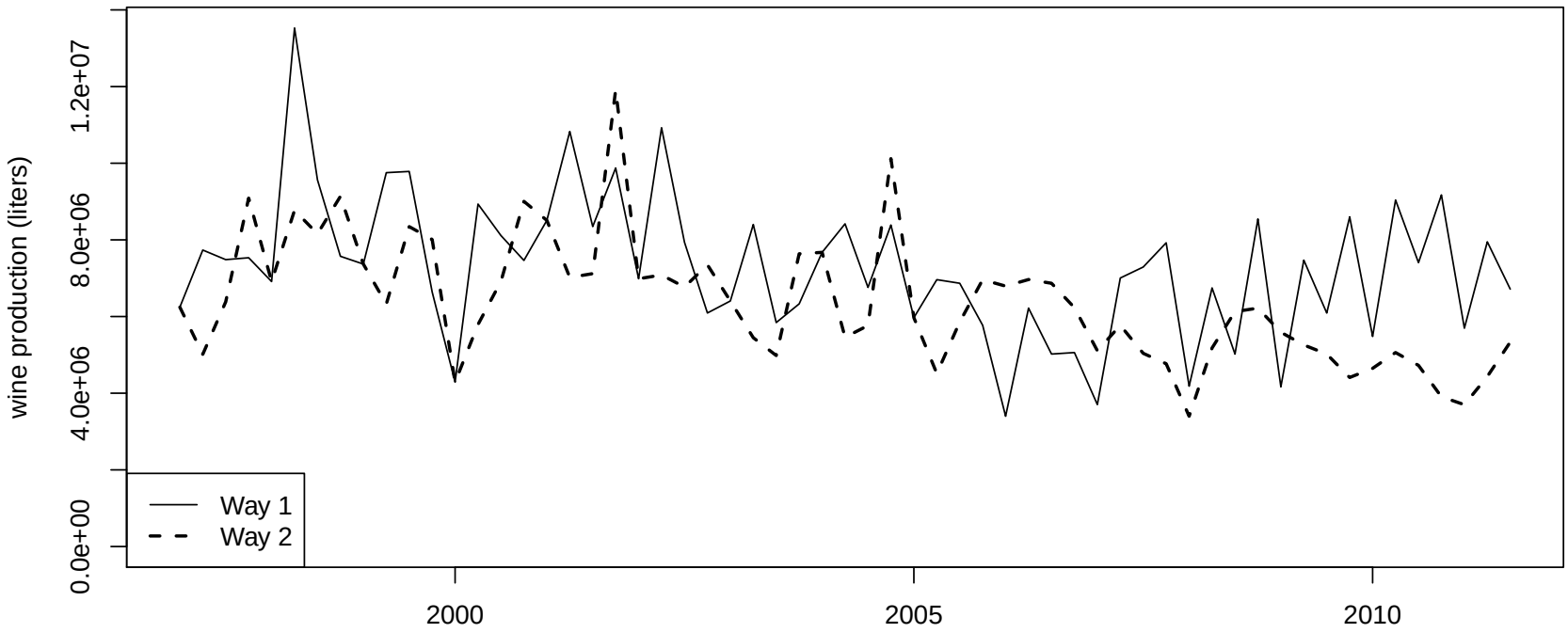
$$r_t = \frac{q_t - q_{t-4}}{q_{t-4}} \cdot 100\%$$

- There is again a slight inconsistency in the series.

t	1	2	3	4	5	6	7	8	9
q_t	100	100	100	100	100	80	80	80	
r_t					−20%	−20%	−20%	−20%	−10%

1.3 Data

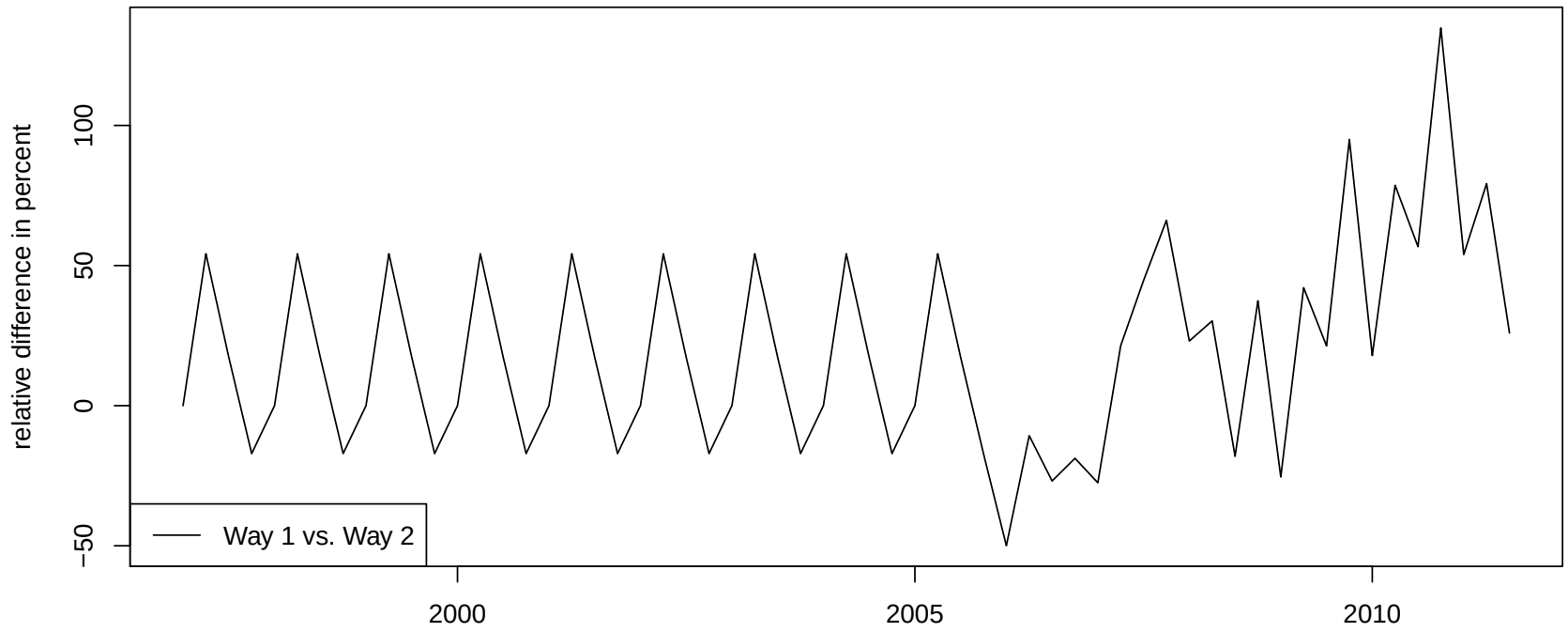
Example 3: Wine production in Turkey.



Result of putting together partial level and change series (source: TÜİK) in different ways.

1.3 Data

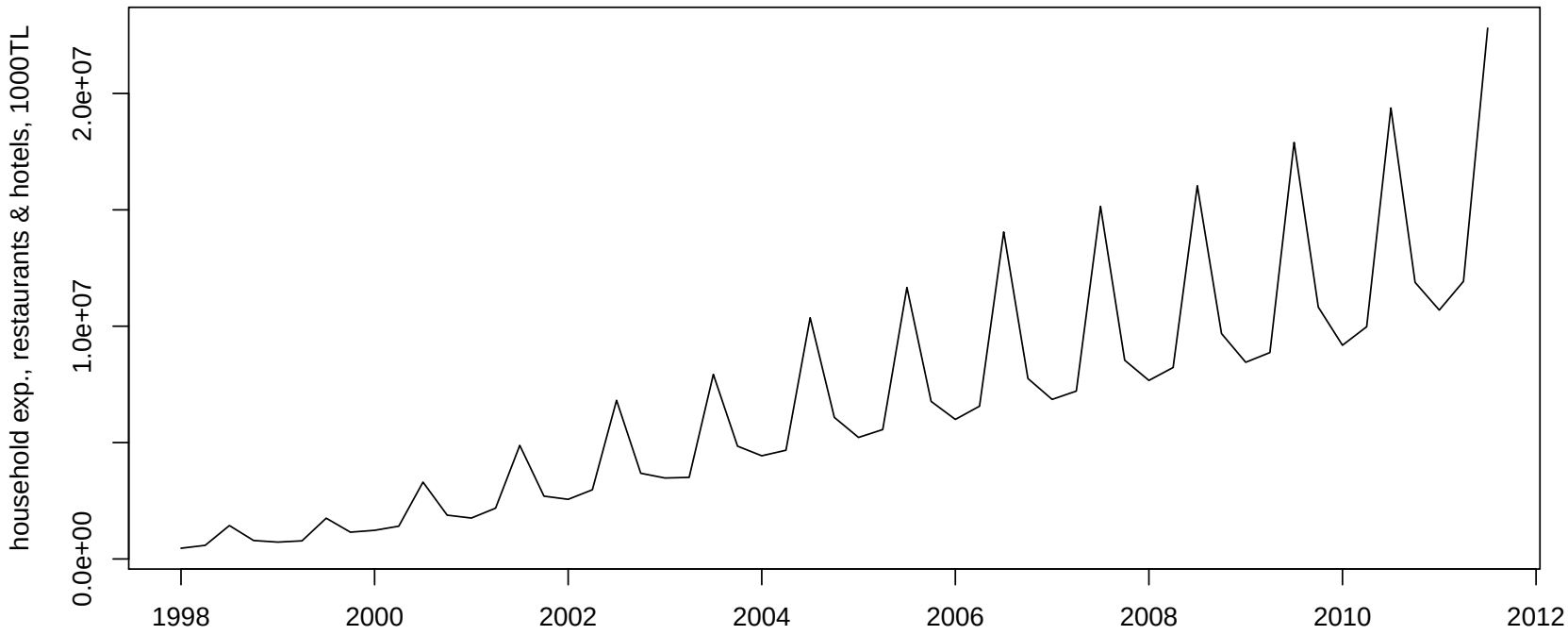
Example 3: Wine production in Turkey.



Relative differences between the two ways to reconstruct the level series.

1.3 Data

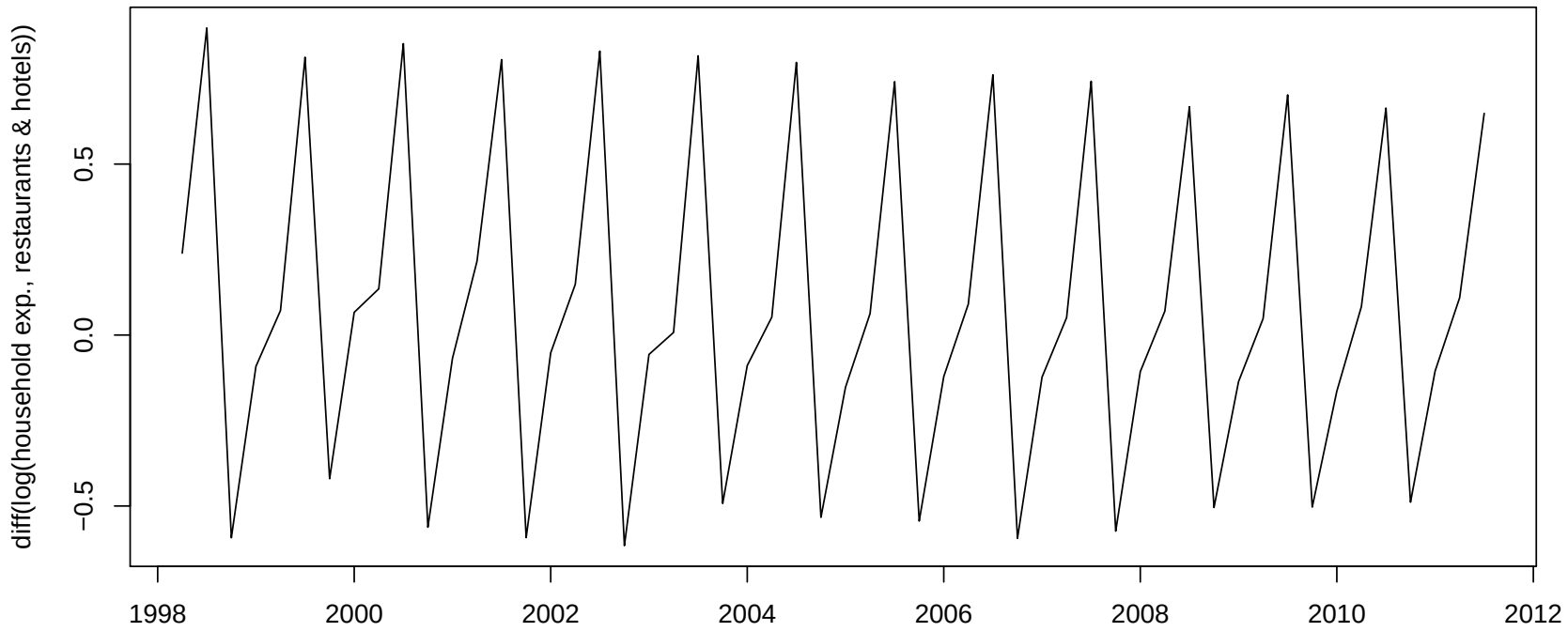
Example 4: Expenditure on hotels and restaurants.



"Final Consumption Expenditure of Resident and Non-Resident Households on the Economic Territory (at current prices), 1998–2011" (TÜİK); here: Restaurants and Hotels.

1.3 Data

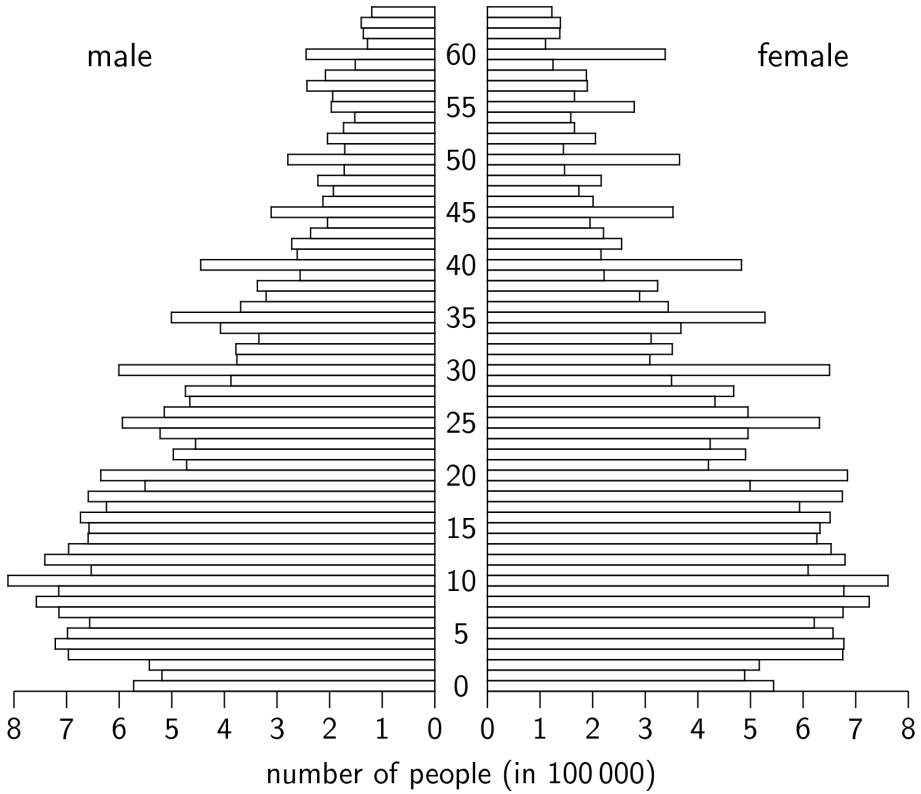
Example 4: Expenditure on hotels and restaurants.



Series as before; here: differences of logarithms.

1.3 Data

Example 5: The population of Turkey.



Is this the population of Turkey in 1990?

1.3 Data

Conclusion.

download data

$\Downarrow$

analyze them!

This is an **illusion**.

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1.5 Outlook

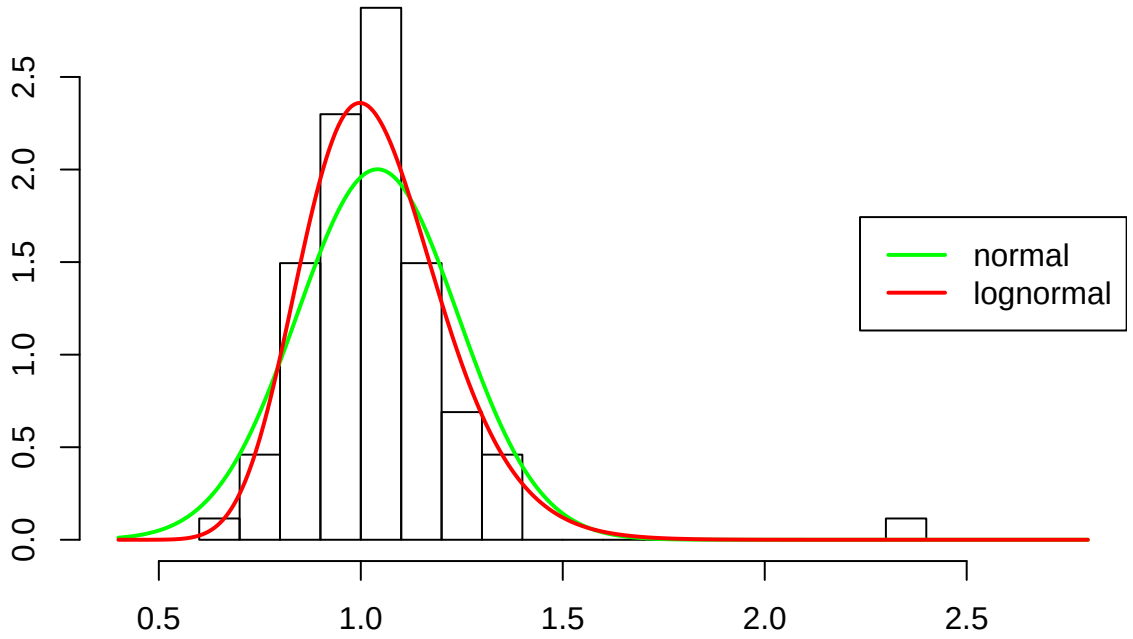
Chapter 2: Analyzing Price Changes: Some Aspects

- review of statistical paradigms
- the role of stochastic modeling
- empirical distribution of returns; examples
- comparison with the normal distribution

1.5 Outlook

Chapter 2: Analyzing Price Changes: Some Aspects

An example from Chapter 2: gross returns



1.5 Outlook

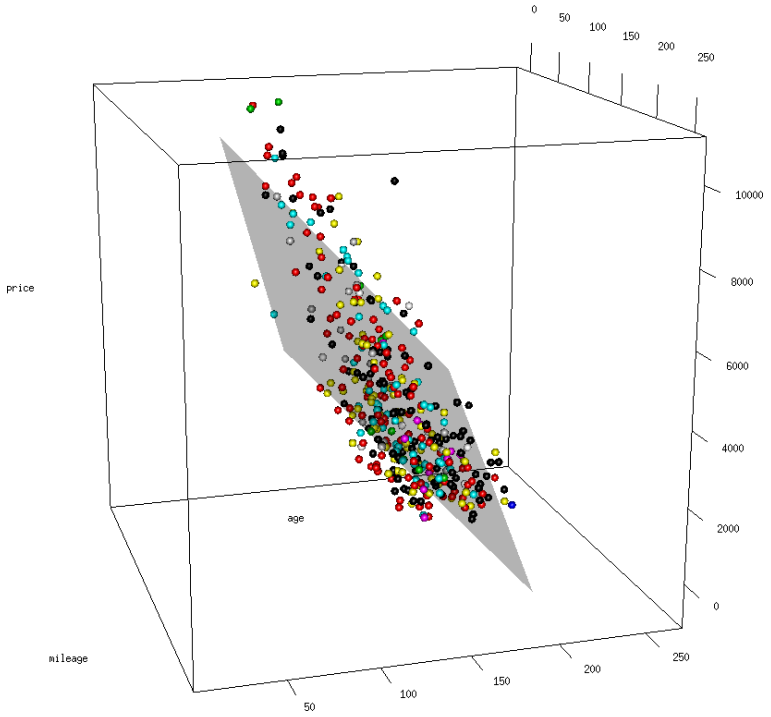
Chapter 3: Multiple Regression and Extensions

- visualizing data: 3d scatterplots
- multiple regression and its interpretation
- logistic regression
- Poisson regression
- examples

1.5 Outlook

Chapter 3: Multiple Regression and Extensions

An example from Chapter 4: 3d scatterplot, used cars (age, mileage, price)



1.5 Outlook

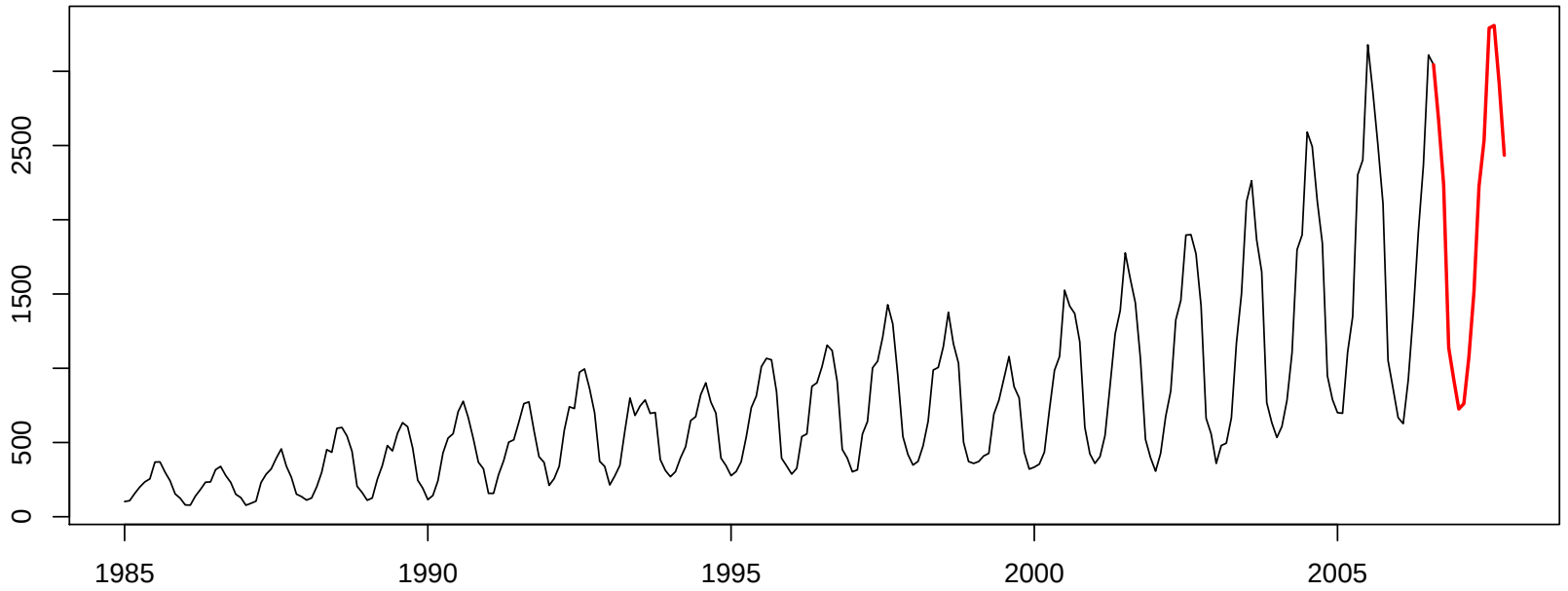
Chapter 4: ARMA Processes

- model structure
  (ARMA processes as conditional expectation models)
- simulation
- model identification etc.
- examples

1.5 Outlook

Chapter 4: ARMA Processes

An example from Chapter 5: Tourists visiting Turkey



1.5 Outlook

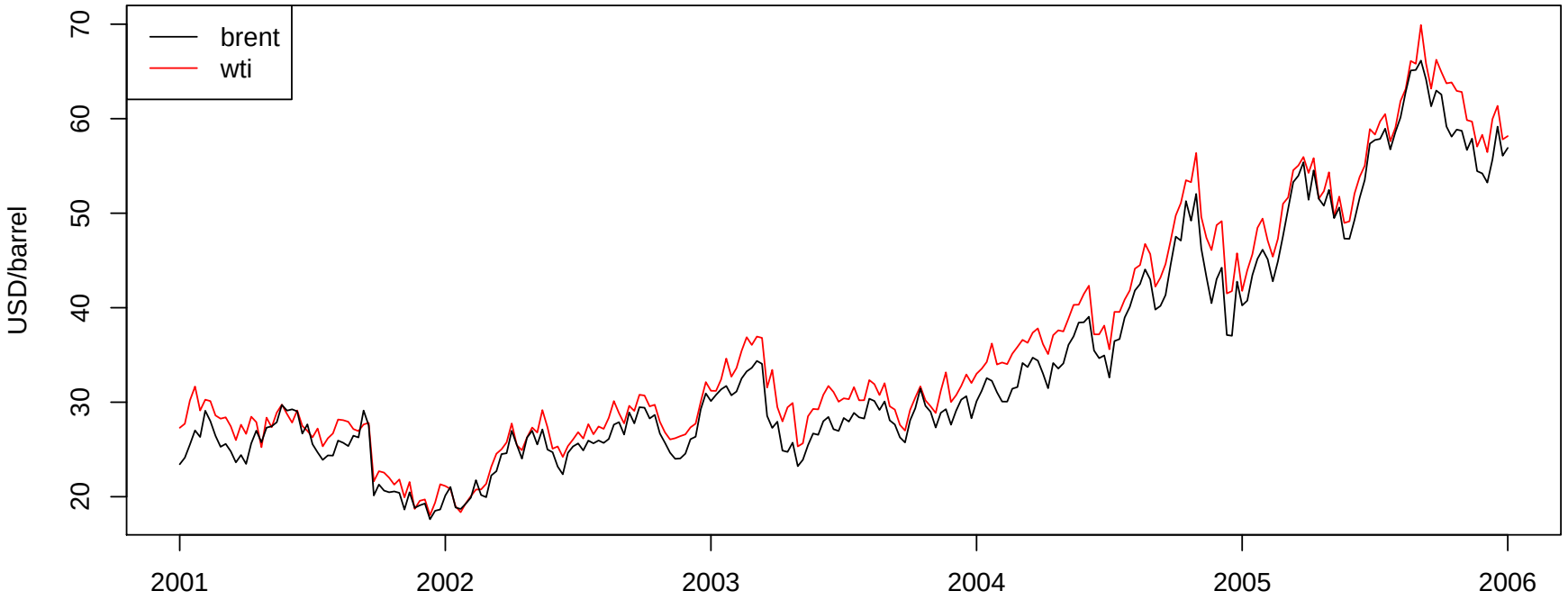
Chapter 5: Cointegration, Error Correction Models

- stationary vs. non-stationary time series
- stationarity transformations
- integrated and cointegrated series
- joint analysis of non-stationary series
- testing for cointegration

1.5 Outlook

Chapter 5: Cointegration, Error Correction Models

An example from Chapter 5: Brent and WTI prices



1.5 Outlook

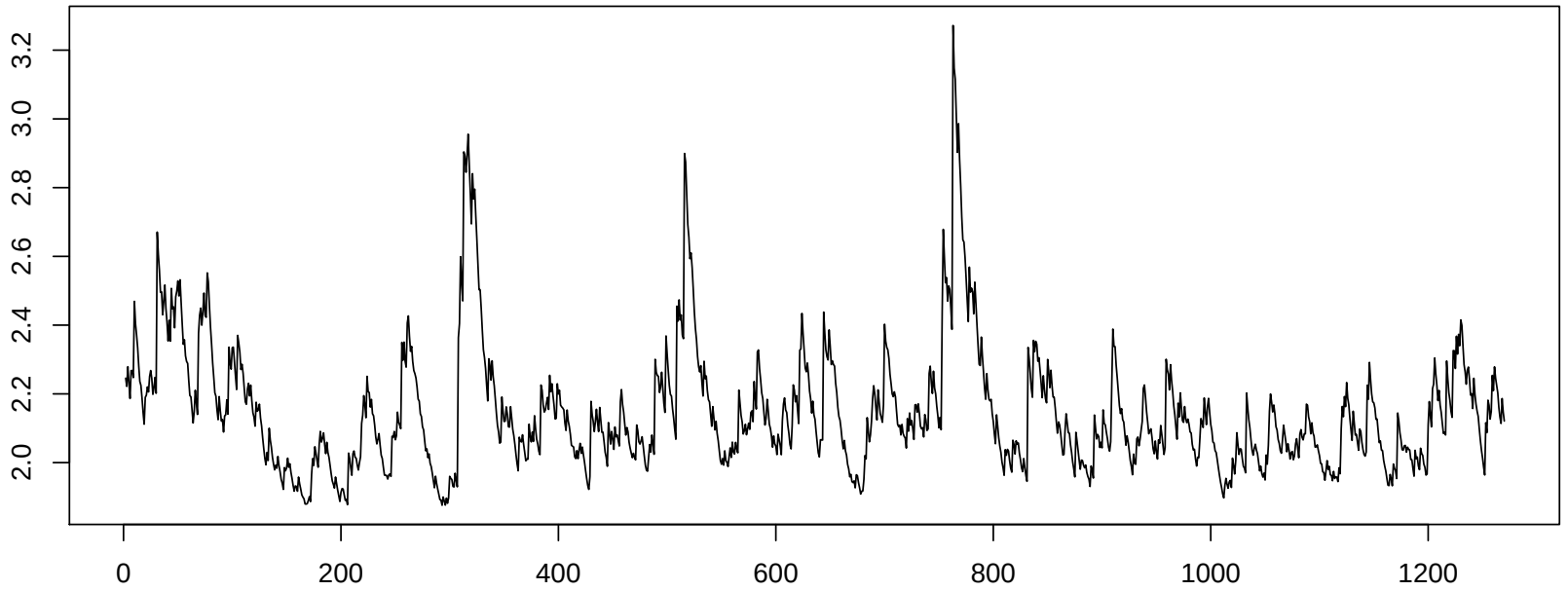
Chapter 6: Univariate GARCH Processes

- model structure
  (GARCH processes as conditional variance models)
- simulation
- model identification
- news impact etc.

1.5 Outlook

Chapter 6: Univariate GARCH Processes

An example from Chapter 6: conditional volatility series, Brent



1.5 Outlook

Chapter 7: Bivariate GARCH Processes

- model structure
- simulation
- model identification
- symmetric and asymmetric news impact
- example: crude oil and the stock market

1.5 Outlook

Chapter 7: Bivariate GARCH Processes

An example from Chapter 7: joint forecast ellipses, WTI/DJIA