FEC 522:
Financial Econometrics II

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

Some Projects

From Our Recent Research

Recent (and ongoing) research projects.

The following slides give an outline of four projects.

- Project 1: Green Segmentation: A Cross-National Study
  (with Barış Yılmazsoy & Angi Rösch)
- Project 2: OPEC Announcements and Oil Price Volatility
  (with Angi Rösch)
- Project 3: Algorithmic Trading
  (with Angi Rösch, Tolga Sezer, Vehbi Sinan Tunalıoğlu)
- Project 4: Population Dynamics With Leslie-Type Models
  (with Angi Rösch & Narod Erkol)
- Project 5: Festivals and Gold Prices
  (with Angi Rösch)

Project 1:
Green Segmentation: A Cross-National Study

Some aspects.

- world facing environmental challenges
- business consequences
- shift in consumer attitude and preferences
- understanding the "green" consumer is important
- key concepts: attitudes, behavioural intentions
- theory of Reasoned Action:
  attitudes $\Rightarrow$ behavioural intentions $\Rightarrow$ actual behaviour
- relationship between green attitudes and green behaviour:
  no agreement in literature

Project 1:
Green Segmentation: A Cross-National Study

The questionnaire: Attitude items.

strongly agree / agree / indifferent / don't agree / don't agree at all

- Tenor, basic attitudes: A1, A4, A9

  too much trouble; not too late to save the environment; natural resources are scarce

- Emotional concern: A2, A5, A8

  responsible for global warming; frustrated with industies polluting; frightened with chemicals in food

- Scepticism: A3, A6, A7

  job loss; green trend is marketing gimmick; benefits of consumer products more important

Project 1:
Green Segmentation: A Cross-National Study

The questionnaire: Behaviour items.

always / mostly / sometimes / rarely / never

- Daily behaviour: B1, B3, B8, B9

  using public transport; re-usable bags; energy-saving light bulbs; recycling

- Consumption: B5, B6

  products with less packaging; buying more expensive "greener alternative"

- Environmental activism: B2, B4, B7

  advising others; participation in meetings; reading about environmental issues

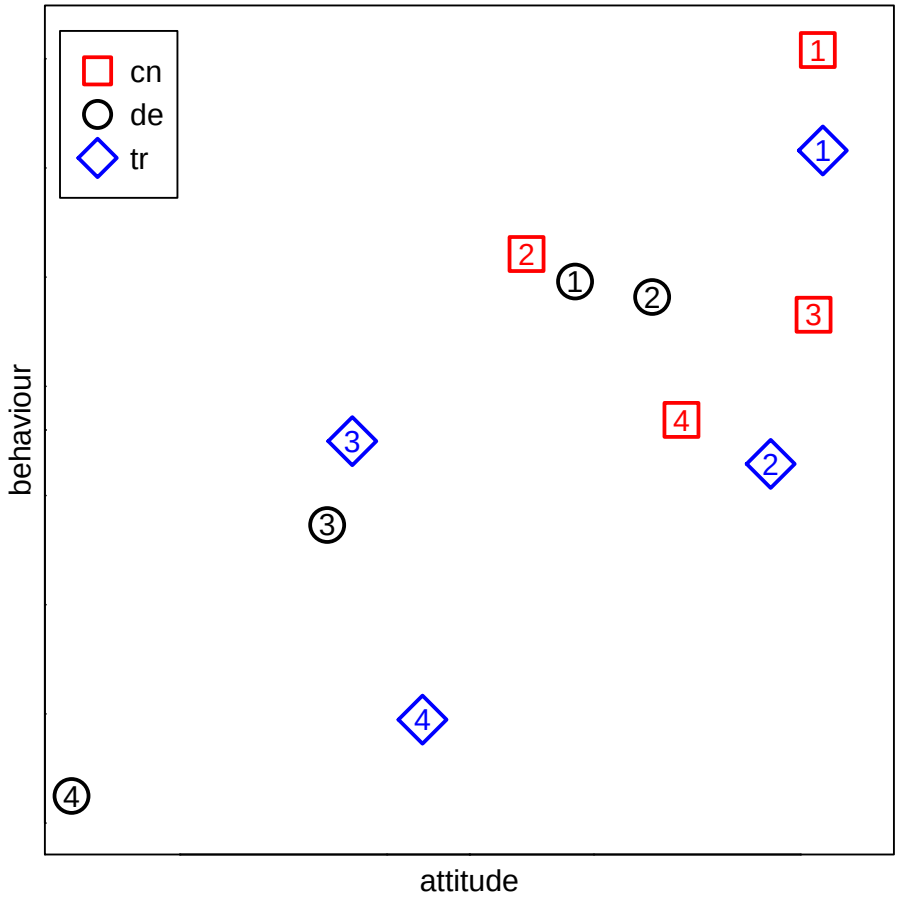
Project 1:
Green Segmentation: A Cross-National Study

Data & Analysis.

- Data (convenience sample) from China (395), Germany (360), Turkey (660)
- students enrolled in business-related programmes in private/public universities
- "Split the difference"-method used to eliminate gender effect
- For each country: four segments (clusters) obtained using "pam"

Project 1:
Green Segmentation: A Cross-National Study

Characterizing clusters.



Project 1:
Green Segmentation: A Cross-National Study

Managerial Implications.

- Focus on segment-specific customer expectations.
- Incentive for shifting customers to "greener segment"?
- "Positive marketing": parties exchange value such that they are better off
- Environmental attitude and purchase channel choice???

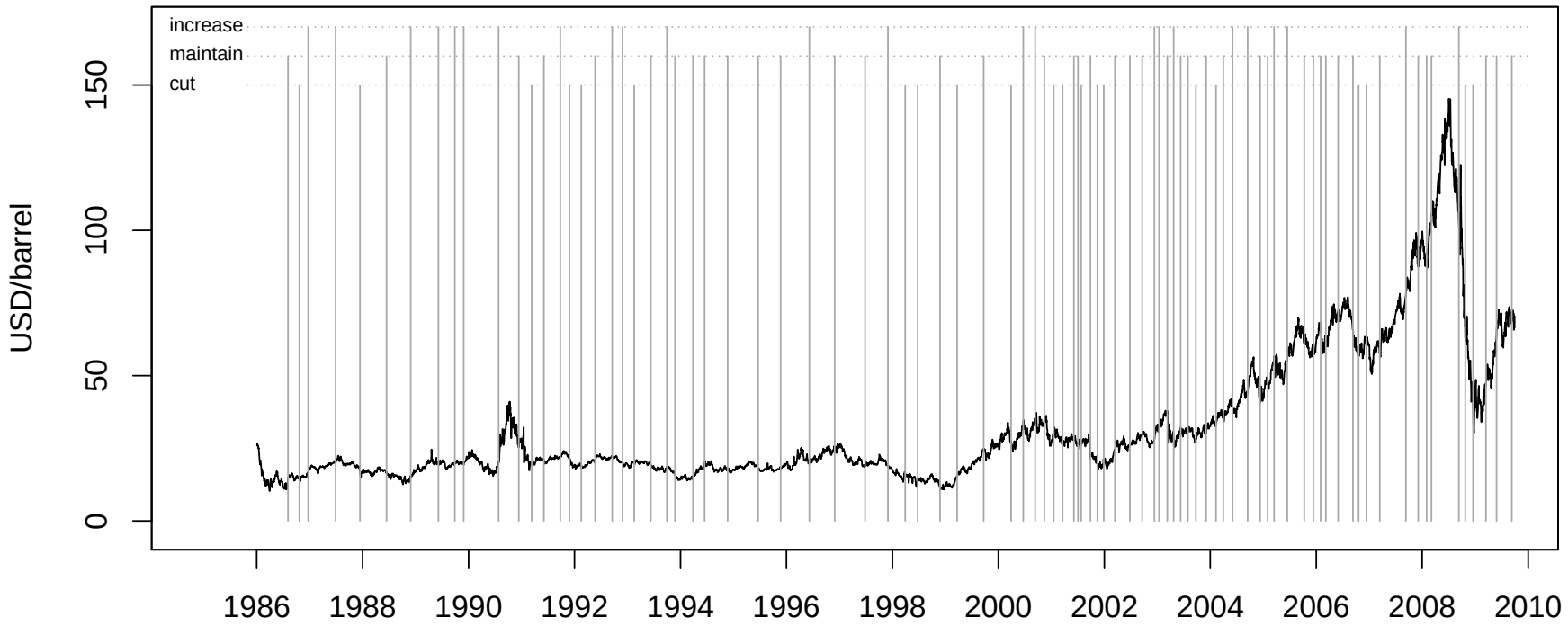
Project 2:
OPEC Announcements and Oil Price Volatility

Crude oil prices and OPEC announcements.

- Impact of OPEC announcements on crude oil prices?
- Impact on the distribution of daily returns, in particular:
  - on the expectation of daily returns?
  - on the variance of daily returns?
- What can be said about expectation and volatility. . .
  - right *before* an announcement will be made (anticipation of the announcement),
  - right *after* an announcement has been made (aftereffect of the announcement)?

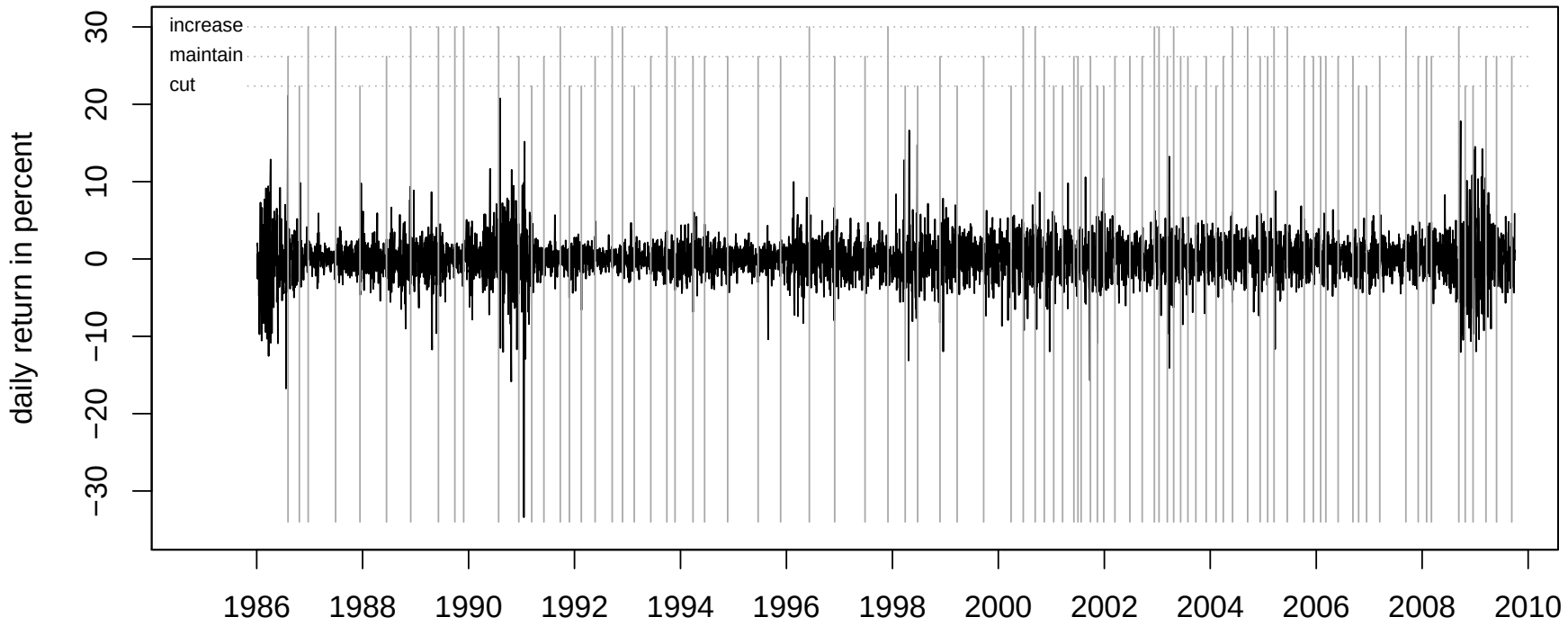
Project 2:
OPEC Announcements and Oil Price Volatility

The WTI price series and OPEC announcements.



Project 2:
OPEC Announcements and Oil Price Volatility

The daily WTI return series and OPEC announcements.



Project 2:
OPEC Announcements and Oil Price Volatility

Regression: conditional expectation; GARCH: conditional variance.

$$r_t = c + \sum_{s \geq 1} a_s r_{t-s} + \sum_i b_i d_{it} + \epsilon_t, \tag{1}$$

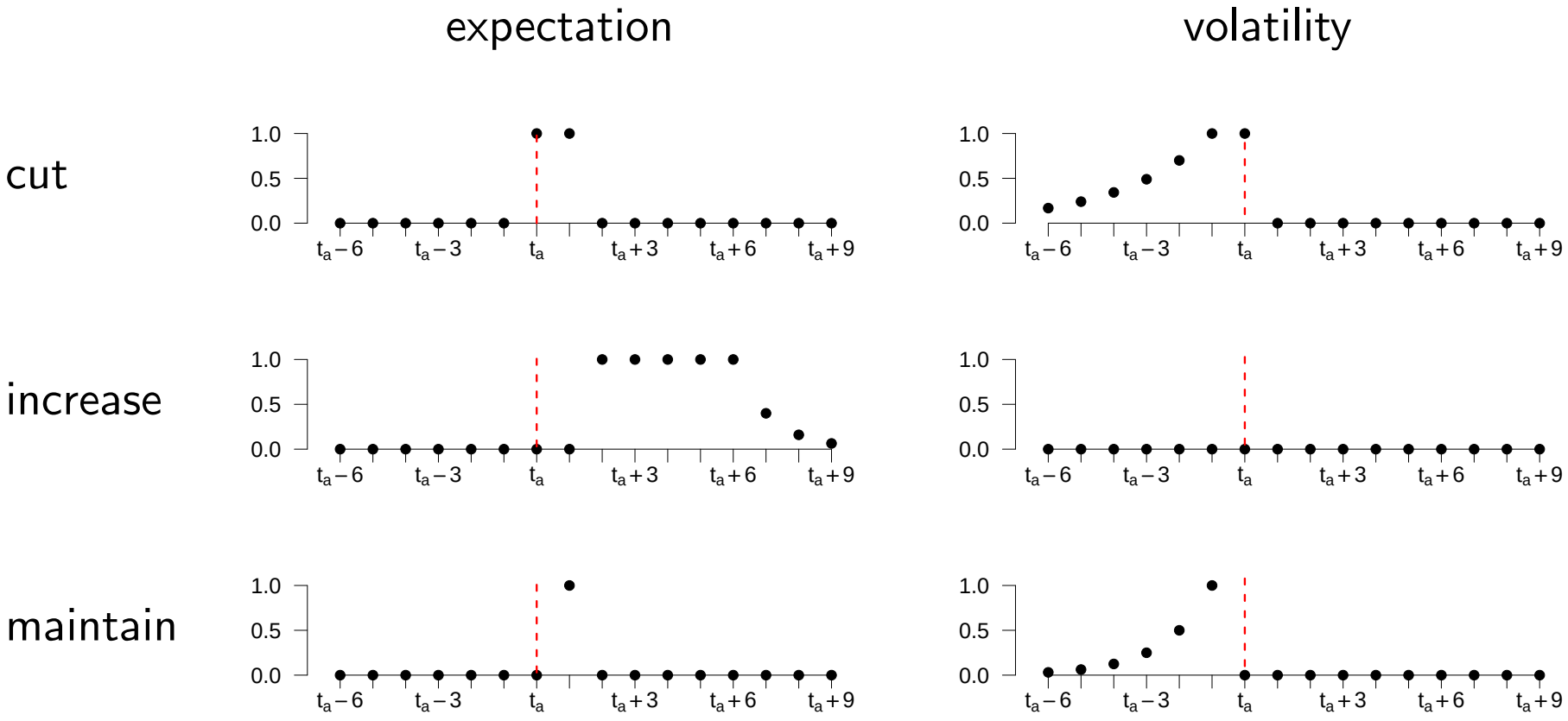
$$\epsilon_t = \nu_t \cdot \sqrt{h_t}, \tag{2}$$

$$h_t = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \beta h_{t-1} + \sum_i \gamma_i d_{it}. \tag{3}$$

- (r_t): series of daily returns on WTI crude oil price
- (d_{it}): (modified) dummy variables for announcements of kind i
- (ν_t): Gaussian white noise with $\mathrm{var}(\nu_t) = 1$
- b_i, γ_i: parameters (impact of an announcement of kind i)

Project 2:
OPEC Announcements and Oil Price Volatility

Summary: The optimal model structure.



Project 2:

OPEC Announcements and Oil Price Volatility

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OPEC news announcements: Effects on oil price expectation and volatility

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ABSTRACT

Several times a year, OPEC hosts conferences among its members to agree on further oil production policies. Prior to OPEC conferences, there is usually rampant speculation about which decision concerning world oil production levels (no change, increase, or cut) will be announced. The purpose of our investigation is to assess the impact of OPEC announcements on expectation and volatility of daily oil price changes (returns). We modify dummy variables indicating the day of an OPEC announcement to reflect a certain pattern of impact on return expectation and volatility. A combination of regression and GARCH models can then differentiate between pre- and post-announcement effects, and distinguish between the three kinds of OPEC decisions.
We find evidence for a post-announcement effect on expectation, which is negative in the case of a cut decision and positive in case of an increase or maintain decision, while there is a positive pre-announcement effect on volatility, which is strongest in the case of a cut decision.

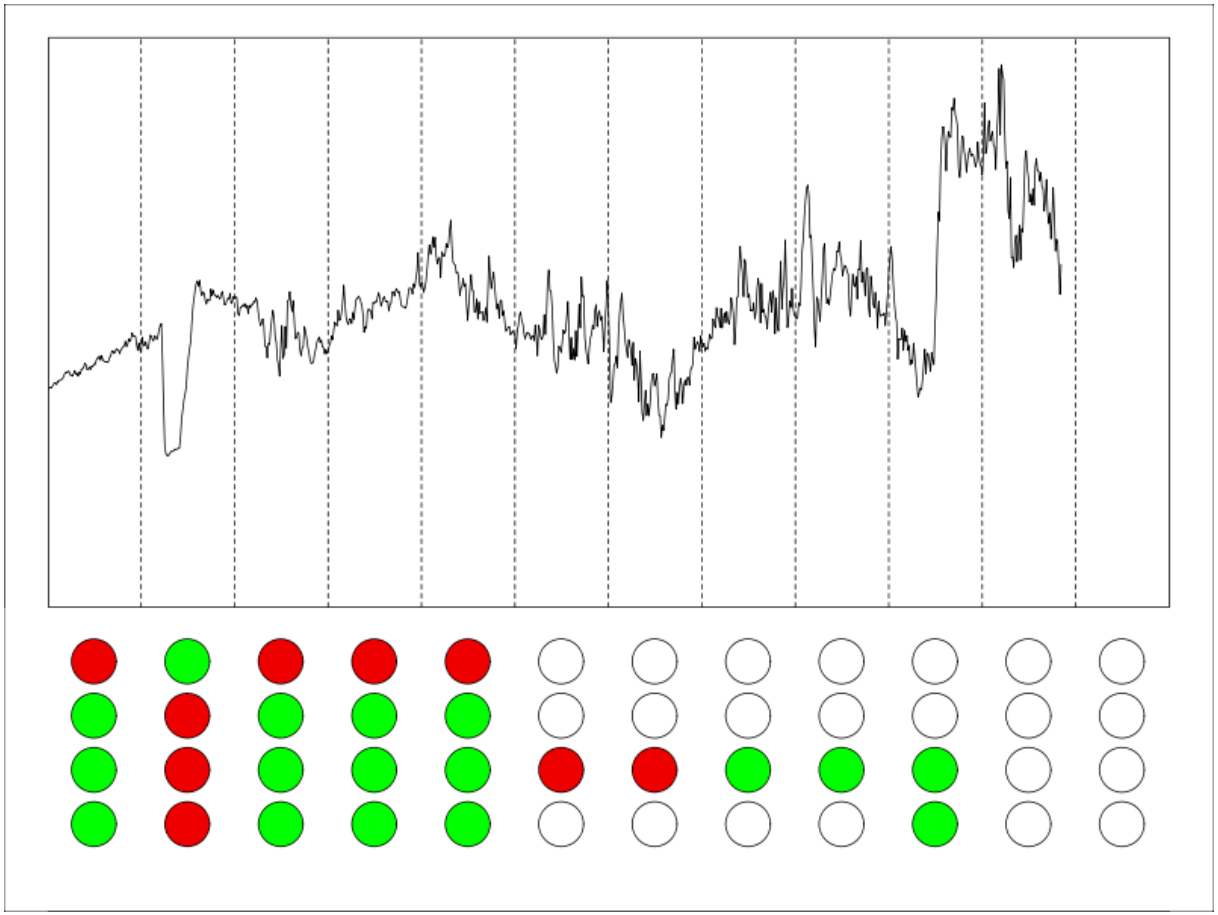
Project 3:
Algorithmic Trading

Algorithmic trading.

- Can we combine simple trading rules to generate profit?
- Example: €-$ trading.
  - Trading every 5 minutes.
  - Use 2 days' data to construct a trading rule.
  - Use this rule for the next day.

Project 3:
Algorithmic Trading

A sequence of trading signals.



Project 3:
Algorithmic Trading

How to obtain complex trading rules?

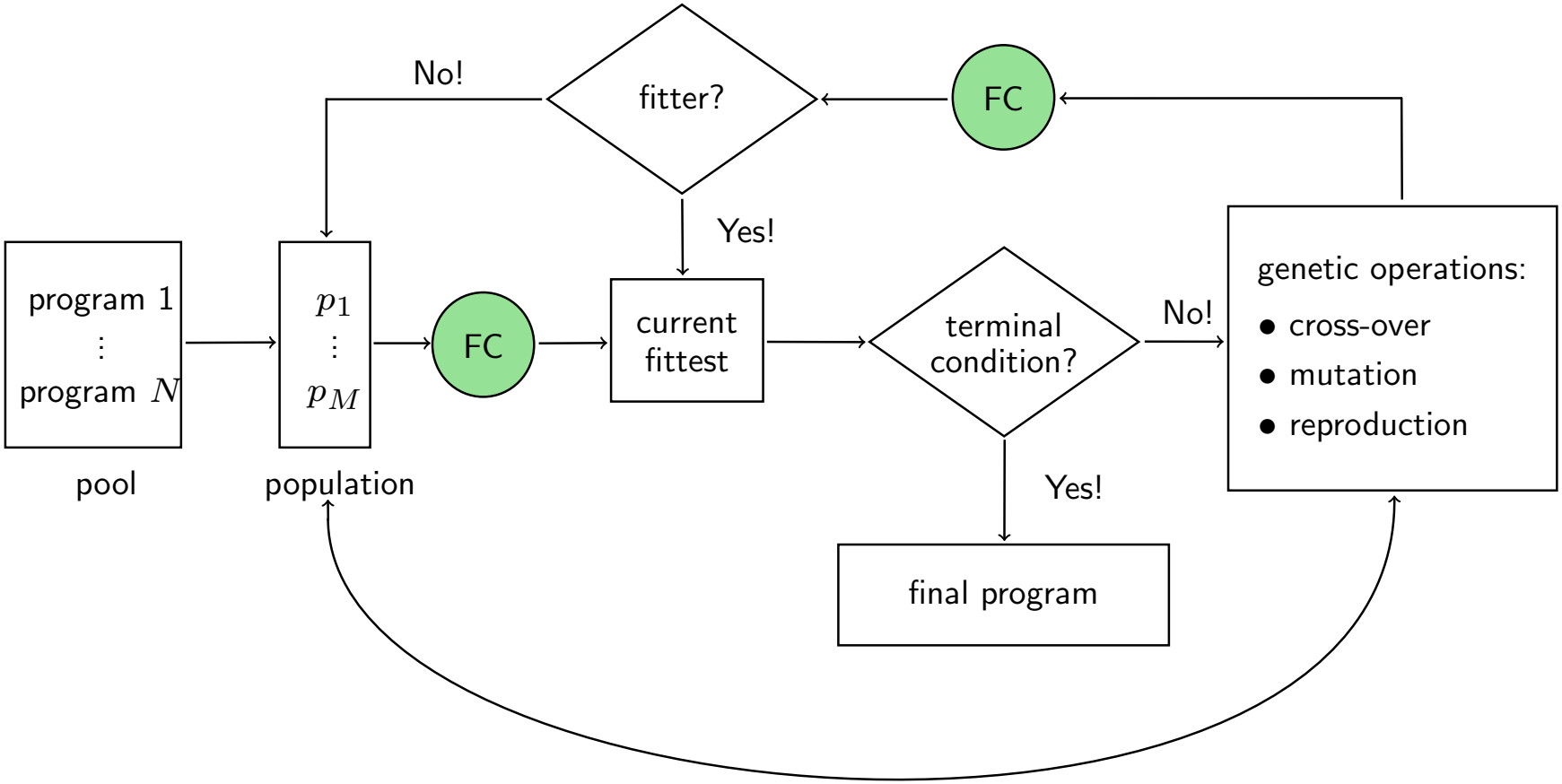
- Genetic algorithm: based on
  - cross-over
  - mutation
  - reproduction
- Example of a program:

(IF $TR_1 =$ "buy!") AND NOT $\Big($($TR_2 =$ "sell!") OR ($TR_3 =$ "sell!")$\Big)$

THEN "buy!"

Project 3:
Algorithmic Trading

Creating a Program.



Project 3:
Algorithmic Trading

Keywords.

- data-snooping bias
- robustness
- time series bootstrap
- tick data

Project 4:
Population Dynamics With Leslie-Type Models

The classical Leslie model.

- Leslie model:
  a discrete, age-structured model of population growth
- time-constant age-specific fertility and mortality rates
- population is closed to migration
- only females considered
- three 15-year intervals of age covering ages 0 to 45

Project 4:
Population Dynamics With Leslie-Type Models

The classical Leslie model.

- Equation of the Leslie model:

$$\begin{pmatrix} n_{1,t} \\ n_{2,t} \\ n_{3,t} \end{pmatrix} = \begin{pmatrix} f_1 & f_2 & f_3 \\ p_1 & 0 & 0 \\ 0 & p_2 & 0 \end{pmatrix} \cdot \begin{pmatrix} n_{1,t-1} \\ n_{2,t-1} \\ n_{3,t-1} \end{pmatrix}$$

$$\vec{n}_t = \mathtt{M} \cdot \vec{n}_{t-1}$$

Project 4:
Population Dynamics With Leslie-Type Models

A Leslie-type model for a population with constant immigration.

$$\left(\begin{array}{c} n_{1,t} \\ n_{2,t} \\ n_{3,t} \\ \hline n^*_{1,t} \\ n^*_{2,t} \\ n^*_{3,t} \\ \hline R \end{array}\right) = \left(\begin{array}{ccc|ccc|c} f_1 & f_2 & f_3 & f^*_1 & f^*_2 & f^*_3 & 0 \\ p_1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & p_2 & 0 & 0 & 0 & 0 & 0 \\ \hline 0 & 0 & 0 & 0 & 0 & 0 & r_1 \\ 0 & 0 & 0 & p^*_1 & 0 & 0 & r_2 \\ 0 & 0 & 0 & 0 & p^*_2 & 0 & r_3 \\ \hline 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{array}\right) \cdot \left(\begin{array}{c} n_{1,t-1} \\ n_{2,t-1} \\ n_{3,t-1} \\ \hline n^*_{1,t-1} \\ n^*_{2,t-1} \\ n^*_{3,t-1} \\ \hline R \end{array}\right)$$

(Schmidbauer & Rösch, 1995)

Project 4:
Population Dynamics With Leslie-Type Models

A Leslie-type model with two populations.

$$
\begin{pmatrix}
n_{c1,t} \\ n_{c2,t} \\ n_{c3,t} \\ \hline
n^*_{c1,t} \\ n^*_{c2,t} \\ n^*_{c3,t} \\ \hline
n_{v1,t} \\ n_{v2,t} \\ n_{v3,t} \\ \hline
n^*_{v1,t} \\ n^*_{v2,t} \\ n^*_{v3,t}
\end{pmatrix}
=
\left(\begin{array}{ccc|ccc|ccc|ccc}
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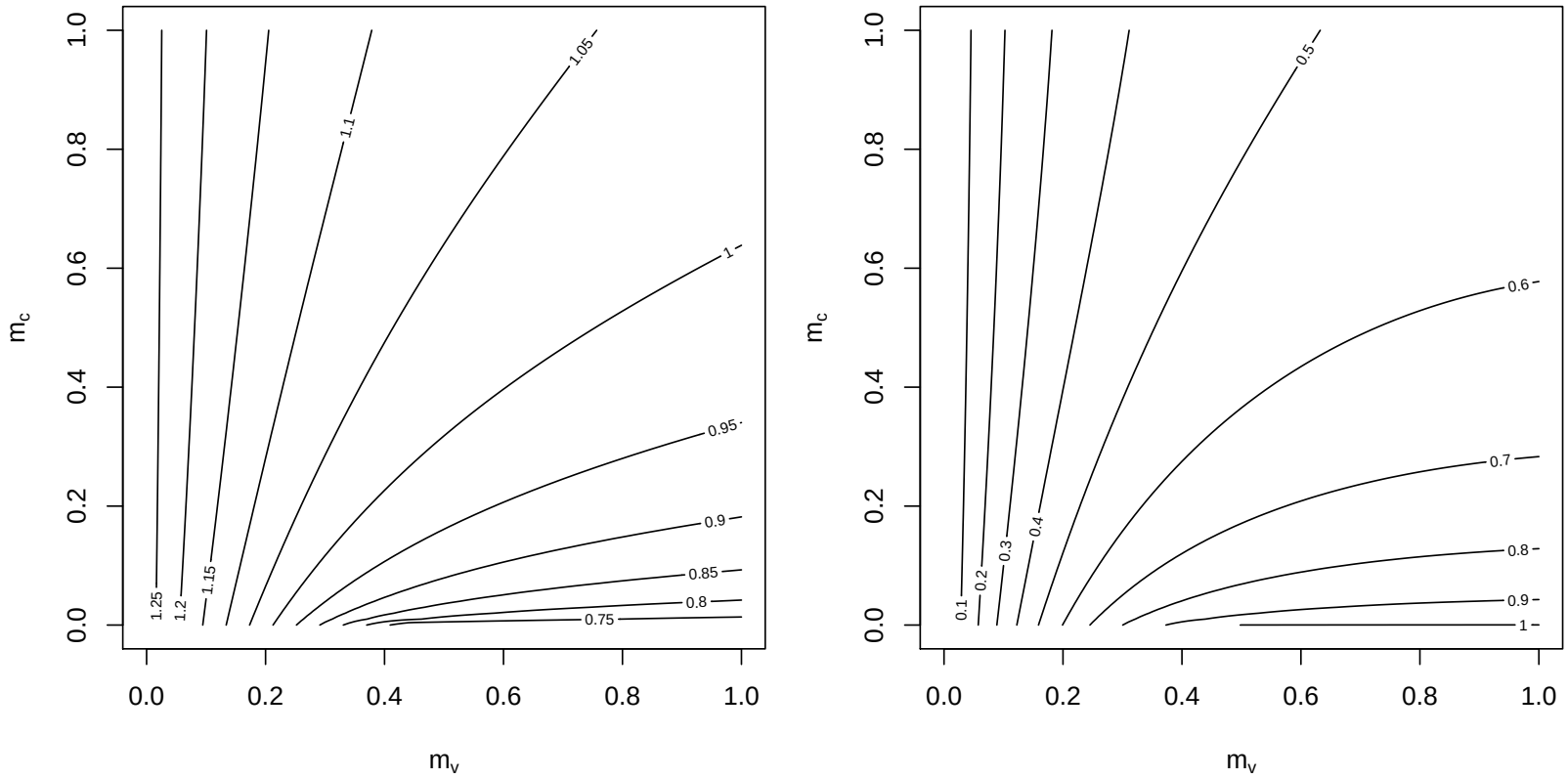
0 & \spadesuit & 0 & 0 & \spadesuit & 0 & 0 & 0 & 0 & 0 & \spadesuit & 0
\end{array}\right)
\cdot
\begin{pmatrix}
n_{c1,t-1} \\ n_{c2,t-1} \\ n_{c3,t-1} \\ \hline
n^*_{c1,t-1} \\ n^*_{c2,t-1} \\ n^*_{c3,t-1} \\ \hline
n_{v1,t-1} \\ n_{v2,t-1} \\ n_{v3,t-1} \\ \hline
n^*_{v1,t-1} \\ n^*_{v2,t-1} \\ n^*_{v3,t-1}
\end{pmatrix}
$$

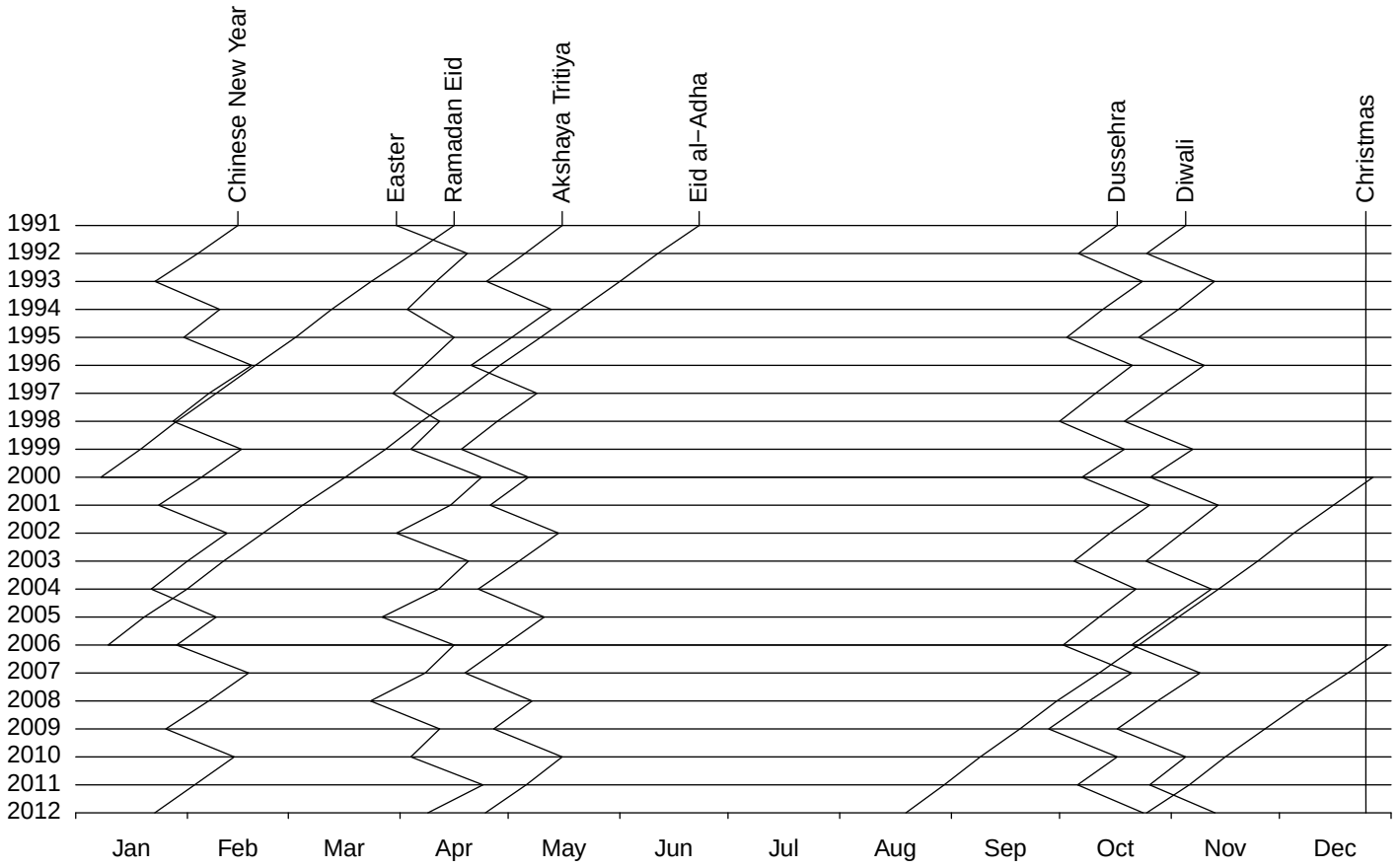
Project 4:
Population Dynamics With Leslie-Type Models

Turkey: Long-run growth and urbanization.



Project 5: Festivals and Gold Prices

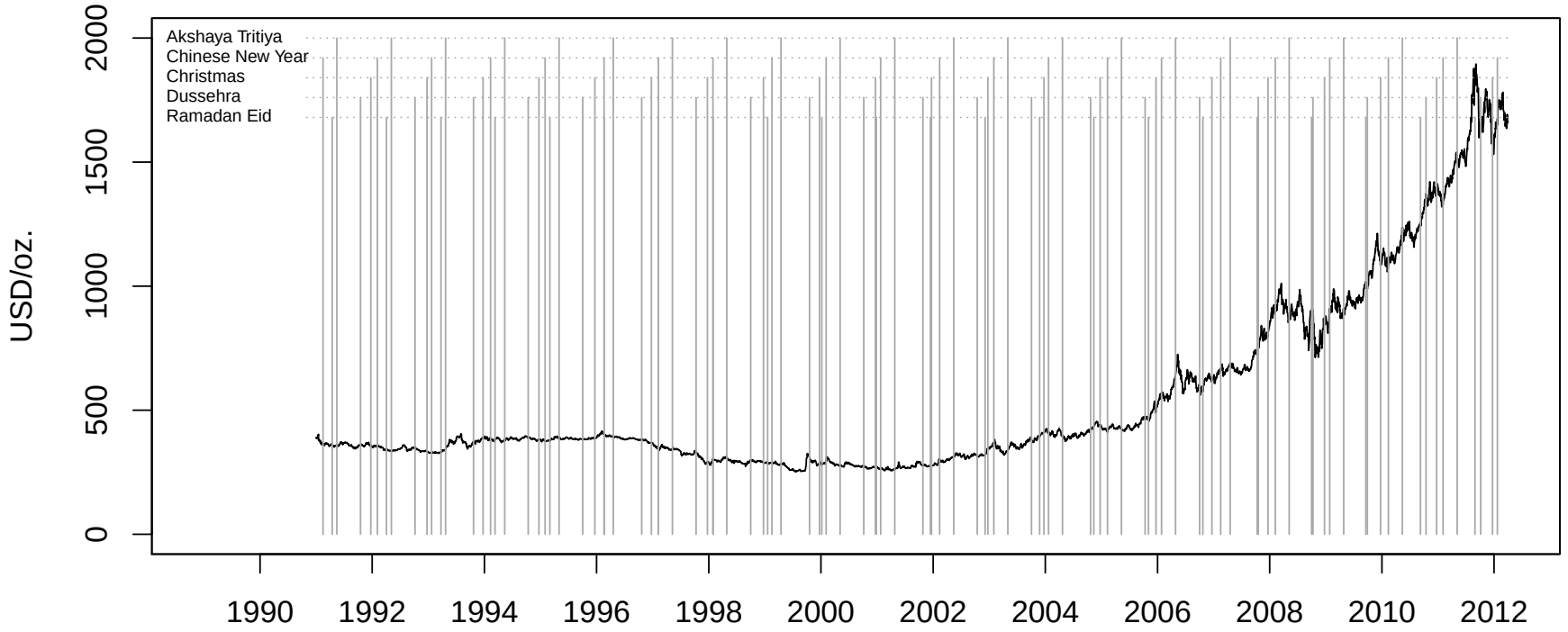
A festival calendar.



. . . and their impact on daily returns on gold?

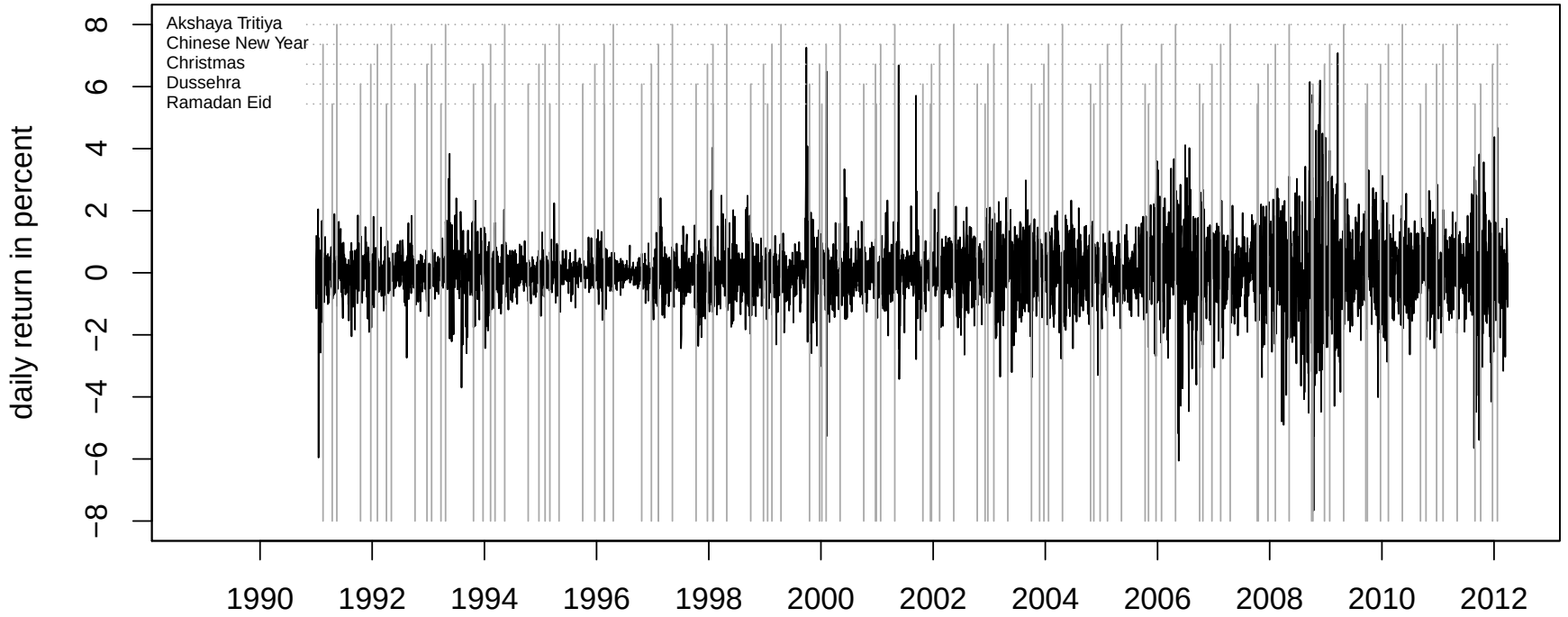
Project 5: Festivals and Gold Prices

Gold prices.



Project 5: Festivals and Gold Prices

Daily returns on prices.



Project 5: Festivals and Gold Prices

The model: regression and GARCH.

$$r_t = c + \nu_t \sqrt{h_t} = c + \epsilon_t \tag{4}$$

$$\nu_t = \eta_t + \sum_i b_i \, d_{it} \tag{5}$$

$$h_t = \alpha_0 + \alpha_1 \, \epsilon_{t-1}^2 + \beta \, h_{t-1} + \sum_i \gamma_i \, d_{it} \tag{6}$$

- Summation is over festivals.
- (r_t): series of daily returns on gold price
- (d_{it}): (extended) dummy variables for festival i
- (η_t): Gaussian white noise with $\mathrm{var}(\nu_t) = 1$
- b_i, γ_i: parameters quantifying the impact of festival i

Project 5: Festivals and Gold Prices

Some findings (details not shown here).

	impact on. . .	
festival	expectation	volatility
Akshaya Tritiya	*	*
Chinese New Year	*	
Christmas	*	*
Diwali		
Dussehra	*	
Easter	*	
Eid al-Adha	*	
Ramadan Eid	*	*