estudy2: an R package for the event study

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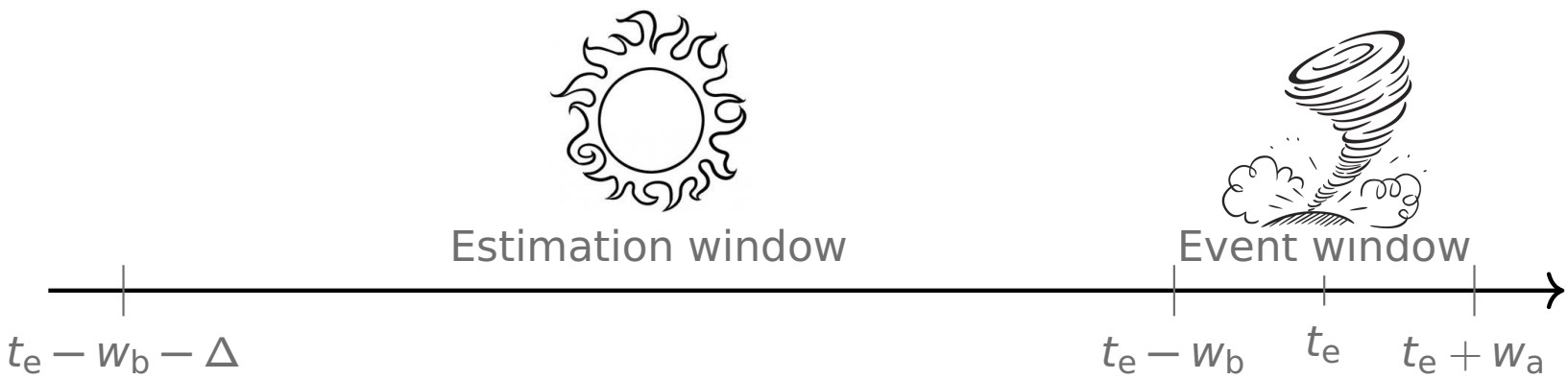
Introduction

Definition:
Event study is a statistical toolbox that allows to examine the impact of certain events on the stock valuation of a company(-ies).

Methodology (starting point)

- N securities (stocks of insurance companies)
- t_{e}: the day of the event
- Parameters:
  - Δ: the length of the estimation window
  - w_{b}: the # of days before the event
  - w_{a}: the # of days after the event



Methodology (market models)

- Adjusted mean-returns model
  $R_{i,t} = \bar{R}_i + \epsilon_{i,t}$ $\qquad A_{i,t} = R_{i,t} - \bar{R}_i$
- Adjusted market-returns model
  $R_{i,t} = R_{M,t} + \epsilon_{i,t}$ $\qquad A_{i,t} = R_{i,t} - R_{M,t}$
- Single-index market model
  $R_{i,t} = \alpha_i + \beta_i \cdot R_{M,t} + \epsilon_{i,t}$ $\qquad A_{i,t} = R_{i,t} - \hat{\alpha}_i - \hat{\beta}_i \cdot R_{M,t}$

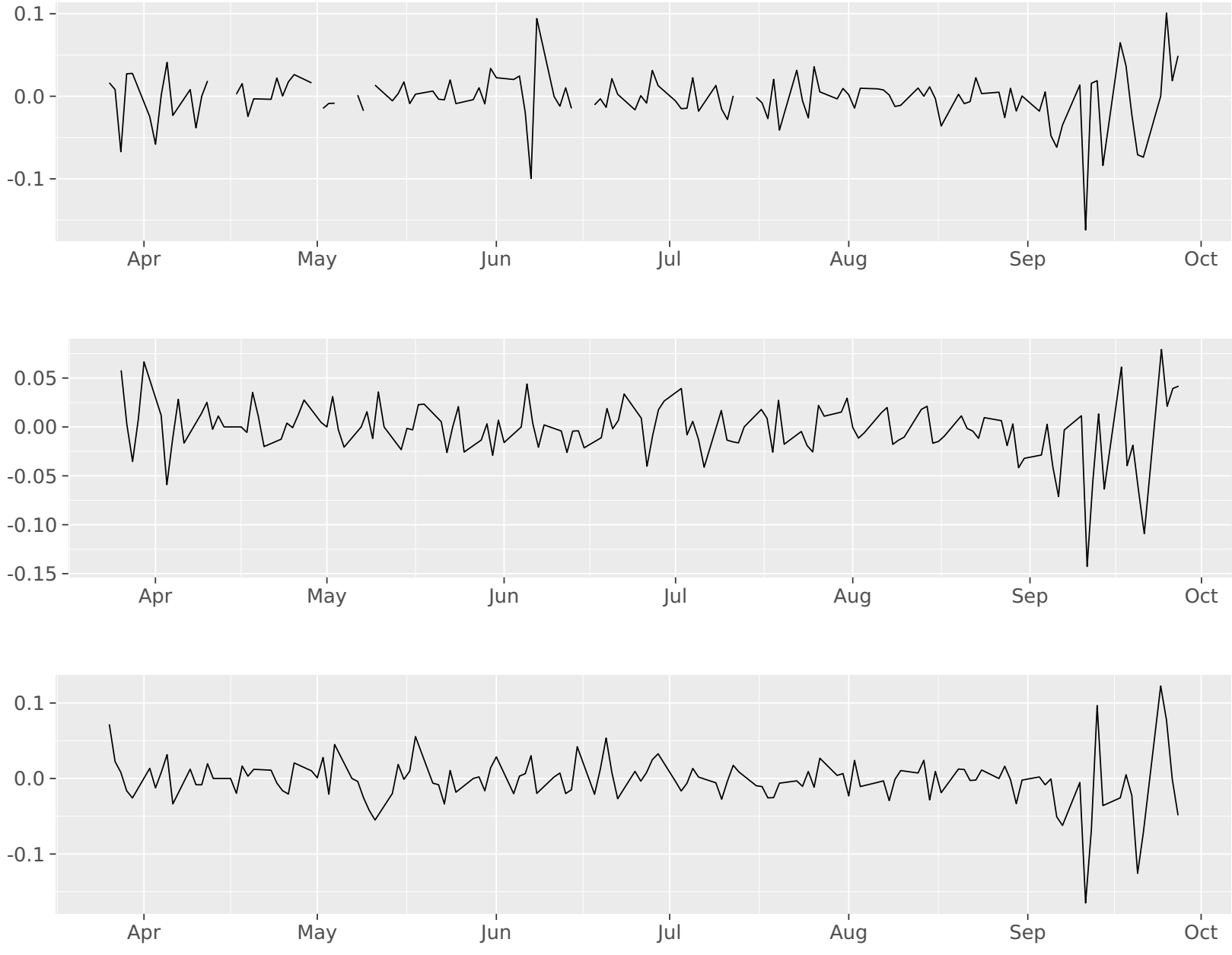
Methodology (statistical tests)

- Parametric tests:
  - Student's *t*-test
  - Brown and Warner (1980)
  - Brown and Warner (1985)
  - Patell (1976)
  - Boehmer et al. (1991)
  - Lamb (1995)
- Nonparametric tests:
  - Sign test
  - Generalized sign test
  - Corrado and Zivney (1992)
  - Rank test
  - Modified rank test
  - Wilcoxon signed-rank test

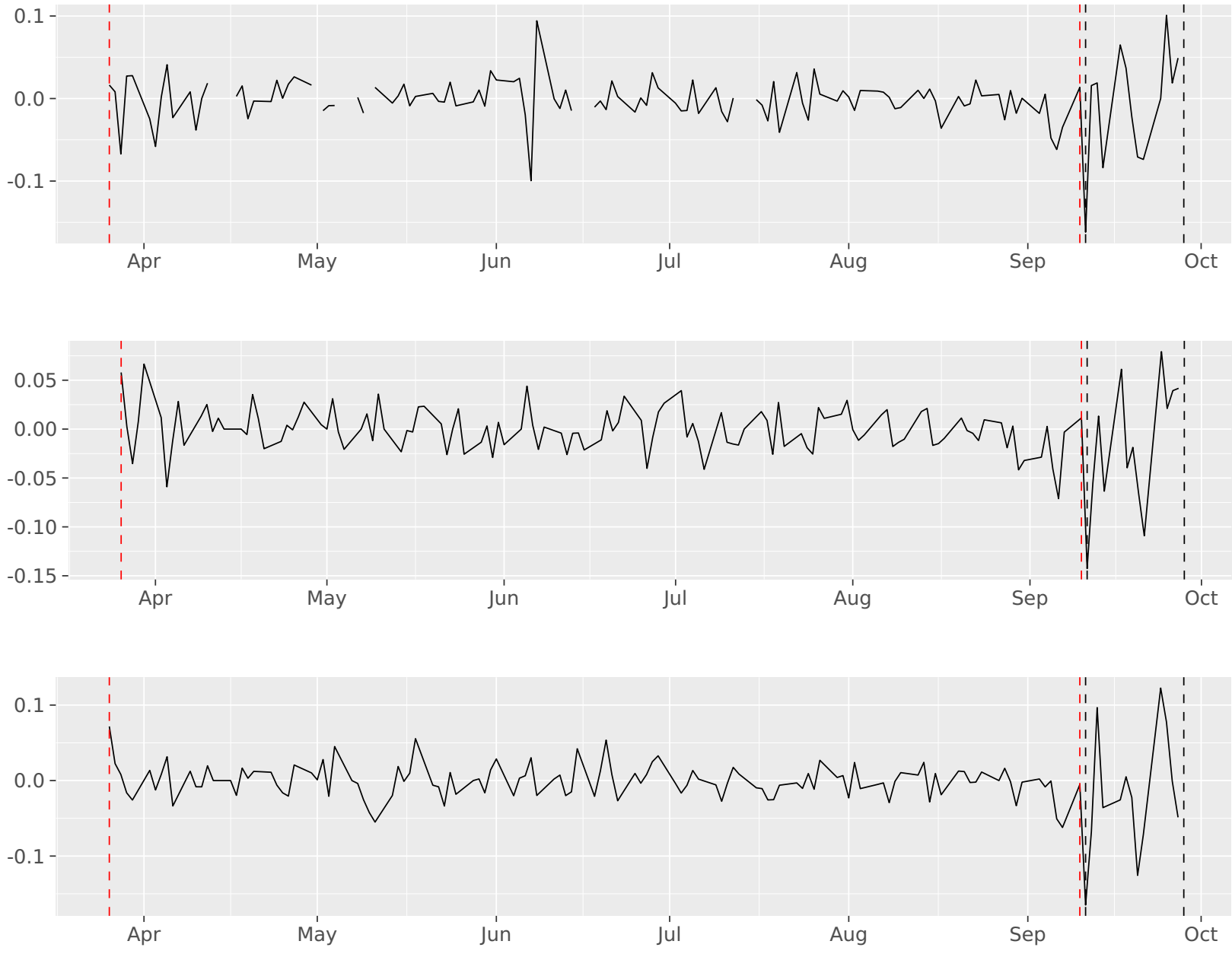
An example of event study: 9/11 terrorist attacks

- 31 European non-life companies
  17 FL, 10 P&C, 4 Re
- $\Delta = 120$, $w_b = 0$, $w_a = 17$
- Single-index market model with STOXX Global 1800 as proxy is used

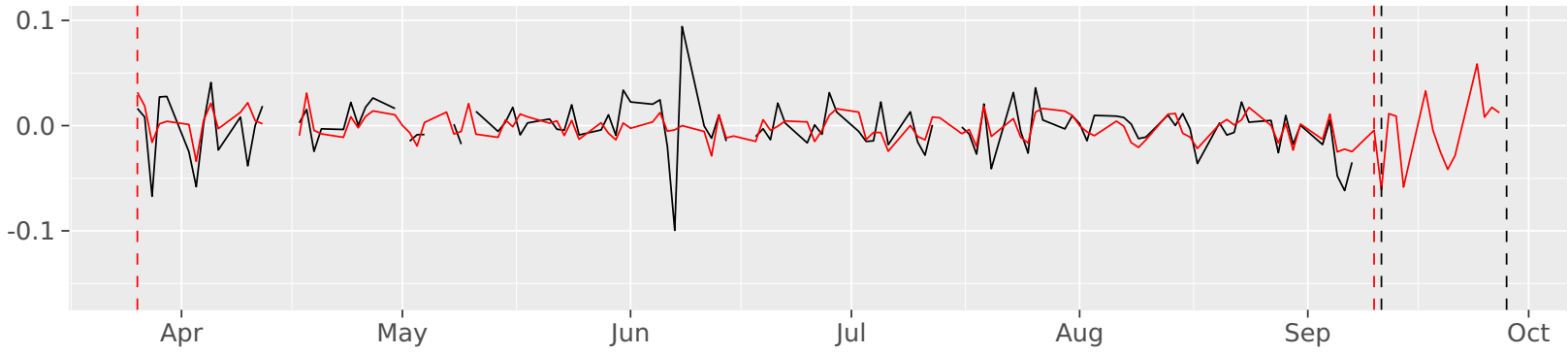
An example...(cont.)



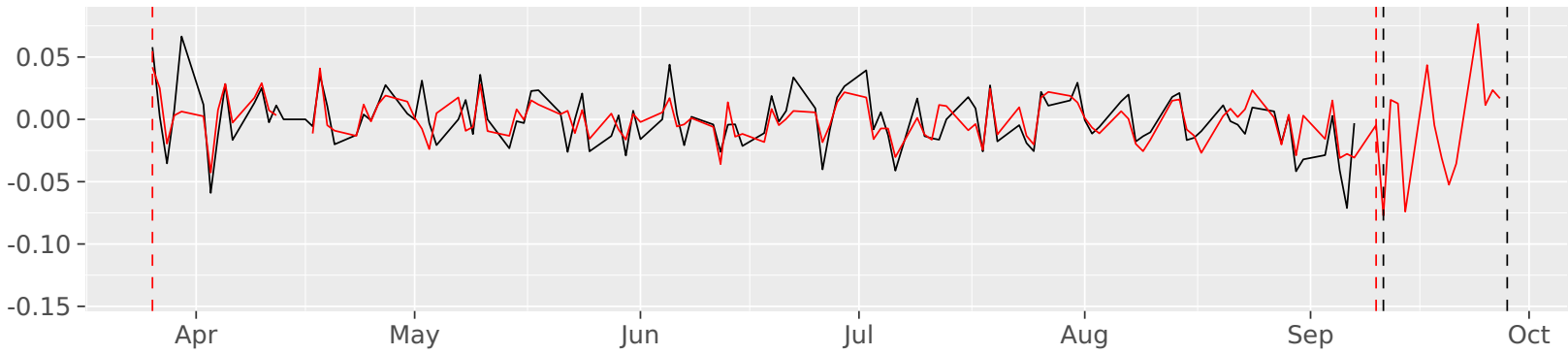
An example...(cont.)



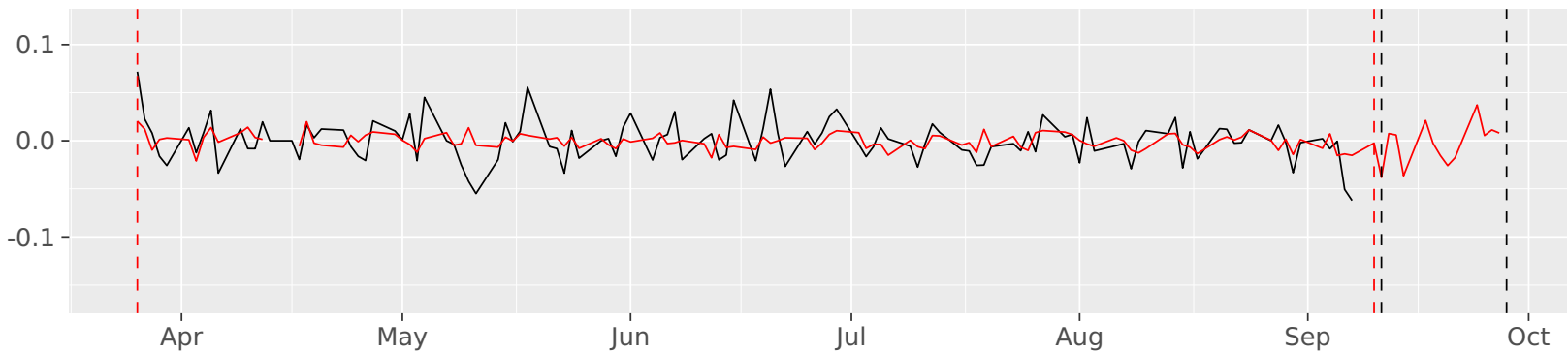
An example...(cont.)



$$R_{1,t} = -0.00017 + 0.91709 \cdot R_{M,t} + \epsilon_{i,t}$$

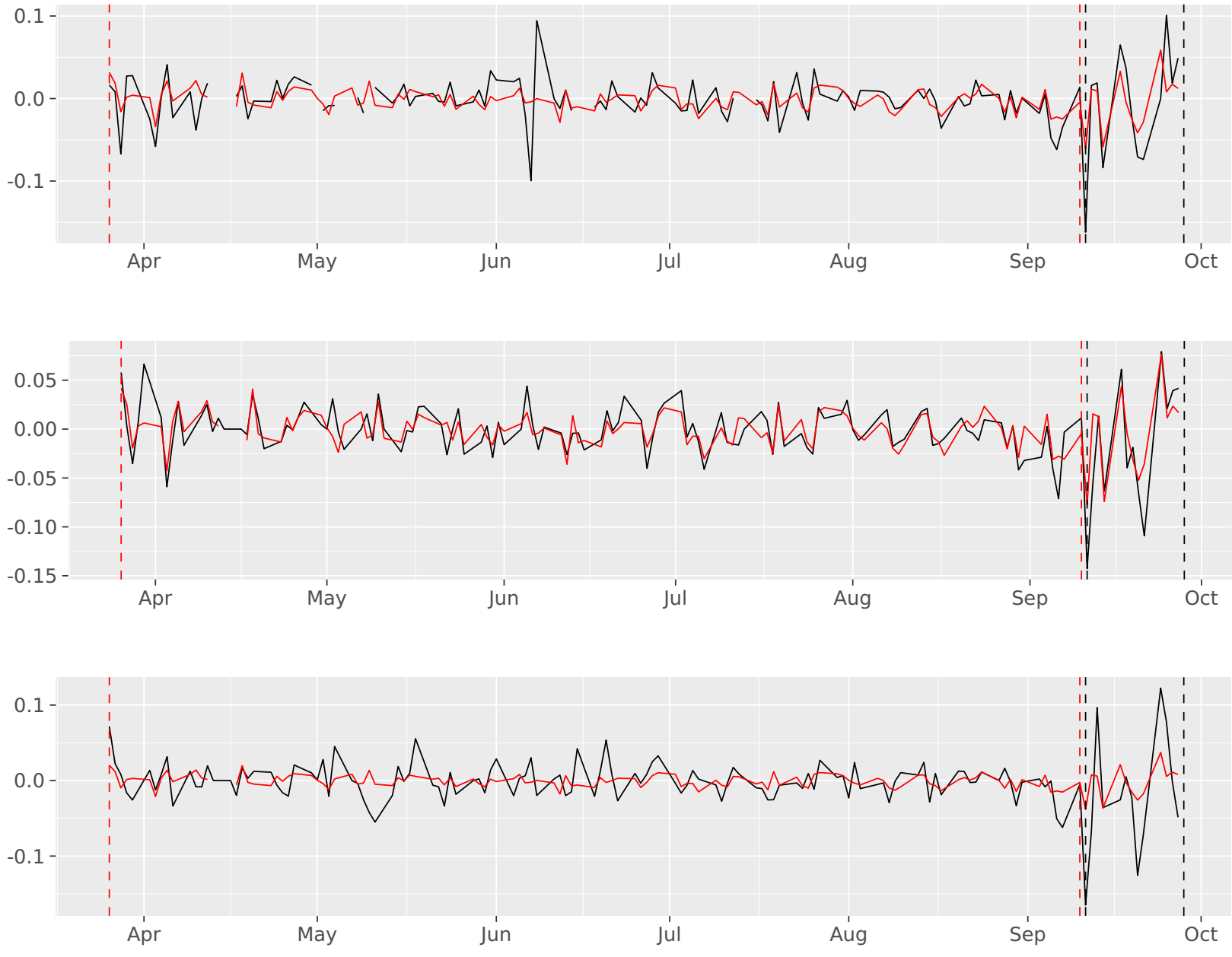


$$R_{2,t} = 0.00086 + 1.17992 \cdot R_{M,t} + \epsilon_{i,t}$$

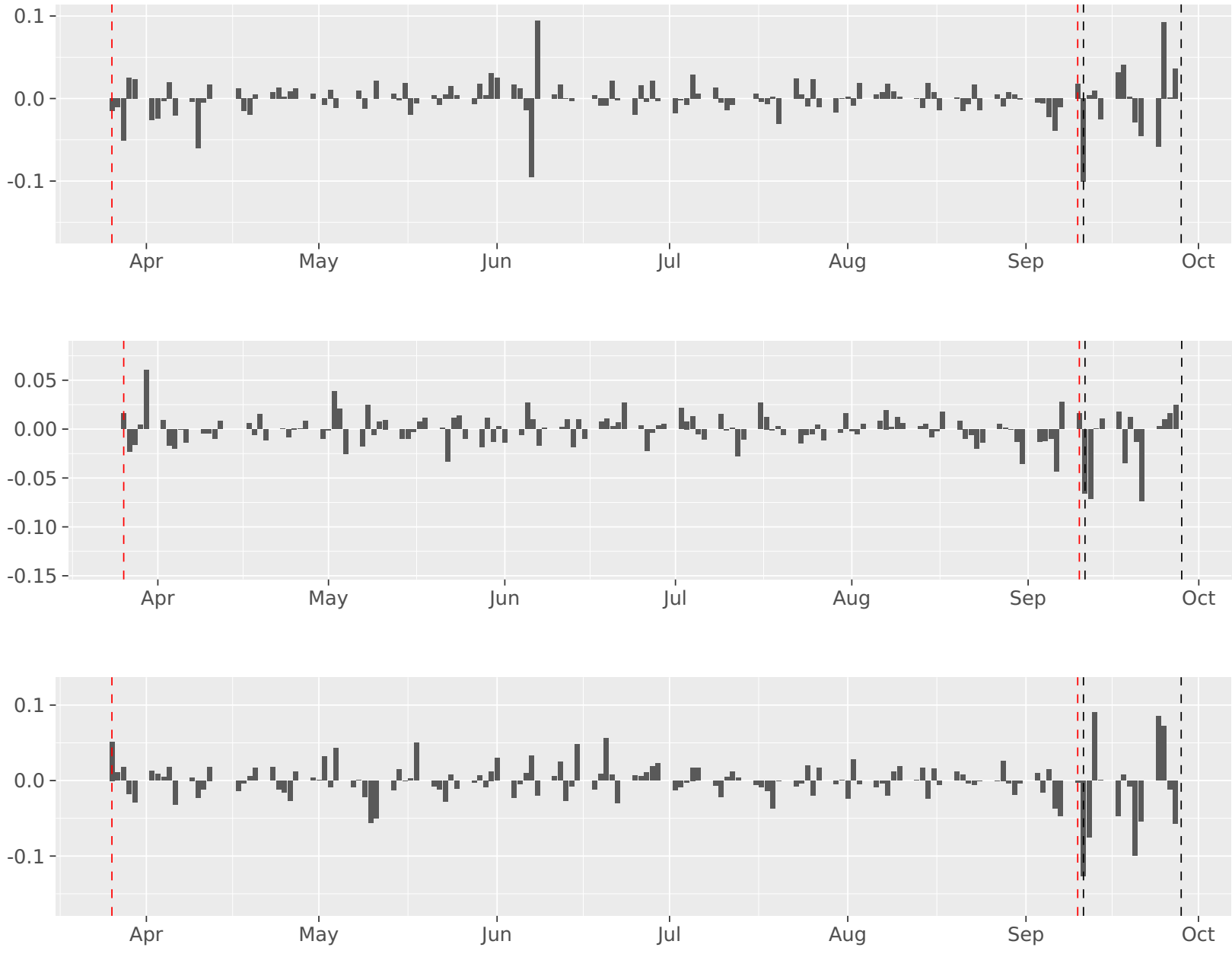


$$R_{31,t} = 0.00020 + 0.57736 \cdot R_{M,t} + \epsilon_{i,t}$$

An example...(cont.)



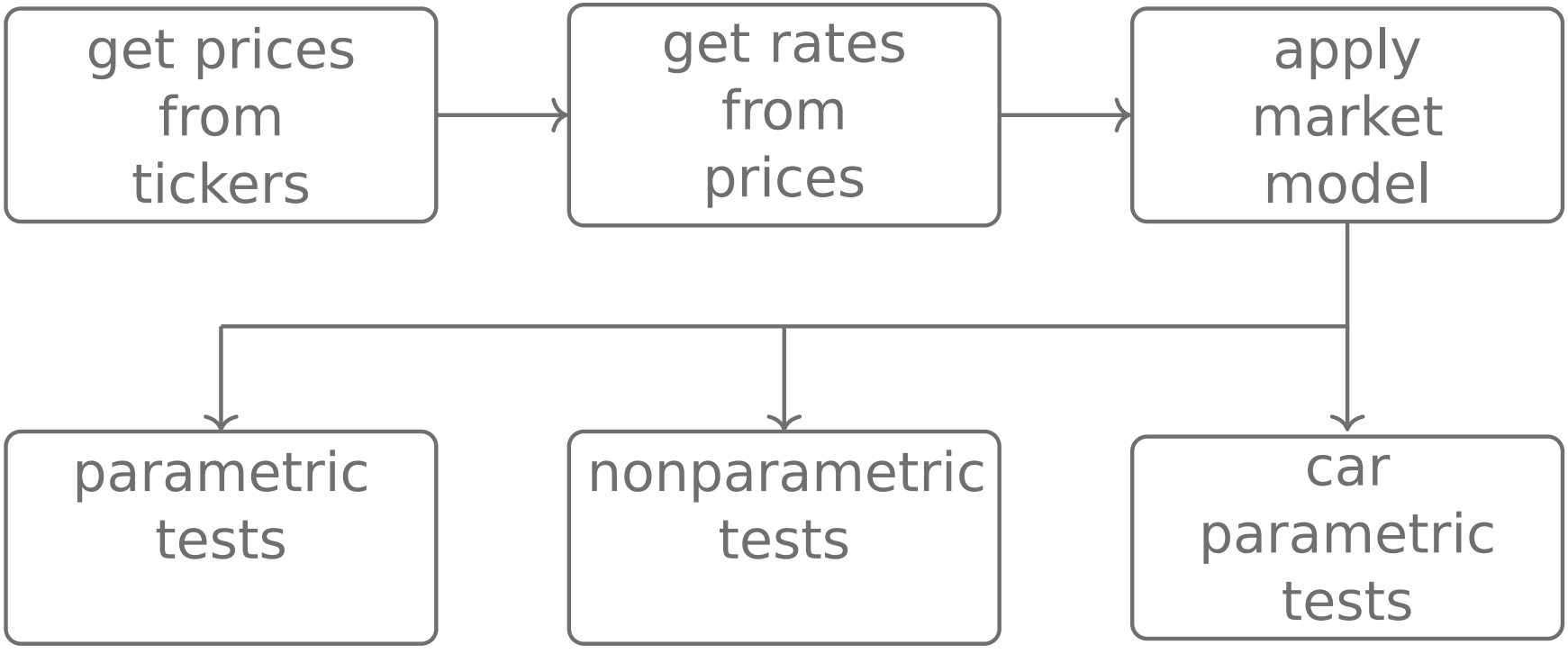
An example...(cont.)



Existing commercial solutions

- eventstudymetrics.com
- eventstudytools.com
- eventstudy.com*

github.com/irudnyts/estudy2



Code snippet (example from help file)

```
tickers <- c("ALV.DE", ...,"TOP.CO")
prices <- get_prices_from_tickers(tickers,
      start = as.Date("2000-01-01"),
      end = as.Date("2002-01-01"),
      quote = "Close", retclass = "list")
rates <- get_rates_from_prices(prices,
      quote = "Close", multi_day = TRUE,
      compounding = "continuous")
securities_returns <- apply_market_model(
      rates = rates,
      market_model = "mean_adj",
      estimation_start = as.Date("2001-03-26"),
      estimation_end = as.Date("2001-09-10"))
parametric_tests(securities_returns,
      as.Date("2001-09-11"),
      as.Date("2001-09-28"))
```

Our research

Purposes:

- examine the impact of selected shocks and their significance on the stock valuation of insurance companies
- investigate the relation of companies characteristics and the effect caused by such events
- compare different test statistics on the same set of events and firms

> summary(research)

The impact of 13 major catastrophes (6 hurricanes, 3 earthquakes, 2 winter storms, and 2 airline crashes) on 87 listed non-life insurer have been analyzed:

- There is no clear pattern in stock responses to catastrophes
- North American and Western European companies behave differently
- Only for several events the market capitalization is the essential characteristic, which influence the reaction
- Reinsurance companies are the most sensitive to the catastrophe events

Thank you!