Measuring economic uncertainty using news-media textual data

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Motivation

- Uncertainty affects economic decision-making
- But is unobservable, and existing proxies have drawbacks
- News-media measures promising (Baker, Bloom, Davis, 2015) but need further development and characterisation

Contribution of this paper

Theory of measurement

Refined methodology

Comparison to stock volatility

Conclusions

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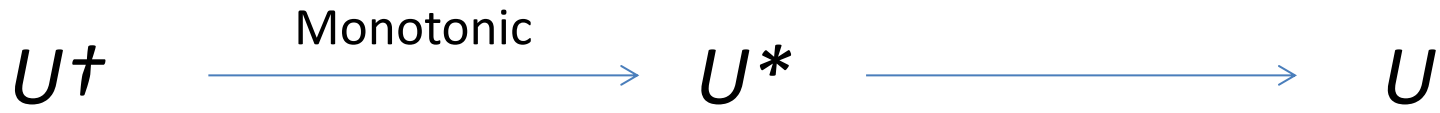
$$U \equiv \frac{\text{\# of articles containing keyphrase(s)}}{\text{total \# of articles in FT}}$$

What is *U* measuring?



Intensity of the **cognitive state** of uncertainty

Propensity to <u>express</u> uncertainty in natural language

Frequency of <u>expressions</u> of uncertainty in natural language

U as an unbiased, consistent estimator of U*
Articles = independent Bernoulli trials
Success = article expresses uncertainty
Pr(Success) = U*
→ *U* ~ scaled Poisson binomial with mean *U**

Noise-to-signal ratio:

Daily	0.87
Weekly	0.21
Monthly	0.05
Annual	0.01

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Uncertainty keyphrases: baseline

- {“uncertain”, “uncertainty”, “uncertainties”}
- Including “uncertainties” boosts signal by 14% without material noise increase
- Measurement error should be modest *a priori*
  - Fairly compact semantic space
  - Semantics stable over time
  - Negation is rare because already self-negated

Uncertainty keyphrases: extensions?

Added keyphrase	Gain in U	Correlation with baseline (monthly)
unclear*	23%	0.51
not clear*	14%	no data
unpredictabl*	7%	0.59
not sure*	7%	0.47
unsure*	4%	0.45
not certain*	1%	0.38
not predictabl*	0%	0.05
all the above	**54%**	**no data**
risk*	238%	no data

For data availability reasons I stick to “uncertain*”
Advantage of a relatively ‘clean’ measure

Isolating economic uncertainty

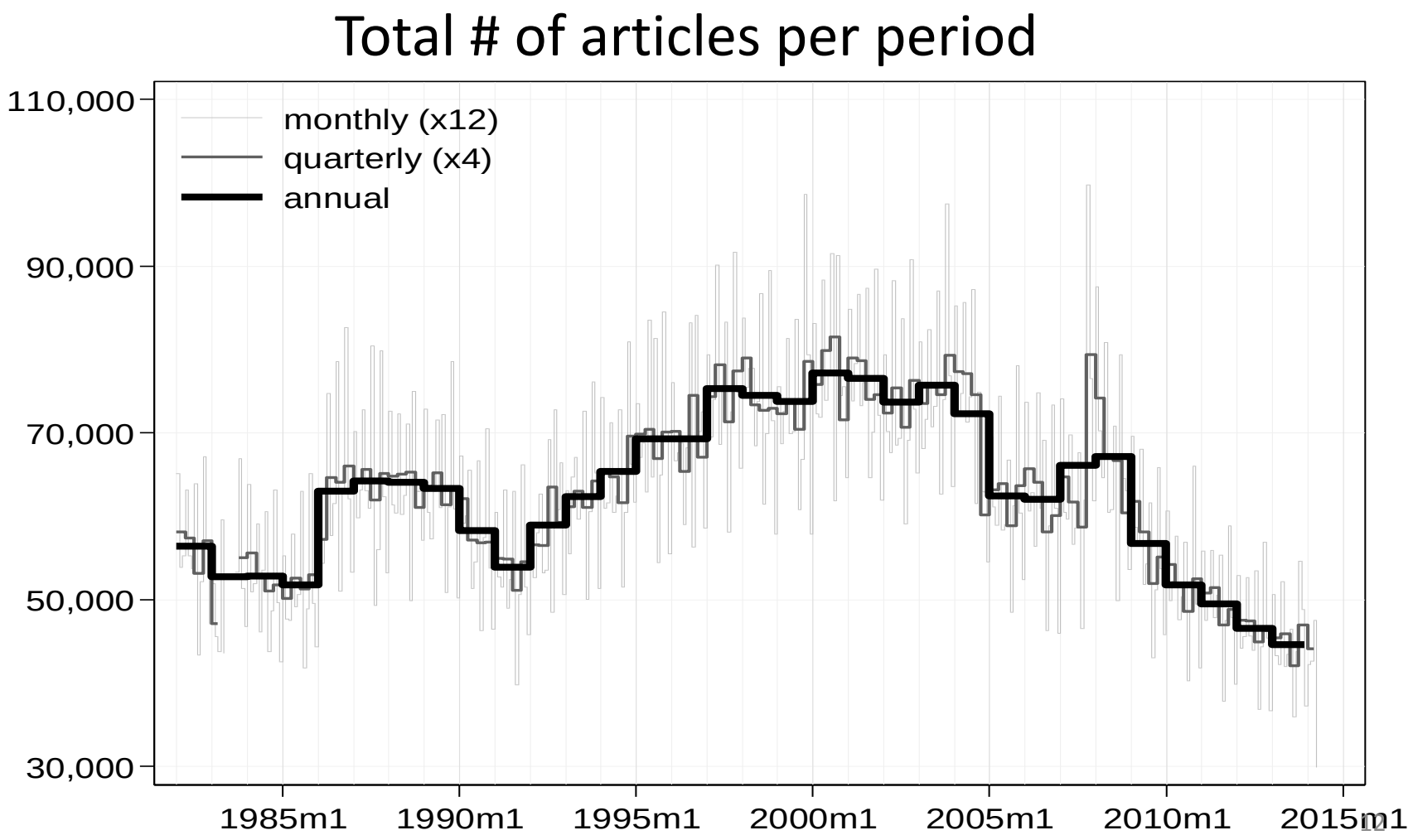
- Literature using generalist newspapers has to filter out non-economic articles
  - Typically only use articles containing “economic” or “economy”
- Unnecessary with FT
  - Almost all articles have an economic angle
  - May even give stronger signal than subset of articles from multiple generalist papers

% of “uncertain*” articles that do NOT contain “economic” or “economy” but DO contain…	
financ*	66%
bank*	34%
debt*	14%
credit*	15%
bond*	11%
equity | equities	16%
money*	18%
business*	38%
profit*	30%
earnings*	15%
revenue*	11%
wage*	2%
government*	36%
politic*	19%
policy*	13%
Eurozone	2%
oil	10%
gas	6%
coal	2%
any of the above	**95%**

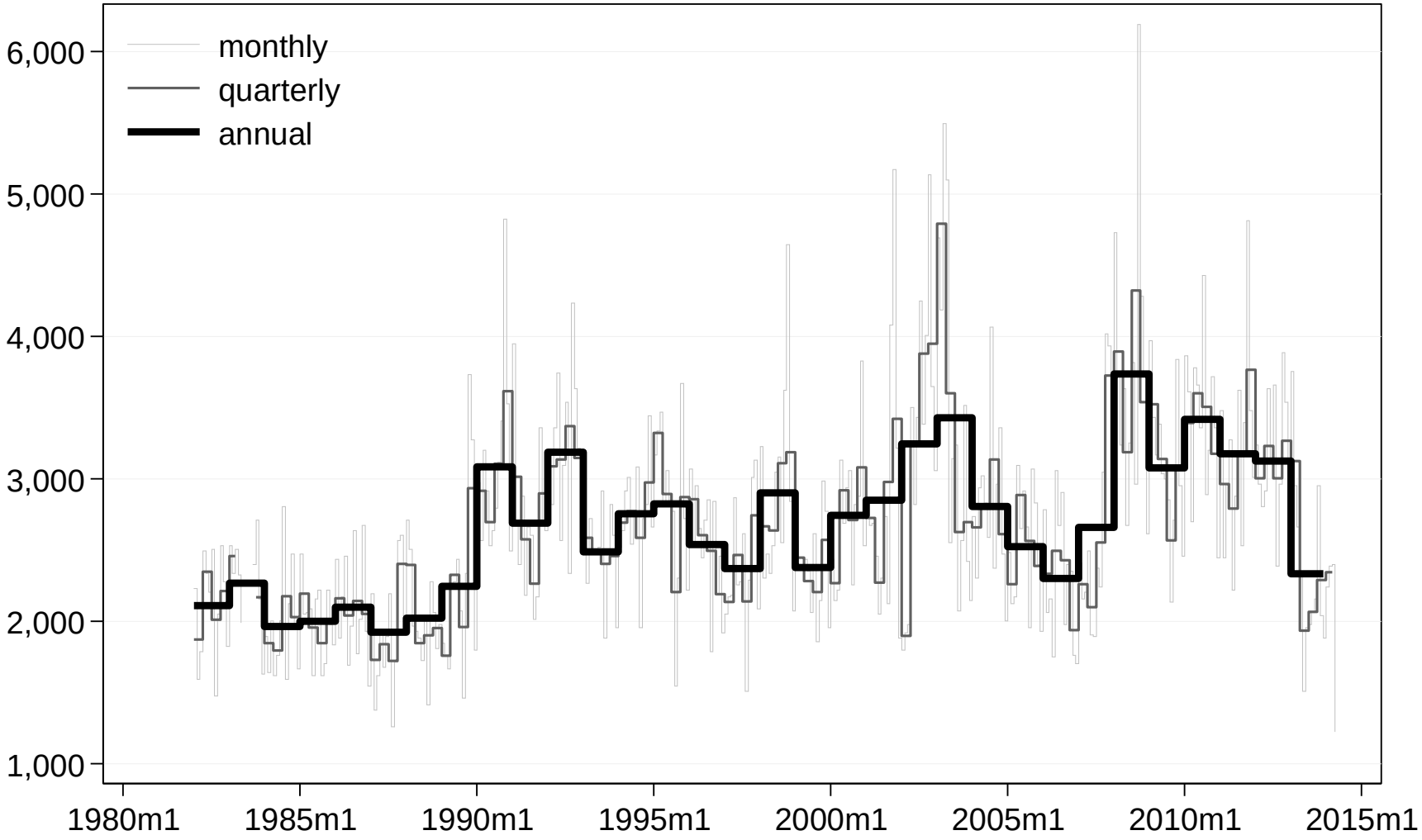
De-duplication

Ratio of daily FT record counts in Factiva vs. Nexis UK

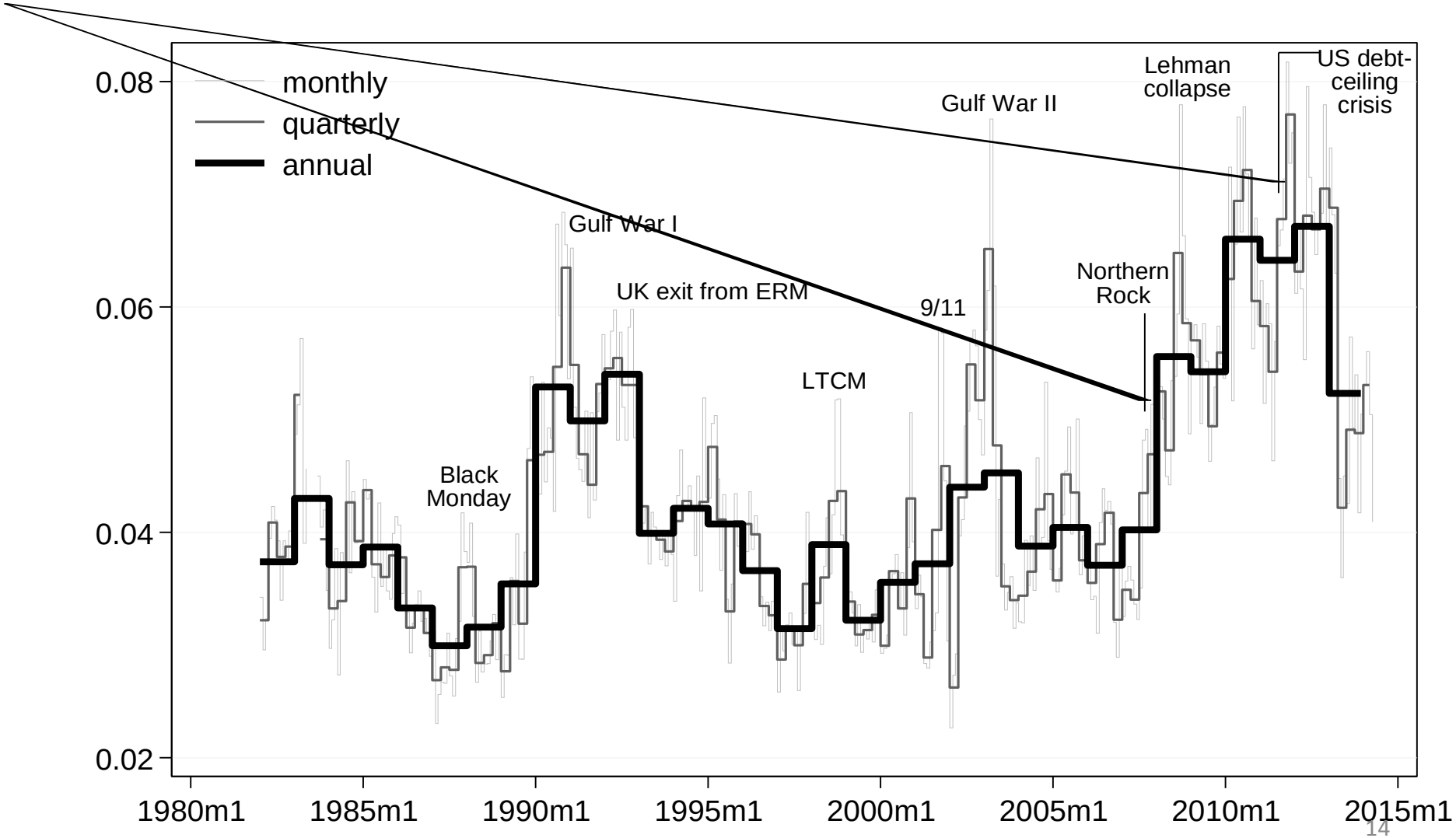
Normalising by news volume



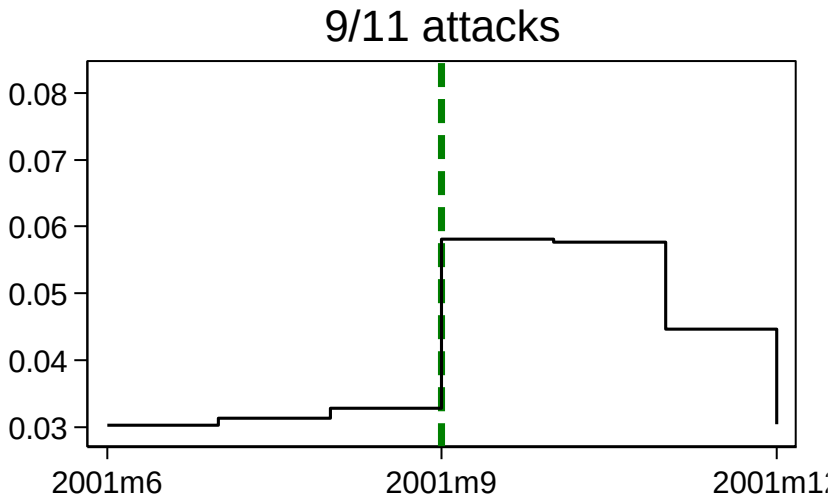
Without normalisation (numerator of *U*)

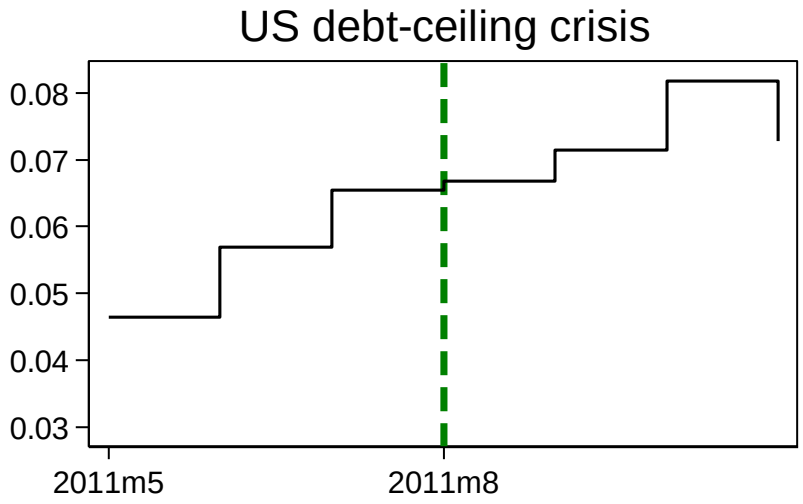


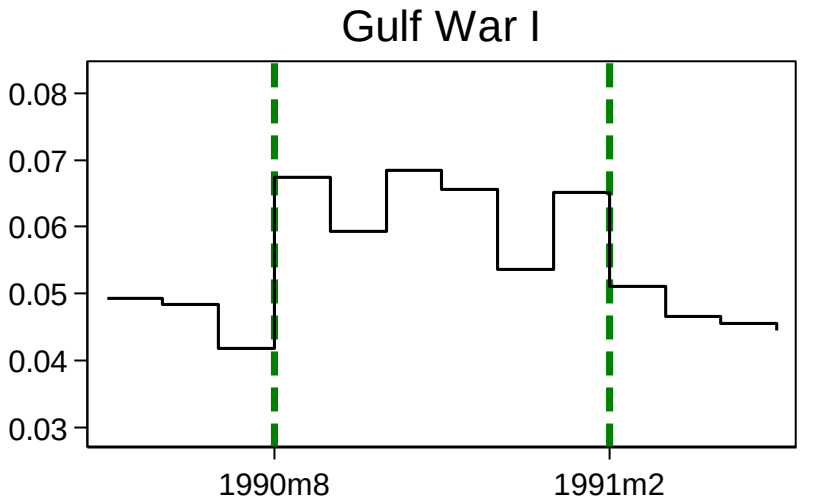
With normalisation (news-media uncertainty, *U*)

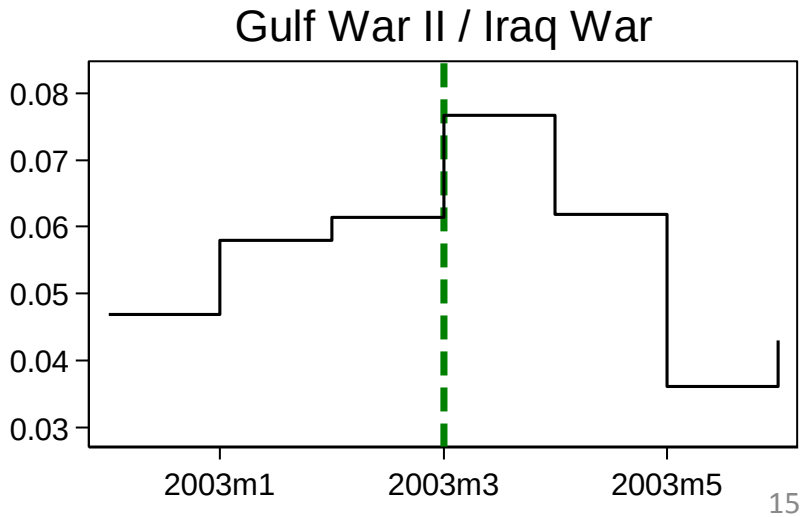


Moves around major narrative events









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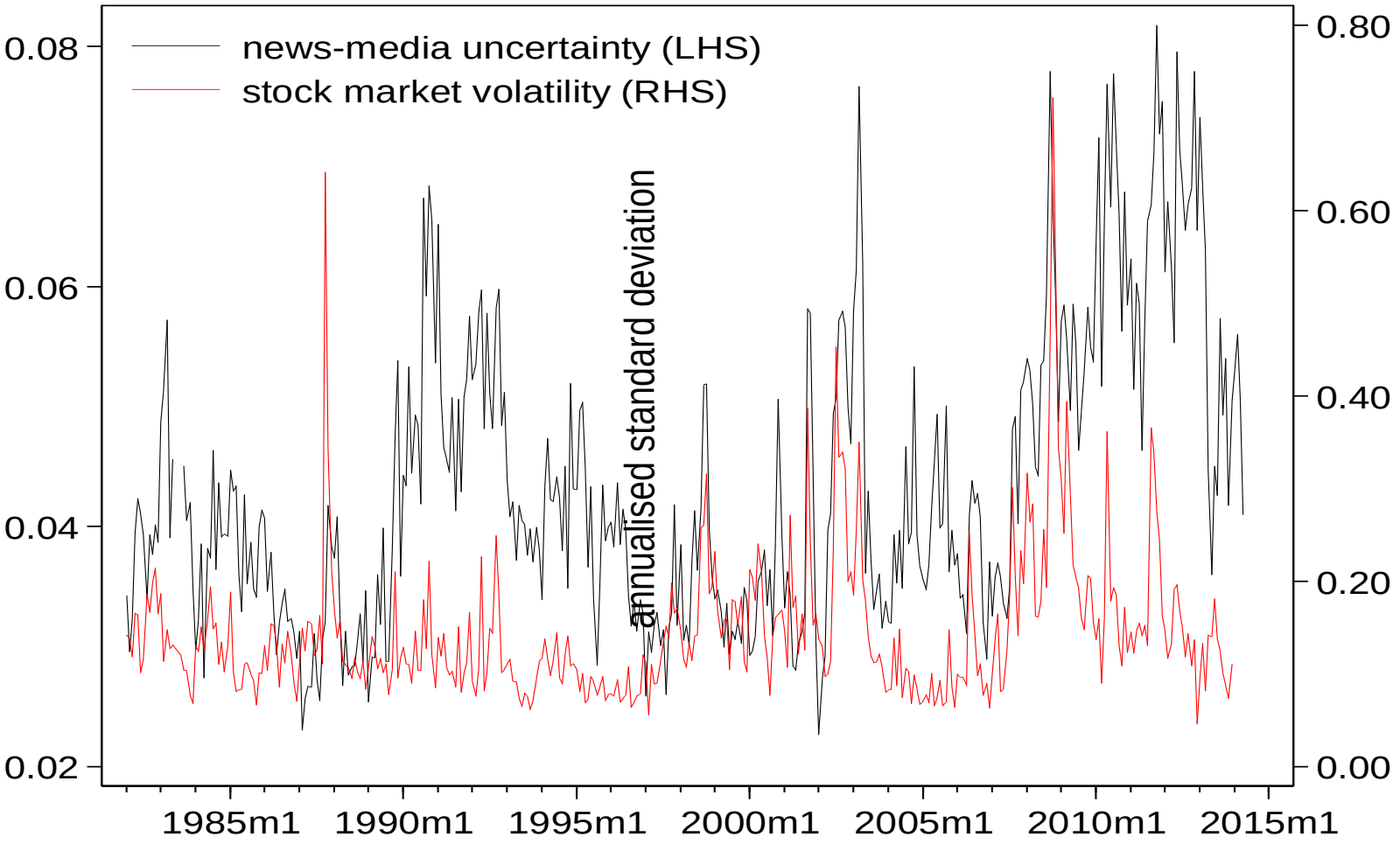
U vs. σ


news-media uncertainty (LHS)
stock market volatility (RHS)
annualised standard deviation
0.08
0.06
0.04
0.02
0.80
0.60
0.40
0.20
0.00
1985m1
1990m1
1995m1
2000m1
2005m1
2010m1
2015m1

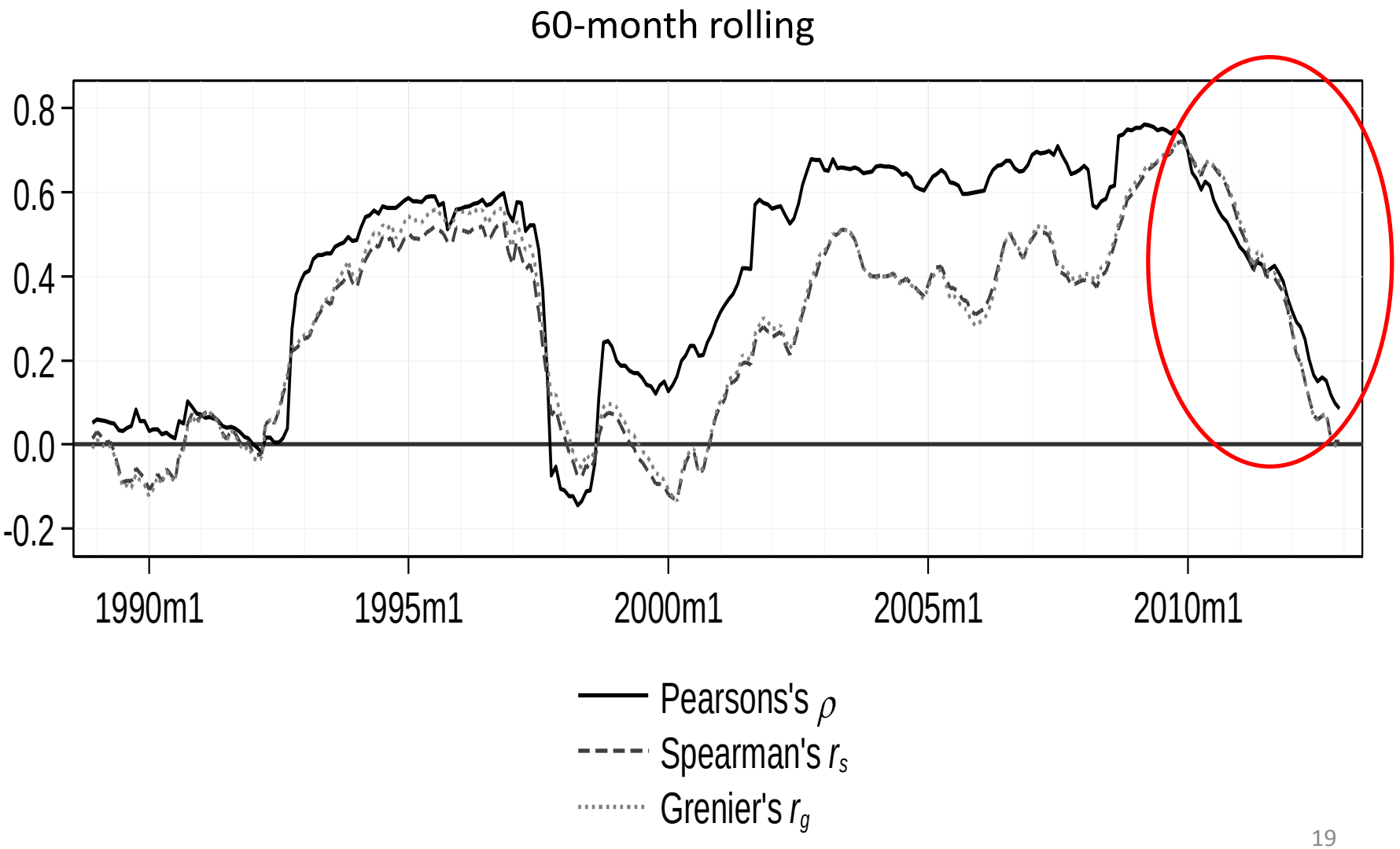
Granger causality tests

- Bivariate daily VAR with RV estimates* of σ (2000-2012)
- $U \nrightarrow \sigma$ [p=0.487 on joint exclusion of all lags]
- $\sigma \rightarrow U$ [p=0.010 on joint exclusion of all lags]
- But markets lead by only one day, consistent with FT being published before markets open

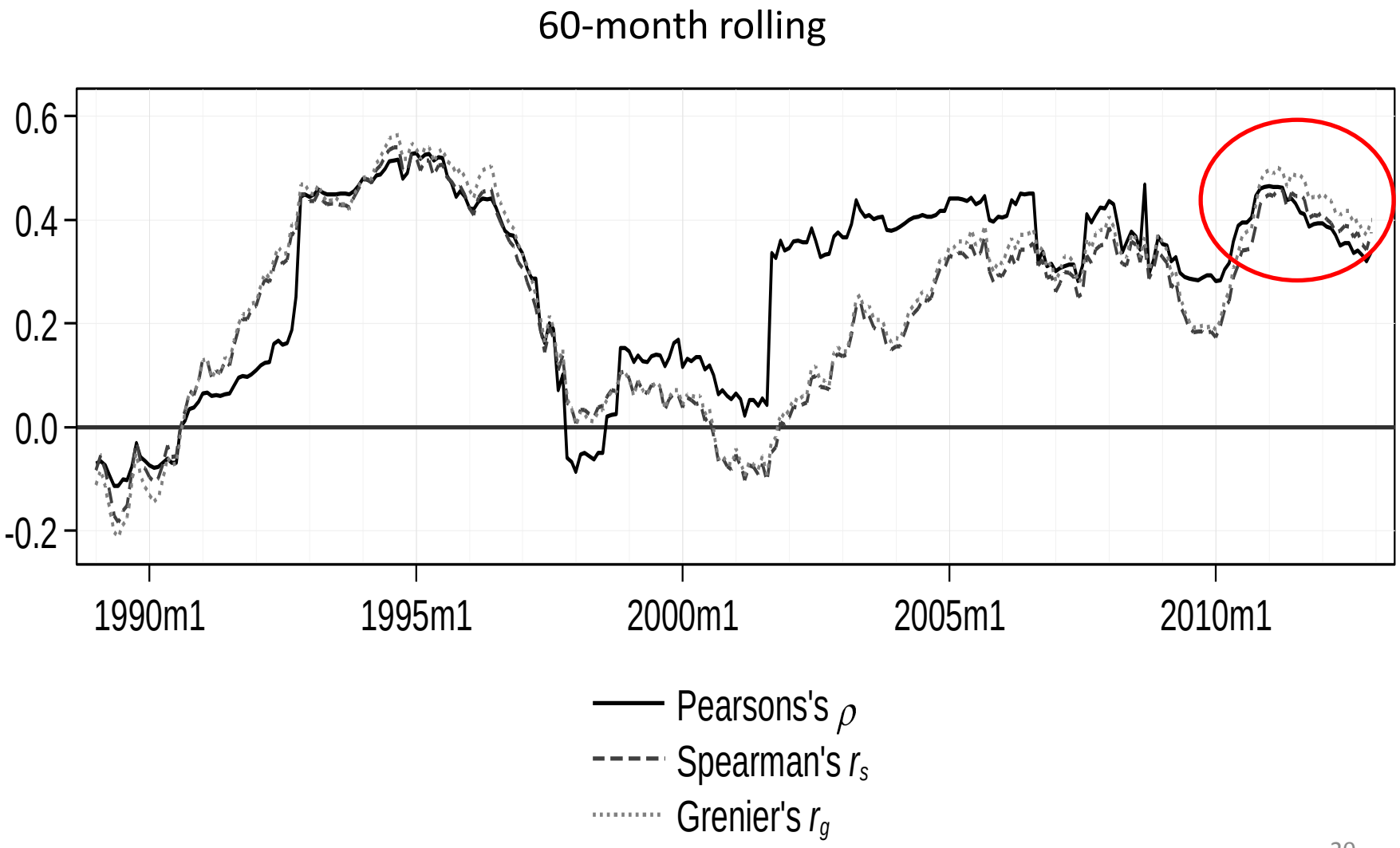
  [p=0.202 for joint exclusion restriction on σ lags 2+]

* Realized volatility (RV) estimates of Heber, Lunde, Shephard, & Sheppard (2009) based on intra-day tick data

Correlation of *U* and *σ*

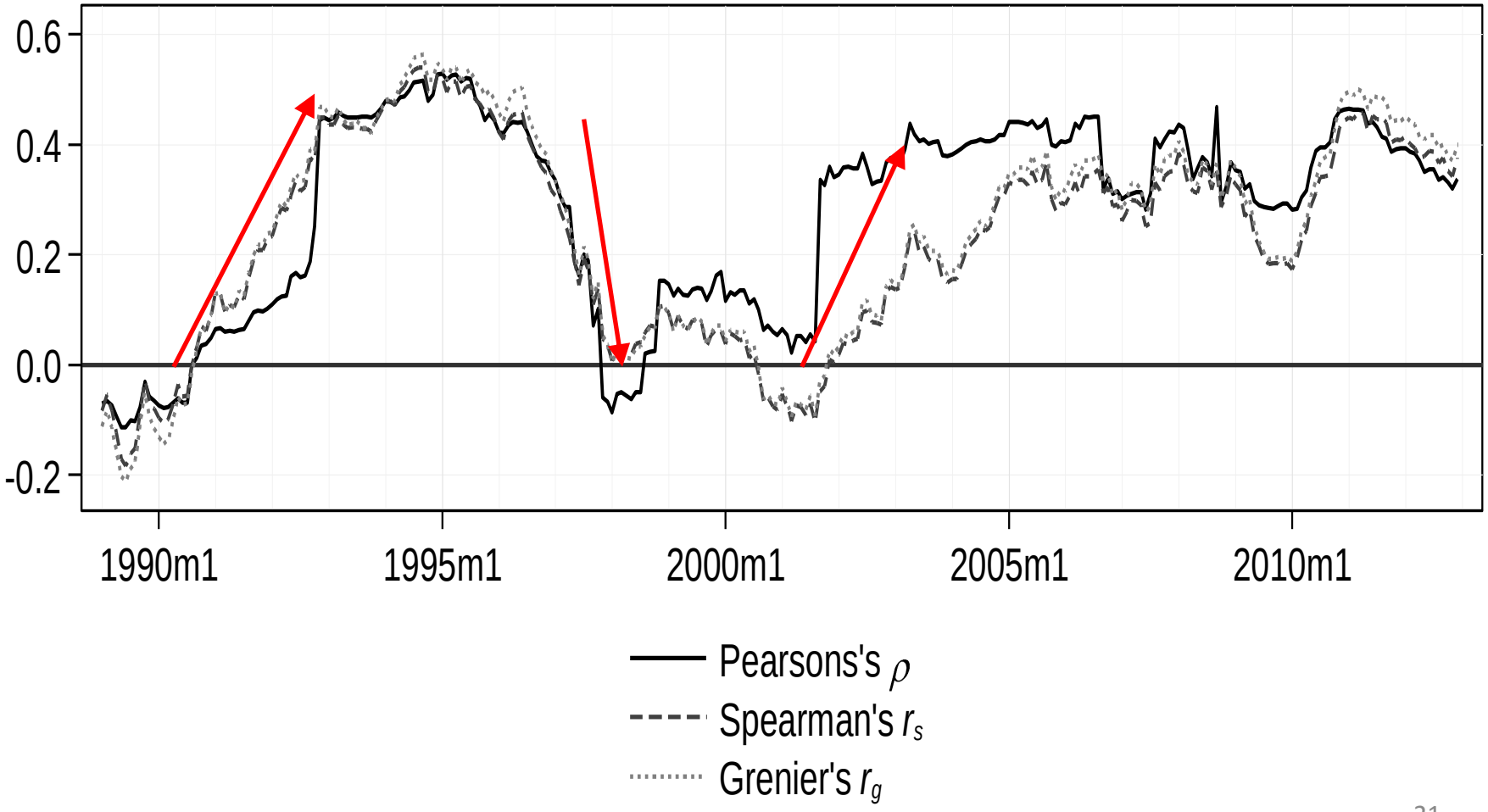


Correlation of ΔU and $\Delta\sigma$



Switching between high and low correlation

60-month rolling



Possible explanation: asymmetry in *U*

- Upside risk not naturally expressed as “uncertainty”
- Whereas σ treats upside and downside symmetrically
- Circumstantial evidence consistent with hypothesis
  - Correlation lower when perceived risk more skewed to the upside, e.g. in booms
  - Correlation higher when downside risk is higher, which under our hypothesis will be when U (or $|\Delta U|$) is larger.

    Consistent with this, correlation is 0.331 for U above its median vs. 0.076 below. Similar result with $|\Delta U|$, and not for placebo with σ above vs. below its median.

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- Theory of measurement clarifies what we are measuring, and how much noise to expect
- Some simple methodology refinements give material reduction in measurement error
- Others are shown to have a modest impact, which gives greater confidence in the apparently simplistic approach of counting small numbers of keywords
- Relationship between U and σ is time-varying . We proposed an explanation for further testing.

Questions?

Key references

- **Alexopolous & Cohen (2009).** "Uncertain times, uncertain measures." *University of Toronto Department of Economics*
- **Baker & Bloom (2013).** "Measuring Economic Policy Uncertainty." *www.policyuncertainty.com*
- **Bekaert et al (2009).** "Risk, uncertainty and asset prices." *Journal of Financial Economics*
- **Bloom (2014).** "Fluctuations in Uncertainty." *Journal of Economic Perspectives*

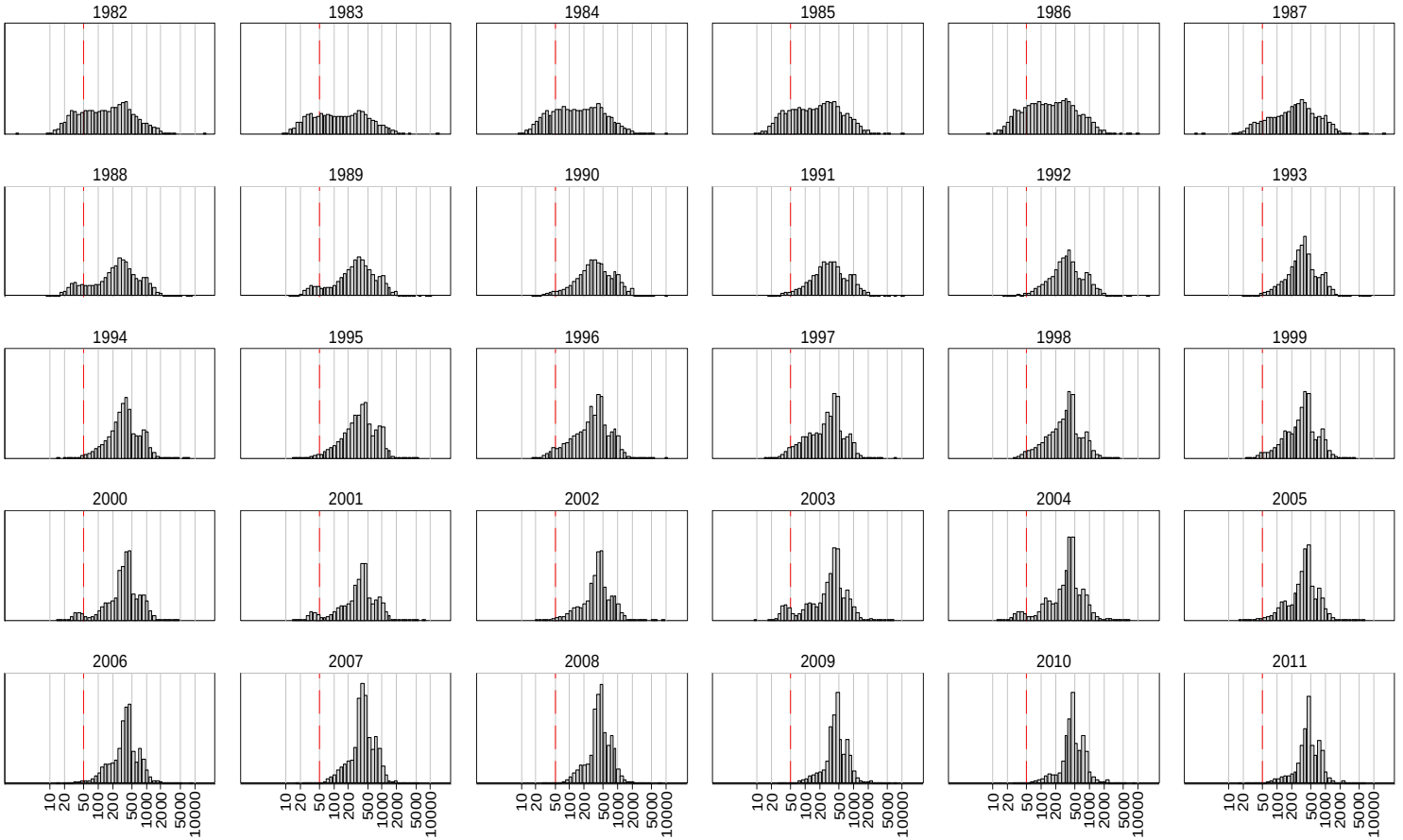
APPENDIX

U as an estimator of *U**: sampling noise in finite samples

- Discretisation grid c. 0.005 at daily frequency (c. 200 articles)
- cf. mean[U] ~ 0.04, sample var[U] ~ 0.01-0.02
- Estimated noise-to-signal ratio (using model-based partition of *U*)
  - Daily: 0.871
  - Weekly: 0.205
  - Monthly: 0.054
  - Annual: 0.006

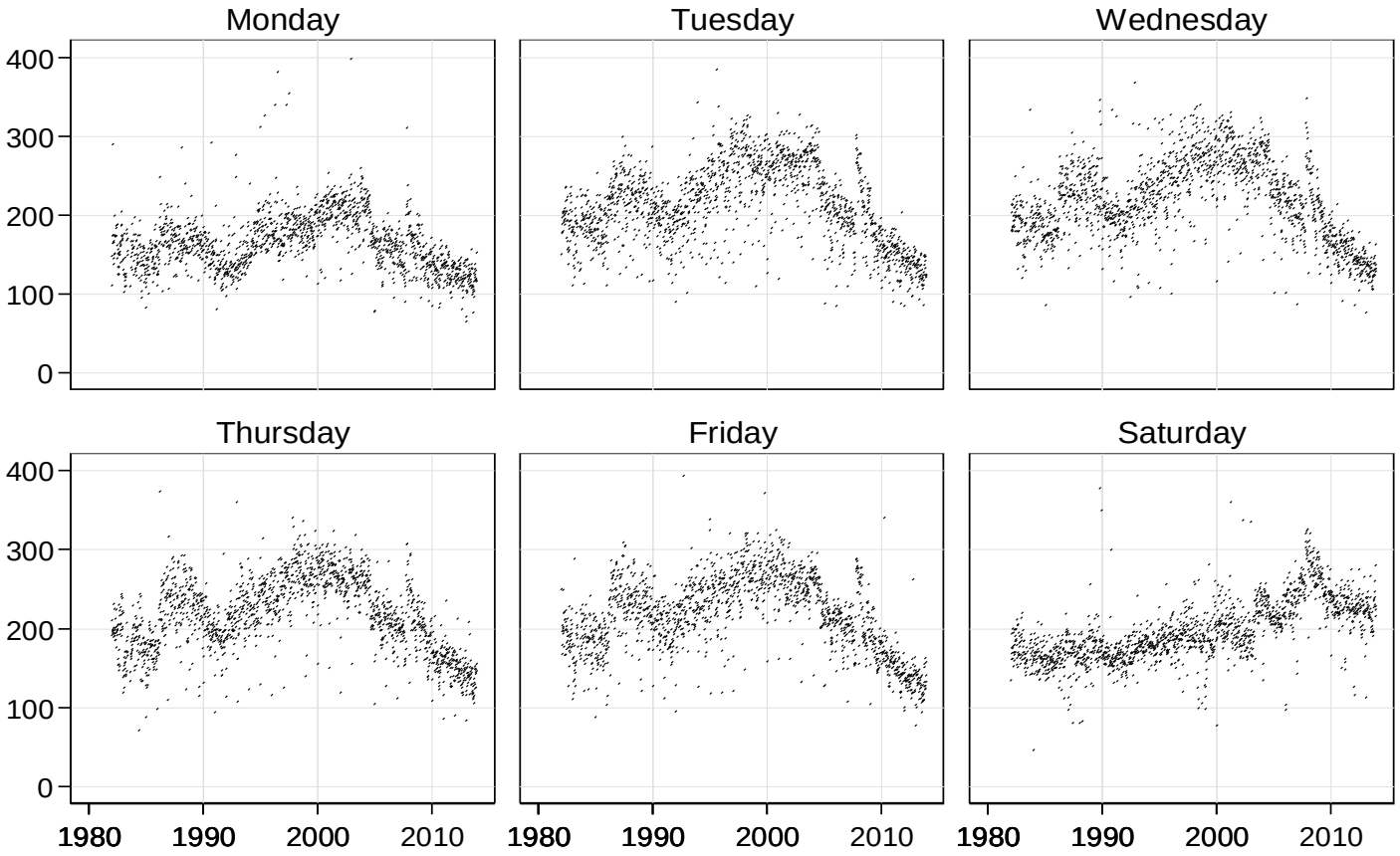
$$\frac{Var_{U-U^*|n}[U-U^*|n]}{Var_{U^*|n}[U^*|n]}$$

Article length: secular variation in the distribution



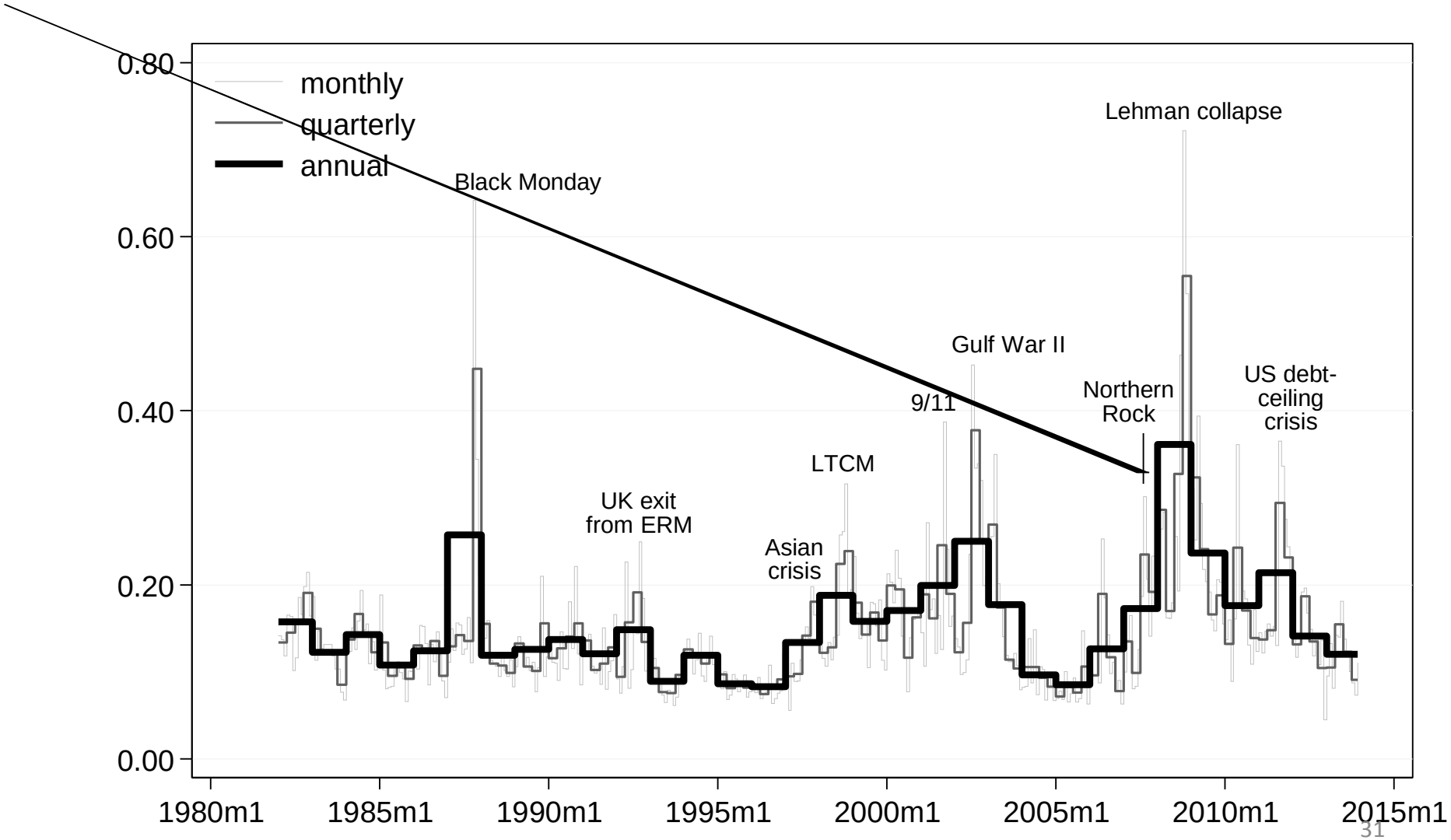
article word count (log scale)

News volumes: day-of-week seasonality

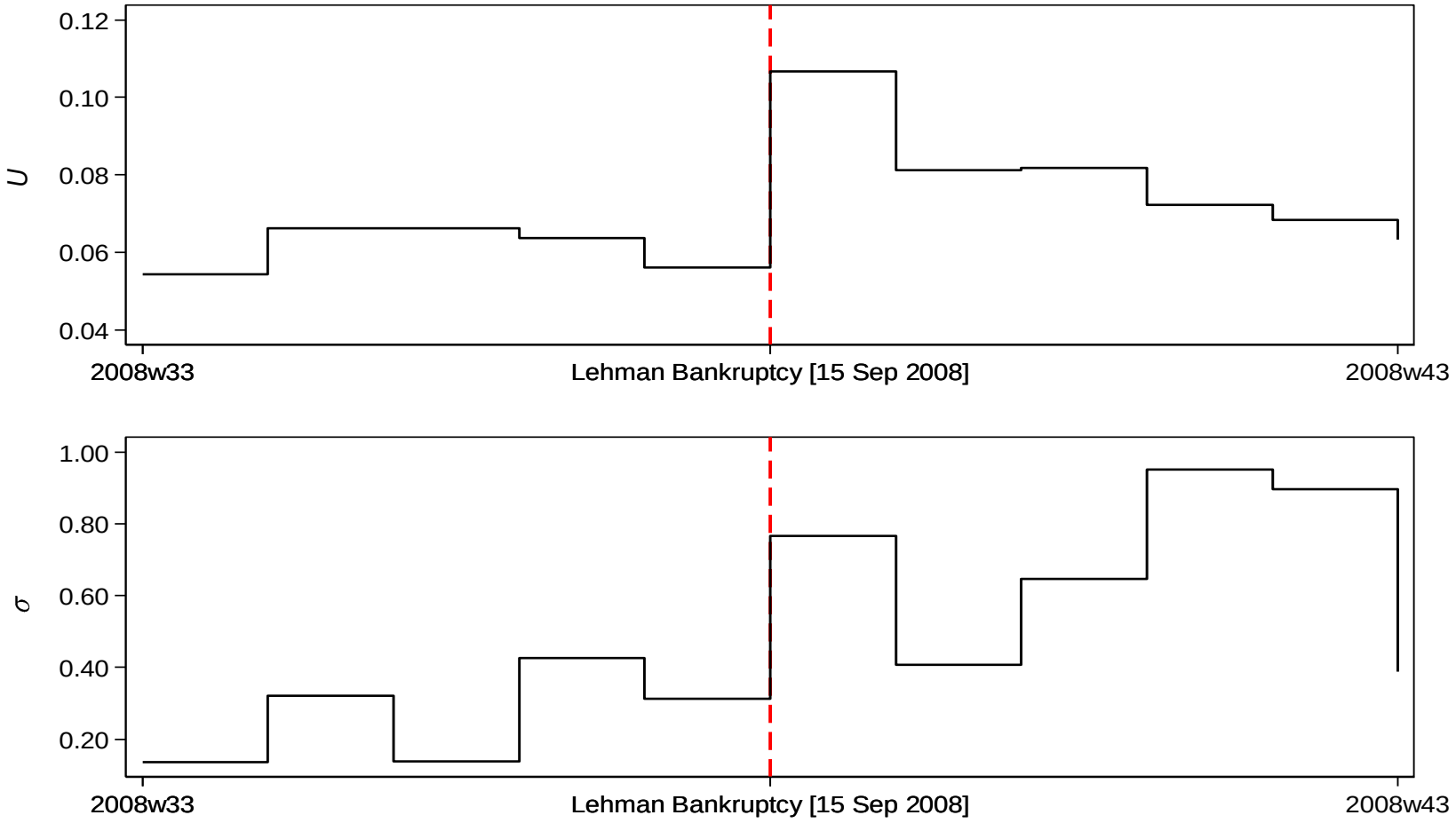


Note: observations with more than 400 articles per days were truncated from the plot.

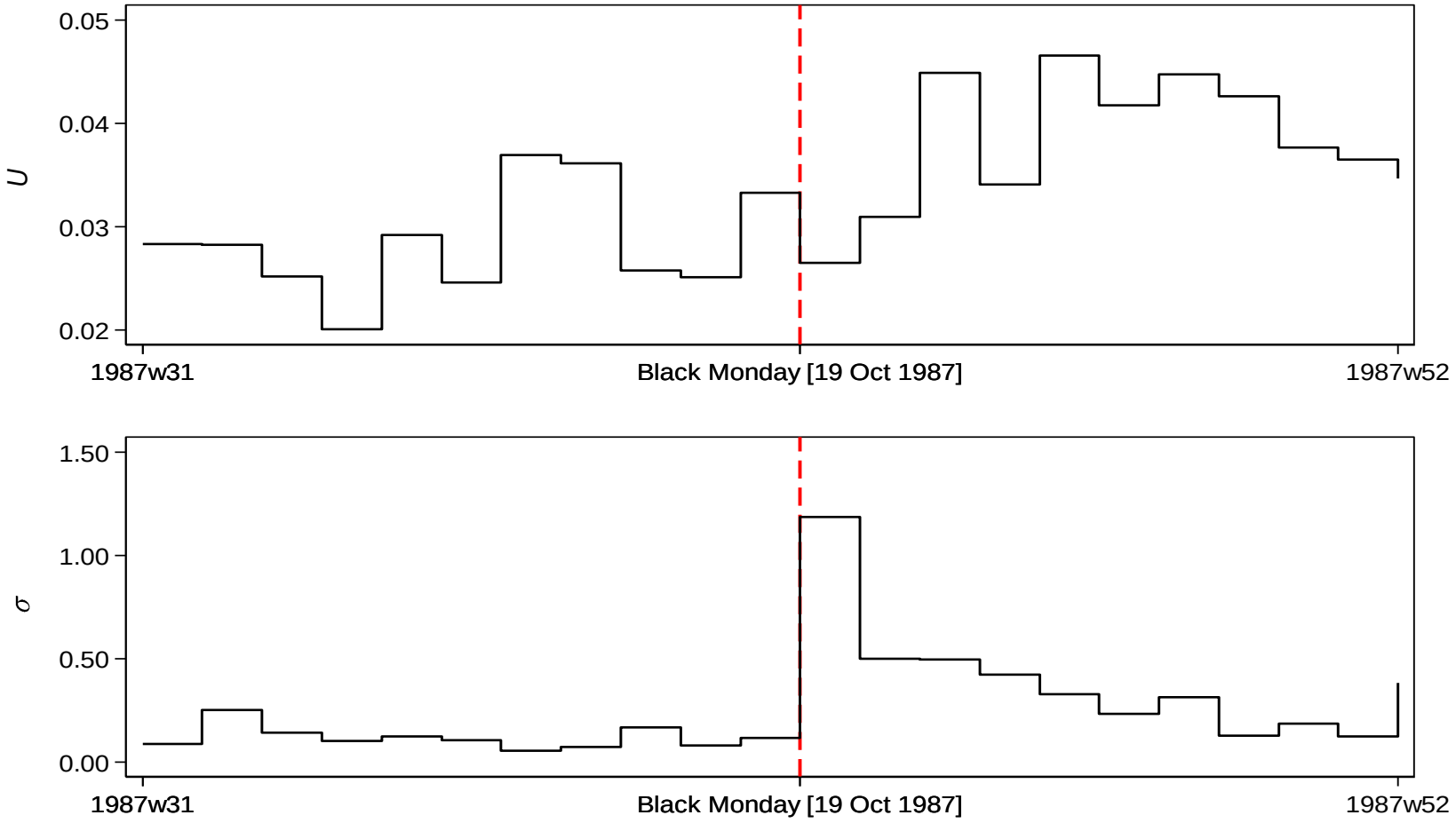
Stock returns volatility, σ



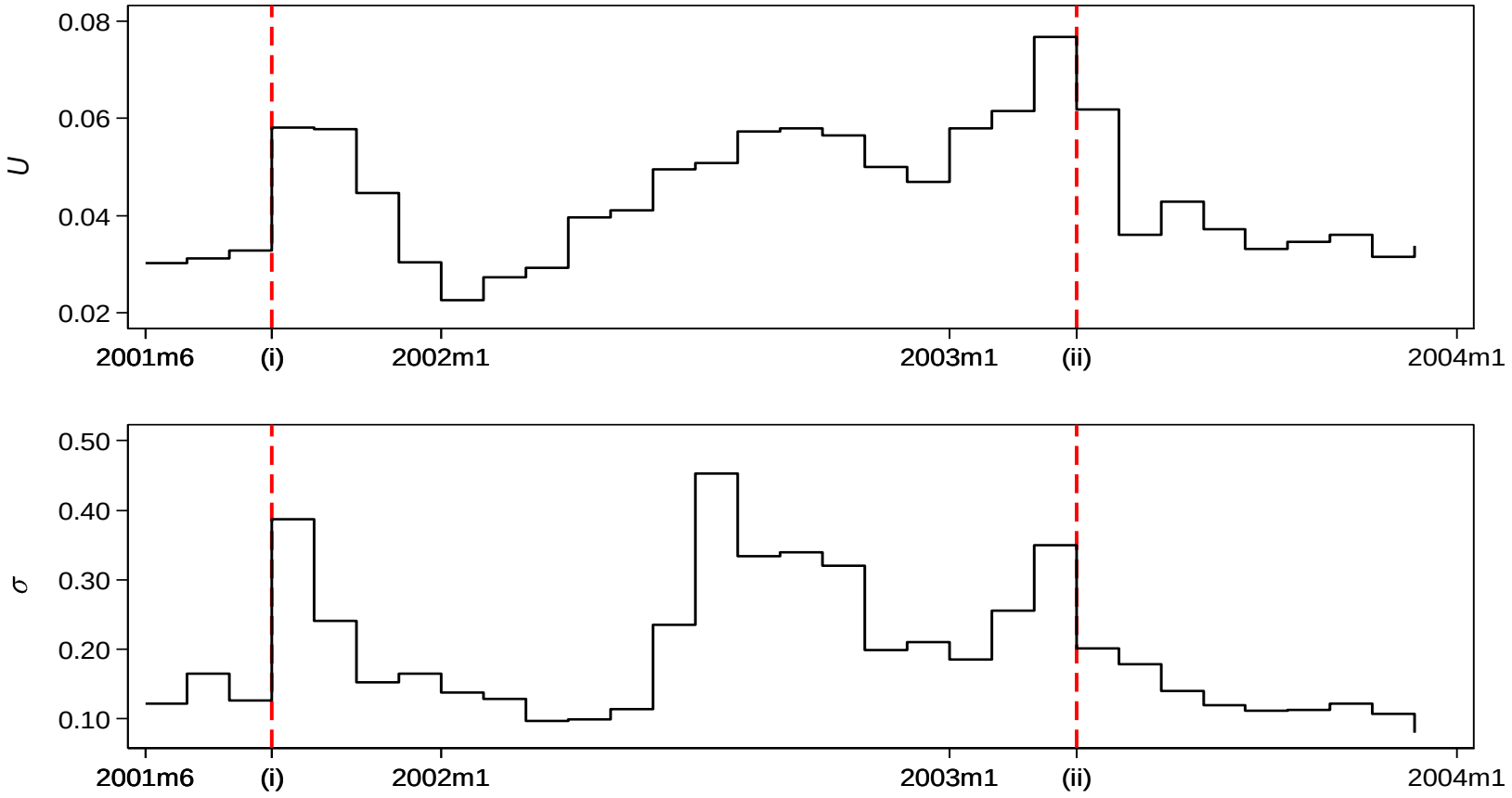
Lehman collapse 2008



Black Monday 1987

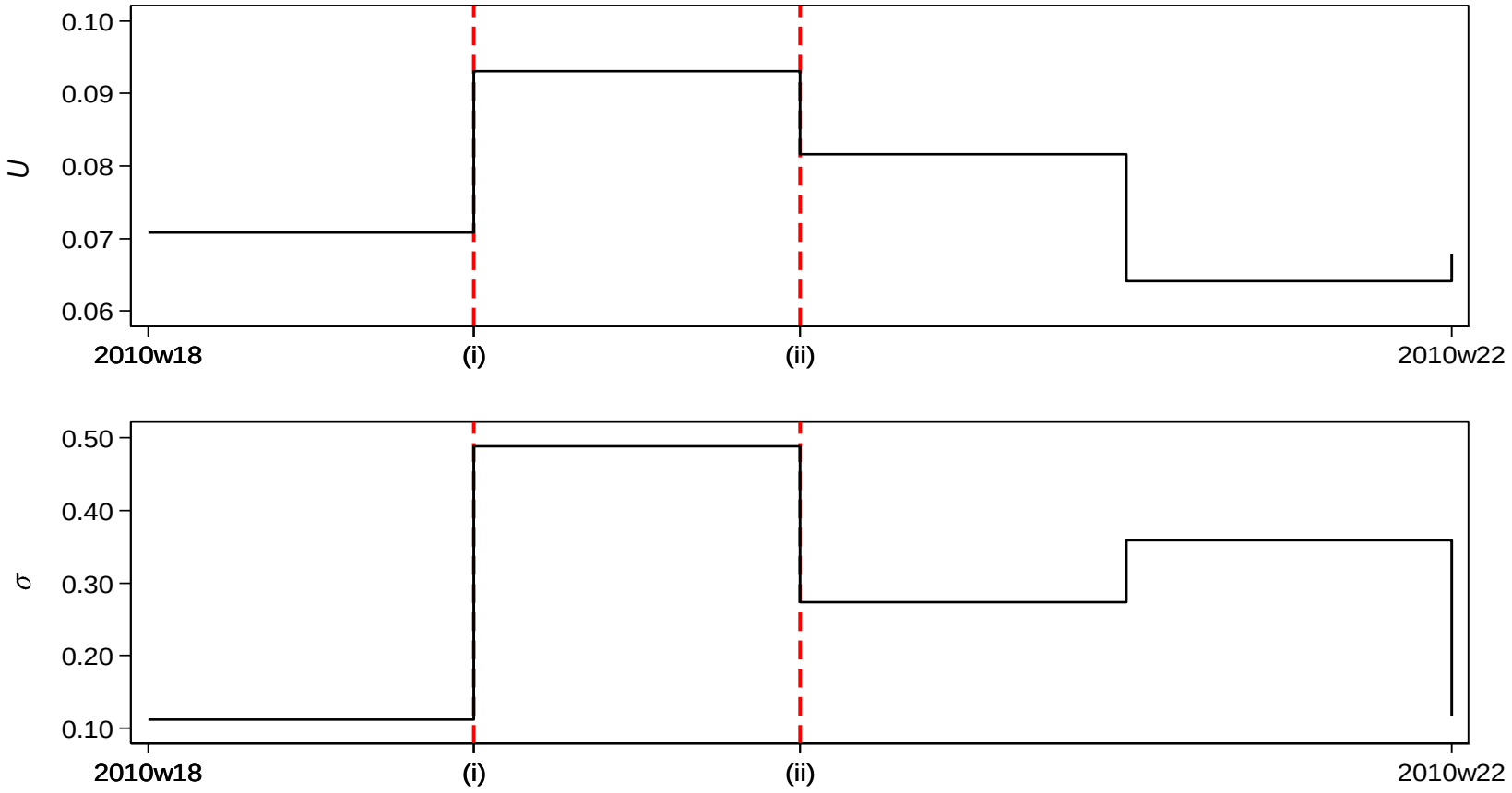


9/11 and Iraq War



(i) Terrorist attacks in US [9 Sep 2001]
(ii) Iraq War begins (20 Mar 2003)

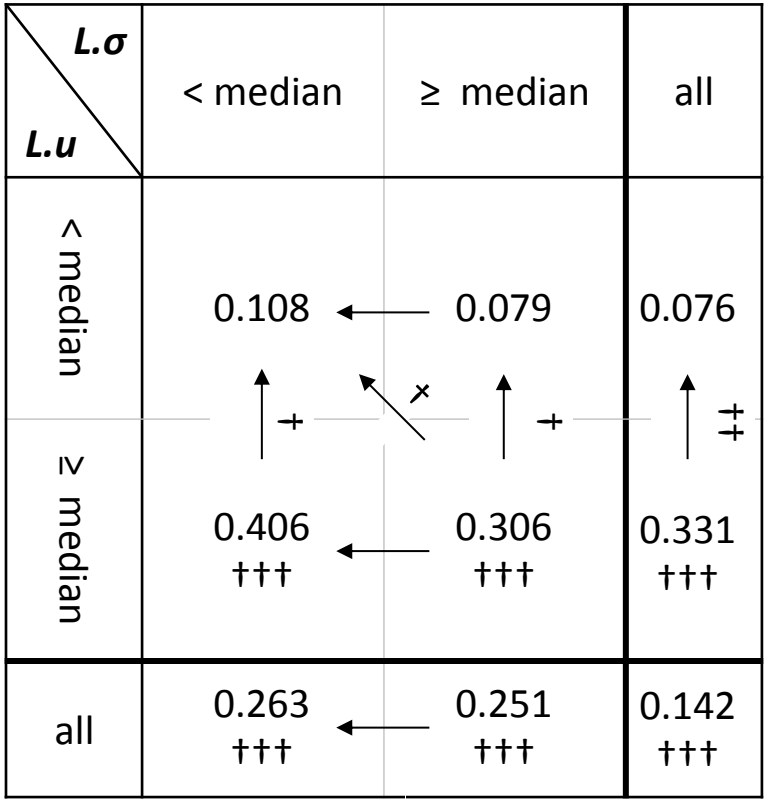
UK hung parliament May 2010



(i) UK national elections result in hung parliament for first time since 1974 [6 May 2010]
(ii) Coalition government formed [12 May 2010]

Rank correlation segmented by levels

monthly differences, 1984-2012



Note: significance levels estimated using block bootstrap to account for autocorrelation

Sign concordance segmented

monthly differences, 1984-2012

L.σ / *L.u*	< median	≥ median	all
< median	0.539	0.437 xx	0.497 +++
≥ median	0.606 ††	0.670 †††	0.644 †††
all	0.566 †	0.575 ††	0.571 †††

|*Δσ*| / |*Δu*|	< median	≥ median	all
< median	0.495 +	0.500 xxx +++	0.497 +++
≥ median	0.600 †	0.681 †††	0.644 †††
all	0.543	0.598 †††	0.571 †††

Note: significance levels estimated using block bootstrap to account for autocorrelation