More efficient event studies

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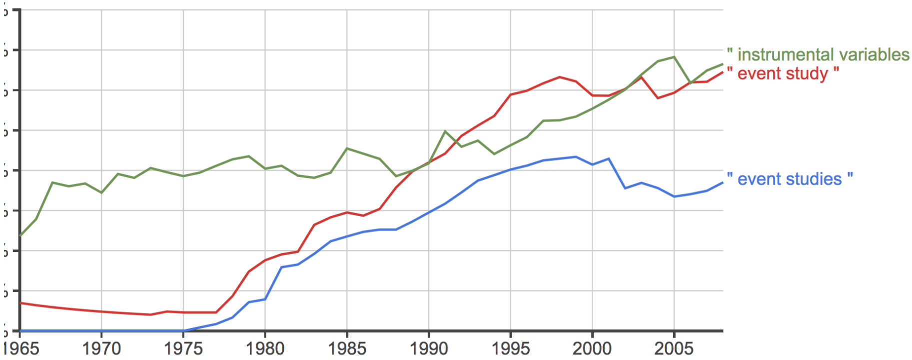
Event studies: A big idea in empirical economics

- FFJR 1969, but key idea anticipated before this.
- Counts in Google Scholar:

"Event study"	37,000
"Event studies"	27,900
"Event study methodology"	12,900
"Instrumental variables"	129,000

- Gone well beyond the original setting (stock prices) to all kinds of units of observation (households, countries, firms) and all kinds of data observed (household income, exchange rates, GDP growth, accounting data, etc).

Word counts in Google books



Why is this such a nice methodology?

1. The concept of placing events in event time – average out everything else going on.
2. Causal interpretation: What happens at +1 comes *after* the event and there is no risk of reverse causality going on.
3. Key insight: An event study with stock returns is statistically valid even if we simply work with raw returns! All that happens is there is more noise and there is less precision.

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3. Key insight: An event study with stock returns is statistically valid even if we simply work with raw returns! All that happens is there is more noise and there is less precision.
4. Market index as the control.
5. There is stuff happening in the background owing to macroeconomics; this gets picked up by the index.
6. Hope a linear model works well, and we have the market model.

Mainstream econometrics in 1969 was not so sophisticated! Event studies are seen kindly in the light of 2014 causal econometrics.

No adjustment vs. market model adjustment

- Assume $r_j \sim N(\mu, \sigma^2)$ for all j.
- Averaging across m events gives imprecision of the sample mean of $\sigma/\sqrt{m}$.
- We estimate the market model $r_j = a_0 + a_1 r_M + e_j$ which often has $R^2 \approx 0.3$.
- Now $\mathrm{Var}(e_j) < \mathrm{Var}(r_j)$
- Averaging across m gives reduced imprecision.

Fame-French factors with linearity

- We know that the one-factor model is a poor description of asset returns
- Fama-French three-factor model, adds size and B/P.
- Suggests a linear regression with three indexes.
- This generally gives a further variance reduction.
- Fairly well known and is starting to get used in doing event studies.
- Can we do better?

A different attack on size and B/P

- What if the world is not linear?
- An alternative strategy: *Identify k companies with similar size and similar B/P*
- Identify k partners using nearest neighbour Mahalanobis-distance matching.

$$\sqrt{(x-\mu)^T S^{-1}(x-\mu)}$$

- Construct a stock market index using these k firms, in two ways:
  1. Equal weights
  2. Inverse distance weights.
- Returns on this customised market index is $r_{M't}$
- Residual for each day is just $r_{jt} - r_{M't}$.

Intuition

- If you want a control for a stock, look at other firms which have a similar size and B/P.
- There is no need for a market model style regression.
- For each firm, we have constructed a customised stock market index which is the control.
- Intuition: Treatment and control
- Computation-intensive.

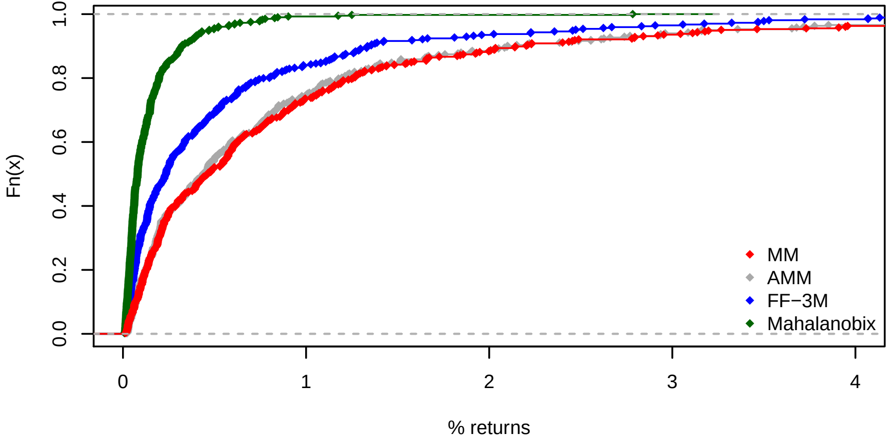
Data description

- All listed firms in India, 2008-2014
- CMIE Prowess database
- Fama-French factors from Jayanth Varma's work

Terms

1. Excess returns to the market (ER)
2. Market model (MM)
3. Augumented market model (with currency risk) (AMM)
4. Fama-French 3 factor model (FF-3M)
5. Mahalanobix - equal weights and inverse-distance weightsx (M1, M2)

Oh I have slipped the surly bonds of linearity



Power study

- A good estimator has high power
- I.e. ability to reject H_0 when H_0 is false.
- It is hard to reject when the effect size is small (a small shock) and when sample sizes are small.
- Thumb-rule: Rejecting H_0 with $p = 0.7$ is considered good.
- We setup a simulation where an artificial small shock is injected into the event date and the event study is conducted.
- Event study inference: Bootstrap.

Power - Percentage of correct rejections of null

Shock size: 1%

Sample size	MM	AMM	FF-3M	M1	M2
5	23.00	26.53	26.53	33.00	40.00
10	24.49	33.33	28.89	42.00	47.00
20	44.00	62.50	59.32	66.00	66.00
25	47.37	73.33	63.64	85.00	85.00

Power of the test

Shock size: 2%

Sample size	MM	AMM	FF-3M	M1	M2
5	20.00	24.49	26.26	30.00	20.00
10	27.27	38.30	41.94	45.00	45.00
20	60.47	78.38	63.89	64.00	63.00
25	73.58	80.43	76.74	90.00	88.00

Power of the test

Shock size: 3%

Sample size	MM	AMM	FF-3M	M1	M2
5	16.33	28.42	25.26	30.00	25.00
10	44.00	52.13	55.43	60.00	57.00
20	73.91	78.95	66.67	80.00	79.00
25	84.21	81.25	80.00	90.00	89.00

What have we acheived

- An improvement upon the event study methodology
- Gives us the ability to discern smaller shocks with smaller datasets.
- (No reason to use old methodologies even if you have a large *m* or a big shock).
- Extends the applicability of the event study methodology

Reproducible research

- eventstudies : an R package by Chirag Anand, Vimal Balasubramaniam, Ajay Shah.
- A platform for conducting event studies and for research in the event study methodology.
- Implements standard techniques.
- Implements the extreme events event studies methods from *Foreign Investors under Stress: Evidence from India*, Ila Patnaik, Ajay Shah and Nirvikar Singh. *International Finance*, Volume 16, Issue 2, Page 213–244, September 2013.
- Implements the methods of this paper.

Future extensions

- A lot can be done with $m = 1$! Bridge the gap between case studies and event studies.
- The empirical asset pricing literature has proposed other candidates e.g. momentum. Do these help here?
- Why $k = 50$?
- The matching state of mind: There is no control for Reliance! Are we better off dropping these firms rather than doing extrapolation? (Less damage than in corporate finance regressions).
  Or, how to construct counter-factuals for very large firms?
- Are the notorious problems of long-horizon event studies connected with the linearity assumptions of the market model?

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- Are the notorious problems of long-horizon event studies connected with the linearity assumptions of the market model?
- Something akin to pairs trading could be done?
- What does this evidence tell us about asset pricing theory?

Thank you

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