Financial Econometrics Econ 40357
The Event Study Method
Brooks pp 571-583
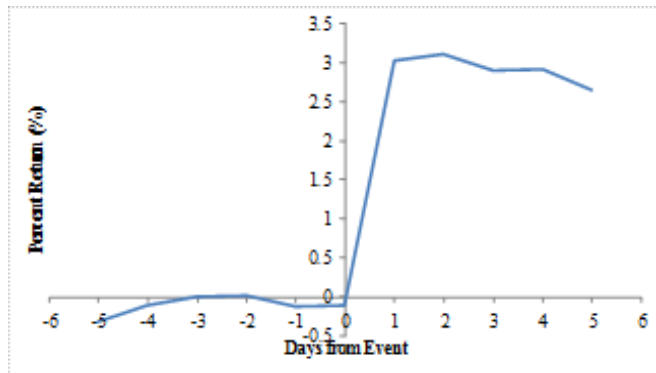
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What Event Studies are good for

- Study impact of news on asset prices.
  - Mergers and acquisitions
  - New debt or equity issues
  - Macroeconomic announcements (surprises)
  - Stock splits
  - Trump's tweets
 - Corruption reform in China

Assumptions

- Market is efficient.
- Event is unanticipated (and exogenous).

  If this is not true, returns will have already fully or partially adjusted before the event, and you won't find anything.
- No confounding effects during the event window (because you want to measure the effect of what you define as the event, not something else).

Procedure

Pre-event window (L_1) **Event** (L_2) **Post-event window** (L_3)

T_0 T_1 τ T_2 T_3
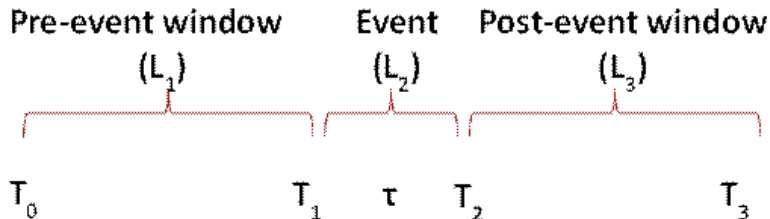
- L_1 is estimation window. Use to estimate what 'normal' returns look like.
- L_2 is event window. Ask if you see 'abnormal' returns during this time.
- L_3 is Post-event window. Use to verify that returns go back to 'normal.'

Procedure

- Choose the event and data sampling frequency
  - Higher frequency of observations means more statistical power. Daily better than weekly better than monthly better than quarterly.
- Length of event window
  - Decide the time required for market to digest information.
  - Long-run or short run effects? Short run: 10 pre-event trading days and 10 post-event trading days. Long run: a month or a year after the event.
- Which firms to include in sample
- How to measure normal and abnormal returns
- Decide on estimation window. (e.g., with daily data, use 120 days before the event)

Procedure

- The key to approach is to isolate the event. We don't want the event window to be confounded with other causal factors. e.g., looking at effect on firm from being included in S&P index. What if announcement was on 9/11?
- Let $r_{t,i}$ be the rate of return for firm i on day t.
- Object of interest is **abnormal** return, $AR_{t,i}$,

$$AR_{t,i} = r_{t,i} - \underbrace{E\left(r_{t,i}|X_t\right)}_{NormalReturn}$$

where X_t is the relevant conditioning information for the normal performance period.

- Need a model for $E(r_{t,i}|X_t)$. Candidates can be purely statistical or economic We going to estimate the model for normal returns $E(r_{t,i}|X_t)$ using pre-event data.
  - Constant return model: $E(r_{t,i}|X_t) = \mu$, $AR_{t,i} = r_{t,i} - \mu$
  - Market model: $AR_{t,i} = r_{t,i} - \alpha - \beta r_{t,m}$
  - CAPM: $AR_{t,i} = r_{t,i}^e - \alpha - \beta r_{t,m}^e$
  - Fama-French 3-factor model.

Procedure

- Lenght of pre-event window (for estimation)
  - Daily returns: 100 to 300 observations.
  - Monthly returns: 24 to 60 months.
- Length of event window
  - Very short (a day or two)–can probably get away with the constant return model. This also avoids inducing sampling error from estimated parameters.
  - Market model is the most common approach. People argue about whether to include α in normal return. Anticipatory effects (of the event) may bleed into estimate of α. If so, assume $\alpha = 0$.
- We test the null hypothesis that event has **no effect** on abnormal returns.
- We are going to ignore the sampling variation in $\hat{\alpha}$ and $\hat{\beta}$, as done in the Brooks text. I can show you how to account for that uncertainty if you need it, say for your senior thesis.

Abnormal Returns for Individual Firm at t

Standardized abnormal return

$$\widehat{SAR}_{t,i} = \frac{\widehat{AR}_{t,i}}{\hat{\sigma}_{ar(t,i)}} \sim N(0,1) \tag{1}$$

where

$$\hat{\sigma}^2_{ar(t,i)} = \frac{1}{T-1} \sum_{t=1}^{T_1} AR^2_{t,i}$$

We use $\widehat{SAR}_{t,i}$ as the test statistic for each firm i for each event date t.

Cumulating Abnormal Returns over Event Window for Firm i

Returns can be **noisy**. Instead, cumulate the abnormal returns

$$\widehat{CAR}_{T_1,T_2,i} = \sum_{t=T_1}^{T_2} \widehat{AR}_{t,i} \tag{2}$$

$$\hat{\sigma}^2_{car(T_1,T_2,i)} = (T_2 - T_1 + 1)\hat{\sigma}^2_{ar(t,i)} \tag{3}$$

Test statistic for firm i

$$\widehat{SCAR}_{T_1,T_2,i} = \frac{\widehat{CAR}_{T_1,T_2,i}}{\hat{\sigma}_{car(T_1,T_2,i)}} \sim N(0,1) \tag{4}$$

Averaging Abnormal Returns across Firms

$$\widehat{AR}_t = \frac{1}{N} \sum_{i=1}^{N} \widehat{AR}_{t,i} \tag{5}$$

$$\hat{\sigma}^2_{ar(t)} = \frac{1}{N^2} \sum_{i=1}^{N} \hat{\sigma}^2_{ar(t,i)} \tag{6}$$

Test statistic for the firm average at date t

$$\widehat{SAR}_t = \frac{\widehat{AR}_t}{\hat{\sigma}_{ar(t,i)}} \sim N(0,1) \tag{7}$$

Cumulating Firm Averaged Abnormal Returns

$$\widehat{CAR}_{T_1, T_2} = \sum_{t=T_1}^{T_2} \widehat{CAR}_{T_1, T_2, i} \tag{8}$$

$$\hat{\sigma}^2_{car(T_1, T_2)} = \frac{1}{N^2} \sum_{i=1}^{N} \hat{\sigma}^2_{car(T_1, T_2, i)} \tag{9}$$

$$\widehat{SCAR}_{T_1, T_2} = \frac{\widehat{CAR}_{T_1, T_2}}{\hat{\sigma}_{car(T_1, T_2)}} \tag{10}$$