A couple more things on event studies.

To do event study, use Excel.

What if the AR's are cross-sectionally correlated? E.g, Trump made a tweet. Violates assumption that returns across firms are independent. Probably, not a bad idea to form a portfolio of the firms and analyze the AR from the portfolio.

What if you are interested in different sensitivities (exposure) across firms to an event? e.g., say it's a stock split. Is there a difference betwee large and small firms?

Let AR_i be the abnormal return of firm i. (the AR at a particular t in the event window, or the cumulated AR during the event window CAR_i). You have a cross-section of these returns. Suppose you also have X_i which is firm size. Then run the cross-sectional regression

$$AR_i = \gamma_0 + \gamma_1 X_i + \epsilon_i$$

New topic: Time-varying Volatility.

Financial returns exhibit volatility clustering. High volatility signals high degree of uncertainty in the market. Next topic is modeling and estimating the time-variation in volatility.

Why?

A standard measure of the value of market risk is the Sharpe ratio. r_p is the return on a portfolio. r_f is the risk free rate.

$$\text{Sharp}=\frac{E\left(r_p - r_f\right)}{\sigma_p}$$

The "reward" per unit of volatility risk.

$$\begin{aligned} r_t &= a + \beta x_t + \epsilon_t \\ \epsilon_t &\sim N\left(0, \sigma_t^2\right) \end{aligned}$$

σ_t^2 varies over time, hence the time subscript. This is the time varying conditional variance. Let $E_t\,()$ mean the expectation on () conditional on information at t.The definition of the conditional variance of ϵ_t is

$$\sigma_t^2 = E_{t-1}\left(\epsilon_t - E_{t-1}\left(\epsilon_t\right)\right)^2$$

and the ARCH/GARCH class of models are different ways of modeling σ_t^2.

ARCH(1):

$$\sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2$$

ARCH(2):

$$\sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \alpha_2 \epsilon_{t-2}^2$$

ARCH(q)

$$\sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \cdots + \alpha_q \epsilon_{t-q}^2$$

In Eviews, QUICK, Estimate Equation, Choose ARCH/GARCH.
GARCH model, where $0 \leq \beta \leq 1$

$$\sigma_t^2 = \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \beta \sigma_{t-1}^2$$

GARCH becomes an infinite-order ARCH.

$$\sigma_{t-1}^2 = \alpha_0 + \alpha_1 \epsilon_{t-2}^2 + \beta \sigma_{t-2}^2$$

substitute into the first equation,

$$\begin{aligned}\sigma_t^2 &= \alpha_0 + \alpha_1 \epsilon_{t-1}^2 + \beta \left(\alpha_0 + \alpha_1 \epsilon_{t-2}^2 + \beta \sigma_{t-2}^2\right) \\ &= \alpha_0 \left(1 + \beta\right) + \alpha_1 \left(\epsilon_{t-1}^2 + \beta \epsilon_{t-2}^2\right) + \beta^2 \sigma_{t-2}^2\end{aligned}$$

Clearly, continuing on like this gives σ_t^2 as a function of all past ϵ_{t-j}^2 terms. It's a constrained ARCH(∞).