Hi Everyone!

Course paper is due Tuesday 29 November.

Run paper topics by me by 12 November.

Time-series method. For each return $i = 1, ..., n$,run the time-series regression

$$r^e_{ti} = \alpha_i + \beta_i r^e_{tm} + \epsilon_{ti}$$

to get asset i's beta, β_i.The theory says the asset's return is explained entirely by exposure to the risk factor (here, r^e_{tm}). Implies the α_i (constant) is 0.

$$\bar{r}^e_i = \lambda \beta_i$$

Sidenote. Suppose we think we have a 2 factor model.

$$\begin{aligned} r^e_{ti} &= \alpha_i + \beta_{1i} f_{t1} + \beta_{2i} f_{t2} + \epsilon_{ti} \\ \bar{r}^e_i &= \lambda_1 \beta_{1i} + \lambda_2 \beta_{2i} \end{aligned}$$

Going back to the one-factor model.

We have estimated the β_i and the α_i.We want to test if the α_i are all (jointly) zero. We need the joint distribution of the α_i across returns. We do that by estimating the time-series regression jointly for all the assets. That is, we stack everything together, and estimate them jointly. I'll get back to you on the exact form.

I show you how to do this in eviews.

Estimate as system. View→Coefficient Diagnostics → Wald Coefficient Test

0.1 The Fama-MacBeth Method

The time-series method can only be used if the factors are excess returns. The FMB method works if factors are excess returns and if they are not. Why? If the factor is an excess return, we estimate the factor risk premium by

$$\hat{\lambda} = \frac{1}{T} \sum_{t=1}^{T} f_t$$

This only makes sense if f_t is an excess return.

Illustrate with a single factor model (CAPM again).

1. For each asset run the time-series regression to estimate its beta

$$\begin{aligned} r^e_{t,1} &= \alpha_1 + \beta_1 f_t + \epsilon_{t,1} \longleftarrow \text{Asset 1} \\ r^e_{t,2} &= \alpha_2 + \beta_2 f_t + \epsilon_{t,2} \longleftarrow \text{Asset 2} \\ &\vdots \\ r^e_{t,n} &= \alpha_n + \beta_n f_t + \epsilon_{t,n} \longleftarrow \text{Asset n} \end{aligned}$$

This gives us n betas. Sometimes people call them 'factor loadings'.

2. Run a single cross-sectional regression with constant (γ) and error term α_i.

$$\bar{r}_i^e = \gamma + \lambda\beta_i + \alpha_i$$

So we want to know if λ is significant (if it's not, the β_i aren't explaining the average excess returns). Also want to test if $\gamma = 0$. Eviews will give a t-ratio on λ in the cross-sectional regression but it is wrong. The theory behind the regular t-ratio assumes the independent variable is data. Here, the independent variable is an estimated β_i. Fama-Macbeth is a technique for computing the standard error (or t-ratio) on λ.

3. Here's the Fama-MacBeth method. For each t, we have a cross-section of returns. Run the cross-sectional regression

$$\begin{aligned}
r_{1,i}^e &= \gamma_1 + \lambda_1\beta_i + \alpha_{1,i} \longleftarrow \text{Time period 1} \\
r_{2,i}^e &= \gamma_2 + \lambda_2\beta_i + \alpha_{2,i} \longleftarrow \text{Time period 2} \\
&\vdots \\
r_{T,i}^e &= \gamma_T + \lambda_T\beta_i + \alpha_{T,i} \longleftarrow \text{Time period T}
\end{aligned}$$

This gives us a time-series of the $\lambda' s$. Test if the $\lambda' s$ are zero by regressing them on a constant and doing Newey-West

$$\lambda_t = c + e_t$$

Do the same with the time series of the γ_t, to test if $\gamma = 0$.