Financial Econometrics - Assignment

November 11, 2019

Exercise 1. (Event Study. 30pts)

During the Tutorial, we analyzed the disclosure of accountancy scandals using the market model. An accountancy scandal is defined as the intentional manipulation of financial statements to create a favorable impression of a company's financial health. The event date is identified as the first time the scandal was announced. In this data-set there are three kinds of first announcement: The announcement of an earnings restatement, the announcement of the start of an SEC or any other national institution investigation, and articles provided by different news sources that indicated fraud. Below in Table 1. is the list of companies and the event dates. Some cases are well-known, such as Enron and WorldCom.

Use the data set provided on Nestor on daily stock prices and download the 3 Fama-French factors (daily) from Kenneth French website to rerun the analysis we made, this time using the factors model to compute the normal returns.

1. Assume the event window is 41 days (20 days before the event date and 20 days after the event date). Put the data in the right form in order to run the regressions for the normal return. This means that for each stock, you need to put the stock returns data for the pre-event period together with the factors returns. The difficulty here is that the event date is not the same for firms and thus you might use different sub-sample of factors returns data for each stock.

2. Run the OLS regressions of the stock returns on the factors returns (This is done using the pre-event data or the estimation window).

3. Compute the abnormal returns for the event window and the cumulative abnormal returns for each firms. Test their significance at the 5% level.

4. Compute the Average abnormal returns and Cumulative average abnormal returns by taking the average of cumulative abnormal returns over firms. Test their significance at the 5% level.

5. Plot the CAAR over the event window (starting from the first date of the event windows, you gradually increase the number of days to be included in the CAAR by one until the last date of the event window.

Table 1: List of events

Company Name	ISIN	Event date
Sybase	US8711301007	1/22/1998
MicroStrategy	US5949724083	3/20/2000
Xerox	US9841211033	6/16/2000
Lernout & Hauspie	BE0157285488	8/8/2000
Enron	US2935611069	10/22/2001
Adelphia	US0068481052	3/27/2002
Peregrine Systems	US71366Q1013	5/1/2002
CMS Energy	US1258961002	5/10/2002
El Paso Corporation	US2836778546	5/17/2002
Halliburton	US4062161017	12/7/2001
Merrill Lynch	US5901881087	4/24/2002
Merck&co.	US58933Y1055	6/21/2002
Duke Energy	US26441C2044	7/12/2002
Bristol-Myers Squibb	US1101221083	7/11/2002
Nicor Energy	US6540861076	7/19/2002
Mirant	US6046751086	7/31/2002

Exercise 2. (International factor models. 40pts)

This exercise is based on Tinang (2019, WP). We study empirically whether the cross-sectional higher order moments of countries real consumption growth can explain the variation in the observed markets returns in an internationally integrated financial market. For that, you will need to:

- Download quarterly data on household private expenses from 1970 to 2018 on developped or emerging countries. Using the Consumer Price Index and the Population data, you can compute the real consumption growth rate.

- Download the MSCI index (Return Index) data for different financial markets covering the same period and frequency as consumption. Use the US Tbill rate data to compute the excess returns.

The data sources are : **Datastream, FRED of St. Louis Fed and Thomson Reuters Eikon**.

1. Compute the first (Δc_t), second ($CrossVar_t$), third ($CrossSkew_t$) and fourth ($CrossKur_t$) central cross-sectional moments of countries consumption growth. Provide the descriptive statistics of their times series and plot their evolution.

2. Consider the following factor models:

$$\text{CAPM model: } R_{i,t} - R_{f,t} = \alpha_i + \beta_i(R_{m,t} - R_{f,t}) + \epsilon_{it}$$

$$\text{CCAPM model: } R_{i,t} - R_{f,t} = \alpha_i + \beta_i \Delta c_t + \epsilon_{it}$$

$$\text{DLP model: } R_{i,t} - R_{f,t} = \alpha_i + \beta_{1i} \Delta c_t + \beta_{2i} CrossVar_t + \epsilon_{it}$$

HO model: $R_{i,t} - R_{f,t} = \alpha_i + \beta_{1i}\Delta c_t + \beta_{2i} CrossVar_t + \beta_{2i} CrossSkew_t + \beta_{2i} CrossKur_t + \epsilon_{it}$

3. Estimate and test each model using one of the following methods: Time series regressions (Wald, LM or LR test), cross-sectional regressions or Fama-MacBeth regressions. Interpret the results.

4. Estimate and test each model using the GMM procedure and the following asset pricing Euler equation:

$$\mathbb{E}_t \left[M_{t+1} R^e_{i,t+1} \right] = 0 \tag{1}$$

where the stochastic discount factor M_t is a linear function of the pricing factors considered above : $-\frac{M_{t+1}}{\mathbb{E}(M_{t+1})} = k + b^{'} f_{t+1},\ f \in \{\Delta c, CrossVar, CrossSkew, CrossKur\}$. From the asset pricing Euler equation (1) and the linear SDF formulation, the pricing errors at time t can be expressed as a $(N + F)K \times 1$ vector of moment function as follows:

$$e(z_t, \theta) = \begin{bmatrix} R^e_t - R^e_t \left(f_t - \mu_f \right)^{'} b \\ f_t - \mu_f \end{bmatrix} \otimes Z_t$$

where $\theta = (b^{'}, \mu_f^{'})^{'}$ is a $(2F) \times 1$ vector of parameters, Z_t is a $K \times 1$ vector of instruments, f_t is a $F \times 1$ vector of factors, R^e_t is a $N \times 1$ vector of excess returns and $z_t = (R_t^{e^{'}}, f_t^{'}, Z_t^{'})^{'}$ stacks all the variables together. **The data for the instruments (lag cross section average of consumption growth, term spread, cay.) are provided on Nestor.**

5. Make the link between the coefficients β in (3.) and b in (4.). Compare the results in (3.) with those in (4.). Comment.

Exercise 3. (Parametric Portfolio Policy. 30pts)

Consider the data-set provided on Nestor with some information about the SP 500 constituents from Jan-2008 to Feb-2018. Your goal is to use the Parametric Portfolio Policy to build an optimal portfolio based on two firms characteristics: The market capitalization ($mktcap$) and the past 12 months cumulative return ($m12$).

Use the data-set provided on Nestor to rerun the analysis we made, this time using market capitalization to compute the benchmark weights (The benchmark weight for a given stock is computed as its market capitalization divided by the sum of market capitalization of all the stocks.)

We assume that the investor chooses the portfolio weights $w_{i,t}$ to maximize the conditional expected

utility of the portfolio's return $r_{p,t+1}$:

$$\underset{\{w_{i,t}\}_{i=1}^{N_t}}{max} \mathrm{E}_t\left[u\left(r_{p,t+1}\right)\right] = \mathrm{E}_t\left[u\left(\sum_{i=1}^{N_t} w_{i,t} r_{i,t+1}\right)\right]$$

The weight function takes the following linear form:

$$w_{i,t} = \bar{w}_{i,t} + \frac{1}{N_t}\theta' \hat{x}_{i,t}, \tag{2}$$

Here the characteristics are given by : $x_{i,t} = [m12_{i,t}, mktcap_{i,t-1}]$ and the utility function is given by:

$$u(x) = \frac{x^{1-\gamma} - 1}{1-\gamma} \text{ with } \gamma = 5$$

1. The base sample for the estimation is from Feb-2009-Feb-2018 (You will loose 1 month when computing the return and 12 months when computing the past 12 month cumulative returns). From March-2009 you will start implementing your portfolio strategy each month. The period from March 2009 to Feb-2018 will be used as the out-of-sample period to evaluate the strategy performance. You will estimate the coefficients of the linear policy function recursively starting with the based sample of 48 months and by extending the estimation sample each month. You can thus compute the weights to re-balance your portfolio each month by including. Compute the monthly return delivered by your portfolio and the cumulative returns over the out-of-sample period.

2. Compare the PPP with two other portfolio strategies: the equally weighted portfolio where all the firms are assigned the same weight and oracle portfolio composed of the top 100 firms with the highest cumulative returns in the out-of-sample period.

3. Evaluate the short-selling in the PPP (compute the absolute value of the sum of negative weights). What does it says about the PPP?

4. Using the GMM framework, make an inference about the coefficients of the linear policy function (θ). How does that translate to the portfolio weights uncertainty? And finally what will be the implication for the uncertainty associated to the strategy performance?