BUFN402
Portfolio Management

Assignment 3: tutorial

HW3-1: Bootstrapping

- When the data satisfies all these regularity conditions, we will have the closed form solutions for confidence intervals, p-values, etc.
- Great that we have them because statistical inference is just plugging numbers into them.
- How about when we cannot find the sampling distributions of estimators (even in a very large sample)?
  - Still, those closed forms could provide a reasonable first-order approximation (in most cases).
  - If you want (or must have) high accuracy of inference, but you are unsure whether your data satisfies the regularity conditions, then what?
- **We can use computer as an intensive inferential engine: the bootstrap method!**
  - **Strictly optional:** see details in Hastie's book if you want to torture yourself: https://web.stanford.edu/~hastie/CASI/index.html

Crash course on bootstrap method

- **Bootstrapping: simply performing thousands of estimations** (regressions).
  - Procedure is iterative but simple. Here is an algorithm:

    for loop of n trials {

        resample with replacement from the dataset;

        run the regression model with the resampled dataset;

        save the coefficients;

    }

    In the end, we have n pairs of coefficients.
- Use theses bootstrap samples:
  - We find the standard deviation of the bootstrap samples and use it as $se[\hat{\beta}]$.
  - We approximate the true distribution and find the confidence intervals.

HW3-2: Distress Risk Puzzle

- Recently, a new anomaly – **distress risk puzzle** – attracts an attention.
  - Seminal papers (**strictly optional**): Campbell et al. (2008, Journal of Finance), Shumway (2008, Review of Financial Studies).
    - Will be posted on Canvas.
    - Read them if and only if you're interested in how to measure a firm's distress risk – the expected default frequency (EDF, henceforth) (needs the basics of option pricing).

- Fama-French three-factor model **cannot** explain the distress-risk anomaly.

Distress Risk Puzzle

- You will be provided the following data
  - There are 1225787 firm-month observations
  - permno: firm identifier
  - curdat: year-month
  - retx: monthly return
  - edf: distress risk measure (EDF)
    - The higher EDF, the more likely a firm default.
    - EDF is between 0 and 1.
- **Note:** a firm has a different EDF measure in a different month.

	permno	curdat	retx	edf
36	10001	199001	-0.018519	0.000030
37	10001	199002	-0.006289	0.000030
38	10001	199003	0.000000	0.000120
39	10001	199004	0.000000	0.000070
40	10001	199005	-0.012658	0.000070
...	...	...	...	...
1498835	93436	201808	0.011806	0.000002
1498836	93436	201809	-0.122290	0.008472
1498837	93436	201810	0.274011	0.003664
1498838	93436	201811	0.039013	0.003664
1498839	93436	201812	-0.050445	0.001081

1327031 rows × 4 columns

Part I: Constricting EDF decile portfolios

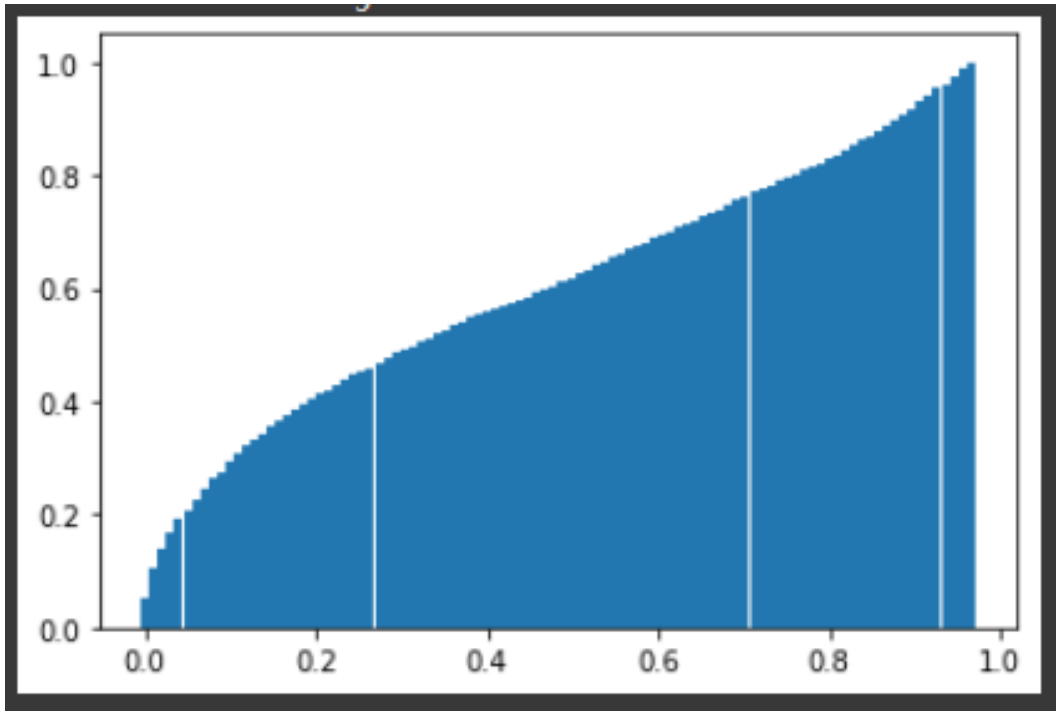
Step 1: Assign EDF portfolio index to a firm in each month.

- **Example**: in Oct. 2001, there are 3616 firms.

	permno	curdat	retx	edf
177	10001	200110	-0.033473	9.677194e-03
876	10012	200110	0.115789	7.290896e-02
1647	10025	200110	-0.198000	7.064424e-01
1990	10026	200110	0.180800	4.496810e-05
2597	10032	200110	0.060221	3.512910e-01
...	...	...	...	...
1322718	92340	200110	-0.026087	6.227358e-01
1323846	92399	200110	0.163743	2.567976e-01
1328732	92583	200110	0.015625	4.282934e-03
1330961	92655	200110	-0.011278	6.194238e-20
1335607	92874	200110	-0.043478	2.917798e-01

3616 rows × 5 columns

EDF Cumulative Histogram
October 2001



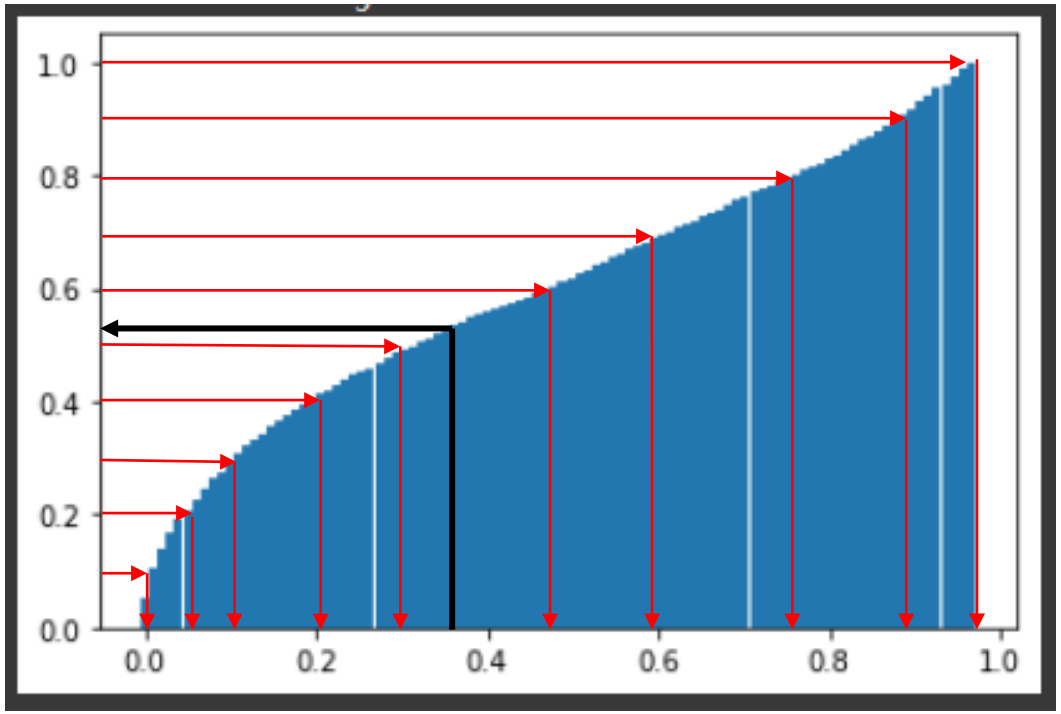
EDF

Part I: Constricting EDF decile portfolios

Step 1: Assign EDF portfolio index

- Suppose A firm's EDF in Oct. 2001 is given as 0.38.
- EDF 0.38 belongs 50-percentile and 60-percentile.
- That is, the firm in Oct. 2001 belongs to **sixth** portfolio in EDF decile portfolios.
- **IMPORTANT:** The firm may belong to different EDF portfolios in each month.
  - If, say in Dec. 2001, the firm's EDF measure is 0.22, then the firm should belong to the EDF PF 5 in Dec 2001.

EDF Cumulative Histogram October 2001



EDF

Task 1: Assign EDF portfolio index

- Assign the EDF portfolio index to all firms in Oct. 2001.
- **Repeat** this process **every month** from in the data.

	permno	curdat	retx	edf	edf_port
177	10001	200110	-0.033473	9.677194e-03	5
876	10012	200110	0.115789	7.290896e-02	6
1647	10025	200110	-0.198000	7.064424e-01	9
1990	10026	200110	0.180800	4.496810e-05	3
2597	10032	200110	0.060221	3.512910e-01	8
...	...	...	...	...	...
1322718	92340	200110	-0.026087	6.227358e-01	9
1323846	92399	200110	0.163743	2.567976e-01	7
1328732	92583	200110	0.015625	4.282934e-03	4
1330961	92655	200110	-0.011278	6.194238e-20	1
1335607	92874	200110	-0.043478	2.917798e-01	7

3616 rows × 5 columns

Task 2: Construct EDF decile portfolios

Step 2: Find the mean returns of **each** portfolio in **each** month.

- Example: in Oct. 2010, 362 firms belong to sixth EDF portfolio.
- The mean monthly return of EDF PF 6 in Oct 2010 is 0.0818 (or 8.18%).

- **Repeat** this process for **each** PF in each month.

	permno	curdat	retx	edf	edf_port
876	10012	200110	0.115789	0.072909	6
5481	10080	200110	-0.029954	0.138232	6
11314	10182	200110	0.126385	0.131321	6
19456	10353	200110	0.533079	0.062590	6
21359	10383	200110	-0.229630	0.048755	6
...	...	...	...	...	...
1193338	88899	200110	0.141667	0.102292	6
1194945	88938	200110	-0.068100	0.132415	6
1224223	89587	200110	0.043902	0.091347	6
1254353	90352	200110	0.036075	0.070537	6
1291055	91287	200110	0.077778	0.113335	6

362 rows × 5 columns

Part I: Result (monthly returns of EDF decile portfolios)

edf_port	1	2	3	4	5	6	7	8	9	10
curdat										
199001	-0.071882	-0.063992	-0.068018	-0.051137	-0.058680	-0.068747	-0.054324	-0.043685	-0.040020	-0.040388
199002	0.017969	0.029681	0.016206	0.029345	0.022992	0.020108	0.006041	0.020147	0.003011	0.009783
199003	0.040453	0.053970	0.043579	0.030298	0.043341	0.038824	0.041638	0.022323	0.033330	0.015609
199004	-0.027157	-0.030853	-0.030442	-0.018969	-0.028502	-0.031579	-0.040148	-0.043685	-0.015234	-0.019144
199005	0.090579	0.073790	0.067727	0.058988	0.039807	0.069111	0.053870	0.032415	0.023465	0.031303
...	...	...	...	...	...	...	...	...	...	...
201808	0.026795	0.026750	0.035084	0.029055	0.028832	0.036536	0.015486	0.017422	0.014609	-0.012484
201809	-0.003578	0.004740	-0.001456	-0.014152	-0.006904	0.011755	-0.004069	-0.020193	-0.029168	-0.042230
201810	-0.083670	-0.098409	-0.097326	-0.102713	-0.095460	-0.095983	-0.097991	-0.099281	-0.106857	-0.105269
201811	0.026632	0.020180	0.011850	0.000355	0.008811	-0.005091	-0.026795	-0.023427	-0.020951	-0.053584
201812	-0.079095	-0.082695	-0.081875	-0.098785	-0.102752	-0.119083	-0.126161	-0.138438	-0.144276	-0.204715

Part II: Distress Risk Puzzle Analysis

- Use the EDF monthly decile portfolio returns, and perform the following:
  - CAPM regression
  - Fama-French 3 factor regression

- Interpret the results.
  - Reuse the codes you implemented in HW2 and HW1.