Statistics Methods in Finance
Homework 4

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Outline (HW4 questions)

1.(50%) Find the monthly Fama-French three factors from 1927 to 2017
Hint. Kenneth R. French has provided it online.

2.(50%) We talk about the factors and risk-free rate in the Fama-French three factor models, but do these have relationship itself? Do a multivariate linear regression for the risk-free rate against the Fama-French three factors.

1. Find the monthly Fama-French three factors

I got the data from the following website:

https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

HOME
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DATA LIBRARY
- U.S. RESEARCH RETURNS
- U.S. RESEARCH BREAKPOINTS
- U.S. BOOK EQUITY DATA
- INTERNATIONAL RESEARCH RETURNS
- DEVELOPED MARKET FACTORS AND RETURNS

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Current Research Returns

In August 2020, we removed the adjustment to book equity related to FASB Statement No. 106, Employers' Accounting for Postretirement Benefits Other Than Pensions, which was issued in 1990.

	August 2020	Last 3 Months	Last 12 Months
Fama/French 3 Research Factors			
Rm-Rf	7.62	16.63	23.20
SMB	-0.10	0.31	-3.42
HML	-3.10	-7.25	-40.39
Fama/French 5 Research Factors (2x3)			
Rm-Rf	7.62	16.63	23.20
SMB	-0.80	-2.14	-12.55
HML	-3.10	-7.25	-40.39
RMW	4.13	5.19	3.62
CMA	-1.50	-0.11	-6.30
Fama/French Research Portfolios			
Size and Book-to-Market Portfolios			
Small Value	5.38	12.12	-7.89
Small Neutral	4.77	10.30	2.57
Small Growth	7.43	15.43	26.68
Big Value	5.33	10.35	-6.21
Big Neutral	3.06	5.01	-2.17
Big Growth	9.50	21.56	40.00
Size and Operating Profitability Portfolios			
Small Robust	9.25	16.77	5.37
Small Neutral	5.21	9.23	-1.87
Small Weak	5.13	13.81	16.29

Download link

U.S. Research Returns Data (Downloadable Files)

Changes in CRSP Data

Fama/French 3 Factors TXT CSV Details
Fama/French 3 Factors [Weekly] TXT CSV Details
Fama/French 3 Factors [Daily] TXT CSV Details

Content of data

	A	B	C	D	E	F	G	H
1	This file was created by CMPT_ME_BEME_RETS using the 202008 CRSP database.							
2	The 1-mor Inc.							
3								
4		Mkt-RF	SMB	HML	RF			
5	192607	2.96	-2.3	-2.87	0.22			
6	192608	2.64	-1.4	4.19	0.25			
7	192609	0.36	-1.32	0.01	0.23			
8	192610	-3.24	0.04	0.51	0.32			
9	192611	2.53	-0.2	-0.35	0.31			
10	192612	2.62	-0.04	-0.02	0.28			
11	192701	-0.06	-0.56	4.83	0.25			
12	192702	4.18	-0.1	3.17	0.26			
13	192703	0.13	-1.6	-2.67	0.3			
14	192704	0.46	0.43	0.6	0.25			
15	192705	5.44	1.41	4.93	0.3			
16	192706	-2.34	0.47	-1.53	0.26			
17	192707	7.26	-3.23	-1.16	0.3			
18	192708	1.97	-0.72	-3.69	0.28			
19	192709	4.76	-3.57	-0.71	0.21			
20	192710	-4.31	2.13	-4.33	0.25			
21	192711	6.58	2.76	-0.31	0.21			
22	192712	2.09	0.93	-1.06	0.22			
23	192801	-0.68	4.25	-0.72	0.25			

2. Multivariate linear regression for the risk-free rate against the Fama-French three factors

Results table:

OLS Regression Results

Dep. Variable:	RF	R-squared:	0.007
Model:	OLS	Adj. R-squared:	0.004
Method:	Least Squares	F-statistic:	2.617
Date:	Mon, 26 Oct 2020	Prob (F-statistic):	0.0498
Time:	21:59:53	Log-Likelihood:	-52.778
No. Observations:	1092	AIC:	113.6
Df Residuals:	1088	BIC:	133.5
Df Model:	3		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	0.2770	0.008	35.574	0.000	0.262	0.292
Mkt-RF	-0.0031	0.002	-1.975	0.049	-0.006	-1.97e-05
SMB	-0.0029	0.003	-1.150	0.250	-0.008	0.002
HML	0.0031	0.002	1.380	0.168	-0.001	0.008

Omnibus:	172.477	Durbin-Watson:	0.058
Prob(Omnibus):	0.000	Jarque-Bera (JB):	269.488
Skew:	1.060	Prob(JB):	3.03e-59
Kurtosis:	4.194	Cond. No.	5.71

Code:

```
import pandas as pd
import statsmodels.api as sm

df = pd.read_csv('F-F_Research_Data_Factors_monthly.csv', index_col='yr_mth')
RF = df.loc['192701':'201712','RF']
three_factor = df.loc['192701':'201712','Mkt-RF':'HML']

X1 = sm.add_constant(three_factor)
reg = sm.OLS(RF, X1).fit()
y_fitted = reg.fittedvalues
reg.summary()
```

Only the p-value of market risk premium (Mkt_RF) is less than 5%. It means there is a relationship between Mkt_RF and RF.

For the size factor (SMB) and Book to market factor (HML), their p-values are higher than 0.05. So the SMB and HML are not significant to the RF.