Crossectional asset pricing - Fama French

The research post CAPM-APT.

The Fama French papers and the literature following.

The Fama French debate

Background: Fama on efficient markets
Fama at the forefront of the efficient markets debate since the 70's.
Market efficiency: Asset Prices reflect all available information
His classical survey Fama [1970] is widely cited, its main conclusion is that markets are efficient.

Main point made in that survey:

> *We can only test whether information is properly reflected in prices in the context of a pricing model that defines the meaning of properly.*

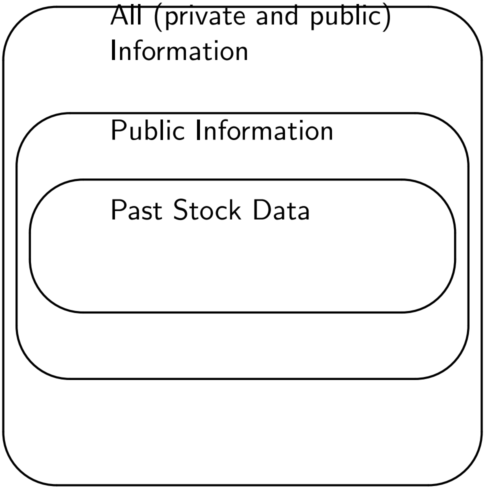
(Fama [1991], pg 1576.)

Because of its preeminence as a model of asset prices, the CAPM became the model that most had in mind when talking about a model that "properly" describes asset prices.
Some unfortunate consequences for the cross-sectional debate.

Reminder of the setup in Fama [1970].
Introduced 3 categories of efficiency

1. Weak form tests
    - Can past prices be used to predict public information
2. Semi strong form tests
    - Do prices reflect public information
3. Strong form efficiency
    - Do prices reflect private info.

The efficiency definition depend on the information available:
Think about the information sets



In terms of the original setup, CAPM used as a model of “expected returns” in semi–strong tests (event studies). Note that tests of the CAPM does not really fit into these categories.

Fama [1991], Efficient Markets, the sequel

Fama [1991] returns to the efficient markets debate.
Conclude: markets on the main efficient.
The three categories above were changed, to better fit what had happened in the last 20 years.

1. Tests for return predictabiliy
   - time series predictability (will return to)
   - cross-sectional predictability (tests of asset pricing models)
2. Event studies
3. Tests for private information
   - Insider trading
   - Security analysts
   - Portfolio managers

Fama [1991], Efficient Markets, the sequel

What about return predictability in the context of an asset pricing model?

Summarize results

- Early evidence: Positive relation returns & beta
- Roll critique: Without the market portfolio, can not claim to have tested CAPM
- Anomalies: Other variables beside beta important in explaining returns.
  - Size (Banz [1981])
  - Seasonality
  - E/P ratios
  - Leverage

Fama [1991], Efficient Markets, the sequel

Bottom Line: (Asset pricing models)

> *The SLB model also passes the test of practical usefulness. Before it became a standard part of MBA investments courses, market professionals had only a vague understanding of risk and diversification. . . . The SLB model gave a summary measure of risk, market β, interpreted as market sensitivity, that rang mental bells. Indeed, in spite of the evidence against the SLB model, market professionals (and academics) still think about risk in terms of market β.*

Fama [1991], pg 1593.

Fama and French, the revolution

This was the state of the efficient markets (and the CAPM debate), according to Fama, in 1991.
However, at the same time Fama and French [1992] is lurking...
Paper: Use Fama and MacBeth [1973] methods on

- newer data
- portfolios also split according to other criteria (size, B/M)

Results (summary):

- β does a poor job in explaining cross–section of asset returns.
- Size and B/M does a much better job.

FF goes on in a series of papers (Fama and French [1993], Fama and French [1995], Fama and French [1996]) to beat the issue into the ground.

Reactions to FF

The FF paper produced big headlines in newspapers, practical journals. Beta is dead!
Most of the finance profession smells a good fight, and rises to meet the challenge.
Some of the fronts at which attacks are made

- Theory is bad (Berk [1995])
- Data is bad (Kothari et al. [1995])
- Econometrics is bad (Kim [1995])
- Unconditional CAPM is dead, lets hear it for the conditional CAPM (Jagannathan and Wang [1996])
- Hooray for the NEW finance (Haugen [1995])

Size, the Berk [1995] paper

Interesting (and simple) paper commenting on the size effect.
Berk claim: *Expect* to see a positive relation between size (market value), and return.
Intuition:
Two firms with identical expected perpetual future cashflows $\tilde{c}$.
Current price:

$$p = \frac{E[\tilde{c}]}{r}$$

If the firm have different risk, the one with the higher risk will have lower price. . . .
The paper formalizes this notion by showing how any mis–estimation of β gives a positive relation between unexplained returns and firms market value.
Go over the thoretical arguments

Berk '95

- I firms
- $\tilde{c}_i$: end of period cashflow
- p_i: market value of firm i.
- $\tilde{r}_i = \log\left(\frac{\tilde{c}_i}{p_i}\right)$
- $C_i = E[\log \tilde{c}_i]$: "true" size.
- $R_i = E[\tilde{r}_i]$: Expected return.

Assume independence between cash flows and returns:
$L(C, R) = G(C)H(R)$.

Berk '95

Claim: $\log p_i$ will predict expected return.
Consider the regression

$$R_i = \alpha + \theta \log p_i + \epsilon_i$$

Recall the definition of R_i

$$R_i = E[\tilde{r}_i] = E\left[\log\left(\frac{\tilde{c}}{p_i}\right)\right] = E[\log c_i - \log p_i] = E[\log c_i] - \log p_i$$

giving

$$\log p_i = C_i - R_i$$

Recall what the coefficient is for a univariate regression

$$y = a + bx + \epsilon$$

$$\hat{b} = \frac{\text{cov}(x, y)}{\text{var}(x)}$$

Berk '95

$$\hat{\theta} = \frac{\text{cov}(R_i, \log p_i)}{\text{var}(\log p_i)} = \frac{\text{cov}(R_i, C_i - R_i)}{\text{var}(\log p_i)} = \frac{\text{cov}(R_i, C_i)}{\text{var}(\log p_i)} - \frac{\text{cov}(R_i, R_i)}{\text{var}(\log p_i)}$$

$$= 0 - \frac{\text{var}(R_i)}{\text{var}(\log p_i)} < 0$$

Thus, in the regression

$$R_i = \alpha + \theta \log p_i + \epsilon_i$$

$\theta < 0$, there is an inverse relation between returns and size, as measured by market value.
Thus, market value is correlated with return because the market value is dicounted using the same return

FF - current usage

Previous: Early reactions to the FF research.
Little of it concerns methodological innovations.
Still in a setting with methods of Black et al. [1972] and Fama and MacBeth [1973].
Expanding on the number of "factors" considered in the pricing equation.
The best known such factors: The two Fama and French factors `SMB` and `HML`.

FF - current usage

$$E[r_{it}] = \beta_i er_{mt} + b^{SMB} SMB_t + b^{HML} HML_t$$

In estimation settings we need the two factors SMB and HML. These are typically downloaded from Ken French homepage when dealing with US (or global) data, or alternatively constructed from the crossection.

The two factors `SMB` and `HML` were introduced in Fama and French [1996].

For the construction they split data for the US stock market as shown in figure.

FF - current usage

		Book/Market		
		L	H	M
Size	Small	S/L	S/M	S/H
	Big	B/L	B/M	B/H

The construction of the two Fama and French [1996] factors

FF - current usage

The pricing factors are calculated as

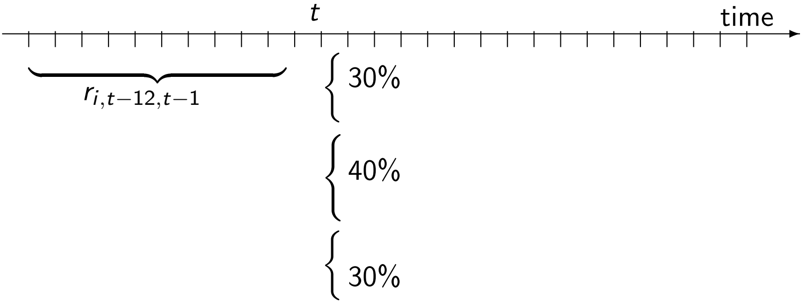
$$\texttt{SMB} = \text{average}(S/L, S/M, S/H) - \text{average}(B/L, B/M, B/H)$$

$$\texttt{HML} = \text{average}(S/H, B/H) - \text{average}(S/L, B/L)$$

Property of these factors:
They are zero investment investment strategies, a long position minus a short position.

Momentum

The Carhart [1997] momentum factor PR1YR.



Each month the stock return is calculated over the previous eleven months. The returns are ranked, and split into three portfolios: The top 30%, the median 40% and the bottom 30%.

The Carhart [1997] factor PR1YR is the difference between the average return of the top and the bottom portfolios. The ranking is recalculated every month.

An alternative momentum factor: UMD

Ken French introduces an alternative momentum factor UMD, which he describes as follows:

> *....a momentum factor, constructed from six value-weight portfolios formed using independent sorts on size and prior return of NYSE, AMEX, and NASDAQ stocks. Mom is the average of the returns on two (big and small) high prior return portfolios minus the average of the returns on two low prior return portfolios. The portfolios are constructed monthly. Big means a firm is above the median market cap on the NYSE at the end of the previous month; small firms are below the median NYSE market cap. Prior return is measured from month -12 to - 2. Firms in the low prior return portfolio are below the 30th NYSE percentile. Those in the high portfolio are above the 70th NYSE percentile.*
>
> *(from Ken French's web site)*

Alternative factors

Much of current empirical asset pricing literature:
Search for alternatives to the Fama French two factors.
Examples:

- Macroeconomic factors
- Liquidity factors

Each time one suggests a "new" factor one does a similar construction to the FF constuction:
Construct a zero investment portfolio of stocks sorted by the given criterion.
Does the suggested factor price the cross section of asset returns?

Illustrating the typical current usage

Consider the analysis of Ferreira et al. [2013], a randomly chosen paper, in which they have a huge crossection of international mutual funds, and want to test for excess performance.
They describe their estimation as follows:

$$''R_{it} = \alpha_i + \beta_{0i} RM_t + \beta_{1i} SMB_t + \beta_{2i} HML_t + \beta_{3i} MOM_t + \varepsilon_{it}$$

where R_{it} is the return in US dollars of fund i in excess of the 1 month US Treasury bill in month t, RM_t is the excess return in US dollars on the market, SMB_t (small minus big) is the average return on the small capitalization portfolio minus the average return on the large capitalization portfolio;....''

So this formulation for investigating performance is by now standard in current research.

Fama and French add factors (again) (2014)

A recent step on the "lets add factors" road is Fama and French [2015], which add two more variables, profitability and investment, to their three factor model.

Their definitions of these variables are

> *"In the sort for June of year t, B is book equity at the end of the fiscal year ending in year $t-1$ and M is market cap at the end of December of year $t-1$, adjusted for changes in shares outstanding between the measurement of B and the end of December. Operating profitability, OP, in the sort for June of year t is measured with accounting data for the fiscal year ending in year $t-1$ and is revenues minus cost of goods sold, minus selling, general, and administrative expenses, minus interest expense all divided by book equity. Investment, Inv, is the rate of growth of total assets from the fiscal year ending in year $t-2$ to the fiscal year ending in $t-1$."*

(Fama and French [2015], table 8.)

Example: US Cross section

Exercise

Collect from Ken French's homepage data on returns on ten industry portfolios (equally weighted) for the period 1926-2012.

1. Estimate the CAPM using the BJS method industry for industry. Do you reject that the constant coefficients are zero?
2. Estimate the three factor model (RMRF plus SMB and HML) using the BJS method industry for industry. Do these provide a better fit?

Exercise Solution

Reading data

```
# make sure that the first date do not change, this hardcoc
library(zoo)
FF1 <- read.table("../data/F-F_Research_Data_Factors_monthl
                  header=TRUE,skip=3)
FF <- zooreg(FF1[2:5],start=c(1926,7),frequency=12)
RMRF <- FF$Mkt.RF
SMB  <- FF$SMB
HML  <- FF$HML
RF   <- FF$RF
FF10IndusEW <- read.table("../data/10_Industry_Portfolios_m
                          header=TRUE,skip=10)
FF10IndusEW <- zooreg(FF10IndusEW,start=c(1926,7),frequency
```

Exercise Solution

Running the CAPM

```
eRi <- FF10IndusEW-RF
eRm <- RMRF
data <- merge.zoo(eRi,eRm,all=FALSE)
eRi <- as.matrix(data[,1:10])
eRm <- as.matrix(data[,11])
summary(data)
```

Exercise Solution

```
     Index           NoDur              Durbl              Manuf
 Min.   :1926   Min.   :-28.5300   Min.   :-34.690   Min.   :-32.260
 1st Qu.:1948   1st Qu.: -2.1500   1st Qu.: -3.245   1st Qu.: -2.675
 Median :1970   Median :  0.9300   Median :  0.790   Median :  1.220
 Mean   :1970   Mean   :  0.8662   Mean   :  0.891   Mean   :  1.039
 3rd Qu.:1991   3rd Qu.:  3.7850   3rd Qu.:  4.860   3rd Qu.:  4.590
 Max.   :2013   Max.   : 57.4200   Max.   : 81.250   Max.   : 70.050
     Enrgy             HiTec             Telcm             Shops
 Min.   :-32.570   Min.   :-37.690   Min.   :-27.900   Min.   :-30.2500
 1st Qu.: -3.365   1st Qu.: -3.410   1st Qu.: -2.810   1st Qu.: -2.6050
 Median :  1.120   Median :  1.150   Median :  1.100   Median :  0.9200
 Mean   :  1.150   Mean   :  1.151   Mean   :  0.948   Mean   :  0.9173
 3rd Qu.:  5.180   3rd Qu.:  5.665   3rd Qu.:  4.775   3rd Qu.:  4.3050
 Max.   : 71.530   Max.   : 54.580   Max.   : 52.270   Max.   : 67.8000
      Hlth              Utils              Other               eRm
 Min.   :-33.320   Min.   :-32.0500   Min.   :-30.8000   Min.   :-28.98
 1st Qu.: -2.780   1st Qu.: -1.6950   1st Qu.: -2.3650   1st Qu.: -2.10
 Median :  1.050   Median :  0.8000   Median :  1.0600   Median :  1.01
 Mean   :  1.077   Mean   :  0.8437   Mean   :  0.9874   Mean   :  0.62
 3rd Qu.:  4.985   3rd Qu.:  3.1350   3rd Qu.:  4.1500   3rd Qu.:  3.65
 Max.   : 42.560   Max.   : 65.5700   Max.   : 77.2400   Max.   : 37.77
```

Exercise Solution

Result for industry NoDur (Non Durables)

```
Call:
lm(formula = NoDur ~ eRm)

Residuals:
     Min       1Q   Median       3Q      Max
-11.6174  -1.8605  -0.2133   1.5024  23.6169

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  0.19884    0.10209   1.948   0.0517 .
eRm          1.06264    0.01868  56.879   <2e-16 ***

Residual standard error: 3.263 on 1033 degrees of freedom
Multiple R-squared: 0.758,Adjusted R-squared: 0.7577
F-statistic:  3235 on 1 and 1033 DF,  p-value: < 2.2e-16
```

Exercise Solution

		Estimate	Std. Error	t value	Pr(>|t|)
NoDur	(Intercept)	0.1988	0.1021	1.95	0.0517
	eRm	1.0626	0.0187	56.88	0.0000
Durbl	(Intercept)	-0.0090	0.1427	-0.06	0.9495
	eRm	1.4332	0.0261	54.89	0.0000
Manuf	(Intercept)	0.2169	0.1056	2.05	0.0402
	eRm	1.3092	0.0193	67.75	0.0000
Enrgy	(Intercept)	0.4104	0.1747	2.35	0.0190
	eRm	1.1782	0.0320	36.86	0.0000
HiTec	(Intercept)	0.2548	0.1424	1.79	0.0738
	eRm	1.4267	0.0261	54.77	0.0000
Telcm	(Intercept)	0.2910	0.1351	2.15	0.0315
	eRm	1.0463	0.0247	42.31	0.0000
Shops	(Intercept)	0.1905	0.1231	1.55	0.1221
	eRm	1.1572	0.0225	51.35	0.0000
Hlth	(Intercept)	0.4135	0.1305	3.17	0.0016
	eRm	1.0566	0.0239	44.25	0.0000
Utils	(Intercept)	0.2607	0.1355	1.92	0.0546
	eRm	0.9284	0.0248	37.44	0.0000
Other	(Intercept)	0.2128	0.1315	1.62	0.1058
	eRm	1.2333	0.0241	51.26	0.0000

Exercise Solution

Same portfolios adding the two Fama French factors SMB and HML.

```
> source("read_industries.R")
> eRi <- FF10IndusEW-RF
> eRm <- RMRF
> data <- merge.zoo(eRi,eRm,SMB,HML, all=FALSE)
> summary(data)
```

Exercise Solution

Additional data:

```
      SMB                   HML
 Min.    :-16.3900   Min.    :-13.450
 1st Qu.: -1.5200   1st Qu.: -1.295
 Median :  0.0500   Median :  0.220
 Mean   :  0.2352   Mean   :  0.382
 3rd Qu.:  1.7750   3rd Qu.:  1.745
 Max.   : 39.0400   Max.   : 35.480
```

Exercise Solution

First industry, nondurables:

```
lm(formula = NoDur ~ eRm + SMB + HML)

Residuals:
     Min       1Q   Median       3Q      Max
-10.4511  -1.1701  -0.0814   0.9188  13.0919

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  0.01752    0.06219   0.282    0.778
eRm          0.86677    0.01226  70.718   <2e-16 ***
SMB          0.72316    0.01974  36.640   <2e-16 ***
HML          0.35155    0.01779  19.756   <2e-16 ***

Residual standard error: 1.98 on 1031 degrees of freedom
Multiple R-squared: 0.9111,Adjusted R-squared: 0.9108
F-statistic:  3521 on 3 and 1031 DF,  p-value: < 2.2e-16
```

Exercise Solution

		Estimate	Std. Error	t value	Pr(>|t|)
NoDur	(Intercept)	0.0175	0.0622	0.28	0.7783
	eRm	0.8668	0.0123	70.72	0.0000
	SMB	0.7232	0.0197	36.64	0.0000
	HML	0.3515	0.0178	19.76	0.0000
Durbl	(Intercept)	-0.2364	0.0921	-2.57	0.0104
	eRm	1.1718	0.0181	64.58	0.0000
	SMB	1.0161	0.0292	34.78	0.0000
	HML	0.3995	0.0263	15.17	0.0000
Manuf	(Intercept)	0.0156	0.0588	0.27	0.7907
	eRm	1.0967	0.0116	94.70	0.0000
	SMB	0.7685	0.0186	41.21	0.0000
	HML	0.4034	0.0168	23.99	0.0000
Enrgy	(Intercept)	0.2007	0.1558	1.29	0.1980
	eRm	0.9868	0.0307	32.13	0.0000
	SMB	0.5950	0.0495	12.03	0.0000
	HML	0.4973	0.0446	11.15	0.0000
HiTec	(Intercept)	0.1975	0.1040	1.90	0.0578
	eRm	1.2547	0.0205	61.23	0.0000
	SMB	0.9875	0.0330	29.92	0.0000
	HML	-0.1750	0.0298	-5.88	0.0000

Exercise Solution

		Estimate	Std. Error	t value	Pr(>|t|)
Telcm	(Intercept)	0.2949	0.1234	2.39	0.0170
	eRm	0.9708	0.0243	39.93	0.0000
	SMB	0.5335	0.0392	13.63	0.0000
	HML	-0.2146	0.0353	-6.08	0.0000
Shops	(Intercept)	0.0362	0.0838	0.43	0.6656
	eRm	0.9498	0.0165	57.50	0.0000
	SMB	0.8963	0.0266	33.70	0.0000
	HML	0.1932	0.0240	8.05	0.0000
Hlth	(Intercept)	0.4031	0.1068	3.77	0.0002
	eRm	0.9449	0.0211	44.87	0.0000
	SMB	0.7343	0.0339	21.65	0.0000
	HML	-0.2411	0.0306	-7.89	0.0000
Utils	(Intercept)	0.0968	0.1234	0.78	0.4330
	eRm	0.8238	0.0243	33.88	0.0000
	SMB	0.1542	0.0392	3.94	0.0001
	HML	0.5060	0.0353	14.33	0.0000
Other	(Intercept)	-0.0784	0.0690	-1.14	0.2565
	eRm	0.9658	0.0136	70.99	0.0000
	SMB	0.8372	0.0219	38.21	0.0000
	HML	0.6868	0.0198	34.77	0.0000

Example: Norwegian Cross section

Exercise

Running the Black et al. [1972] regression

$$er_{it} = \alpha_i + \beta_i er_{mt} + e_{it}$$

on a set of 10 size-based portfolios on the Oslo Stock Exchange, we find that we on an equation by equation basis reject the null hypothesis that $\alpha_i = 0$ for many of the portfolios. An alternative model is the Fama French model

$$E[r_i] - r_f = E[r_m - r_f]\beta_i + b_i^{smb} SMB + b_i^{hml} HML_t$$

where *SMB* and *HML* are "zero investment" portfolios designed to represent size and book-to-market "factors." Using domestic versions of the Fama French factors, consider the regression

$$er_{it} = \alpha_i + \beta_i er_{mt} + + b_i^{smb} SMB_t + b_i^{hml} HML_t e_{it}$$

Run these regressions on 10 (ew) size sorted portfolios at the OSE. Test $\alpha_i = 0$ on a portfolio by portfolio basis. Use an equally weighted market index, and returns data 1980-2012.

Exercise Solution

Reading the data and running the regressions

```
library(zoo)
library(xtable)
Rets <- read.zoo("../../data/equity_size_portfolios_monthly_ew.t
                    header=TRUE,sep=";",format="%Y%m%d")
Rf <- read.zoo("../../data/NIBOR_monthly.txt",
                format="%Y%m%d",header=TRUE,sep=";")
eR  <- Rets - lag(Rf,-1)
Rm <- read.zoo("../../data/market_portfolios_monthly.txt",
                format="%Y%m%d",header=TRUE,sep=";")
eRmew <- Rm$EW - lag(Rf,-1)
FF <- read.zoo("../../data/pricing_factors_monthly.txt",
                header=TRUE,sep=";",format="%Y%m%d")
data  <- merge(eR,eRmew,FF$SMB,FF$HML,all=FALSE)
er  <- as.matrix(data[,1:10])
erm <-as.matrix(data[,11])
SMB <- as.matrix(data[,12])
HML <- as.matrix(data[,13])
reg=lm(er~erm + SMB + HML )
```

Exercise Solution ctd Results for the first portfolio (smallest stocks)

```
Response X1..small.size. :

Residuals:
     Min       1Q   Median       3Q      Max
-0.14418 -0.03050 -0.00379  0.02299  0.33764

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 0.009332   0.002781   3.356 0.000872 ***
erm         0.762926   0.047877  15.935  < 2e-16 ***
SMB         0.244951   0.058359   4.197 3.38e-05 ***
HML         0.147748   0.051301   2.880 0.004206 **

Residual standard error: 0.0519 on 374 degrees of freedom
  (6 observations deleted due to missingness)
Multiple R-squared: 0.4203,Adjusted R-squared: 0.4156
F-statistic: 90.38 on 3 and 374 DF,  p-value: < 2.2e-16
```

Exercise Solution ctd And for portfolio 2

```
Response X2 :

Residuals:
      Min        1Q    Median        3Q       Max 
-0.180823 -0.021229 -0.002246  0.021534  0.155906 

Coefficients:
            Estimate Std. Error t value Pr(>|t|)    
(Intercept) 0.002393   0.002289   1.046   0.2964    
erm         0.928658   0.039405  23.567  < 2e-16 ***
SMB         0.363066   0.048032   7.559 3.17e-13 ***
HML         0.077116   0.042223   1.826   0.0686 .  

Residual standard error: 0.04272 on 374 degrees of freedom
  (6 observations deleted due to missingness)
Multiple R-squared: 0.6086,Adjusted R-squared: 0.6054 
F-statistic: 193.8 on 3 and 374 DF,  p-value: < 2.2e-16
```

Exercise Solution ctd

Summarizing the results in a table:

		Estimate	Std. Error	t value	$\Pr(>\lvert t\rvert)$
1(small)	(Intercept)	0.0093	0.0028	3.36	0.0009
	erm	0.7629	0.0479	15.94	0.0000
	SMB	0.2450	0.0584	4.20	0.0000
	HML	0.1477	0.0513	2.88	0.0042
2	(Intercept)	0.0024	0.0023	1.05	0.2964
	erm	0.9287	0.0394	23.57	0.0000
	SMB	0.3631	0.0480	7.56	0.0000
	HML	0.0771	0.0422	1.83	0.0686
3	(Intercept)	-0.0018	0.0020	-0.92	0.3595
	erm	0.9847	0.0338	29.10	0.0000
	SMB	0.2370	0.0412	5.75	0.0000
	HML	-0.0211	0.0363	-0.58	0.5608
4	(Intercept)	-0.0040	0.0019	-2.05	0.0413
	erm	1.0636	0.0335	31.75	0.0000
	SMB	0.3090	0.0408	7.57	0.0000
	HML	-0.0430	0.0359	-1.20	0.2321
5	(Intercept)	0.0012	0.0018	0.68	0.4939

Exercise Solution ctd

6	(Intercept)	-0.0004	0.0019	-0.21	0.8330
	erm	0.9516	0.0322	29.51	0.0000
	SMB	-0.0539	0.0393	-1.37	0.1714
	HML	0.0544	0.0346	1.57	0.1165
7	(Intercept)	-0.0024	0.0019	-1.25	0.2103
	erm	1.0884	0.0326	33.40	0.0000
	SMB	-0.1652	0.0397	-4.16	0.0000
	HML	0.0748	0.0349	2.14	0.0329
8	(Intercept)	-0.0010	0.0019	-0.55	0.5796
	erm	1.0466	0.0324	32.33	0.0000
	SMB	-0.2380	0.0395	-6.03	0.0000
	HML	-0.0079	0.0347	-0.23	0.8207
9	(Intercept)	-0.0041	0.0019	-2.16	0.0313
	erm	1.2009	0.0323	37.21	0.0000
	SMB	-0.3073	0.0393	-7.81	0.0000
	HML	-0.0144	0.0346	-0.42	0.6768
10(large)	(Intercept)	0.0026	0.0025	1.08	0.2805
	erm	0.9585	0.0422	22.71	0.0000
	SMB	-0.6657	0.0514	-12.94	0.0000

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