

Fama-French Three-Factor Model

- Influential 1993 study in the *Journal of Financial Economics*
- Introduces factors to capture firm-size and value effects
- Value metric: (book value of equity)/(market value of equity)
- Factors:
 - MKT: excess return on market
 - SMB: small-firm return minus big-firm return
 - HML: high-B/M return minus low B/M return
- Regression of asset i 's excess return on the factors:

$$R_{it} = \alpha_i + b_i \text{MKT}_t + s_i \text{SMB}_t + h_i \text{HML}_t + \epsilon_{i,t}$$

- The asset's factor "betas": b_i , s_i , and h_i
- Abnormal return: α_i

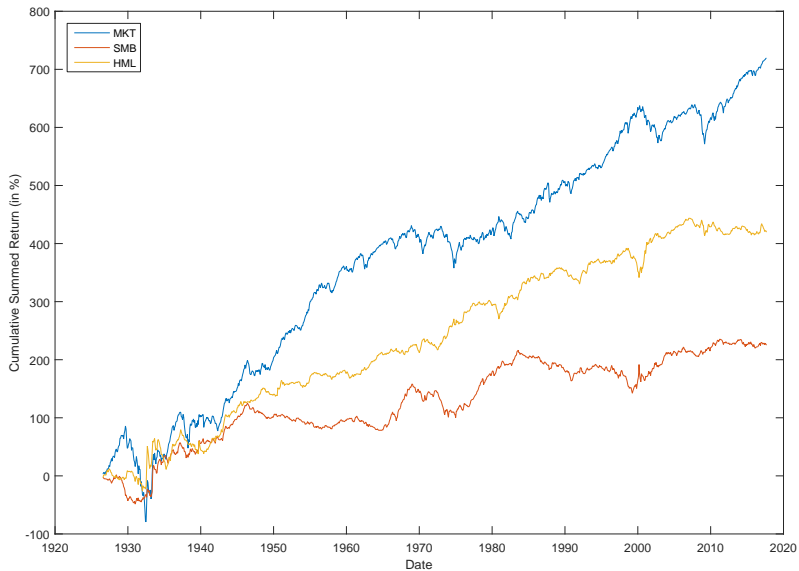
Factor Construction

- Portfolio sorts performed at the end of June of each year
- NYSE/AMEX/NASDAQ stocks
- Divide stocks into 2 groups at the NYSE median size
- Independently divide stocks into 3 groups of B/M:
 - below 30th percentile of NYSE
 - between 30th and 70th percentile of NYSE
 - above 70th percentile of NYSE
- Intersections of size and B/M sorts yield six portfolios
- Form value-weighted returns on each of the six portfolios
- SMB: (simple) average of 3 small-firm B/M returns minus average of 3 large-firm B/M returns
- HML: average of small- and large-firm high B/M returns minus average of small- and large-firm low B/M returns

Factor Properties

Fama-French Three Factors, 1927–2016

	Mean (%/yr)	Std. Dev. (%/yr)	Sharpe Ratio	Correlations			Tangent Weights
				MKT-RF	SMB	HML	
MKT	8.4	20.5	0.41	1.000	0.319	0.239	0.36
SMB	3.3	13.8	0.24	0.319	1.000	0.125	0.18
HML	5.1	14.2	0.36	0.239	0.125	1.000	0.46
Tangent	5.9	11.9	0.50	0.818	0.476	0.719	-



MKT Betas, Single-Factor Model

(Value-Weighted Portfolios, 7/1927–8/2017)

Size	Book/Market				
	Low	2	3	4	High
Small	1.63	1.41	1.37	1.27	1.38
2	1.27	1.23	1.20	1.21	1.38
3	1.25	1.12	1.12	1.16	1.38
4	1.09	1.08	1.11	1.16	1.42
Big	0.96	0.95	0.97	1.11	1.31

MKT Betas, Fama-French 3-Factor Model

(Value-Weighted Portfolios, 7/1927–8/2017)

Size	Book/Market				
	Low	2	3	4	High
Small	1.29	1.08	1.05	0.95	0.99
2	1.09	1.02	0.99	0.97	1.07
3	1.13	1.02	0.99	0.98	1.13
4	1.08	1.02	1.02	1.03	1.22
Big	1.03	0.99	0.96	1.04	1.18

SMB Betas, Fama-French 3-Factor Model

(Value-Weighted Portfolios, 7/1927–8/2017)

Size	Book/Market				
	Low	2	3	4	High
Small	1.43	1.54	1.24	1.22	1.30
2	1.12	0.98	0.83	0.81	0.91
3	0.82	0.51	0.44	0.46	0.59
4	0.33	0.23	0.20	0.19	0.29
Big	-0.15	-0.20	-0.25	-0.19	-0.15

HML Betas, Fama-French 3-Factor Model

(Value-Weighted Portfolios, 7/1927–8/2017)

Size	Book/Market				
	Low	2	3	4	High
Small	0.42	0.23	0.51	0.57	0.91
2	-0.23	0.13	0.35	0.57	0.88
3	-0.23	0.04	0.31	0.55	0.88
4	-0.35	0.09	0.35	0.57	0.94
Big	-0.26	0.02	0.34	0.65	1.02

R-squared, Single-Factor Model

(Value-Weighted Portfolios, 7/1927–8/2017)

Size	Book/Market				
	Low	2	3	4	High
Small	0.51	0.59	0.67	0.66	0.63
2	0.72	0.77	0.78	0.76	0.72
3	0.81	0.87	0.85	0.81	0.75
4	0.87	0.90	0.87	0.83	0.76
Big	0.92	0.92	0.85	0.81	0.67

Average R-squared: 0.772

R-squared, Fama-French 3-Factor Model

(Value-Weighted Portfolios, 7/1927–8/2017)

Size	Book/Market				
	Low	2	3	4	High
Small	0.65	0.82	0.89	0.93	0.94
2	0.91	0.93	0.94	0.95	0.95
3	0.93	0.93	0.93	0.93	0.93
4	0.93	0.92	0.91	0.92	0.91
Big	0.95	0.93	0.90	0.92	0.84

Average R-squared: 0.908

R-squared, Two Factors: Market and SMB

(Value-Weighted Portfolios, 7/1927–8/2017)

Size	Book/Market				
	Low	2	3	4	High
Small	0.64	0.81	0.85	0.87	0.83
2	0.90	0.93	0.91	0.88	0.83
3	0.92	0.93	0.90	0.86	0.80
4	0.90	0.92	0.88	0.84	0.78
Big	0.93	0.93	0.86	0.81	0.68

Average R-squared: 0.855

R-squared, Two Factors: Market and HML

(Value-Weighted Portfolios, 7/1927–8/2017)

Size	Book/Market				
	Low	2	3	4	High
Small	0.53	0.60	0.71	0.73	0.76
2	0.72	0.77	0.81	0.84	0.85
3	0.82	0.87	0.88	0.89	0.88
4	0.91	0.91	0.90	0.91	0.90
Big	0.95	0.92	0.89	0.92	0.84

Average R-squared: 0.828

Alphas (%/month), Single-Factor Model
(Value-Weighted Portfolios, 7/1927–8/2017)

Size	Book/Market				
	Low	2	3	4	High
Small	-0.50	-0.23	0.09	0.35	0.45
2	-0.20	0.12	0.20	0.27	0.33
3	-0.12	0.17	0.19	0.26	0.23
4	0.00	0.04	0.13	0.21	0.10
Big	-0.00	0.01	0.07	-0.07	0.09

Average absolute alpha: 0.177

Alpha t-statistics, Single-Factor Model

(Value-Weighted Portfolios, 7/1927–8/2017)

Size	Book/Market				
	Low	2	3	4	High
Small	-2.24	-1.40	0.65	2.74	3.06
2	-1.66	1.21	2.16	2.74	2.60
3	-1.26	2.42	2.60	3.10	1.95
4	0.05	0.78	1.90	2.58	0.85
Big	-0.08	0.20	0.99	-0.82	0.65

Average absolute t-statistic: 1.63

Alphas (%/month), Fama-French 3-Factor Model (Value-Weighted Portfolios, 7/1927–8/2017)

Size	Book/Market				
	Low	2	3	4	High
Small	-0.73	-0.42	-0.15	0.09	0.09
2	-0.23	0.00	0.03	0.04	0.01
3	-0.12	0.12	0.06	0.07	-0.06
4	0.08	0.00	0.01	0.03	-0.18
Big	0.08	0.02	-0.01	-0.24	-0.18

Average absolute alpha: 0.123

Alpha t-statistics, Fama-French 3-Factor Model

(Value-Weighted Portfolios, 7/1927–8/2017)

Size	Book/Market				
	Low	2	3	4	High
Small	-4.15	-3.64	-1.80	1.41	1.42
2	-3.18	0.06	0.64	0.96	0.25
3	-2.10	2.21	1.22	1.24	-0.96
4	1.58	0.03	0.27	0.56	-2.35
Big	2.40	0.48	-0.17	-4.22	-1.74

Average absolute t-statistic: 1.56