FM1 Notes, Spring 2020
Market Anomalies

I. What is wrong with the standard CAPM?

Motivations

Empirical anomalies

(1) Size effect (Banz): returns on small stocks are too high.

(2) Leverage effect: Bhandari finds that returns are positively related to leverage. He finds that leverage helps explain the cross-section of average stock returns in tests that include size and market beta.

(3) Book/market ratio effect: Stattman and Rosenberg et al. find that returns are positively related to BE/ME.

(4) E/P ratio effect: Basu finds that the E/P ratio helps explain returns in tests that includes size and market beta.

Ball argues that E/P is a proxy for unnamed factors in expected returns. E/P is likely to be higher for stocks with higher risk and expected return.

This argument may also apply to size, leverage, and book/market ratio. These variables can be regarded as different ways to scale stock prices to extract info in prices about risk and expected returns.

Since E/P, size, leverage and book/market ratio are all scaled versions of price, some of them may be redundant for describing average returns.

Fama and French want to evaluate the joint roles of beta, size, E/P, leverage and, book/market ratio in the cross section of average returns.

II. Fama and French three-factor model

$$r_{i,t} - r_{f,t} = \alpha + \beta_m (r_{m,t} - r_{f,t}) + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \varepsilon_t$$

where

$(r_{m,t} - r_{f,t})$: the market factor (market return – risk-free rate);

SMB_t : the size factor (return on firms with smallest sizes – return on firms with biggest sizes);

HML_t : the value factor (return on firms with highest book/market ratios – return on firms with lowest book/market ratios).

III. Important market anomalies (Examples)

Prior returns

1. Short-term reversal (STREV): Prior one-month return is negatively related to future return.
2. Momentum (MOM): Stocks with high returns over the past 3-12 months have high returns for the next 3-12 months.
3. Long-term reversal (LTR): Stocks with low returns over the past 3-5 years have high returns over the next 3-5 years.

External financing

4. Net stock issuance (NSI): Stock returns are lower after stock issuance.
5. Long-term stock issuance (LSI): Stocks with low composite issuance have high future returns.

Valuation

6. Book-to-market (BM): Stocks with high book-to-market ratios have high future returns.
7. Earning-to-price (EP): Stocks with high earnings-to-price ratios have high future returns.
8. Sales-to-price (SP): Stocks with high sales-to-price ratios have high future returns.

Earnings

9. Returns on assets (ROA): Stocks with high returns on assets have high future returns.
10. Standardized unexpected earnings (SUE): Stocks with high standardized unexpected earnings have high future returns.
11. Sales growth (SG): Stocks with low past sales growths have high future returns.
12. Growth profitability premium (GP): Stocks with high profitability have high future returns.

Distress

13. O-score (OS): Stocks with low Ohlson scores (lower probability of default) have high future returns.

Investment

14. Investment-to-assets (IA): Stocks with low investment-to-assets ratios have high future returns.
15. Asset growth (AG): Stocks with low asset growths have high future returns.
16. Accruals (TOTA): Stocks with low accruals have high future returns.
17. Net operating assets (NOA): Stocks with low net operating assets have high future returns.
18. Investment-to-capital (IK): Stocks with low investment-to-capital ratios have high future returns.
19. Investment growth (IG): Stocks with low investment growths have high future returns.

Others

20. Turnover (TO): Stocks with low turnovers over the past 3-12 months have high future returns.
21. Idiosyncratic volatility (IVOL): Stocks with high idiosyncratic return volatilities have low future returns.

IV. Empirical evidence on anomalies

All NYSE/AMEX/Nasdaq Stocks, Monthly Data, 1981.1 – 2018.2

Strategy		Return on Hedge Portfolio		Risk-adjusted Return (Fama-French alpha)		Strategy		Return on Hedge Portfolio		Risk-adjusted Return (Fama-French alpha)	
		ret (% per month)	t-stat	α (% per month)	t-stat			ret (% per month)	t-stat	α (% per month)	t-stat
1	STREV	0.80	4.06	0.64	3.13	12	GP	0.66	5.15	0.68	5.12
2	**MOM**	**0.95**	**3.97**	**1.15**	**5.12**	13	OS	0.65	4.17	0.83	5.85
3	**LTR**	**0.40**	**2.64**	**0.23**	**1.81**	14	IA	0.86	7.92	0.89	8.09
4	NSI	0.76	4.16	0.78	6.50	15	AG	0.88	6.92	0.81	6.96
5	LSI	0.74	3.97	0.76	6.00	16	TOTA	0.40	5.50	0.33	4.53
6	BM	0.89	4.28	0.57	3.41	17	NOA	0.66	4.44	0.78	6.45
7	EP	0.66	3.23	0.37	2.95	18	IK	0.45	3.48	0.42	4.93
8	SP	0.87	4.06	0.47	3.08	19	IG	0.50	5.97	0.46	5.39
9	ROA	1.03	5.52	1.17	7.07	20	TO	0.64	2.73	0.78	5.68
10	SUE	1.20	11.87	1.25	14.50	21	IVOL	0.26	0.91	0.52	3.18
11	SG	0.49	4.37	0.40	3.97	**COMB**		**0.71**	**9.30**	**0.66**	**15.40**

V. Other types of factors

1. Fundamental factors (accounting based)
   e.g., size, B/M, D/P, E/P, CF/P

2. Technical factors (historical returns)
   e.g., momentum (intermediate term, 3-12 months), reversal (short term, and long term)

3. Macroeconomic factors
   e.g., Chen, Roll and Ross factors: default premium, maturity premium, unanticipated inflation, growth in industrial production.

4. Market factors

5. Statistical factors

Principal components

VI. More recent developments

1. Four-factor model

$$r_{i,t} - r_{f,t} = \alpha + \beta_m (r_{m,t} - r_{f,t}) + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \beta_{UMD} UMD_t + \varepsilon_t$$

where UMD_t is the momentum (or Carhart) factor.

2. Fama and French five-factor model

$$r_{i,t} - r_{f,t} = \alpha + \beta_m (r_{m,t} - r_{f,t}) + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \beta_{RMW} RMW_t + \beta_{CMA} CMA_t + \varepsilon_t$$

where

RMW_t: the profitability factor (return on firms with robust profitability - return on firms with weak profitability);

CMA_t: the investment factor (return on firms with conservative investments – return on firms with aggressive investments).

3. Hou, Xue and Zhang (HXZ) q-factor model

$$r_{i,t} - r_{f,t} = \alpha + \beta_m (r_{m,t} - r_{f,t}) + \beta_{ME} r_{ME,t} + \beta_{I/A} r_{I/A,t} + \beta_{ROE} r_{ROE,t} + \varepsilon_t$$

where

r_{ME}: the difference between the return on a portfolio of small size stocks and the return on a portfolio of big size stocks;

$r_{I/A}$: the difference between the return on a portfolio of low investment stocks and the return on a portfolio of high investment stocks;

r_{ROE}: the difference between the return on a portfolio of high profitability (return on equity, ROE) stocks and the return on a portfolio of low profitability stocks.