Discussion of:

Dissecting Factors

by:

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Outline

- Review of key findings
- Interpretation of findings:
  - "Beating" the FF 3-factor model.
  - What is dme_t?
  - Mututal Fund Results.
- Conclusions

GL fundamental-to-price measure decomposition

1. GL motivate their calculation of the “priced” book-to-price factor using a book-to-market ratio decomposition used in Daniel and Titman (2006, DT), and elsewhere:

$$bm_t \equiv \log\left(\frac{BE_t}{ME_t}\right) = bm_{t-\tau} + \log\left(\frac{BE_t}{BE_{t-\tau}}\right) - \log\left(\frac{ME_t}{ME_{t-\tau}}\right)$$

2. The three components are:
   - The log-BM ratio τ periods ago: $bm_{t-\tau}$,
   - The log-change in book-value: $\log\left(BE_t/BE_{t-\tau}\right)$,
   - The log-change in the firm size: $\log\left(ME_t/ME_{t-\tau}\right)$.

GL fundamental-to-price measure decomposition

1. One can further break down the changes in log BE and ME into the sum of each years' changes:

$$bm_t \equiv \log\left(\frac{BE_t}{ME_t}\right) = bm_{t-\tau} + \underbrace{\log\left(\frac{BE_t}{BE_{t-\tau}}\right)}_{=\sum_{s=0}^{\tau-1} dbe_{t-s}} - \underbrace{\log\left(\frac{ME_t}{ME_{t-\tau}}\right)}_{=\sum_{s=0}^{\tau-1} dme_{t-s}}$$

2. GL argue that bm_t will only be an optimal forecast of the cross-section of returns if, in projecting future returns onto the 3 components, the projection coefficients are equal.
   - However, it is possible that the "components" of book-to-market forecast future returns differently
   - This would mean that B/M could be improved by re-weighting the different components.

Beating size and book-to-market – Table 2

Fama-MacBeth Regressions of returns on ...

	Model									
Regressor	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$r_t^{1,1}$	−5.91	−6.01	−6.12	−6.18	−6.24	−6.27	−6.39	−6.17	−6.10	−5.77
	(−14.88)	(−15.30)	(−15.73)	(−15.94)	(−16.09)	(−16.22)	(−16.65)	(−16.08)	(−16.02)	(−14.68)
$r_t^{2,12}$	0.64	0.64	0.62	0.61	0.58	0.57	0.54	0.65	0.68	0.74
	(3.62)	(3.72)	(3.57)	(3.54)	(3.40)	(3.35)	(3.20)	(3.87)	(4.04)	(4.26)
me_t	−0.10	−0.10	−0.10	−0.09	−0.09	−0.09	−0.08	−0.05	−0.02	
	(−2.84)	(−2.83)	(−2.77)	(−2.78)	(−2.75)	(−2.69)	(−2.37)	(−1.70)	(−0.58)	
bm_t	0.27	0.19	0.14	0.11	0.10	0.07	0.07	0.07	0.08	
	(4.56)	(3.25)	(2.36)	(1.94)	(1.64)	(1.25)	(1.23)	(1.27)	(1.40)	
dme_t		0.24	0.27	0.30	0.32	0.33	0.36	−0.25	−0.23	−0.28
		(2.58)	(2.74)	(3.06)	(3.27)	(3.39)	(3.64)	(−2.68)	(−2.43)	(−2.93)
dme_{t-1}			0.25	0.25	0.28	0.31	0.33	−0.22	−0.20	−0.24
			(3.04)	(3.03)	(3.30)	(3.58)	(3.90)	(−2.64)	(−2.40)	(−2.80)
dme_{t-2}				0.25	0.27	0.29	0.29	−0.21	−0.19	−0.24
				(3.87)	(4.02)	(4.39)	(4.34)	(−3.24)	(−3.02)	(−3.12)
dme_{t-3}					0.24	0.25	0.26	−0.18	−0.17	−0.24
					(3.80)	(3.94)	(4.02)	(−2.86)	(−2.75)	(−3.36)
dme_{t-4}						0.21	0.23	−0.13	−0.12	−0.17
						(3.83)	(4.20)	(−2.50)	(−2.22)	(−2.68)
Older *dmes*							Yes			
rank chg_t								−0.30	−0.34	−0.37
								(−6.61)	(−6.37)	(−5.77)
rank chg_t^2									0.20	0.23
									(6.55)	(6.47)

Key Findings

- For forecasting future returns, GL improve on book-to-market (and size)
  - They a "reweighted" BM ratio – $\widehat{bm}_t$ – "beats" bm_t in Fama-MacBeth regressions, and in sorted portfolio tests.
    - $\widehat{bm}_t$ is a projection of bm_t on the last 4 years of dme_{t-s}, their size rank change variable, and rank chg_t^2

$$\widehat{bm}_t = \sum_{s=0}^{4} \hat{\gamma}_s dme_{t-s} + \hat{\gamma}_5 \cdot \text{rank chg}_t + \hat{\gamma}_6 \cdot \text{rank chg}_t^2$$

  where the coefficients $\hat{\gamma}_i$ are from the FM return forecasting regressions.

- $\hat{me}_t$ is calculated using the same regressors.

Key Findings (2)

- GL find that these "fixed" $\hat{bm}_t$ and $\hat{me}_t$ factors better explain size and value sorted portfolios.
- They "explain" the profitability anomaly of Novy-Marx (2012)
- With the "fixed" FF3 benchmark, there is evidence that a substantial fraction of mutual-funds outperform, *net of fees*

Is the MVE portfolio in span of Mkt, HML & SMB?

- Below are the realized Sharpe-ratios of the *ex-post* tangency portfolios based on trading in:
  - The three Fama and French (1993) portfolios (Mkt, SMB, HML)
  - Carhart (1997) price momentum portfolio UMD.
  - Daniel-Titman (2006a) issuance (ISU) and accrual (ACR) portfolios
    - *All strategies are value-weighted and rebalanced annually.*

Portfolio Weights (%)						*Ex-Post*
Mkt	SMB	HML	UMD	ISU	ACR	Sharpe ratio
100.00	–	–	–	–	–	0.31
75.07	24.93	–	–	–	–	0.32
28.19	14.63	57.18	–	–	–	0.80
21.13	10.16	41.92	26.79	–	–	1.18
18.82	15.33	13.87	9.55	42.44	–	1.55
17.35	14.47	12.32	8.18	36.65	11.04	1.60

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The BM decomposition is Arbitrary

1. GL motivate their calculation of the book-return using a book-to-market ratio decomposition:

$$bm_{i,t} \equiv \log\left(\frac{BE_{i,t}}{ME_{i,t}}\right) = bm_{i,t-\tau} + \log\left(\frac{BE_{i,t}}{BE_{i,t-\tau}}\right) - \log\left(\frac{ME_{i,t}}{ME_{i,t-\tau}}\right)$$

2. However, this decomposition is arbitrary. We could also use book- and market-value per share:

$$bm_{i,t} = bm_{i,t-\tau} + \log\left(\frac{B_{i,t}}{B_{i,t-\tau}}\right) - \log\left(\frac{P_{i,t}}{P_{i,t-\tau}}\right)$$

3. and, for that matter, we can add any constant $n_{i,t}$ to both the changes in book and market:

$$bm_{i,t} = bm_{i,t-\tau} + \left[\log\left(\frac{BE_{i,t}}{BE_{i,t-\tau}}\right) + n_{i,t}\right] - \left[\log\left(\frac{ME_{i,t}}{ME_{i,t-\tau}}\right) + n_{i,t}\right]$$

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Why dme?

- Intuitively, $\hat{bm}_t$ (and $\hat{me}_t$) probably better "explain" different sets of portfolio returns becuase the come closer to spanning the MVE portfolios.
- This begs the question of why $\hat{bm}_t$ should be better than bm.

Why dme?

- One would think that dme_t would be a lot like log returns.
  - It isn't.
- the difference between *dme* and log returns $r_{i,t}$ is share issuance (Daniel and Titman 2006):

$$\sum_{s=0}^{\tau-1} dme_{i,t-s} = r_i(t-\tau,t) + \iota_i(t-\tau,t)$$

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Fig 1 – Historgram of differences in fund $t(\alpha)$s

Raw FF3 factor model vs. "fixed" FF3 factor model.

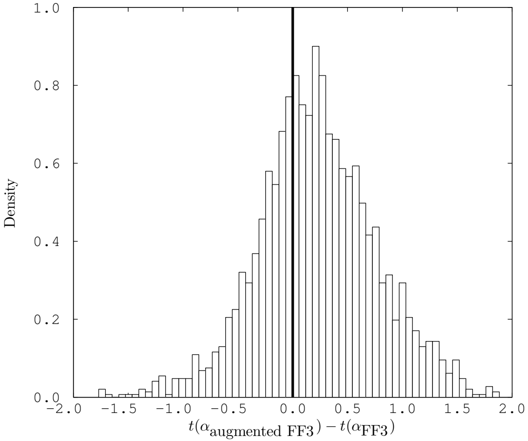
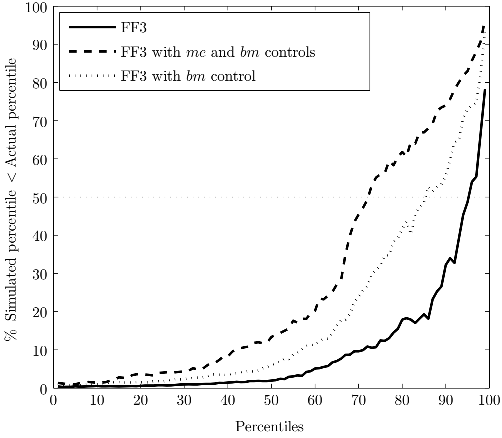


Figure 2 – Luck vs. Skill



Mutual Fund Performance

- Figure 1 suggest that the post-expense αs of *the average* fund increase when the "fixed" factor model is used.
- This seems odd, as Fama and French (2010) show that the time series of returns for average fund is very, very close to the market minus fees/expenses.
  - This seems like it has to imply the the average fund's loading on any factor other than the market must be very close to zero
  - Thus, the average alpha shouldn't be affected by an improvement of the efficiency of the factors.
- This is perhaps worth digging into a bit more.

Conclusions

- It is reasonable that constructing a set of factors that come closer to spanning the MVE portfolio will better explain individual asset and portfolio returns.
- If the only goal is increasing the Sharpe-Ratio of the "factor," you can almost certainly do better than just linear combinations of dme_{t-s}.
  - Clearly, given complete freedom in the specification of the decomposition, you can really "improve" on the simple book-to-price ratio.
- However, the end goal of this line of research is to understand the economic mechansims that cause these premia to arise.

References I

Carhart, Mark M., 1997, On persistence in mutual fund performance, *Journal of Finance* 52, 57–82.

Daniel, Kent D., and Sheridan Titman, 2006, Market reactions to tangible and intangible information, *Journal of Finance* 61, 1605–1643.

Fama, Eugene F., and Kenneth R. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3–56.

Fama, Eugene F, and Kenneth R French, 2010, Luck versus skill in the cross-section of mutual fund returns, *The Journal of Finance* 65, 1915–1947.