Discussion of:

Quality Minus Junk

by:
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Outline

- *Motivation:* Prices or Returns?
- Review of the Model & Empirical Results
- Modeling P/B
- Testing a Price Model
- Summary and Conclusions

Thanks to Charles Lee – many parts of this discussion are adapted from his earlier discussion of QMJ.

Motivation: *Prices or Returns?*

- The epigraph to the this paper is from Cochrane (2011, p. 1063):

> *When did our field stop being "asset pricing" and become "asset expected returning?" . . . Market-to-book ratios should be our left-hand variable, the thing we are trying to explain, not a sorting characteristic for expected returns.*

Paper Overview

Motivation: Try to explain prices (scaled by book)

- What makes a firm valuable?
  - Quality: $Q(\text{Profit}, \text{Payout}, \text{Safety}, \text{Growth})$;
  - z-score all indicators and combine
- Create a QMJ factor portfolio (buy Q, sell J)
- *Key Findings:*
  - Quality is persistent (Table II; A1)
  - Quality explains P/B (Table III)
  - Quality predicts returns
    - ... close to monotonically (Table IV – Decile Alphas)
    - ... for QMJ and its components, everywhere (Table VI)
    - ... in booms, busts, low- & high-vol mkts., *etc.* (Table VII)
    - ... better when P/B-Quality slope is weaker (Table VIII)
  - Size works really well, after adjusting for quality (even after 1980!) (Table IX)

"Quality" Measure

- The motivation for the AFP quality measure is the Gordon Growth Model:

$$\begin{aligned}\text{Value}_{i,t} &= \frac{e_{i,t} \cdot \delta_i}{r_i - g_i} \\ \text{Quality}_{i,t} &= \frac{\text{Profitability}_i \cdot \text{Payout}_i}{(-\text{Safety}_i) - \text{Growth}_i}\end{aligned}$$

- Defined in this way,

$$\frac{\partial \text{Quality}(\cdot)}{\partial x_j} > 0 \quad \forall\ x_j.$$

Calculating Quality:

- Quality is a z-scored combination of the four components:

$$\text{Quality} = z(\text{Profitability} + \text{Payout} + \text{Safety} + \text{Growth})$$

- where each component is based on z-scored combinations of various instruments:

$$\begin{aligned}
\text{Profitability} &= z(z_{\text{gpoa}} + z_{\text{roe}} + z_{\text{cfoa}} + z_{\text{gmar}} + z_{\text{acc}}) \\
\text{Payout} &= z(z_{\text{eiss}} + z_{\text{diss}} + z_{\text{npop}}) \\
\text{Safety} &= z(z_{\text{bab}} + z_{\text{ivol}} + z_{\text{o}} + z_{\text{z}} + z_{\text{evol}}) \\
\text{Growth} &= z(z_{\Delta\text{gpoa}} + z_{\Delta\text{roe}} + z_{\Delta\text{roa}} + z_{\Delta\text{cfoa}} + z_{\Delta\text{acc}})
\end{aligned}$$

- *Issues:*
  - component weighting
  - classification:
    - non-safety vars; issuance forecasting growth

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How well does Quality explain Price?

Table III, Panel A – Fama-MacBeth Regression Coefficients:

Panel A: The Price of Quality

	Long Sample (U.S. , 1956 - 2012)				Broad Sample (Global, 1986 - 2012)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Quality	**0.32**	**0.19**	**0.32**	**0.20**	**0.24**	**0.10**	**0.22**	**0.09**
	(22.47)	(15.94)	(23.92)	(13.94)	(23.33)	(17.20)	(24.39)	(15.54)
Size		**0.31**		**0.30**		**0.29**		**0.31**
		(19.19)		(27.08)		(17.71)		(20.91)
Ret(t-12,t)		**0.27**		**0.28**		**0.27**		**0.28**
		(21.36)		(26.50)		(18.60)		(22.54)
Industry FE	No	No	Yes	Yes	No	No	Yes	Yes
Country FE					Yes	Yes	Yes	Yes
Average R2	0.12	0.31	0.11	0.30	0.06	0.25	0.05	0.26

- The avg. R^2 is 0.12 (0.06).

How well does Quality explain Price? (Table III-b)

Panel B: The Price of Each Quality Component

	Long Sample (U.S., 1956 - 2012)					Broad Sample (Global, 1986 - 2012)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Profitability	**0.41**				**0.30**	**0.29**				**0.19**
	(26.19)				(23.64)	(33.76)				(31.37)
Growth		**0.38**			**0.11**		**0.28**			**0.08**
		(31.18)			(12.25)		(35.02)			(12.67)
Safety			**0.14**		**-0.08**			**0.11**		**-0.10**
			(9.95)		-(11.38)			(8.19)		-(12.59)
Payout				**-0.10**	**-0.13**				**-0.06**	**-0.10**
				-(11.11)	-(18.41)				-(4.69)	-(11.23)
Size					**0.28**					**0.31**
					(26.22)					(21.67)
Ret(t-12,t)					**0.28**					**0.28**
					(28.69)					(23.33)
Industry FE	No	No	No	No	Yes	No	No	No	No	Yes
Country FE						Yes	Yes	Yes	Yes	Yes
Average R2	0.18	0.15	0.03	0.01	0.40	0.09	0.08	0.02	0.01	0.31

- For both samples, the avg. R^2 for Profitability alone & for Growth alone is higher than for Quality.

But quality explains returns well .. (Table V-a)

	Panel A: Long Sample (U.S. , 1956 - 2012)					Panel B: Broad Sample (Global , 1986 - 2012)				
	QMJ	Profitability	Safety	Growth	Payout	QMJ	Profitability	Safety	Growth	Payout
Excess Returns	**0.40**	**0.27**	**0.23**	0.12	**0.31**	**0.38**	**0.34**	0.19	0.02	**0.38**
	(4.38)	(3.81)	(2.06)	(1.63)	(3.37)	(3.22)	(3.30)	(1.33)	(0.24)	(3.41)
CAPM-alpha	**0.55**	**0.33**	**0.42**	0.08	**0.46**	**0.52**	**0.43**	**0.34**	0.02	**0.49**
	(7.27)	(4.78)	(4.76)	(1.06)	(6.10)	(5.75)	(4.61)	(3.07)	(0.18)	(5.29)
3-factor alpha	**0.68**	**0.45**	**0.59**	**0.20**	**0.43**	**0.61**	**0.53**	**0.50**	0.14	**0.44**
	(11.10)	(7.82)	(8.68)	(3.32)	(6.86)	(7.68)	(6.11)	(5.40)	(1.92)	(5.17)
4-factor alpha	**0.66**	**0.53**	**0.57**	**0.38**	**0.21**	**0.45**	**0.49**	**0.39**	**0.29**	**0.19**
	(10.20)	(8.71)	(7.97)	(6.13)	(3.43)	(5.50)	(5.34)	(4.00)	(3.91)	(2.26)
MKT	**-0.25**	**-0.11**	**-0.34**	**0.05**	**-0.20**	**-0.24**	**-0.16**	**-0.28**	0.00	**-0.18**
	(-17.02)	(-8.08)	(-20.77)	(3.35)	(-14.47)	(-14.36)	(-8.33)	(-13.74)	(-0.06)	(-10.50)
SMB	**-0.38**	**-0.21**	**-0.41**	**-0.05**	**-0.30**	**-0.33**	**-0.20**	**-0.31**	**-0.18**	**-0.23**
	(-17.50)	(-10.21)	(-17.00)	(-2.53)	(-14.82)	(-9.46)	(-5.07)	(-7.48)	(-5.62)	(-6.58)
HML	**-0.12**	**-0.28**	**-0.23**	**-0.44**	**0.39**	-0.01	**-0.16**	**-0.22**	**-0.38**	**0.36**
	(-5.03)	(-12.16)	(-8.50)	(-18.81)	(16.68)	(-0.31)	(-3.95)	(-5.23)	(-11.62)	(9.89)
UMD	0.02	**-0.07**	0.01	**-0.17**	**0.21**	**0.15**	0.03	**0.10**	**-0.14**	**0.24**
	(0.82)	(-3.80)	(0.64)	(-8.55)	(10.79)	(5.54)	(1.01)	(3.07)	(-5.64)	(8.57)
Sharpe Ratio	0.58	0.51	0.27	0.22	0.45	0.62	0.63	0.26	0.05	0.66
Information Ratio	1.46	1.25	1.14	0.88	0.49	1.16	1.13	0.84	0.83	0.48
Adjusted R2	0.57	0.37	0.63	0.40	0.60	0.60	0.34	0.58	0.35	0.52

- In the global sample, the Payout portfolio Sharpe ratio exceeds that of the QMJ portfolio.

Persistence & Quality

- In the price regression, the coefficient on payout is likely negative because:
  - firms that issue a lot of equity grow subsequently.
  - firms that issue a lot have low future returns.
- Both of these effects probably contribute to the negative relation between payout and price.
- Why, instead of just looking at persistence of quality and the components of quality, not think about how to best explain each firm's P/B (or "Q")?

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How Accountants think about this problem

- The workhorse model for firm valuation is the E-B-O *residual income model*.
  - Edwards and Bell (1961), Ohlson (1995).
- Each project's per-period NPV is the earnings over and above the cost of capital r:

$$\mathrm{RI}_{i,t+1} = \textsf{Earnings}_{i,t+1} - r \cdot \mathrm{Capital}_{i,t}$$

- The firm value is the sum of the firm's capital and the NPV of all of the projects (in place and growth options):

$$\mathrm{FirmValue}_{i,t} = \mathrm{Capital}_{i,t} + \textsf{NPV(all current \& future projects)}_{i,t}$$

E-B-O Residual Income Model

$$\text{Firm Value}_{i,t} = \text{Capital}_{i,t} + \text{PV(all current \& future projects)}_{i,t}$$

- assuming a constant discount rate r:

$$P_{i,t} = B_{i,t} + \sum_{\tau=1}^{\infty} \mathbb{E}_t \left[\frac{(ROE_{t+\tau} - r)B_{i,t+\tau-1}}{(1+r)^{\tau}} \right]$$

  or scaling by book, we get the P/B (or "Q"):

$$\frac{P_{i,t}}{B_{i,t}} = 1 + \sum_{\tau=1}^{\infty} \mathbb{E}_t \left[\frac{(ROE_{t+\tau} - r)}{(1+r)^{\tau}} \cdot \frac{B_{i,t+\tau-1}}{B_{i,t}} \right]$$

- where $B_{i,t}$ evolution follows the *Clean Surplus Relation*:

$$B_{i,t} = B_{i,t-1} + \text{Earnings}_{i,t} - \text{Dividends}_{i,t}$$

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What can a price model tell us?

- Suppose that you were to construct an optimal estimator of the scaled-NPV of all future cash flows from the firm, based on all of your information ($\hat{\mathcal{F}}_t$), *i.e.*,

$$\widehat{\left(\frac{P}{B}\right)}_{i,t} = \mathbb{E}\left[\sum_{\tau=1}^{\infty} \tilde{m}_{t,t+\tau} \frac{D_{i,t+\tau}}{B_{i,t}} \middle| \hat{\mathcal{F}}_t \right]$$

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- Suppose you then regress (cross-sectionally) the actual price-to-book ratios at time t on your “model” P/B ratios:

$$\left(\frac{P}{B}\right)_{i,t} = \gamma_0 + \gamma_1 \widehat{\left(\frac{P}{B}\right)}_{i,t} + \epsilon_{i,t}$$

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$$\left(\frac{P}{B}\right)_{i,t} = \gamma_0 + \gamma_1 \widehat{\left(\frac{P}{B}\right)}_{i,t} + \epsilon_{i,t}$$

- *Cross-sectionally, what will* $(P/B)_{i,t} - \widehat{(P/B)}_{i,t}$ *forecast?:*
- *What will the* R^2 *be?*
- *What will the slope coefficient* (γ_1) *be?*

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- *Cross-sectionally, what will* $(P/B)_{i,t} - \widehat{(P/B)}_{i,t}$ *forecast?:*
  - future dividends $(+)$
  - future returns (*i.e.*, discount-rates) $(-)$

  The market has better information than you about either the cash-flows or the returns, or both.
- *What will the* R^2 *be?*
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  - < 1, because $\hat{\mathcal{F}}_t \subset \mathcal{F}_t$.
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  - < 1, because
    $$\widehat{\left(\frac{P}{B}\right)}_{i,t} = \left(\frac{P}{B}\right)_{i,t} + \tilde{u}_{i,t}.$$
    - Note that the coefficient (the "price of quality") will be lower when there is more "noise," (*i.e.*, when your cash-flow and discount rate forecasts are worse.)

Motivation: Prices or Returns? (again)

The FOC for investor optimization, for firm *i* is:

$$P_{i,t} = \mathbb{E}\left[\sum_{\tau=1}^{\infty} \tilde{m}_{t,t+\tau}\tilde{D}_{i,t+\tau}\middle|\mathcal{F}_t\right] \tag{1}$$

- If, using iterated expectations, we substitute in:

$$P_{i,t+1} = \mathbb{E}\left[\sum_{\tau=2}^{\infty} \tilde{m}_{t+1,t+\tau}\tilde{D}_{i,t+\tau}\middle|\mathcal{F}_{t+1}\right]$$

  and divide through by $P_{i,t}$ we get our standard "return" restriction:

$$1 = \mathbb{E}[\tilde{m}_{t,t+1}\underbrace{\tilde{R}_{i,t+1}}_{=\frac{\tilde{P}_{i,t+1}+\tilde{D}_{i,t+1}}{P_{i,t}}}|\mathcal{F}_t] \tag{2}$$

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Explaining P/B

$$P_{i,t} = \mathbb{E}\left[\sum_{\tau=1}^{\infty} \tilde{m}_{t,t+\tau} \tilde{D}_{i,t+\tau} \middle| \mathcal{F}_t\right]$$

- Alternatively, if we normalize both sides of equation (1) by book value at t, we get:

$$\left(\frac{P}{B}\right)_{i,t} = \mathbb{E}\left[\sum_{\tau=1}^{\infty} \tilde{m}_{t,t+\tau} \frac{D_{i,t+\tau}}{B_{i,t}} \middle| \mathcal{F}_t\right]$$

Prices and Returns?

- Our usual cross-sectional (returns) test is a test of:

$$1 = \mathbb{E}[\tilde{m}_{t,t+1} \tilde{R}_{i,t+1} | \mathcal{F}_t]$$

- This paper tests:

$$\left(\frac{P}{B}\right)_{i,t} = \mathbb{E}\left[\sum_{\tau=1}^{\infty} \tilde{m}_{t,t+\tau} \frac{D_{i,t+\tau}}{B_{i,t}} \middle| \mathcal{F}_t\right]$$

- What's the difference?
- *Clearly the two restrictions are equivalent, so why would you want to look at one versus another?*

"Mispricing" of Short-Term Reversal Portfolios

- Over the 1980's a relatively simple short-term reversal strategy, implemented on the 100 largest common stocks, yields an annualized Sharpe-ratio of 10.
  - This strategy is based on modeling the exponential decay following an idiosyncratic shock to prices.
  - The difference between the extreme high- and low-expected return portfolios is 28%/year.
- However, the 2-sigma price "error" associated with this anomaly is $\approx$1.3%.
- So, despite the huge returns and Sharpe-ratio associated with this strategy, because it is so short lived the pricing error is small.
  - This anomaly would be unlikely to lead to much loss in allocative efficiency.

"Mispricing" of FF25 Size/BM Portfolios

	Book-to-Price				
Size	1	2	3	4	5
1	-2.62	2.06	6.08	7.92	11.24
2	-0.35	4.32	5.47	6.37	8.34
3	1.19	3.20	4.40	5.22	6.69
4	0.96	1.43	3.23	4.39	5.17
5	-0.50	-0.56	0.51	0.96	3.23

- In contrast, the table above shows the mean excess returns – $(\overline{r_i - r_m})$ – for the 25 FF Sz/BM portfolios.
  - Note that the avg. excess return of small/value portfolio is about 11%/year.
- The transition probabilities for these portfolios are such that the avg. time in this portfolio is probably 4-5 years(?)
  - This suggests that the price of this portfolio of small-value firms is "too low" by perhaps 30-40%.

Prices vs. Returns

- Assume you are willing to take a stand on a particular pricing kernel.
- Then, any residual from the projection of (P/B) on $\widehat{(P/B)}$ that does not explain future cash-flows can be labeled as mispricing.
  - As always, this is going to depend on your model of $\tilde{m}$.
- The *magnitude* of the price "errors" that come out of this exercise might be interesting in estimating the misallocation of resources that occur as a result of the errors.

Conclusions

- That the Quality variable used here (unscaled by price) forecasts returns is interesting, but not surprising.
  - "Quality" here includes lots of things we already know forecast the cross-section of returns.
  - It doesn't seem like we've learned much about what determines discount rates/mispricings (?)
- The authors need to be clearer on what the point of this paper is:
  - is it to explain prices?
  - is it to forecast the cross-section of returns?
- There are, potentially, lots of interesting things we can learn from looking at the *magnitudes* of violations of pricing models.

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