Empirical Asset Pricing

You have 2 hours to complete the exam. The exam is open-book. Good luck!

1. Clifford S. Asness, Andrea Frazzini, and Lasse H. Pedersen in the abstract to their recent working paper "Quality Minus Junk" write what follows:

   We define a quality security as one that has characteristics that, all-else-equal, an investor should be willing to pay a higher price for: stocks that are safe, profitable, growing, and well managed. High-quality stocks do have higher prices on average, but not by a very large margin. Perhaps because of this puzzlingly modest impact of quality on price, high-quality stocks have high risk-adjusted returns. Indeed, a quality-minus-junk (QMJ) factor that goes long high-quality stocks and shorts low-quality stocks earns significant risk-adjusted returns in the U.S. and globally across 24 countries. The price of quality – i.e., how much investors pay extra for higher quality stocks – varies over time, reaching a low during the internet bubble. Further, a low price of quality predicts a high future return of QMJ. Finally, controlling for quality resurrects the otherwise moribund size effect.

   (a) To explain the intuition for their analysis, the authors refer to the following version of the Gordon Model:

   $$\frac{P}{B} = \frac{Profitability \times Payout\ Ratio}{Required\ Return - Growth} \tag{1}$$

   where P is the stock price and B is the book value per share. So, from now on, prices are divided by book value to have stationary variables. From equation (1), prices should be positively related to Profitability. Assume you can perfectly measure profitability. In an efficient market, do you expect Profitability to predict future returns?

   (b) For the rest of the exam, let us assume that *quality* firms correspond to those with high profitability, while *junk* firms coresond to those with low profitability. (The authors also consider payout ratio, growth, and safety to define quality and junk, but let us keep things simple here.) The authors show that, while a regression of prices on firm level quality and risk controls (equation (2)), produces a positive b coefficient, the explanatory power of quality is small (the R^2 is about 12%):

   $$\left(\frac{P}{B}\right)_i = a + bQuality_i + cMeasures\ of\ Risk_i + \varepsilon_i \quad i = 1...N \tag{2}$$

   There can be three potential explanations for this finding:

   i. Market prices are based on a differently/better measured quality characteristic than the one that the authors consider. In other words, the authors' measure of quality is just noise;

ii. The quality characteristic is correlated with risk factors not fully captured in the authors' risk adjustments (so while the quality measure alone might command a higher P/B, the risk increase the authors fail to capture could imply an offsetting lower one);

iii. Market prices fail to fully reflect the quality characteristic for reasons linked to behavioral finance and limits of arbitrage.

For each of these three explanations, make a prediction in terms of the expected returns of quality-sorted portfolios.

(c) The authors sort stocks into 10 groups according to their quality score and consider the value-weighted return of each group. Here are the portfolios average returns and alphas (t-statistics in parentheses):

Panel A: Long Sample U.S., 1956 - 2012	P1 (Low)	P2	P3	P4	P5	P6	P7	P8	P9	P10 (High)	H-L
Excess return	0.15 (0.55)	0.36 (1.56)	0.38 (1.90)	**0.39** (2.04)	**0.45** (2.51)	**0.45** (2.60)	**0.57** (3.42)	**0.47** (2.75)	**0.58** (3.48)	**0.61** (3.68)	**0.47** (2.80)
CAPM alpha	**-0.53** (-4.62)	**-0.24** (-2.85)	**-0.15** (-2.25)	**-0.12** (-2.01)	-0.02 (-0.33)	-0.01 (-0.18)	**0.13** (2.41)	0.01 (0.23)	**0.14** (2.71)	**0.18** (2.86)	**0.71** (4.92)
3-factor alpha	**-0.67** (-7.83)	**-0.38** (-5.47)	**-0.25** (-4.47)	**-0.21** (-4.11)	-0.08 (-1.44)	-0.06 (-1.09)	**0.12** (2.26)	0.01 (0.12)	**0.16** (3.37)	**0.29** (5.24)	**0.97** (9.02)
4-factor alpha	**-0.56** (-6.24)	**-0.42** (-5.73)	**-0.26** (-4.26)	**-0.29** (-5.39)	**-0.14** (-2.37)	**-0.12** (-2.22)	0.04 (0.68)	-0.05 (-1.08)	**0.19** (3.62)	**0.41** (7.30)	**0.97** (8.55)

The three-factor alpha is relative to the Fama and French (1993) model and the four-factor alpha is relative to a model that also includes momentum.
The authors also construct a quality-minus-junk (QMJ) factor which is long the top 30% high-quality stocks and short the bottom 30% junk stocks. The QMJ portfolio has negative market, value, and size exposures, positive alpha, relatively small residual risk and QMJ returns are high during market downturns.
How does this body of evidence relate to the three explanations above, that is, (i), (ii), and (iii)? Which explanation seems more relevant? Explain.

(d) The authors want to further test the hypothesis that the high expected returns of high quality firms are due to an expectational error. They use analysts' target prices as a proxy of market expectations of future prices. They compute the implied Expected Return from the analysts' target price as

$$Implied\ ER = \frac{Target\ Price}{Current\ Price} - 1$$

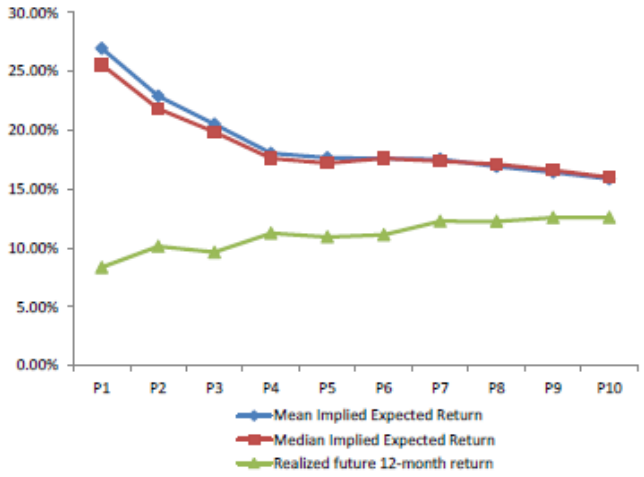
The results are summerized in the table below and are portrayed in Figure 6, below the table. Note that the price is the current price (scaled by book).

Panel A: U.S. 1999 - 2013	P1 (Low)	P2	P3	P4	P5	P6	P7	P8	P9	P10 (High)	H-L	H-L t-statistics
Price (scaled by book)	2.44	2.45	2.49	2.64	2.91	3.26	3.21	3.71	4.76	6.51	**4.07**	21.88
Mean price target (scaled by book)	3.24	3.04	3.07	3.17	3.45	3.84	3.78	4.39	5.57	7.70	**4.46**	19.80
Median price target (scaled by book)	3.21	3.02	3.06	3.14	3.43	3.84	3.77	4.39	5.58	7.71	**4.50**	19.84
Mean Implied Expected Return	0.27	0.23	0.21	0.18	0.18	0.18	0.18	0.17	0.16	0.16	**-0.11**	-9.86
Median Implied Expected Return	0.26	0.22	0.20	0.18	0.17	0.18	0.17	0.17	0.17	0.16	**-0.10**	-9.07
Dispersion	0.71	0.86	0.90	0.92	0.93	0.94	0.94	0.93	0.95	0.93	**0.22**	37.40
Number of estimates	7.61	10.14	10.67	10.72	11.42	11.72	12.57	12.78	14.30	15.46	**7.84**	45.13
Realized future 12-month return	0.08	0.10	0.10	0.11	0.11	0.11	0.12	0.12	0.13	0.13	**0.05**	6.62

Figure 6
Expected Returns vs. Return Expectations

This figure shows realized returns and return expectations based on I/B/E/S target prices for quality-sorted portfolios. Portfolio P1 contains the stocks with the lowest quality scores and P10 those with the highest quality scores. The implied return expectation is the equity analysts' mean (median) one-year-ahead target price divided by the current price. The sample is described in Table X.

Panel A: U.S. sample, 1999 – 2013



i. How do the results in the table relate to the evidence from the regression in equation (2) in point (b)?

ii. What do the results in the table have to say about the test of the hypothesis that the market is making an expectational error when pricing the quality characteristic?

(e) Now, let us think more broadly and remember the discussion about anomalies and arbitrage we had a few times in class. Let us consider an arbitrage opportunity as a trade that is exposed to no risk or, more realistically, to very little idiosyncratic risk, which can be diversified away in a large portfolio. What kind of properties should the quality characteristic display for it **not** to be an arbitrage opportunity? How would you search for these properties? (the Daniel and Titman, 1997, paper can be helpful, but not indispensable, in answering this question)