

Quality Minus Junk

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This draft: June 5, 2017

Abstract

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 varies over time, reaching a low during the internet bubble, and a low price of quality predicts a high future return of QMJ. Analysts' price targets suggest that the required return of quality stock is low despite the high realized return.

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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.

– Cochrane, Presidential Address, American Finance Association, 2011

The asset pricing literature in financial economics studies the drivers of returns, but, while linked, the economic consequences of market efficiency ultimately depend on prices, not returns, as emphasized by Summers (1986) and Cochrane (2011). Do the highest quality firms command the highest price so that these firms can finance their operations and invest?

To address this question, we define *quality* as characteristics that investors should be willing to pay a higher price for, everything else equal. We show that investors pay more for firms with higher quality characteristics. However, the explanatory power of quality for prices is limited, presenting a puzzle for asset pricing. This puzzle for asset *prices* is analogous to the old puzzle of the low R^2 of asset *returns* presented by Roll (1984, 1988). Consistent with the limited pricing of quality, high-quality stocks have historically delivered high risk-adjusted returns while low-quality *junk* stocks delivered negative risk-adjusted returns. Hence, a *quality-minus-junk* (QMJ) portfolio that invests long quality stocks and shorts junk stocks produces high risk-adjusted returns. Further, we find that the price of quality (the marginal amount extra investors pay for higher quality characteristics) has varied over time as the market has sometimes put a larger or smaller price premium on quality stocks vs. junk stocks. For instance, the price of quality was particularly low during the internet bubble. Since prices and returns are linked, the price of quality predicts the future return to the QMJ factor. Lastly, we consider analyst forecast and broader asset pricing applications.

To apply our general definition of quality, we must identify stock characteristics that should command a higher price. For this, we derive a dynamic asset pricing model with time-varying growth, profitability, and risk. We show explicitly how price-to-book ratios depend on these quality characteristics. To get some intuition before we present the general model,

we can rewrite Gordon's growth model to express a stock's price-to-book value (P/B) as follows:¹

$$\frac{P}{B} = \frac{\text{profitability} \cdot \text{payout-ratio}}{\text{required-return} - \text{growth}} \quad (1)$$

We scale prices by book values to make them more stationary over time and in the cross section. For instance, a food company with 10,000 restaurants likely has a price and book value that are 10 times that of another food company with only 1,000 restaurants, but it is more interesting to consider which firm has the larger price-to-book (or, in this example, price per restaurant).

The three key right-hand side variables form the basis for our definition of quality:²

- i. **Profitability.** Profitability is the profits per unit of book value. All else equal, more profitable companies should command a higher stock price. We measure profits in several ways, including gross profits, margins, earnings, accruals and cash flows, and focus on each stock's average rank across these metrics.
- ii. **Growth.** Investors should also pay a higher price for stocks with growing profits. We measure growth as the prior five-year growth in each of our profitability measures.
- iii. **Safety.** Investors should also pay, all-else-equal, a higher price for a stock with a lower required return, that is, a safer stock. What should enter into required return is still a very contentious part of the literature. We do not attempt to resolve those issues here, but, rather, consider both return-based measure of safety (e.g., market beta) and

¹ We rewrite the Gordon model simply as $\frac{P}{B} = \frac{1}{B} \frac{\text{dividend}}{\text{required-return} - \text{growth}} = \frac{\text{profit}/B \times \text{dividend}/\text{profit}}{\text{required-return} - \text{growth}}$.

² The payout ratio does not affect price in our general model since we consider a frictionless economy in which Modigliani-Miller holds. However, the payout (fraction of profits paid out to shareholders) can be seen as a measure of shareholder friendliness if management's agency problems are diminished when free cash flows are reduced through higher dividends (Jensen (1986)), as we considered in an earlier version of this paper. Payout is an example of how each of these measures is about their marginal effect, that is, all else being equal. Indeed, if a higher payout is associated with a lower future profitability or growth (as in our dynamic model), then payout should not affect the price, but a higher payout should be positive if we could hold all other factors constant.

fundamental-based measures of safety (low volatility of profitability, low leverage, and low credit risk).

While Gordon's growth model assumes that all variables are constant over time, it is central to our empirical analysis that price-to-book ratios and quality characteristics vary across stocks and across time. Our general model allows such time variation, showing how prices increase with quality.

For the market to rationally put a price on these quality characteristics, they need to be measured in advance and predict future quality characteristics, that is, they need to be persistent. We show that this is indeed the case; profitable, growing, and safe stocks continue on average to display these characteristics over the following five or ten years.

We test the pricing of quality over a long sample of U.S. stocks from 1957 to 2016 and a broad sample of stocks from 24 developed markets from 1989 to 2016. To evaluate the pricing of quality, we first run cross-sectional regressions of price-to-book on each stock's overall quality score. Both in the long and broad sample, we find that higher quality is significantly associated with higher prices. However, the explanatory power of quality on price is limited as the average R^2 is only about 10% in both samples. When we also control for the firm's size, the past 12-month stock returns, controls suggested by Pástor and Veronesi (2003), and include industry-, country-, and firm-fixed effects, the cross-sectional R^2 increases to a maximum of, respectively, 49% and 43%, still leaving unexplained a large fraction of the cross sectional distribution of prices. Interestingly, larger firms are more expensive controlling for quality, the analogue of the size effect on returns (Banz (1981)).

We also regress the price-to-book on the three quality measures separately and in a multivariate regression. Each of the quality components has a positive marginal price, accounting for all the control variables, and having all quality measures separately modestly increases the R^2 . Lastly, we consider the price of quality in different sub-samples, finding a positive price of quality across industries and size deciles, with a somewhat larger price of quality for large stocks relative to small ones.

There could be several potential reasons for the limited explanatory power of quality on prices: (a) market prices are based on superior quality characteristics than the ones we consider (e.g., an omitted variable); (b) the quality characteristics are correlated to risk

factors not captured in our risk adjustments (so while the quality measure alone might command a higher P/B, the risk increase we fail to capture could imply an offsetting lower one); or (c) market prices fail to fully reflect these characteristics for reasons linked to behavioral finance or constraints.

These three hypothesis have different implications for the return of quality sorted stocks: (a) does not necessarily predict that the stocks that we classify as high quality have high risk-adjusted returns; (b) predicts that high quality stocks should have low returns during distress periods or other times of high marginal utility; while (c) predicts that high quality stocks do have high risk-adjusted returns.

To examine these potential explanations, we first consider the returns of high- vs. low-quality stocks. We sort stocks into ten deciles based on their quality scores and consider the value-weighted return in each portfolio. We find that high-quality stocks have significantly higher excess returns than junk stocks. The difference in their risk-adjusted returns (i.e., 4-factor alphas) is even larger since high-quality stocks tend to have lower market, size, value and momentum exposures than junk stocks.

We then construct a QMJ factor with a methodology that follows that of Fama and French (1993) and Asness and Frazzini (2013). The factor is long the top 30% high-quality stocks and short the bottom 30% junk stocks within the universe of large stocks and similarly within the universe of small stocks. This QMJ factor (as well as its large-cap only and small-cap only components) delivers positive returns in 23 out of 24 countries that we study and highly significant risk-adjusted returns in our long and broad sample. QMJ portfolios have negative market, value, and size exposures, positive alpha, relatively small residual risk and QMJ returns are high during market downturns, presenting a challenge to risk-based explanations relying on covariance with market crises. Rather than exhibiting crash risk, if anything QMJ exhibits a mild positive convexity, that is, it benefits from *flight to quality* during crises. In other words, the evidence challenges hypotheses (a) and (b) from above, while appearing more consistent with (c).

To test (c) more directly, we look at equity analysts forecasts as reflected in their “target prices,” i.e., the expected stock price one year into the future using the methodology of Brav, Lehavy, and Michaely (2005). Analysts’ target prices (scaled by book value) are higher for high-quality stocks, consistent with a positive price of quality. However, analysts’

implied return expectations (target price divided by current actual price) is lower for high-quality stocks than junk stocks, presenting a systematic error relative to the realized returns. In other words, analysts appear to have higher target prices for high-quality stocks, but not high enough on average, consistent with (c).

To further test the link between the price and return to quality, it is interesting to exploit the time-variation in the price of quality. In particular, each month, we estimate the current price of quality as the cross-sectional regression coefficient of price-to-book on quality. The time series of these cross-sectional regression coefficients reflects how the pricing of quality varies over time. Intuitively, the price of quality reached its lowest level in February 2000 during the height of the internet bubble. The price of quality was also relatively low leading into the 1987 crash and leading into the Global Financial Crisis of 2007-2009. Following each of these three dramatic events, the price of quality increased, reaching highs in late 1990 (first gulf war), in late 2002 (after the Enron and WorldCom scandals), and in early 2009 (during the height of the banking crisis). Prices and returns are naturally connected, and we show that the price of quality negatively predicts the future return on QMJ. Said differently, a higher price of quality is associated with a lower return on high-quality stocks, consistent with the theory (c) that a low price of quality means that the market is inefficient in incorporating quality into prices.

We note that the QMJ strategy of buying profitable, safe, growing stocks while shorting unprofitable, risky, shrinking stocks is very different from the standard value strategy HML (in fact the two are negatively correlated). QMJ is buying and selling based on quality characteristics *irrespective* of stock prices, while HML is buying based on stock prices *irrespective* of quality. Naturally, the two concepts can be combined, which we call quality at a reasonable price (QARP).³ This concept goes back at least to Graham and Dodd (1934) who stated that “*investment must always consider the price as well as the quality of the security.*” Naturally, value investing is improved by QARP, consistent with the finding in the accounting literature that information from financial statements can improve value investing (e.g., Frankel and Lee (1998) and Piotroski (2000)).

³ Our definition of QARP is a generalization of the so-called growth at a reasonable price (GARP) strategy.

Our paper is related to a large literature. A number of papers study return-based anomalies. It has been documented that stocks with high profitability outperform (Novy-Marx (2012, 2013)), stocks that repurchase tend to do well (Baker and Wurgler (2002), Pontiff and Woodgate (2008), McLean, Pontiff, and Watanabe (2009)), low beta is associated with high alpha for stocks, bonds, credit, and futures (Black, Jensen, and Scholes (1972), Frazzini and Pedersen (2013)), firms with low leverage have high alpha (George and Hwang (2010), Penman, Richardson, and Tuna (2007)), firms with high credit risk tend to under-perform (Altman (1968), Ohlson (1980), Campbell, Hilscher, and Szilagyi (2008)), growing firms outperform firms with poor growth (Mohanram (2005)), and firms with high accruals are more likely to suffer subsequent earnings disappointments and their stocks tend to underperform peers with low accruals (Sloan (1996), and Richardson, Sloan, Soliman, and Tuna (2005)). While these papers are very different and appear disconnected, our framework illustrates a unifying theme, namely that all these effects are about the outperformance of high-quality stocks, and we link returns and prices.

Our paper is also related to the literature that considers how the price-to-book predicts future returns and future fundamentals based on the present-value relationship. Campbell and Shiller (1988) consider the overall market, and their dividend growth variable can be interpreted as an aggregate quality variable. Vuolteenaho (2002), Cohen, Polk, and Vuolteenaho (2003, 2009), and Fama and French (2006) consider individual stocks. Cohen, Polk, and Vuolteenaho (2003) decompose the cross-sectional variance of firms' book-to-market ratios across book-to-market portfolios and Cohen, Polk, and Vuolteenaho (2009) consider how cash-flow betas affect price levels and long-run returns. See also the overview by Cochrane (2011) and references therein.

In summary, we complement the literature by showing (i) the theoretical price of quality in a dynamic model; (ii) how quality affects price multiples and how much of the cross-sectional variation of price multiples can be explained by quality; (iii) that the price of quality varies over time and predicts the future return on quality factors; (iv) that quality stocks earn higher returns and yet appear safer, not riskier, than junk stocks, benefitting from flight to quality; (v) that analysts' target prices imply systematic errors in return expectations about quality stocks; and (vi) how our quality framework unifies a number of anomalies and can be used in asset pricing more broadly.

The rest of the paper is organized as follows. Section 1 presents our model. Section 2 presents our data and quality measures, showing that ex ante quality forecasts future quality (i.e., quality is sticky as would be necessary for it to affect prices). Section 3 analyzes the price of quality. Section 4 tests different potential explanations for the limited explanatory power of quality for price. Section 5 further asset pricing applications. Section 6 concludes. The appendix contains a number of additional results and robustness checks.

1. The Price of Quality: Dynamic Model

A. A Dynamic Model of Firm Quality: Time-Varying Profits, Growth, and Risk

We consider a firm in an economy with pricing kernel M_t . The pricing kernel is given by $\frac{M_{t+1}}{M_t} = \frac{1}{1+r^f}(1 + \varepsilon_{t+1}^M)$, where r^f is the risk-free rate and ε_{t+1}^M is the zero-mean innovation to the pricing kernel. For example, if the CAPM holds then ε_{t+1}^M is linked to the return on the market portfolio, r_{t+1}^{MKT} . More specifically, the CAPM pricing kernel is $\varepsilon_{t+1}^M = -\lambda_t \left(\frac{r_{t+1}^{MKT} - E_t(r_{t+1}^{MKT})}{\sigma_t^2(r_{t+1}^{MKT})} \right)$, where $\lambda_t = E_t(r_{t+1}^{MKT}) - r^f$ is the market risk premium.

The value of the firm is the present value of all future dividends, d_t :

$$V_t = \sum_{s=1}^{\infty} E_t \left(\frac{M_{t+s} d_{t+s}}{M_t} \right)$$

We rewrite the valuation equation in terms of the book value B_t and earnings (or net income) NI_t by using the clean surplus relation, $B_t = B_{t-1} + NI_t - d_t$:

$$V_t = B_t + \sum_{s=1}^{\infty} E_t \left(\frac{M_{t+s} NI_{t+s}}{M_t} \right)$$

where the so-called residual income, $RI_{t+s} = NI_{t+s} - r^f B_{t+s-1}$, is the net income in excess of the cost of book capital.⁴ We assume that the firm keeps all financial assets in risk-free securities, which implies that dividend policy and capital structure do not affect residual income.⁵ Therefore, we can specify an exogenous process for the residual income (which depends on the firm's free cash flows from operations). Residual income consists of two components:

$$RI_t = e_t + a_t$$

where e_t captures "sustainable earnings" and a_t captures "transitory earnings shocks." As defined precisely below, sustainable earnings are characterized by the fact that they are persistent and may grow over time, whereas transitory shocks are temporary profits or losses that do not affect the long-term earnings of the firm. Specifically, sustainable earnings e_t are expected to grow by g_t such that

$$e_{t+1} = e_t + g_t + \varepsilon_{t+1}^e$$

⁴ Residual income is often defined as $NI_t - k B_{t-1}$ where k is the required return on equity, but one should use the risk-free rate r^f when the valuation equation is written with a pricing kernel M_t (rather than a required return in the denominator). This can be seen using a simple calculation based on inserting the clean surplus relation into the valuation equation, or see the derivation in appendix and Feltham and Ohlson (1999).

⁵ To see this result, suppose first that the firm lowers dividends by 1 at time t , puts the money in risk-free securities, and increases the dividend by $(1 + r^f)^\tau$ at time $t + \tau$. Then, at any time $t + s < t + \tau$, the net income NI_{t+s} increases by the interest income $r^f (1 + r^f)^{s-1}$ and the book value B_{t+s-1} increases by $(1 + r^f)^{s-1}$, leaving the residual income unchanged. Second, suppose that the firm takes a loan of and invests the money in the risk-free asset at time t . Then, at any time $t + s$, the income from the risk-free asset cancels the interest payment on the loan, again leaving residual income unchanged. Other changes of dividend policy and capital structure can be seen as combinations of such actions.

The zero-mean earnings innovation ε_t^e has a risk premium π_t due to covariation with the pricing kernel, $\pi_t = -cov_t(\varepsilon_{t+1}^e, \varepsilon_{t+1}^M)$. We use the negative covariation such that a high risk premium corresponds to a higher required return. Under the CAPM, the risk premium is the cash flow's standard market beta multiplied by the market risk premium λ_t , that is,

$$\pi_t = \lambda_t \frac{cov_t(\varepsilon_{t+1}^e, r_{t+1}^M)}{\sigma_t^2(r_{t+1}^{MKT})} =: \lambda_t \beta_t^e$$

The growth g_t and risk premium π_t are time-varying:

$$\begin{aligned} g_{t+1} &= \varphi_g g_t + (1 - \varphi_g) \bar{g} + \varepsilon_{t+1}^g \\ \pi_{t+1} &= \varphi_\pi \pi_t + (1 - \varphi_\pi) \bar{\pi} + \varepsilon_{t+1}^\pi \end{aligned}$$

where \bar{g} and $\bar{\pi}$ are the long-run means, φ_g and φ_π indicate the persistence of the processes, and ε_{t+1}^g and ε_{t+1}^π are zero-mean shocks that are uncorrelated to ε_{t+1}^M .

The transitory earnings shock follows a moving average process and for simplicity we only consider a single lag:

$$a_t = \varepsilon_t^a - \theta \varepsilon_{t-1}^a$$

We see that ε_t^a captures zero-mean random shocks to residual income and θ measures dependence on past shocks. These transitory earnings do not grow over time and a positive shock is even expected to be partly reversed in the next period if $\theta > 0$. For example, aggressive accounting accruals can lead to such reversals in earnings.⁶

⁶ Accrual accounting is a method to measure profits at the time when an economic activity takes place, rather than when cash is paid or received. Accruals can be used to make reported earnings capture true profits better

B. Valuation: The Price of Quality

To compute the fundamental value, we first compute the conditional expectation of the sustainable earning for next period:

$$E_t \left(\frac{m_{t+1}}{m_t} e_{t+1} \right) = E_t \left(\frac{1}{1+r_f} (1 + \varepsilon_{t+1}^M) (e_t + g_t + \varepsilon_{t+1}^e) \right) = \frac{1}{1+r_f} (e_t + g_t - \pi_t)$$

We can iterate this result to show that the value of sustainable earnings τ periods into the future is

$$\begin{aligned} E_t \left(\frac{m_{t+\tau}}{m_t} e_{t+\tau} \right) &= \frac{1}{(1+r_f)^\tau} \left(e_t + \sum_{n=1}^{\tau} E_t (g_{t+n} - \pi_{t+n}) \right) \\ &= \frac{1}{(1+r_f)^\tau} \left(e_t + \sum_{n=1}^{\tau} (\varphi_g^n g_t + (1 - \varphi_g^n) \bar{g} - \varphi_\pi^n \pi_t - (1 - \varphi_\pi^n) \bar{\pi}) \right) \\ &= \frac{1}{(1+r_f)^\tau} \left(e_t + \frac{\varphi_g - \varphi_g^{\tau+1}}{1 - \varphi_g} (g_t - \bar{g}) + \tau \bar{g} - \frac{\varphi_\pi - \varphi_\pi^{\tau+1}}{1 - \varphi_\pi} (\pi_t - \bar{\pi}) - \tau \bar{\pi} \right) \end{aligned}$$

Based on this result, we can next compute the fundamental value as the sum of all future discounted profits:⁷

$$V_t = B_t + v^e e_t + v - v^a \varepsilon_t^a + v^g (g_t - \bar{g}) - v^\pi (\pi_t - \bar{\pi})$$

where the valuation coefficients are $v = \frac{1+r_f}{r_f^2} (\bar{g} - \bar{\pi})$, $v^e = \frac{1}{r_f}$, $v^g = \frac{\varphi_g(1+r_f)}{r_f(1+r_f-\varphi_g)}$, $v^\pi = \frac{\varphi_\pi(1+r_f)}{r_f(1+r_f-\varphi_\pi)}$, and $v^a = \frac{\theta}{1+r_f}$. The fundamental value can be written as a fraction of book value B_t :

than pure cash-based measures, but accruals can also be used to artificially boost earnings. E.g, see Richardson, Sloan, Soliman, and Tuna (2005) find that “less reliable accruals lead to lower earnings persistence.”

⁷ We are using the standard results that $\sum_{\tau=1}^{\infty} z^\tau = \frac{1}{1-z}$ and $\sum_{\tau=1}^{\infty} \tau z^\tau = \frac{z}{(1-z)^2}$

$$\frac{V_t}{B_t} = 1 + \frac{v^e e_t + v - v^a \varepsilon_t^a}{B_t} + v^g \frac{g_t - \bar{g}}{B_t} - v^\pi \frac{\pi_t - \bar{\pi}}{B_t}$$

This specification motivates our empirical work. In particular, we see that the ratio of fundamental value to book value increases in the profitability adjusted for accruals,⁸ it increases in the growth of sustainable profits, and it increases in safety (i.e., it decreases in market risk π_t). Further, we see that the valuation is linear in these values.

2. Data, Quality Measures, and Preliminary Analysis

In this section we describe our data sources and the methodology for constructing our quality measures. Further, we document that current quality predicts future quality.

A. Data Sources

The data is collected from a variety of sources. Our sample consists of 54,616 stocks covering 24 countries between June 1957 and December 2016. The 24 markets in our sample correspond to union of all countries belonging to the MSCI World Developed Index over our sample period. We report summary statistics in Table I. Stock returns and accounting data are from the union of the Center for Research on Security Prices (CRSP) pricing database, the Compustat North America Fundamentals Annual, Fundamentals Quarterly and Security Daily databases, the Compustat Global Fundamentals Annual, Fundamentals Quarterly, and Security Daily databases. All returns are in USD, they do not include any currency hedging, and are measured as excess returns above the U.S. Treasury bill rate.⁹ We follow the standard convention (Fama and French (1992)) and align accounting variables at the end of the firm's fiscal year ending anywhere in calendar year $t-1$ to June of calendar year t . We focus on a *long sample* of U.S. stocks and a *broad sample* of global stocks.

⁸ We note that there may be two reasons to adjust for transitory earnings shocks. First, if $\theta > 0$ then $v^a > 0$, leading to the adjustment shown in the valuation equation. Second, if we start with net income NI_t , then sustainable earnings c_t is net income adjusted transitory shocks (and cost of capital), $c_t = NI_t - a_t - r^f B_{t-1}$.

⁹ We include delisting returns when available. If a firm is delisted but the delisting return is missing and the delisting is performance-related, we follow Shumway (1997) and assume a -30% delisting return.

Our *long sample* of U.S. data includes all available common stocks on the merged CRSP/Compustat North America data.¹⁰ Our default primary source for pricing information is Compustat, supplemented with CRSP over the earlier period when Compustat pricing data is not available. Table A1 in the Appendix reports details on the data sources for each period. The first available date for our regressions and return tests is June 1957.¹¹

Our *broad sample* includes all available common stocks on the union of the CRSP, the Compustat North America and the Compustat Global database for 24 developed markets. We assign individual issues to the corresponding market based on the location of the primary exchange. For companies traded in multiple markets we use the primary trading vehicle identified by Compustat. The first available date for our regressions and return test is June 1989. Table I, reports date coverage of the individual markets.

Target prices are from the Thomson Reuters I/B/E/S global database. It contains the projected price level forecasted by analysts within a specific time horizon. For our analysis, we use the monthly mean and median consensus target prices. I/B/E/S computes consensus prices over a 12-month time horizon.

B. Quality Score

To avoid data mining, we base our measures on our theoretical model implemented using standard “off-the-shelf” empirical measures to compute three composite quality measures: *Profitability*, *Growth*, and *Safety*. We then average these three quality components to compute a single overall quality score. Our results are qualitatively robust to the specific choices of factors.

Let us first describe the theoretical intuition behind our measures. First, the theory suggests that profitability should be measured as the “sustainable” part of profits in relation to book value, adjusted for accruals, which we implement empirically by averaging several measures of profitability to reduce noise (hopefully leaving the more sustainable part) and avoiding focusing on a particular measure. Second, theory suggests that growth should be the increase in sustainable profits in relation to book values. Since profits are noisy, we use a 5-

¹⁰ Common stocks are identified by a CRSP share code (SHRCD) of 10 or 11 or by a Compustat issue code (TPCI) of 0. We also drop stocks traded on over-the-counter (OTC) exchanges.

¹¹ Our tests require at least a 5-year history as some of our variables are five-year growth measures.

year window to focus on sustainable growth and, again based on our model, accruals are not included in the growth measure. Lastly, safety is based on market beta and other risk measures.

More specifically, our quality measures are constructed as follows (details are in the Appendix). We measure profitability as gross profits over assets (GPOA), return on equity (ROE), return on assets (ROA), cash flow over assets (CFOA), gross margin (GMAR), and the fraction of earnings composed of cash (i.e. minus accruals, ACC). In order to put each measure on equal footing and combine them, each month we convert each variable into ranks and standardize to obtain a z -score. More formally, let x be the variable of interest and r be the vector of ranks, $r_i = \text{rank}(x_i)$. Then the z -score of the ranks of x is given by $z(x) = z_x = (r - \mu_r)/\sigma_r$, where μ_r and σ_r are the cross sectional mean and standard deviation of r . Our *Profitability* score is the average of the individual z -scores:

$$\text{Profitability} = z(z_{gpoa} + z_{roe} + z_{roa} + z_{cfoa} + z_{gmar} + z_{acc}) \quad (2)$$

Similarly, we measure growth as the five-year growth in profitability (excluding accruals), averaged across five measures:

$$\text{Growth} = z(z_{\Delta gpoa} + z_{\Delta roe} + z_{\Delta roa} + z_{\Delta cfoa} + z_{\Delta gmar}) \quad (3)$$

Here, Δ denotes five-year growth. Specifically, for each profitability measure, we define five-year growth as the change in the numerator (e.g. profits) divided by the lagged denominator (e.g. assets). We define safe securities as companies with low beta (BAB), low leverage (LEV), low bankruptcy risk (O-Score and Z-Score) and low ROE volatility (EVOL):

$$\text{Safety} = z(z_{bab} + z_{lev} + z_o + z_z + z_{evol}) \quad (4)$$

Finally, we combine the three measures into a single quality score:

$$\text{Quality} = z(\text{Profitability} + \text{Growth} + \text{Safety}) \quad (5)$$

To construct our composite quality measure as well as the individual subcomponents we use all available information: if a particular measure is missing due lack of data availability, we simply average the remaining ones. We also consider a number of robustness tests, e.g., using raw values rather than the ranks.

C. Portfolios

Our portfolio analysis relies on two sets of test factors: quality-sorted portfolios and quality-minus-junk factors (hereafter, QMJ factors). For both approaches, we form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization.

To form quality-sorted portfolios, at the end of each calendar month, we assign stocks in each country to ten quality-sorted portfolios. U.S. sorts are based on NYSE breakpoints. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights.

The QMJ portfolio construction follows Fama and French (1992, 1993 and 1996) and Asness and Frazzini (2013). QMJ factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, we assign stocks to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country.¹² We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high-quality portfolios minus the average return on the two low-quality (junk) portfolios:

$$\begin{aligned}
 QMJ &= \frac{1}{2} (Small\ Quality + Big\ Quality) - \frac{1}{2} (Small\ Junk + Big\ Junk) \\
 &= \underbrace{\frac{1}{2} (Small\ Quality - Small\ Junk)}_{QMJ\ in\ small\ stocks} + \underbrace{\frac{1}{2} (Big\ Quality - Big\ Junk)}_{QMJ\ in\ big\ stocks}
 \end{aligned} \tag{7}$$

¹² In our sample, the 80th size percentile by country corresponds approximately to NYSE breakpoints.

Portfolios based on profitability, growth and safety are constructed in a similar manner. We compute alphas with respect to domestic and global 4-factor model. The explanatory variables are the market (MKT), size (small-minus-big, SMB), book-to-market (high-minus-low, HML), and momentum (up-minus-down, UMD) portfolios. The portfolio construction follows Fama and French (1992, 1993 and 1996) and Asness and Frazzini (2013) and we report a more detailed description in the Appendix.¹³ In some of our test, we also use the Fama and French (2015) 5-factor model based on the market factor (MKT), size (small-minus-big, SMB), book-to-market (high-minus-low, HML), profitability (factor robust-minus-weak, RMW), and an investment factor (conservative-minus-aggressive, CMA).¹⁴

D. Ex Ante Quality Forecasts Fundamentals

We start by showing that a stock's quality is a persistent characteristic. That is, by selecting companies that were profitable, growing and safe in the recent past, we succeed in selecting companies that display these characteristics in the future. This step is important when we turn to the central analysis of whether the high quality firms command higher prices since, in a forward-looking rational market, prices should be related to *future* quality characteristics. Of course, predictability of quality is perfectly consistent with an efficient market – market efficiency says only that, since prices should reflect quality, *stock returns* should be unpredictable (or only predictable due to risk premia) not that quality itself should be unpredictable.

Table II analyzes the predictability of quality as follows. Each month, we sort stocks into ten portfolios by their quality scores (as defined in Section 2). The table reports the value-weighted average of our quality measures across stocks in each of the portfolios. The table shows these average quality scores both at the time of the portfolio formation (time t) and in the subsequent ten years ($t + 120$ months). The standard errors are adjusted for heteroskedasticity and autocorrelation with a lag length of five years (Newey and West (1987)). By construction, the quality scores vary monotonically across portfolios at the time of portfolio formation so the interesting part of the table is the future quality scores. Table II

¹³ The data can be downloaded at <https://www.aqr.com/library/data-sets>.

¹⁴ The data can be downloaded at http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

shows that, on average, high quality firms today remain high quality firms five and ten years into the future (conditional on survival) and we can reject the null hypothesis of no difference in each of quality characteristics up to ten years. Table A1 in the appendix reports additional results: we sort firms separately using each component of our quality score (profitability, growth, and safety) and report the spread in each variable up to 10 years, yielding similarly consistent results.

To summarize, quality is a persistent characteristic such that high quality today predicts future high quality. For both the U.S. long and global sample, profitability is the most persistent and, while still surprisingly stable, growth and safety are the least persistent.

3. The Price of Quality

Given that future quality can be forecasted in advance, we now turn to the central question of how quality affects prices: Do high-quality stocks command higher prices than low-quality ones?

A. *The Price of Quality in the U.S. and Globally*

To address this question, we run a cross-sectional regression of each stock i 's log market-to-book (MB) ratio on its overall quality score, $Quality_t^i$ (defined in Section 2). Specifically, we let $P_t^i = \log(MB)_t^i$ and run the regression:

$$P_t^i = a + b Quality_t^i + controls + \varepsilon_t^i \quad (8)$$

Market-to-book is defined as book equity divided by the current market equity of the firm in June of year t . This regression tests whether high quality is associated with high prices in the cross section. Using ranked z -scores as our explanatory variable limits the effect of outliers and it implies that the regression coefficient b has a simple interpretation: b measures the percent increase (log changes) in market-to-book associated to a one standard deviation

increase in our quality score.¹⁵ We include several control variables motivated by theory as discussed below.

Panel A of Table III reports results of Fama and MacBeth (1973) regressions of prices on quality. In June of each year, we regress scaled prices on quality measures and we report time series averages of the cross sectional slope estimates. Standard errors are adjusted for heteroskedasticity and autocorrelation (Newey and West (1987)) with a lag length of five years. We run the regression with and without industry-, country-, or firm-fixed effects, as indicated.

We see that the price of quality b is generally positive and highly statistically significant: high quality firms do command higher (scaled) prices. Indeed, the price of quality is positive both in the U.S. and global samples and across specifications with controls and fixed effects. The univariate estimated price of quality in the long domestic (broad global) sample is 0.23 (0.17). This coefficient implied that a one standard deviation change in a stock's quality score is associated (in the cross section) with a 23% (17%) increase in its price-to-book.

While theory does not provide specific guidance on what the R^2 "should" be, the explanatory power of quality on price appears limited. Quality alone explains only about 10% of the cross sectional variation in prices in both our U.S. and global sample.

We also include several controls. With the exception of dummies variables, we measure each of these controls as the z -score of their cross-sectional rank for consistency and ease of interpretation of the coefficients. First, we control for size motivated by the theory that large stocks are more liquid and have less liquidity risk than small firms, and thus higher prices and lower required returns (Amihud and Mendelson (1986), Pástor and Stambaugh (2003), Acharya and Pedersen (2005)). Consistent with this theory, we see that larger firms do have higher prices, controlling for quality. This result is the analogue of the size effect on returns (Banz (1981), see also Berk (1995)), expressed in terms of prices. That is, big firms, even for the same quality, are more expensive, possibly leading to the return effect observed by Banz.

¹⁵ Using the z -score of the market-to-book on the left hand side as opposed to logs or computing ordinal z -scores by dropping the rank step from the z -score construction does not significantly impact any of the results. For brevity, we do not report these additional results.

Motivated by the theory of learning about profitability by Pástor and Veronesi (2003), we also control for age, profit uncertainty and a dividend payer dummy, as defined as in their paper. Firm age is the cumulative number of years since the firm's IPO. Profit uncertainty is the standard deviation of the residuals of an AR(1) model for each firm's ROE, using the longest continuous series of a firm's valid annual ROE up to June of each year. Dividend payer is a dummy equal to one if the firm paid any dividends over the prior year. Consistent with Pástor and Veronesi (2003), we find that prices are lower for firms that pay dividends, decrease in age and increase in profit uncertainty, especially for firms that pay no dividends.

We also control for past stock returns. Including past returns is necessary since our sample include firms with different fiscal year end up to 11 months apart (accounting variables at the end of the firm's fiscal year ending anywhere in calendar year $t-1$ are aligned to June of calendar year t). A positive coefficient on past returns simply reflects that high recent returns raise current prices while the book value has not had time to adjust. Consistent with this observation, Table III shows that, *ceteris paribus*, stocks with higher stock returns tend to have higher scaled prices.

Finally, we also consider industry-, country-, and firm-fixed effects. We see that the R^2 increases markedly with these controls. Nevertheless, the coefficient on quality is relatively immune to the inclusion of these controls and its statistical significance actually increases. The maximum R^2 across all these specifications is 49%, leaving the majority of cross sectional variation on prices unexplained.

B. The Price of Quality Sub-Components

Panel B of Table III considers cross-sectional regressions on each separate quality score, univariately and multivariately:

$$P_t^i = a + b^1 Profitability_t^i + b^2 Growth_t^i + b^3 Safety_t^i + controls + \varepsilon_t^i \quad (9)$$

We see that prices of profitability, growth and safety are positive throughout, controlling for each other and our other control variables and fixed effects. In other words, high-quality stocks tend to have relatively higher prices than low-quality stocks. The maximum R^2

reaches 48% in the U.S. and 42% in the global sample, still leaving a large part of the cross section of prices unexplained.

C. The Price of Quality across Subsets of Stocks

Panel C of Table III reports the price of quality by size decile. In particular, we run regression (8) for each sub-sample of stocks sorted by size. We see that the results are consistent across size groups, both in the U.S. and globally. Also note that the average R^2 rises across decile size reaching 71% (55%) for U.S. (global) firms in the top size deciles. Although for the median firm the vast majority of cross sectional variation on prices remained unexplained, over the largest firms, quality does explain a significant amount of cross sectional dispersion in (scaled) prices.

The Appendix contains further robustness tests. Table A3 reports results from monthly regressions where market-to-book follows the convention in Asness and Frazzini (2013) defined as book equity divided by the current market equity of the firm each month. Figure A1 report results by industry. This figure plots t-statistics of the quality coefficients from annual Fama-Macbeth regressions within 71 GICS industries using our full set of controls. All the results tell a consistent story: high quality firm tend to command higher prices.

To summarize, our results are consistent with the hypothesis that high quality firm command higher (scaled) prices. However, the explanatory quality is limited, leaving a large amount of variation in prices unexplained. Our results appear robust to specification, not driven by effects related to small stocks or by a particular industry or geography.

4. Understanding the Price of Quality: The Return of Quality Stocks

We would like to shed light on our finding that quality explains prices only to a limited extent: is this finding because of (a) the market uses superior quality measures (and, if we observed these measures, they would be strongly related to prices) or in some cases reverse causality; (b) quality is linked to risk in a way not captured by our safety measure; or (c) limited market efficiency. Explanation (c) implies that high-quality stocks have higher risk-adjusted returns than low-quality stocks as market prices fail to fully reflect the quality characteristics; (b) implies a univariate relation between quality and future returns which is

reduced or eliminated by an effective risk model; (a) means that the relation between our measured quality and ex post returns is attenuated, noisy, or potentially biased – in the simplest form, this explanation means that quality should be unrelated to risk-adjusted returns. Hence, to seek an explanation for the limited relation between price and quality, we need to analyze the future returns of quality stocks.

A. *The Returns of Quality-Sorted Portfolios*

Table IV reports the returns of stocks sorted into ten deciles based on their quality score. The table reports both excess returns over T-bills and alphas with respect to, respectively, the CAPM 1-factor model, the Fama and French (1993) 3-factor model (which includes the size factor SMB and the value factor HML in addition to the market factor MKT), and the 4-factor model that also includes the momentum factor UMD (Jegadeesh and Titman (1993), Asness (1994), and Carhart (1997)). Specifically, these alphas are the intercepts from the following regression with the first 1, 3, or 4 right-hand-side variables included:

$$r_t = \alpha + \beta^{MKT}MKT_t + \beta^{SMB}SMB_t + \beta^{HML}HML_t + \beta^{UMD}UMD_t + \varepsilon_t \quad (10)$$

We see that excess returns increase almost monotonically in quality such that high-quality stocks outperform low-quality stocks. The right-most column reports the return difference between the highest and lowest deciles and the associated t -statistic, showing that high quality stocks earn higher average returns than low quality stocks (40 and 48 basis points per month depending on the sample) and we can reject the null hypothesis of no difference in average returns (t -statistics of 2.43 and 3.36).

When we control for market risk and other factor exposures, the outperformance in the alpha of high-quality stocks and their statistical significance is in fact even larger. This higher outperformance arises because high-quality stocks actually have lower market exposures, and lower exposures to other factors, than low-quality stocks. In other words, as measured by the CAPM or a 3- and 4-factor model, high quality stocks are safer (have lower factor loadings) than low quality stocks. Adjusting by the CAPM alone materially strengthens our results as higher quality stocks are, partly by construction, lower beta stocks.

Across our three risk models in our long U.S. sample, a portfolio that is long high quality stocks and short low quality stocks earns average abnormal returns ranging from 60 to 104 basis points per month with associated t -statistics ranging between 3.98 and 8.83. In our broad global sample, we obtain similar results with abnormal returns between 66 to 94 basis points and t -statistics between 3.90 and 6.43.

Our results are thus consistent with explanation (c) discussed above, but do not appear to support the simplest versions of explanations (a) and (b). Indeed, a simple risk explanation (b) is inconsistent with our finding that high-quality stocks have lower factor exposures than junk stocks, but we study risk in more detail by considering the performance of the QMJ factor.

B. Quality Minus Junk

In this section we examine the returns of our QMJ factors. As described in Section 2 (Equation 7), QMJ is long the average of the *Small Quality* and *Big Quality* portfolios and short the average of the *Small Junk* and *Big Junk* portfolios. We also construct long/short factors based on each separate quality component using the same method. Hence, in addition to QMJ, we have quality factors based on profitability, safety and growth.

Table V reports the correlations between the different quality components. The table reports the correlation both for the excess returns and for the abnormal returns relative to a 4-factor model (i.e., the correlations of the regression residuals). We see that all of the pairwise correlations among the quality components are positive. The average pairwise correlation among the quality components is 0.63 in the U.S. and 0.62 in the global sample, and 0.59 and 0.57 for abnormal returns in the two samples. Hence, while the quality components measure different firm characteristics that investors should be willing to pay for, firms that are high quality in one respect tend to also be high quality in other respects. This did not have to be. Each of these variables, we argue, are quality measures investors should pay for at the margin, but they did not have to be related to one another. While theory is no guide here, we think these significant positive correlations lend support to our practical decision to combine these three thematic sets of measures as one quality variable.

Table VI reports the performance of each of our quality factors in the U.S. (panel A) and globally (panel B). Specifically, the table reports the average excess returns and the

alphas with respect to the CAPM, 3-, and 4- factor models. We see that each quality factor delivers a statistically significant positive excess return and alpha with respect to the CAPM, 3-, and 4-factor models in the U.S. sample and significant 4-factor alphas in the global sample as well (the 3- and 4-factor results are quite similar as momentum, or UMD, does not change much). The overall QMJ factor tends to be the strongest of the four, with highly significant alphas in the U.S. and global samples. The abnormal returns are large in magnitude and highly statistically significant. In our U.S. long sample, a QMJ portfolio that is long high quality stocks and short junk stocks delivers CAPM, 3-, and 4-factor abnormal returns of 34, 46, and 57 basis points per month (with corresponding *t*-statistics of 4.69, 7.81, and 9.22). Similarly, in our Global broad sample, the QMJ factor earns abnormal returns of 49, 58 and 58 basis points per month (with corresponding *t*-statistics of 5.53, 8.22 and 7.61).

Panels A and B of Table VI also report the risk-factor loadings for the 4-factor model. We see that the QMJ factor (with the exception of the UMD loading in the global sample) have significant negative factor exposures, that is according to 4-factor model, quality stocks are in general safer than junk stocks, yet surprisingly earn higher (not lower) average returns. QMJ has a significantly negative market and size exposures. That is, QMJ is long low-beta and large stocks, while being short high-beta small ones. As would be expected, the safety factor has the most negative market exposure, though only growth attains a zero or small positive market beta, the other quality composites also show negative beta. The value exposure of QMJ is negative in the U.S. and globally. This negative value loading is expected since high-quality stocks have high prices while the value factor HML is long cheap stocks. The loadings on UMD tend to be smaller in magnitude and statistically insignificant in some the specifications. The loadings are consistent across quality sub-components, with profitability, safety, and growth all having negative market, SMB, and HML loadings in the U.S. and global samples.

Panel C of Table VI and Figure 1 report the performance of the QMJ factor across countries. Remarkably, the QMJ factor delivers positive returns and alphas in all but one of the 24 countries that we study, displaying a strikingly consistent pattern (with the only small negative being in New Zealand, one of the smallest countries in market capitalization and number of stocks). Furthermore 4-factors alphas are statistically significant in 17 out of 24

countries despite the fact that many individual countries have a small cross section of securities and a short time series.

Figures 2 and 3 show the performance of the QMJ factor over time in the U.S. and global samples. Specifically, Figure 2 shows the cumulative return of the QMJ factor (plotted as the cumulative sum of excess returns to avoid compounding issues) and Figure 3 shows the cumulative sum of QMJ's 4-factor risk-adjusted returns (the sum of the monthly in-sample regression alpha plus the regression error). Both plots show that QMJ factor has consistently delivered positive excess returns and risk-adjusted returns over time with no particular subsample driving our results. Figure A2 in the appendix plot the 4-factor alphas by year.

C. Robustness of QMJ Performance

Table VII reports the performance of our quality factors using alternative risk-adjustments. Specifically, we report alphas relative to the 5-factor model of Fama and French (2015) and the 6-factor model augmented with the (UMD) momentum portfolio.¹⁶ While using this 6-factor adjustment reduces the magnitude of the abnormal returns, the results are consistent with prior ones: QMJ portfolios earn significant returns, controlling for the 5- or 6-factor models. We note that QMJ portfolios have large positive loading on the RMW factor based on gross profit over assets (GPOA), which is not surprising given that GPOA is a component out our profitability composite. Nevertheless, alphas are positive, ranging from 17 to 30 basis points per month with *t*-statistics ranging from 2.10 to 6.34 across the various specifications. Said differently, RMW is a quality factor so we are measuring the return of quality broadly defined, controlling for a narrow quality measure and other factors.

Furthermore, factor loadings to the market, size, and value remain negative, indicating that high quality stocks are safer than junk stocks in terms of these risk exposures (while CMA, RMW, and UMD have less clear interpretations as risk).

¹⁶ The explanatory variables are the returns of the market (MKT), size (SMB), book-to-market (HML), profitability (RMW) and investment (CMA) portfolios from Fama and French (2015) and the momentum (UMD) portfolio. All the portfolios are from Ken's French data library. The shorter sample period (July 1963 to December 2016 for the U.S. and November 1990 to December 2016 for the Global sample) is due to the slightly shorter availability of the data on Ken's French data library relative to our sample.

We report a series of additional results and robustness checks in the appendix. Table A4 reports returns for the individual components (Small Quality, Big Quality, Small Junk, Big Junk) of the QMJ factors. In Table A5 we split the sample in 20-year subsamples and report QMJ returns by size (10 size-sorted based on NYSE-breakpoints). Table A6 and Figure A3 report results for large and small cap stocks within each country. Table A7 reports QMJ abnormal returns controlling for the 4-factor model augmented with the betting against beta (BAB) factor of Frazzini and Pedersen (2014). Table A8 reports QMJ abnormal returns controlling for the 6-factor model plus BAB. Finally, Figure A4 reports results by industry using 71 global GICS industries. We form a QMJ portfolio within each industry and report 4-factor adjusted information ratios.

All the results point in the same direction with consistency across size, time periods, countries, and construction methodology: QMJ portfolios that are long high quality stocks and short junk stocks earn large and significant abnormal returns relative to variety of factor models, ranging from 1- to 7-factor models. Furthermore, quality stocks do not appear riskier (as defined by model loadings); if anything they appear safer than junk stocks and a result earn abnormal returns that are larger than their excess returns.

The return evidence on the QMJ factors could potentially be consistent with both mispricing (quality stocks are underpriced and junk stocks are overpriced), or risk (quality stocks underperform junk stocks in bad states of the world) that is not fully captured by the factor models considered above. Although a full explanation of the driver of quality returns is beyond the scope of this paper, we can nonetheless provide some stylized facts that either explanation should generate in order to fit the available evidence.

D. The Risk of Quality Stocks

We have already noted that the evidence does not point toward compensation for risk measured by the host of factor models considered above. The evidence also does not point toward compensation for tail risk as seen in Table VIII. We compute the return of the QMJ factors during recession and expansions, during severe bear and bull markets (defined as total market returns in the past 12 months below -25% or above +25%), during periods of high and low market volatility (we measure volatility as the 1-month standard deviation of daily returns of the CRSP-value weighted index or the MSCI-World index and split the sample in

the 30% top and bottom time periods) and during periods of a large increase or drop in aggregate volatility (again, we split the sample into the 30% top and bottom time periods in terms of the 1-month change in volatility). We find no evidence of compensation for tail risk, if anything the evidence again points toward high quality stocks being safer rather than riskier than junk stocks: quality appears to hedge (as opposed being correlated to periods) of market distress.

To study further the risk of QMJ, Figure 4 plots the performance of QMJ against the return on the market. The negative beta of QMJ is clearly visible by the downward sloping relation of the excess return of QMJ and the market. Further, the relatively tight fit around the curve shows the limited residual risk, implying a strong and consistent historical performance of QMJ during down periods for the market. QMJ also performs well in extreme down markets; in fact, the estimated second-order polynomial shown in the graph has a positive (but insignificant) quadratic term, meaning that the fitted curve bends upward in the extreme. This mild concavity is mostly driven by the returns to the profitability subcomponent of quality. The quadratic term is marginally significant (t -statistic of 2.4) for the profitability factor in our long sample. The strong return in extreme down markets is consistent with a *flight to quality* (or at least to profitability). That is, in down markets, investors may exhibit flight to quality in the sense that prices of unprofitable stocks drop more than the prices of profitable stocks, even adjusting for their betas. The strong performance of QMJ in down markets is robust to considering longer time periods such as down-market quarters or down-market years (not shown for brevity).

Looking at the alphas, also reveal a similar pattern of mild flight to quality. At the very least, quality stocks, even after adjustment for their factor loadings, do not appear to perform poorly in period of extreme market distress, if anything they tend to deliver higher returns in those states of the world.

Overall, our findings present serious challenges for the risk-based theories (explanation (b) discussed above). Using a variety of factor models ranging from the CAPM to a 7-factor model as our risk adjustment, we show that QMJ factors earn significant abnormal returns. Looking at factor exposures and performance during distressed market conditions, quality stocks appear safer, not riskier, than junk stocks. Of course, alternative

risk-based explanations are always possible; such explanations will have to generate these patterns to match the empirical evidence.

E. Market (In)efficiency: Analysts' Expectations of the Price of Quality

To test whether the limited explanatory power of quality on price could be driven at least partly by limited efficiency (theory (c) above), we consider the expectations of equity analysts using the methodology of Brav, Lehavy, and Michaely (2008). We consider each analyst's target price, that is, the expected price one year into the future. As seen in Table IX, target prices scaled by book values are higher for high-quality stocks. In other words, analyst forecasts appear consistent with the idea that high-quality stocks deserve higher prices.

Next, Table IX and Figure 5 consider the implied return expectations computed as the ratio of the target price to the current price minus 1. We see that analysts have lower return expectations for higher-quality stocks than junk stocks. In other words, analyst expectations are inconsistent with the high ex-post realized returns of high-quality stocks.

Analysts' implied return expectations could reflect that the *required* return of high-quality stocks is lower than that of junk stocks (because quality stocks are viewed as safer). If so, quality stocks should realize lower returns than junk stocks, or said differently, quality stocks should have a larger price premium. These findings of erroneous analyst expectations are therefore consistent with theory (c) for our finding that the price of quality is too limited.

If the limited price of quality is partly driven by limited market efficiency, then how far off the mark are market prices? This is an important question, but a precise answer is beyond the scope of this paper. To get a sense of magnitudes, we can consider the event-time cumulative 5-year abnormal return of QMJ.¹⁷ Buying quality and shorting junk for 5 years earns a cumulative 4-factor alpha of 21.29% on average in our US sample (22.6% in the global sample). The cumulative abnormal return can be interpreted as an average underpricing of 10.64% among high-quality stocks and overpricing of 10.64% of junk stocks.

¹⁷ We compute the k -month event-time abnormal return α^k as the intercept in a regression

$$r_t^k = \alpha^k + \beta^{MKT} MKT_t + \beta^{SMB} SMB_t + \beta^{HML} HML_t + \beta^{UMD} UMD_t + \varepsilon_t$$

where $r_t^k = \sum_i w_{i,t-k} r_{i,t}$ is excess return in month t of a calendar-time portfolio formed in month $t - k$. The event-time cumulative abnormal return CAR is given by $CAR = \sum_k \alpha^k$.

Of course, this could reflect that some quality stocks are more underpriced while others are less underpriced or even overpriced.

F. Linking Prices and Returns: The Price of Quality Predicts QMJ

We next consider more directly the link between the price of quality and the future returns of QMJ. The theory of limited market efficiency (explanation (c) above) implies that a higher price of quality predicts lower future returns to quality. In other words, when market prices incorporate quality to a larger extent, then the expected returns to buying quality is lower. In contrast, theories (a)-(b) do not have clear predictions for the time-variation of risk-adjusted returns.

We first consider how the price of quality varies over time. To study this, Figure 6 shows the time series of the price of quality, that is, the time series of the Fama-MacBeth regression coefficients that we estimate above in Equation 8. Specifically, we plot the monthly coefficients from Table A3 column (1) and (7). We see that the price of quality varies significantly over time. As one might expect, the price of quality is low during the height of the internet bubble in early 2000 and has other large swings during time periods consistent with economics intuition as discussed in the introduction. Figure A5 in the appendix plot the times series of cross sectional coefficient for the quality sub-components.

The intuitive pattern of the price of quality suggests that the variation is not just driven by noise. To explore further the variation in the price of quality, it is interesting to link prices and subsequent returns in the time series. Specifically, if this time variation is not due to mis-measurement noise, then a high price of quality should predict low subsequent returns of QMJ. Table X provides evidence of such predictability. This table reports the regression coefficients of time-series regressions of future QMJ returns on the ex ante price of quality:

$$QMJ_{t \rightarrow t+k} = \beta^0 + \beta^{lagged\ FMB} b_{t-1} + \beta^{lagged\ QMJ} QMJ_{t-12,t-1} + \varepsilon_t \quad (11)$$

Said simply, $QMJ_{t \rightarrow t+k}$ is the return of QMJ over the future k months, b_{t-1} is the lagged price of quality (the variable of interest), and $QMJ_{t-12,t-1}$ controls for past returns. Let us describe each of these variables in detail.

We run the regression in two ways: Using the excess returns of the QMJ factor on the left hand side (“Ret-Rf”) and using the alpha of the QMJ factor on the left hand side (“Alpha”). The future excess return on the raw QMJ factor is computed simply by cumulating returns, $QMJ_{t \rightarrow t+k} = \prod_{j=0}^k (1 + QMJ_{t+j} + r_{t+j}^f) - \prod_t (1 + r_{t+j}^f)$. To compute the alphas, we regress QMJ on the contemporaneous returns of the market, size, value, and momentum factors and compute the alpha as the regression residual plus the intercept (i.e., as the return of QMJ with its factor exposures hedged out). We then cumulate these alphas $QMJ_{t \rightarrow t+k} = \prod_{j=0}^k (1 + \alpha_{t+j} + r_{t+j}^f) - \prod_t (1 + r_{t+j}^f)$ and use them on the left hand side of (11). We consider alphas to ensure that the predictability of the price of quality on QMJ is not driven by any potential predictability of other factors.

The price of quality, b_{t-1} is the lagged Fama-MacBeth regression coefficient from Equation (8) that gives the connection between price and quality at each time. Specifically, the price of quality is estimated from the monthly regressions reported in table A3 column (1) and (7). We are interested in testing the hypothesis that a high lagged price of quality predicts lower subsequent returns, that is, $b_{t-1} < 0$.

Last, $QMJ_{t-12,t-1}$ is defined as the portfolio-weighted average of the past 1-year returns of the stocks in the QMJ portfolio. This captures standard momentum effects, again to ensure that the predictability of the price of quality is a novel finding.

Table X reports only the regression coefficient for the variable of interest, b_{t-1} , the ex ante price of quality. We run overlapping forecasting regressions predicting returns from one month up to five years. We adjust standard errors for heteroskedasticity and autocorrelation (Newey and West (1987)) with a lag length of five years.

Table X shows that a high price of quality indeed predicts lower future returns on QMJ. In our U.S. long sample shown in Panel A, all the coefficients have the expected negative sign and we are able to reject the null hypothesis of no predictability in all but one specification. Predictability rises with the forecasting horizon, indicating slowly changing expected returns. The results for our shorter global sample in Panel B are noisier, but we see that all of the statistically significant coefficients are negative as expected. The bottom rows of Table X similarly test whether the price of the separate quality characteristics predict the returns of the corresponding long/short factors. While these results are noisier, the estimates tend to be negative, as conjectured.

To summarize, the results in Table X are consistent with the hypothesis that the variation of the price of quality is not pure noise but, rather, reflects changes in the market pricing of quality characteristics, generating variation in QMJ returns.

5. Further Asset Pricing Applications

A. *Quality at a Reasonable Price*

It is interesting to consider what is the “fair” price of quality? That is, if we suppose that a stock’s fundamental value V is a multiple of its quality, $V = m \text{ Quality}$, then what is the fair value of m ? Relatedly, if the market pays a price for quality different from m , then what is the best way to buy cheap quality stocks?

To answer these questions, we construct a long-short portfolio that we call *quality at a reasonable price* (QARP) as follows. Using the same factor construction as for QMJ, we construct a long-short portfolio based on the signal $n \text{ Quality}_t^i - z(P_t^i)$ for various choices of n . That is, QARP is based on the difference between a stock’s quality times n minus its price-to-book (normalized as a z-score). We should get the highest risk-adjusted return if we let $n = m$, that is, if we base the signal on the quality multiple that corresponds to the true fundamental value. Indeed, in this case, the portfolio is long the highest-alpha securities and short the lowest-alpha securities.¹⁸

While m is generally unobservable as we do not know true fundamental values, we can proceed by relying on the fact that we have normalized quality and prices based on the

¹⁸ For simplicity consider a 2-period model so that the fundamental value is the expected payoff at time 2 discounted at the required return, $V = \frac{E(P_2)}{1+k}$, where k is the required return. The alpha of the security, that is, the expected excess return above the required return is then

$$\alpha = E\left(\frac{P_2}{P_1}\right) - 1 - k = \frac{V - P_1}{P_1}(1 + k)$$

Naturally, the alpha depends on the difference between the fundamental value V and the price P_1 . Since our measures of quality and price are based on z-scores, we simply subtract the two (rather than dividing by price as above).

cross-section. Specifically, if the highest-quality stocks were the most expensive, then the quality and price ranks would line up, corresponding to $m = 1$. When we construct QARP empirically, we do find that the alpha is highest for n close to 1 both in the U.S. and globally (as seen in Figure A6 in the appendix, which plots the monthly alpha of QARP as function of n).

Another way to consider QARP is to simply form a portfolio of quality (QMJ) and value (HML). The combination of QMJ and HML that has the highest Sharpe ratio puts a weight of about 63% on QMJ (and, hence, the remaining 37% on HML) in the U.S. and about 62% weight on QMJ globally.

The Sharpe ratio of QARP (whether constructed based on combining signals or combining factor returns) is naturally higher than either quality or value alone, about 0.7 in the U.S. and 0.9 globally. QARP performs well as quality strategies complement value by helping an investor avoid the “value trap,” namely the trap of buying securities that look cheap but deserve to be cheap. Instead, QARP buys securities that are cheap relative to their quality. Our evidence suggests that the return to QARP is above the equity risk premium, which seems to challenge rational risk-based models.

B. QMJ on the Right-Hand-Side of a Factor Model

We have seen that QMJ is an intuitive and powerful factor that has significant alpha relative to a series of standard factor models. It is also interesting to switch things around and put QMJ on the right-hand-side to see how it affects the alphas and interpretation of the standard factors. More broadly, QMJ is a useful factor to add to the toolbox of global factors, e.g., when researchers need to test whether new phenomena are driven by quality.

Table XI reports the results of regressing each of the SMB, HML, and UMD on the other standard factors, with and without QMJ on the right-hand-side. Let us first consider SMB, that is, the size effect. SMB has a modest, but significant, excess return in our US sample and global sample. In both samples, SMB has a small and insignificant alpha when controlling for the other standard factors (the market, HML, and UMD). The size effect is not present in our sample, but controlling for QMJ completely changes this conclusion. SMB has a very large negative exposure to QMJ. Clearly, small stocks are junky relative to big stocks. This finding is intuitive as small stocks could, for instance, be young firms that are yet to be

profitable, and are more volatile. Moreover, controlling for QMJ, the size effect becomes large and highly significant in both samples. The size effect is alive and well when we account for quality as small stocks outperform large stocks when we compare firms of similar quality (and market beta, value and momentum exposure). This finding in return space is the analog of the strong size effect for prices that we documented in Table III.

Table XI further shows that HML has a negative loading on QMJ. This is also intuitive as cheap stocks (with high book-to-market) are naturally lower quality than expensive stocks. This negative loading implies that controlling for QMJ increases the alpha of HML, strengthening the value effect.

The appendix contains further tests. Indeed, Tables A9-A11 analyzes different combinations of size (SMB), value (HML), momentum (UMD), investments (CMA), profitability (RMW), and betting against beta (BAB). The results show, for instance, that controlling for quality eliminates the alpha of RMW.

To summarize, quality stocks, despite earning on average higher returns, appear safer, not riskier, than junk stocks in terms of their market, size, value exposures. As a result, these factor's alpha increase when we control for quality since they, too, load negative on QMJ. At the same time, quality can explain other factors such as RMW and possibly other factors related to quality or mispricing.

6. Conclusion

In this paper we define a quality security as one that has characteristics that should command a higher (scaled) price. We present a dynamic valuation model, which shows that quality stocks are profitable, growing, and safe. We create empirical counterparts of each quality subcomponent and quality in general, which are robust and inclusive from across the literature, testing the hypothesis that high quality firms have higher scaled prices.

Consistent with market efficiency, we find that high quality firms do exhibit higher prices, on average. However, the explanatory power of quality on prices is low, leaving the majority of cross sectional dispersion in scaled prices unexplained. As a result, high quality firms exhibit high risk-adjusted returns. A quality-minus-junk (QMJ) factor that goes long high-quality stocks and shorts low-quality stocks earns significant risk-adjusted returns with

an information ratio above 1 (i.e., a Sharpe ratio above 1 after hedging its other factor exposures) in the U.S. and globally across 24 countries.

Our results are consistent with quality stocks being underpriced and junk stocks overpriced or, alternatively, with quality stocks being riskier than junk stocks. However, while one can never rule out a risk explanation for the high return of quality stocks, we are unable to identify this risk; in anything, we find evidence of the opposite. We show that quality stocks are low beta and, rather than exhibiting crash risk, if anything they benefit from “flight to quality,” that is, they have a tendency to perform well during periods of extreme market distress. These findings present a challenge for risk-based explanations. To test the mispricing hypothesis, we consider analysts’ expectations. Analysts’ expectations are consistent with the idea that high-quality stocks deserve higher prices. However, analysts expect high-quality stocks to deliver lower returns than junk stocks, contrary to the *ex post* realized returns. This evidence of systematic analyst errors is consistent with the mispricing hypothesis that the price of quality is too low.

Finally, we show that the price of quality varies over time, generating a time-varying expected return on quality-minus-junk portfolios: a low price of quality predicts a high future return of quality stocks relative to junk stocks.

In summary, we document strong and consistent abnormal returns to quality, and do so in a far more inclusive and complete setting than prior papers simultaneously using all quality components implied by our theoretical model. We also tie these results to the cross-section and time-series of the pricing of quality in novel ways. Our results present an important puzzle for asset pricing: We cannot tie the returns of quality to risk, or, in a highly related finding, demonstrate that prices cross-sectionally vary “enough” with quality measures. At this point the returns to quality must be either an anomaly, data mining (incredibly robust data mining - including across countries, size and time periods, and out-of-sample relative to the first draft of the paper), or the results of a still-to-be-identified risk factor.

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Table I
Summary Statistics

This table shows summary statistics. Our sample consists of all common stocks traded in 24 developed markets between June 1957 and December 2016. The 24 markets in our sample correspond to union of all countries belonging to the MSCI World Developed Index over our sample period. Stock returns and accounting data are from the union of the Center for Research on Security Prices (CRSP) pricing database, the Compustat North America Fundamentals Annual, Fundamentals Quarterly and Security Daily databases, and the Compustat Global Fundamentals Annual, Fundamentals Quarterly and Security Daily databases. We assign individual issues to the corresponding market based on the location of the primary exchange. For companies traded in multiple markets we use the primary trading vehicle identified by Compustat. We restrict the sample to common stocks (identified by a CRSP share code “shrcd” of 10 or 11 or a Compustat share code “tcp1” of 0) and exclude securities trading on over-the-counter exchanges.

Country	Total number of stocks	Average number of stocks	Average Firm size (Billion- USD)	Average Global Market Weight	Start Date	End Date
Australia	2,847	1,224	0.69	0.026	199506	201612
Austria	168	80	1.02	0.003	199506	201612
Belgium	282	136	1.90	0.008	199506	201612
Canada	5,337	1,736	0.61	0.039	198906	201612
Switzerland	426	225	3.57	0.024	199506	201612
Germany	1,567	749	1.71	0.037	199506	201612
Denmark	325	161	1.03	0.005	199506	201612
Spain	314	143	3.94	0.018	199506	201612
Finland	214	114	1.58	0.005	199506	201612
France	1,590	695	2.38	0.049	199506	201612
United Kingdom	4,899	1,822	1.53	0.081	199306	201612
Greece	375	246	0.39	0.003	200106	201612
Hong Kong	1,982	989	1.30	0.040	199506	201612
Ireland	103	46	2.07	0.003	199506	201612
Israel	620	303	0.45	0.003	200106	201612
Italy	559	250	2.36	0.018	199506	201612
Japan	5,136	3,235	1.16	0.107	199306	201612
Netherlands	341	168	3.23	0.015	199506	201612
Norway	526	191	1.00	0.006	199506	201612
New Zealand	266	111	0.33	0.001	199506	201612
Portugal	112	55	1.44	0.002	199706	201612
Singapore	1,037	528	0.65	0.010	199506	201612
Sweden	881	321	1.20	0.011	199506	201612
United States	24,709	4,608	1.58	0.487	195706	201612

Table II
Persistence of Quality Measures

This table shows average quality scores. Each calendar month, stocks in each country in are ranked in ascending order on the basis of their quality score. The ranked stocks are assigned to one of ten portfolios. U.S. sorts are based on NYSE breakpoints. This table reports each portfolio's quality score at portfolio formation (date t) up to the subsequent ten years (date t + 120 months). We report the time series average of the value-weighted cross sectional means. Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from June 1957 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from June 1989 to December 2016. Standard errors are adjusted for heteroskedasticity and autocorrelation with a lag length of five years (Newey and West (1987)) and 5% significance is indicated in bold.

Panel A: Long Sample (U.S.) 195706 - 201612		P1 (Low)	P2	P3	P4	P5	P6	P7	P8	P9	P10 (High)	H-L	H-L t-stat
Quality	t	-1.44	-0.82	-0.51	-0.27	-0.05	0.17	0.39	0.65	0.99	1.62	3.06	51.04
Quality	t + 12M	-0.88	-0.50	-0.33	-0.17	-0.01	0.19	0.35	0.55	0.84	1.45	2.35	36.32
Quality	t + 36M	-0.52	-0.32	-0.24	-0.16	-0.02	0.12	0.24	0.42	0.65	1.23	1.77	21.90
Quality	t + 60M	-0.27	-0.20	-0.14	-0.13	-0.05	0.07	0.15	0.31	0.51	1.04	1.32	12.96
Quality	t + 120M	-0.27	-0.22	-0.13	-0.11	-0.05	0.03	0.14	0.26	0.44	0.86	1.13	10.90
Profit	t + 120M	-0.37	-0.23	-0.12	-0.02	0.10	0.13	0.25	0.33	0.51	1.08	1.47	21.58
Growth	t + 120M	-0.23	-0.18	-0.16	-0.16	-0.18	-0.14	-0.08	0.01	0.16	0.26	0.50	4.91
Safety	t + 120M	-0.42	-0.25	-0.14	-0.03	0.02	0.13	0.23	0.38	0.59	0.74	1.16	13.33

Panel B: Broad Sample 198906 - 201612		P1 (Low)	P2	P3	P4	P5	P6	P7	P8	P9	P10 (High)	H-L	H-L t-stat
Quality	t	-1.62	-0.91	-0.56	-0.29	-0.06	0.17	0.41	0.67	1.01	1.57	3.18	46.69
Quality	t + 12M	-1.16	-0.59	-0.38	-0.18	-0.01	0.15	0.32	0.54	0.82	1.32	2.49	32.91
Quality	t + 36M	-0.81	-0.42	-0.30	-0.16	-0.03	0.09	0.21	0.39	0.62	1.06	1.87	19.63
Quality	t + 60M	-0.54	-0.25	-0.18	-0.12	-0.05	0.04	0.13	0.28	0.47	0.84	1.38	14.72
Quality	t + 120M	-0.42	-0.24	-0.14	-0.07	-0.02	0.02	0.11	0.20	0.39	0.60	1.01	15.30
Profit	t + 120M	-0.30	-0.13	-0.03	0.04	0.16	0.18	0.28	0.38	0.51	0.93	1.23	16.82
Growth	t + 120M	-0.18	-0.13	-0.15	-0.13	-0.13	-0.13	-0.08	0.01	0.06	0.09	0.27	3.67
Safety	t + 120M	-0.50	-0.32	-0.21	-0.09	-0.02	0.07	0.16	0.32	0.46	0.56	1.07	11.46

Table III
Results: Cross Sectional Regressions, the Price of Quality

This table reports results from annual Fama-Macbeth regressions. The dependent variable is the log of a firm's market to book ratio in June of each calendar year (date t). The explanatory variables are the quality scores on date t and a series of controls. "Firm size" is the log of the firm's market capitalization; "1-year return" is the firm's stock return over the prior year. "Firm age" is the cumulative number of years since the firm's IPO. "Uncertainty about mean profitability" (Pastor and Veronesi (2003)) is the standard deviation of the residuals of an AR(1) model for each firm's ROE, using the longest continuous series of a firm's valid annual ROE up to date t. We require a minimum of five years of non-missing ROEs. "Dividend payer" is a dummy equal to one if the firm paid any dividends over the prior year. With the exception of the "Dividend payer" dummy, all explanatory variables at time t are ranked cross-sectionally and rescaled to have a zero cross-sectional mean and a cross-sectional standard deviation of one. Industry, country or firm fixed effects are included when indicated ("Industry FE", "Country FE", "Firm FE"). "Average AdjR2" is the time series average of the adjusted R-square of the cross sectional regression. Standard errors are adjusted for heteroskedasticity and autocorrelation (Newey and West (1987)) with a lag length of five years. T-statistics are shown below the coefficient estimates and 5% statistical significance is indicated in bold.

Panel A	Long Sample (U.S., 195706 - 201612)						Broad Sample (Global, 198906 - 201612)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Quality	0.23 (9.69)	0.24 (15.89)	0.24 (9.62)	0.22 (10.09)	0.23 (9.69)	0.24 (15.89)	0.17 (13.65)	0.19 (21.97)	0.17 (13.04)	0.15 (18.59)	0.17 (13.65)	0.19 (20.59)
Firm size		0.32 (21.16)		0.32 (19.71)		0.32 (21.16)		0.33 (13.38)		0.33 (13.37)		0.31 (11.45)
1-year return		0.21 (13.29)		0.22 (13.34)		0.21 (13.29)		0.26 (24.27)		0.26 (27.86)		0.26 (23.92)
Firm age		-0.17 (-7.33)		-0.16 (-6.64)		-0.17 (-7.33)		-0.12 (-4.94)		-0.11 (-4.72)		-0.12 (-7.00)
Profit Uncertainty		0.37 (14.91)		0.35 (14.22)		0.37 (14.91)		0.40 (29.45)		0.34 (20.50)		0.40 (29.01)
Dividend payer		-0.15 (-7.88)		-0.07 (-3.31)		-0.15 (-7.88)		-0.19 (-6.97)		-0.09 (-2.82)		-0.20 (-4.83)
Profit Uncertainty x Dividend payer		-0.20 (-10.89)		-0.20 (-7.70)		-0.20 (-10.89)		-0.22 (-15.24)		-0.20 (-8.19)		-0.23 (-14.04)
Average AdjR2	0.10	0.41	0.26	0.49	0.10	0.41	0.10	0.36	0.20	0.43	0.03	0.33
Nobs (years)	60	54	60	54	60	54	28	28	28	28	28	28
Industry FE			X	X					X	X		
Country FE							X	X	X	X		
Firm FE					X	X					X	X

Table III (continued)
Results: Cross Sectional Regressions, the Price of Quality

This table reports results from annual Fama-Macbeth regressions. The dependent variable is the log of a firm's market to book ratio in June of each calendar year (date t). The explanatory variables are the quality scores on date t and a series of controls. "Firm size" is the log of the firm's market capitalization; "1-year return" is the firm's stock return over the prior year. "Firm age" is the cumulative number of years since the firm's IPO. "Uncertainty about mean profitability" (Pastor and Veronesi (2003)) is the standard deviation of the residuals of an AR(1) model for each firm's ROE, using the longest continuous series of a firm's valid annual ROE up to date t. We require a minim of five years of non-missing ROEs. "Dividend payer" is a dummy equal to one if the firm paid any dividends over the prior year. With the exception of the "Dividend payer" dummy, all explanatory variables at time t are ranked cross-sectionally and rescaled to have a zero cross-sectional mean and a cross-sectional standard deviation of one. Industry, country or firm fixed effects are included when indicated ("Industry FE", "Country FE", "Firm FE"). "Average AdjR2" is the time series average of the adjusted R-square of the cross sectional regression. Standard errors are adjusted for heteroskedasticity and autocorrelation (Newey and West (1987)) with a lag length of five years. T-statistics are shown below the coefficient estimates and 5% statistical significance is indicated in bold.

Panel B	Long Sample (U.S., 195706 - 201612)					Broad Sample (Global, 198906 - 201612)				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Profitability	0.19 (10.15)			0.12 (7.11)	0.15 (12.53)	0.13 (15.51)			0.08 (6.18)	0.10 (21.20)
Growth		0.16 (8.41)		0.10 (5.39)	0.10 (6.01)		0.11 (11.33)		0.06 (3.88)	0.07 (5.81)
Safety			0.13 (7.95)	0.05 (4.51)	0.04 (3.80)			0.10 (8.85)	0.04 (4.20)	0.05 (4.22)
Firm size	0.33 (17.74)	0.32 (20.92)	0.37 (22.85)	0.31 (19.81)	0.31 (20.24)	0.33 (12.13)	0.32 (14.22)	0.36 (14.67)	0.32 (13.18)	0.31 (10.98)
1-year return	0.22 (12.96)	0.23 (13.24)	0.22 (14.15)	0.21 (12.89)	0.21 (12.91)	0.27 (27.48)	0.27 (26.53)	0.27 (28.74)	0.26 (28.45)	0.26 (24.56)
Firm age	-0.18 (-6.70)	-0.15 (-6.26)	-0.20 (-6.99)	-0.16 (-7.47)	-0.17 (-7.96)	-0.12 (-4.78)	-0.10 (-4.36)	-0.12 (-5.13)	-0.11 (-5.59)	-0.13 (-7.44)
Profit Uncertainty	0.31 (11.74)	0.31 (12.03)	0.35 (12.81)	0.34 (14.03)	0.35 (13.25)	0.32 (18.58)	0.31 (16.54)	0.35 (26.08)	0.34 (24.87)	0.40 (37.73)
Dividend payer	-0.07 (-3.73)	-0.01 (-0.29)	-0.06 (-2.79)	-0.06 (-3.61)	-0.14 (-6.93)	-0.10 (-3.14)	-0.05 (-1.67)	-0.09 (-2.79)	-0.09 (-3.21)	-0.19 (-5.18)
Profit Uncertainty x Dividend payer	-0.19 (-6.62)	-0.21 (-7.59)	-0.19 (-6.35)	-0.21 (-8.13)	-0.20 (-11.29)	-0.20 (-8.11)	-0.20 (-7.48)	-0.20 (-8.21)	-0.21 (-8.47)	-0.24 (-14.79)
Average AdjR2	0.48	0.47	0.45	0.49	0.43	0.42	0.42	0.41	0.43	0.34
Nobs (years)	54	54	54	54	54	28	28	28	28	28
Industry FE				X					X	
Country FE						X	X	X	X	
Firm FE					X					X

Table III (continued)
Results: Cross Sectional Regressions, the Price of Quality

This table reports results from annual Fama-Macbeth regressions. The dependent variable is the log of a firm's market to book ratio in June of each calendar year (date t). The explanatory variables are the quality scores on date t and a series of controls. "Firm size" is the log of the firm's market capitalization; "1-year return" is the firm's stock return over the prior year. "Firm age" is the cumulative number of years since the firm's IPO. "Uncertainty about mean profitability" (Pastor and Veronesi (2003)) is the standard deviation of the residuals of an AR(1) model for each firm's ROE, using the longest continuous series of a firm's valid annual ROE up to date t. We require a minim of five years of non-missing ROEs. "Dividend payer" is a dummy equal to one if the firm paid any dividends over the prior year. With the exception of the "Dividend payer" dummy, all explanatory variables at time t are ranked cross-sectionally and rescaled to have a zero cross-sectional mean and a cross-sectional standard deviation of one. Industry, country or firm fixed effects are included when indicated ("Industry FE", "Country FE", "Firm FE"). "Average AdjR2" is the time series average of the adjusted R-square of the cross sectional regression. Standard errors are adjusted for heteroskedasticity and autocorrelation (Newey and West (1987)) with a lag length of five years. T-statistics are shown below the coefficient estimates and 5% statistical significance is indicated in bold.

Panel C Size decile	Long Sample (U.S., 195706 - 201612)										Broad Sample (Global, 198906 - 201612)									
	P1 (small)	P2	P3	P4	P5	P6	P7	P8	P9	P10 (large)	P1 (small)	P2	P3	P4	P5	P6	P7	P8	P9	P10 (large)
Quality	0.11 (7.45)	0.20 (10.57)	0.22 (11.44)	0.24 (11.98)	0.23 (14.45)	0.25 (15.40)	0.30 (13.15)	0.29 (10.06)	0.30 (13.10)	0.31 (15.00)	0.08 (6.29)	0.14 (11.64)	0.14 (8.84)	0.16 (21.52)	0.16 (8.96)	0.18 (6.61)	0.19 (9.96)	0.16 (8.62)	0.21 (15.17)	0.22 (13.12)
Firm size	0.20 (13.03)	0.01 (0.47)	0.00 (-0.33)	0.03 (4.18)	0.02 (2.24)	0.02 (2.97)	0.01 (1.45)	0.02 (2.95)	0.03 (3.65)	0.05 (3.93)	0.21 (13.91)	0.04 (5.15)	0.00 (0.72)	0.02 (4.80)	0.02 (3.84)	0.02 (1.51)	0.02 (2.98)	0.03 (5.09)	0.03 (2.51)	0.04 (4.79)
1-year return	0.24 (15.13)	0.22 (10.68)	0.19 (8.86)	0.20 (15.07)	0.19 (10.41)	0.18 (11.37)	0.17 (9.32)	0.16 (8.11)	0.15 (8.56)	0.14 (8.93)	0.28 (27.69)	0.28 (34.65)	0.26 (39.28)	0.24 (20.23)	0.23 (20.17)	0.22 (17.32)	0.24 (14.33)	0.22 (11.58)	0.20 (9.16)	0.17 (13.33)
Firm age	-0.14 (-4.40)	-0.11 (-4.54)	-0.11 (-5.72)	-0.12 (-6.17)	-0.13 (-6.58)	-0.12 (-7.89)	-0.10 (-5.34)	-0.11 (-5.28)	-0.09 (-5.09)	-0.08 (-4.31)	-0.10 (-2.77)	-0.10 (-4.24)	-0.09 (-7.26)	-0.08 (-6.17)	-0.07 (-6.35)	-0.09 (-7.60)	-0.07 (-3.38)	-0.07 (-3.85)	-0.06 (-2.48)	-0.03 (-2.76)
Profit Uncertainty	0.30 (3.85)	0.29 (4.55)	0.29 (7.54)	-0.44 (-0.64)	0.30 (3.47)	0.24 (5.56)	-0.14 (-0.76)	-0.05 (-0.26)	0.28 (1.25)	0.21 (0.66)	0.42 (27.24)	0.34 (35.61)	0.27 (15.78)	0.27 (18.70)	0.20 (6.63)	0.18 (8.67)	0.18 (4.78)	0.12 (7.42)	0.04 (1.51)	0.15 (3.75)
Dividend payer	-0.08 (-2.08)	-0.04 (-1.30)	-0.04 (-0.49)	-1.13 (-1.12)	0.07 (0.56)	-0.01 (-0.07)	-0.58 (-2.08)	-0.43 (-1.21)	0.00 (0.00)	0.03 (0.09)	-0.07 (-1.33)	-0.08 (-2.77)	-0.13 (-3.59)	-0.09 (-2.55)	-0.10 (-2.19)	-0.18 (-2.91)	-0.14 (-4.30)	-0.16 (-5.76)	-0.24 (-4.27)	-0.07 (-1.72)
Profit Uncertainty x Dividend payer	-0.11 (-1.48)	-0.14 (-2.74)	-0.13 (-3.37)	0.60 (0.86)	-0.16 (-2.13)	-0.12 (-2.99)	0.24 (1.31)	0.14 (0.67)	-0.19 (-0.88)	-0.11 (-0.36)	-0.18 (-8.13)	-0.15 (-11.27)	-0.11 (-4.70)	-0.11 (-3.59)	-0.08 (-3.42)	-0.07 (-6.34)	-0.08 (-3.21)	-0.05 (-3.51)	0.05 (2.00)	-0.06 (-2.02)
Average R2	0.41	0.43	0.44	0.50	0.50	0.53	0.61	0.61	0.65	0.71	0.38	0.43	0.42	0.44	0.44	0.45	0.48	0.48	0.53	0.55
Industry FE	54	54	54	54	54	54	54	54	54	54	28	28	28	28	28	28	28	28	28	28
Country FE											X	X	X	X	X	X	X	X	X	X

Table IV
Quality-Sorted Portfolios

This table shows calendar-time portfolio returns. Each calendar month, stocks in each country are ranked in ascending order on the basis of their quality score. The ranked stocks are assigned to one of ten portfolios. U.S. sorts are based on NYSE breakpoints. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. The rightmost column reports returns of a self-financing portfolio that is long the high quality portfolio and shorts the low quality portfolio. Alpha is the intercept in a time-series regression of monthly excess return. The explanatory variables are the returns of the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from June 1957 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from June 1989 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Returns and alphas are in monthly percent, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. "Beta" is the realized loading on the market portfolio. "Information ratio" is equal to the 4-factor alpha divided by the standard deviation of the estimated residuals in the time-series regression. Sharpe ratios and information ratios are annualized.

Panel A: Long Sample U.S., 195707 - 201612	P1 (Low)	P2	P3	P4	P5	P6	P7	P8	P9	P10 (High)	H-L
Excess return	0.29 (1.16)	0.47 (2.31)	0.50 (2.65)	0.47 (2.70)	0.56 (3.35)	0.49 (2.87)	0.56 (3.36)	0.57 (3.42)	0.49 (2.97)	0.69 (4.01)	0.40 (2.43)
CAPM alpha	-0.41 (-3.48)	-0.12 (-1.65)	-0.05 (-0.80)	-0.05 (-0.80)	0.07 (1.17)	-0.02 (-0.31)	0.06 (1.20)	0.07 (1.41)	0.00 (-0.08)	0.19 (2.86)	0.60 (3.98)
3-factor alpha	-0.53 (-5.82)	-0.23 (-3.69)	-0.14 (-2.36)	-0.12 (-2.27)	0.00 (-0.08)	-0.07 (-1.32)	0.03 (0.64)	0.06 (1.24)	0.03 (0.60)	0.30 (5.62)	0.84 (7.44)
4-factor alpha	-0.57 (-5.81)	-0.35 (-5.41)	-0.25 (-3.94)	-0.22 (-4.13)	-0.12 (-2.06)	-0.11 (-1.94)	-0.02 (-0.36)	0.06 (1.07)	0.04 (0.83)	0.47 (8.66)	1.04 (8.83)
Beta	1.27	1.15	1.09	1.04	1.01	1.02	1.00	0.98	0.95	0.93	-0.34
Sharpe Ratio	0.15	0.30	0.34	0.35	0.43	0.37	0.44	0.44	0.38	0.52	0.31
Information Ratio	-0.82	-0.76	-0.55	-0.58	-0.29	-0.27	-0.05	0.15	0.12	1.22	1.24
Adjusted R2	0.87	0.91	0.90	0.92	0.90	0.91	0.91	0.92	0.91	0.91	0.55

Panel B: Broad Sample Global, 198907 - 201612	P1 (Low)	P2	P3	P4	P5	P6	P7	P8	P9	P10 (High)	H-L
Excess return	0.13 (0.37)	0.35 (1.22)	0.42 (1.55)	0.43 (1.69)	0.47 (1.96)	0.50 (2.09)	0.59 (2.59)	0.54 (2.39)	0.54 (2.48)	0.60 (2.64)	0.48 (2.36)
CAPM alpha	-0.40 (-2.50)	-0.09 (-0.74)	0.00 (-0.04)	0.03 (0.31)	0.09 (1.02)	0.12 (1.38)	0.23 (2.72)	0.19 (2.10)	0.20 (2.22)	0.26 (2.40)	0.66 (3.90)
3-factor alpha	-0.48 (-3.32)	-0.18 (-1.53)	-0.06 (-0.59)	-0.03 (-0.31)	0.03 (0.35)	0.05 (0.62)	0.20 (2.40)	0.18 (1.98)	0.24 (2.67)	0.36 (3.72)	0.85 (6.32)
4-factor alpha	-0.40 (-2.50)	-0.26 (-2.08)	-0.17 (-1.55)	-0.11 (-1.10)	-0.09 (-0.94)	0.05 (0.59)	0.14 (1.54)	0.12 (1.27)	0.22 (2.20)	0.54 (5.22)	0.94 (6.43)
Beta	1.20	1.06	1.03	0.96	0.92	0.90	0.87	0.86	0.83	0.80	-0.40
Sharpe Ratio	0.07	0.23	0.30	0.32	0.37	0.40	0.49	0.46	0.47	0.50	0.45
Information Ratio	-0.53	-0.44	-0.33	-0.23	-0.20	0.12	0.33	0.27	0.46	1.10	1.35
Adjusted R2	0.83	0.85	0.87	0.87	0.87	0.88	0.87	0.85	0.83	0.83	0.57

Table V
Quality Minus Junk: Correlations

This table shows correlation of monthly returns. Quality minus Junk (QMJ) factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. Portfolios based on profitability, growth and safety scores are constructed in a similar manner. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Abnormal returns are constructed as the intercept plus the residual of a time-series regression of monthly excess returns. The explanatory variables are the returns of the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from June 1957 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from June 1989 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate.

	Panel A: Long Sample (U.S. , 195707 - 201612)				Panel B: Broad Sample (Global, 198907 - 201612)			
	QMJ	Profitability	Safety	Growth	QMJ	Profitability	Safety	Growth
	Returns				Returns			
QMJ	1.00				1.00			
Profitability	0.90	1.00			0.87	1.00		
Safety	0.84	0.66	1.00		0.88	0.80	1.00	
Growth	0.61	0.54	0.26	1.00	0.51	0.41	0.27	1.00
	Abnormal Returns (4-factor)				Abnormal Returns (4-factor)			
QMJ	1.00				1.00			
Profitability	0.85	1.00			0.77	1.00		
Safety	0.73	0.48	1.00		0.70	0.63	1.00	
Growth	0.67	0.52	0.27	1.00	0.58	0.52	0.22	1.00

Table VI
Quality Minus Junk: Returns

This table shows calendar-time portfolio returns and factor loadings. Quality minus Junk (QMJ) factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. Portfolios based on profitability, growth and safety scores are constructed in a similar manner. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Alpha is the intercept in a time-series regression of monthly excess return. The explanatory variables are the returns of the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from June 1957 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from June 1989 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Returns and alphas are in monthly percent, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. "Information ratio" is equal to the 4-factor alpha divided by the standard deviation of the estimated residuals in the time-series regression. Sharpe ratios and information ratios are annualized.

	Panel A: Long Sample (U.S. , 195707 - 201612)				Panel B: Broad Sample (Global , 198907 - 201612)			
	QMJ	Profitability	Safety	Growth	QMJ	Profitability	Safety	Growth
Excess Returns	0.25 (3.16)	0.25 (3.67)	0.23 (2.57)	0.08 (1.14)	0.36 (3.19)	0.39 (4.39)	0.23 (1.74)	0.15 (1.89)
CAPM-alpha	0.34 (4.69)	0.31 (4.70)	0.41 (5.59)	0.04 (0.59)	0.49 (5.53)	0.48 (6.94)	0.40 (4.50)	0.15 (1.87)
3-factor alpha	0.46 (7.81)	0.40 (6.93)	0.53 (9.18)	0.16 (2.78)	0.58 (8.22)	0.51 (8.15)	0.51 (7.88)	0.22 (3.09)
4-factor alpha	0.57 (9.22)	0.50 (8.32)	0.53 (8.69)	0.37 (6.32)	0.58 (7.61)	0.47 (6.97)	0.40 (5.82)	0.37 (5.04)
MKT	-0.19 (-12.93)	-0.12 (-8.21)	-0.31 (-22.02)	0.02 (1.16)	-0.26 (-15.24)	-0.19 (-12.68)	-0.35 (-22.40)	-0.01 (-0.50)
SMB	-0.25 (-11.08)	-0.22 (-9.99)	-0.29 (-12.94)	-0.03 (-1.27)	-0.32 (-8.65)	-0.27 (-8.28)	-0.22 (-6.50)	-0.15 (-4.25)
HML	-0.38 (-16.05)	-0.29 (-12.67)	-0.29 (-12.59)	-0.50 (-22.27)	-0.29 (-8.11)	-0.06 (-1.92)	-0.26 (-8.17)	-0.35 (-10.31)
UMD	-0.10 (-5.10)	-0.10 (-4.95)	-0.01 (-0.24)	-0.19 (-10.20)	0.00 (-0.14)	0.03 (1.40)	0.10 (4.13)	-0.14 (-5.32)
Sharpe Ratio	0.41	0.48	0.33	0.15	0.61	0.84	0.33	0.36
Information Ratio	1.29	1.17	1.22	0.89	1.60	1.47	1.23	1.06
Adjusted R2	0.47	0.34	0.61	0.45	0.63	0.51	0.77	0.27

Table VI (Continued)
Quality Minus Junk: Returns By Country

This table shows calendar-time portfolio returns and factor loadings. Quality minus Junk (QMJ) factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Alpha is the intercept in a time-series regression of monthly excess return. The explanatory variables are the returns of the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from June 1957 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from June 1989 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Returns and alphas are in monthly percent, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. "Information ratio" is equal to the 4-factor alpha divided by the standard deviation of the estimated residuals in the time-series regression. Sharpe ratios and information ratios are annualized.

Panel C	Excess return	T-stat excess return	4-factor alpha	T-stat alpha	Factor loadings				Sharpe ratio	Information ratio	Number of months	Return date range
					MKT	SMB	HML	UMD				
Australia	0.30	1.76	0.48	3.09	-0.16	-0.28	-0.20	-0.02	0.38	0.77	258	199507-201612
Austria	-0.05	-0.15	0.10	0.41	-0.42	-0.02	-0.18	0.21	-0.03	0.09	258	199507-201612
Belgium	0.43	1.55	0.39	2.02	-0.26	-0.41	-0.38	0.21	0.33	0.46	258	199507-201612
Canada	0.63	2.96	0.53	2.68	-0.20	-0.29	-0.14	0.14	0.56	0.55	330	198907-201612
Switzerland	0.31	1.21	0.37	1.99	-0.41	-0.21	-0.26	0.21	0.26	0.45	258	199507-201612
Germany	0.53	2.88	0.60	4.04	-0.23	-0.14	-0.24	0.05	0.62	0.96	258	199507-201612
Denmark	0.33	1.32	0.07	0.34	-0.16	-0.30	-0.34	0.21	0.28	0.08	258	199507-201612
Spain	0.02	0.09	0.08	0.42	-0.34	-0.13	-0.27	0.20	0.02	0.09	258	199507-201612
Finland	0.18	0.60	0.33	1.46	-0.02	-0.05	-0.48	-0.02	0.13	0.33	258	199507-201612
France	0.35	1.60	0.51	3.34	-0.29	-0.21	-0.34	0.12	0.35	0.77	258	199507-201612
United Kingdo	0.21	1.28	0.17	1.34	-0.23	-0.09	-0.14	0.16	0.26	0.30	282	199307-201612
Greece	1.93	3.52	1.30	4.07	-0.22	-0.26	-0.14	0.48	0.89	1.07	186	200107-201612
Hong Kong	-0.01	-0.02	0.59	2.55	-0.38	-0.40	-0.47	0.06	0.00	0.57	258	199507-201612
Ireland	0.82	1.32	0.93	1.98	-0.67	-0.17	-0.03	0.21	0.28	0.44	258	199507-201612
Israel	0.50	1.56	0.39	1.79	-0.32	-0.32	-0.22	0.29	0.40	0.49	186	200107-201612
Italy	0.62	2.26	0.61	3.68	-0.32	-0.16	-0.35	0.20	0.49	0.82	258	199507-201612
Japan	0.23	1.09	0.55	3.56	-0.34	-0.27	-0.43	0.06	0.22	0.79	282	199307-201612
Netherlands	0.07	0.25	0.40	1.92	-0.38	-0.20	-0.28	0.05	0.05	0.43	258	199507-201612
Norway	0.52	1.92	0.55	2.30	-0.23	-0.24	-0.21	0.10	0.41	0.52	258	199507-201612
New Zealand	-0.02	-0.11	-0.05	-0.26	-0.03	-0.11	-0.22	0.04	-0.02	-0.06	258	199507-201612
Portugal	0.84	2.26	0.83	2.60	-0.34	-0.33	-0.34	0.07	0.51	0.61	234	199707-201612
Singapore	0.36	1.27	0.64	4.09	-0.22	-0.28	-0.43	0.07	0.27	0.91	258	199507-201612
Sweden	0.56	2.27	0.43	2.37	-0.10	-0.26	-0.32	0.21	0.49	0.54	258	199507-201612
United States	0.25	3.16	0.57	9.22	-0.19	-0.25	-0.38	-0.10	0.41	1.29	714	195707-201612
Global	0.36	3.19	0.58	7.61	-0.26	-0.32	-0.29	0.00	0.61	1.60	330	198907-201612

Table VII
Quality Minus Junk: 6-Factor Adjusted Returns

This table shows calendar-time portfolio returns and factor loadings. Quality minus Junk (QMJ) factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. Portfolios based on profitability, growth and safety scores are constructed in a similar manner. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Alpha is the intercept in a time-series regression of monthly excess return. The explanatory variables are the returns of the market (MKT), size (SMB), book-to-market (HML), profitability (RMW) and investment (CMA) portfolios from Fama and French (2015) and the momentum (UMD) portfolios from Ken's French data library. Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from July 1963 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from November 1990 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Returns and alphas are in monthly percent, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. "Information ratio" is equal to the 4-factor alpha divided by the standard deviation of the estimated residuals in the time-series regression. Sharperatios and information ratios are annualized.

	Panel A: Long Sample (U.S. ,196307 - 201612)				Panel B: Broad Sample (Global , 199011 - 201612)			
	QMJ	Profitability	Safety	Growth	QMJ	Profitability	Safety	Growth
Excess Returns	0.26 (3.01)	0.29 (3.92)	0.22 (2.26)	0.07 (0.88)	0.31 (2.67)	0.37 (4.14)	0.18 (1.37)	0.15 (1.82)
5-factor alpha	0.34 (7.21)	0.29 (6.76)	0.41 (6.26)	0.19 (4.36)	0.31 (4.83)	0.29 (5.90)	0.26 (3.50)	0.22 (3.55)
6-factor alpha	0.30 (6.39)	0.28 (6.46)	0.31 (5.02)	0.17 (3.98)	0.27 (4.27)	0.28 (5.67)	0.16 (2.46)	0.21 (3.41)
MKT	-0.15 (-13.38)	-0.08 (-7.28)	-0.28 (-18.21)	0.00 (0.05)	-0.23 (-13.60)	-0.15 (-10.68)	-0.31 (-17.49)	-0.06 (-3.24)
SMB	-0.09 (-5.72)	-0.07 (-4.52)	-0.18 (-8.51)	0.05 (3.42)	-0.17 (-5.45)	-0.17 (-6.83)	-0.16 (-4.72)	-0.13 (-4.08)
HML	-0.26 (-11.29)	-0.29 (-13.98)	-0.20 (-6.64)	-0.24 (-11.32)	-0.24 (-6.13)	-0.10 (-3.15)	-0.27 (-6.55)	-0.05 (-1.26)
CMA	-0.07 (-2.28)	0.10 (3.18)	0.03 (0.61)	-0.44 (-14.54)	0.04 (0.85)	0.07 (1.73)	0.14 (2.69)	-0.45 (-9.56)
RMW	0.59 (26.84)	0.58 (28.46)	0.32 (10.83)	0.39 (19.11)	0.67 (14.07)	0.59 (15.38)	0.47 (9.46)	0.32 (6.81)
UMD	0.05 (4.91)	0.01 (1.18)	0.13 (8.95)	0.02 (1.95)	0.07 (4.34)	0.02 (1.14)	0.18 (10.79)	0.01 (0.66)
Sharpe Ratio	0.41	0.54	0.31	0.12	0.52	0.81	0.27	0.36
Information Ratio	0.94	0.95	0.74	0.58	0.93	1.23	0.53	0.74
Adjusted R2	0.74	0.70	0.64	0.72	0.77	0.74	0.81	0.51

Table VIII
QMJ: Recessions, Severe Bear and Bull Markets and Volatility Environment

This table shows calendar-time portfolio returns. Quality minus Junk (QMJ) factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Alpha is the intercept in a time-series regression of monthly excess return. The explanatory variables are the returns of the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from June 1957 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from June 1989 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Returns and alphas are in monthly percent, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. "Recession" indicates NBER recessions. "Expansion" indicates all other months. "Severe bear (bull) market" is defined as a total market return in the past 12-month below (above) -25% (25%). "Low (high) volatility" indicated periods of low (high) market volatility. We measure volatility as the 1-month standard deviation of daily returns of the CRSP-value weighted index (U.S.) or the MSCI-World index (Global) and split the sample in the top and bottom 30% high and low periods. "Spike Up (down) in Volatility" indicates periods of large increases or drops in market volatility. We measure volatility changes as the 1-month change in market volatility and split the sample into top and bottom 30% Spike Up and Down periods.

Panel A: Long Sample									
U.S., 195707 - 201612	Return				t-statistics				Number of months
	Excess Return	CAPM Alpha	3-Factor Alpha	4-Factor Alpha	Excess Return	CAPM Alpha	3-Factor Alpha	4-Factor Alpha	
All Periods	0.25	0.34	0.46	0.57	3.16	4.69	7.81	9.22	714
Recession	0.51	0.49	0.76	0.85	2.04	2.15	4.50	5.06	110
Expansion	0.20	0.32	0.43	0.51	2.48	4.17	6.99	7.83	604
Severe bear market	-0.03	0.24	0.75	0.73	-0.03	0.32	1.49	1.36	21
Severe bull Market	0.15	0.15	0.31	0.49	0.93	0.97	2.41	3.60	141
Low volatility	0.45	0.63	0.71	0.78	2.57	4.11	5.51	5.95	242
High volatility	0.10	0.16	0.38	0.54	0.93	1.52	4.99	6.51	234
Spike up in volatility	0.44	0.50	0.53	0.69	2.93	3.70	4.58	5.94	238
Spike down in volatility	0.02	0.25	0.50	0.50	0.17	1.95	5.14	4.69	237

Panel B: Broad Sample									
Global, 198907 - 201612	Return				t-statistics				Number of months
	Excess Return	CAPM Alpha	3-Factor Alpha	4-Factor Alpha	Excess Return	CAPM Alpha	3-Factor Alpha	4-Factor Alpha	
All Periods	0.36	0.49	0.57	0.58	3.19	5.52	8.22	7.61	330
Recession	0.94	0.64	1.27	1.27	1.95	1.81	5.25	5.24	37
Expansion	0.29	0.47	0.55	0.53	2.58	5.27	7.86	6.82	293
Severe bear market	0.52	0.87	1.16	1.30	0.48	1.70	4.99	4.79	15
Severe bull Market	0.62	0.55	0.68	0.86	2.26	2.28	3.84	3.92	38
Low volatility	0.52	0.67	0.81	0.79	2.31	4.26	6.50	6.16	136
High volatility	0.03	0.14	0.35	0.47	0.20	1.07	3.10	3.60	95
Spike up in volatility	0.49	0.60	0.57	0.60	2.32	3.69	4.37	4.44	115
Spike down in volatility	0.16	0.38	0.63	0.60	0.84	2.43	5.00	4.26	117

Table IX
Quality-Sorted Portfolios: Target Prices

This table shows average I/B/E/S one-year-ahead target prices for quality-sorted portfolios. Each calendar month, stocks in each country are ranked in ascending order on the basis of their quality score. The ranked stocks are assigned to one of ten portfolios, where U.S. sorts are based on NYSE breakpoints. For each portfolio, each month we compute the weighted-average target price (scaled by book equity) using the I/B/E/S mean and median consensus for each stock. We report time-series averages of each variable. The implied expected return is given by the ratio of target prices to current prices minus 1. “Dispersion” is the cross sectional standard deviation of the price targets divided by the average price target. The rightmost columns report the difference between portfolios 10 and 1 and the corresponding *t*-statistic. Standard errors are adjusted for heteroskedasticity and autocorrelation (Newey and West (1987)) with a lag length of five years and 5% statistical significance is indicated in bold. Stocks in each portfolio are value-weighted and refreshed every calendar month. For the global sample, we form one set of portfolios in each country and compute global portfolios by weighting each country’s portfolio by the country’s total (lagged) market capitalization. The sample period of our I/B/E/S target price data runs from March 1999 to December 2016.

Panel A: United States 199903 - 201612	P1 (Low)	P2	P3	P4	P5	P6	P7	P8	P9	P10 (High)	H-L t-statistics	H-L
Price (scaled by book)	2.74	2.40	2.54	2.96	2.96	3.07	3.36	3.80	4.52	6.98	4.24	4.04
Mean price target (scaled by book)	3.51	2.88	2.99	3.51	3.46	3.56	3.90	4.39	5.24	8.20	4.69	3.60
Median price target (scaled by book)	3.49	2.87	2.98	3.52	3.46	3.56	3.90	4.39	5.24	8.21	4.72	3.63
Mean Implied Expected Return	0.25	0.20	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.16	-0.09	-4.04
Median Implied Expected Return	0.24	0.19	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.16	-0.08	-3.94
Dispersion	0.81	0.91	0.94	0.97	0.96	0.97	0.97	0.97	0.97	0.96	0.14	6.82
Number of estimates	8.57	10.71	11.65	12.12	12.74	13.18	14.00	13.77	14.57	17.57	8.99	8.43
Realized future 12-month return	0.021	0.068	0.072	0.058	0.074	0.087	0.080	0.093	0.072	0.066	0.057	1.85
Panel B: Global 199903 - 201612	P1 (Low)	P2	P3	P4	P5	P6	P7	P8	P9	P10 (High)	H-L t-statistics	H-L
Price (scaled by book)	2.80	2.48	2.56	2.94	2.92	3.03	3.32	3.73	4.42	6.78	3.98	3.90
Mean price target (scaled by book)	3.65	3.03	3.04	3.49	3.41	3.52	3.84	4.31	5.12	7.97	4.32	3.38
Median price target (scaled by book)	3.63	3.02	3.03	3.49	3.41	3.51	3.84	4.31	5.12	7.98	4.35	3.40
Mean Implied Expected Return	0.27	0.22	0.18	0.18	0.17	0.16	0.16	0.16	0.16	0.16	-0.11	-5.70
Median Implied Expected Return	0.26	0.21	0.18	0.18	0.17	0.16	0.16	0.16	0.16	0.16	-0.10	-5.64
Dispersion	0.81	0.91	0.94	0.97	0.96	0.97	0.98	0.97	0.97	0.96	0.15	7.54
Number of estimates	8.24	10.37	11.38	11.93	12.56	13.03	13.84	13.69	14.44	16.95	8.72	8.79
Realized future 12-month return	0.022	0.065	0.068	0.058	0.076	0.090	0.083	0.093	0.076	0.068	0.060	2.14

Table X
Time Variation of the Price of Quality: High Price of Quality Predicts Low QMJ Returns

This table shows results of monthly time series regressions of future quality factor returns on the lagged price of quality. The left-hand side is the cumulative excess return (labeled “Ret-Rf”) and the cumulative abnormal return (labeled “Alpha”) of the QMJ factor (or profitability, growth and safety) over the subsequent 1, 12, 36, or 60 months. Abnormal returns are constructed from a time-series regression of monthly excess returns on the returns of the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. Regression coefficients are estimated using all available data and abnormal returns are cumulated over the subsequent t+k period. The right hand side variables are the lagged price of quality and prior quality returns. The lagged price of quality at time t is the regression coefficient of a cross sectional regression of log market to book ratios in month t-1 on quality score in month t-1. The prior quality return is defined as the portfolio-weighted average of the past 1-year returns of the stocks in the portfolio. Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from June 1957 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from June 1989 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Each line and each column reports results from a separate regression. We report only the coefficient on the variable of interest, the lagged price of quality. An intercept and prior quality returns are included in all regressions but not reported. Standard errors are adjusted for heteroskedasticity and autocorrelation (Newey and West (1987)) with lag length of five years, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. “Average Adj R2” is the average adjusted R-squared across all the regressions above.

Left-hand side	Panel A: Long Sample (U.S. , 195707 - 201612)								Panel B: Broad Sample (Global, 198907 - 201612)							
	Return (t)		Return (t, t+12)		Return (t, t+36)		Return (t, t+60)		Return (t)		Return (t, t+12)		Return (t, t+36)		Return (t, t+60)	
	Ret-Rf	Alpha	Ret-Rf	Alpha	Ret-Rf	Alpha	Ret-Rf	Alpha	Ret-Rf	Alpha	Ret-Rf	Alpha	Ret-Rf	Alpha	Ret-Rf	Alpha
QMJ	-0.03	-0.01	-0.41	-0.22	-1.15	-0.68	-1.43	-2.01	-0.04	0.02	-0.94	0.02	-1.85	0.08	-1.31	-3.40
	(-3.50)	(-1.74)	(-2.99)	(-2.11)	(-3.00)	(-1.98)	(-2.50)	(-3.07)	(-1.76)	(1.30)	(-3.03)	(0.14)	(-2.56)	(0.14)	(-3.71)	(-7.87)
Profitability	-0.04	-0.02	-0.48	-0.33	-1.46	-1.15	-2.20	-2.63	-0.03	0.02	-0.93	-0.06	-1.74	-0.30	-2.34	-4.20
	(-3.38)	(-2.27)	(-3.03)	(-2.49)	(-3.51)	(-2.78)	(-3.17)	(-4.20)	(-1.28)	(1.36)	(-3.50)	(-0.47)	(-2.77)	(-0.67)	(-3.82)	(-6.46)
Growth	-0.03	-0.01	-0.29	-0.09	-0.76	-0.13	-0.49	-1.44	-0.02	0.00	-0.30	-0.02	-0.90	-0.17	-1.15	-0.79
	(-3.28)	(-0.91)	(-1.73)	(-0.56)	(-1.38)	(-0.26)	(-0.52)	(-1.66)	(-1.06)	(0.11)	(-1.28)	(-0.07)	(-2.56)	(-0.34)	(-1.29)	(-2.46)
Safety	-0.01	0.00	-0.16	-0.08	-1.03	-0.73	-2.16	-2.56	-0.03	0.00	-0.40	-0.01	-0.54	0.61	0.75	-1.21
	(-0.98)	(-0.28)	(-0.86)	(-0.58)	(-2.03)	(-1.57)	(-2.09)	(-3.22)	(-1.41)	(-0.30)	(-1.50)	(-0.09)	(-1.30)	(4.23)	(3.24)	(-2.31)
Average Adj R2	0.07	0.04	0.08	0.04	0.16	0.07	0.13	0.29	0.05	0.02	0.09	0.01	0.12	0.06	0.15	0.30

Table XI
Asset Pricing Tests: HML, SMB and UMD

This table shows calendar-time portfolio returns and factor loadings. Quality minus Junk (QMJ) factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Alpha is the intercept in a time-series regression of monthly excess return. The test portfolios are the Quality minus Junk (QMJ) factor, the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. We run a regression of each of SMB, HML and UMD on the remaining factors excluding and including the QMJ factor as explanatory variable. Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from June 1957 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from June 1989 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Returns and alphas are in monthly percent, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. "Information ratio" is equal to regression intercept, divided by the standard deviation of the estimated residuals. Sharpe ratios and information ratios are annualized.

Left-hand side	Panel A: Long Sample (U.S. , 195707 - 201612)						Panel B: Broad Sample (Global , 198907 - 201612)					
	SMB	SMB	HML	HML	UMD	UMD	SMB	SMB	HML	HML	UMD	UMD
Excess Returns	0.15 (1.50)	0.15 (1.50)	0.31 (2.47)	0.31 (2.47)	0.71 (4.78)	0.71 (4.78)	0.02 (0.18)	0.02 (0.18)	0.35 (2.20)	0.35 (2.20)	0.66 (3.09)	0.66 (3.09)
Alpha	0.13 (1.23)	0.45 (4.48)	0.80 (8.59)	0.99 (12.23)	1.07 (9.81)	1.23 (11.01)	0.08 (0.70)	0.40 (3.69)	0.77 (6.87)	0.98 (9.30)	1.09 (7.65)	1.10 (7.01)
MKT	0.17 (7.22)	0.03 (1.32)	-0.15 (-7.00)	-0.24 (-12.37)	-0.19 (-7.39)	-0.25 (-8.94)	0.06 (2.55)	-0.10 (-3.36)	-0.10 (-3.73)	-0.23 (-8.01)	-0.22 (-6.79)	-0.22 (-5.13)
SMB			-0.05 (-1.31)	-0.21 (-6.50)	-0.08 (-1.95)	-0.17 (-3.72)			-0.13 (-2.22)	-0.30 (-5.22)	-0.13 (-1.72)	-0.13 (-1.61)
HML	-0.05 (-1.31)	-0.27 (-6.50)			-0.81 (-24.80)	-0.91 (-24.04)	-0.12 (-2.22)	-0.26 (-5.22)			-0.94 (-19.21)	-0.94 (-16.16)
UMD	-0.06 (-1.95)	-0.12 (-3.72)	-0.57 (-24.80)	-0.49 (-24.04)			-0.07 (-1.72)	-0.06 (-1.61)	-0.57 (-19.21)	-0.47 (-16.16)		
QMJ		-0.59 (-11.08)		-0.70 (-16.05)		-0.35 (-5.10)		-0.59 (-8.65)		-0.59 (-8.11)		-0.02 (-0.14)
Sharpe Ratio	0.20	0.20	0.32	0.32	0.62	0.62	0.04	0.04	0.42	0.42	0.59	0.59
Information Ratio	0.17	0.66	1.15	1.65	1.29	1.51	0.15	0.83	1.35	1.89	1.48	1.49
Adjusted R2	0.09	0.22	0.47	0.61	0.48	0.49	0.04	0.22	0.53	0.61	0.57	0.57

Figure 1
QMJ: 4-Factor Adjusted Information Ratios

This figure plots 4-factor adjusted information ratios of Quality minus Junk (QMJ) factors. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Information ratios are equal to the intercept of a time-series regression of monthly excess return divided by the standard deviation of the estimated residuals. The explanatory variables are the monthly returns of the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Information ratios are annualized.

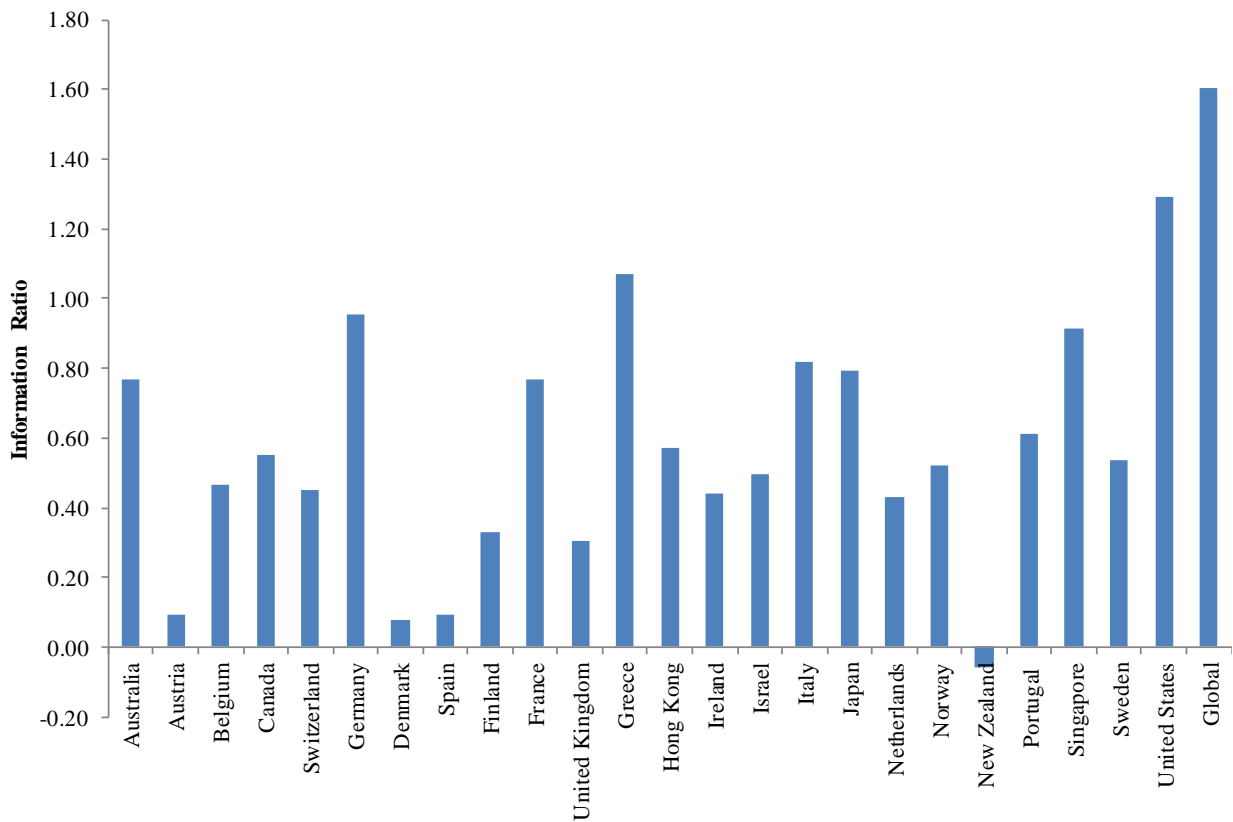
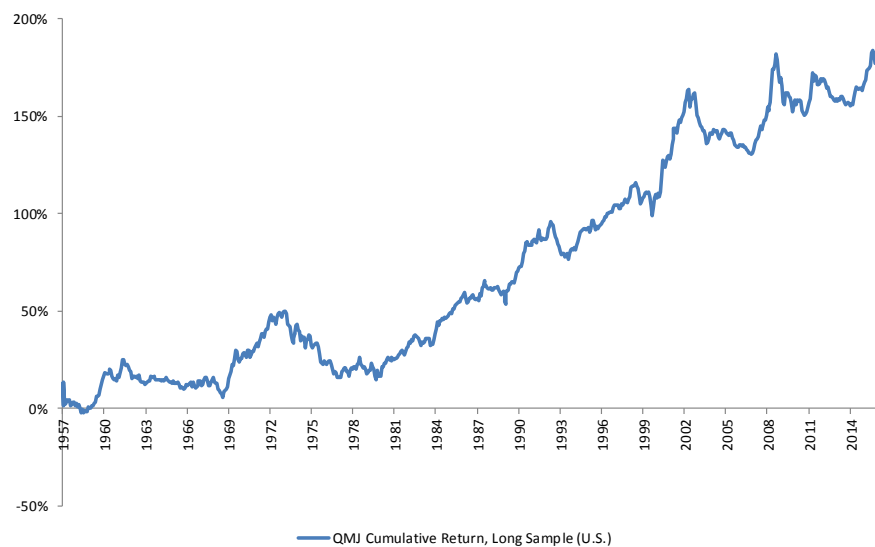


Figure 2
QMJ: Cumulative Returns

This figure shows cumulative returns of Quality minus Junk (QMJ) factors. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from June 1957 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from June 1989 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate.

Panel A: Long Sample (U.S. , 1957 - 2016)



Panel B: Broad Sample (Global , 1989 - 2016)

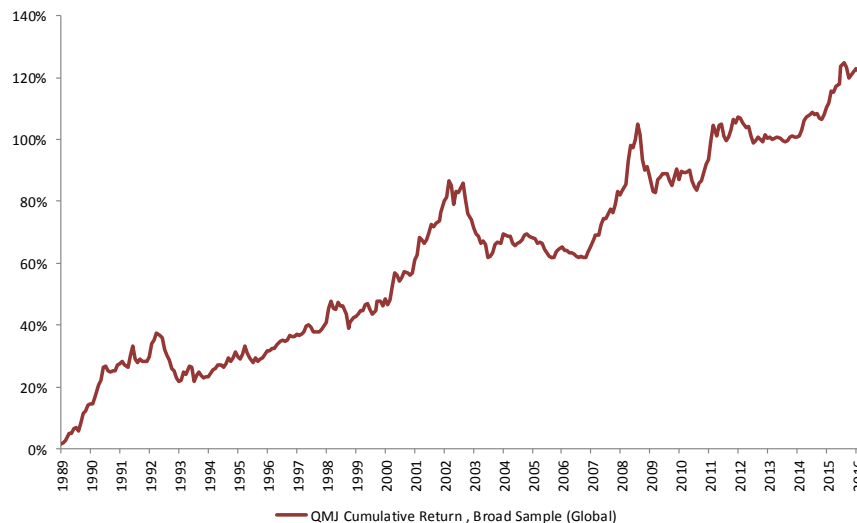
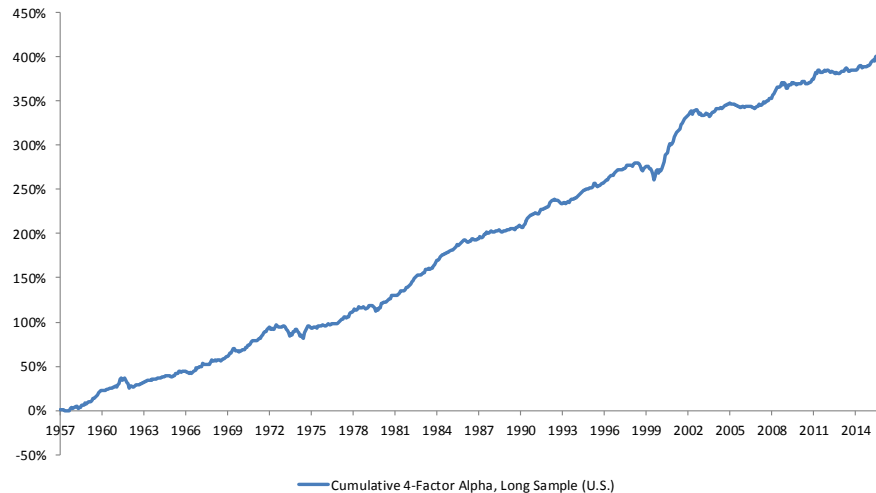


Figure 3
QMJ: Cumulative 4-Factor Alphas

This figure shows 4-factor adjusted cumulative returns of Quality minus Junk (QMJ) factors. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from June 1957 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from June 1989 to December 2016. Alpha is the intercept in a time-series regression of monthly excess return. The explanatory variables are the monthly returns of the market, (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. We plot the cumulative abnormal returns (alpha plus regression residual) from the time series regression.

Panel A: Long Sample (U.S. , 1957 - 2016)



Panel B: Broad Sample (Global , 1986 - 2012)

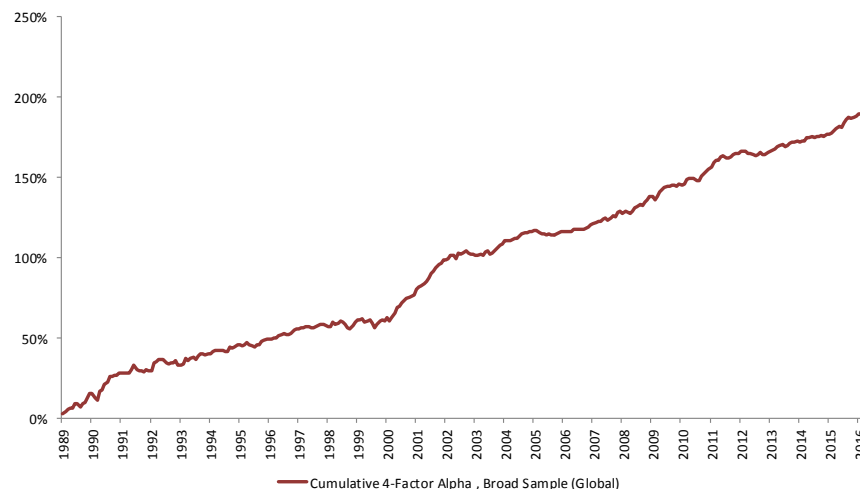
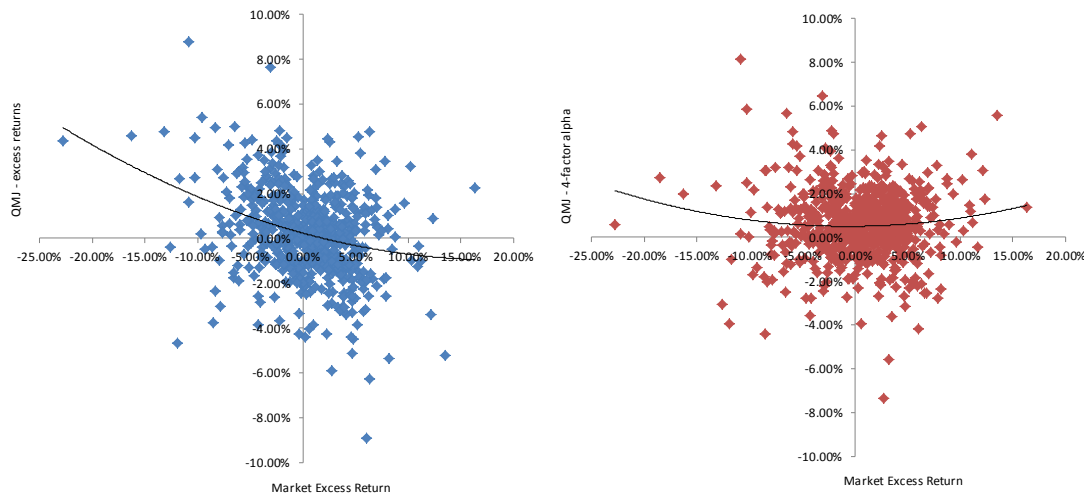


Figure 4
QMJ: Flight to Quality

This figure shows monthly returns and 4-factor alpha of Quality minus Junk (QMJ) factors. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from June 1957 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from June 1989 to December 2016. Alpha is the intercept in a time-series regression of monthly excess return. The explanatory variables are the monthly returns of the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. We plot monthly excess returns and alphas on the y-axes and market excess returns on the x-axes. Market returns indices are either the CRSP-value weighted index(U.S.) or the MSCI-World index(Global).

Panel A: Long Sample (U.S. , 1957 - 2016)



Panel B: Broad Sample (Global , 1989 - 2016)

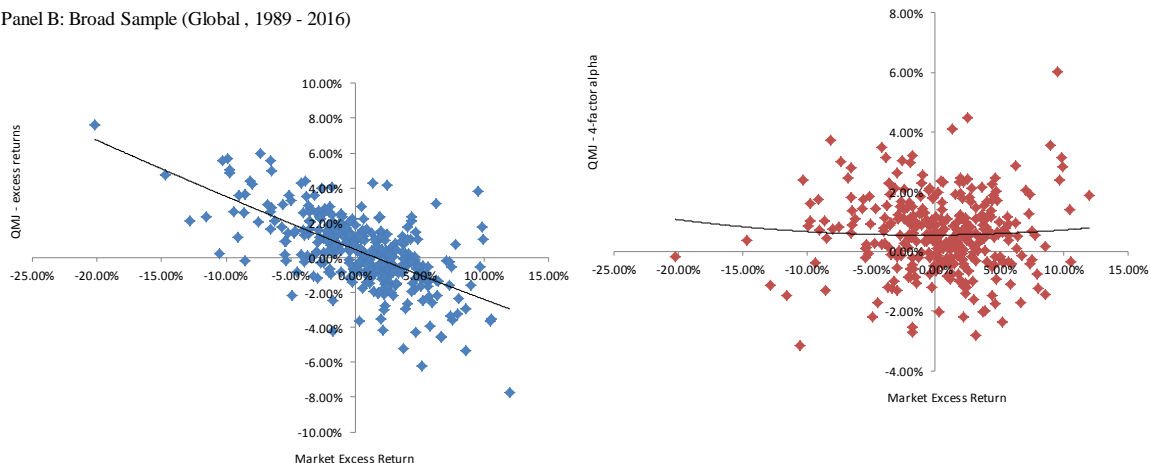
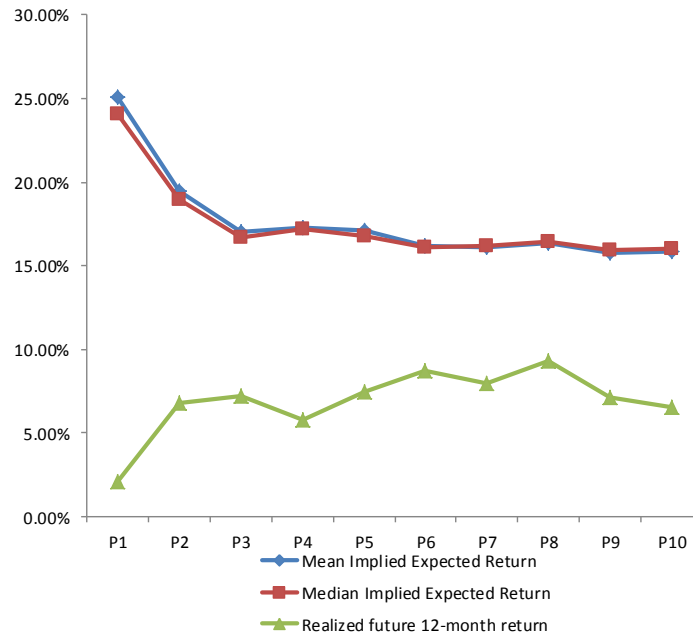


Figure 5
Expected Returns vs. Return Expectations

This figure plots 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. Each calendar month, stocks in each country are ranked in ascending order on the basis of their quality score. The ranked stocks are assigned to one of ten portfolios, where U.S. sorts are based on NYSE breakpoints. For each portfolio, each month we compute the weighted-average target price (scaled by book equity) using the I/B/E/S mean and median consensus for each stock. We report time-series averages of each variable. The implied expected return is given by the ratio of target prices to current prices minus 1. For the global sample, we form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. The sample period of our I/B/E/S target price data runs from March 1999 to December 2016.

Panel A: United States, 1999 – 2016



Panel B: Global, 1999 – 2016

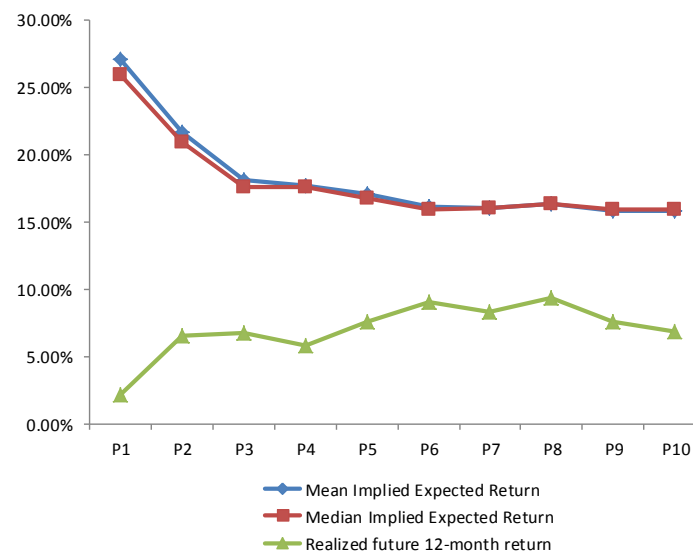
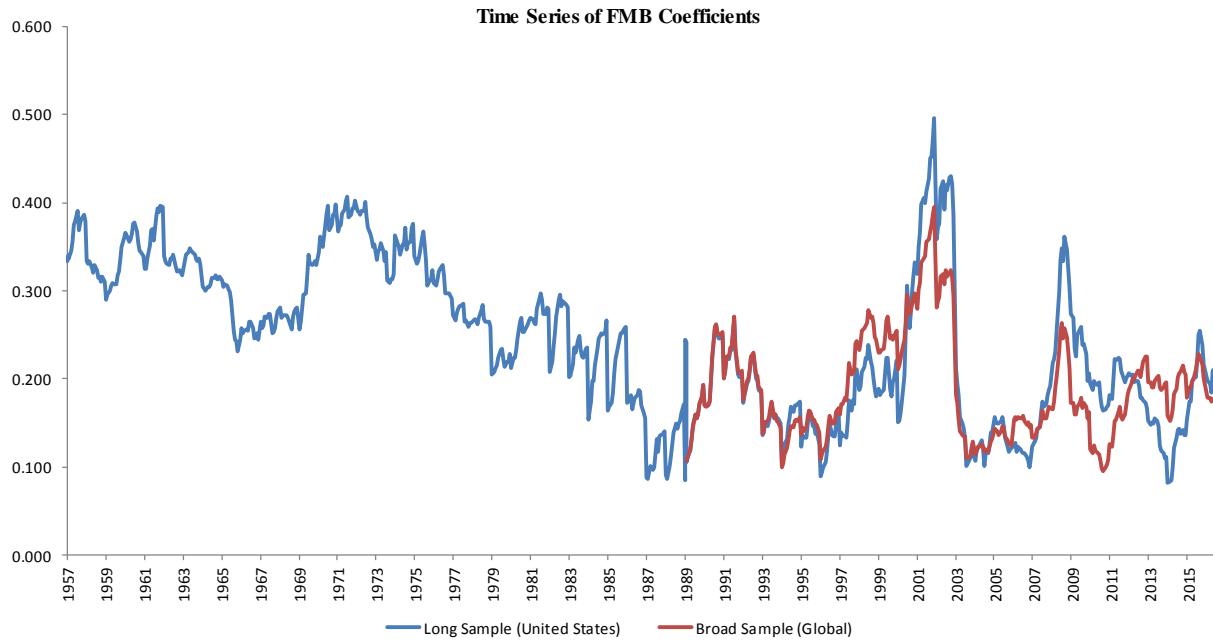


Figure 6
Cross Sectional Regressions Coefficient, the Price of Quality

This figure plots coefficients from monthly cross-sectional regressions. The dependent variable is the log of a firm's market to book ratio in month t . The explanatory variable is the quality score in month t . We plot the time series of the cross sectional coefficients.



Internet Appendix A

A1: Variable Definitions

In this section we report details of each variable used on our quality score. Our variables' definitions are based on Altman (1968), Ohlson (1980), Ang, Hodrick, Xing, and Zhang (2006), Daniel and Titman (2006), Penman, Richardson, and Tuna (2007), Campbell, Hilscher, and Szilagyi (2008), Chen, Novy-Marx and Zhang (2011), Novy-Marx (2012), Frazzini and Pedersen (2013) and Asness and Frazzini (2013). Variable names correspond to CRSP and Compustat data items and we omit the time subscript t for contemporaneous variables. Finally, unless specified, Compustat data items refer to annual items and time subscripts refer to years. To compute the z-score of a variable x at time t we rank x cross-sectionally in ascending order

$$r_x = \text{rank}(x)$$

The cross-sectional ranks are rescaled to have a zero cross-sectional mean and a cross-sectional standard deviation of one:

$$z(x) = z_x = [r_x - \bar{r}_x] / \sigma(r_x)$$

Profitability

We compute a profitability z-score by averaging z-scores of gross profits over assets (GPOA), return on equity (ROE), return on assets (ROA), cash flow over assets (CFOA), gross margin (GMAR) and low accruals (ACC):

$$\text{Profitability} = z(z_{\text{gpoa}} + z_{\text{roe}} + z_{\text{roa}} + z_{\text{cfoa}} + z_{\text{gmar}} + z_{\text{acc}})$$

$GPOA$ is equal to revenue minus costs of goods sold divided by total assets $(RETV - COGS) / AT$. ROE is net income divided by book-equity IB/BE . ROA is net income divided by total assets IB/AT . $CFOA$ is net income plus depreciation minus changes in working capital and capital expenditures divided by total assets: $(NB + DP - \Delta WC - CAPX) / AT$. $GMAR$ is revenue minus costs of goods sold divided by total sales: $(RETV - COGS) / SALE$. ACC is depreciation minus changes in working capital $-(\Delta WC - DP) / AT$. Working capital WC is defined as current assets minus current liabilities minus cash and short term instruments plus short term debt and income taxes payable $ACT - LCT - CHE + DLC + TXP$. Book equity BE

is defined as shareholders' equity minus preferred stock. To obtain shareholders' equity we use we use stockholders' equity (SEQ) but if not available, we use the sum of common equity (CEQ) and preferred stocks ($PSTK$). If both SEQ and CEQ are unavailable, we proxy shareholders' equity by total assets (AT) minus the sum of total liability (LT) and minority interest (MIB). To obtain book equity (BE), we subtract from shareholders' equity the preferred stock value ($PSTKRV$, $PSTKL$ or $PSTK$ depending on availability).

Growth

We compute a *growth* z-score by averaging z-scores of five-year growth in gross profits over assets $(GP_t - GP_{t-5})/AT_{t-5}$ where $GP = REVT - COGS$, five-year growth in return on equity $(IB_t - IB_{t-5})/BE_{t-5}$, five-year growth in return over assets $(IB_t - IB_{t-5})/AT_{t-5}$, five-year growth in cash flow over assets $(CF_t - CF_{t-5})/AT_{t-5}$ where $CF = IB + DP - \Delta WC - CAPX$, and five-year growth in gross margin $(GP_t - GP_{t-5})/SALE_{t-5}$:

$$\text{Growth} = z(z_{\Delta gpoa} + z_{\Delta roe} + z_{\Delta roa} + z_{\Delta cfoa} + z_{\Delta gmar})$$

Safety

We compute a *safety* z-score by averaging z-scores of low beta (BAB), low leverage (LEV), low bankruptcy risk (Ohlson's O and Altman's Z) and low earnings volatility ($EVOL$):

$$\text{Safety} = z(z_{bab} + z_{lev} + z_o + z_z + z_{evol})$$

BAB is equal to minus market beta $-\beta$. Betas are estimated as in Frazzini and Pedersen (2013) based on the product of the rolling one-year daily standard deviation and the rolling five-year three-day correlations. For correlations, we use three-day returns to account for nonsynchronous trading and a longer horizon because correlations are more stable than volatilities. LEV is minus total debt (the sum of long term debt, short term debt, minority interest and preferred stock) over total assets $-(DLTT + DLC + MIBT + PSTK)/AT$. We compute Ohlson's O -Score as

$$0 = -(-1.32 - 0.407 * \log(\text{ADJASSET}/\text{CPI}) + 6.03 * \text{TLTA} - 1.43 * \text{WCTA} + 0.076 \\ * \text{CLCA} - 1.72 * \text{OENEG} - 2.37 * \text{NITA} - 1.83 * \text{FUTL} + 0.285 * \text{INTWO} \\ - 0.521 * \text{CHIN});$$

where *ADJASSET* is adjusted total assets equal to total assets plus 10% of the difference between book equity and market equity $AT + .1 * (ME - BE)$. *CPI* is the consumer price index. *TLTA* is equal to book value of debt ($DLC + DLTT$) divided by *ADJASSET*. *WCTA* is current assets minus current liabilities scaled by adjusted assets $(ACT - LCT)/ADJASSET$. *CLCA* is current liabilities divided by current assets LCT/ACT . *OENEG* is a dummy equal to 1 if total liabilities exceed total assets $1(LT > AT)$. *NITA* is net income over assets IB/AT . *FUTL* is pre-tax income over total liabilities PT/LT . *INTWO* is a dummy equal to one if net income is negative for the current and prior fiscal year $1(\text{MAX}\{IB_t, IB_{t-1}\} < 0)$. *CHIN* is changes in net income defined as $(IB_t - IB_{t-1})/(|IB|_t + |IB_{t-1}|)$. Altman's Z-Score is a weighted average of working capital, retained earnings, earnings before interest and taxes, market equity and sales, all over total assets:

$$Z = (1.2 \text{ WC} + 1.4 \text{ RE} + 3.3 \text{ EBIT} + 0.6 \text{ ME} + \text{SALE})/AT$$

EVOL is the standard deviation of quarterly *ROE* over the past 60 quarters. We require at least twelve non missing quarters. If quarterly data is unavailable we use the standard deviation of annual *ROE* over the past 5 years and we require five non missing fiscal years¹.

Book-to-Market

Book-to-market ratios follow Asness and Frazzini (2013). We require stocks to have a positive book equity and compute book-to-market as book equity divided by the most recent market equity: BE/ME .

¹ Quarterly data is unavailable for countries in our global sample.

A2: Global Factor Returns

In this section we report details of the construction of the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios used on the analysis. The data can be downloaded at <https://www.aqr.com/library/data-sets/quality-minus-junk-factors-monthly>. The portfolio construction follows Fama and French (1992, 1993 and 1996) and Asness and Frazzini (2013). We form one set of portfolios in each country and compute global factor portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. The market factor MKT is the value-weighted return on all available stocks minus the one-month Treasury bill rate. The size, value and momentum factors are constructed using six value-weighted portfolios formed on size (market value of equity ME) and book-to-market (book equity divided by the most recent market equity BE/ME) and 1-year return (return over the prior 12 months, skipping the most recent month). At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For our international sample the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on the second variable. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The size factor SMB is the average return on the 3 small portfolios minus the average return on the 3 big portfolios:

$$SMB = 1/3 (Small Value + Small Neutral + Small Growth) \\ - 1/3 (Big Value + Big Neutral + Big Growth)$$

The value factors HML is the average return on the two value portfolios minus the average return on the two growth portfolios:

$$HML = 1/2 (Small Value + Big Value) - 1/2 (Small Growth + Big Growth)$$

The momentum factor UMD is the average return on the two high return portfolios minus the average return on the two low return portfolios:

$$UMD = 1/2 (Small High + Big High) - 1/2 (Small Low + Big Low)$$

Portfolio returns are in USD and do not include any currency hedging. Excess returns are over the U.S. Treasury bill rate.

Table A1
Pricing and Accounting Data Sources

This table shows pricing and accounting data sources by time period.

Data Type	Universe	Date Range	Source
Pricing data	Domestic	192601–196706	CRSP
Pricing data	Domestic	196707–199712	Merged CRSP/Compustat
Pricing data	Domestic	199801–Present	Compustat
Pricing data	International	198401–Present	Compustat
Accounting data	Global	195006–Present	Compustat
Risk free rate		192601–198012	CRSP
Risk free rate		198101–Present	Compustat

Table A2
Persistence of Quality Measures

This table shows average quality scores. Each calendar month, stocks in each country in are ranked in ascending order on the basis of their quality score. The ranked stocks are assigned to one of ten portfolios. U.S. sorts are based on NYSE breakpoints. This table reports each portfolio's quality score at portfolio formation (date t) up to the subsequent ten years (date $t + 120$ months). We report the time series average of the value-weighted cross sectional means. Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from June 1957 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from June 1989 to December 2016. Standard errors are adjusted for heteroskedasticity and autocorrelation with a lag length of five years (Newey and West (1987)) and 5% significance is indicated in bold.

Panel A: Long Sample (U.S.)	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	H-L	H-L
195706 - 201612	(Low)									(High)		t-stat
Profit (t)	-1.43	-0.81	-0.49	-0.23	0.01	0.24	0.47	0.74	1.10	1.74	3.17	62.56
Profit (t + 12M)	-0.92	-0.51	-0.29	-0.08	0.09	0.26	0.43	0.65	0.95	1.51	2.43	37.85
Profit (t + 36M)	-0.66	-0.38	-0.22	-0.04	0.08	0.21	0.38	0.52	0.78	1.37	2.03	25.45
Profit (t + 60M)	-0.53	-0.31	-0.17	-0.05	0.09	0.17	0.31	0.47	0.66	1.29	1.83	20.00
Profit (t + 120M)	-0.38	-0.23	-0.11	0.00	0.10	0.16	0.30	0.36	0.59	1.13	1.53	24.70
Growth (t)	-1.49	-1.00	-0.68	-0.41	-0.15	0.11	0.38	0.69	1.03	1.60	3.10	121.52
Growth (t + 12M)	-0.87	-0.64	-0.46	-0.27	-0.07	0.06	0.26	0.53	0.83	1.29	2.16	39.99
Growth (t + 36M)	-0.40	-0.39	-0.31	-0.22	-0.12	-0.03	0.09	0.26	0.54	0.88	1.28	13.69
Growth (t + 60M)	0.01	-0.14	-0.17	-0.20	-0.14	-0.15	-0.03	0.04	0.27	0.51	0.50	4.04
Growth (t + 120M)	-0.24	-0.21	-0.16	-0.17	-0.15	-0.17	-0.09	0.02	0.16	0.29	0.53	4.91
Safety (t)	-1.53	-0.91	-0.54	-0.27	-0.04	0.17	0.40	0.65	0.95	1.46	2.98	47.90
Safety (t + 12M)	-1.22	-0.73	-0.44	-0.22	-0.01	0.18	0.36	0.61	0.86	1.27	2.48	36.27
Safety (t + 36M)	-0.86	-0.54	-0.33	-0.18	0.00	0.12	0.31	0.53	0.74	1.02	1.88	18.36
Safety (t + 60M)	-0.65	-0.40	-0.23	-0.13	0.01	0.11	0.29	0.47	0.66	0.91	1.59	14.55
Safety (t + 120M)	-0.43	-0.27	-0.15	-0.05	0.06	0.13	0.25	0.39	0.59	0.71	1.15	12.04

Panel B: Broad Sample	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	H-L	H-L
198906 - 201612	(Low)									(High)		t-stat
Profit (t)	-1.46	-0.85	-0.51	-0.24	0.01	0.25	0.49	0.77	1.12	1.70	3.16	64.75
Profit (t + 12M)	-0.84	-0.46	-0.24	-0.07	0.09	0.26	0.44	0.65	0.95	1.44	2.28	76.18
Profit (t + 36M)	-0.57	-0.33	-0.16	-0.03	0.09	0.24	0.39	0.55	0.79	1.28	1.85	33.83
Profit (t + 60M)	-0.43	-0.24	-0.11	0.01	0.14	0.22	0.35	0.50	0.70	1.18	1.60	29.09
Profit (t + 120M)	-0.30	-0.14	-0.03	0.05	0.15	0.23	0.31	0.40	0.57	0.99	1.29	19.09
Growth (t)	-1.52	-1.01	-0.69	-0.41	-0.16	0.10	0.36	0.65	1.02	1.70	3.20	68.34
Growth (t + 12M)	-0.74	-0.53	-0.40	-0.22	-0.09	0.08	0.27	0.50	0.72	1.22	1.96	58.64
Growth (t + 36M)	-0.33	-0.29	-0.27	-0.16	-0.08	0.02	0.13	0.28	0.43	0.78	1.11	23.54
Growth (t + 60M)	0.18	-0.01	-0.11	-0.08	-0.08	-0.09	0.00	0.08	0.13	0.30	0.13	1.83
Growth (t + 120M)	-0.19	-0.21	-0.14	-0.13	-0.18	-0.15	-0.11	0.00	0.05	0.09	0.29	4.58
Safety (t)	-1.63	-0.97	-0.60	-0.31	-0.06	0.17	0.40	0.65	0.97	1.47	3.10	45.28
Safety (t + 12M)	-1.31	-0.79	-0.51	-0.26	-0.06	0.14	0.34	0.57	0.85	1.20	2.50	33.21
Safety (t + 36M)	-0.99	-0.63	-0.42	-0.24	-0.06	0.08	0.25	0.45	0.68	0.89	1.88	23.64
Safety (t + 60M)	-0.79	-0.51	-0.33	-0.20	-0.05	0.06	0.23	0.38	0.58	0.74	1.54	19.57
Safety (t + 120M)	-0.47	-0.30	-0.20	-0.11	0.01	0.07	0.18	0.31	0.46	0.54	1.01	12.17

Table A3
Results: Monthly Cross Sectional Regressions, the Price of Quality

This table reports results from monthly Fama-Macbeth regressions. The dependent variable is the log of a firm's market to book ratio in month t . The explanatory variables are the quality scores on month t and a series of controls. "Firm size" is the log of the firm's market capitalization; "1-year return" is the firm's stock return over the prior year. "Firm age" is the cumulative number of years since the firm's IPO. "Uncertainty about mean profitability" (Pastor and Veronesi (2003)) is the standard deviation of the residuals of an AR(1) model for each firm's ROE, using the longest continuous series of a firm's valid annual ROE up to date t . We require a minimum of five years of non-missing ROEs. "Dividend payer" is a dummy equal to one if the firm paid any dividends over the prior year. With the exception of the "Dividend payer" dummy, all explanatory variables at time t are ranked cross-sectionally and rescaled to have a zero cross-sectional mean and a cross-sectional standard deviation of one. Industry, country or firm fixed effects are included when indicated ("Industry FE", "Country FE", "Firm FE"). "Average AdjR2" is the time series average of the adjusted R-square of the cross sectional regression. Standard errors are adjusted for heteroskedasticity and autocorrelation (Newey and West (1987)) with a lag length of five years. T-statistics are shown below the coefficient estimates and 5% statistical significance is indicated in bold.

	Panel A: Long Sample (U.S., 195706 - 201612)						Panel b: Broad Sample (Global, 198906 - 201612)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Quality	0.24 (12.32)	0.26 (19.31)	0.26 (12.27)	0.24 (12.66)	0.22 (14.13)	0.08 (6.59)	0.19 (13.21)	0.21 (19.35)	0.19 (13.81)	0.17 (19.21)	0.19 (9.13)	0.05 (6.45)
Firm size		0.35 (20.03)		0.35 (19.90)		0.80 (20.27)		0.37 (12.93)		0.37 (13.51)		0.82 (15.99)
1-year return		0.24 (14.67)		0.25 (14.61)		0.19 (16.44)		0.30 (21.72)		0.30 (23.05)		0.23 (41.21)
Firm age		-0.18 (-8.00)		-0.17 (-7.21)		-0.17 (-6.23)		-0.13 (-5.31)		-0.12 (-5.02)		-0.16 (-5.95)
Profit Uncertainty		0.38 (15.04)		0.35 (13.44)		0.38 (10.19)		0.42 (30.51)		0.36 (21.07)		0.46 (31.37)
Dividend payer		(-0.16) (-7.37)		(-0.08) (-3.61)		(-0.01) (-0.33)		(-0.20) (-7.03)		(-0.11) (-3.32)		(0.07) (2.04)
Profit Uncertainty x Dividend payer		-0.20 (-10.50)		-0.20 (-7.30)		-0.15 (-6.49)		-0.23 (-17.17)		-0.20 (-8.82)		-0.20 (-9.79)
Average AdjR2	0.10	0.43	0.25	0.50	0.06	0.45	0.10	0.38	0.20	0.44	0.03	0.41
Nobs (months)	715	648	715	648	715	648	331	331	331	331	331	331
Industry FE			X	X					X	X		
Country FE							X	X	X	X		
Firm FE					X	X					X	X

Table A4
Quality Minus Junk Components

This table shows calendar-time monthly portfolio returns and factor loadings. Quality minus Junk (QMJ) factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. Portfolios based on profitability, growth and safety scores are constructed in a similar manner. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Alpha is the intercept in a time-series regression of monthly excess return. The explanatory variables are the returns of the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from June 1957 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from June 1989 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Returns and alphas are in monthly percent, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. "Information ratio" is equal to the 4-factor alpha divided by the standard deviation of the estimated residuals in the time-series regression. Sharpe ratios and information ratios are annualized.

	Panel A: Long Sample (U.S. , 195707 - 201612)					Panel B: Broad Sample (Global , 198907 - 201612)				
	High Quality		Low Quality		QMJ	High Quality		Low Quality		QMJ
	Small	Big	Small	Big		Small	Big	Small	Big	
Excess Returns	0.86 (4.20)	0.56 (3.45)	0.48 (1.85)	0.45 (2.41)	0.25 (3.16)	0.73 (2.99)	0.56 (2.50)	0.20 (0.58)	0.36 (1.27)	0.36 (3.19)
CAPM-alpha	0.28 (3.09)	0.07 (1.55)	-0.22 (-1.68)	-0.11 (-2.04)	0.34 (4.69)	0.37 (2.94)	0.21 (2.30)	-0.30 (-1.58)	-0.09 (-0.82)	0.49 (5.52)
3-factor alpha	0.21 (5.55)	0.15 (4.24)	-0.37 (-6.64)	-0.19 (-4.05)	0.46 (7.81)	0.34 (3.44)	0.28 (3.24)	-0.36 (-2.76)	-0.17 (-1.69)	0.57 (8.22)
4-factor alpha	0.23 (5.54)	0.26 (7.31)	-0.36 (-6.07)	-0.29 (-6.00)	0.57 (9.22)	0.33 (3.09)	0.36 (3.81)	-0.24 (-1.68)	-0.23 (-2.13)	0.58 (7.61)
MKT	0.97 (102.46)	0.94 (114.02)	1.16 (84.35)	1.12 (98.63)	-0.19 (-12.93)	0.78 (32.73)	0.84 (40.24)	1.06 (33.61)	1.08 (44.14)	-0.26 (-15.24)
SMB	0.86 (58.31)	-0.11 (-8.11)	1.21 (55.99)	0.05 (2.59)	-0.25 (-11.08)	0.77 (14.79)	-0.15 (-3.37)	1.25 (18.23)	0.00 (0.09)	-0.32 (-8.65)
HML	0.05 (3.26)	-0.30 (-21.75)	0.22 (9.46)	0.30 (15.97)	-0.38 (-16.05)	0.14 (2.91)	-0.27 (-6.32)	0.14 (2.11)	0.30 (5.98)	-0.29 (-8.11)
UMD	-0.01 (-0.97)	-0.10 (-9.00)	-0.01 (-0.45)	0.10 (6.08)	-0.10 (-5.10)	0.01 (0.18)	-0.07 (-2.09)	-0.11 (-2.25)	0.06 (1.47)	0.00 (-0.14)
Sharpe Ratio	0.54	0.45	0.24	0.31	0.41	0.57	0.48	0.11	0.24	0.61
Information ratio	0.78	1.03	-0.85	-0.84	1.29	0.65	0.80	-0.35	-0.45	1.60
R2	0.97	0.96	0.95	0.94	0.47	0.84	0.86	0.86	0.88	0.63

Table A5
Robustness Checks: QMJ by Time Period and by Size

This table shows calendar-time monthly portfolio returns and factor loadings. Quality minus Junk (QMJ) factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. Portfolios based on profitability, growth and safety scores are constructed in a similar manner. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Alpha is the intercept in a time-series regression of monthly excess return. The explanatory variables are the returns of the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. The table report results from our *Long Sample* of domestic stocks (sample period running from June 1957 to December 2016) and from our *Broad Sample* of global stocks (sample period running from June 1989 to December 2016). Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Returns and alphas are in monthly percent, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. "Information ratio" is equal to the 4-factor alpha divided by the standard deviation of the estimated residuals in the time-series regression. Sharpe ratios and information ratios are annualized.

Sample	Universe	Sample Period	Excess return	T-stat Excess return	4-factor alpha	T-stat Alpha	Sharpe Ratio	Information Ratio
Long Sample	United States	1957 - 1988	0.17	1.84	0.59	8.21	0.33	1.63
Long Sample	United States	1989 - 2005	0.37	2.33	0.72	5.49	0.56	1.50
Long Sample	United States	2006 - 2016	0.29	1.26	0.51	3.88	0.38	1.20
Broad Sample	Global	1989 - 2005	0.33	2.36	0.54	4.70	0.58	1.33
Broad Sample	Global	2006 - 2016	0.42	2.14	0.64	7.11	0.65	2.32

Sample	Universe	Sample Period	Excess return	T-stat Excess return	4-factor alpha	T-stat Alpha	Sharpe Ratio	Information Ratio
P1 (small)	United States	1957 - 2016	0.63	4.33	0.70	5.48	0.56	0.77
P2	United States	1957 - 2016	0.45	3.78	0.59	5.33	0.49	0.75
P3	United States	1957 - 2016	0.33	2.91	0.53	4.84	0.38	0.68
P4	United States	1957 - 2016	0.32	2.95	0.58	5.60	0.38	0.79
P5	United States	1957 - 2016	0.06	0.64	0.30	2.99	0.08	0.42
P6	United States	1957 - 2016	0.10	1.07	0.36	4.06	0.14	0.57
P7	United States	1957 - 2016	0.15	1.73	0.44	5.22	0.22	0.73
P8	United States	1957 - 2016	0.20	2.11	0.51	5.66	0.27	0.79
P9	United States	1957 - 2016	0.09	1.00	0.40	4.91	0.13	0.69
P10 (large)	United States	1957 - 2016	0.20	1.87	0.66	7.18	0.24	1.01
P1 (small)	Global	1989 - 2016	0.39	1.97	0.21	1.45	0.38	0.31
P2	Global	1989 - 2016	0.52	3.26	0.44	3.81	0.62	0.80
P3	Global	1989 - 2016	0.51	3.50	0.51	4.44	0.67	0.93
P4	Global	1989 - 2016	0.46	3.59	0.52	5.28	0.69	1.11
P5	Global	1989 - 2016	0.31	2.42	0.43	3.85	0.46	0.81
P6	Global	1989 - 2016	0.28	2.60	0.45	4.52	0.50	0.95
P7	Global	1989 - 2016	0.35	3.38	0.54	6.10	0.64	1.29
P8	Global	1989 - 2016	0.34	3.19	0.65	7.03	0.61	1.48
P9	Global	1989 - 2016	0.21	2.00	0.54	6.33	0.38	1.33
P10 (large)	Global	1989 - 2016	0.22	1.52	0.62	5.30	0.29	1.12

Table A6
Robustness Checks: QMJ among Small and Large by Country

This table shows calendar-time monthly portfolio returns and factor loadings. Quality minus Junk (QMJ) factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. Portfolios based on profitability, growth and safety scores are constructed in a similar manner. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Alpha is the intercept in a time-series regression of monthly excess return. The explanatory variables are the returns of the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. The table report results from our *Long Sample* of domestic stocks (sample period running from June 1957 to December 2016) and from our *Broad Sample* of global stocks (sample period running from June 1989 to December 2016). Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Returns and alphas are in monthly percent, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. "Information ratio" is equal to the 4-factor alpha divided by the standard deviation of the estimated residuals in the time-series regression. Sharpe ratios and information ratios are annualized.

	Small Cap						Large Cap					
	Excess return	T-stat Excess return	4-factor Alpha	T-stat Alpha	Sharpe Ratio	Informati on Ratio	Excess return	T-stat Excess return	4-factor Alpha	T-stat Alpha	Sharpe Ratio	Informati on Ratio
Australia	-0.11	-0.48	0.22	0.93	-0.10	0.23	0.71	2.75	0.74	3.06	0.59	0.76
Austria	0.15	0.32	0.10	0.25	0.07	0.06	-0.24	-0.74	0.10	0.38	-0.16	0.08
Belgium	0.34	0.90	0.29	0.95	0.19	0.22	0.51	1.77	0.49	1.94	0.38	0.45
Canada	0.60	2.48	0.61	2.56	0.47	0.53	0.65	2.49	0.45	1.93	0.48	0.40
Switzerland	0.37	0.96	0.46	1.47	0.21	0.33	0.25	1.16	0.29	1.54	0.25	0.35
Germany	-0.07	-0.28	0.49	2.02	-0.06	0.48	1.13	4.74	0.70	3.47	1.02	0.82
Denmark	0.16	0.41	-0.24	-0.69	0.09	-0.16	0.49	1.86	0.39	1.56	0.40	0.36
Spain	-0.06	-0.17	-0.01	-0.04	-0.04	-0.01	0.11	0.36	0.17	0.71	0.08	0.16
Finland	0.24	0.48	0.50	1.28	0.10	0.29	0.11	0.42	0.17	0.64	0.09	0.14
France	0.20	0.70	0.40	1.70	0.15	0.39	0.50	2.20	0.62	3.53	0.48	0.81
United Kingdom	-0.04	-0.16	-0.13	-0.60	-0.03	-0.13	0.45	3.12	0.47	3.72	0.64	0.84
Greece	2.58	3.10	1.58	2.58	0.79	0.68	1.27	2.66	1.03	3.00	0.68	0.79
Hong Kong	0.10	0.24	0.77	2.61	0.05	0.59	-0.11	-0.26	0.41	1.33	-0.06	0.30
Ireland	0.25	0.30	0.57	0.91	0.06	0.20	1.40	2.04	1.29	2.08	0.44	0.46
Israel	0.37	0.80	0.39	1.05	0.20	0.29	0.62	2.01	0.39	1.51	0.51	0.42
Italy	0.39	1.06	0.40	1.44	0.23	0.32	0.86	3.02	0.82	3.99	0.65	0.89
Japan	0.30	1.21	0.67	3.02	0.25	0.68	0.15	0.69	0.44	2.60	0.14	0.58
Netherlands	-0.20	-0.49	0.22	0.68	-0.11	0.15	0.35	1.21	0.59	2.45	0.26	0.55
Norway	0.15	0.43	0.28	0.78	0.09	0.18	0.89	2.47	0.82	2.58	0.53	0.59
New Zealand	0.11	0.40	0.11	0.38	0.09	0.09	-0.16	-0.59	-0.21	-0.76	-0.13	-0.18
Portugal	1.39	2.94	1.42	3.31	0.67	0.78	0.29	0.64	0.25	0.60	0.14	0.14
Singapore	0.08	0.20	0.54	2.03	0.04	0.45	0.64	2.17	0.75	3.36	0.47	0.75
Sweden	-0.09	-0.28	0.00	-0.02	-0.06	0.00	1.20	4.04	0.86	3.23	0.87	0.73
United States	0.12	1.27	0.55	7.73	0.16	1.08	0.38	3.99	0.59	6.99	0.52	0.98
Global	0.20	1.53	0.59	6.03	0.29	1.27	0.52	3.96	0.57	6.08	0.75	1.28

Table A7
Quality Minus Junk: Alpha to 4-Factor Model Plus BAB

This table shows calendar-time portfolio returns and factor loadings. Quality minus Junk (QMJ) factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. Portfolios based on profitability, growth and safety scores are constructed in a similar manner. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Alpha is the intercept in a time-series regression of monthly excess return. The explanatory variables are the returns of the market (MKT), size (SMB), book-to-market (HML), momentum (UMD) portfolios all from Appendix A2 and the low beta (BAB) factor (Frazzini and Pedersen (2014)). Panel A reports results from our Long Sample of domestic stocks. The sample period runs from June 1957 to December 2016. Panel B reports results from our Broad Sample of global stocks. The sample period runs from June 1989 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Returns and alphas are in monthly percent, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. "Information ratio" is equal to the 4-factor alpha divided by the standard deviation of the estimated residuals in the time-series regression. Sharpe ratios and information ratios are annualized.

	Panel A: Long Sample (U.S. , 195707 - 201612)				Panel B: Broad Sample (Global , 198907 - 201612)			
	QMJ	Profitability	Safety	Growth	QMJ	Profitability	Safety	Growth
Excess Returns	0.25 (3.16)	0.25 (3.67)	0.23 (2.57)	0.08 (1.14)	0.36 (3.19)	0.39 (4.39)	0.23 (1.74)	0.15 (1.89)
5-factor alpha	0.52 (8.50)	0.48 (7.82)	0.47 (7.85)	0.36 (6.13)	0.54 (7.35)	0.45 (6.70)	0.36 (5.50)	0.37 (4.95)
MKT	-0.19 (-13.39)	-0.12 (-8.35)	-0.31 (-23.08)	0.02 (1.14)	-0.25 (-15.57)	-0.19 (-12.65)	-0.34 (-23.51)	-0.01 (-0.46)
SMB	-0.25 (-11.45)	-0.22 (-10.13)	-0.29 (-13.59)	-0.03 (-1.29)	-0.37 (-10.15)	-0.30 (-9.01)	-0.27 (-8.41)	-0.16 (-4.26)
HML	-0.43 (-17.46)	-0.32 (-13.18)	-0.35 (-14.83)	-0.50 (-21.39)	-0.38 (-10.18)	-0.12 (-3.33)	-0.37 (-11.00)	-0.36 (-9.44)
UMD	-0.15 (-6.99)	-0.12 (-5.86)	-0.06 (-2.96)	-0.20 (-9.83)	-0.09 (-3.05)	-0.02 (-0.57)	0.01 (0.22)	-0.15 (-4.86)
BAB	0.12 (5.91)	0.07 (3.38)	0.15 (7.63)	0.02 (0.87)	0.16 (5.74)	0.09 (3.51)	0.18 (7.04)	0.02 (0.56)
Sharpe Ratio	0.41	0.48	0.33	0.15	0.61	0.84	0.33	0.36
Information Ratio	1.21	1.11	1.11	0.87	1.56	1.42	1.17	1.05
Adjusted R2	0.49	0.34	0.64	0.45	0.66	0.53	0.80	0.27

Table A8
Quality Minus Junk: Alphas to 5-Factor Model Plus UMD and BAB

This table shows calendar-time portfolio returns and factor loadings. Quality minus Junk (QMJ) factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. Portfolios based on profitability, growth and safety scores are constructed in a similar manner. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Alpha is the intercept in a time-series regression of monthly excess return. The explanatory variables are the returns of the market (MKT), size (SMB), book-to-market (HML), profitability (RMW) and investment (CMA) portfolios from Fama and French (2015) and the momentum (UMD) portfolios from Ken's French data library and the low beta (BAB) factor (Frazzini and Pedersen (2014)). Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from July 1963 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from June 1990 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Returns and alphas are in monthly percent, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. "Information ratio" is equal to the 4-factor alpha divided by the standard deviation of the estimated residuals in the time-series regression. Sharpe ratios and information ratios are annualized.

	Panel A: Long Sample (U.S. ,196307 - 201612)				Panel B: Broad Sample (Global , 199007 - 201612)			
	QMJ	Profitability	Safety	Growth	QMJ	Profitability	Safety	Growth
Excess Returns	0.26 (3.01)	0.29 (3.92)	0.22 (2.26)	0.07 (0.88)	0.33 (2.84)	0.38 (4.26)	0.20 (1.49)	0.13 (1.59)
7-factor alpha	0.30 (6.38)	0.30 (6.80)	0.29 (4.68)	0.18 (4.17)	0.23 (3.74)	0.26 (5.16)	0.12 (1.90)	0.17 (2.68)
MKT	-0.15 (-13.15)	-0.07 (-6.83)	-0.28 (-18.43)	0.00 (0.33)	-0.22 (-13.25)	-0.13 (-9.91)	-0.31 (-18.63)	-0.03 (-1.76)
SMB	-0.09 (-5.64)	-0.06 (-4.21)	-0.19 (-8.78)	0.05 (3.61)	-0.19 (-5.77)	-0.16 (-5.93)	-0.17 (-5.03)	-0.10 (-3.09)
HML	-0.25 (-10.99)	-0.28 (-13.30)	-0.21 (-6.99)	-0.23 (-10.80)	-0.27 (-6.98)	-0.09 (-2.77)	-0.30 (-7.61)	-0.04 (-0.91)
CMA	-0.07 (-0.01)	0.12 (-0.05)	0.01 (0.05)	-0.43 (-0.03)	0.03 (0.05)	0.07 (-0.02)	0.07 (0.11)	-0.44 (-0.04)
RMW	-2.12 (0.59)	3.74 (0.60)	0.15 (0.29)	-13.96 (0.40)	0.71 (0.64)	1.71 (0.60)	1.38 (0.36)	-9.27 (0.36)
UMD	25.57 (0.06)	28.17 (0.02)	9.41 (0.13)	18.79 (0.03)	12.84 (0.08)	14.73 (0.03)	7.07 (0.17)	7.17 (0.03)
BAB	4.94 (-0.72)	1.85 (-3.24)	8.21 (2.36)	2.35 (-2.10)	4.75 (1.87)	2.52 (-0.68)	10.22 (4.02)	1.95 (-1.29)
Sharpe Ratio	0.41	0.54	0.31	0.12	0.55	0.83	0.29	0.31
Information Ratio	0.94	1.00	0.69	0.62	0.80	1.11	0.41	0.58
Adjusted R2	0.74	0.71	0.64	0.73	0.78	0.74	0.82	0.50

Table A9
Asset Pricing Tests: 4-Factor Model plus BAB

This table shows calendar-time portfolio returns and factor loadings. Quality minus Junk (QMJ) factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Alpha is the intercept in a time-series regression of monthly excess return. The test portfolios are the Quality minus Junk (QMJ) factor, the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2 and the low beta (BAB) factor (Frazzini and Pedersen (2014)). We run a regression of each of SMB, HML, UMD and BAB on the remaining factors excluding and including the QMJ factor as explanatory variable. Panel A reports results from our *Long Sample* of domestic stocks. The sample period runs from June 1957 to December 2016. Panel B reports results from our *Broad Sample* of global stocks. The sample period runs from June 1989 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Returns and alphas are in monthly percent, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. "Information ratio" is equal to regression intercept, divided by the standard deviation of the estimated residuals. Sharpe ratios and information ratios are annualized.

Left-hand side	Panel A: Long Sample (U.S. ,196307 - 201612)								Panel B: Broad Sample (Global , 199011 - 201612)							
	SMB	SMB	HML	HML	UMD	UMD	BAB	BAB	SMB	SMB	HML	HML	UMD	UMD	BAB	BAB
Excess Returns	0.15 (1.50)	0.15 (1.50)	0.31 (2.47)	0.31 (2.47)	0.71 (4.78)	0.71 (4.78)	0.85 (7.36)	0.85 (7.36)	0.02 (0.18)	0.02 (0.18)	0.35 (2.20)	0.35 (2.20)	0.66 (3.09)	0.66 (3.09)	0.83 (5.29)	0.83 (5.29)
Alpha	0.12 (1.15)	0.42 (4.26)	0.61 (6.66)	0.79 (10.27)	0.79 (7.42)	0.97 (9.13)	0.45 (3.84)	0.21 (1.78)	0.03 (0.26)	0.37 (3.62)	0.52 (5.06)	0.74 (7.95)	0.68 (5.30)	0.82 (6.10)	0.26 (1.83)	-0.07 (-0.47)
MKT	0.17 (7.20)	0.02 (0.97)	-0.14 (-6.84)	-0.23 (-12.76)	-0.17 (-7.13)	-0.25 (-9.55)	0.02 (0.69)	0.09 (3.21)	0.07 (2.75)	-0.12 (-4.10)	-0.07 (-2.76)	-0.21 (-8.36)	-0.14 (-5.04)	-0.22 (-5.87)	-0.04 (-1.16)	0.11 (2.77)
SMB			-0.05 (-1.40)	-0.21 (-7.08)	-0.08 (-2.00)	-0.19 (-4.50)	0.02 (0.49)	0.12 (2.74)			-0.20 (-3.88)	-0.39 (-7.89)	-0.24 (-3.63)	-0.34 (-4.68)	0.30 (4.29)	0.48 (6.53)
HML	-0.06 (-1.40)	-0.31 (-7.08)			-0.84 (-27.38)	-0.98 (-27.53)	0.40 (8.92)	0.55 (10.88)	-0.22 (-3.88)	-0.42 (-7.89)			-0.98 (-23.19)	-1.07 (-21.04)	0.60 (9.12)	0.77 (11.07)
UMD	-0.07 (-2.00)	-0.15 (-4.50)	-0.61 (-27.38)	-0.53 (-27.53)			0.38 (10.18)	0.42 (11.35)	-0.17 (-3.63)	-0.19 (-4.68)	-0.64 (-23.19)	-0.54 (-21.04)			0.55 (10.70)	0.55 (11.25)
BAB	0.02 (0.49)	0.09 (2.74)	0.25 (8.92)	0.26 (10.88)	0.33 (10.18)	0.36 (11.35)			0.18 (4.29)	0.24 (6.53)	0.34 (9.12)	0.36 (11.07)	0.47 (10.70)	0.51 (11.25)		
QMJ		-0.62 (-11.45)		-0.71 (-17.46)		-0.44 (-6.99)		0.41 (5.91)		-0.66 (-10.15)		-0.63 (-10.18)		-0.30 (-3.05)		0.57 (5.74)
Sharpe Ratio	0.20	0.20	0.32	0.32	0.62	0.62	0.95	0.95	0.04	0.04	0.42	0.42	0.59	0.59	1.01	1.01
Information Ratio	0.16	0.63	0.92	1.43	1.01	1.29	0.54	0.26	0.05	0.81	1.03	1.67	1.08	1.32	0.38	-0.11
Adjusted R2	0.09	0.23	0.52	0.66	0.54	0.57	0.14	0.18	0.09	0.31	0.63	0.72	0.68	0.69	0.31	0.37

Table A10
Asset Pricing Tests: 5-Factor Model Plus UMD

This table shows calendar-time portfolio returns and factor loadings. Quality minus Junk (QMJ) factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. Portfolios based on profitability, growth and safety scores are constructed in a similar manner. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Alpha is the intercept in a time-series regression of monthly excess return. The explanatory variables are the returns of the market (MKT), size (SMB), book-to-market (HML), profitability (RMW) and investment (CMA) portfolios from Fama and French (2015), the momentum (UMD) portfolios from Ken's French data library and the low beta (BAB) factor (Frazzini and Pedersen (2014)). Panel A reports results from our Long Sample of domestic stocks. The sample period runs from July 1963 to December 2016. Panel B reports results from our Broad Sample of global stocks. The sample period runs from November 1990 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Returns and alphas are in monthly percent, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. "Information ratio" is equal to the 4-factor alpha divided by the standard deviation of the estimated residuals in the time-series regression. Sharpe ratios and information ratios are annualized.

Left-hand side	Panel A: Long Sample (U.S. ,196307 - 201612)										Panel B: Broad Sample (Global , 199011 - 201612)									
	SMB	SMB	HML	HML	CMA	CMA	RMW	RMW	UMD	UMD	SMB	SMB	HML	HML	CMA	CMA	RMW	RMW	UMD	UMD
Excess Returns	0.27 (2.20)	0.27 (2.20)	0.37 (3.35)	0.37 (3.35)	0.31 (3.91)	0.31 (3.91)	0.24 (2.74)	0.24 (2.74)	0.66 (3.98)	0.66 (3.98)	0.15 (1.34)	0.15 (1.34)	0.36 (2.77)	0.36 (2.77)	0.25 (2.31)	0.25 (2.31)	0.33 (4.01)	0.33 (4.01)	0.58 (2.62)	0.58 (2.62)
Alpha	0.30 (2.54)	0.44 (3.80)	0.10 (1.24)	0.28 (3.67)	0.20 (3.56)	0.23 (4.01)	0.34 (4.13)	-0.11 (-1.82)	0.73 (4.35)	0.50 (2.91)	0.29 (2.61)	0.40 (3.70)	0.03 (0.30)	0.14 (1.65)	0.16 (2.14)	0.14 (1.87)	0.37 (5.22)	0.07 (1.19)	0.58 (2.63)	0.32 (1.45)
MKT	0.13 (4.68)	0.04 (1.35)	0.01 (0.27)	-0.10 (-4.69)	-0.10 (-7.81)	-0.12 (-8.00)	-0.09 (-4.64)	0.09 (6.02)	-0.13 (-3.10)	-0.02 (-0.41)	-0.12 (-3.81)	-0.22 (-6.38)	0.10 (4.32)	-0.01 (-0.43)	-0.15 (-8.05)	-0.14 (-5.50)	-0.16 (-8.99)	0.04 (1.82)	-0.11 (-1.83)	0.09 (1.19)
SMB			0.03 (1.00)	-0.04 (-1.40)	-0.03 (-1.39)	-0.04 (-1.86)	-0.23 (-8.37)	-0.02 (-1.23)	0.07 (1.17)	0.13 (2.20)			0.17 (3.80)	0.07 (1.63)	-0.12 (-3.17)	-0.11 (-2.75)	-0.23 (-6.41)	-0.04 (-1.22)	0.38 (3.43)	0.50 (4.51)
HML	0.06 (1.00)	-0.08 (-1.40)			0.47 (23.34)	0.44 (17.97)	0.18 (4.44)	0.31 (11.21)	-0.54 (-6.85)	-0.35 (-4.00)	0.26 (3.80)	0.12 (1.63)			0.60 (18.93)	0.61 (17.53)	0.23 (4.96)	0.28 (7.80)	-0.78 (-5.88)	-0.54 (-3.79)
CMA	-0.11 (-1.39)	-0.15 (-1.86)	0.98 (23.34)	0.77 (17.97)			-0.33 (-5.68)	-0.09 (-2.13)	0.41 (3.50)	0.45 (3.86)	-0.27 (-3.17)	-0.23 (-2.75)	0.90 (18.93)	0.82 (17.53)			-0.19 (-3.30)	-0.14 (-3.10)	0.41 (2.41)	0.35 (2.12)
RMW	-0.44 (-8.37)	-0.10 (-1.23)	0.17 (4.44)	0.53 (11.21)	-0.15 (-5.68)	-0.08 (-2.13)			0.24 (3.09)	-0.17 (-1.46)	-0.51 (-6.41)	-0.13 (-1.22)	0.33 (4.96)	0.59 (7.80)	-0.18 (-3.30)	-0.22 (-3.10)			0.55 (3.32)	-0.04 (-0.17)
UMD	0.03 (1.17)	0.06 (2.20)	-0.13 (-6.85)	-0.07 (-4.00)	0.05 (3.50)	0.05 (3.86)	0.06 (3.09)	-0.02 (-1.46)			0.10 (3.43)	0.12 (4.51)	-0.13 (-5.88)	-0.08 (-3.79)	0.05 (2.41)	0.04 (2.12)	0.06 (3.32)	0.00 (-0.17)		
QMJ		-0.54 (-5.71)		-0.66 (-11.29)		-0.11 (-2.28)		0.91 (26.84)		0.68 (4.91)		-0.51 (-5.45)		-0.45 (-6.13)		0.06 (0.85)		0.59 (14.07)		0.83 (4.34)
Sharpe Ratio	0.30	0.30	0.46	0.46	0.53	0.53	0.37	0.37	0.54	0.54	0.26	0.26	0.54	0.54	0.45	0.45	0.78	0.78	0.51	0.51
Information Ratio	0.37	0.57	0.18	0.55	0.52	0.60	0.60	-0.27	0.63	0.44	0.56	0.81	0.07	0.37	0.46	0.41	1.08	0.27	0.56	0.32
Adjusted R2	0.16	0.20	0.52	0.60	0.55	0.55	0.19	0.62	0.09	0.12	0.14	0.21	0.60	0.64	0.61	0.61	0.33	0.59	0.18	0.22

Table A11
Asset Pricing Tests: 5-Factor Model Plus UMD and BAB

This table shows calendar-time portfolio returns and factor loadings. Quality minus Junk (QMJ) factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. Portfolios based on profitability, growth and safety scores are constructed in a similar manner. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. Alpha is the intercept in a time-series regression of monthly excess return. The explanatory variables are the returns of the market (MKT), size (SMB), book-to-market (HML), profitability (RMW) and investment (CMA) portfolios from Fama and French (2015) and the momentum (UMD) portfolios from Ken's French data library. Panel A reports results from our Long Sample of domestic stocks. The sample period runs from July 1963 to December 2016. Panel B reports results from our Broad Sample of global stocks. The sample period runs from November 1990 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Returns and alphas are in monthly percent, t-statistics are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. "Information ratio" is equal to the 4-factor alpha divided by the standard deviation of the estimated residuals in the time-series regression. Sharpe ratios and information ratios are annualized.

Left-hand side	Panel A: Long Sample (U.S. ,196307 - 201612)												Panel B: Broad Sample (Global , 199011 - 201612)											
	SMB	SMB	HML	HML	CMA	CMA	RMW	RMW	UMD	UMD	BAB	BAB	SMB	SMB	HML	HML	CMA	CMA	RMW	RMW	UMD	UMD	BAB	BAB
Excess Returns	0.27 (2.20)	0.27 (2.20)	0.37 (3.35)	0.37 (3.35)	0.31 (3.91)	0.31 (3.91)	0.24 (2.74)	0.24 (2.74)	0.66 (3.98)	0.66 (3.98)	0.27 (2.20)	0.82 (6.48)	0.15 (1.34)	0.15 (1.34)	0.36 (2.77)	0.36 (2.77)	0.25 (2.31)	0.25 (2.31)	0.33 (4.01)	0.33 (4.01)	0.58 (2.62)	0.58 (2.62)	0.15 (1.34)	0.83 (5.16)
Alpha	0.26 (2.23)	0.41 (3.49)	0.06 (0.74)	0.24 (3.17)	0.17 (2.97)	0.19 (3.40)	0.24 (3.00)	-0.14 (-2.43)	0.59 (3.57)	0.37 (2.18)	0.26 (2.23)	0.33 (2.79)	0.20 (1.96)	0.32 (3.14)	0.00 (-0.02)	0.12 (1.40)	0.14 (1.94)	0.13 (1.76)	0.28 (4.23)	0.06 (1.00)	0.44 (2.10)	0.26 (1.22)	0.20 (1.96)	0.09 (0.67)
MKT	0.12 (4.26)	0.03 (1.09)	-0.01 (-0.33)	-0.10 (-5.03)	-0.11 (-8.29)	-0.12 (-8.35)	-0.11 (-5.47)	0.08 (5.11)	-0.15 (-3.77)	-0.05 (-1.00)	0.12 (4.26)	0.09 (2.70)	-0.13 (-4.45)	-0.24 (-7.27)	0.08 (3.48)	-0.04 (-1.34)	-0.15 (-8.29)	-0.14 (-5.82)	-0.16 (-9.34)	0.02 (0.92)	-0.15 (-2.48)	0.02 (0.22)	-0.13 (-4.45)	0.16 (3.45)
SMB			0.01 (0.53)	-0.04 (-1.72)	-0.03 (-1.82)	-0.04 (-2.23)	-0.23 (-8.77)	-0.03 (-1.75)	0.03 (0.57)	0.09 (1.60)		0.09 (2.31)			0.09 (1.83)	-0.02 (-0.39)	-0.15 (-3.79)	-0.14 (-3.39)	-0.29 (-8.44)	-0.09 (-2.70)	0.13 (1.10)	0.25 (2.12)		0.51 (7.18)
HML	0.03 (0.53)	-0.11 (-1.72)			0.43 (20.21)	0.40 (16.06)	0.11 (2.69)	0.27 (9.52)	-0.60 (-7.67)	-0.41 (-4.74)	0.03 (0.53)	0.24 (3.85)	0.12 (1.83)	-0.03 (-0.39)			0.56 (15.93)	0.57 (14.57)	0.12 (2.62)	0.22 (5.79)	-0.89 (-6.93)	-0.68 (-4.90)	0.12 (1.83)	0.44 (5.02)
CMA	-0.15 (-1.82)	-0.18 (-2.23)	0.91 (20.21)	0.72 (16.06)			-0.38 (-6.85)	-0.12 (-3.13)	0.27 (2.30)	0.31 (2.66)	-0.15 (-1.82)	0.37 (4.56)	-0.30 (-3.79)	-0.26 (-3.39)	0.81 (15.93)	0.72 (14.57)			-0.21 (-3.95)	-0.15 (-3.53)	0.26 (1.57)	0.23 (1.43)	-0.30 (-3.79)	0.23 (2.21)
RMW	-0.48	-0.14	0.11	0.47	-0.18	-0.12			0.08	-0.31	-0.48	0.49	-0.66	-0.27	0.19	0.45	-0.23	-0.25			0.14	-0.27	-0.66	0.55
UMD	0.02 (0.57)	0.04 (1.60)	-0.14 (-7.67)	-0.08 (-4.74)	0.03 (2.30)	0.04 (2.66)	0.02 (1.03)	-0.04 (-2.76)			0.02 (0.57)	0.16 (5.84)	0.03 (1.10)	0.06 (2.12)	-0.15 (-6.93)	-0.11 (-4.90)	0.03 (1.57)	0.03 (1.43)	0.02 (0.81)	-0.02 (-1.27)			0.03 (1.10)	0.17 (4.86)
BAB	2.52 (-8.77)	2.31 (-1.75)	4.51 (2.69)	3.85 (9.52)	4.64 (-6.85)	4.56 (-3.13)	8.43	6.23	5.83 (1.03)	5.84 (-2.76)	2.52 (-8.77)		6.72 (-8.44)	7.18 (-2.70)	4.44 (2.62)	5.02 (5.79)	2.31 (-3.95)	2.21 (-3.53)	7.36	4.28	5.56 (0.81)	4.86 (-1.27)	6.72 (-8.44)	
QMJ		-0.53 (-5.62)		-0.64 (-11.00)		-0.10 (-2.12)		0.86 (25.64)		0.67 (4.93)		-0.06 (-0.63)		-0.52 (-5.99)		-0.47 (-6.58)		0.04 (0.53)		0.52 (12.14)		0.65 (3.44)		0.29 (2.41)
Sharpe Ratio	0.30	0.30	0.46	0.46	0.53	0.53	0.37	0.37	0.54	0.54	0.30	0.89	0.26	0.26	0.54	0.54	0.45	0.45	0.78	0.78	0.51	0.51	0.26	1.01
Information Ratio	0.33	0.53	0.11	0.48	0.43	0.51	0.44	-0.37	0.52	0.33	0.33	0.42	0.42	0.69	0.00	0.31	0.42	0.39	0.89	0.22	0.45	0.27	0.42	0.15
Adjusted R2	0.17	0.21	0.53	0.61	0.56	0.57	0.27	0.64	0.13	0.16	0.17	0.25	0.24	0.32	0.62	0.67	0.62	0.62	0.43	0.61	0.25	0.27	0.24	0.44

Figure A1
Cross Sectional Regressions Coefficient t-statistics by Industry

This figure plots coefficients from annual Fama-Macbeth regressions within 71 GICS industries. The dependent variable is the log of a firm's market to book ratio in June of each calendar year (date t). The explanatory variables are the quality scores on date t and a series of controls. "Firm size" is the log of the firm's market capitalization; "1-year return" is the firm's stock return over the prior year. "Firm age" is the cumulative number of years since the firm's IPO. "Uncertainty about mean profitability" (Pastor and Veronesi (2003)) is the standard deviation of the residuals of an AR(1) model for each firm's ROE, using the longest continuous series of a firm's valid annual ROE up to date t. We require a minim of five years of non-missing ROEs. "Dividend payer" is a dummy equal to one if the firm paid any dividends over the prior year. With the exception of the "Dividend payer" dummy, all explanatory variables at time t are ranked cross-sectionally and rescaled to have a zero cross-sectional mean and a cross-sectional standard deviation of one. We plot t-statistics of the quality regression coefficient.

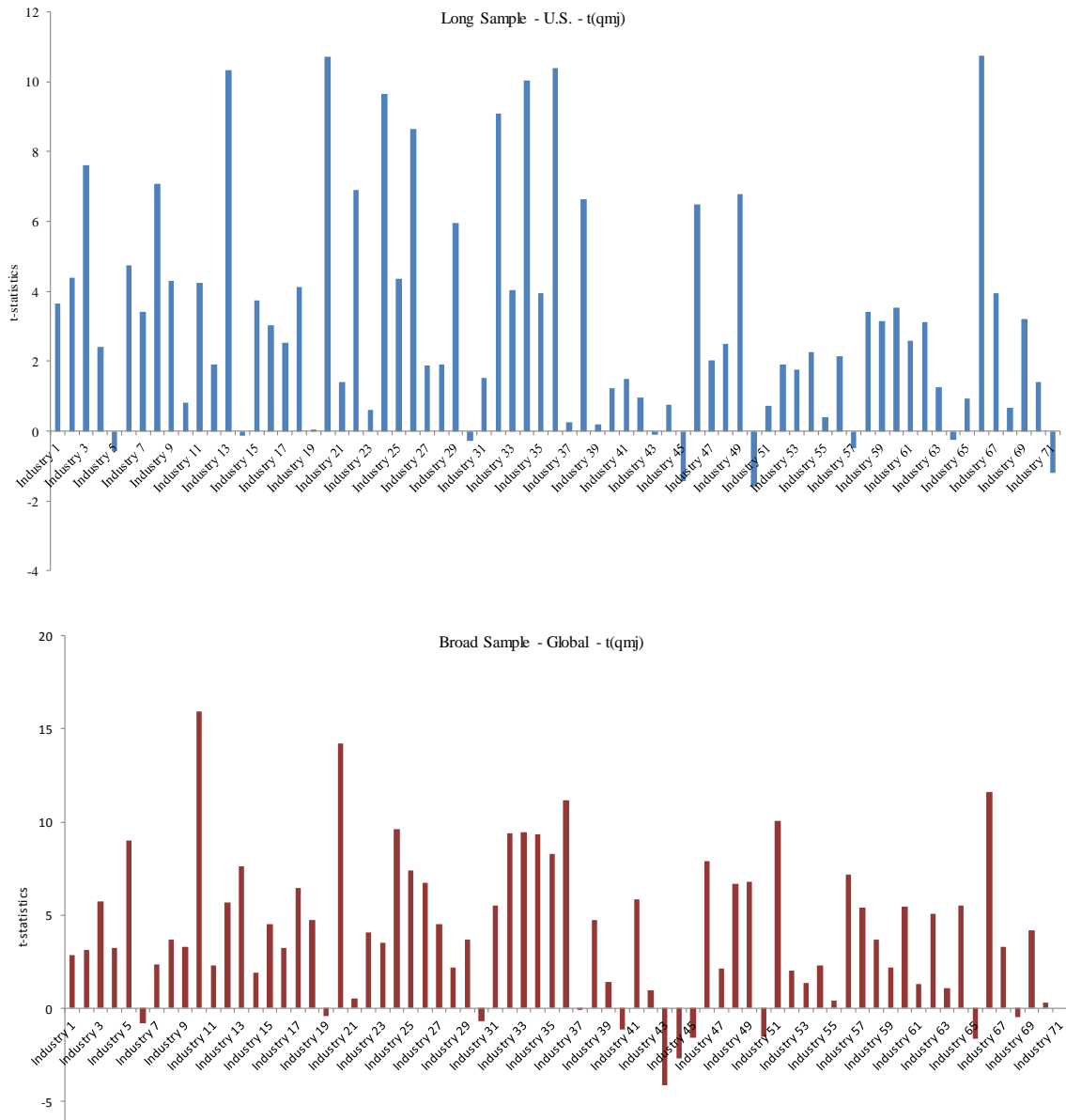


Figure A2
QMJ: 4-Factor Alphas by Year

This figure plots 4-factor adjusted information ratios of Quality minus Junk (QMJ) factors. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. Information ratios are equal to the intercept of a time-series regression of monthly excess return divided by the standard deviation of the estimated residuals. The explanatory variables are the monthly returns of the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. We run a separate regression by year. Alphas are annualized.

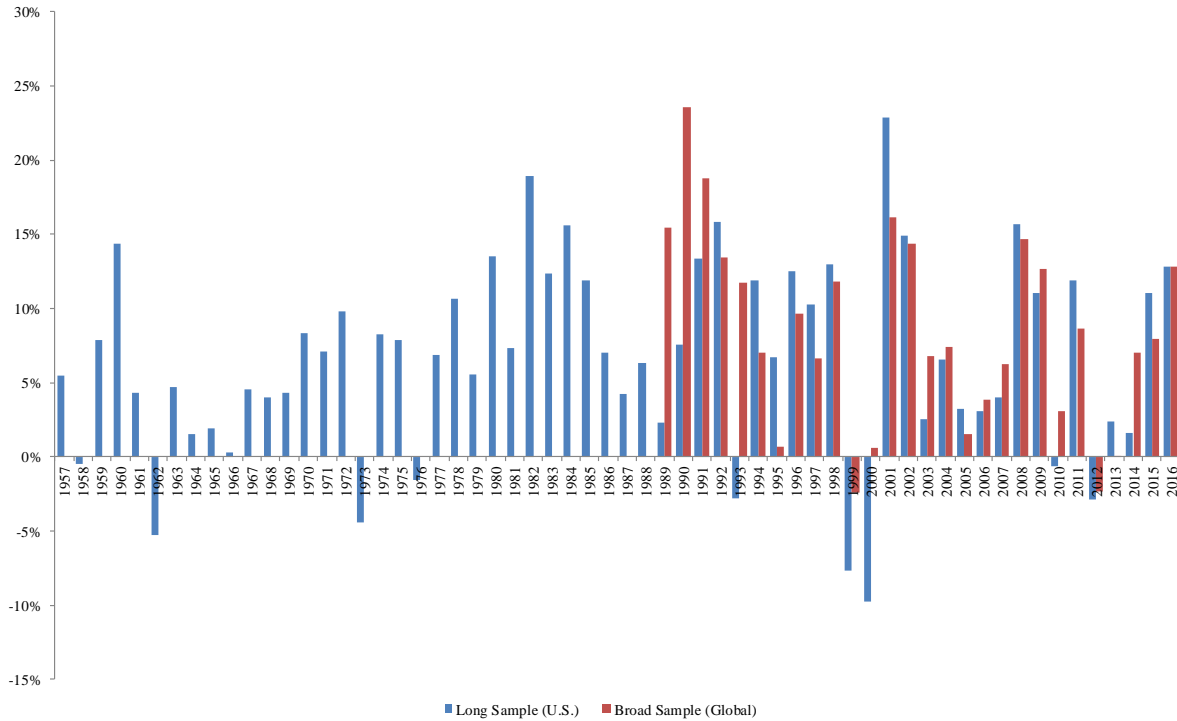


Figure A3
QMJ: 4-Factor Adjusted Information Ratios by Size

This figure plots 4-factor adjusted information ratios of Quality minus Junk (QMJ) factors. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. Information ratios are equal to the intercept of a time-series regression of monthly excess return divided by the standard deviation of the estimated residuals. The explanatory variables are the monthly returns of the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Information ratios are annualized.

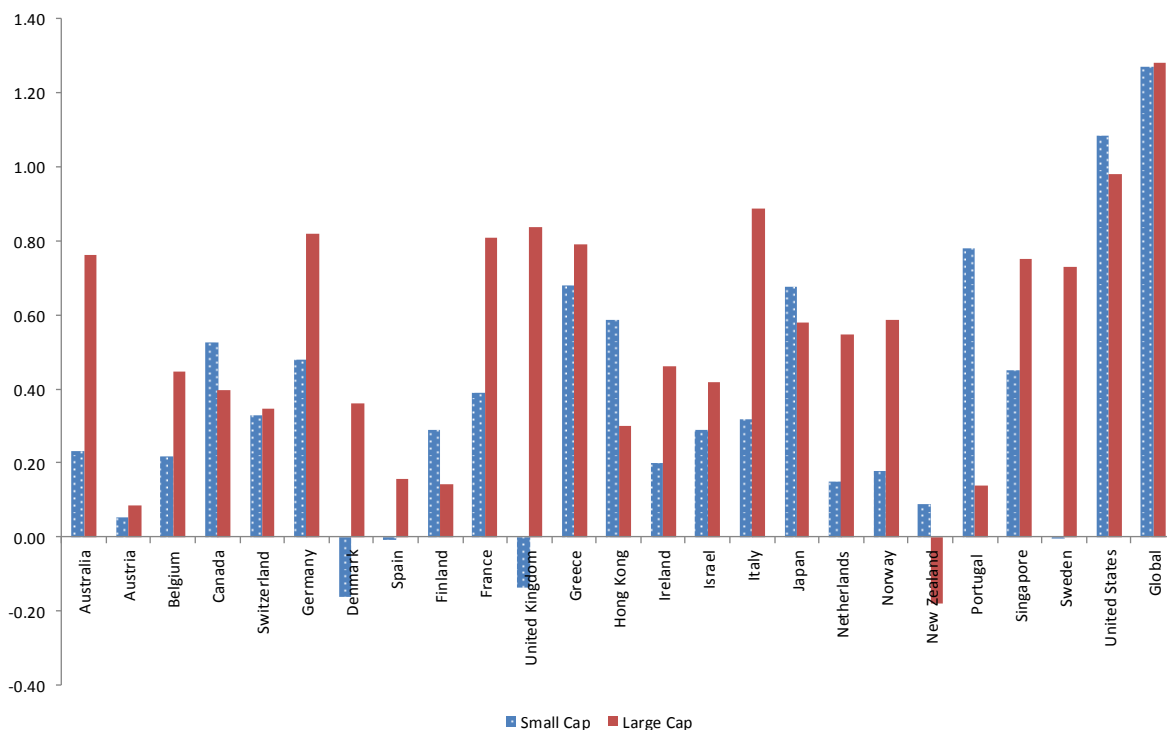
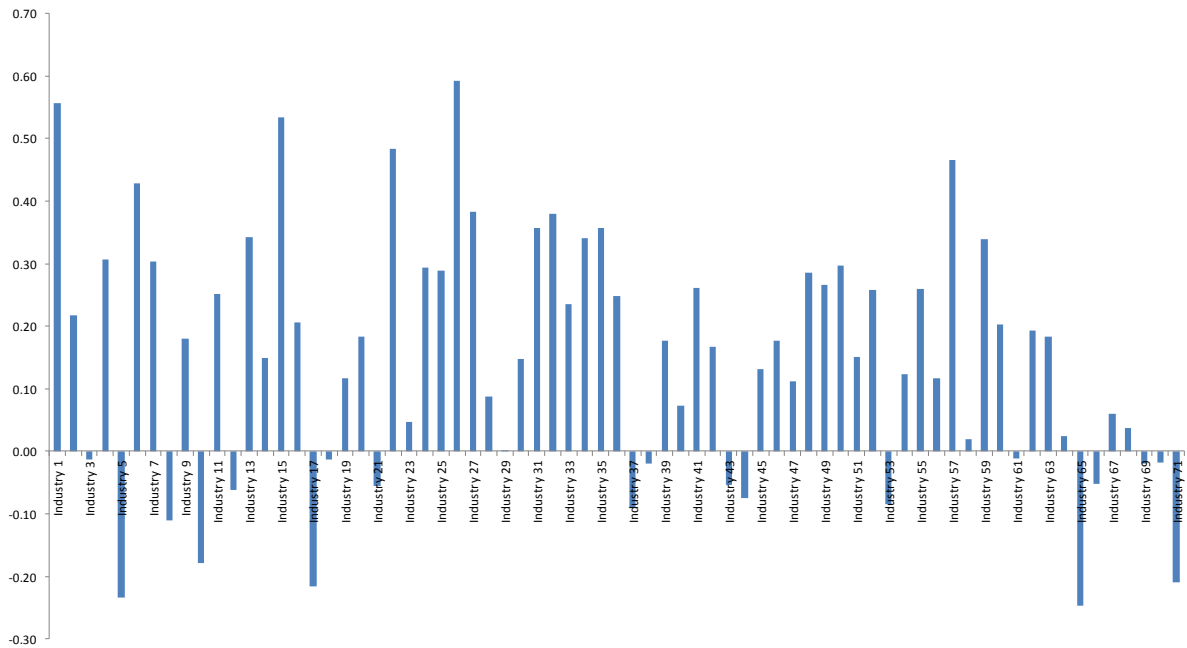


Figure A4
QMJ: 4-Factor Adjusted Information Ratios by Industry

This figure plots 4-factor adjusted information ratios of Quality minus Junk (QMJ) factor within 71 GICS industries. Information ratios are equal to the intercept of a time-series regression of monthly excess return divided by the standard deviation of the estimated residuals. The explanatory variables are the monthly returns of the market (MKT), size (SMB), book-to-market (HML), and momentum (UMD) portfolios from Appendix A2. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Information ratios are annualized.

Panel A: Long Sample (U.S., 1957 - 2016)



Panel B: Broad Sample (Global, 1989 - 2016)

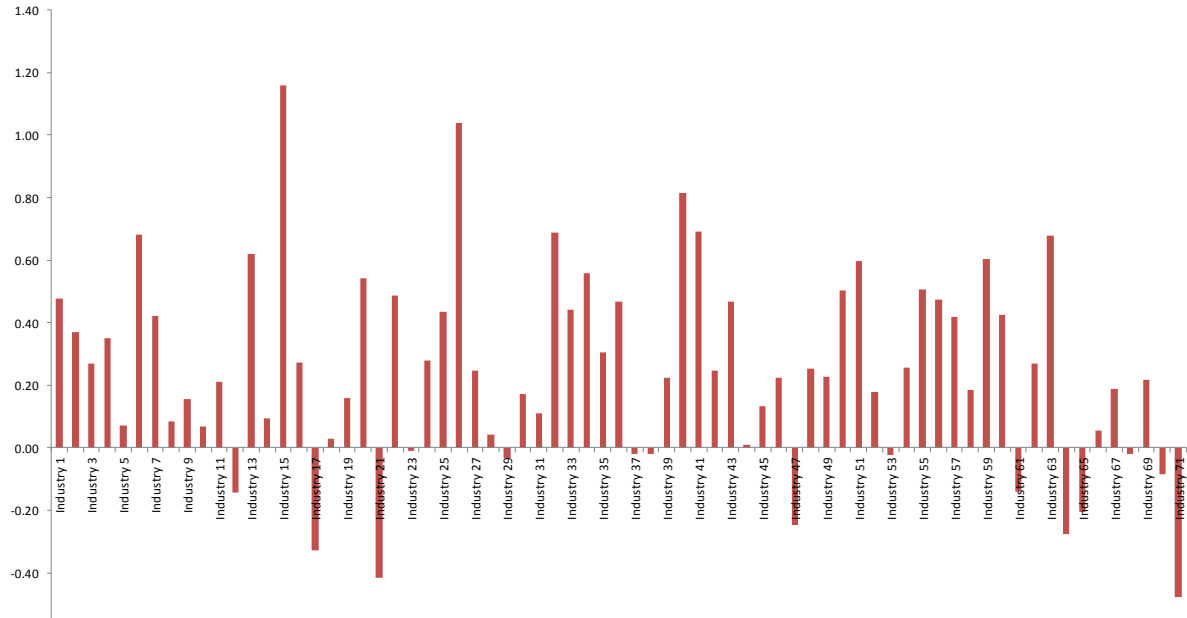


Figure A5
Cross Sectional Regressions Coefficient, the Price of Quality

This figure plots coefficients from monthly cross-sectional regressions. The dependent variable is the log of a firm's market to book ratio in month t . The explanatory variables are the quality scores in month t . We plot the time series of the cross sectional coefficients.

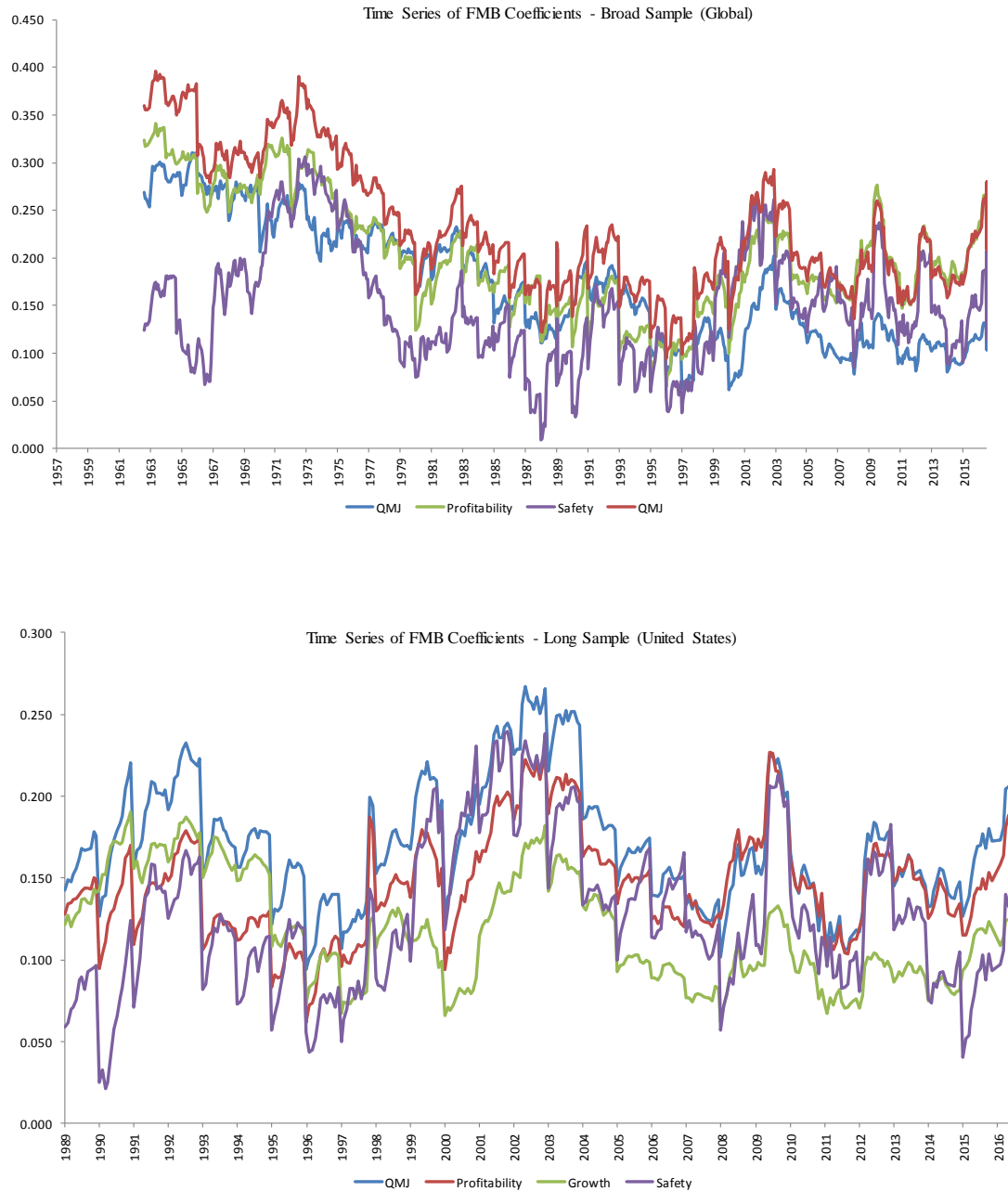


Figure A6
Quality at a Reasonable Price (QARP)

This figure plots monthly returns of Quality at a Reasonable Price (QARP) factors. QARP factors are constructed as the intersection of six value-weighted portfolios formed on size and price adjusted quality $n \text{Quality}_t^i - z(P_t^i)$ where $z(P_t^i)$ is the z-score of a firm's market to book and n a constant. At the end of each calendar month, stocks are assigned to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. For other markets the size breakpoint is the 80th percentile by country. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QARP factor return is the average return on the two high quality portfolios minus the average return on the two low quality (junk) portfolios. We form one set of portfolios in each country and compute global portfolios by weighting each country's portfolio by the country's total (lagged) market capitalization. The figure reports results from our Long Sample of domestic stocks and from our Broad Sample of global stocks. The long sample period runs from July 1963 to December 2016. The broad sample period runs from June 1990 to December 2016. Returns are in USD, do not include currency hedging, and excess returns are over the U.S. Treasury bill rate. Alpha is the intercept in a time-series regression of monthly excess return. The explanatory variables are the returns of the market (MKT) portfolios from Appendix A2. The figures plot the monthly alpha as function of n .

