Quality Investing – Industry versus Academic Definitions

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Abstract

In this study we provide an overview of common quality definitions that are currently used in the industry and those used in academic studies, and we outline the differences between these definitions. We show that there is a large dispersion in the definitions that are used for the quality factor with 'industry' definitions ranging from return-on-equity and profit margins to leverage and earnings variability, and 'academic' definitions such as operating accruals, net stock issues, and gross profitability. We document large performance differences between the different quality definitions. While 'academic' definitions for quality all seem to have significant predictive power for stock returns above and beyond common factors, we do not find significant predictive power for individual 'industry' definitions. Our results have important implications for the design of investment vehicles that provide investors exposure to the quality factor.

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1. INTRODUCTION

Perhaps one of the most significant developments in the asset management industry over the past decade is the rise of factor investing. An increasing number of investors have been adopting this approach to investing where investment portfolios are strategically allocated to specific segments of the market such as the small cap, value, and low-risk segments.[1] In brief, the underlying rationale of the factor investing approach builds on the body of academic literature that shows that a significant portion of the value added of active management can be attributed to factors such as small cap, value, and momentum that have been documented by numerous academic studies (see for example the work of Carhart, 1997). By strategically allocating to these factors directly (instead of by selecting a fund manager that might allocate the investment portfolio to the factors) investors gain benefits such as increased transparency and control, and lower costs. The most common factors that are currently used in factor investing approaches are small cap, value, momentum, and low-risk. These factors have been reported by many academic studies (see, e.g., Fama and French, 1993, Jegadeesh and Titman, 1993, and Carhart, 1997). In addition, funds that provide investors exposure to these factors are currently readily available (with exception of the momentum factor that seems somewhat more challenging to implement because of the higher turnover that is associated with the factor).

A newcomer to the factor investing arena over the most recent years is the so-called quality factor. A notable observation regarding the quality factor is that there does not appear to be an unambiguous definition for quality. While different definitions are also used to measure value (e.g., book-to-price and earnings-to-price), momentum (e.g., 6-minus-1-month return and 12-

[1] For an in-depth documentation of factor investing we refer to the work of Ang, Goetzmann, and Schaeffer (2009), Ang (2014), and Ilmanen (2011).

minus-1-month return), and low-risk (e.g., 36-month volatility and 52-week market beta), the dispersion in definitions is substantially larger for quality.

Examples of anomaly variables from academic studies that are seen as quality indicators are accruals (Sloan, 1996), gross profitability (Novy-Marx, 2013), and low investments (Pontiff and Woodgate, 2008). Due to the lack of any market data in these characteristics they are generally referred to as quality variables. At the same time, the definitions that are often used for quality in the industry[2] seem to be very different from the definitions that have been put forward in academic studies. For example we mainly find variables related to bottom-line profitability measures such as return-on-equity or derivations of it in index definitions (see, e.g., Piotroski, 2000, GMO, 2012, MSCI, 2013, and S&P, 2014). As a consequence, it is unclear if the quality returns that have been documented by academic studies can validly be used as expectation for quality funds that are currently offered to investors.

The contribution of this study to the literature is threefold: first, we provide an overview of common quality definitions that are currently used in the industry and those that have been used in academic studies, and we indicate the differences between these definitions. Second, we perform asset pricing tests to investigate which of the used definitions have predictive power for relative stock returns above and beyond common factors such as market beta, small cap, value, and momentum. Third, we analyse the robustness of the predictive power for an investable international setting as well as within a corporate bond universe. Existing academic studies investigating the quality-type factors have mainly been performed using broad U.S. equity data

[2] The terms 'industry' and 'academic' quality definitions are assigned to serve as proxies for the most often seen variables in both areas. In reality some practitioners do use certain 'academic' variables and some academics have analyzed the 'industry' variables.

that can be dominated by microcaps.[3] Furthermore, we are among the first to test the predictive power of quality outside the equity space[4]. Therefore, the out-of-sample evidence supporting the existence of a quality factor in international and investable universes as well as a different asset class is threefold and currently non-existent.

In the first part of our study, we show that there is a large dispersion in quality factor definitions with 'industry' definitions ranging from return-on-equity and profit margins to leverage and earnings variability, and 'academic' definitions such as operating accruals, net stock issues, and gross profitability.

In the second part of our study, we document large performance differences between the different quality definitions. While the 'academic' definitions for quality all seem to have significant predictive power for stock returns above and beyond common factors, we do not find significant predictive power for individual 'industry' definitions. Earnings variability does seem to predict stock returns to some extent, but this effect appears to be attributable to the low-volatility factor. The other 'industry' definitions do not seem to have any significant predictive power individually. A combination of the different 'industry' definitions does seem to have some predictive power for future stock returns after correction for common factors, albeit marginally so.

In the third part of our study, we show that our results are robust for large-cap stocks across different regions. We document regional differences in the predictive power of the alternative quality definitions: the predictive power of 'academic' quality definitions appears to be the strongest in Emerging markets and Europe, and the weakest in Japan. But overall our results are

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[3] E.g., Fama and French (2008) highlight that micro caps comprise on average only about 3% of the aggregated market cap of the NYSE-Amex-NASDAQ universe, but account for about 60% of the total number of stocks.
[4] See also Bhojraj and Swaminathan (2009).

qualitatively similar across the regions: we find only marginal predictive power of 'industry' definitions of quality, while the 'academic' definitions consistently have significant predictive power for stock returns. For additional robustness we test our equity quality definitions in the corporate bond space and find consistent results – bonds issued by high quality companies outperform those issued by low quality companies and the academic quality definition yields stronger results in both the investment grade and high yield segments of the market.

2. DATA, QUALITY DEFINITIONS, AND METHODOLOGY

In this section we describe the data, quality variable definitions, and methodology used throughout this paper.

2.1. Data

Our sample comprises developed and emerging market stocks starting from December 1985 and December 1992, respectively, until December 2014. At the end of every month, we identify all constituents of the FTSE World Developed Index and the S&P/IFC Investable Emerging Markets Index for that particular month. We exclude financial firms as they are subject to special accounting standards and do not exhibit comparable values for some of our anomaly variables. The resulting developed global large-cap universe consists of approximately 1,600 stocks on average; the actual number ranges between about 1,200 and 1,900 over time. As many return anomalies are known to disappear or become significantly less pronounced when the universe is restricted to large-caps our choice of universe is rather conservative. For emerging markets, we make a similar conservative choice by restricting our sample each month to the 500 biggest stocks as measured by market capitalization in USD.

We gather monthly stock returns taking into account dividends, stock splits and other capital adjustments. Our first data source for returns and outstanding shares is Interactive Data Exshare. In case this data is not available, we use MSCI return series instead. Alternatively, when neither of these is available, we calculate total returns using data from S&P/IFC. Monthly returns above 500% are truncated at this level. In addition to returns, we gather free-float adjusted market capitalization data from FTSE and S&P/IFC and fundamental data from Compustat and Worldscope. As a proxy for the risk-free rate, we obtain the 1-month U.S. Treasury bill rate from the data library of Kenneth French.

Our corporate bond dataset is based on the Barclays U.S. Corporate Investment Grade index and U.S. Corporate High Yield index during the period January 1994 – December 2014. Bond returns are provided by Barclays and accounting data is downloaded from Compustat and Worldscope. We only include bonds for companies with publicly traded equity due to the availability of accounting information. In the case of multiple bonds outstanding we include only one as we prefer 1) senior bonds over subordinated ones, 2) bonds in the maturity segment 5-15 years, 3) younger bonds, and 4) larger bonds. Our final sample consists of 414 investment grade bonds and 474 high yield bonds. We base our corporate bond analysis on returns in excess over duration matched treasuries as provided by Barclays. This allows us to focus on the default premium component of corporate bond returns and ignore the term premium which can be gained by investing in government bonds.

2.2. Quality definitions

In contrast to value, momentum, or low-risk investing, the quality investing theme is rather a vague concept that seems to lack a universally accepted definition.[5] Therefore, this section provides an overview of quality definitions applied by both financial industry parties as well as academics, and motivates our variable choices.

Selecting variables that proxy for the quality definition of practitioners is far from trivial as mutual funds, hedge funds, and index providers all have a proprietary component in their investment strategies. Still, our thorough research of fund prospectuses, index methodologies, and research notes shows common patterns when it comes to quality. We can broadly categorize them in three groups – profitability, stability, and growth. Some of the leading industry parties such as S&P, MSCI and GMO focus on bottom line profitability captured by return on equity for their quality indices (see GMO, 2012, MSCI, 2013, and S&P, 2014). Others such as FTSE (see FTSE, 2014) use more diversified profitability definitions but bottom line earnings are still an important factor. Stability, often measured by leverage and earnings volatility, is also an integral part of practitioners' quality indicators. These firm characteristics are supposed to ensure that the selected companies are conservatively managed and have stable and predictable earnings. Finally, influenced by Piotroski (2000) and Asness et al. (2014), profitability growth is also a frequently seen feature.

Based on the above overview we have selected a representative but non-exhaustive list of 'industry' variables consisting of return on equity (ROE), earnings to sales (Margins), twelve

[5] Value strategies have generally in common that they invest in stocks with a low price to their fundamentals, such as book value of equity, earnings, or dividends, while momentum strategies usually buy stocks that have had high returns over the past three to twelve months. Low-risk strategies typically invest in stocks with low beta or low volatility estimated over different time periods and frequencies.

months growth in return on equity (ROE growth), Total debt to common equity (Leverage), and volatility of earnings growth (Earnings variability).[6] With the exception of Leverage all these variables are based on earnings. This is at odds with academic insights which question the predictive power of earnings based profitability measures for stock selection. For instance, Fama and French (2008) conclude that there is no basis for a ‘relation between average returns and profitability’ (p. 1663) using return-on-equity as a profitability proxy. One argument in favour of using earnings based variables is the fact that they can be defined for both corporate and financial firms which is not the case for most of the quality variables used in academia.

These ‘industry’ definitions seem to differ significantly from the ones that have been documented and found to be robust in the academic literature. Following the documentation of size, value, and momentum patterns in average stock returns, the Fama and French three-factor and Carhart four-factor models have been the “industry standard” in empirical asset pricing for many years. However, already Sloan (1996) shows that accruals are negatively related to future earnings and that higher accruals predict lower stock returns. Furthermore, researchers argued that companies with high ROE (Haugen and Baker, 1996) and low investments proxied by total asset growth (Cooper et al., 2008) or net stock issues (Pontiff and Woodgate, 2008) have high returns.[7] Fama and French (2008) jointly test these new anomalies all associated with investments and profitability. They conclude that the anomalous returns associated with accruals and net stock issues are robust; however, they also document that the asset growth and profitability (as proxied

[6] For the variable details see Appendix A.1.1.
[7] Both asset growth and net stock issues provide a proxy for a firm’s investment expansion or contraction. While net stock issues takes only the equity financing part into account, total assets growth takes all financing and investment effects into account.

by ROE) anomalies are less robust as both anomalies do not predict returns for big stocks.[8] While 'net stock issues' seems to be a robust anomaly for a broader investment theme, the findings of Novy-Marx (2013) are a game-changer for the profitability theme. Novy-Marx (2013) finds that gross profitability as a top-line profitability measure is superior to bottom-line earnings in predicting future stock returns. The author argues that gross profitability performs better than ROE because it is the better proxy for true economic (expected) profitability. Therefore, Novy-Marx's (2013) main contribution is not that expected profitability is a driver of future returns but to provide a better proxy for it.

The overview above shows that there is also not an unambiguous quality definition in the academic literature. However, we believe that the term quality is best described by companies with high profitability, high earnings quality, and conservative investment behaviour.[9] Therefore, our 'academic' quality variables consist of gross profitability, accruals, and net stock issues, following the definitions as in Novy-Marx (2013), Sloan (1996), and Pontiff and Woodgate (2008).[10] While we admit that there is still an ongoing discussion on whether these proxies can be further improved, the definitions used in this paper are the ones initially documented in the literature and therefore represent a conservative choice.[11]

2.3. Methodology

At the end of each month, we construct equally-weighted quintile portfolios by ranking stocks on all the variables described above. For accruals, net stock issues, earnings variability and leverage

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[8] According to Fama and French (2008), a robust anomaly should be present for standalone variable test (portfolios sorts) as well as for marginal effects (Fama and MacBeth regressions). Furthermore, the results should be robust across different size groups.
[9] Profitability and investments are also the two new factors of the Fama and French (2015) five-factor model.
[10] For the variable details see Appendix A.1.2.
[11] See, for example, Thomas and Zhang (2002) and Richardson et al. (2005) for accruals or Ball et al. (2015) and Fama and French (2015) for profitability.

measures, stocks with the lowest values are assigned to the top quintile, while for the remaining variables stocks with the highest factor scores are the top quintiles. We also create two overall quality measures (Industry and Academic) by constructing a strategy which uses an equally-weighted combination of all individual variables' z-scores and then sorts stocks on the composite score. For all variable sorts, factor scores are compared directly across all stocks, without imposing sector or country restrictions. However, we do control for regional effects in our global developed market sample by also presenting results for the U.S., Europe, and Japan in isolation. Portfolios are rebalanced monthly, and transaction costs are ignored throughout the analysis.

For the top, bottom, and top-minus-bottom (T-B) quintile portfolios, we report the annualized average returns (in USD and in excess of the risk-free rate), volatilities and Sharpe ratios. Furthermore, we also estimate the Fama and French – Carhart 4-factor alphas and coefficients for the T-B portfolios by running the following regression:

$$R_{T-B,t} = \alpha_{T-B} + \beta \cdot \left(R_{M,t} - R_{f,t}\right) + s \cdot SMB_t + h \cdot HML_t + w \cdot WML_t + \varepsilon_{T-B,t}$$

where $R_{T-B,t}$ is the difference of the top and bottom portfolio returns in period t, $R_{f,t}$ is the risk-free return in period t, α_{T-B} is the alpha of top minus bottom portfolio, $R_{M,t}$ is the return on t market portfolio in period t, and β, s, h, and w are the estimated factor coefficients. Global and regional size (small-minus-big, SMB), value (high-minus-low, HML) and momentum (winner-minus-loser, WML) factors are calculated by ranking stocks, on their market capitalization, book-to-market ratio and past 12-minus-1 month local total return respectively, and taking the difference in return between the equally-weighted top and bottom terciles.

Finally, we use the cross-sectional regression approach of Fama and MacBeth (1973) to answer which quality variables are really distinct and which have no marginal power to predict returns.

Furthermore, we estimate three different models: Model 1 includes the 'industry' quality variables, Model 2 includes the 'academic' quality variables, and Model 3 includes all these variables. Furthermore, all three models include the standard control variables, beta, size (market cap), book-to-price, and momentum. We use standardized variable scores to make the coefficients comparable.

A consistent rank portfolio approach is used for our corporate bond analysis – we form equally-weighted quintile portfolios. Due to the systematically lower liquidity of corporate bonds compared to equities we substitute the one month holding period, used for equities, with twelve months holding period. To do so we use the overlapping portfolio approach of Jegadeesh and Titman (1993). We split the corporate bond universe into investment grade and high yield as they are effectively seen as two different asset classes by practitioners and academics (e.g., Ambastha et al., 2010).

3. EMPIRICAL RESULTS

In this section we conduct a set of empirical tests to shed more light on the common quality indicators. First, we compare the performance of hypothetical global investment strategies based on alternative quality definitions used in both industry and academia. Second, we perform a regional analysis to verify that the global effect is not a result of some systematic regional allocation bets. For further robustness, we extend our analysis to emerging markets and US corporate bonds. Finally, we analyse the marginal effects of the selected 'industry' and 'academic' quality characteristics in a Fama MacBeth (1973) framework.

3.1. Global developed market results

In the first part of the analysis we present the performance of top, bottom, and the top-minus-bottom (henceforth T-B) quintile portfolios based on two sets of quality indicators – commonly used in the industry and commonly used in academia.

[INSERT TABLE 1 ABOUT HERE]

Panel A of Table 1 shows the performance of strategies based on the selected 'industry' quality characteristics. We also create an overall quality measure (henceforth 'Industry') by constructing a strategy which uses an equally-weighted combination of all individual variables. Focusing on the T-B quintile portfolios we see that all of them produce positive returns and the most commonly used one (ROE) seems to be superior to the rest with a return of 3.1%. Due to short sale constraints practitioners often focus on the top quintile portfolio. Therefore, we also present separate results for the long and the short leg of the self-financing portfolio. By looking at the top quintile portfolio we notice that, with the exception of Leverage and ROE growth, all variables outperform the market portfolio. The combined quality strategy generates a T-B quintile return of 2.3%. However, none of the T-B return spreads are statistically different from zero.

Controlling for the standard risk factors such as market beta, size, value, and momentum, Panel B shows a similar picture. The strongest variable (ROE) has positive loadings on the value and momentum factors and the alpha of 2.6% per annum is again not statistically different from zero (*t*-statistic of 1.50). In terms of factor loadings, the combined quality 'industry' strategy is similar to ROE and also fails to produce a significant alpha. One variable that stands out is Earnings variability with a four factor alpha of 3.5% per annum (*t*-statistic of 3.03). Its market loading of -0.26 (*t*-statistic of -11.65) hints that it behaves like another well-known effect, namely the low-risk effect documented by Black, Jensen, and Scholes (1972) and Blitz and van Vliet (2007).

Results from Panel A confirm this notion as the top portfolio has a volatility of 13.3% and the bottom – 18.4% compared to a market volatility of 16.1%. Therefore, its usage as a quality indicator is questionable since it can also be seen as a low-risk measure.

In Table 2 we show similar information but now for quality characteristics that are often used in academic studies.

[INSERT TABLE 2 ABOUT HERE]

Panel A shows that the T-B portfolios for all three characteristics have positive returns that are significantly different from zero[12] – 3.6% for Gross profitability, 3.7% for Accruals and 4.0% for Net Stock Issues. Furthermore, all top quintile portfolios also outperform the total market portfolio. The combined 'academic' quality definition clearly benefits from diversification as it has better performance than each individual characteristic (T-B return of 6.2% with comparable volatility).

The 'academic' definitions remain strong after correcting for other risk factors as each individual factor has a highly significant alpha. Novy-Marx (2013) has documented that stocks with high gross profitability tend to be relatively more expensive and that a good working investment approach is to combine profitability and value or the so called 'quality at a reasonable price' strategy. Our global large cap results point in the same direction as Gross profitability has a negative (but insignificant) loading on HML. However, Table 2 indicates that an investor can also achieve a performance improvement by diversifying across multiple quality signals. The 'academic' quality strategy has an alpha of 6.9% per annum (*t*-statistic of 6.16) which is substantially higher than gross profits, accruals, and net stock issues stand alone. Further, even for

[12] The lowest T-B return *t-stat*istic is 2.30.

an investable large-cap universe, the academic quality factor is superior to the industry one for both T-B raw returns and after correcting for risk factors.

3.2. Regional and emerging markets results

In this section we extend the scope of the study as well as check for robustness of our results across regions. Section 3.1 presents results on global large capitalization stocks which are commonly used as an investment universe by practitioners. Our findings confirm previously documented U.S. results on profitability, accruals, and investments. However, what we find could potentially be driven by a strong systematic U.S. bias in the data which results in us effectively comparing the performance of U.S. to non-U.S. stocks. As such, we aim to provide evidence that the global results are not just the result of some systematic regional allocation bets. We therefore further split the global universe into three main regions – United States, Europe, and Japan as well as add Emerging markets for additional out of sample robustness tests.

Table 3 summarizes the performance for the two combined quality strategies – ’industry’ and ‘academic’. The main takeaway is that ’academic’ consistently outperforms ‘industry’ based on both T-B returns as well as alphas.

[INSERT TABLE 3 ABOUT HERE]

Panel A compares the long-short return of the two strategies. Focusing on the ‘academic’ definition we see that the T-B returns for United States are highest within global developed markets. Furthermore, the composite ‘academic’ quality factor yields positive returns in all regions (significant with the exception of Japan). On the other hand, the ‘industry’ quality definition does not exhibit returns which are statistically distinguishable from zero. Finally, the emerging market results reinforce the superiority of the ‘academic’ definition over the ‘industry’ one. These results can serve as a true out-of-sample test as this universe is much less looked at in academic studies. Correcting for other risk factors in Panel B yields similar conclusions meaning that the results cannot be attributed to the well-known factors such as size, value, and momentum.

[INSERT FIGURE 1 ABOUT HERE]

The results for individual variable reinforce our conclusions. Figure 1 shows that within every region every 'academic' variable outperforms all of the 'industry' measures of quality. Furthermore, all 'academic' variables have positive T-B quintile returns in all regions (though returns for gross profits is weak in Japan). On the other hand, for the 'industry' definitions we find mixed results across regions.

[INSERT FIGURE 2 ABOUT HERE]

A further examination of the two strategies is shown in Figure 2 which plots their regional performance in the volatility-return space. There we see consistently high Sharpe ratios for 'academic' quality across regions compared to its 'industry' counterpart.

3.3. Cross-sectional regressions

After documenting the standalone portfolio returns and four-factor model alphas in the previous two sections, we are now interested which quality variables carry unique information. Therefore, we employ the Fama and MacBeth (1973) methodology to estimate the marginal effects of the single quality variables after controlling for each other.

In Table 4 we show the results for three different variable sets, all controlled for the standard factors size, beta, value, and momentum. Model 1 shows results for 'industry' quality definitions. Similar to the time series analysis ROE is the strongest variable with a loading of 0.12 (*t*-statistic of 2.71). Margins, ROE growth, Leverage, and Earnings variability have no additional explanatory power after controlling for other factors.

[INSERT TABLE 4 ABOUT HERE]

Table 2 showed that the T-B quintiles strategies based on Gross profitability, Accruals, and Net Stock Issues all have significant alphas. Model 2 of Table 4 takes this one step further as it includes them in a regression simultaneously. The fact that even in a cross sectional context and controlling for each other they still have high and significant coefficients reinforces the notion that they are all predictors for future stock returns. However, this might also have a negative connotation. Being significant at the same time might mean that they actually account for distinguished phenomena and their inclusion in one combined quality factor captures premiums from different sources. Fama and French (2015), for example, include profitability and investments as separate factors in their five factor model. Nevertheless, having a starting point that quality is non-market firm specific accounting information we think that these characteristics could be seen as separate dimensions of quality.

Model 3 is the main part of our analysis. It directly compares all quality characteristics used in this study. Looking at the coefficients we see that conclusions drawn from Model 1 and Model 2 remain intact as the 'academic' quality factors are strongly significant at the expense of the 'industry' ones where only ROE is marginally significant at the 5% level (*t*-statistic of 1.96).

[INSERT TABLE 5 ABOUT HERE]

Table 5 repeats Model 3 in an international context and results remain robust. Gross profitability, Accruals, and Net stock issues are significant in all regions (with the exception of Gross profitability in Japan and Net stock issues in Emerging markets). On the other hand, within the regions ROE is the only significant ‘industry’ variable although it is weaker than Gross profitability.

3.4. Corporate bonds

With this section we aim at two main objectives. First, gather strong evidence for the robustness of quality as a factor by testing it in a fundamentally different setting than previously done in the literature. Second, stimulate future research on the existence of similar underlying return drivers across asset classes (e.g., Correia et al, 2012, Kozhemiakin, 2007, Houweling and Van Zundert, 2014)

To do so we directly apply our ‘industry’ and ‘academic’ quality definitions from the previous section. Corporate bonds fundamentally differ from equities with features such as maturity date, duration, and interest rate risk. The latter one has no impact on our results due to using excess returns over duration matched securities, focusing on the default premium. Nevertheless, we acknowledge that for a proper quality definition further adjustments to the variables could be made. Using simple equity quality definitions makes our results conservative.

Table 6 shows performance statistics for both investment grade and high yield bonds. The top portfolio investment grade bonds based on ‘industry’ and ‘academic’ quality definitions outperforms the market in terms of excess return as well as on a risk adjusted basis (Sharpe ratios of 0.18 and 0.17 compared to 0.11 for the market) showing evidence for a quality premium. The ‘academic’ definition stands out in terms of identifying ‘low quality’ bonds as the bottom portfolio performs worse than the bottom industry portfolio and the market portfolio. These results in a top-minus-bottom premium 0.2% for the ‘academic’ definition compared to a negative premium of -

0.1% for the ‘industry’ definition although both of them do not appear statistically different from zero.[13]

[INSERT TABLE 6 ABOUT HERE]

The results for high yield bonds show strong evidence that an investment strategy based on quality can be also profitable applied in corporate bond markets. Furthermore, the superiority of the ‘academic’ definition proves robust once again with a top-minus-bottom premium of 3.1% (t-stat of 2.51) compared to 0.6% for the ‘industry’ definition. A further observation is that the magnitude of the T-B Sharpe ratios is similar to those of our U.S. equity results over the same sample period (0.09 and 0.55 in U.S. high yield corporate bonds and 0.06 and 0.51 for U.S equities of the ’industry’ and ‘academic’ definitions, respectively). The better performance of quality among high yield bonds relative to the performance in investment grade bonds can be partially attributed to the relative riskiness of both segments. In corporate bonds the downside risk, heavily influenced by defaults, is generally much higher than the upside potential. A closer examination of the risk and return profiles of the top and bottom quality portfolios hints that investing in high quality bonds effectively lowers the risk of default, as well as earns a return premium.

3.5. Quality and other factor premiums

Finally, we discuss the relation between quality and other factor premiums to address the question of whether it is a separate factor or just a reframing of already documented effects. Being a relatively unexplored factor in the landscape of factor premiums, three main aspects for a quality factor have to be thoroughly tested – is the premium robust, sizeable enough, and distinct enough to be regarded as a factor similar to value, momentum, size, and low volatility? The results of the previous sections show that the academic quality definition seems to be a robust and also sizeable

[13] T-statistics are -0.23 and 0.56 for the ‘industry’ and ‘academic’ portfolio, respectively.

new factor as the premiums exist within several regions and based on a large-cap investable sample. For the ‘industry’ quality definition, however, we observed overall weaker results. Furthermore, some observations such as the low beta of the Earnings variability variable raise the question if there is some overlap between factors. Naturally, the answer of this question depends on the exact definition of the anomaly which we aim to clarify with this paper. Apart from the single factor academic definitions of among others Sloan (1996), Novy-Marx (2013), and Fama and French (2015), the studies of Piotroski (2000) and Asness et al. (2014) propose more complex quality factor composition consisting of multiple characteristics separated in thematic groups. One of these groups – namely stability - has been embraced by practitioners, blurring the borders between quality and low-risk documented by Black, Jensen, and Scholes (1972), and Blitz and van Vliet (2007).

The phenomenon of mixing the terms of low-risk and quality is also noticed in a more general context. GMO (2012) uses low-risk investing and quality investing interchangeably. They, together with other practitioners such as MSCI, include Leverage and Earnings variability in their definition of quality. However, as Table 1 shows strategies based on these characteristics have higher reduction in volatility than an increase in returns which comes close to the low volatility effect documented by Blitz and van Vliet (2007).

To give some new insights to this discussion we aim to elaborate on how the ‘industry’ and ‘academic’ definitions overlap with other factors. However, unlike in section 3.1 we do not focus on returns but rather on the underlying stocks that are favored by the two approaches.

[INSERT FIGURE 3 ABOUT HERE]

Figure 3 shows the average rank correlation of quality and value, size, momentum, and low volatility factor portfolios. Indeed we see that the 'industry' definition of quality is relatively highly correlated with low volatility due to explicitly including characteristics that focus on stability. At the same time these stocks tend to be relatively more expensive as the rank correlation with book to price is negative. The higher price of 'quality' is not a new insight as it has been documented by Novy-Marx (2013), Fama and French (2015), and Asness et al (2014). Both quality definitions show similar correlations with the other factors reinsuring that they capture the same effect. However, the 'academic' quality is correlated to a much more limited extent making it a more independent factor. Its low rank correlation of 0.08 with low volatility shows that the defensive features of quality come indirectly as a result of the strong underlying fundamentals and not by directly targeting low-volatile companies.

3.6. Putting the discrepancies in perspective

Perhaps the most striking take-away from this study is that there are large discrepancies between the stock quality measures used in academic studies and in the industry. Not only in terms of definitions that are used, but also in terms of the predictive value they have for future stock returns. For the small cap, value, momentum, and low-volatility factors there seems to be much more similarity between the measures used in academic studies and the industry. For example, for the value factor typically fundamentals-to-price ratios are used such a book-to-price, cashflow-to-price, earnings-to-price, and dividend-to-price ratios.[14] And for the momentum factor 6-month or 12-month past returns are typically used.

[14] See e.g. Lakonishok et al. (1994) or Fama and French (1996) for early studies on the value effect.

While it might seem that these discrepancies are specific to the Quality factor, we argue in this subsection that discrepancies were present for the other factors as well just after their public dissemination; that they became smaller over time for these factors; and that we expect them to also become smaller for the quality factor.

For example, several studies have been conducted over the past two decades following the seminal work of Fama and French (1992, 1993) to investigate the extent to which funds that label themselves as value funds actually provide investors exposure to the value factor documented by amongst others Fama and French (1993). Examples of these studies are the work of Cooper et al. (2005) and DiBartolomeo and Witkowski (1997). Cooper et al. (2005) show that funds include popular investment styles such as ‘value’ in their names although their holdings do not match the implied style. Similarly, DiBartolomeo and Witkowski (1997) report that a substantial portion of mutual funds deviate from their classification. However, we also observe that more recent rules-based factor investing propositions in the industry use value measures that are very similar to those used in the academic studies mentioned above. For instance, the fundamental index methodology as outlined in Arnott et al. (2005) uses fundamentals such as sales, cashflows, book values, and dividends and is regarded as a way to capture the value premium (see Asness et al., 2015).

We argue that the discrepancies between the notion of value in academic studies and the industry becoming smaller over time is the result of a learning effect in financial markets where notions and measures evolve over time and converge to the ones that are most successful in predicting stock returns. Following this line of reasoning we expect the discrepancies between the measures used for the quality factor in academic studies and the industry to become smaller over time and to converge more to the ones used in academic studies that appear to have more predictive power for future stock returns. We attribute the observation that the discrepancies between the used measures is currently larger for the quality factor than for the other factors to the quality factor being a relatively young factor.

4. CONCLUDING COMMENTS

In this paper we investigate the different quality definitions that are currently used in the industry and those that have been used in academic studies, and we find large performance differences between them. Common ‘industry’ definition include return-on-equity, profit margins, leverage, and earnings variability whereas academic studies often focus on operating accruals, net stock issues, and gross profitability. Using a liquid international universe we find that ‘academic’ quality definitions consistently have higher predictive power for future stock returns than the ones used in the ‘industry’. We are among the first to show that the quality effect is also present in the corporate bond space as ‘academic’ definitions yield superior performance in both the investment grade and high yield segments of the market. Our results have important implications for the design of investment vehicles to provide investors exposure to the quality factor. First, we show that currently practitioners include stability factors, such as earnings variability, in their quality definitions. This boosts alpha but also increases the overlap with the low volatility effect. Second, new investment vehicles should learn from academia and use factors that not only select stocks with strong fundamentals but also stock with high future expected returns.

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TABLE 1. Performance of quality factors based on industry definitions

In Table 1 we show performance characteristics for multiple quality strategies. Panel A consists of returns, volatilities, and Sharpe ratios for Top, Bottom, and Top minus Bottom (T-B) portfolios sorted on the relevant factor. Top is the portfolio with the highest 20% ranked stocks, Bottom is the portfolio with the lowest 20% ranked stocks, and T-B is a self-financing portfolio which is long the top 20% stocks (Top) and short the bottom 20% stocks (Bottom). The factors are calculated as explained in Appendix A. Returns and volatilities are estimated based on monthly data and then annualized. Panel B contains regression coefficients based on Fama and French / Carhart 4-factor model. The factors used are based on our replication of original factors and are based on the investment universe used for the analysis. Alphas are annualized. The sample period is January 1986 - December 2014.

		ROE	Margins	ROE growth	Leverage	Earnings variability	Industry	Universe
	Panel A: Performance of Top, Bottom, and Top-minus-Bottom portfolios							
Top	Return	10.0%	8.6%	8.5%	7.7%	9.2%	9.6%	8.4%
	Volatility	15.8%	15.3%	17.1%	16.1%	13.3%	14.9%	16.1%
	Sharpe ratio	0.63	0.56	0.50	0.48	0.69	0.64	0.53
Bottom	Return	6.9%	7.6%	8.3%	7.2%	8.3%	7.3%	
	Volatility	20.1%	20.8%	18.9%	17.7%	18.4%	20.1%	
	Sharpe ratio	0.34	0.37	0.44	0.40	0.45	0.36	
T-B	Return	3.1%	1.0%	0.2%	0.6%	0.9%	2.3%	
	t-statistic	1.46	0.39	0.18	0.32	0.58	1.07	
	Volatility	11.6%	13.5%	6.9%	9.5%	8.1%	11.6%	
	Sharpe ratio	0.27	0.07	0.03	0.06	0.11	0.20	
	Panel B: Fama and French / Carhart 4-factor regression coefficients							
	alpha	2.6%	1.8%	-0.1%	1.1%	3.5%	3.1%	
		1.50	0.94	-0.08	0.66	3.03	1.92	
	Mkt-RF	-0.07	-0.15	-0.05	-0.08	-0.26	-0.17	
		-1.92	-3.85	-2.14	-2.36	-11.65	-5.27	
	SMB	-0.43	-0.83	0.11	0.09	-0.20	-0.48	
		-4.71	-8.20	1.82	0.96	-3.31	-5.65	
	HML	0.18	0.49	-0.16	-0.29	-0.02	0.18	
		2.32	5.85	-3.13	-3.98	-0.38	2.52	
	WML	0.31	0.21	0.19	0.14	0.07	0.26	
		7.77	4.58	7.00	3.55	2.66	6.88	
	R-sqr	0.39	0.44	0.19	0.12	0.47	0.46	

TABLE 2. Performance of quality factors based on academic definitions

In Table 2 we show performance characteristics for multiple quality strategies. Panel A consists of returns, volatilities, and Sharpe ratios for Top, Bottom, and Top minus Bottom (T-B) portfolios sorted on the relevant factor. Top is the portfolio with the highest 20% ranked stocks, Bottom is the portfolio with the lowest 20% ranked stocks, and T-B is a self-financing portfolio which is long the top 20% stocks (Top) and short the bottom 20% stocks (Bottom). The factors are calculated as explained in Appendix A. Returns and volatilities are estimated based on monthly data and then annualized. Panel B contains regression coefficients based on Fama and French / Carhart 4-factor model. The factors used are based on our replication of original factors and are based on the investment universe used for the analysis. Alphas are annualized. The sample period is January 1986 - December 2014.

		Gross profitability	Accruals	Net stock issues	Academic	Universe
	Panel A: Performance of Top, Bottom, and Top-minus-Bottom portfolios					
Top	Return	10.1%	9.9%	11.1%	11.5%	8.4%
	Volatility	14.9%	17.3%	14.9%	14.5%	16.1%
	Sharpe ratio	0.68	0.57	0.74	0.79	0.53
Bottom	Return	6.6%	6.1%	7.1%	5.3%	
	Volatility	16.9%	17.6%	19.0%	18.4%	
	Sharpe ratio	0.39	0.35	0.37	0.29	
T-B	Return	3.6%	3.7%	4.0%	6.2%	
	t-statistic	2.52	3.01	2.30	4.21	
	Volatility	7.7%	6.7%	9.3%	7.9%	
	Sharpe ratio	0.47	0.56	0.43	0.78	
	Panel B: Fama and French / Carhart 4-factor regression coefficients					
	alpha	4.8%	3.8%	4.7%	6.9%	
		3.65	3.07	3.51	6.16	
	Mkt-RF	-0.11	0.01	-0.18	-0.16	
		-4.09	0.45	-6.68	-7.17	
	SMB	-0.21	-0.27	-0.20	-0.31	
		-3.07	-4.17	-2.90	-5.28	
	HML	-0.05	0.11	0.60	0.48	
		-0.88	1.98	10.26	9.75	
	WML	0.07	0.02	-0.01	0.06	
		2.24	0.72	-0.16	2.13	
	R-sqr	0.22	0.08	0.43	0.45	

TABLE 3. International evidence

In Table 3 we show returns and alphas of the industry and academic quality definitions for multiple regions. Panel A shows returns of Top minus Bottom (T-B) quality portfolios. T-B is a self-financing portfolio which is long the top 20% stocks (Top) and short the bottom 20% stocks (Bottom). Returns are estimated based on monthly data and then annualized. Panel B contains annualized 4-factor Fama and French / Carhart alphas per region. The factors used are based on our replication of original factors using the same investment universe as used for the analysis. The universe definitions of United States, Europe, and Japan are based on carveouts of these regions from our Global markets universe. Emerging markets universe is based on the biggest 500 stocks measured by market capitalization. The sample period is January 1986 - December 2014 for Global markets, United States, Europe, and Japan and January 1993 - December 2014 for Emerging markets

	Industry	Academic
Panel A: Top-minus-Bottom return differential		
United States	0.8%	6.3%
t-statistic	0.32	3.90
Europe	2.6%	5.7%
t-statistic	1.29	4.38
Japan	-2.9%	2.4%
t-statistic	-1.00	1.47
Global markets	2.3%	6.2%
t-statistic	1.07	4.21
Emerging markets	1.4%	10.1%
t-statistic	0.53	4.17
Panel B: Fama and French / Carhart 4-factor alphas		
United States	2.9%	6.3%
t-statistic	1.90	3.94
Europe	4.3%	5.3%
t-statistic	2.81	4.83
Japan	2.1%	2.3%
t-statistic	0.87	1.45
Global markets	3.1%	6.9%
t-statistic	1.92	6.16
Emerging markets	6.7%	10.8%
t-statistic	3.29	4.90

TABLE 4. Global Fama-MacBeth (1973) regressions

Table 4 reports results of Fama-MacBeth (1973) regressions of monthly stock returns on individual firm characteristics. Characteristics are calculated according to Appendix A and then standardized. The last row shows the average adjusted R-squared. Results are calculated on monthly data for the period January 1986 - December 2014.

	Model 1		Model 2		Model 3	
	mean	*t*-stat	mean	*t*-stat	mean	*t*-stat
Intercept	0.96	3.68	0.94	3.51	0.94	3.56
ROE	0.12	2.71			0.09	1.96
Margins	-0.01	-0.36			0.00	-0.12
ROE growth	-0.01	-0.57			-0.01	-0.47
Leverage	-0.03	-0.96			0.01	0.25
Earnings variability	0.00	0.06			-0.01	-0.33
Gross profitability			0.14	3.88	0.12	3.34
Accruals			-0.09	-3.97	-0.09	-4.23
Net stock issues			-0.05	-2.67	-0.04	-2.56
Market cap	-0.03	-1.02	-0.04	-1.10	-0.04	-1.30
Beta	-0.08	-0.83	-0.09	-0.94	-0.07	-0.73
Book to Price	0.18	3.54	0.19	3.79	0.22	4.11
Momentum12-1	0.23	3.14	0.24	3.18	0.24	3.24
R-sqr	8.78		7.90		9.56	

TABLE 5. International Fama-MacBeth (1973) regressions

Table 5 reports results of Fama-MacBeth (1973) regressions of monthly stock returns on individual firm characteristics. Characteristics are calculated according to Appendix A and then standardized. The last row shows the average adjusted R-squared. The sample period is January 1986 - December 2014 for Global markets, United States, Europe, and Japan and January 1993 - December 2014 for Emerging markets. The universe definitions of United States, Europe, and Japan are based on carveouts of these regions from our Global markets universe. Emerging markets universe is based on the biggest 500 stocks measured by market capitalization.

	United States		Europe		Japan		Global markets		Emerging markets	
	mean	*t*-stat	mean	*t*-stat	mean	*t*-stat	mean	*t*-stat	mean	*t*-stat
Intercept	1.09	4.12	1.03	3.42	0.63	1.75	0.94	3.56	0.74	1.58
ROE	0.10	2.36	0.10	2.96	0.02	0.37	0.09	1.96	0.18	2.58
Margins	-0.06	-1.68	-0.03	-0.83	0.04	0.80	0.00	-0.12	-0.01	-0.20
ROE growth	0.00	-0.12	-0.01	-0.40	-0.02	-0.80	-0.01	-0.47	-0.08	-1.65
Leverage	-0.05	-1.15	-0.04	-1.28	0.15	3.00	0.01	0.25	0.00	0.04
Earnings variability	0.00	0.07	-0.04	-1.55	-0.02	-0.81	-0.01	-0.33	-0.06	-1.57
Gross profitability	0.15	2.54	0.09	2.49	0.09	1.89	0.12	3.34	0.26	3.44
Accruals	-0.07	-2.69	-0.07	-3.12	-0.06	-2.30	-0.09	-4.23	-0.11	-2.24
Net stock issues	-0.04	-1.98	-0.05	-3.48	-0.07	-2.49	-0.04	-2.56	-0.06	-1.78
Market cap	-0.07	-1.98	-0.02	-0.58	-0.02	-0.49	-0.04	-1.30	0.00	-0.03
Beta	-0.04	-0.42	-0.04	-0.45	-0.01	-0.17	-0.07	-0.73	0.00	-0.02
Book to Price	0.15	2.69	0.25	4.62	0.43	6.92	0.22	4.11	0.43	4.25
Momentum12-1	0.11	1.44	0.32	3.78	0.05	0.61	0.24	3.24	0.45	4.03
R-sqr	10.21		8.83		13.98		9.56		8.11	

TABLE 6. Corporate bonds analysis

In Table 6 we show performance characteristics for the Industry and Academic quality strategies for U.S. Investment Grade and U.S. High Yield corporate bonds. To calculate the return in month *t* we take the average return of the portfolios constructed from month *t-11* to *t*. Each month the universe is split in 5 portfolios sorted on the relevant factor as Top means the 20% highest quality bonds, and Bottom – 20% lowest quality bonds. T-B is the difference between the return of the Top portfolio and the return of the Bottom portfolio. Investment grade is defined as stocks with credit ratings AAA, AA, A, BBB; High Yield – BB, B, CCC, CC, C. Returns and volatilities are calculated based on monthly data and then annualized. The sample period is January 1994 - December 2014.

		Investment Grade			High Yield		
		Industry	Academic	Universe	Industry	Academic	Universe
Top	Return	0.6%	0.7%	0.5%	3.2%	4.4%	2.1%
	Volatility	3.66%	3.79%	4.33%	8.56%	9.12%	9.46%
	Sharpe ratio	0.18	0.17	0.11	0.38	0.49	0.22
Bottom	Return	0.7%	0.5%		2.6%	1.3%	
	Volatility	4.77%	4.80%		13.07%	12.05%	
	Sharpe ratio	0.15	0.09		0.20	0.11	
T-B	Return	-0.1%	0.2%		0.6%	3.1%	
	t-statistic	-0.23	0.56		0.42	2.51	
	Volatility	1.64%	1.64%		7.01%	5.66%	
	Sharpe ratio	-0.05	0.12		0.09	0.55	

FIGURE 1. International performance of different quality characteristics

In Figure 1 we show Top-minus-Bottom (T-B) returns of the alternative quality definitions for multiple regions. T-B is a self-financing portfolio which is long the top 20% stocks (Top) and short the bottom 20% stocks (Bottom). Returns are estimated based on monthly data and then annualized. The universe definitions of United States, Europe, and Japan are based on carve-outs of these regions from our Global markets universe. Emerging markets universe is based on the biggest 500 stocks measured by market capitalization. The sample period is January 1986 - December 2014 for Global markets, United States, Europe, and Japan and January 1993 - December 2014 for Emerging markets.

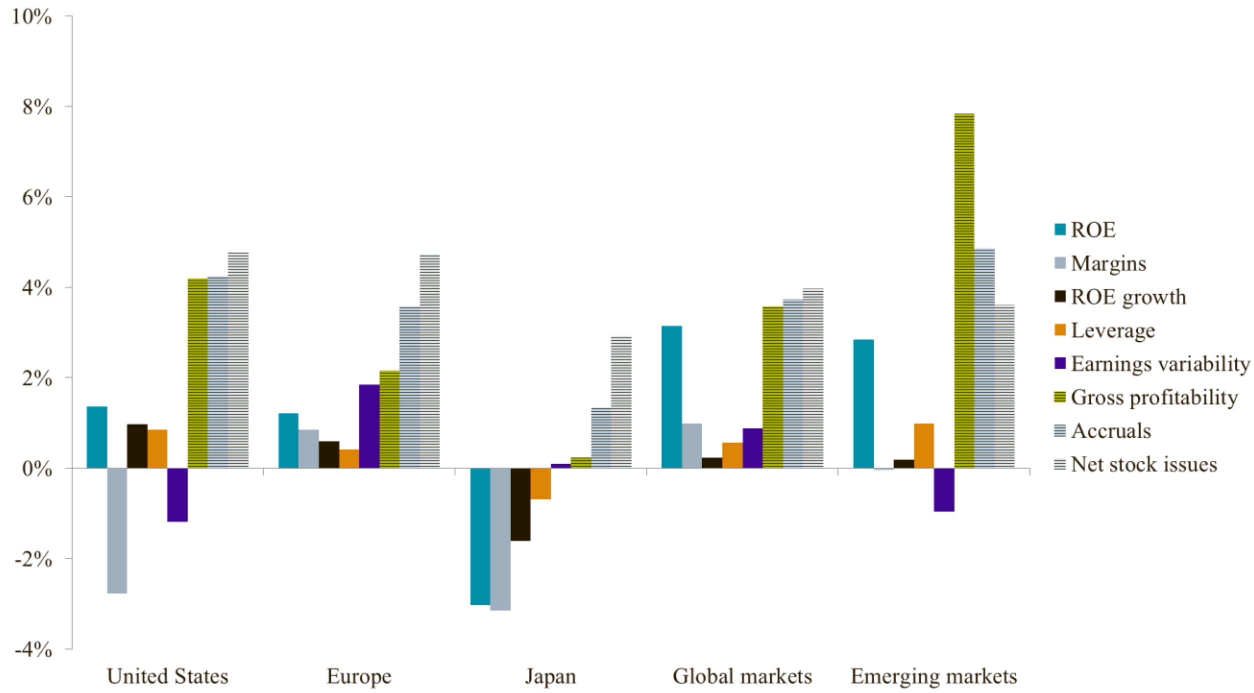
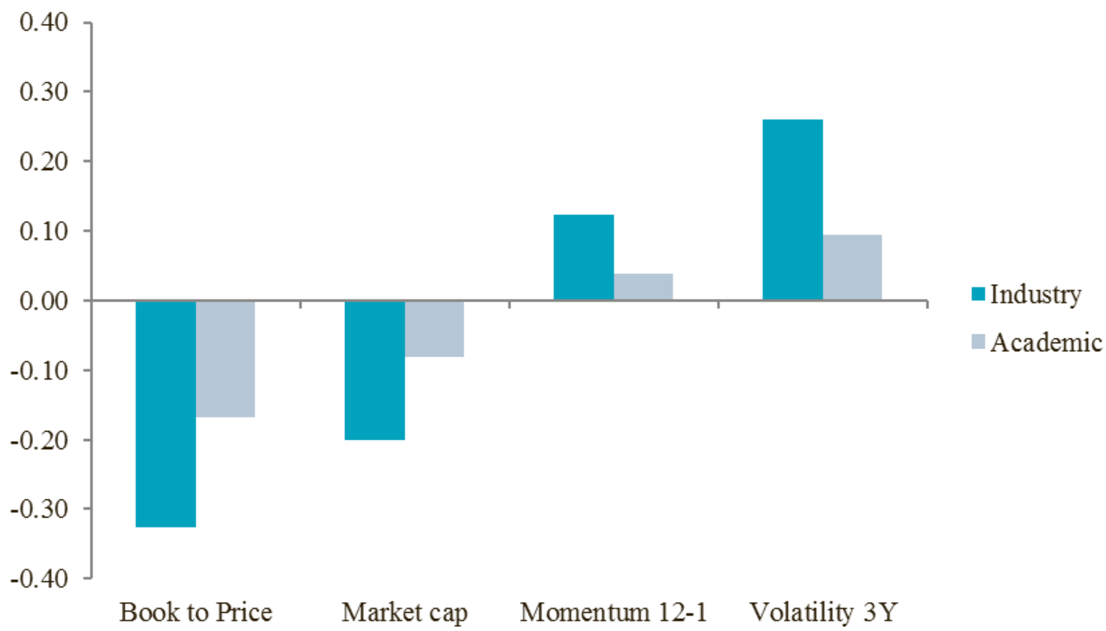


FIGURE 2. International performance of different quality characteristics

In Figure 2 we show volatility-return scatter plots of the Industry and Academic Quality definitions per region. Results apply for a Top-minus-Bottom (T-B) self-financing portfolio which is long the top 20% stocks (Top) and short the bottom 20% stocks (Bottom). Returns and volatilities are estimated based on monthly data and then annualized. The universe definitions of United States, Europe, and Japan are based on carve-outs of these regions from our Global markets universe. Emerging markets (EM) universe is based on the biggest 500 stocks measured by market capitalization. The sample period is January 1986 - December 2014 for Global markets, United States, Europe, and Japan and January 1993 - December 2014 for Emerging markets.

FIGURE 3. Rank correlation between quality and other factors

In Figure 3 we show average rank correlation of the Industry and Academic Quality definitions with Book to Price, Market capitalization in USD, past 12 minus 1 month return (Momentum 12-1), and past 3 years monthly volatility (Volatility 3Y). Each month the rank correlation is calculated and then averaged over the full sample. Results are estimated based on our Global universe and the sample period is January 1986 - December 2014.



APPENDIX A:

A.1 Variable Definitions

In this section we describe for each anomaly variable its detailed definition. We obtain the fundamental data, in order of preference, Compustat quarterly, Compustat annual, Worldscope quarterly, Worldscope semi-annual, Worldscope annual. To avoid a forward looking bias we lag Compustat data by three and Worldscope data by six months.

A.1.1 'Industry' Quality Definitions

ROE is income before extraordinary items divided by book equity.

Margins are defined as income before extraordinary items divided by sales.

ROE growth is the 12-months difference in ROE as defined above.

Earnings variability is the standard deviation of y-o-y ROE growth over the last five years.

Leverage is calculated as total debt to book equity.

A.1.2 'Academic' Quality Definitions

Accruals are defined as the change in operating working capital minus depreciation, depletion and amortization all deflated by total assets. Thereby, operating working capital is current asset minus cash and short term investments minus changes in current liabilities plus short-term debt and taxes payable (both if available).

Net stock issues are measures by the ratio of the split-adjusted shares outstanding in month t to the split-adjusted shares outstanding in month t−12.

Gross profitability is defined as sales minus cost of goods sold both divided by total assets.