Research

FTSE Russell

Factor exposure indexes

Quality factor

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Summary

Following Asness et al. (2013), we consider quality as the consistent ability to generate strong future cash flows. We assess quality from several perspectives: profitability, operating efficiency, earnings quality (accruals) and leverage. Current profitability is related to future levels of profitability and the persistency of profitability is a key indicator of quality. Profitability improvements that are the result of increased operating efficiency or asset utilisation are likely to be more sustainable and therefore symptomatic of quality. The level of accruals (Sloan (1996)) may also identify the recurring component of earnings and therefore act as an additional measure of quality. Conversely, a high level of debt is typically perceived as an indicator of low quality.

The building blocks of each quality measure are accounting ratios sourced from consolidated annual company reports. We examine the performance of individual measures in each Developed market region from two perspectives; improvements in company fundamentals (operating performance) and stock performance.

- Return on Assets (ROA) and change in Asset Turnover (ATO): We find that historically companies with high current levels of ROA and larger changes in ATO have displayed superior subsequent operating performance. Historically, quality companies identified using these measures have outperformed those with lower levels of ROA and smaller changes in ATO. Highly profitable companies that display improvements in operating efficiency also exhibit lower levels of volatility and systematic risk.
- Accruals: Historically, companies with higher levels of accruals have been associated with lower levels of future profitability and display lower risk adjusted performance outcomes.
- Operating Cash flow to Total Debt (OPCFD): ROA, change in ATO and accruals assess earnings quality from a profitability perspective. Leverage provides another perspective on quality. We find that historically, OPCFD is positively associated with future profitability, i.e. increased levels of leverage are associated with lower levels of future profitability.

We examine the degree of independence between the various quality measures and assess the incremental improvement in performance from combining alternative measures of quality. We conclude that it is appropriate to form a composite measure of quality based on profitability and leverage measures.

All quality metrics are based on annual company fundamentals, implying an annual index rebalance. By the end of September, fundamental data for the majority of large countries is typically available in Worldscope. Consequently, we rebalance the quality indexes annually in September and employ a six-month lag on all fundamental data to mitigate foresight in our back-tests.

The Quality factor indexes are designed to exhibit a greater exposure to quality factors. However, liquidity, turnover and diversification considerations also influence the approach to index construction. We examine a set of broad and narrow quality indexes, where the latter are designed to exhibit higher levels of exposure to our preferred measure of quality whilst remaining well diversified.

High quality companies prove relatively resilient during periods of economic hardship. We illustrate the historical performance of quality indexes across the economic cycle. A broad quality index historically outperforms the capitalisation weighted equivalent index during recessionary periods. Furthermore, a narrow quality index, displaying increased levels of exposure to quality, outperforms a broad quality index during these same periods.

The structure of this document is as follows: Section 1 provides a review of the literature on the use of quality as a factor; Section 2 discusses alternative definitions of quality; Section 3 defines a set of quality factors; Section 4 examines the performance of the individual accounting measures associated with each quality measure; Section 5 considers practical issues regarding index construction.

1. Is quality a risk factor?

The literature focuses on whether investors pay a premium for firms exhibiting quality characteristics. Asness et al (2013) propose a general definition of quality arising from a re-formulation of the Gordon growth model, where P, D, r and g are the current stock price, dividend, discount rate and growth rate in dividends respectively. If high quality securities possess common characteristics, equation (1) suggests that these attributes may include profitability, growth in earnings, the required return (i.e. safer stocks) and the proportion of earnings returned to the shareholders as dividends (i.e. payout ratio).

$$P = \frac{D}{r-g} = \frac{\text{Earnings} * \text{Payout Ratio}}{r-g} \quad (1)$$

Asness et al (2013) find empirical evidence that investors are willing to pay a premium for stocks that display quality characteristics. Furthermore, they observe that the premium attached to quality varies through time: It tends to be lower during less turbulent periods and higher during periods of crisis. They highlight that equation (1) gives no consideration to the premium attached to quality and propose that quality should be viewed in the context of value in order to identify quality at a reasonable price.

Bender and Nielsen (2013) examine a narrower definition of quality: Earnings quality or accruals[1]. They find strong empirical evidence of a quality effect that persists after controlling for common risk factors such as size, value, momentum and volatility. The question of whether quality is a risk factor remains. Bender and Nielsen (2013) examine accruals as a risk model factor and find that it is not statistically significant. They conclude that an accruals measure of earnings quality is not a good risk factor.

Earnings variability and leverage however, which fall into broader definitions of quality, are considered risk factors. Hunstad (2013) demonstrates that high quality stocks earn a risk premium. He suggests risk-averse investors hold high quality stocks in order to achieve greater certainty in investment outcomes, i.e. high quality stocks should exhibit lower price volatility and risk-seeking investors bid up the price of low quality stocks, resulting in a quality premium.

[1] Specifically, they examine an earnings quality score based on accruals.

2. Definitions of quality

2.1 Profitability

High quality firms are frequently described as those with sustainable earnings backed by robust cash flows. There are several candidates that may proxy for Profitability. Return on Equity (ROE), measured as the ratio of earnings to shareholders' equity focuses on the returns to equity holders. From an accounting perspective, ROE includes interest income and cash holdings.[2] Performance targets linked to ROE may incentivise companies to generate improvements in ROE, either by boosting assets through mergers and acquisitions (M&A) or gearing up their balance sheet, particularly during periods of cheap credit (e.g. banks in the late 90s, (Haldane 2011)). Return on Capital (ROIC)[3] is a broader measure of profitability reflecting a firm's corporate structure and incorporates the return to equity holders and the cost of debt in the form of interest expense.

Profit Margin (PM), measured as the ratio of net income (or operating net income) to sales, captures pricing power resulting from product innovation, product positioning, and brand name recognition – see Soliman (2008). PM exhibits significant variability across industrial sectors; for example, typically the PM of a food retailer is lower than that of a tobacco business. A high PM tends to attract new entrants into a particular industry, with the result that competition tends to erode high margins through time.

De Chow et al (2010) examine various proxies for earnings quality. Earnings variability is used as a proxy for earnings persistency as indicator of quality. The variability of earnings relative to the variability of cash flows is a measure of earnings quality. These measures are subject to possible opportunistic earnings management and vary in their sensitivity to the business cycle, making it difficult to disentangle the sources of earnings variability.

2.2 Leverage

Profitability is typically negatively related to leverage. Nissim and Penman (2003) suggest that an increase in financial leverage has a negative effect on future earnings. Firms that are highly profitable generate positive free cash flow and tend to employ it in order to repay debt and acquire financial assets.

Debt measures such as Debt to Equity (or Debt to Total Assets) may partly be determined by a company's ability to time equity issuance. Baker and Wurgler (2002) document that the market valuation of firms has a strong and persistent effect on the choice of capital structure; low leverage firms raise funds when their market valuations (price-to-book ratio) are high, whilst high leverage and presumably financially distressed firms raise funds when their market valuations are low.

Rajan and Zingales (1994) highlight that total assets is not an ideal base for determining leverage, since accounts payable (contractual trade obligations) and other liabilities (e.g. assets held against pension liabilities) should not affect assessments of leverage.

[2] ROE is net income divided by the book value of equity. Interest income is part of net income and the book value of equity incorporates the cash holdings of the firm, see Damodaran (2007).

[3] Defined as ROIC= [Operating Income * (1- Tax Rate)]/ Book Value of Invested Capital$_{t-1}$.

3. FTSE quality factors

A definition of quality as the ability to consistently generate strong future cash flows is consistent with the general definition provided by Asness et al (2013). In this Section, we specify potential measures of quality factors from the perspectives of profitability, growth and leverage.

3.1 Profitability

3.1.1 Return on assets

There is some evidence that companies with high current levels of profitability tend to exhibit high future levels of profitability; see Novy-Marx (2012). We represent profitability by Return on Assets (ROA), defined as current fiscal year net income divided by average total assets of the current and preceding fiscal year. ROA incorporates the entire corporate financial structure and is not therefore distorted by differing levels of leverage. All else being equal a company that targets earnings through M&A and leverage would exhibit a lower level of ROA than ROE.

$$ROA_t = Net\ Income_t \Big/ average(Total\ Assets_t + Total\ Assets_{t-1})$$

3.1.2 Change in asset turnover

The mechanisam used to achieve improvements in profitability is important. Profitability improvements that are the result of increased operating efficiency or asset utilisation are likely to be sustainable and therefore symptomatic of quality. Asset utilisation is measured by asset turnover (ATO). Soliman (2008) shows that changes in ATO are an indicator of future profitability and that performance is positively related to changes in ATO after controlling for the level of profitability (PM) and ATO.

$$\Delta ATO = Sales_t \Big/ Total\ Assets_t - Sales_{t-1} \Big/ Total\ Assets_{t-1}$$

3.1.3 Accruals

An alternative perspective on quality is provided by an examination of non-cash balance sheet items or accruals. Sloan (1996) suggests that earnings can be divided into stable and transitory components – cash flow and accruals respectively. A high current level of earnings that stems from high levels of accruals is unlikely to persist. All else being equal, lower operating assets or higher operating liabilities result in a lower level of accruals. For example, high levels of operating assets that are the result of rising inventories and receivables represent unrealised or anticipated future benefits, which may have a lower value than their current stated value.

Richardson et al (2005), define total accruals (TACC), as the sum of the change in working capital (ΔWC), the change in net non-current operating assets (ΔNCO) and the change in net financial assets (ΔFIN), deflated by average total assets. The working capital component of total accruals is driven by accounts receivable

and inventories. Net non-current operating assets are the difference between the change in non-current operating assets and non-current operating liabilities. The major components of non-current operating assets are Plant, Property and Equipment (PP&E) and intangibles. The change in net financial assets is measured as the change in short-term investments, plus the change in longterm investments less changes in debt and preferred stock.

$$TACC = \frac{\Delta WC + \Delta NCO + \Delta FIN}{average\,total\,assets}$$

3.2 Growth

Mohanram (2005) finds empirical evidence that high growth firms outperform low growth firms. He shows that growth firms are more likely to exceed earnings forecasts and earn significant abnormal returns around earnings announcements. Asness et al (2013) demonstrate that strong risk-adjusted performance is associated with growth. In a similar vein, we examine ROA growth over the past five years and explicitly consider the price of such growth by relating it to current valuation levels (Price to Book – P/B), to form a growth at a reasonable price measure (ROA-GARP).

$$ROA - GARP = \frac{(Net\ Income_t - Net\ Income_{t-5}) / avg(Total\ Assets)}{P/B}$$

3.3 Leverage

We employ the ratio of net operating cash flow to total debt (OPCFD) to measure leverage. Specifically, to account for industry differences in financial structure, the ratio of operating cash flow to debt relative to the regional ICB industry median level is employed.

$$OPCFD = Operating\ Cash\ Flow / Total\ Debt$$

Typically, a company will first draw on internal sources of funds (cash and marketable securities) to meet obligations or fund investment programs. If additional funding is required, external financing is used. This suggests relating the level of debt to operating cash flow is important.

OPCFD relates operating cash flow to interest charges and debt-repayment. Low levels of cash flow to debt have been shown to be related to the likelihood of business failure, see Fiedler (1971). Consequently, required rates of return or discount rates should be higher for riskier, more leveraged companies with low levels of operating cash-flow to debt.

3.4 Quality factors for financials

We define financials as Banks, Insurance and Financial Services companies (ICB Industry 8000, Financials). Owing to the specific nature of their business; from both an operating and financing perspective, we distinguish between financial and non-financial companies. For example, working capital, CAPEX and debt are not clearly defined under IFRS or US GAAP for Financials. Consequently, a number of the quality measures discussed, such as operating cash flow and accruals cannot meaningfully be calculated or are not applicable to financial companies.

For financial companies, ROA is the sole measure of profitability. Additionally, the (ROA-GARP) measure in section 3.2 is used to capture growth. No measure of leverage is employed for Financials.

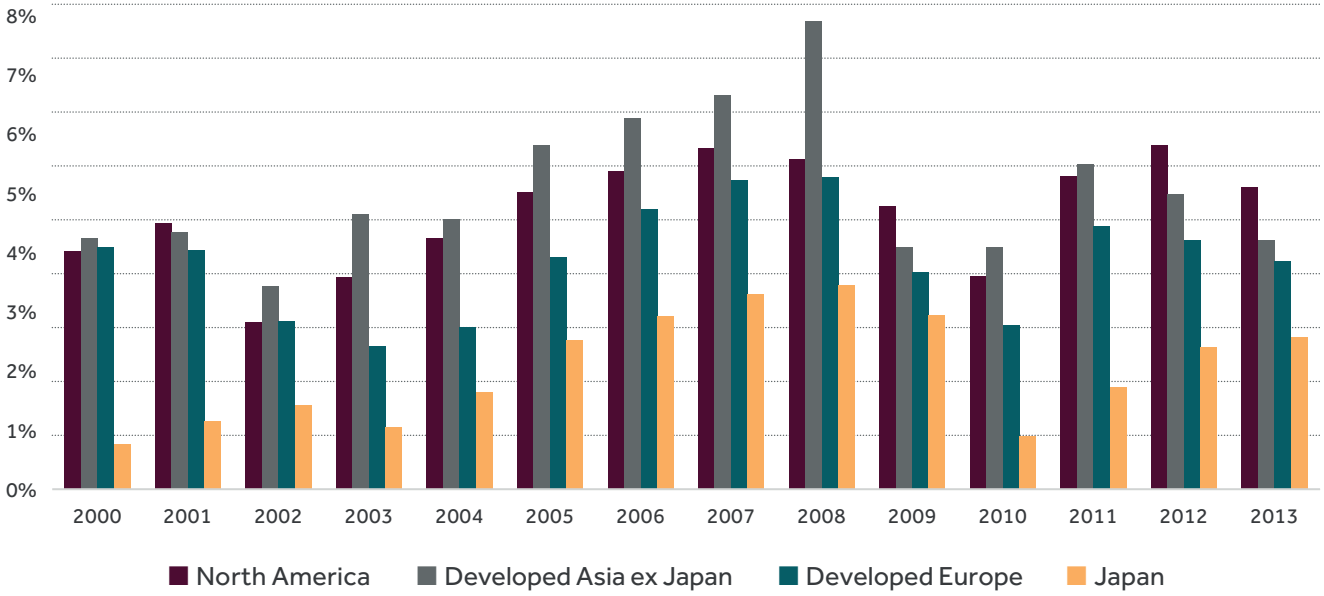
4. Performance

4.1 Factor assessment

We assess the factors discussed in Section 3 by examining both future operating and stock performance. Specifically, we define future earnings as ROA in the next fiscal year. Fundamental differences across regions prompt us to consider each region separately. Figure 1 indicates that the median company ROA varies systematically over time and across regions, with North America exhibiting the highest and Japan the lowest levels of ROA.

The remainder of this section examines the simulated performance of each quality measure. We examine the operating performance of constituents of the FTSE Developed Index over the period September 2000 to September 2013. All accounting data is lagged by six months in these back-tests.

Figure 1: Median ROA by Region (Sep 2000–2013)



Source: FTSE. September 2000 to September 2013. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

4.2 Profitability (ROA, change in ATO and accruals)

Table 1 displays the equally-weighted average future profitability (ROA in the next fiscal year) for North America (for other regions see Appendix A3) between fiscal years 2000 and 2012. Specifically, each fiscal year we sort firms into three groups based on the current level of ROA. Within each ROA group, we sort firms on the current year change in ATO. Stocks with missing data, no future ROA or that are loss making in the current fiscal year are removed.

Stocks that exhibit both high current ROA and high changes in ATO form the group in the bottom right corner of each table (High-High group), whilst those with low current ROA and small changes in ATO form the group in the top left corner (Low-Low group). The fourth column and first row report the average *future* ROA from independent sorts on changes in ATO and *current* ROA respectively.

A high current level of ROA signals high levels of future profitability. For example, in North America the high current ROA group on average exhibits future ROA of 19.8%, compared to 7.1% for the low current ROA group. Furthermore, larger changes in ATO incrementally signal higher future average levels of profitability. Stocks with both high current ROA and large changes in ATO had on average future profitability of 21.4% compared to 19.8% for all high current ROA stocks and 6.8% for stocks with both low current ROA and small changes in ATO. Within each ROA group, stocks with larger changes in ATO exhibit higher than average future profitability.

These results are broadly confirmed in all regions, suggesting that sustainable profitability may be identified by current ROA together with the change in ATO. Current ROA is related to future ROA; yet high ROA prompted by increases in operational efficiency is likely to be more durable.

Table 1. Average Future ROA – North America (2000 – 2012)

		Chg. in ATO			
		Low	2	High	AVG
ROA	Low	6.8	7.0	7.6	7.1
	2	11.2	11.1	12.3	11.5
	High	19.2	18.8	21.4	19.8
	AVG	13.0	11.5	14.0	

Source: FTSE Russell. FTSE North America 2000 to 2012. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

Table 2 contains the simulated historical performance metrics of equally weighted quintiles formed on profitability and changes in ATO. Each September, we sort constituents of the FTSE Developed (ex Financials) for each region into five groups based on these measures. Securities with the highest average ROA and change in ATO ranks form the high quintile group, whilst those with the lowest composite rank form the low quintile group. Historically, the high scoring group has performed better than the low scoring group, in terms of performance and lower volatility and draw-downs. Furthermore, the high scoring groups consistently exhibit lower levels of systematic risk (beta) than the low scoring group.

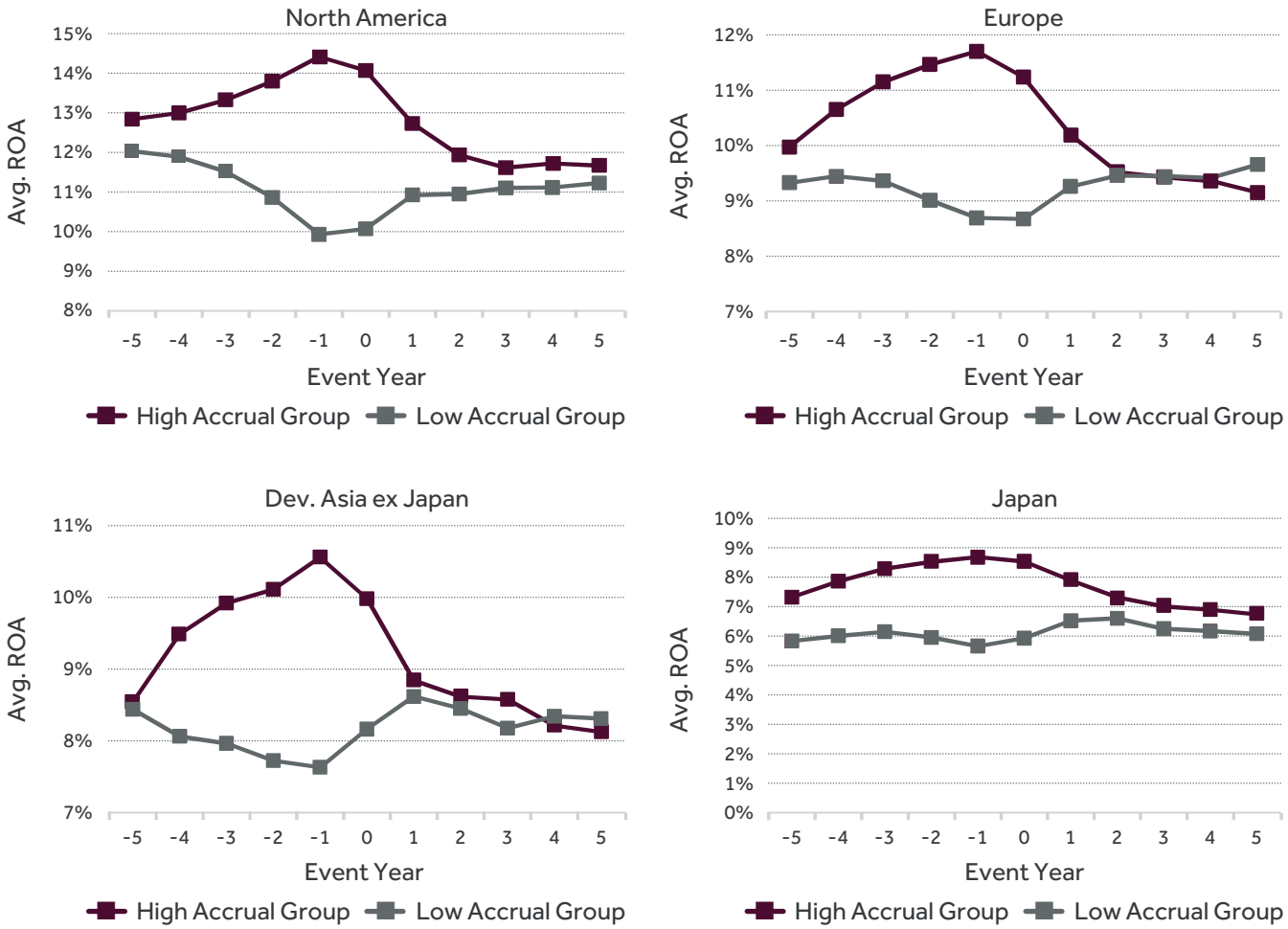
Table 2. Performance of ROA + Change in ATO (FTSE Developed ex Financials, Total Returns in EUR, Sep 2000 – Mar 2014)

Quintile by Region	Developed Europe		North America		Developed Asia ex Japan		Japan	
	Low	High	Low	High	Low	High	Low	High
Return (%p.a.)	4.30	6.97	4.62	7.12	8.43	10.21	-0.32	1.24
Volatility (%p.a.)	19.91	17.71	22.57	20.45	19.71	18.14	22.73	22.27
Sharpe Ratio	0.22	0.39	0.20	0.35	0.43	0.56	-0.01	0.06
Max DD (%)	-60.09	-54.97	-58.70	-44.49	-55.56	-54.68	-48.31	-52.46
Excess Returns (%p.a.)	2.26	4.88	4.16	6.64	1.58	3.25	2.79	4.40
Tracking Error (%p.a.)	7.36	7.38	8.23	6.36	8.59	8.10	8.02	7.15
Information Ratio	0.31	0.66	0.50	1.04	0.18	0.40	0.35	0.62
Alpha (%p.a.)	2.50	5.03	4.35	6.44	2.44	4.31	2.66	4.10
Alpha (T stat)	1.31	2.98	1.98	4.04	1.10	2.21	1.27	2.22
Beta	0.91	0.81	0.97	0.90	0.89	0.83	0.93	0.92

Source: FTSE Russell. September 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

In addition to ROA and changes in ATO, we assess Total Accruals over fiscal years 2000 – 2012. Figure 2 illustrates the average trailing and future profitability (ROA) of groups of stocks sorted on the current level of accruals. Each fiscal year, we separately sort firms into three groups based on the current level of Total Accruals. Stocks with no accruals data or future ROA data are removed. On average, the number of stocks in each group ranges from 80 (Developed Asia ex Japan) to 170 (North America) per year. It is evident from the charts that the high accrual groups experience rising profitability in the five years prior to group formation and declining profitability in the subsequent five years. In contrast, the low accrual groups exhibited declining profitability in the five years preceding group formation and rising profitability in the period post group formation.

Figure 2. Average Profitability (ROA): Pre and Post High/Low Accrual Group Formation (FTSE Developed Index, ex Financials), 2000 –2012



Source: FTSE Russell. 2000 to 2012. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

Various definitions of accruals have been developed since Sloan (1996). Sloan (1996) defines Current Accruals as the change in net current operating assets minus depreciation deflated by average total assets. Richardson et al (2005) propose a measure of accruals spanning both current and non-current operating assets, deflated by prior-year net operating assets. Richardson et al (2005) broaden this definition by including financial assets. Table 3 illustrates the historical, equally-weighted performance metrics of high and low accrual quintiles formed annually in September using these three definitions of accruals for Developed Europe ex financials (for other regions see Appendix A3). The accrual measures perform differently in each region over the period examined. Broadly, companies with lower levels of accruals are rewarded by the market. This is true in all regions and particularly for the Total Accruals measure.

Table 3. Performance of Accrual measures (FTSE Developed Europe ex Financials, Total Returns in EUR, Sep 2000 – Mar 2014)

	Current accruals		Current + Non-current accruals		Total accruals	
	Low	High	Low	High	Low	High
Return (%p.a.)	3.62	5.28	7.76	3.52	6.00	2.14
Volatility (%p.a.)	18.61	19.35	18.29	19.60	17.98	19.88
Sharpe Ratio	0.19	0.27	0.42	0.18	0.33	0.11
Max DD (%)	-56.54	-62.47	-56.37	-59.78	-53.15	-61.87
Excess Returns (%p.a.)	1.60	3.22	5.66	1.49	3.93	0.14
Tracking Error (%p.a.)	6.94	8.18	6.98	7.01	7.22	7.55
Information Ratio	0.23	0.39	0.81	0.21	0.54	0.02
Alpha (%p.a.)	1.81	3.50	5.74	1.72	4.10	0.42
Alpha (T stats)	1.07	1.69	3.45	0.96	2.44	0.21
Beta	0.86	0.87	0.84	0.90	0.83	0.91

Source: FTSE Russell. FTSE Developed Europe ex Financials September 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

4.3 Growth

The use of growth as quality proxy is confounded by other considerations; high growth rates tend to attract competitors, driving down growth rates; companies with high past growth rates typically display higher valuation multiples. Consequently, proxies for expected growth take many forms. We highlight the empirical results of two measures: ROA-GARP (defined in Section 3.2), where past growth in ROA is adjusted for valuation differences; and ROA growth (the numerator from ROA-GARP).

Table 4 illustrates the simulated historical performance of each growth metric by region for the FTSE Developed ex Financials universe. Specifically, we form equally-weighted quintiles each September on each growth measure. A performance differential between the high and low ROA-GARP quintiles is evident in Asia ex Japan, but somewhat less obvious in North America, Europe and Japan. The ROA growth results display no such effect.

Table 4. Performance of growth (FTSE Developed ex Financials, total returns in EUR, Sep 2000 – Mar 2014)

		Developed Europe		North America		Developed Asia ex Japan		Japan	
		Low	High	Low	High	Low	High	Low	High
	Return (%p.a.)	5.89	6.87	5.09	6.13	6.76	11.17	0.30	0.71
ROA GARP	Volatility (%p.a.)	19.73	19.53	24.90	22.55	19.92	20.43	24.35	22.72
	Sharpe Ratio	0.30	0.35	0.20	0.27	0.34	0.55	0.01	0.03
	Return (%p.a.)	4.90	5.48	4.13	3.90	8.44	9.61	-1.13	-0.02
ROA Growth	Volatility (%p.a.)	19.96	18.80	24.46	22.51	19.45	20.13	24.70	22.80
	Sharpe Ratio	0.25	0.29	0.17	0.17	0.43	0.48	-0.05	0.00

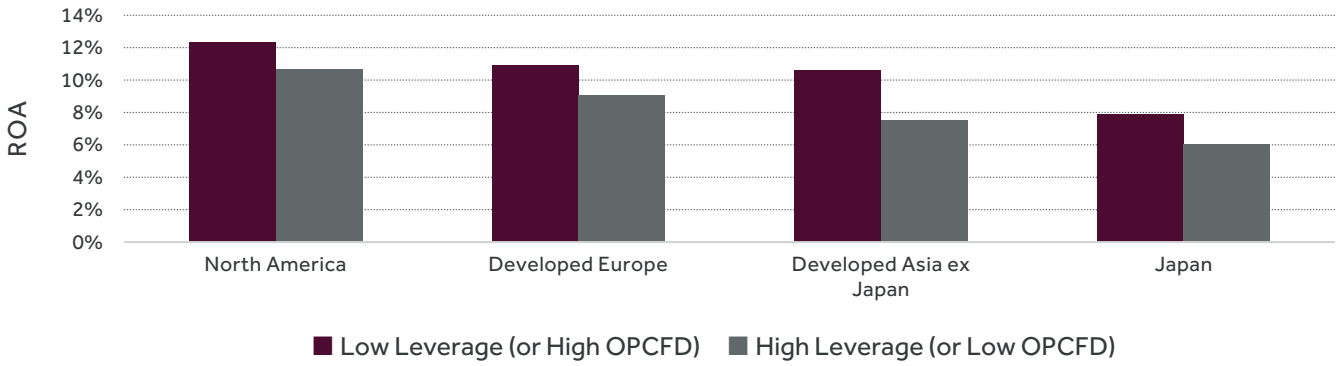
Source: FTSE Russell. September 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

4.4 Leverage

Figure 3 illustrates the realised future profitability of groups formed on the regional industry relative measure of leverage (OPCFD). Each fiscal year, firms within each region are sorted into three groups by relative OPCFD and the average *future* level of profitability (ROA) calculated. Note high OPCFD represents low leverage firms.

Within all regions there is a strong inverse relationship between the level of leverage and future levels of profitability. On average, companies in the high leverage group borrow nearly half of their total assets (~38-42%), implying a Debt to Equity Ratio of ~70%, whilst companies in the low leverage group on average borrow around 4-10% of their total assets. Simple measures of leverage exhibit a strong industrial bias. For example, technology companies are more likely to be represented in the low leverage group, whilst utilities are disproportionately present in the high leverage group. We therefore use an industry relative measure of leverage.

Figure 3. Realised Future Profitability of Industry Relative OPCFD by Region, Sep 2000 – Sep 2013



Source: FTSE Russell. September 2000 to September 2013. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

Table 5 illustrates the simulated historical equally weighted performance of high and low quintiles for each region, formed on the industry relative measure of OPCFD. Quintiles are rebalanced annually in September. On average the low leverage quintile has historically exhibited higher performance and lower levels of volatility and systematic risk than their high leverage equivalents.

Table 5. Performance of Leverage (FTSE Developed ex Financials, Total Returns in EUR, Sep 2000 – Mar 2014)

Quintile by Region	Developed Europe		North America		Developed Asia ex Japan		Japan	
	High	Low	High	Low	High	Low	High	Low
Return (%p.a.)	2.01	7.07	4.91	6.83	6.20	8.44	-1.09	-1.06
Volatility (%p.a.)	19.37	17.68	23.60	19.92	20.71	18.27	23.35	21.54
Sharpe Ratio	0.10	0.40	0.21	0.34	0.30	0.46	-0.05	-0.05
Max DD (%)	-63.88	-53.08	-58.81	-44.95	-61.21	-59.27	-57.20	-59.28
Excess Returns (%p.a.)	0.02	4.98	4.44	6.36	-0.51	1.59	2.00	2.03
Tracking Error (%p.a.)	7.77	7.48	8.57	6.69	8.99	8.76	6.70	7.15
Information Ratio	0.00	0.67	0.52	0.95	-0.06	0.18	0.30	0.28
Alpha (%p.a.)	0.31	5.12	4.74	6.14	0.21	2.79	2.05	1.63
Alpha (T stats)	0.16	3.00	2.07	3.77	0.09	1.31	1.15	0.91
Beta	0.88	0.81	1.01	0.87	0.93	0.82	0.97	0.89

Source: FTSE Russell. September 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

4.5 Financials

As discussed in section 3.4, within Financials we restrict our attention to a single measure of profitability (ROA) in conjunction with the preferred measure of growth (ROA-GARP). Table 6 illustrates the simulated historical performance metrics from forming equally weighted quintiles on the composite rank of these two measures within financials. The High and Low columns represent the performance of the top and bottom ranked companies respectively. Table 6 suggests that a composite of ROA and ROA-GARP only distinguishes high and low quality financial firms in North America and Europe in terms of performance and volatility reductions. Within Developed Asia Pacific ex Japan and Japan, these metrics have historically shown no ability to distinguish between high and low quality financial companies.

Table 6. Performance: Composite ROA and ROA–GARP (FTSE Developed financials, Total Returns in EUR, Sep 2000 – Mar 2014)

Quintile by Region	Developed Europe		North America		Developed Asia ex Japan		Japan	
	Low	High	Low	High	Low	High	Low	High
Return (%p.a.)	1.01	2.34	0.82	4.03	11.89	11.74	-2.85	-2.60
Volatility (%p.a.)	25.59	20.17	29.14	24.21	20.64	20.95	27.55	28.47
Sharpe Ratio	0.04	0.12	0.03	0.17	0.58	0.56	-0.10	-0.09
Max DD (%)	-78.90	-72.56	-79.84	-63.69	-61.96	-66.27	-65.16	-70.21
Excess Returns (%p.a.)	-0.97	0.34	0.37	3.57	4.82	4.69	0.18	0.44
Tracking Error (%p.a.)	10.93	8.70	15.13	9.98	8.13	10.85	13.25	13.92
Information Ratio	-0.09	0.04	0.02	0.36	0.59	0.43	0.01	0.03
Alpha (%p.a.)	-0.36	0.71	1.83	4.04	5.29	5.63	1.34	1.87
Alpha (T stats)	-0.13	0.31	0.47	1.51	2.46	1.98	0.38	0.51
Beta	1.15	0.90	1.16	1.01	0.95	0.90	1.05	1.08

Source: FTSE Russell. September 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

5. Composite quality factor

5.1 Combining profitability, growth and leverage

Section 4 demonstrated that profitability measures (ROA, Changes in ATO and Total Accruals) and industry relative measures of leverage (OPCFD) exhibit some relationship to future levels of profitability and that this has historically been rewarded by the market. Table 7 summarises the differences in Sharpe Ratio between high and low quintiles formed on each measure. Total Accruals typically generate large spreads in each region, whilst growth metrics have historically shown the smallest spreads in Europe, North America and Japan.

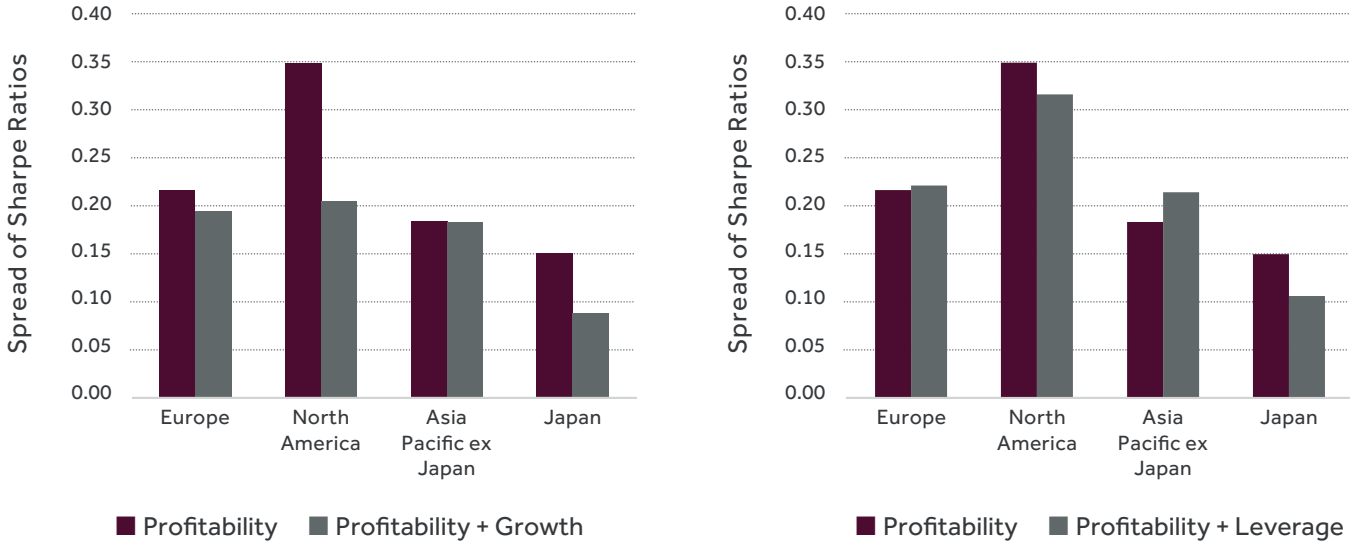
Table 7. Quintile Spread in Sharpe Ratio (FTSE Developed ex Financials, Total Returns in EUR, Sep 2000 – Mar 2014)

	Developed Europe	North America	Developed Asia ex Japan	Japan
ROA and Changes in ATO	0.18	0.14	0.14	0.07
Total Accruals	0.23	0.40	0.15	0.07
Growth (ROA GARP)	0.05	0.07	0.21	0.02
Leverage	0.30	0.14	0.16	0.00

Source: FTSE Russell. September 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

We assess the incremental improvement in the Sharpe Ratios of extreme quintiles, formed from combining profitability measures with leverage or growth measures. Leverage exhibits a small incremental effect in Asia Pacific ex Japan. However, combining growth with profitability has not historically resulted in any incremental improvement in the spread between the Sharpe Ratios of extreme quintiles.

Figure 4. Quintile Spread in Sharpe Ratio (FTSE Developed ex Financials, Total Returns in EUR, Sep 2000 – Mar 2014)



Source: FTSE Russell. FTSE Developed ex Financials September 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

Table 8 examines the degree of independence between the various quality measures discussed. Specifically we show the average rank correlation between annual profitability, growth and leverage rankings in each region; growth exhibits a relatively high correlation with profitability whilst leverage shows relatively low levels of correlation with growth and profitability[4].

Table 8. Average Rank Correlations (Sep 2000 – Sep 2013)

	Profitability vs. GARP	Profitability vs. Leverage	GARP vs. Leverage
Europe	47%	34%	23%
North America	45%	31%	30%
Developed Asia ex Japan	50%	36%	24%
Japan	47%	34%	23%

Source: FTSE Russell. FTSE Developed ex Financials September 2000 to September 2013. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

The potential diversification benefit from combining profitability and leverage, in addition to the incremental improvement shown in Asia ex Japan, prompt us to employ profitability and leverage as quality factors.

[4] Leverage is an industry relative measure. However, the conclusion also holds for an absolute measure of leverage (OPCFD).

5.2 Performance of a global composite quality factor

In this section, we simulate the historical performance of indexes (financials and non-financials) premised on a composite quality measure. Composite quality scores are constructed annually in September, with all fundamental data being lagged by six months.

We form a composite Quality factor by taking an equally weighted average of the composite profitability scores and leverage scores each September. The composite profitability score is the equally weighted average of ROA, Accruals and Change in ATO ranks, where each profitability measure is calculated relative to the regional median.

We rank non-financials on regional relative measures of Accruals and Change in ATO. ROA ranks are determined by regional relative measures of ROA across the whole universe including financials. The Leverage scores are determined by the regional industry relative OPCFD rank for non-financials as described in Section 4.4.

Table 9 displays the simulated equally weighted performance of the resulting quality quintiles. The high quality quintile of stocks has historically displayed outperformance and defensive characteristics (relatively low-beta, volatility and draw-downs) compared to the low quality quintile.

Table 9. Performance: Composite Quality Factor (FTSE Developed, Total Returns in EUR, Sep 2000 – Mar 2014)

	Profitability and Leverage	
	Low	High
Return (%p.a.)	1.84	6.98
Volatility (%p.a.)	17.29	13.64
Sharpe Ratio	0.11	0.51
Max DD (%)	-65.61	-47.64
Excess Returns (%p.a.)	1.03	6.12
Tracking Error (%p.a.)	6.43	7.43
Information Ratio	0.16	0.82
Turnover (%p.a.)	83	115
Alpha (%p.a.)	1.20	6.05
Alpha (T stats)	0.70	3.86
Beta	0.95	0.73

Source: FTSE Russell. FTSE Developed September 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

5.3 Historical performance of broad quality factor indexes

The simulations detailed in Section 5.2 do not result in a practical index, exhibiting two-way turnover in excess of 100% per annum. We illustrate the simulated performance of a more pragmatic quality index in Table 10. Briefly, we map the normalised composite quality measure (Z-Score) to a score in the range of zero to one using a cumulative normal mapping. This score is then combined with a stock's

weighting in a capitalisation weighted underlying index to determine individual stock weightings in the factor index. The approach is tantamount to a factor tilt on an underlying index, where the strength (and number) of any tilts and the degree of diversification maybe controlled. This approach is detailed in the paper 'Factor Exposure Indexes – Index Construction Methodology', FTSE (2014).

Table 10 illustrates the simulated performance by region. Each pair of columns represents a quality index formed by tilting an underlying capitalisation weighted index towards quality. We also show the average factor exposure and capacity of the resulting factor index. Factor exposure is defined as the weighted sum of factor Z-Scores. We assess potential investment capacity using the weighted capacity ratio (WCR). Let $\widehat{W}_i$ be the weights of the factor index for which we are computing capacity and W_i the weights of the corresponding market capitalisation weighted index.

$$WCR = \sum_{i=1}^{N} \widehat{W}_i * \frac{\widehat{W}_i}{W_i}.$$

The level of WCR is inversely related to investment capacity and is defined relative to the capitalisation weighted index WCR, which assumes a value of one.

Table 10 indicates that all quality indexes exhibit defensive characteristics. The volatility of the quality indexes is lower than that of the underlying capitalisation weighted index. All quality indexes exhibit a sub-market beta. Average factor exposure is approximately 0.5 compared to zero exposure for the underlying index. The quality indexes exhibit the required positive tilt towards quality. The average WCR suggests that quality indexes exhibit comparable levels of capacity to the underlying capitalisation weighted index.

Table 10. Performance of FTSE Quality Factor (Total Returns in EUR, Sep 2000 – Mar 2014)

Region	Developed Europe		North America		Developed Asia ex Japan		Japan	
Index name	Quality	Developed Europe	Quality	North America	Quality	Developed Asia ex Japan	Quality	Japan
Return (%p.a.)	2.82	1.99	1.56	0.45	5.81	6.74	-3.11	-3.03
Volatility (%p.a.)	18.70	20.36	20.07	21.74	20.32	20.10	22.13	23.03
Sharpe Ratio	0.15	0.10	0.08	0.02	0.29	0.34	-0.14	-0.13
Max DD (%)	-53.15	-58.15	-54.06	-62.91	-56.56	-58.25	-66.13	-64.58
Excess Returns (%p.a.)	0.81		1.11		-0.87		-0.09	
Tracking Error (%p.a.)	2.84		2.72		4.62		3.37	
Information Ratio	0.29		0.41		-0.19		-0.03	
Turnover (%p.a.)	32.15		27.46		36.58		32.44	
Beta	0.91		0.92		0.98		0.95	
Average Exposure	0.47	0.05	0.50	0.11	0.51	0.05	0.53	0.01
Average WCR	1.09	1.00	1.04	1.00	1.12	1.00	1.09	1.00

Source: FTSE Russell. September 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

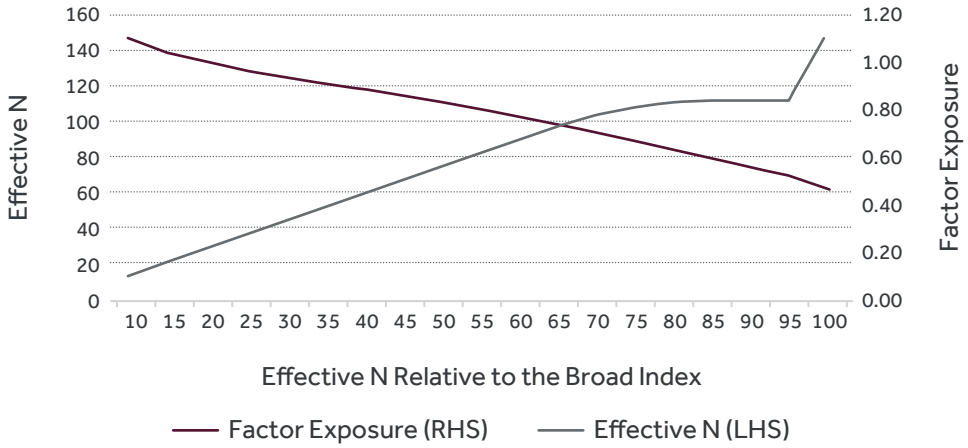
5.4 Narrowing of broad quality indexes

A broad quality index retains all underlying index constituent stocks. The aggregate index level factor exposure may be improved, by removing from the broad index, stocks with the smallest contribution to index level factor exposure. Specifically, we calculate the factor contribution of each stock in the broad index (broad value index weight * Z-Score). The Effective N[5] shows the breadth of the index, measured by the effective number of stocks. We then sequentially remove stocks with the smallest factor contribution and recalculate the Effective N, capacity and exposure of the resulting index. This is repeated until the narrow index diversification target of 70% of the broad index Effective N is achieved.

As the diversification target is reduced, the resulting narrow index becomes increasingly concentrated and a greater exposure to the quality factor is achieved. Figure 5 shows the trade-off between average factor exposure and the breadth of the index, measured by the effective number of stocks (Effective N). At around two thirds of the broad index Effective N, we achieve noticeable improvements in factor exposure without compromising the diversification levels exhibited by the index.

[5] Effective Number of Stocks is defined as, where N is the total number of stocks and $1/\sum_{i=1}^{N} w_i^2$ represents stock weights.

Figure 5. Average Factor Exposure and Effective N of Quality Indexes (Sep 2000 – Mar 2014)



Source: FTSE Russell. FTSE Developed September 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

Table 11 shows that historically, narrow indexes exhibit systematically higher levels of exposure to the desired factor compared to the broad index, whilst remaining diversified. The two-way turnover figures in Tables 10 and 11 indicate that the narrow quality indexes exhibit higher turnover than the broad indexes. The risk-adjusted performance of the narrow quality indexes is comparable to their broad counterparts.

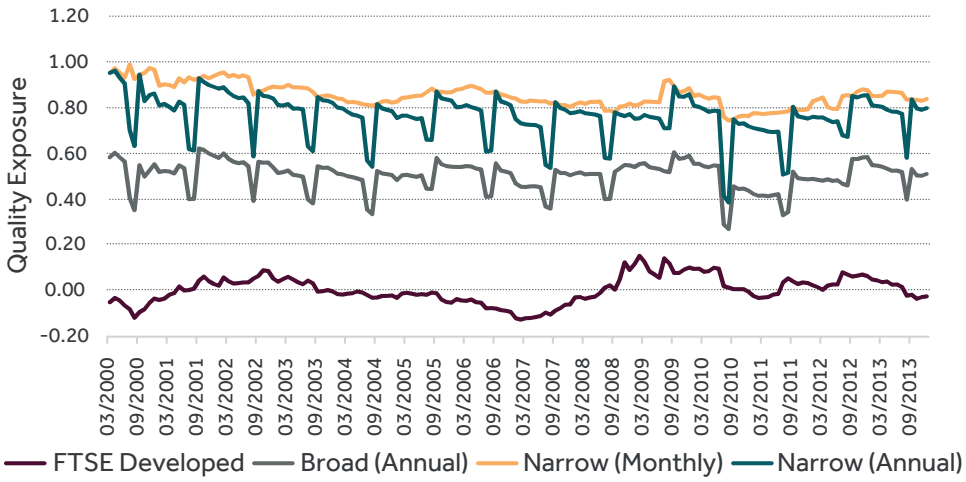
Table 11. Performance of Narrow Quality Indexes, (Total Returns in EUR, Sep 2000 – Mar 2014)

Region	Developed Europe		North America		Developed Asia ex Japan		Japan	
Index name	Quality	Developed Europe	Quality	North America	Quality	Developed Asia ex Japan	Quality	Japan
Return (%p.a.)	3.36	1.99	2.18	0.45	6.03	6.74	-3.02	-3.03
Volatility (%p.a.)	18.35	20.36	19.68	21.74	20.44	20.10	21.81	23.03
Sharpe Ratio	0.18	0.10	0.11	0.02	0.30	0.34	-0.14	-0.13
Max DD (%)	-53.04	-58.15	-52.61	-62.91	-56.48	-58.25	-66.67	-64.58
Excess Returns (%p.a.)	1.34		1.72		-0.66		0.01	
Tracking Error (%p.a.)	3.75		3.76		5.06		4.51	
Information Ratio	0.36		0.46		-0.13		0.00	
Turnover (%p.a.)	44		37		44		61	
Beta	0.89		0.89		0.99		0.93	
Average Exposure	0.65	0.05	0.62	0.11	0.75	0.05	0.79	0.01
Average WCR	1.09	1.00	1.17	1.00	1.13	1.00	1.09	1.00

Source: FTSE Russell. FTSE Developed September 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

Figure 6 shows the historical quality exposure of a set of quality indexes for the FTSE Developed universe using alternative rebalance frequencies. A monthly rebalance provides an indication of the upper limit to the level of quality exposure that may be achieved. Figure 6 suggests that the application of the narrowing process and a low rebalance frequency (annual) is an appropriate mechanism for maintaining index level exposure to quality.

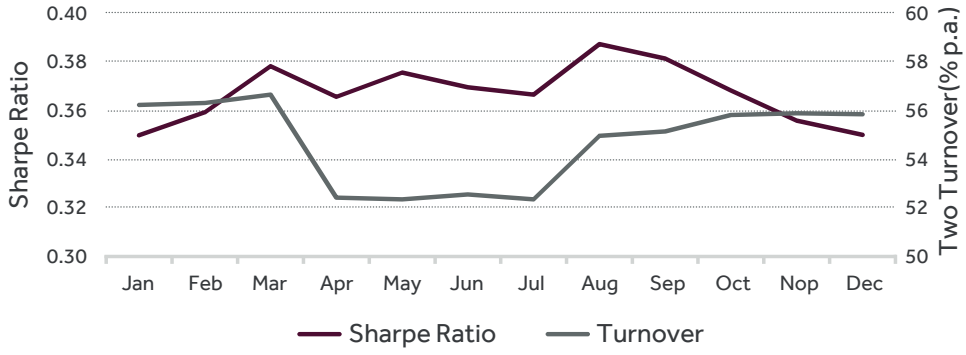
Figure 6. FTSE Developed: Exposure of Broad and Narrow Quality Indexes



Source: FTSE Russell. FTSE Developed March 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

To ensure the results are robust to the timing of the annual rebalance, we examine the outcomes of annual rebalances that follow different rebalance cycles (January to January, February to February, etc). Figure 7 confirms that simulated risk-adjusted performance outcomes, i.e. Sharpe Ratios and two-way turnover outcomes are insensitive to the timing of the annual rebalance.

Figure 7. FTSE Developed Narrow Quality Indexes, Annual Rebalance: Sharpe Ratios and Two-Way Turnover

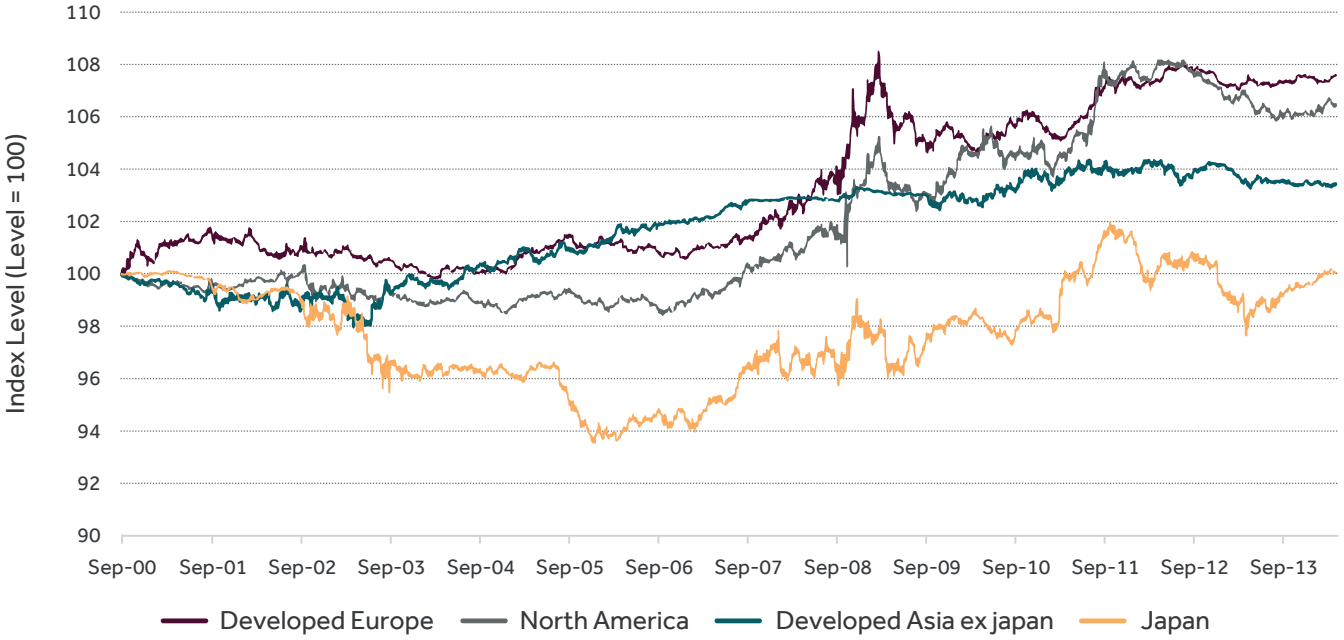


Source: FTSE Russell. FTSE Developed September 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

Figure 8 shows the relative performance of narrow broad quality indexes by region. Japan aside, narrow quality indexes, with higher levels of quality exposure, outperform during turbulent times. In particular, Developed Europe and North America display a pronounced uplift in relative performance around 2007-2008 and

late 2011 and relatively flat performance in other periods. Quality is not continuously rewarded and periods of reward tend to coincide with periods of crisis when quality characteristics are most required and consequently in the greatest demand.

Figure 8. Relative Performance of Narrow Quality versus Broad Quality



Source: FTSE Russell. September 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

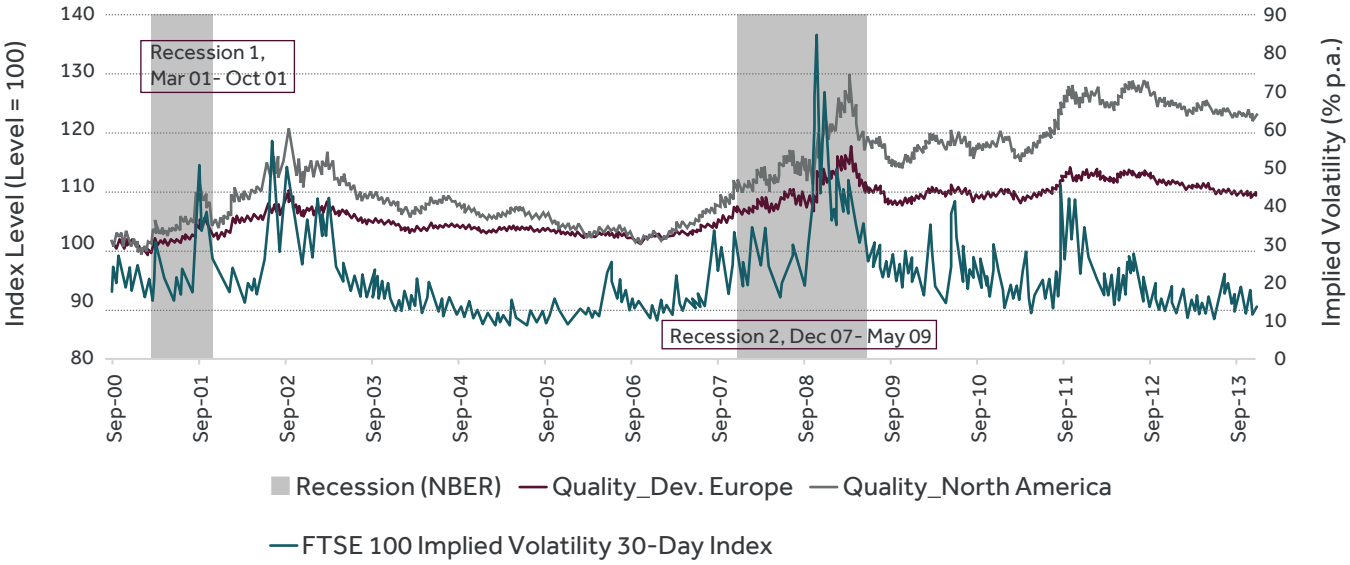
5.5 Performance: Alternative market environments

Figure 9 shows the relative performance of broad quality indexes (capitalisation weighted underlying) for FTSE Developed Europe and FTSE North America across different market environments. Periods highlighted in grey are NBER contractions in the US business cycle.[6] Business cycle classifications are based on GDP; a slow moving and backward looking indicator. Market sentiment generally anticipates future economic difficulties and high quality stocks have a tendency to perform in recessionary periods.

Consequently, one interpretation of any quality premium is that it reflects an insurance risk premium against poor economic conditions. High quality stocks are relatively insensitive to the macro-economic environment and any quality premium typically arises during turbulent times. In more tranquil periods, quality is not rewarded as economic sensitivity is perceived as unimportant.

We also overlay the FTSE 100 Implied Volatility 30-Day Index (IVI Index) on Figure 9. Increases in the IVI Index indicate a greater degree of uncertainty and coincide with periods of quality outperformance; when uncertainty is prevalent, performance is largely driven by perceptions of safety, hence "a flight to quality".

Figure 9. Relative Performance of Quality indexes vs. FTSE 100 Implied Volatility Index (Sep 2000 – Oct 2013)



Source: FTSE Russell. September 2000 to October 2013. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

[6] http://www.nber.org/cycles.html

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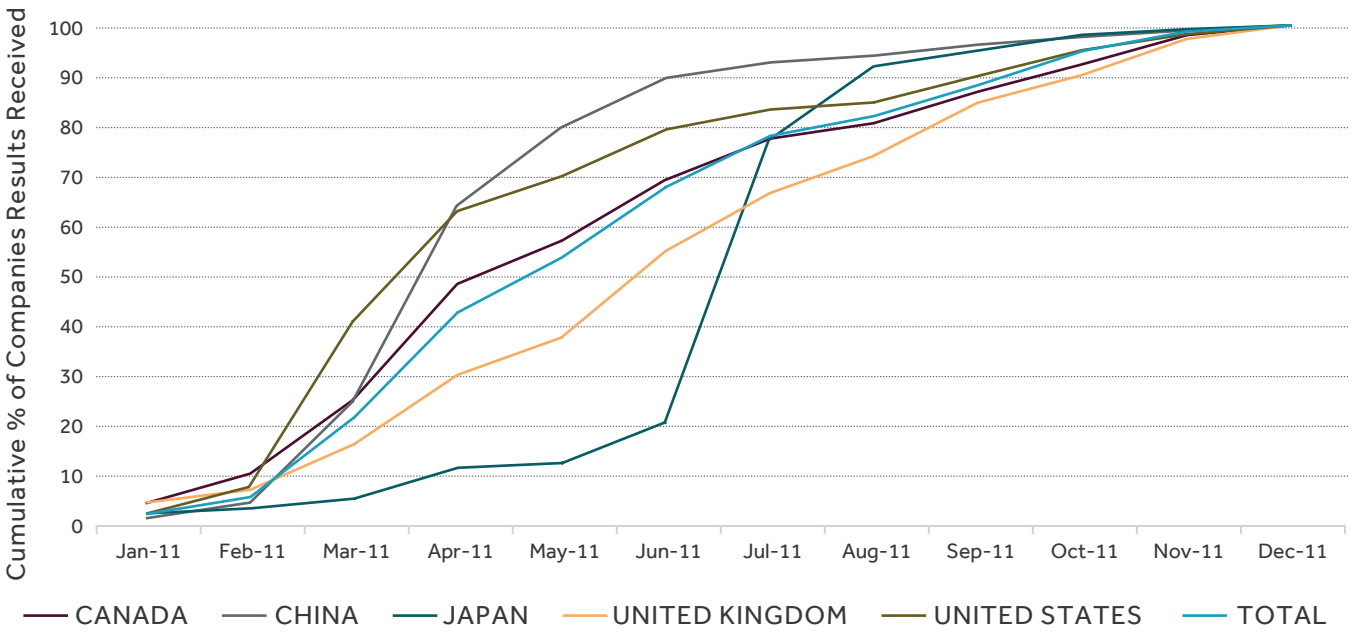
Appendices

A1 Fundamental Data and Rebalance Timing

Figure A1 shows the cumulative percentage of final company results received by Worldscope in 2011 by month. This pattern applies in other years, as companies in aggregate, rarely change their reporting year end. By the end of September, fundamental data for the majority of large countries is typically available in Worldscope.

Figure A 1. Worldscope Data: Cumulative Percentage Update by Month



Source: FTSE Russell and Worldscope. 2011. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

A2 Definitions

- $ROA_t = {}^{\text{Net Income}_t}/_{\text{average(Total Assets over prev. 2 years)}}$
- $ATO_t = {}^{\text{Sales}_t}/_{\text{Total Assets}_t}$
- $\Delta ATO = ATO_t - ATO_{t-1}$
- Profit Margin = Net Income / Sales
- Current Accruals = ΔWC-Depreciation

Where

ΔWC = (ΔCurrent Assets – ΔCash & Short Term Investment) – (ΔCurrent Liability – ΔShort Term Debt)

- Current+Non-current Accruals = (ΔTotal Assets – ΔCash)

  – (ΔTotal Assets – ΔShort-Term Debt – ΔLong-Term Debt

  – ΔMinority Interests – ΔCommon Equity – ΔPreferred Stock)
- TACC = ΔWC + ΔNCO + ΔFIN

Where

ΔNCO = (ΔTotal Assets – ΔCurrent Assets – ΔCurrent Assets – ΔInvestment and Advances)

– (ΔTotal Liabilities – ΔCurrent Liabilities – ΔLong-Term Debt)

ΔFIN = (ΔShort Term Investment + ΔLong Term Investment)

– (Δlong Term Debt + ΔShort Term Debt + ΔPreferred Stock)

- ROA Growth = (Net Income$_t$ – Net Income$_{t-5}$) / avg(Total Assets over the prev. 5 years)
- OPCFD = Operating Cash Flow / Total Debt
- OPCFA = Operating Cash Flow / Total Assets
- Debt/Assets = Total Debt / Total Assets

A3 Performance Characteristics in Other Regions

Table A 1. Average Future ROA, Developed Europe (2000 – 2012)

		Chg. in ATO			
		Low	2	High	AVG
ROA	Low	4.8	5.2	5.4	5.1
	2	8.2	8.5	9.1	8.6
	High	15.8	15.2	19.3	16.7
	AVG	9.9	9.1	11.4	

Source: FTSE Russell. FTSE Developed Europe 2000-2012. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

Table A 2. Average Future ROA, Developed Asia ex Japan (2000 – 2012)

		Chg. in ATO			
		Low	2	High	AVG
ROA	Low	4.5	4.6	5.1	4.7
	2	7.5	7.1	8.2	7.6
	High	14.2	12.8	17.2	14.8
	AVG	8.9	8.0	10.1	

Source: FTSE Russell. FTSE Developed Asia ex Japan 2000-2012. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

Table A 3. Average Future ROA, Japan (2000 – 2012)

		Chg. in ATO			
		Low	2	High	AVG
ROA	Low	3.7	3.8	3.9	3.8
	2	5.7	6.0	6.1	5.9
	High	12.4	11.7	12.8	12.3
	AVG	7.6	6.7	7.6	

Source: FTSE Russell. FTSE Japan 2000-2012. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

Table A 4. Performance of Accrual Measures (FTSE Developed North America ex Financials, Total Returns in EUR, Sep 2000 – Mar 2014)

	Current accruals		Current + Non-current accruals		Total accruals	
	Low	High	Low	High	Low	High
Return (%p.a.)	4.96	5.85	8.14	2.05	8.79	0.24
Volatility (%p.a.)	23.21	21.42	21.69	23.85	21.51	24.85
Sharpe Ratio	0.21	0.27	0.38	0.09	0.41	0.01
Max DD (%)	-54.50	-46.81	-55.17	-64.30	-51.60	-64.99
Excess Returns (%p.a.)	4.49	5.38	7.66	1.60	8.31	-0.20
Tracking Error (%p.a.)	8.07	6.51	7.78	8.99	8.06	9.79
Information Ratio	0.56	0.83	0.98	0.18	1.03	-0.02
Alpha (%p.a.)	4.72	5.34	7.56	2.02	8.16	0.37
Alpha (T stats)	2.19	3.13	3.70	0.84	3.87	0.14
Beta	1.00	0.94	0.93	1.02	0.92	1.05

Source: FTSE Russell. FTSE North America ex Financials 2000-2012. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

Table A 5. Performance of Accrual Measures (FTSE Developed Asia ex Japan ex Financials, Total Returns in EUR, Sep 2000 – Mar 2014)

	Current accruals		Current + Non-current accruals		Total accruals	
	Low	High	Low	High	Low	High
Return (%p.a.)	13.23	5.44	10.33	10.17	9.50	7.90
Volatility (%p.a.)	17.59	20.92	17.45	21.71	17.69	20.47
Sharpe Ratio	0.75	0.26	0.59	0.47	0.54	0.39
Max DD (%)	-53.41	-63.05	-50.74	-64.62	-55.25	-61.51
Excess Returns (%p.a.)	6.08	-1.21	3.37	3.22	2.59	1.09
Tracking Error (%p.a.)	8.67	9.32	8.51	9.28	8.72	8.93
Information Ratio	0.70	-0.13	0.40	0.35	0.30	0.12
Alpha (%p.a.)	7.23	-0.49	4.64	3.70	3.86	1.85
Alpha (T stats)	3.57	-0.20	2.36	1.49	1.89	0.79
Beta	0.79	0.93	0.79	0.98	0.79	0.92

Source: FTSE Russell. FTSE Developed Asia ex Japan ex Financials September 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

Table A 6. Performance of Accrual Measures (FTSE Japan ex Financials, Total Returns in EUR, Sep 2000 – Mar 2014)

	Current accruals		Current + Non-current accruals		Total accruals	
	Low	High	Low	High	Low	High
Return (%p.a.)	-1.03	1.06	2.18	-1.68	0.55	-0.97
Volatility (%p.a.)	23.07	22.00	22.04	21.88	22.29	22.25
Sharpe Ratio	-0.04	0.05	0.10	-0.08	0.02	-0.04
Max DD (%)	-54.58	-51.67	-48.47	-58.30	-51.86	-56.51
Excess Returns (%p.a.)	2.06	4.21	5.37	1.39	3.69	2.12
Tracking Error (%p.a.)	6.13	6.92	7.13	6.63	7.19	6.65
Information Ratio	0.34	0.61	0.75	0.21	0.51	0.32
Alpha (%p.a.)	2.04	3.86	4.98	1.09	3.43	1.89
Alpha (T stats)	1.25	2.19	2.73	0.65	1.84	1.10
Beta	0.97	0.91	0.91	0.91	0.92	0.93

Source: FTSE Russell. FTSE Japan ex Financials September 2000 to March 2014. Past performance is no guarantee of future results. Returns shown may reflect hypothetical historical performance. Please see the disclaimer page for important legal disclosures.

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