PGIM QUANTITATIVE SOLUTIONS

THE INNOVATION FACTOR: THE LEADING EDGE OF QUALITY

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There is no clear-cut definition or consensus around what constitutes quality when evaluating a potential investment. Quality factors are designed to identify stocks of companies that are profitable, stable (and are therefore expected to maintain profitability in the future), financially healthy and growing. And while the definition of quality can vary across investors, these attributes broadly capture the spirit of what's typically included in discussion of quality. But of course, there are other firm attributes that can fit into the quality 'bucket'. Our research has shown that a firm's innovation – or its intangible assets – can meaningfully expand on other aspects of firm quality.

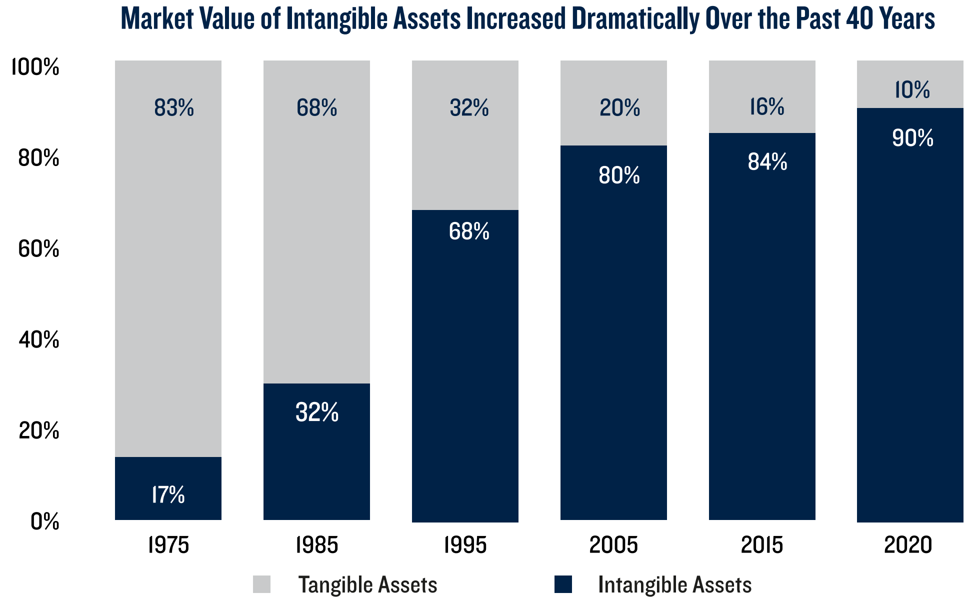
Questions of Quality

In recent years, the quality factor hasn't performed as expected during periods of extreme market upheaval and volatility, leaving active investors to search for answers. We believe there are several explanations for this departure from expectations that relate to how quality factors are constructed. First, quality factors can easily take on biases against firms with negative earnings or no sales. But the absence of earnings or sales may not necessarily equate to low quality, rather, the occurrence may be related to transitory issues that may have little impact on the future growth trajectory of a firm.

Second, quality factors (and many quantitative factors as well) have typically relied on 'hard' information such as financial data from income statements, balance sheets and cash flow statements. However, companies are remarkably multidimensional so 'hard' data may not properly capture the true quality attributes of a firm. This line of thinking has contributed to the interest in ESG issues that relate to company stakeholders. It has also led to increased interest in understanding the 'soft' attributes of firms, such as culture and strategic vision. Lastly, quality factors have generally not adapted to reflect the rise of asset-light or 'weightless' firms[1]. Indeed, over 70% of the market value of companies in the S&P Europe 350 Index is now composed of intangible assets. The trend is even more striking in the US, where that value stands at 90% for the S&P 500 Index (Exhibit 1). Furthermore, intangible assets as a share of GDP overtook tangible assets in the 1990s and continue to rise today. While primarily a developed market phenomenon, there is new evidence that intangibles are also a growing share of total global assets, indicating that this shift in developed markets does not merely reflect the offshoring of manufacturing to emerging markets, but illustrates a more profound global shift.

[1] https://www.pgim.com/megatrends/future-means-business

Exhibit 1: Intangible Assets as a Share of S&P 500 Market Value:



Source: Ocean Tomo, a part of J.S. Held, Intangible Asset Market Value Study, 2020. https://www.oceantomo.com/intangible-asset-market-value-study/

Intangible assets are defined as assets that are not physical in nature. They typically include: research and development, data, design, patents, software, training, intellectual capital, business practices and processes, marketing, digitization and branding, among other things.

Importantly, intangible assets are the hallmark of innovation. Innovation can also be thought of as a 'soft' attribute of a firm. Innovation arguably confers value to a firm that is more forward looking – meaning the innovative focus and potential of a firm should not be influenced by the lack of earnings or sales.

In our research we aim to quantify the innovative focus of a firm and examine its potential as an addition to our quality factor framework.

The Quality of Innovation

Innovation is typically associated with being an attribute related to growth stocks: growth firms that continue to deliver innovative products and services can keep growing. They are more likely to be able to maintain or deliver on growth outlooks, a reasonable expectation for a quality growth stock.

However, innovation is also important for slower-growth, value-oriented stocks. Value firms that innovate can better evolve and navigate short-term challenges that weigh on their stock prices. Moreover, in slower-growth sectors such as Consumer Staples, innovation can support the evolution of supply chain management. Such practices can help slower-growth stocks maintain a competitive advantage and sustain their profitability over time.

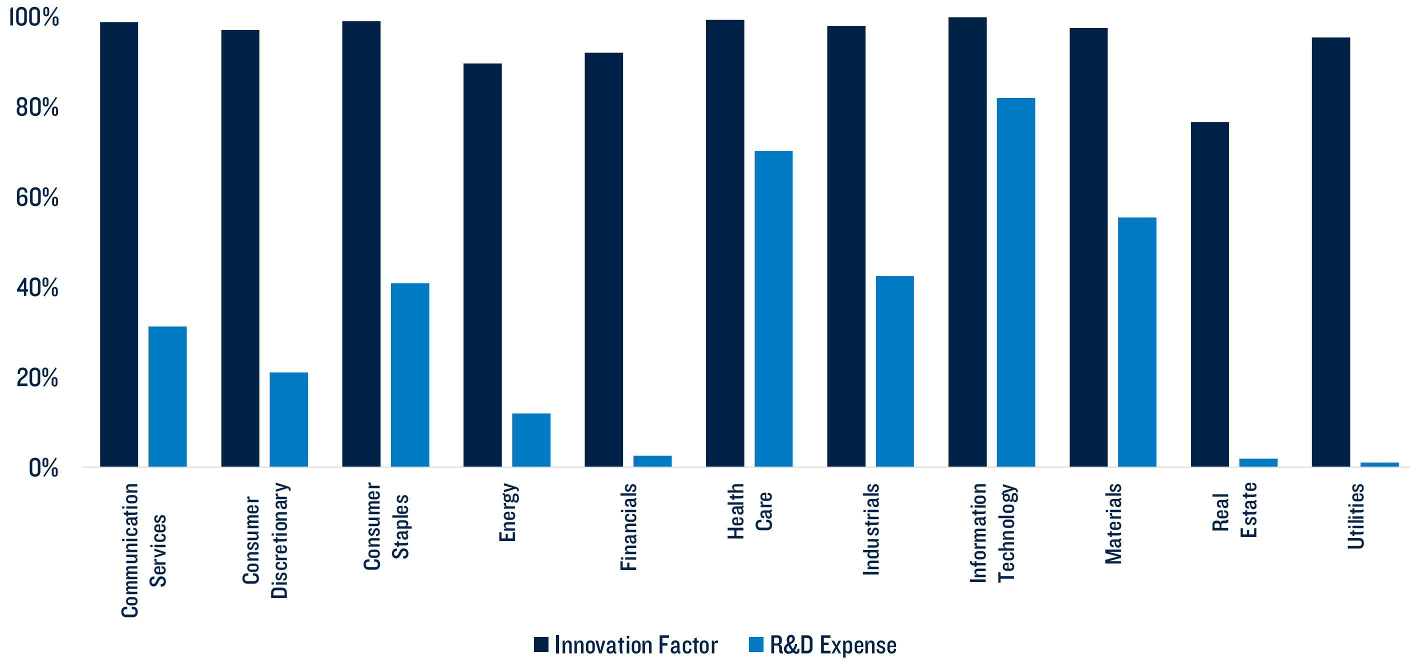
Innovation Beyond Research and Development

The importance of innovation isn't new. Academics have evaluated innovation via research and development (R&D) for nearly 30 years. It's important to understand though that R&D is only one expression of a firm's innovative ability and potential.

Instead, we develop newer computational methods that draw on varied information sources to better quantify innovation. In addition, we incorporate insights related to sector-specific innovative activities. The benefit of our approach is that we are able to generate innovation insights across the majority of our investment universe (Russell 3000).

In Figure 2 we show the average percentage of stocks in each sector that our innovation factor covers, along with the percentage of companies for which R&D expense is available. The coverage difference is striking: R&D coverage is strongest in Information Technology and Health Care. This reflects the notion that R&D is only one expression of innovation. In contrast, our innovation factor typically generates insights across more than 90% of a sector (with Real Estate being the exception).

Figure 2: Average Factor Coverage by Sector

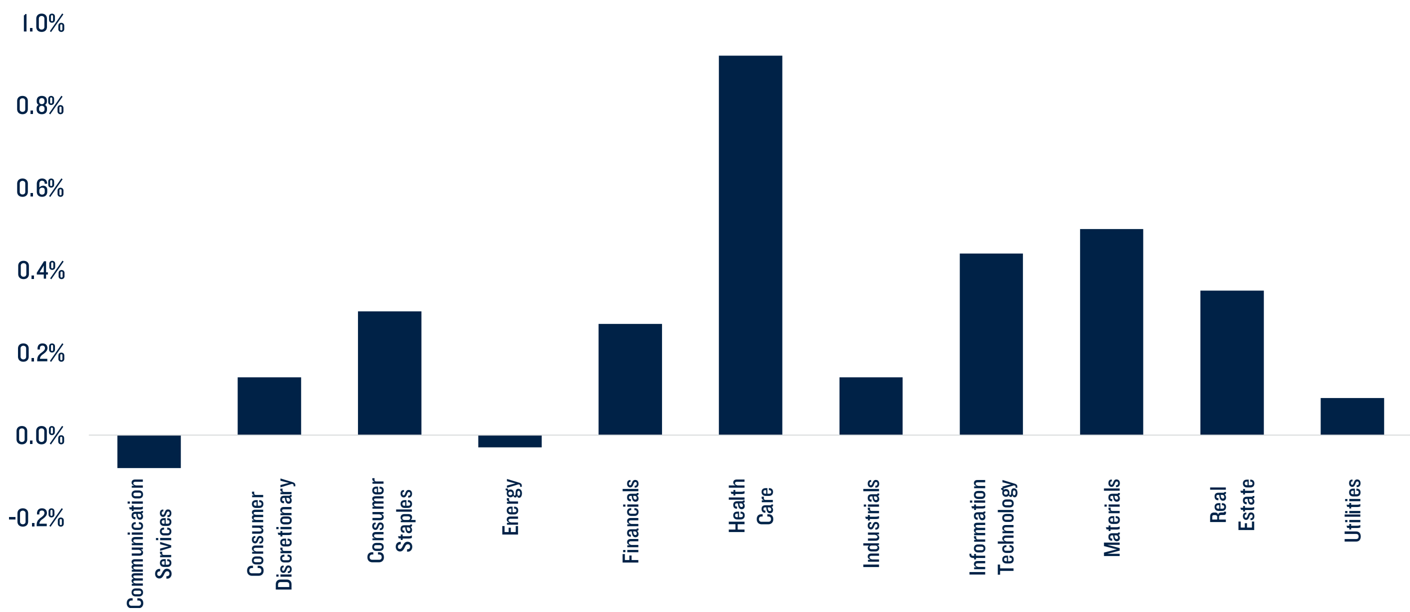


Sources: PGIM Quantitative Solutions, Russell, SEC, S&P. Data from 1/1/2010 - 12/31/2021.

Innovative Firms: Proving Grounds

Because innovation is viewed as being sector specific or varying across sectors, we look at the performance of our innovation factor through a sector lens. Figure 3 shows the average quartile spread returns within each sector.

Figure 3: Average Spread Performance by Sector

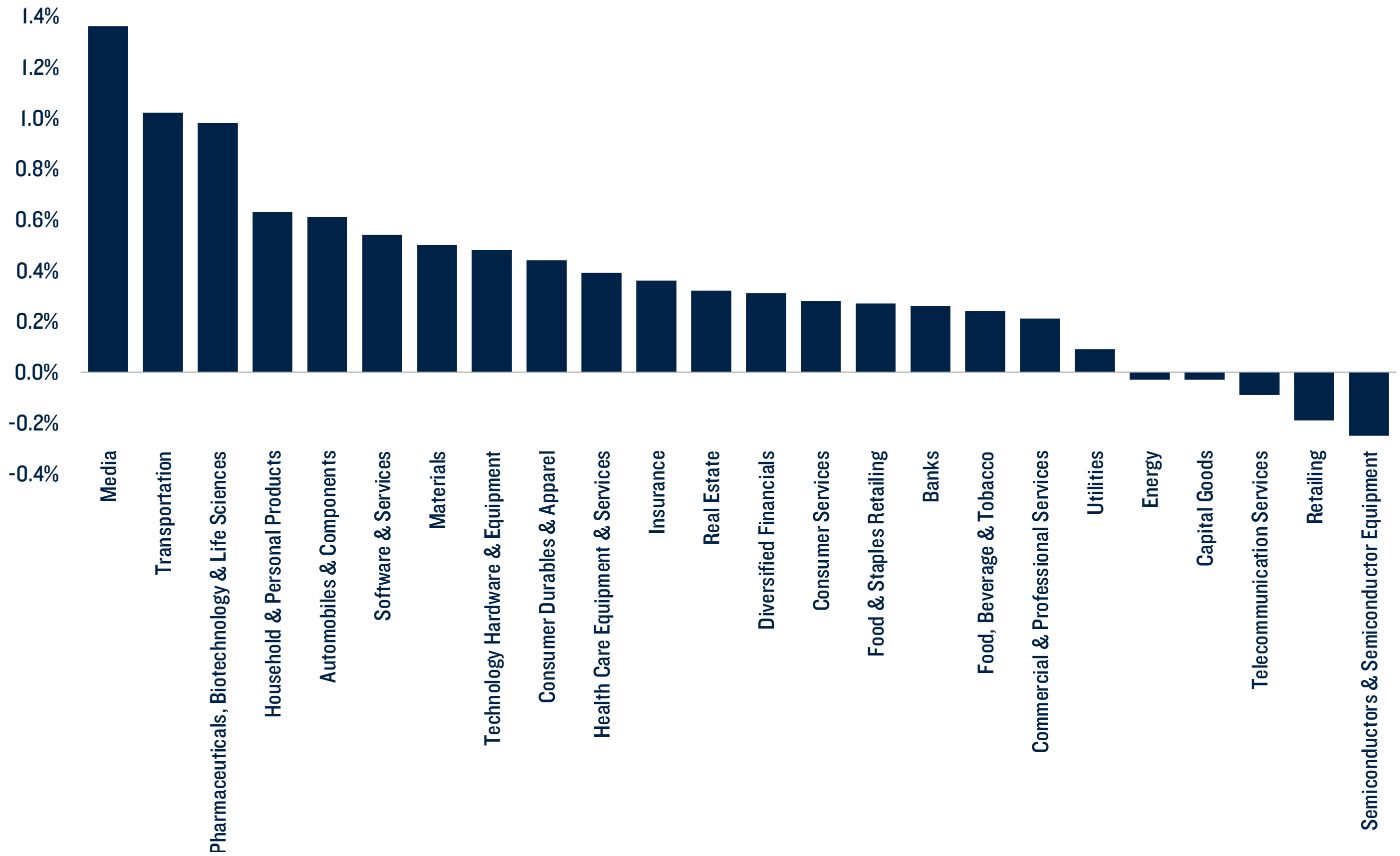


Sources: PGIM Quantitative Solutions, Datastream, Russell, SEC, S&P. Data from 1/1/2010 - 12/31/2021.

Not surprisingly, the innovation factor performs strongly in the Health Care sector with average monthly spread returns of ~90bps. Beyond Health Care, meaningful performance is found across the Consumer Discretionary, Consumer Staples, Financials, Industrials, Information Technology, Materials and even Real Estate sectors. Performance in the Utilities sectors is more muted, while performance in the Communication Services and Energy sectors is negative (which we attribute to low breadth and changing composition within the sectors over time).

Recognizing that sectors are not homogenous in composition, we delve deeper to examine performance at the industry level and find that the factor delivers positive spread performance in 19 out of 24 industries.

Figure 4: Average Spread Performance by Industry



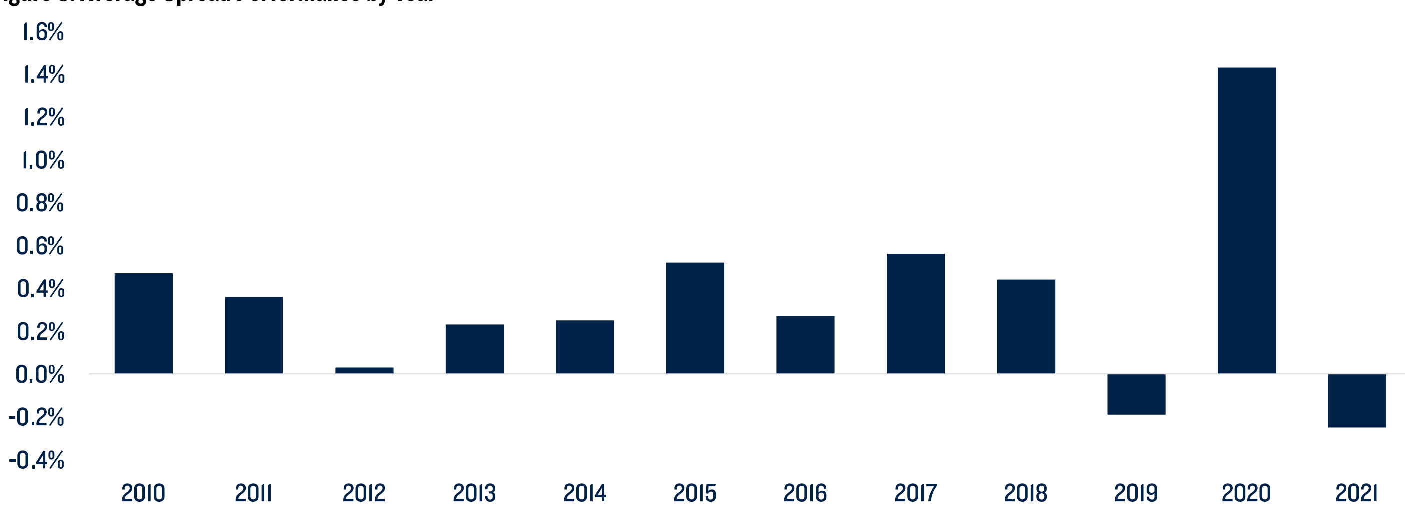
Sources: PGIM Quantitative Solutions, Datastream, Russell, SEC, S&P. Data from 1/1/2010 - 12/31/2021.

Growth of Quality Innovation

While we have shown the innovation factor's effectiveness across most sectors and industries (beyond normal growth segments), there could still be an expectation that the innovation factor behaves more like a growth than a quality signal. To explore this point, we examine the performance of the innovation factor through time. A quality factor is expected to have relatively consistent performance, while growth factors are likely to exhibit more cyclicality.

Figure 5 illustrates that despite fluctuating in recent years, the innovation factor has delivered relatively stable and positive performance from 2010-2018. While 2020's strong returns are considered by many to have been driven by growth, the gains seen that year are attributable in large part to innovative growth, evident in the performance of many 'work from home' stocks. And although the innovation factor underperformed in 2021, when value started to rebound, the weakness was not the same as that witnessed for growth factors. This analysis further supports innovation behaving more like quality than growth.

Figure 5: Average Spread Performance by Year



Sources: PGIM Quantitative Solutions, Datastream, Russell, SEC, S&P. Data from 1/1/2010 - 12/31/2021.

A Perfect Pair: Quality and Innovation

In Figure 6 we evaluate whether innovation is incremental to our existing quality factor. We first sort our investment universe into quartiles based on quality. Then we sort each quality quartile based on innovation. The question we seek to answer is whether there is a meaningful difference in performance between high-innovation and low-innovation stocks within each quality quartile. Figure 7 plots this difference. It is apparent that the innovation factor is much more effective among lower-quality stocks. This is important as it reflects the possibility that our quality factor is misclassifying firms as 'low quality' (due to biases against negative earnings/no sales) and indicates that the innovation factor could be a valuable addition to our quality category of factors.

Figure 6: Innovation Quartile Performance Within Quality Quartiles

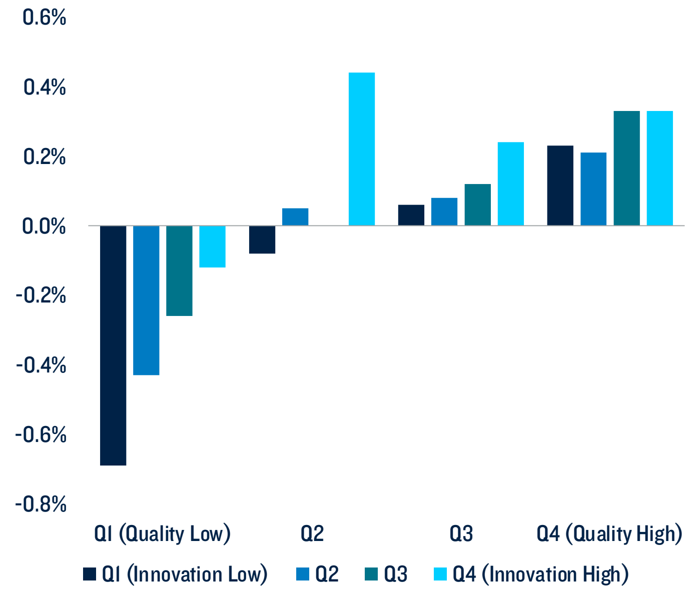
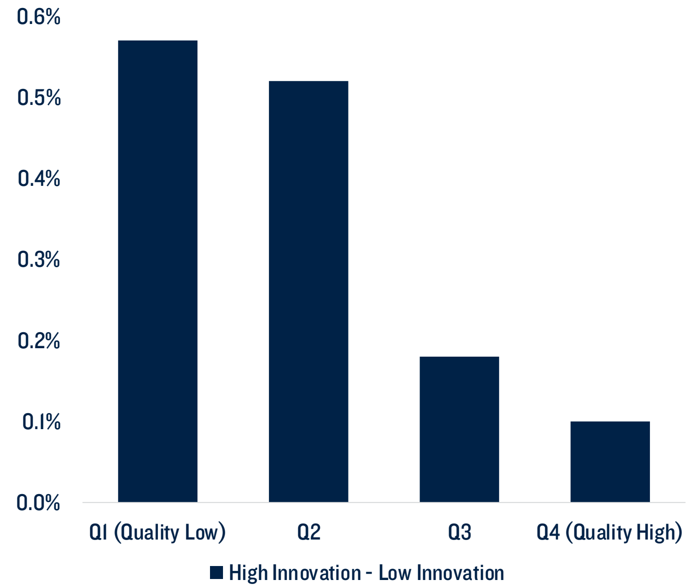


Figure 7: Innovation Spread Performance Within Quality Quartiles



Sources: PGIM Quantitative Solutions, Datastream, Russell, SEC, S&P. Data from 1/1/2010 - 12/31/2021.

Putting It All Together

The premise of this research was to improve our quality factor by identifying quality biases (due to negative earnings/no sales effects) and incorporating important "soft" information that comprises firms' intangible assets. The encouraging outcome of our research is evident in sector and industry performance spreads as well as stability in long-term returns: our innovation factor has superior coverage and delivers meaningful outperformance in nine of 11 sectors and 19 of 24 industries. This addition to our quality factor reflects our ongoing efforts to utilize new analytical methods and alternative data sources to bolster the foundation of our active management process in search of alpha for our clients.

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