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Alternative Thinking Q4 2016: Superstar Investors

U.K Supplement

This document accompanies AQR's 2016 article *Superstar Investors*, which analyzed the performance of four famous investors from a factor perspective. That analysis explored the value of identifying structural edges (factor tilts or otherwise) and then having the patience to stick with them for the long term.

Here, we present additional results for two renowned U.K. fund managers, Neil Woodford and Terry Smith. Our findings confirm that these managers' investment returns are consistent with their stated philosophies. As in the original article, we find that their success has partly been compensation for disciplined exposure to factors that have historically produced excess returns.

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1: Neil Woodford — Value, Low-Risk, Quality

" I am…absolutely convinced that, in the long-term, valuation and fundamentals of a company are the only things that matter and, like gravity, those things will reassert themselves."

– Neil Woodford, Invesco Perpetual.[1]

8/1993-2/2014[2]	Average Return	Volatility	Sharpe Ratio	Annual Outperformance	Information Ratio
Invesco	6.7%	15.3%	0.44	3.1%	0.37
U.K. Equities[3]	3.6%	16.1%	0.22	-	-

Source: AQR, Bloomberg. Returns denominated in USD. Risk-free rate is 1-month T-Bill. Past performance is not a guarantee of future performance; please read important disclosures at the end of this presentation.

We start with the Invesco Perpetual U.K. High Income fund over the period from August 1993 to Febuary 2014. This covers the fund's earliest available data through to Woodford's departure in March 2014.

Over the period, Invesco's High Income fund exhibits higher returns than the U.K. stock market (excess of cash returns of 6.7% versus 3.6%), with slightly lower volatility. The fund's Sharpe ratio is 0.44 compared to 0.22 for the broad market.

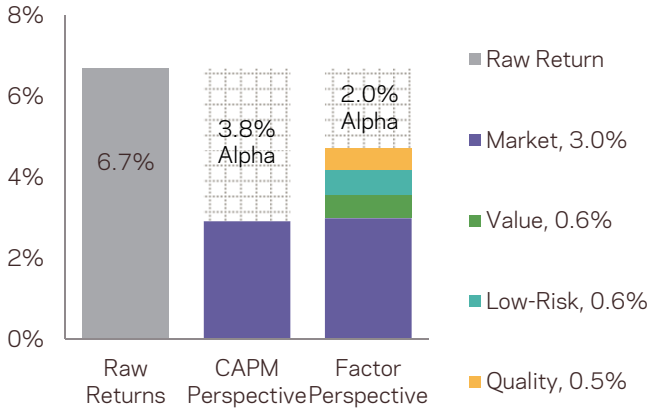
The fund has also produced significant alpha to traditional risk factors. However, we find that this alpha becomes statistically insignificant when controlling for exposure to several systematic investment styles. Specifically, our factors for this analysis are:[4]

- **Market:** the U.K. equity market, represented by the FTSE All-Share Index
- **Value:** the "HML Devil" factor[5] from AQR's data library (U.K. universe)
- **Low-Risk:** the "Betting-Against-Beta" (BAB) factor[6] from AQR's data library (U.K. universe)
- **Quality:** the "Quality-Minus-Junk" (QMJ) factor[7] from AQR's data library (U.K. universe)

Our regression results are presented in the table at the top of Exhibit A1. We find statistically significant exposure to all three factors, suggesting that each of these investment styles played a role in Woodford's success during this time at Invesco Perpetual. To provide a sense of magnitudes, we also show an attribution (based on the regression results) in the chart at the bottom of Exhibit A1. Factor exposures account for nearly half of the CAPM alpha.

Exhibit A1 | Invesco, *August 1993-Febuary 2014*

	Alpha (ann'l)	Market	Value	Low Risk	Quality	R^2
Coeff.	2.0%	0.83	0.11	0.07	0.14	75%
T-stat	1.12	22.79	2.89	2.42	2.25	



Source: AQR, Bloomberg. All variables here and in subsequent tables are excess of cash, unless stated otherwise. Return attribution is factor coefficient multiplied by average factor premium over this period.

[1] As quoted in The Guardian (2013), "Neil Woodford, the man for taking the long view, takes a short walk"
[2] Returns in all exhibits are excess of cash, unless stated otherwise. Factor returns are all gross of fees and transactions costs.
[3] U.K. Equities are the FTSE All-Share Index, a capitalization-weighted index comprising of the FTSE 350 and the FTSE SmallCap Indices.
[4] See Appendix for details on factor construction.
[5] As defined in Asness and Frazzini (2013).
[6] As defined in Frazzini and Pedersen (2014).
[7] As defined in Asness, Frazzini and Pedersen (2014).

2: Terry Smith — Quality

"Third, don't worry too much about valuations.. If you are a long-term investor, buying shares in a good business is more important than valuation."

– Terry Smith, Fundsmith.[8]

12/2010-6/2017[9]	Average Return	Volatility	Sharpe Ratio	Annual Outperformance	Information Ratio
Fundsmith	15.9%	10.7%	1.48	6.0%	0.93
Global Developed Equities	9.9%	12.2%	0.81	-	-

Source: AQR, Bloomberg. Returns denominated in USD. Risk-free rate is 1-month T-Bill . Past performance is not a guarantee of future performance; please read important disclosures at the end of this presentation.

Next, we explore Fundsmith's Equity Fund over the period from the fund's inception in December 2010 to June 2017. Over this period, Fundsmith exhibits higher returns than the broad market (excess of cash returns of 15.9% versus 9.9%), with lower volatility. The fund's Sharpe ratio is 1.48 compared to 0.81 for the broad market.

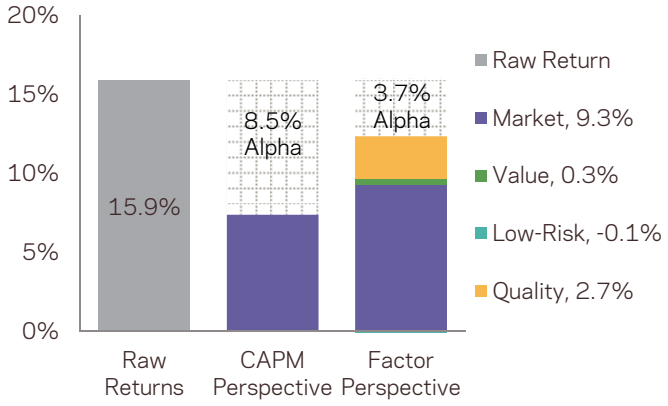
The fund's significant positive alpha becomes statistically insignificant when controlling for the same investment styles we used for Woodford. These factors are constructed from a broader universe to match Fundsmith's investment policy:[10]

- **Market:** Global Developed Equities, represented by the MSCI World Net Index
- **Value:** the "HML Devil" factor[11] from AQR's data library
- **Low-Risk:** the "Betting-Against-Beta" (BAB) factor[12] from AQR's data library
- **Quality:** the "Quality-Minus-Junk" (QMJ) factor[13] from AQR's data library

Our regression results are presented in the table at the top of Exhibit A2. Exposure to the Quality factor is statistically significant, suggesting that stock selection based on Quality has played a role in Smith's success in managing Fundsmith. Interestingly, there is borderline-significant negative exposure to the Value factor, apparently consistent with the above quotation. To provide a sense of magnitudes, we also show an attribution (based on the regression results) in the chart at the bottom of Exhibit A2. Again, factor exposures (and the factor-adjusted market beta) account for nearly half of the CAPM alpha.

Exhibit A2 | Fundsmith, *Dec 2010 - Jun 2017*

	Alpha (ann'l)	Market	Value	Low Risk	Quality	R^2
Coeff.	3.7%	0.94	-0.19	-0.01	0.39	79%
T-stat	1.22	14.63	-1.86	-0.06	3.11	



Source: AQR, Bloomberg. All variables here and in subsequent tables are excess of cash, unless stated otherwise. Return attribution is factor coefficient multiplied by average factor premium over this period.

[8] As quoted in The Telegraph (October 2016), "Terry Smith: Stay focused on the 'known knowns'".
[9] Returns in all exhibits are excess of cash, unless stated otherwise. Factor returns are all gross of fees and transactions costs.
[10] Factors are now constructed using the global universe of stocks, reflecting Fundsmith's investment policy to invest in equities on a global basis. See Appendix for details on factor construction.
[11] As defined in Asness and Frazzini (2013).
[12] As defined in Frazzini and Pedersen (2014).
[13] As defined in Asness, Frazzini and Pedersen (2014).

Conclusion

Neil Woodford and Terry Smith are among the most successful U.K. fund managers in recent history, and our findings shed some light on the sources of their returns. We find that these superstars' investment returns are consistent with their investment philosophies. Woodford's emphasis on identifying "valuation" and "fundamentals" is captured by our Value and Quality factors respectively, while Smith's emphasis on "good businesses" is captured by our Quality factor and a lack of exposure to our Value factor.

Woodford's and Smith's success can be attributed to skill in identifiying sources of return which proved to be fruitful, and discipline in implementing them over long periods. This finding may have broader implications for manager selection, regardless of whether the manager is discretionary or quantitative/systematic:[14] investors should understand which (if any) styles are part of a manager's process, and decide whether there are positive expected returns associated with those styles. For strategies designed to capture these styles explicitly in a systematic fashion, we believe that implementation skill is critical. Indeed, skillfull harnessing of style premia may be considered a form of alpha.[15]

References

AQR *Alternative Thinking*, Fourth Quarter 2016, "Superstar Investors".

AQR *Alternative Thinking*, Third Quarter 2017, "Systematic vs. Discretionary".

Asness, C., and A. Frazzini, 2013, "The Devil in HML's Detail," *Journal of Portfolio Management*, 39, 49-68.

Asness, C., A. Frazzini and L. Pedersen, 2014, "Quality Minus Junk," working paper.

Frazzini, A., D. Kabiller, and L. Pedersen, 2013, "Buffett's Alpha," working paper.

Frazzini, A., and L. Pedersen, 2014, "Betting Against Beta," *The Journal of Financial Economics*, 111, 1-25.

Israel, R., S. Jiang and A. Ross, 2017, "Craftsmanship Alpha," AQR White Paper.

[14] See *Alternative Thinking Q3 2017: Systematic vs. Discretionary* where we argue that diversifying across high-quality systematic and discretionary managers may be the most reliable course to long term investment success.

[15] In "Craftmanship Alpha" (2017), we show that seemingly non-material design choices may have material implications for investment performance of systematic strategies.

Appendix: Factor Descriptions:

For Invesco

- **Market** (U.K. Equities): The FTSE All-Share Index, a capitalization-weighted index comprising of the FTSE 350 and the FTSE SmallCap Indices.

- **Value**: the "HML^{devil}" (High Minus Low) factor from AQR's data library, as defined in Asness and Frazzini (2014). Formed from the United Kingdom universe of stocks. "HML^{devil}" is the average return on the two value portfolios minus the average return on the two growth portfolios, HML^{devil} = 1/2 (Small Value + Big Value) - 1/2 (Small Growth + Big Growth). The superscript "devil" indicates that to compute book to market ratios we scale book equity (BE) by the current total market value of equity (ME) at the end of each month following Asness and Frazzini (2013). HML^{devil} portfolios are value-weighted. The size and book-to-market breakpoints are refreshed every calendar month, and the portfolios are rebalanced every calendar month to maintain value weights

- **Low-Risk**: the "Betting-Against-Beta" (BAB) factor from AQR's data library, as defined in Frazzini and Pedersen (2014). Formed from the United Kingdom universe of stocks. BAB factors are portfolios that are long low-beta securities and that short-sell high-beta. To construct each BAB factor, all securities in a country are ranked in ascending order on the basis of their estimated beta and the ranked securities are assigned to one of two portfolios: low-beta and high-beta. In each portfolio, securities are weighted by the ranked betas (lower-beta securities have larger weights in the low-beta portfolio and higher-beta securities have larger weights in the high-beta portfolio). The portfolios are rebalanced every calendar month. To construct the BAB factor, both portfolios are rescaled to have a beta of one at portfolio formation. The BAB is the self-financing zero-beta portfolio that is long the low-beta portfolio and that short-sells the high-beta portfolio

- **Quality**: the "Quality-Minus-Junk" (QMJ) factor from AQR's data library, as defined in Asness, Frazzini and Pedersen (2014). Formed from the United Kingdom universe of stocks. The Quality Score is the average of four aspects of quality: Profitability, Growth, Safety and Payout. We use a broad set of measures to compute each of four aspects of quality; the score for each aspect is the average of the individual z-scores of the underlying measure. Each variable is converted each month into ranks and standardized to obtain the z-score. 1) Profitability is measured by: Gross profits over assets, return on equity, return on assets, cash flow over assets, gross margin, and the fraction of earnings composed of cash. 2) Growth is measured by: The five-year prior growth in profitability, averaged across the measures of profitability. 3) Safety is defined as: Companies with low beta, low idiosyncratic volatility, low leverage, low bankruptcy risk and low ROE volatility. 4) Payout is defined using: Equity and debt net issuance and total net payout over profits. QMJ factors are constructed as the intersection of six value-weighted portfolios formed on size and quality. At the end of each calendar month, we assign stocks to two size-sorted portfolios based on their market capitalization. For U.S. securities, the size breakpoint is the median NYSE market equity. We use conditional sorts, first sorting on size, then on quality. Portfolios are value-weighted, refreshed every calendar month, and rebalanced every calendar month to maintain value weights. The QMJ factor return is the average return on the two high-quality portfolios minus the average return on the two low-quality (junk) portfolios.

For Fundsmith

- **Market** (Global Developed Equities): The MSCI World Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed markets.

- **Value:** the same as used for the Invesco analysis but based on the Global universe of stocks.

- **Low-Risk:** the same as used for the Invesco analysis but based on the Global universe of stocks.

- **Quality:** the same as used for the Invesco analysis but based on the Global universe of stocks.

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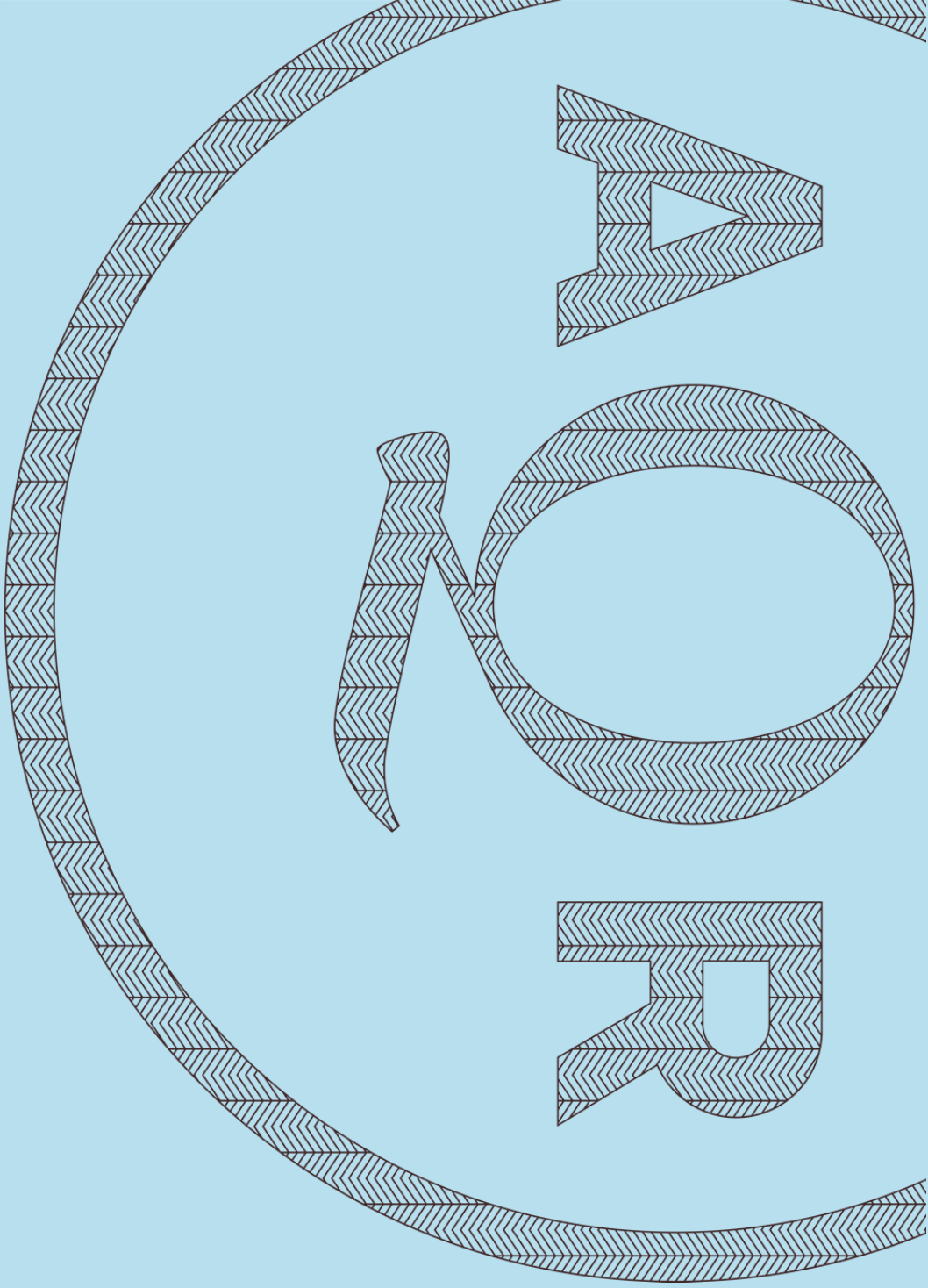

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