
Assessing Alternative Quality Metrics

Byung Hyun Ahn, PhD
Researcher

Namiko Saito, PhD
Co-Head of Strategy Research

November 2023

KEY TAKEAWAYS

- ▶ The relation between profitability and expected returns is supported by valuation theory and empirical evidence.
- ▶ Alternative quality metrics don't contain incremental information about expected returns beyond what's in operating profitability.
- ▶ We find operating profitability to be more effective than alternative metrics at capturing the profitability premium.

Introduction

Quality factor investing has grown in popularity in the last decade partially due to the seminal paper by Robert Novy-Marx (2013) on profitability and the inclusion of the profitability factor in the five-factor Fama/French model (2015). While there is no consensus on the definition of quality, a common practice in the financial industry is to form a composite quality score that incorporates the following broad concepts: profitability, leverage, earnings variability, and net payout. Specifically, high-quality stocks are often defined as stocks with high profitability, low leverage, low earnings variability, and high net payout. Do investors really need a blend of all these variables to pursue the profitability premium effectively? We provide an answer below.

Assessing Efficacy of Quality Metrics

Valuation theory says that the expected return on an investment is driven by its price today and its expected future cash flows. Holding the current price fixed, the higher the expected future cash flows of a company, the higher its expected return. Therefore, expected future profitability should be positively related to expected returns. This is the theoretical motivation behind the profitability premium.

Measures of current profitability, such as operating profits scaled by book equity (“operating profitability”) and net income scaled by book equity (“return on equity” or “ROE”), are reliable proxies for expected future profitability (O’Reilly and Rizova 2013). Therefore, they should generate reliable spreads in average stock returns. The other popular quality metrics (leverage, earnings variability, and net payout) are not directly related to expected returns under the valuation theory. However, they might still generate spreads in average stock returns if they contain information about expected future cash flows or are correlated with current valuation ratios.

To explore this possibility, we examine portfolios of US stocks sorted on each of those metrics. **Exhibit 1** provides the definitions of the quality metrics we use. Due to requiring five years of history, the coverage of the earnings variability, net payout, and blend of alternatives is approximately half of the market capitalization.

EXHIBIT 1: Definitions of Quality Metrics

Metric	Definition
Operating Profitability	Operating income before depreciation and amortization minus interest expense scaled by book equity.
Return on Equity (ROE)	Income before extraordinary items scaled by book equity.
Leverage	Total debt scaled by book equity. Total debt is the sum of long-term and short-term debt.
Earnings Variability	The standard deviation of year-over-year growth in earnings per share, excluding extraordinary items, over the past five fiscal years.
Net Payout over Profits	The sum of total net payout over the past five fiscal years scaled by gross profits over the past five fiscal years. Net payout is income before extraordinary items minus changes in book equity. Gross profits are revenue minus cost of goods sold.

For each quality metric, we form two hypothetical portfolios targeting the highest and lowest 30% of the US market capitalization sorted on the metric. The high expected return portfolios refer to stocks with high relative operating profitability, high ROE, low leverage, low earnings volatility, and high net payout. The low expected return portfolios refer to stocks at the opposite end of the spectrums.

EXHIBIT 2: Average Monthly Return (%) for Hypothetical Portfolios Formed on Quality Metrics, July 1, 1974–December 31, 2022



Returns in USD. Past performance, including hypothetical performance, is no guarantee of future results. Actual investment returns may be lower. Filters were applied to data retroactively and with the benefit of hindsight. Groups of stocks and their returns are hypothetical, are not representative of indices, actual investments, or actual strategies managed by Dimensional, and do not reflect costs and fees associated with an actual investment. See Additional Information in Appendix.

Exhibit 2 reports the results. The hypothetical quality portfolios formed on operating profitability generate the largest spread in average monthly returns (17 basis points per month), followed by 10 bps for ROE and 7 bps for net payout over profits. The stronger results for operating profitability over ROE are not surprising because operating profitability not only captures major costs and expenses of businesses across sectors but also focuses on recurring items (Fama and French 2015; Novy-Marx 2013; O’Reilly and Rizova 2013). On the other hand, bottom-line accounting measures such as net income, used in ROE, are more susceptible to one-off charges and less related to persistent economic profitability.

Not all portfolios formed on quality metrics show positive return spreads. The high-leverage portfolio and the high-earnings volatility portfolio outperform their counterparts by 10 bps and 5 bps per month, respectively. The inconsistent sign of spreads in univariate portfolios formed on nonprofitability quality metrics underscores the importance of a theoretical framework in identifying the drivers of expected returns.

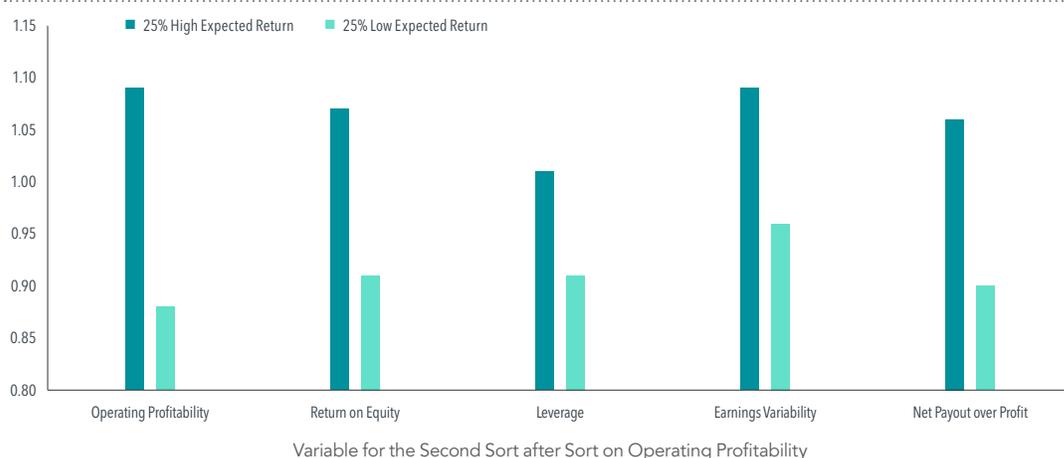
While some quality metrics fail to provide information about expected returns in isolation, they may work better in combination. Therefore, in Exhibit 2 we report the performance of two hypothetical portfolios based on a blend of the alternative metrics. We rank each firm

based on ROE, leverage, earnings variability, and net payout and take the average of these four ranks. While the average return spread is positive, it is still meaningfully smaller than the spread generated by operating profitability (7 vs. 17 bps per month).

It is also possible that some quality metrics contain incremental information after accounting for operating profitability. To consider this possibility, we form double-sorted portfolios on operating profitability and one more quality metric. Specifically, we first sort eligible firms into high- and low-operating-profitability groups, each representing half of the market capitalization, and then partition firms in each operating-profitability group into the top and bottom 50% of the market capitalization based on an additional quality metric. The double-sorted portfolios result in four portfolios, each representing 25% of the market capitalization. Thus, for each variable pair, we have a high-high portfolio of stocks that is considered to have a higher expected return based on both the first and second sorts (e.g., high profitability and low leverage). The low-low portfolios are constructed similarly (i.e., low profitability and high leverage).¹

We examine the return spread between the high-high and low-low portfolios in Exhibit 3. All return spreads become positive, but operating profitability dominates again. The double sort using operating profitability as the second sorting variable yields the largest difference in average returns (21 bps per month).² This implies that the other quality metrics do not have incremental information about expected returns beyond the information contained in operating profitability.

EXHIBIT 3: Average Monthly Return (%) for Hypothetical Portfolios Formed on Operating Profitability and Other Quality Metrics, July 1, 1974–December 31, 2022



Returns in USD. Past performance, including hypothetical performance, is no guarantee of future results. Actual investment returns may be lower. Filters were applied to data retroactively and with the benefit of hindsight. Groups of stocks and their returns are hypothetical, are not representative of indices, actual investments, or actual strategies managed by Dimensional, and do not reflect costs and fees associated with an actual investment. See Additional Information in Appendix.

1. The double-sorted portfolios whose first and secondary sort are both on operating profitability represent a granular cut on operating profitability and serve as a benchmark for alternative double-sorted portfolios.
 2. The findings are similar within large and small cap markets as shown in Exhibits A1 and A2 in the Appendix.

To gain insights into the weak empirical relation between the alternative quality metrics and expected returns, we examine the forecasting power of those metrics for future profitability.

Panel A of Exhibit 4 reports the results of Fama-MacBeth annual regressions of operating profitability one, three, and five years into the future on current operating profitability and other quality metrics (controlling for market capitalization, book-to-market equity, growth in assets, and momentum). To put the different variables on equal footing and mitigate the impact of outliers, we transform all variables into decile rankings. This allows us to interpret each coefficient as the change in the future profitability ranking if the current profitability/quality ranking changes by one decile.

Adding other quality metrics in the regressions that already use operating profitability barely changes the adjusted R^2 .³ Moreover, the coefficients on operating profitability do not materially change, while those on the other metrics are either unexpectedly negative (ROE), unexpectedly positive (leverage), or much smaller. These results suggest that none of the additional quality metrics materially improves the forecasting power of current operating profitability for future operating profitability.

Panel B repeats the analysis while defining future profitability as future ROE. Again, we observe negligible changes in R^2 across all specifications. Operating profitability is a strong predictor of future ROE, and it becomes a stronger predictor than current ROE for five years into the future.

Overall, we find no compelling evidence that the alternative metrics contain additional forecasting power for future profitability. It is no surprise, then, that they do not appear to contain additional forecasting power for future returns either.

3. R^2 measures how much of variance in the dependent variable can be explained by the independent variables. This can be adjusted for the number of independent variables used in the regression.

EXHIBIT 4: Forecasting Power for Future Profitability, 1974-2022

Panel A: Predicting Future Operating Profitability

Dependent Variable = Operating Profitability (t+1)						
Intercept	4.6*** (15.6)	1.3*** (10.1)	1.4*** (9.4)	1.1*** (7.4)	1.6*** (11.4)	1.4*** (12.2)
Size	0.6*** (8.4)	0.2*** (7.6)	0.2*** (7.9)	0.1*** (6.6)	0.1*** (6.4)	0.1*** (7.4)
Value	-0.1*** (-4.9)	0.0*** (-4.7)	0.0*** (-4.5)	0.0*** (-6.4)	0.0*** (-6.3)	-0.1*** (-8.2)
Investment	0.1*** (5.8)	0.0*** (-4.8)	0.0*** (-4.0)	0.0*** (-7.2)	0.0*** (-4.9)	0.0*** (-4.2)
Momentum	0.4*** (5.5)	0.1** (2.4)	0.1*** (3.0)	0.1*** (2.8)	0.1** (2.5)	0.1** (2.1)
Operating Profitability		0.7*** (53.1)	0.8*** (80.1)	0.7*** (62.4)	0.7*** (54.4)	0.7*** (50.9)
Quality			-0.1*** (-4.8)	0.1*** (5.6)	0.0*** (-2.6)	0.0*** (3.5)
Definition of Quality:			ROE	Leverage	Earnings Variability	Net Payout over Profits
Average Adjusted R ²	17.9%	60.7%	61.0%	61.7%	60.8%	59.8%
Dependent Variable = Operating Profitability (t+3)						
Intercept	4.6*** (15.3)	2.1*** (9.3)	2.2*** (8.5)	1.8*** (7.7)	2.4*** (9.7)	2.2*** (10.4)
Size	0.6*** (8.1)	0.3*** (7.6)	0.3*** (8.2)	0.2*** (7.3)	0.2*** (5.9)	0.2*** (6.9)
Value	-0.1*** (-4.4)	0.0 (-1.2)	0.0 (-1.6)	0.0*** (-2.8)	0.0** (-2.1)	0.0*** (-3.2)
Investment	0.0*** (3.1)	-0.1*** (-11.3)	0.0*** (-7.0)	-0.1*** (-12.4)	-0.1*** (-12.6)	0.0*** (-10.0)
Momentum	0.1 (1.1)	-0.2*** (-3.6)	-0.1*** (-3.1)	-0.2*** (-3.4)	-0.2*** (-3.8)	-0.2*** (-4.0)
Operating Profitability		0.6*** (25.9)	0.6*** (53.9)	0.5*** (29.9)	0.6*** (27.0)	0.5*** (29.1)
Quality			-0.1*** (-5.8)	0.1*** (7.8)	0.0*** (-2.8)	0.0*** (6.6)
Definition of Quality:			ROE	Leverage	Earnings Variability	Net Payout over Profits
Average Adjusted R ²	12.8%	36.9%	37.6%	38.1%	37.1%	36.3%
Dependent Variable = Operating Profitability (t+5)						
Intercept	4.4*** (17.9)	2.1*** (10.6)	2.3*** (10.3)	1.9*** (8.3)	2.5*** (9.8)	2.2*** (12.3)
Size	0.6*** (8.6)	0.4*** (9.4)	0.4*** (9.8)	0.3*** (9.4)	0.3*** (7.1)	0.3*** (8.9)
Value	-0.1*** (-3.2)	0.0 (1.0)	0.0 (0.4)	0.0 (-0.4)	0.0 (0.2)	0.0 (-0.8)
Investment	0.0*** (3.4)	-0.1*** (-7.9)	0.0*** (-5.2)	-0.1*** (-8.4)	-0.1*** (-9.5)	0.0*** (-7.9)
Momentum	0.0 (-0.0)	-0.2*** (-3.4)	-0.2*** (-2.8)	-0.2*** (-3.2)	-0.2*** (-3.6)	-0.3*** (-4.3)
Operating Profitability		0.5*** (23.4)	0.6*** (31.4)	0.5*** (26.7)	0.5*** (25.0)	0.5*** (28.8)
Quality			-0.1*** (-8.9)	0.1*** (6.7)	0.0** (-2.2)	0.0*** (5.6)
Definition of Quality:			ROE	Leverage	Earnings Variability	Net Payout over Profits
Average Adjusted R ²	11.5%	28.5%	29.2%	29.7%	28.7%	28.0%

Panel B: Predicting Future ROE

Dependent Variable = ROE (t+1)						
Intercept	4.7*** (19.1)	2.5*** (21.1)	2.1*** (16.8)	2.2*** (16.5)	3.2*** (24.6)	2.7*** (22.7)
Size	0.6*** (9.9)	0.2*** (8.7)	0.2*** (9.2)	0.2*** (7.3)	0.2*** (7.0)	0.2*** (7.4)
Value	-0.2*** (-6.3)	-0.1*** (-11.8)	-0.1*** (-10.6)	-0.1*** (-12.8)	-0.1*** (-14.5)	-0.1*** (-17.3)
Investment	0.1*** (8.2)	0.0*** (-5.6)	0.0*** (-5.5)	0.0*** (-7.3)	0.0*** (-5.8)	0.0*** (-2.8)
Momentum	0.6*** (7.3)	0.2*** (4.6)	0.2*** (4.9)	0.2*** (5.0)	0.2*** (4.9)	0.2*** (4.9)
ROE		0.6*** (46.5)	0.4*** (23.0)	0.6*** (51.7)	0.6*** (40.2)	0.5*** (34.4)
Quality			0.2*** (14.1)	0.1*** (4.5)	0.0*** (-6.3)	0.1*** (6.3)
Definition of Quality:			Operating Profitability	Leverage	Earnings Variability	Net Payout over Profits
Average Adjusted R ²	19.7%	43.7%	46.2%	44.7%	43.8%	43.4%

Dependent Variable = ROE (t+3)						
Intercept	5.1*** (19.9)	3.7*** (17.4)	3.3*** (14.6)	3.4*** (14.0)	4.5*** (18.5)	3.9*** (17.4)
Size	0.5*** (8.6)	0.3*** (7.6)	0.3*** (7.6)	0.3*** (7.5)	0.2*** (5.5)	0.2*** (5.9)
Value	-0.1*** (-5.9)	-0.1*** (-5.1)	-0.1*** (-4.4)	-0.1*** (-6.4)	-0.1*** (-6.7)	-0.1*** (-7.9)
Investment	0.0*** (3.2)	-0.1*** (-7.9)	-0.1*** (-8.2)	-0.1*** (-9.0)	-0.1*** (-9.0)	0.0*** (-4.4)
Momentum	0.1** (2.2)	-0.1*** (-2.7)	-0.1** (-2.3)	-0.1** (-2.6)	-0.1** (-2.4)	-0.1*** (-2.7)
ROE		0.4*** (19.1)	0.2*** (14.6)	0.4*** (21.3)	0.3*** (17.9)	0.3*** (19.2)
Quality			0.2*** (13.1)	0.1*** (5.8)	-0.1*** (-5.8)	0.1*** (11.1)
Definition of Quality:			Operating Profitability	Leverage	Earnings Variability	Net Payout over Profits
Average Adjusted R ²	10.3%	19.5%	21.5%	20.3%	19.9%	20.0%

Dependent Variable = ROE (t+5)						
Intercept	4.8*** (25.9)	3.7*** (23.0)	3.4*** (18.8)	3.5*** (17.9)	4.5*** (24.5)	3.8*** (27.3)
Size	0.5*** (9.2)	0.3*** (9.4)	0.3*** (10.3)	0.3*** (9.5)	0.3*** (6.7)	0.3*** (8.2)
Value	-0.1*** (-4.4)	0.0*** (-2.8)	0.0** (-2.1)	-0.1*** (-3.8)	-0.1*** (-4.7)	-0.1*** (-6.5)
Investment	0.0* (1.7)	-0.1*** (-6.4)	-0.1*** (-6.2)	-0.1*** (-6.9)	-0.1*** (-7.4)	0.0*** (-3.6)
Momentum	0.0 (0.5)	-0.1** (-2.1)	-0.1* (-1.9)	-0.1** (-2.0)	-0.1 (-1.6)	-0.2** (-2.5)
ROE		0.3*** (17.0)	0.1*** (9.6)	0.3*** (18.3)	0.2*** (16.4)	0.2*** (14.9)
Quality			0.2*** (11.2)	0.1*** (5.2)	-0.1*** (-6.2)	0.1*** (9.3)
Definition of Quality:			Operating Profitability	Leverage	Earnings Variability	Net Payout over Profits
Average Adjusted R ²	8.2%	13.3%	14.6%	14.0%	13.7%	14.1%

The Fama-MacBeth estimates of regression coefficients, t-statistics, and R² are based on annual cross-sectional regressions of future operating profitability (ROE) on current market capitalization, book-to-market, operating profitability (ROE), asset growth, price momentum, and various quality metrics. Both dependent and independent variables are transformed to % market capitalization deciles, except for market capitalization, which is transformed into five groups. Higher underlying values correspond to higher ranks. Regressions are performed as of each fiscal year, and the standard errors are Newey-West-adjusted for three lags. See Additional Information in Appendix.

Conclusion

Both valuation theory and empirical evidence support operating profitability as a driver of expected stock returns. The lack of strong theoretical and empirical support for the alternative quality metrics casts doubt on their effectiveness in the pursuit of higher expected returns. Relying on a composite quality score could dilute the information in operating profitability and lead to an inefficient path to capturing the profitability premium. In other words, quality provides yet another example where less is more when it comes to investing.

REFERENCES

Fama, Eugene F., and Kenneth R. French. 2015. "A Five-Factor Asset Pricing Model." *Journal of Financial Economics* 116, no. 1: 1–22.

Novy-Marx, Robert. 2013. "The Other Side of Value: The Gross Profitability Premium." *Journal of Financial Economics* 108, no. 1: 1–28.

O'Reilly, Gerard, and Savina Rizova. 2013. "Expected Profitability: A New Dimension of Expected Returns" (research paper, Dimensional Fund Advisors, 2013).

APPENDIX

Additional Information

Source: Dimensional, using CRSP and Compustat data. The eligible universe includes US firms of all market capitalization, excluding REITs, utilities, tracking stocks, and investment companies. The portfolios are rebalanced semiannually at the end of each June and December. The US market includes eligible firms of all market capitalizations at their market cap.

The hypothetical performance data is “net performance,” which includes the reinvestment of dividends and other earnings and reflects the deduction of an investment advisory fee of 33 basis points for each year. To account for trading costs the simulated performance does reflect the deduction of an assumed brokerage fee of 1.5 basis points for each year using an estimated turnover number.

Performance in US Large and Small Cap Markets

EXHIBIT A1: Average Monthly Return (%) in Large Cap Market, July 1, 1974–December 31, 2022

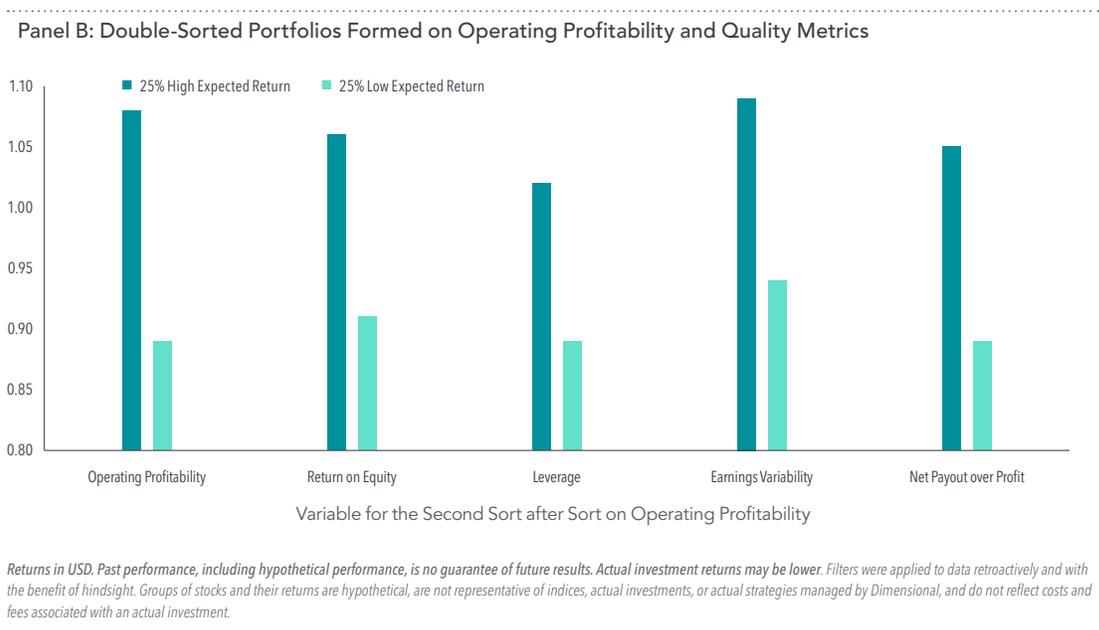
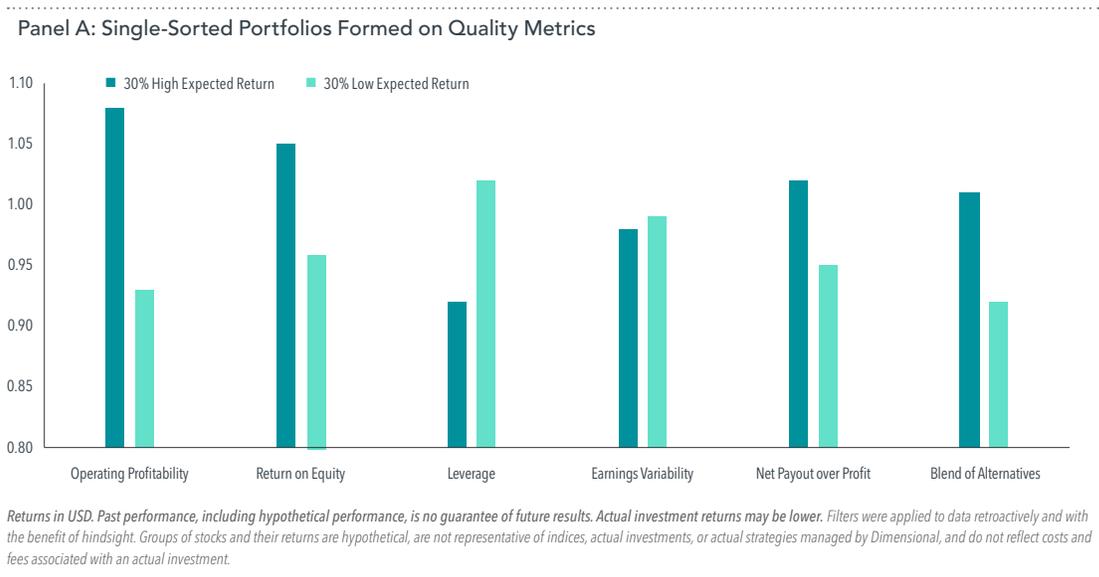


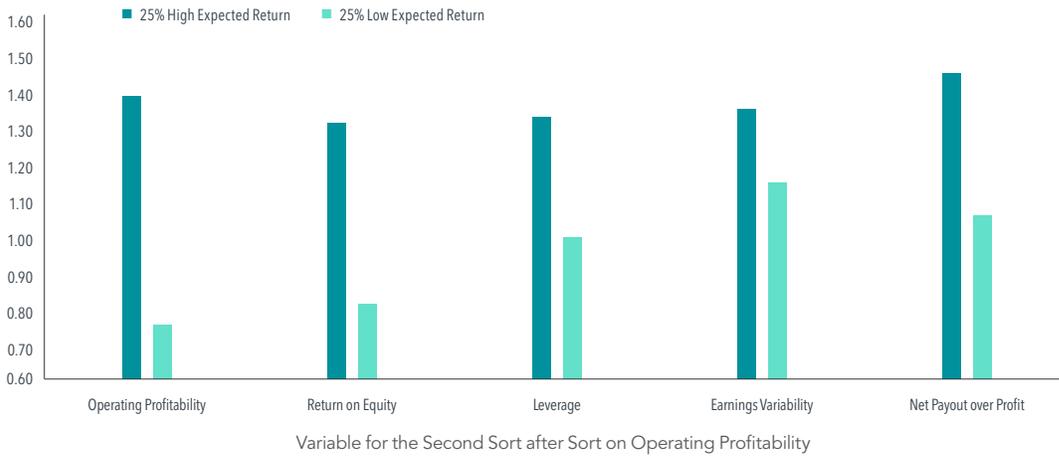
EXHIBIT A2: Average Monthly Return (%) in Small Cap Market, July 1, 1974–December 31, 2022

Panel A: Single-Sorted Portfolios Formed on Quality Metrics



Returns in USD. Past performance, including hypothetical performance, is no guarantee of future results. Actual investment returns may be lower. Filters were applied to data retroactively and with the benefit of hindsight. Groups of stocks and their returns are hypothetical, are not representative of indices, actual investments, or actual strategies managed by Dimensional, and do not reflect costs and fees associated with an actual investment.

Panel B: Double-Sorted Portfolios Formed on Operating Profitability and Quality Metrics



Returns in USD. Past performance, including hypothetical performance, is no guarantee of future results. Actual investment returns may be lower. Filters were applied to data retroactively and with the benefit of hindsight. Groups of stocks and their returns are hypothetical, are not representative of indices, actual investments, or actual strategies managed by Dimensional, and do not reflect costs and fees associated with an actual investment.

FOR PROFESSIONAL USE ONLY. NOT FOR USE WITH RETAIL INVESTORS OR THE PUBLIC.

The information in this material is intended for the recipient's background information and use only. It is provided in good faith and without any warranty or representation as to accuracy or completeness. Information and opinions presented in this material have been obtained or derived from sources believed by Dimensional to be reliable, and Dimensional has reasonable grounds to believe that all factual information herein is true as at the date of this material. It does not constitute investment advice, a recommendation, or an offer of any services or products for sale and is not intended to provide a sufficient basis on which to make an investment decision. Before acting on any information in this document, you should consider whether it is appropriate for your particular circumstances and, if appropriate, seek professional advice. It is the responsibility of any persons wishing to make a purchase to inform themselves of and observe all applicable laws and regulations. Unauthorized reproduction or transmission of this material is strictly prohibited. Dimensional accepts no responsibility for loss arising from the use of the information contained herein.

This material is not directed at any person in any jurisdiction where the availability of this material is prohibited or would subject Dimensional or its products or services to any registration, licensing, or other such legal requirements within the jurisdiction.

"Dimensional" refers to the Dimensional separate but affiliated entities generally, rather than to one particular entity. These entities are Dimensional Fund Advisors LP, Dimensional Fund Advisors Ltd., Dimensional Ireland Limited, DFA Australia Limited, Dimensional Fund Advisors Canada ULC, Dimensional Fund Advisors Pte. Ltd., Dimensional Japan Ltd., and Dimensional Hong Kong Limited. Dimensional Hong Kong Limited is licensed by the Securities and Futures Commission to conduct Type 1 (dealing in securities) regulated activities only and does not provide asset management services.

RISKS

Investments involve risks. The investment return and principal value of an investment may fluctuate so that an investor's shares, when redeemed, may be worth more or less than their original value. Past performance is not a guarantee of future results. There is no guarantee strategies will be successful.

UNITED STATES

This information is provided for registered investment advisors and institutional investors and is not intended for public use. Dimensional Fund Advisors LP is an investment advisor registered with the Securities and Exchange Commission.

CANADA

This material is issued by Dimensional Fund Advisors Canada ULC for registered investment advisors, dealers, and institutional investors and is not intended for public use. The other Dimensional entities referenced herein are not registered resident investment fund managers or portfolio managers in Canada.

This material is not intended for Quebec residents.

Commissions, trailing commissions, management fees, and expenses all may be associated with mutual fund investments. Please read the prospectus before investing. Unless otherwise noted, any indicated total rates of return reflect the historical annual compounded total returns, including changes in share or unit value and reinvestment of all dividends or other distributions, and do not take into account sales, redemption, distribution, or optional charges or income taxes payable by any security holder that would have reduced returns. Mutual funds are not guaranteed, their values change frequently, and past performance may not be repeated.

AUSTRALIA

In Australia, this material is provided by DFA Australia Limited (AFSL 238093, ABN 46 065 937 671). It is provided for financial advisors and wholesale investors for information only and is not intended for public use. No account has been taken of the objectives, financial situation or needs of any particular person. Accordingly, to the extent this material constitutes general financial product advice, investors should, before acting on the advice, consider the appropriateness of the advice, having regard to the investor's objectives, financial situation and needs.

NEW ZEALAND

This material has been prepared and provided in New Zealand by DFA Australia Limited, (incorporated in Australia, AFS License No.238093, ABN 46 065 937 671). This material is provided for financial advisers only and is not intended for public use. All material that DFA Australia Limited provides has been prepared for advisers, institutional investors and clients who are classified as Wholesale investors under the Financial Markets Conduct Act 2013. This material does not give any recommendation or opinion to acquire any financial advice product, and is not financial advice to you or any other person.

WHERE ISSUED BY DIMENSIONAL IRELAND LIMITED

Issued by Dimensional Ireland Limited (Dimensional Ireland), with registered office 25 North Wall Quay, Dublin 1, D01 H104, Ireland. Dimensional Ireland is regulated by the Central Bank of Ireland (Registration No. C185067).

Directed only at professional clients within the meaning of Markets in Financial Instruments Directive (MiFID) (2014/65/EU).

WHERE ISSUED BY DIMENSIONAL FUND ADVISORS LTD.

Issued by Dimensional Fund Advisors Ltd. (Dimensional UK), 20 Triton Street, Regent's Place, London, NW1 3BF. Dimensional UK is authorised and regulated by the Financial Conduct Authority (FCA) - Firm Reference No. 150100.

Directed only at professional clients as defined by the rules of the FCA.

Dimensional UK and Dimensional Ireland issue information and materials in English and may also issue information and materials in certain other languages. The recipient's continued acceptance of information and materials from Dimensional UK and Dimensional Ireland will constitute the recipient's consent to be provided with such information and materials, where relevant, in more than one language.

NOTICE TO INVESTORS IN SWITZERLAND: This is advertising material.

JAPAN

For Institutional Investors only.

This material is deemed to be issued by Dimensional Japan Ltd., which is regulated by the Financial Services Agency of Japan and is registered as a Financial Instruments Firm conducting Investment Management Business and Investment Advisory and Agency Business.

Dimensional Japan Ltd.

Director of Kanto Local Finance Bureau (FIBO) No. 2683

Membership: Japan Investment Advisers Association

FOR LICENSED OR EXEMPT FINANCIAL ADVISORS AND INSTITUTIONAL INVESTORS IN SINGAPORE

This material is deemed to be issued by Dimensional Fund Advisors Pte. Ltd., which is regulated by the Monetary Authority of Singapore and holds a capital markets services license for fund management.

This material is not an advertisement, has not been reviewed by the Monetary Authority of Singapore, and should not be shown to prospective retail investors.

For use by institutional investors and licensed or exempt financial advisors only in Singapore for internal training and educational purposes and not for the purpose of inducing, or attempting to induce, such institutional investors or financial advisors to make an investment. Not for use with the public.

FOR LICENSED FINANCIAL ADVISORS AND INSTITUTIONAL INVESTORS IN HONG KONG

This material is deemed to be issued by Dimensional Hong Kong Limited (CE No. BJE760), which is licensed by the Securities and Futures Commission to conduct Type 1 (dealing in securities) regulated activities only and does not provide asset management services.

For use by licensed financial advisors and institutional investors who are "professional investors" (as defined in the Securities and Futures Ordinance [Chapter 571 of the Laws of Hong Kong] and its subsidiary legislation) only in Hong Kong. This material is provided solely for internal training and educational purposes and is not for the purpose of inducing, or attempting to induce, such financial advisors and institutional investors to make an investment nor for the purpose of providing investment advice. Not for use with the public. This material is not intended to constitute and does not constitute marketing of the services of Dimensional Hong Kong or its affiliates to the public of Hong Kong.

Financial advisors in Hong Kong shall not actively market the services of Dimensional Hong Kong Limited or its affiliates to the Hong Kong public.