

Our Scientific Approach to Investing

INVESTMENT PERSPECTIVE

Investors must navigate an ever-growing array of strategies as they assess options for their portfolios' asset allocations. Additional strategies have led to categories with catchy labels—the Nifty Fifty (think blue-chip stocks in the 1960s and 1970s), portable alpha (who wouldn't want alpha you can take with you?) and more recently, smart beta. While these labels may sound compelling, they provide little insight on the strategies' underlying investment theses. Investors who want to better understand whether a strategy will be additive to their portfolios need to dig deeper.

In this paper, we'll explain our approach to equity investing and limit catchy labels and jargon. Indexing has been a great innovation for investors, but it has key limitations as well. Our strategies try to incorporate the positive aspects of indexing such as transparency, low turnover and broad diversification while striving to beat index returns by addressing some of their implementation inefficiencies.

Thousands of stocks trade every day across global equity markets and the discount rates (i.e., expected returns) for each of these stocks are set by investors through the prices upon which they agree to transact. Valuation theory helps explain *which* fundamental aspects, together with prices, drive expected stock returns. We use these insights to design strategies that put more weight in stocks with higher expected returns and less weight in (or even exclude) those stocks with lower expected returns. We believe a framework that can identify differences in expected returns that is grounded in theory and supported by empirical evidence can help provide peace of mind for investors and increase confidence in our approach to investing.

Current stock prices and company fundamentals drive our buy and sell decisions. This approach differs from an index that rebalances once or twice a year and may therefore rely on stale information from six months or even a year ago. We also pay close attention to when and how we trade in an effort to reduce transaction costs. We believe this results in strategies:

- based on sound underlying investment principles
- that use current prices and fundamentals to enhance expected returns
- with broad diversification and low expected turnover and trading costs



PHIL MCINNIS

Vice President
Director of Investments



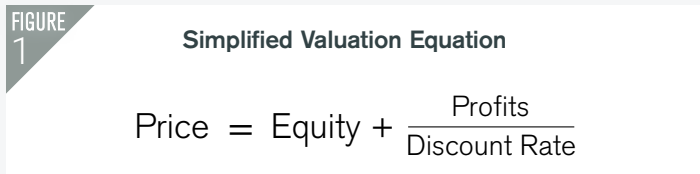
DANIEL ONG

Senior Portfolio Manager

Valuation Theory Lays the Foundation

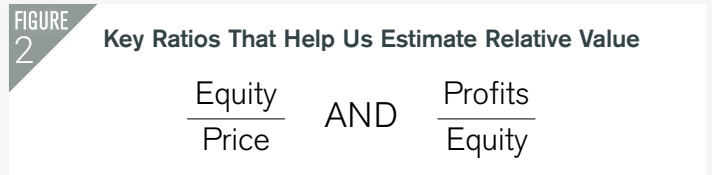
Our approach is based on market prices, meaning we take a security's current price as the best indicator of its fair value. Investors assign discount rates via the prices they are willing to pay for a stock. How the market sets prices can be based on a multitude of factors, including differences in perceived risks, opportunities and/or preferences. Our goal is to identify companies with higher market-implied discount rates to build portfolios with higher expected returns. How do we achieve that most efficiently? *Research.*

Asset pricing is a field within academia that has developed tremendously over the last half-century. While our understanding of what drives differences in average returns across stocks continues to evolve, our framework remains consistent. **Figure 1** shows a simplified form of the valuation equation. The price of a company is based on the equity in that company (assets minus liabilities) plus its expected future cash flows discounted at some rate.



The model informs us that the discount rates investors demand are related to the price of a company in the market, its equity and its profits. Combining these three variables—price, profits and book equity—into two ratios can help identify differences in expected returns among securities. Why two ratios? If we seek information that is complementary, and not redundant, there can be only two independent ratios. While there are several ratios from which to choose, we select the two that provide the most

relevant information in assessing differences across companies while producing low expected turnover (all else equal—less trading means fewer costs). Another way to think of this is “maximizing the signal to noise ratio.” **Figure 2** highlights the two we prioritize—book equity/price* and profits/book equity.

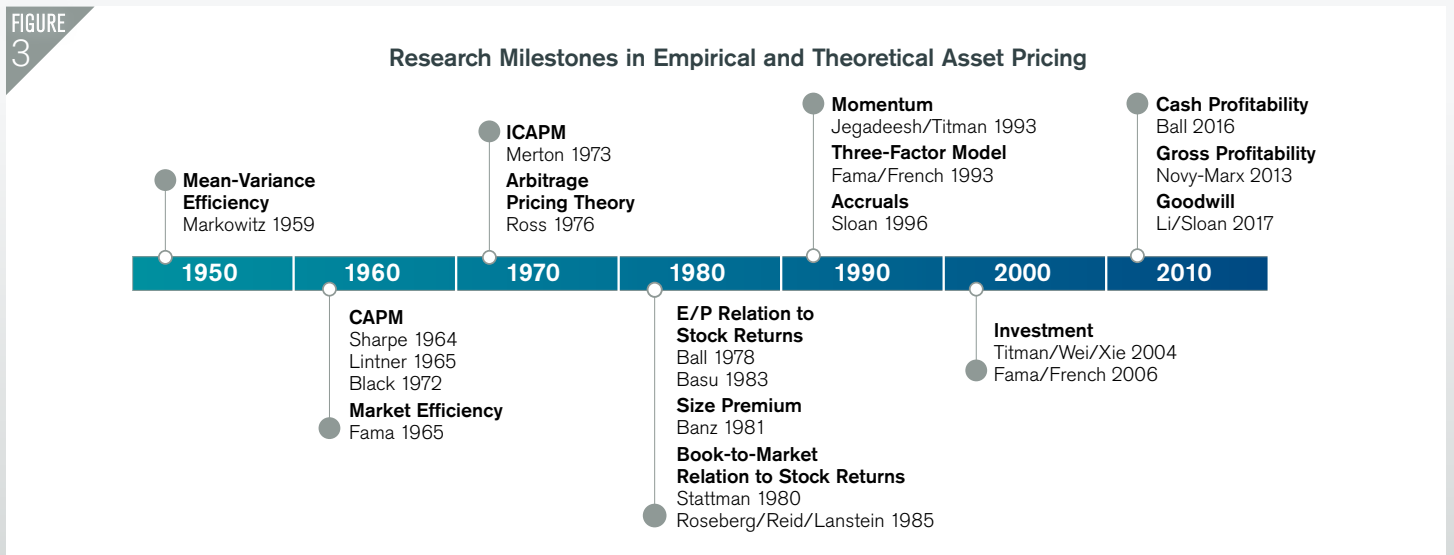


What do the ratios tell us? Theory predicts that companies with higher book equity/price (B/P or B/M) and higher profits/book equity (Prof) ratios should outperform companies with lower B/P and lower Prof ratios. In other words, all else equal, theory predicts that the lower the price you pay for a unit of a company's assets or a unit of its expected future profits, the higher your expected return. This framework should make sense intuitively, but has it played out in the real world? We use empirical data going back decades to validate this theory.

Data Talks

The empirical side of asset pricing research has also advanced considerably over the last half-century. **Figure 3** shows some of the most important enhancements to empirical and theoretical asset pricing. Before citing some specific empirical research, it's worth taking a step back to review the motivation behind single- and multi-factor models.

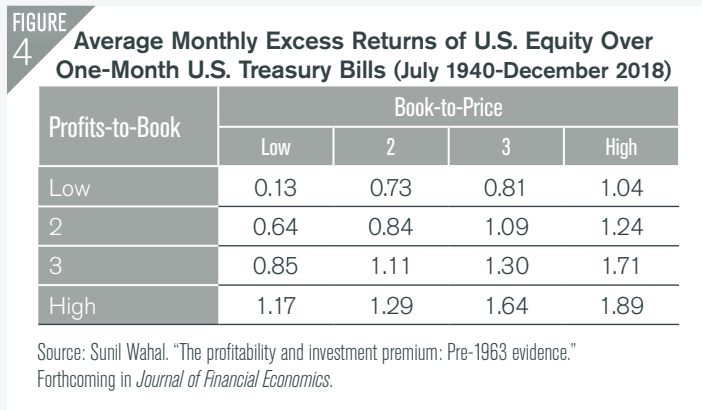
*Book equity/price is also commonly referred to as book equity/market equity or book-to-market in academic literature. We can't agree on a favorite and at times we use them interchangeably. We apologize in advance.



Asset pricing models have a simple objective: to identify what drives stock returns. Take the capital asset pricing model (CAPM), a single-factor model from the early 1960s. The CAPM simply states that individual stock returns are proportional to broad market movements.

Investment strategies have evolved as more research and information became available. Multifactor models, as the name implies, use more than one factor to help explain differences in stock returns. For example, HML (High Minus Low) and SMB (Small Minus Big) are famous factors from Eugene Fama and Kenneth French's 1993 Three-Factor Model paper. HML is a factor or portfolio that is long high book-to-market (value) stocks and short low book-to-market (growth) stocks. SMB is long small-cap stocks and short big- (large-) cap stocks.

Factors are a great research tool for analyzing historical stock returns, and asset pricing models use these factors to provide a framework of how markets work and what drives returns. Let's go back to the theory that tells us we should expect high-B/P and high-Prof companies to outperform low-B/P and low-Prof stocks. **Figure 4** shows excess returns (over U.S. Treasury bills) of various stock portfolios formed by B/P and Prof over a 75-year period.



Reading across each row or down each column, you can see that historical data supports the theory. And when you look at the diagonals, the differences stand out even more. The portfolio of high-B/P, high-Prof companies in the bottom-right corner beats the portfolio of low-B/P, low-Prof companies in the upper-left corner by 1.76% *per month* in the period examined. Both the fundamental rationale and empirical evidence supporting it give us confidence that these premiums should persist in the future. This framework serves as a road map that we believe helps us to increase expected returns in a consistent and transparent manner.

What's in a Proxy?

Valuation theory informs how we can combine prices and company financials to form ratios that explain differences in expected returns. However, determining the exact proxies to use for these ratios requires many decisions.

Advancements in profitability research have provided valuable insights and informed our use of a cash-based profitability proxy to

form strategies. If defined properly, a company's current profitability can serve as a proxy for its future profitability. Robert Novy-Marx's seminal paper on profitability (2013) uses measurements higher in the income statement to produce more reliable estimates of a company's profits. Gross profits (revenue minus cost of goods sold [COGS]), as he discovered, is a better proxy to identify higher expected return securities than earnings because it excludes more non-recurring and discretionary items. Gross profits can readily be netted by selling, general and administrative expenses (SG&A) to give us operating profits, providing a comprehensive measurement of profitability across all sectors as companies in some sectors assign expenses through SG&A instead of COGS.

The latest research from Ray Ball (2016) builds on Novy-Marx's profitability work and operating profitability. It includes Richard Sloan's 1996 research on accruals, which suggests removing accruals from operating profits leads to more predictable future profits. From Ball (2016), the profitability premium (1963-2014) defined with operating profitability was 3.25% with a volatility of 6.39% and a t-stat of 3.65. The same premium defined with cash-based operating profitability was 4.88% with a volatility of 5.57% and a t-stat of 6.29 due to elimination of competing effects.

Ways to measure book-to-market have also continued to evolve based on recent research developments and accounting standard changes. Several studies have documented the underperformance of companies involved in mergers (e.g., Asquith 1983, Agrawal et al. 1992, Mitchell and Stafford 1999, Loughran and Vijh 1997, Daniel and Titman 2006, Pontiff and Woodgate 2008), which reconcile with theory (Merton and Perold 1993). In the early 2000s, the Financial Accounting Standards Board (FASB) issued its Statement of Financial Accounting Standards No. 142 that relaxed amortization requirements for a combined entity's goodwill following a merger. Empirical evidence revealed a rise in goodwill on balance sheets after FASB relaxed these amortization requirements.

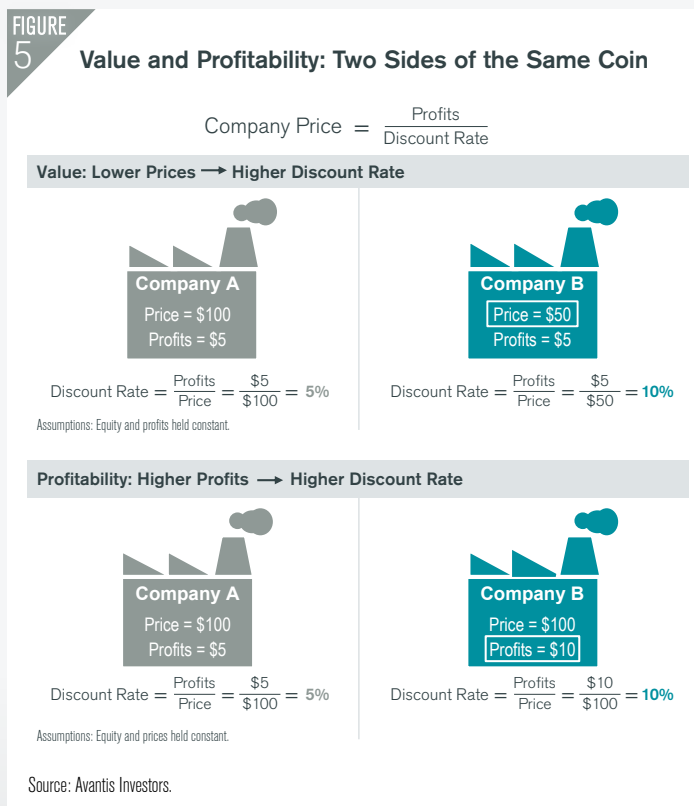
Intuitively, in the presence of mergers, adjustments to book value may be warranted due to accounting standards if we want it to represent the equity in the company. Targeting high book-to-market companies without removing goodwill can lead to an unintentional bias toward companies active in mergers and acquisitions. Goodwill is the premium an acquiring company pays beyond the fair value (market price) of the net assets of the acquired company. The discounted future cash flows of the acquired company end up as part of the goodwill line item on the combined entity's balance sheet at a discount rate the acquirer applied. Since future cash flows of the acquired company are already captured in the profitability metric of the combined entity, we exclude goodwill from book value to avoid double counting it. Without this adjustment, high book-to-market companies with large goodwill balances may be misidentified as value companies, creating an adverse bias toward companies that engage in mergers/acquisitions and tend to underperform.

For these reasons, we use a modified book-to-market metric that subtracts goodwill from book value when assessing a company's relative price.

Value and Profitability—Stronger Together

Our approach attempts to comprehensively capture what goes into a company's valuation. We do this by including an equity variable (modified book-to-market) and a flow variable (cash-based profitability). We believe attempting to assess relative value or an expected return of a company by using one of the two is incomplete. It's similar to valuing a company without considering both the balance sheet and income statement. Using both together informs us of differences in expected returns.

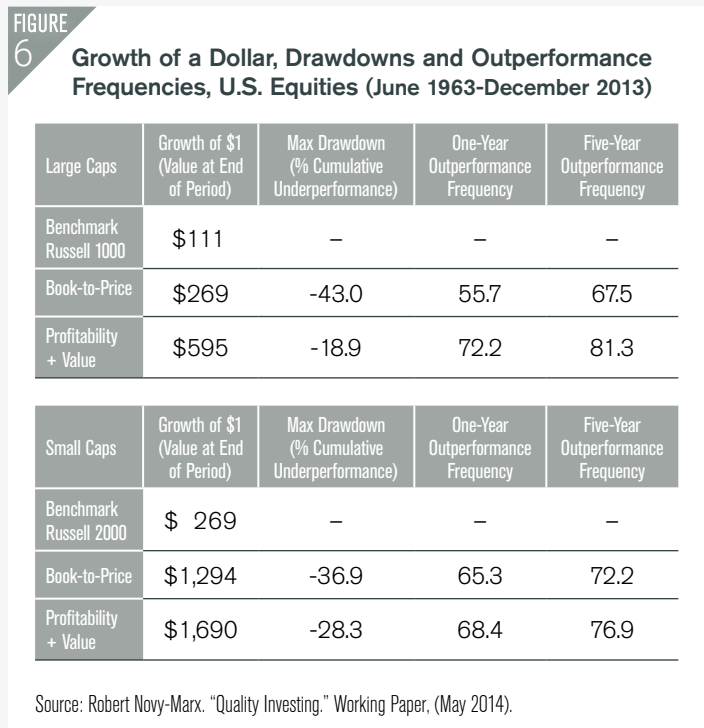
Novy-Marx's Quality Investing paper (2013) offers a useful comparison of value and profitability in assessing differences in discount rates, stating that "the same economic reasoning that predicts the value premium thus also predicts a profitability premium, suggesting that the quality and value phenomena are two sides of the same coin." **Figure 5** illustrates this concept.



If two companies have the same expected future profits and different prices, the company with the lower price must have a higher discount rate. Similarly, if two companies have the same

prices but different expected future profits, the company with higher profitability must have a higher discount rate.

Novy-Marx also compares how a strategy that uses value and profitability jointly compares to one that considers book-to-market only. As shown in **Figure 6**, he presents results for U.S. large caps and U.S. small caps over a 50-year sample period from 1963-2013. The data show improvements in cumulative performance, less significant maximum drawdowns relative to style-neutral benchmarks and increased frequency of outperformance over rolling one- and five-year periods.



Our weighting schema uses a joint metric that combines adjusted book-to-market and cash-based operating profitability together with the company's total market capitalization, ranking each security in the universe from highest to lowest expected return. These rankings determine how much we want to overweight or underweight a security relative to its market cap weight. Joint weightings using equity and flow variables are a reliable way to assess differences in expected returns across stocks. The joint metric also reduces unintended biases toward certain sectors or companies with high levels of accruals and goodwill that could adversely affect the expected return profile of our strategies.

Incorporating Additional Information

Constructing strategies based a valuation framework that is empirically backed and using reliable proxies as inputs can serve investors well over the long term. However, we can further enhance strategies by considering additional well-documented effects that may impact expected stock returns. We believe investment and momentum are two effects we can account for to further improve the likelihood of delivering outperformance.

Investment

Titman, Wei and Xie (2004) showed that high-investment companies—those with high levels of asset growth—tend to underperform lower-investment companies. Their intuition was that companies tend to raise capital when their discount rates are low (meaning their prices are high relative to fundamentals) causing subsequent underperformance. These companies tend to be small growth companies. Studies as far back as Fama and French (1993) show small growth companies tend to underperform. More recent papers show this underperformance is associated with lower profitability companies. **Figure 7**, extracted from Table 2 of Fama and French's Five-Factor paper (2014), illustrates that companies

FIGURE 7
Average Monthly Excess Returns vs. One-Month U.S. Treasury Bills

Panel B: Portfolios Formed on Size, Book-to-Market and Investment				
Book-to-Market	Low	2	3	High
Low Investment	0.69	0.99	1.18	1.23
2	0.87	0.92	0.93	1.08
3	0.84	0.95	1.01	0.97
High Investment	0.39	0.75	0.87	1.01

Panel C: Portfolios Formed on Size, Operating Profitability and Investment				
Operating Profitability	Low	2	3	High
Low Investment	0.85	1.01	1.19	1.27
2	0.94	0.90	0.92	1.04
3	0.61	0.93	0.94	1.06
High Investment	-0.09	0.58	0.76	0.76

Source: Eugene F. Fama and Kenneth R. French. "A Five-Factor Asset Pricing Model." Fama-Miller Working Paper, (September 2014). Averages of monthly percent excess returns for portfolios formed on (i) Size, B/M, and DP, (ii) Size, B/M, and Inv, and (iii) Size, DP and Inv; July 1963 to December 2013, 606 months. At the end of June each year, t stocks are allocated to two Size groups (Small and Big) using the NYSE median market cap as breakpoint. Stocks in each Size group are allocated independently to four B/M groups (Low B/M to High B/M for fiscal year t-1), four DP groups (Low DP to High DP for fiscal year t-1) and four Inv groups (Low Inv to High Inv for fiscal year t-1) using NYSE breakpoints specific to the Size group. The table shows averages of monthly returns in excess of the one-month Treasury bill rate on the 32 portfolios formed from each of three sorts.

with low book-to-market ratios, low profitability and high levels of investment have significantly lagged other small caps.

We exclude small companies with high prices relative to their equity, low levels of profitability and high asset growth that would have otherwise been eligible for purchase in the portfolios. We believe excluding these companies should add value over time since the excluded companies have low expected returns.

Momentum

Since Jegadeesh and Titman first published research on momentum effects in 1993, many empirical studies have formed a consensus that momentum is a significant driver of returns. Momentum suggests companies exhibiting positive (negative) returns relative to their peers will continue to outperform (underperform). While momentum portfolios in theory show strong outperformance relative to the market, in practice it can be costly to capture because companies don't typically exhibit positive or negative momentum for long periods. We integrate momentum into our strategies by balancing the expected return benefits with the implementation costs.

Downward momentum can have negative effects on value strategies since stocks typically become high book-to-market (value) when prices decrease. On the other hand, a portfolio should benefit from stocks that have experienced positive momentum, since these securities are expected to continue increasing in price relative to their peers. Momentum can be managed effectively using a variety of different ranking periods (e.g., previous 12-month or previous three-month performance). We use two complementary measures to robustly manage momentum in our strategies.

The first approach delays the purchase of stocks with large negative six-month returns and avoids the sale of stocks with large positive six-month returns. This approach enables us to pursue momentum without an expected increase in turnover.

We complement the six-month momentum screen by lagging price in our book-to-market ratio, similar to how the HML factor is computed in many Fama/French studies. Strategies using book-to-market ratios with current price in the denominator cause a stock to be eligible for purchase the moment a meaningful price decrease causes it to become "value," which also creates exposure to negative momentum. An adjusted book-to-market ratio that lags price by three months helps mitigate these negative effects. Conversely, the same price lag delays the sale of securities that are increasing in price and exhibiting upward momentum. We believe combining the two momentum techniques improves the expected effects of momentum on the strategy without incurring additional turnover.

Trading—Don't Put All Your Eggs in One Basket

How we execute strategies over time is just as important as the inputs we use to select and weight securities. The speed and frequency at which stock prices adjust necessitates an appropriate mix of rules-based processes around rebalancing and trading combined with strong overarching governance. Our daily investment process compares current holdings to other potential buy candidates based on several key criteria to determine what to buy or sell. **Figure 8** provides a high-level summary that includes some of the criteria we consider at each stage of this process.

Our strategies are designed to be broadly diversified across individual securities and sectors. Diversification forms a sound basis for risk management and mitigates concentration risk. While diversification is meant to increase the reliability of outcomes, the larger pool of candidates also increases flexibility around which securities are eligible to trade when needed. This flexibility translates to improved trade execution.

We focus on maintaining the desired strategy without introducing unnecessary turnover when we assess potential order candidates. Low turnover can be beneficial, but the type of turnover matters. Consider a low-turnover index fund that reconstitutes once a year and therefore concentrates all its turnover around that one day. While it has low turnover, it may not be the most efficient turnover as it is likely to demand a lot of liquidity over a short period. In between index reconstitution dates, this same index fund also makes investment decisions based on stale information and is unable to act on changes in prices and company financials that could impact expected returns.

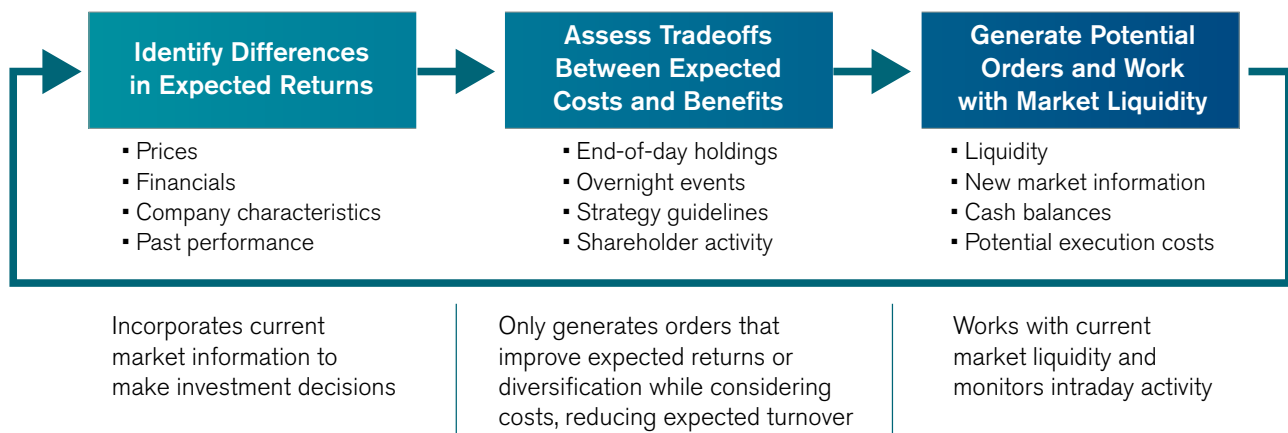
We not only target low-turnover levels, but also spread trades across smaller amounts throughout the year. Information about expected returns changes daily, so an advantage of rebalancing and trading daily is the ability to use current market information to inform investment decisions and potentially improve the expected return profile of an investment strategy. Spreading trades throughout the year also reduces the daily amounts traded, which reduces the chance of adverse market impact and reduces expected trading costs.

Looking Forward

We believe our investment approach is well-suited for asset allocators. Our philosophy is rooted in financial theory and supported empirically. Our investment process focuses on efficiently applying that theory, systematically assessing differences in expected returns across securities to inform buy and sell decisions while mitigating unnecessary risks, and controlling costs. Further, our framework for increasing expected returns is transparent enough to allow for ongoing inspection and verification. We are clear about which risks we are taking in our portfolios and why we are taking them, and we are conscious about what we can (and perhaps, just as importantly, cannot) control. We strive to remain at the forefront of incorporating sound academic research into our strategies to benefit investors as financial science continues to evolve. Most of all though, we will remain committed to developing well-diversified investment solutions at fair fees intended to meet and exceed the needs of our clients over the long haul.

FIGURE 8

Highlights of Our Investment Process



BIBLIOGRAPHY

- Agrawal, Anup, Jeffrey F. Jaffe, and Gerson N. Mandelker. 1992. "The Post-Merger Performance of Acquiring Firms: A Re-examination of an Anomaly." *The Journal of Finance* 47, no. 4 (September): 1605-1621. <https://doi.org/10.1111/j.1540-6261.1992.tb04674.x>
- Asquith, Paul, Robert F. Bruner, and David W. Mullins Jr. 1983. "The gains to bidding firms from merger." *Journal of Financial Economics* 11, no. 1-4 (April): 121-139. [https://doi.org/10.1016/0304-405X\(83\)90007-7](https://doi.org/10.1016/0304-405X(83)90007-7)
- Ball, Ray, Joseph Gerakos, Juhani T. Linnainmaa, and Valeri Nikolaev. 2016. "Accruals, cash flows, and operating profitability in the cross section of stock returns." *Journal of Financial Economics* 121, no. 1 (July): 28-45. <https://doi.org/10.1016/j.jfineco.2016.03.002>
- Daniel, Kent and Sheridan Titman. 2006. "Market Reactions to Tangible and Intangible Information." *The Journal of Finance* 61, no. 4 (August): 1605-1643. <https://doi.org/10.1111/j.1540-6261.2006.00884.x>
- Fama, Eugene F. and Kenneth R. French. 2014. "A Five-Factor Asset Pricing Model." Fama-Miller Working Paper, (September). <https://dx.doi.org/10.2139/ssrn.2287202>
- Fama, Eugene F. and Kenneth R. French. 1993. "Common risk factors in the returns on stocks and bonds." *Journal of Financial Economics* 33, no. 1 (February): 3-56. [https://doi.org/10.1016/0304-405X\(93\)90023-5](https://doi.org/10.1016/0304-405X(93)90023-5)
- Jegadeesh, Narasimhan and Sheridan Titman. 1993. "Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency." *The Journal of Finance* 48, no. 1 (March): 65-91. <https://doi.org/10.1111/j.1540-6261.1993.tb04702.x>
- Loughran, Tim and Anand M. Vijh. 1997. "Do Long-Term Shareholders Benefit From Corporate Acquisitions?" *The Journal of Finance* 52, (December): 1765-1790. <https://doi.org/10.1111/j.1540-6261.1997.tb02741.x>
- Merton, Robert C. and André Perold. 1993. "Theory of Risk Capital in Financial Firms." *Journal of Applied Corporate Finance* 6, no. 3 (Fall): 16-32. <https://doi.org/10.1111/j.1745-6622.1993.tb00231.x>
- Mitchell, Mark L. and Erik Stafford. 1999. "Managerial Decisions and Long-Term Stock Price Performance." *CRSP Working Paper*, no. 453 (October). <https://dx.doi.org/10.2139/ssrn.94137>
- Novy-Marx, Robert. 2013. "The other side of value: The gross profitability premium." *Journal of Financial Economics* 108, no. 1 (April): 1-28. <https://doi.org/10.1016/j.jfineco.2013.01.003>
- Pontiff, Jeffrey and Artemiza Woodgate. 2008. "Share Issuance and Cross-sectional Returns." *The Journal of Finance* 63, no. 2 (April): 921-945. <https://doi.org/10.1111/j.1540-6261.2008.01335.x>
- Sloan, Richard. 1996. "Do Stock Prices Fully Reflect Information in Accruals and Cash Flows about Future Earnings?" *The Accounting Review* 71, no. 3. (July): 289-306. <https://www.jstor.org/stable/248290>
- Titman, Sheridan, K.C. John Wei and Feixue Xie. 2004. "Capital Investments and Stock Returns." *Journal of Financial and Quantitative Analysis* 39, no. 4, (December): 677-700. <https://doi.org/10.1017/S0022109000003173>

PHIL MCINNIS

As a vice president and Director of Investments, Phil meets regularly with financial advisors and institutions to explain Avantis Investors' capabilities. He also oversees marketing content development about the company's investment approach.

Before joining Avantis Investors in 2019, Phil served as a vice president and Head of Portfolio Solutions at Dimensional Fund Advisors (DFA). In that role, he oversaw a team charged with developing content to explain DFA's investment approach and liaised with clients on topics related to asset allocation, manager evaluation and risk budgeting. Before DFA, Phil served as an investment consultant at Towers Watson (now Willis Towers Watson), working primarily with corporate and public defined-benefit and defined-contribution pension plans.

Phil earned a bachelor's of business administration in finance from the Goizueta Business School at Emory University. He holds Series 7, 24 and 66 licenses.

DANIEL ONG, CFA

Daniel is a senior portfolio manager at Avantis Investors. He previously served as a senior portfolio manager and vice president at Dimensional Fund Advisors (DFA). His responsibilities over 14 years at DFA spanned managing international developed and emerging markets equity strategies to leading the emerging markets equity desk and engaging with clients. Before DFA, he was an account manager at Metropolitan West Asset Management and a structure analyst at Pacific Investment Management Co.

Daniel is a Chartered Financial Analyst and earned a bachelor's degree in economics from the University of California and his master's degree in finance and accounting from the University of Chicago Booth School of Business.

Our philosophy is based on the idea that paying less for an expected stream of cash flows or the equity of a company should produce higher expected returns. Our systematic, repeatable and cost-efficient process uniquely designed for Avantis Investors is actively implemented to deliver diversified portfolios expected to harness those higher expected returns.

This material has been prepared for educational purposes only. It is not intended to provide, and should not be relied upon for, investment, accounting, legal or tax advice.

The opinions expressed are those of the investment portfolio team and are no guarantee of the future performance of any Avantis Investors portfolio. This information is not intended as a personalized recommendation or fiduciary advice and should not be relied upon for investment, accounting, legal or tax advice. References to specific securities are for illustrative purposes only and are not intended as recommendations to purchase or sell securities.

Investment return and principal value of security investments will fluctuate. The value at the time of redemption may be more or less than the original cost. Past performance is no guarantee of future results.

The contents of this Avantis Investors presentation are protected by applicable copyright and trade laws. No permission is granted to copy, redistribute, modify, post or frame any text, graphics, images, trademarks, designs or logos.

Avantis Investors[™]

FOR FINANCIAL PROFESSIONAL USE ONLY/NOT FOR DISTRIBUTION TO THE PUBLIC