

**RESEARCH**

# Developing Dimensional Wealth Models (AU)

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Dimensional applies robust investment principles to asset allocation. Our approach starts with defining an investment goal and identifying the key risks relevant to this goal. Then we build a set of asset allocations that aim to help investors achieve their goals by systematically and cost-effectively pursuing reliable sources of higher expected returns while managing risks and costs efficiently.

Recently, Dimensional designed the Dimensional Wealth Models for investors with a broad range of wealth goals, ranging from aggressive wealth growth to preservation of capital.

We have created two sets of models. The Core Wealth Models (AU) consist of Dimensional's core equity strategies and Dimensional's fixed interest strategies, all of which focus on securities with higher expected returns. The Sustainability Wealth Models (AU) are similar to the Core Wealth Models (AU) but invest in strategies that take sustainability considerations into account while targeting securities with higher expected returns.

Below is an outline of the five key decisions incorporated in our wealth-focused asset allocation approach: the split between equity and fixed interest, considerations around regional allocation, whether to hedge currency risk for different allocations, the emphasis on known drivers of higher expected returns and investor preferences around sustainability.

## I. ALLOCATION BETWEEN EQUITY AND FIXED INTEREST

Fixed interest can serve many roles in a portfolio to help investors achieve their goals, including managing overall portfolio volatility or managing liabilities. For example, adding fixed interest to an equity portfolio is one of the most effective tools an investor can use to balance the expected volatility and returns of the total portfolio. Determining the appropriate amount of fixed interest to include in a portfolio should be based on an investor's goals, needs, preferences and constraints.

For investors focused on the growth of assets, we have designed all-equity and equity-heavy allocations.

For investors seeking to dampen some of the volatility in their portfolios, we incorporate a greater allocation to fixed interest. The 50/50 Wealth Model (50% equity/50% fixed interest), for example, seeks total return consisting of capital appreciation and current income.

For investors who first and foremost seek the preservation of capital, we have designed conservative allocations invested predominantly in fixed interest securities. The all-fixed interest and 30/70 (30% equity/70% fixed interest) Wealth Models seek to constrain potential losses in the event of poor equity market performance.

## II. REGIONAL ALLOCATION IN EQUITIES

The global market portfolio's allocations to various regions are a sensible starting point for an equity investor. The global market portfolio is a theoretical basket of investments that holds all securities in the investment universe, and therefore all industries and countries, according to their market capitalisation weights. It incorporates the aggregate forward-looking expectations of all market participants and provides a continuously updated, instantaneous snapshot of global diversification.

We believe global diversification is an effective way to manage country-specific risks and provides a good rationale for investors to hold the equity and fixed interest securities of Australian and non-Australian firms. While both regions offer the potential to earn positive expected returns in the long run, they may perform quite differently over short periods, though there is no reliable evidence that the relative performance of one country or region relative to another can be predicted in advance.

There may, however, be sensible reasons to deviate from that global market portfolio and allocate more than the market cap weight to Australia to incorporate a home bias. Those reasons could be related to differences in implementation costs. For example, foreign dividend tax withholding can create a performance drag on international investments held by low-tax-rate investors. Another consideration is franking credits. For certain investors in Australia, the tax treatment of franking credits may provide further incentive to overweight their home market within their overall portfolio.

For these reasons, Dimensional's Wealth Models have around 36% of the equity weight invested in Australia, as opposed to a market capitalisation weight of around 2%. While significant, a 36% weight to Australia is lower than the typical home bias of Australian investors. We believe that our current level of home bias strikes a balance between maintaining global diversification and investor preferences.

## III. CURRENCY HEDGING

The return on global portfolios depends both on the return of the asset and on the return of the currency.

Research indicates that hedging currency exposure will not impact the long-term expected return of a portfolio compared to an unhedged portfolio. However, currency exposure may impact portfolio volatility. Broadly speaking, the standard deviation of an unhedged equity portfolio is primarily driven by the volatility of equity. Yet, for investors in smaller currencies, short- and medium-term currency movements may contribute meaningfully to portfolio standard deviation. For these reasons, 50% of the developed equity markets currency exposure is hedged in Dimensional's Wealth Models. Emerging markets exposure is left unhedged due to the high costs associated with hedging in emerging markets.

Within fixed interest, standard deviation is dominated by currency volatility; therefore, hedging currencies can greatly reduce the volatility in fixed interest portfolios. To preserve the risk-mitigating properties that an allocation to fixed interest brings to a diversified portfolio, the foreign currency exposure of the underlying fixed interest trusts is 100% hedged back to the Australian dollar.

For further discussion on currency hedging decisions, see Dai et al. (2020).<sup>1</sup>

1. Wei Dai and Warwick Schneller, "To Hedge or Not to Hedge: A Framework for Currency Hedging Decisions in Global Equity & Fixed Income Portfolios" (October 2020).

#### IV. DRIVERS OF HIGHER EXPECTED RETURNS

Dimensional believes prices in global competitive capital markets reflect the aggregate expectations of market participants. We therefore use information contained in market prices to identify systematic differences in expected returns across securities in equity and fixed interest markets.

##### a. Equities

Valuation theory provides a framework about the drivers of expected stock returns, linking expectations about a firm's future cash flows to its current value through a discount rate (or, equivalently, the expected return on the stock). While an approximation, this framework provides useful insights. One insight is that, all else equal, the lower the price paid for a security, the higher the expected return. Another insight is that, for a given price, the higher the expected future cash flows, the higher the expected return.

Market capitalisation and relative price contain information about the prices investors pay. Profitability contains information about the cash flows they expect to receive.<sup>2</sup> Using the valuation framework, we can identify systematic differences in expected stock returns along the company size, relative price and profitability dimensions. That is, we expect small cap stocks to have higher expected returns than large cap stocks (size premium); stocks with low relative prices—as measured, for instance, by the price-to-book ratio—to have higher expected returns than stocks with high relative prices (value premium); and high-profitability stocks to have higher expected returns than low-profitability stocks (profitability premium).

Empirically, extensive literature links firm size, relative price and profitability to the cross-section of expected stock returns<sup>3</sup> over long periods of time and across different markets around the world.

Dimensional's core equity strategies included in the Core and Sustainability Wealth Models seek to efficiently target the size, value and profitability premiums through a total market solution. These solutions systematically overweight stocks with higher expected returns (those with lower market capitalisations, lower relative prices and higher profitability)

relative to their market weights and underweight stocks with lower expected returns (those with higher market capitalisations, higher relative prices, and lower profitability) across the entire market in each eligible country. To do that, we use a weighting schema that integrates multiple premiums and maintains a link to price. A link to price is important because it allows us to control the level of deviation from the market in a more transparent and cost-efficient manner than many alternative approaches (e.g., rank-weighted, equal-weighted) and provides real-time information about changes in expected returns. Through this well-thought-out weighting schema approach, the strategies pursue the size, value and profitability premiums in an integrated, broadly diversified and cost-effective manner. Integration allows us to consider multiple sources of information about expected returns and the interactions among those sources. It also increases the probability of delivering outperformance. Broad diversification reduces stock-, sector- and country-specific risks; allows for flexibility at the point of execution; and increases the reliability of outcomes (see Dai 2016).<sup>4</sup> By spreading investments across the entire market and having built-in flexibility, these strategies seek to reduce unnecessary turnover and lower implementation costs.

In addition to focusing on the size, value and profitability premiums, for the fixed-interest-heavy more conservative allocations of the Core Wealth Models (AU) that often tend to be used by low-tax-rate investors, we emphasise Australian equities with higher franking yield by using the Dimensional Australian Core Imputation Trust as the Australian equity allocation. This trust aims to deliver higher after-tax returns for low-tax-rate investors by employing a core equity approach but also by emphasising companies with higher franking yields.

Dimensional's equity portfolios use a daily investment process that also allows them to incorporate short-term drivers of returns, such as investment, momentum and information from the securities lending market. We also take into consideration differences in expected returns at an intraday horizon through Dimensional's flexible, thoughtful approach to trading.<sup>5</sup>

2. Profitability is measured as operating income before depreciation and amortisation minus interest expense scaled by book.

3. For example, see: Eugene F. Fama and Kenneth R. French, "The Cross-Section of Expected Stock Returns," *Journal of Finance* 47, no. 2 (June 1992); Eugene F. Fama and Kenneth R. French, "Common Risk Factors in the Returns on Stocks and Bonds," *Journal of Financial Economics* 33, no. 1 (February 1993); Eugene F. Fama and Kenneth R. French, "Profitability, Investment and Average Returns," *Journal of Financial Economics* 82, no. 3 (December 2006); Eugene F. Fama and Kenneth R. French, "A Five-Factor Asset Pricing Model," *Journal of Financial Economics* 116, no. 1 (April 2015); Eugene F. Fama and Kenneth R. French, "International Tests of a Five-Factor Asset Pricing Model," *Journal of Financial Economics* 123, no. 3 (March 2017); Robert Novy-Marx, "The Other Side of Value: The Gross Profitability Premium," *Journal of Financial Economics* 108, no. 1 (April 2013); and Gerard O'Reilly and Savina Rizova, "Expected Profitability: A New Dimension of Expected Returns" (white paper, Dimensional Fund Advisors, June 2013).

4. Wei Dai, "How Diversification Impacts the Reliability of Outcomes" (white paper, Dimensional Fund Advisors, November 2016).

5. For further discussion, see the following Dimensional white papers: Stanley Black, Eric Geffroy, and Lukas Smart, "Understanding the Performance of Small Cap Stocks" (June 2018); Joe Hohn, Mary Phillips, and Savina Rizova, "Applying Profitability to Large Caps" (May 2017); Namiko Saito, "The Impact of Implementing Profitability in Equity Strategies: A Four-Year Study" (September 2018); Namiko Saito, "Value and Profitability Premiums Across Sectors" (September 2018); and Savina Rizova and Namiko Saito, "Investment and Expected Stock Returns" (October 2019).

## b. Fixed Interest

As with equities, we use current market prices to identify systematic differences in expected returns among fixed interest securities. Across bonds, expected returns vary by duration, credit quality and currency of issuance. We also use information in current market prices to monitor and manage risks and eliminate unnecessary trading costs. Portfolio implementation—which includes research, portfolio design, and portfolio management and trading—integrates those functions with the goal of increasing overall returns or meeting investors' goals efficiently.<sup>6</sup>

Dimensional focuses on the components of a bond's expected return that are known and observable. These components are the bond's current yield and expected capital appreciation over the holding period, based on the current term structure. The larger the sum of those two components (i.e., the higher the forward rate of a bond), the larger the bond's expected return. Hence, the larger the differences in expected returns among bonds of different durations—as captured, for example, by term spreads—the larger the expected future term premiums.

Dimensional uses this information in global yield curves to dynamically vary a portfolio's duration. For instance, when global yield curves are upwardly sloped and term spreads are wide (or forward rates are high), Dimensional may extend durations due to larger expected term premiums. When global yield curves are flat or inverted and term spreads are narrow (or forward rates are low), Dimensional may shorten durations due to lower expected term premiums.

Research also shows that the expected return of a credit bond is related to its yield and expected capital appreciation (forward rate). In particular, the larger the differences in expected returns among bonds of different credit quality—as reflected, for instance, in credit spreads—the larger the expected credit premium. Using this information from current yield curves, we can also dynamically vary the credit quality of our strategies to pursue higher expected returns.

The available global opportunity set is a further consideration within a fixed interest allocation. Investing in global bonds can increase expected returns, diversify term and credit exposure, and reduce idiosyncratic risks. Considering a global opportunity set in fixed interest allows us to more effectively pursue higher expected returns and manage risks.

In portfolios with higher equity allocations, taking on more term and credit exposure (by focusing on bonds with longer durations or lower credit quality, respectively) can supplement the higher-expected-return goal of such asset allocations without materially impacting the overall volatility of the portfolio since this volatility is dominated by the equity component. In portfolios with higher fixed interest allocations, the goal is to preserve capital, so such allocations would benefit from fixed interest investments that emphasise short duration and high credit quality.<sup>7</sup>

For example, in the portfolios with higher fixed interest allocations, a shorter duration is achieved by allocating more to the Dimensional Two-Year Sustainability Fixed Interest Trust. This trust targets term and credit premiums within the universe of primarily short-term investment-grade securities, with a portfolio duration capped at two years.

Consistent with the goal of providing an integrated and systematic emphasis on known drivers of higher expected returns in bonds, the Core Wealth Models use Dimensional's global core fixed interest strategies (Global Bond Trust and Global Bond Sustainability Trust) for less conservative allocations. These strategies provide deeper exposure to the term and credit premiums and broader opportunities for global diversification compared with the shorter-duration allocations used in conservative allocations.

## V. SUSTAINABILITY CONSIDERATIONS

Investors may wish to incorporate additional considerations into their asset allocation. For example, those who want to reduce their portfolio exposure to firms with less sustainable business practices could achieve this goal with the Sustainability Wealth Models.

The Sustainability Wealth Models offer investors the ability to pursue their sustainability and investment goals simultaneously. Dimensional's sustainability portfolios take into account key environmental and sustainability considerations within a robust investment framework that emphasises securities with higher expected returns, maintains broad diversification and remains mindful of transaction costs.

Across both equity and fixed interest sustainability strategies, we concurrently apply sustainability considerations to a broad investment universe and systematically use information in market prices to increase expected returns and manage risk.

6. For further discussion, see the following Dimensional white papers: David Plecha and L. Jacobo Rodríguez, "A Market-Driven Approach to Fixed Income" (June 2016); and Wei Dai, Joseph Kolerich, and Douglas Longo, "Pursuing Higher Expected Returns with Duration Constraints" (October 2017).

7. Matt Wicker and Kaitlin Simpson Hendrix, "Making Fixed Income Less Fixed" (Dimensional white paper, forthcoming).

As a result, investors can align investment decisions with their environmental values while preserving their ability to pursue reliably higher expected returns across stocks and bonds.

Dimensional uses a combination of internal and external data to systematically evaluate companies on sustainability issues. While there are many sustainability-related concerns an investment strategy can seek to address, an approach that attempts to consider all—or a large number of—variables may find that each has a limited effect or that some variables offset others. That may leave few investors satisfied with the weight given to their primary concerns. In addition, investors are increasingly asking for transparency and reporting on how their investment portfolios are doing in terms of their sustainability goals. For these reasons, we seek to address a focused set of issues that we believe are commonly of concern to sustainability investors and whose impact can be readily measured and reported. The primary consideration of our sustainability approach is environmental impacts from company emissions, including carbon emissions and potential emissions from fossil fuel reserves. Additional considerations include land use and biodiversity, toxic spills and releases, operational waste, water management, coal, factory farming, palm oil, controversial weapons, nuclear weapons components, systems and support services, tobacco, child labour, alcohol, gambling, adult entertainment and personal firearms. Through a combination of strategy-level exclusions and sector-level weighting, the Dimensional sustainability portfolios seek to effectively address key sustainability issues that matter to investors, including a meaningful reduction in the exposure to carbon intensity and potential emissions from reserves.

Dimensional has managed value-added sustainability investment solutions for more than two decades.<sup>8</sup> These well-diversified equity and fixed interest strategies are designed to address the issues most important to environmentally focused investors without compromising on sound investment principles or requiring investors to accept lower expected returns. These offerings provide investors with the ability to build global asset allocations with a consistent sustainability approach across the total portfolio.

## VI. THE DIMENSIONAL DIFFERENCE

At Dimensional, our investment approach is based on a belief in markets. We believe that competition among many market participants in public capital markets all around the globe makes prices quickly reflect new information and expectations. As a result, the global market portfolio provides a continuously updated, instantaneous snapshot of global diversification across securities, sectors, and countries and represents a sensible starting point for an asset allocation. We then deviate from the market portfolio in order to pursue higher expected returns while managing risks and controlling costs.

Valuation theory provides a robust framework about the drivers of expected stock returns. It tells us that a stock's current market price reflects information about future cash flows discounted by the expected stock return. Numerous studies using data that cover over 40 countries and span close to a century show that price variables, such as market capitalisation and relative price, combined with cash flow variables, like profitability and investment, contain reliable information about the cross-section of expected stock returns. We use this information to structure equity portfolios that systematically target the well-known long-term drivers of expected returns while also incorporating into the daily implementation process information about short-term drivers of expected returns, such as investment, momentum and securities lending as well as information about intraday costs. The equity portfolios in the Wealth Models aim to maintain a consistent focus on the size, value and profitability premiums, as there is no compelling evidence that timing the equity premiums is profitable for investors.<sup>9</sup> In summary, our approach to equities is based on rigorous theoretical and empirical research.

The same applies to our approach to asset allocation within fixed interest. The analytical framework for the expected return of a bond shows that forward rates (the yield and expected capital appreciation components of a bond's expected return) can provide information about differences in expected bond returns. Decades of rigorous empirical research spanning from

8. For additional information on Dimensional's sustainability and social strategies, see, for instance, "Dimensional's Approach to Sustainability Investing" (Dimensional Fund Advisors, July 2016); "Sustainability Trusts" (Dimensional Fund Advisors, June 2022); and Dimensional Fund Advisors website, "Dimensional Sustainability." Sustainability considerations may vary between trusts. Please consult each trust's PDS. More details about the sustainability considerations can be found in the Sustainability Considerations document for each underlying trust, available at [au.dimensional.com/funds](http://au.dimensional.com/funds). Sustainability scores are based on criteria created by Dimensional. The weighting of companies in each category (e.g., Most Sustainable, Above Average, Average, Below Average, and Least Sustainable) is determined by computing breakpoints based on each company's sustainability score within its respective target market.

9. For example, see Wei Dai, "Premium Timing with Valuation Ratios" (white paper, Dimensional Fund Advisors, September 2016) and Jim Davis, "Mean Reversion in the Dimensions of Expected Stock Returns" (white paper, Dimensional Fund Advisors, November 2014). See also "The Randomness of Global Equity Returns" (Dimensional Fund Advisors, June 2019) and "Go Global for Diversification That Travels Well" (Dimensional Fund Advisors, October 2022).

Fama in the 1970s<sup>10</sup> to Lee et al. (2020)<sup>11</sup> show that differences in forward rates across bonds of different duration, credit quality and currency of issuance do contain reliable information about differences in their average subsequent returns. Based on that research, our fixed interest portfolios target higher expected returns by using information in current forward rates to dynamically vary their allocations to different durations, credit qualities and yield curves within the allowed ranges of their guidelines. Just as we do in our equity model allocations, we seek to outperform the market without trying to outguess it in our fixed interest model allocations. Ample research shows that, like changes in stock prices, changes in interest rates are largely unpredictable.<sup>12</sup> Hence, our fixed interest allocations do not try to forecast interest rate changes but instead focus on reliable drivers of expected bond returns that are observable today.

Overall, the investment solutions in our models seek to add value by using up-to-date information embedded in the latest market prices to identify reliable differences in expected returns across securities and are supported by rigorous theoretical and empirical research. Thus, unlike some competitors, we avoid both the rigidities of indexing as well as the unreliability of forecasting.

Across both equities and fixed interest, we have an integrated emphasis on reliable drivers of higher expected returns in order to incorporate useful information about interactions among premiums. In contrast, other models either do not target sources of higher expected returns or may target them separately.

Another way our models differ from competitors' models is that Dimensional does not employ traditional optimisation techniques in developing asset allocations but instead designs models using a thoughtful framework designed to help investors meet their goals. An approach to asset allocation that uses ex post investment outcomes as ex ante return assumptions in a complex, opaque model may result in poorly understood or misleading conclusions for investors. For more on this, see Lee (2013) and Davis (2008).<sup>13</sup>

For investors, building a broadly diversified portfolio with a consistent focus on the reliable drivers of expected returns and continuously balancing the tradeoffs among competing premiums, diversification and costs when managing the portfolio may be a more reliable way to pursue higher expected returns than relying on capital market assumptions or opaque optimisation techniques.

## VII. CONCLUSION

We have highlighted what we believe to be the key issues to consider when choosing an asset allocation suitable for an individual investor's goals. Along with the broad split between equities and fixed interest, it is important to consider the specific characteristics within the equity and fixed interest allocations—such as a focus on reliable drivers of expected returns. Investors have different risk tolerances, sensitivities and time horizons, all of which need to be taken into account in the asset allocation process.

Each portfolio included in the Dimensional Wealth Models is broadly diversified and aims to efficiently target a level of expected return while managing sources of risk that are not expected to add value and minimising implementation costs through efficient portfolio design and flexibility in execution. We believe these portfolios are effective solutions that can help many investors pursue their investment goals.

10. See, for example, Eugene F. Fama, "Forward Rates as Predictors of Future Spot Rates," *Journal of Financial Economics* 3, no. 4 (October 1976).

11. Marlena Lee, Savina Rizova, and Samuel Yusun Wang, "The Cross-Section of Global Corporate Bond Returns" (white paper, Dimensional Fund Advisors, March 2022).

12. For example, see Fama, "Forward Rates" (1976); Eugene F. Fama, "The Information in the Term Structure," *Journal of Financial Economics* 13, no. 4 (December 1984); Eugene F. Fama, "Term Premiums in Bond Returns," *Journal of Financial Economics* 13, no. 4 (December 1984); Eugene F. Fama and Robert R. Bliss, "The Information in Long-Maturity Forward Rates," *American Economic Review* 77, no. 4 (September 1987); John Y. Campbell and Robert J. Shiller, "Yield Spreads and Interest Rate Movements: A Bird's Eye View," *Review of Economic Studies* 58, no. 3 (May 1991); and Gregory R. Duffee, "Term Premia and Interest Rate Forecasts in Affine Models," *Journal of Finance* 57, no. 1 (February 2002).

13. Marlena Lee, "Stress Testing Monte Carlo Assumptions" (working paper, Pension Research Council, Wharton School, University of Pennsylvania, October 2013); and Jim Davis, "Efficient Frontiers Constructed with Historical Data Can Be Misleading" (white paper, Dimensional Fund Advisors, November 2008).



## APPENDIX

### Index Descriptions

**DIMENSIONAL US SMALL CAP INDEX** was created by Dimensional in March 2007 and is compiled by Dimensional. It represents a market capitalisation-weighted index of securities of the smallest US companies whose market capitalisation falls in the lowest 8% of the total market capitalisation of the eligible market. The eligible market is composed of securities of US companies traded on the NYSE, NYSE MKT (formerly AMEX), and Nasdaq Global Market. Exclusions: non-US companies, REITs, UITs, and investment companies. From January 1975 to the present, the index excludes companies with the lowest profitability and highest relative price within the small cap universe. The index also excludes those companies with the highest asset growth within the small cap universe. Profitability is measured as operating income before depreciation and amortisation minus interest expense scaled by book. Asset growth is defined as change in total assets from the prior fiscal year to current fiscal year. Source: CRSP and Compustat. The index monthly returns are computed as the simple average of the monthly returns of 12 sub-indices, each one reconstituted once a year at the end of a different month of the year. The calculation methodology for the Dimensional US Small Cap Index was amended on January 1, 2014, to include profitability as a factor in selecting securities for inclusion in the index.

**DIMENSIONAL INTERNATIONAL SMALL CAP INDEX** was created by Dimensional in April 2008 and is compiled by Dimensional. July 1981–December 1993: It includes non-US developed securities in the bottom 10% of market capitalisation in each eligible country. All securities are market capitalisation weighted. Each country is capped at 50%. Rebalanced semiannually. January 1994–present: Market capitalisation-weighted index of small company securities in the eligible markets, excluding those with the lowest profitability and highest relative price within their country's small cap universe. The index also excludes those companies with the highest asset growth within their country's small cap universe. Profitability is measured as operating income before depreciation and amortisation minus interest expense scaled by book. Asset growth is defined as change in total assets from the prior fiscal year to current fiscal year. The index monthly returns are computed as the simple average of the monthly returns of four sub-indices, each one reconstituted once a year at the end of a different quarter of the year.

Prior to July 1981, the index is 50% UK and 50% Japan. The calculation methodology for the Dimensional International Small Cap Index was amended on January 1, 2014, to include profitability as a factor in selecting securities for inclusion in the index.

**DIMENSIONAL EMERGING MARKETS SMALL CAP INDEX** was created by Dimensional in April 2008 and is compiled by Dimensional. January 1989–December 1993: Fama/French Emerging Markets Small Cap Index. January 1994–present: Dimensional Emerging Markets Small Cap Index composition: Market capitalisation-weighted index of small company securities in the eligible markets, excluding those with the lowest profitability and highest relative price within their country's small cap universe. The index also excludes those companies with the highest asset growth within their country's small cap universe. Profitability is measured as operating income before depreciation and amortisation minus interest expense scaled by book. Asset growth is defined as change in total assets from the prior fiscal year to current fiscal year. The index monthly returns are computed as the simple average of the monthly returns of four sub-indices, each one reconstituted once a year at the end of a different quarter of the year. Source: Bloomberg. The calculation methodology for the Dimensional Emerging Markets Small Cap Index was amended on January 1, 2014, to include profitability as a factor in selecting securities for inclusion in the index.

The Dimensional indices have been retrospectively calculated by Dimensional Fund Advisors LP and did not exist prior to their index inception dates. Accordingly, results shown during the periods prior to each index's index inception date do not represent actual returns of the index. Other periods selected may have different results, including losses. Backtested index performance is hypothetical and is provided for informational purposes only to indicate historical performance had the index been calculated over the relevant time periods. Backtested performance results assume the reinvestment of dividends and capital gains.

**FAMA/FRENCH US VALUE RESEARCH INDEX:** Provided by Fama/French from CRSP securities data. Includes the lower 30% in price-to-book of NYSE securities (plus NYSE Amex equivalents since July 1962 and Nasdaq equivalents since 1973). Fama/French and multifactor data provided by Fama/French.

**FAMA/FRENCH US GROWTH RESEARCH INDEX:** Provided by Fama/French from CRSP securities data. Includes the higher 30% in price-to-book of NYSE securities (plus NYSE Amex equivalents since July 1962 and Nasdaq equivalents since 1973). Fama/French and multifactor data provided by Fama/French.

**FAMA/FRENCH INTERNATIONAL VALUE INDEX:** January 1975–present: Fama/French International Value Index. Simulated strategy of international developed countries with securities in the lower 30% price-to-book range. Source: Ken French website. Simulated from MSCI and Bloomberg data. Fama/French and multifactor data provided by Fama/French.

**FAMA/FRENCH INTERNATIONAL GROWTH INDEX:** January 1975–present: Fama/French International Growth Index. Simulated strategy of international developed countries with securities in the higher 30% price-to-book range. Source: Ken French website. Simulated from MSCI and Bloomberg data. Fama/French and multifactor data provided by Fama/French.

**FAMA/FRENCH EMERGING MARKETS VALUE INDEX:** July 1989–present: Fama/French Emerging Markets Value Index. Courtesy of Fama/French from Bloomberg and IFC securities data. Includes stocks in the upper 30% book-to-market range in each country; companies weighted by float-adjusted market cap; rebalanced annually in June. Fama/French and multifactor data provided by Fama/French.

**FAMA/FRENCH EMERGING MARKETS GROWTH INDEX:** July 1989–present: Fama/French Emerging Markets Growth Index. Courtesy of Fama/French from Bloomberg and IFC securities data. Includes stocks in the bottom 30% book-to-market range in each country; companies weighted by float-adjusted market cap; rebalanced annually in June. Fama/French and multifactor data provided by Fama/French.

**FAMA/FRENCH US HIGH PROFITABILITY INDEX:** July 1963–present: Fama/French US High Profitability Index. Courtesy of Fama/French from CRSP and Compustat securities data. Includes all stocks in the upper 30% operating profitability range of NYSE eligible firms; rebalanced annually in June. OP for June of year  $t$  is annual revenues minus cost of goods sold, interest expense, and selling, general, and administrative expenses divided by book equity for the last fiscal year end in  $t-1$ . Fama/French and multifactor data provided by Fama/French.

**FAMA/FRENCH US LOW PROFITABILITY INDEX:** July 1963–present: Fama/French US Low Profitability Index. Courtesy of Fama/French from CRSP and Compustat securities data. Includes all stocks in the lower 30% operating profitability range of NYSE eligible firms; rebalanced annually in June. OP for June of year  $t$  is annual revenues minus cost of goods sold, interest expense, and selling, general, and administrative expenses divided by book equity for the last fiscal year end in  $t-1$ . Fama/French and multifactor data provided by Fama/French.

**FAMA/FRENCH INTERNATIONAL HIGH PROFITABILITY INDEX:** July 1990–present: Fama/French International High Profitability Index. Courtesy of Fama/French from Bloomberg securities data. Includes stocks in the upper 30% operating profitability range in each region; companies weighted by float-adjusted market cap; rebalanced annually in June. OP for June of year  $t$  is annual revenues minus cost of goods sold, interest expense, and selling, general, and administrative expenses divided by book equity for the last fiscal year end in  $t-1$ . Fama/French and multifactor data provided by Fama/French.

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**FAMA/FRENCH EMERGING MARKETS HIGH PROFITABILITY INDEX:** July 1991–present: Fama/French Emerging Markets High Profitability Index. Courtesy of Fama/French from Bloomberg and IFC securities data. Includes stocks in the upper 30% operating profitability range in each country; companies weighted by float-adjusted market cap; rebalanced annually in June. OP for June of year  $t$  is annual revenues minus cost of goods sold, interest expense, and selling, general, and administrative expenses divided by book equity for the last fiscal year end in  $t-1$ . Fama/French and multifactor data provided by Fama/French.



**FAMA/FRENCH EMERGING MARKETS LOW PROFITABILITY INDEX:**

July 1991–present: Fama/French Emerging Markets Low Profitability Index. Courtesy of Fama/French from Bloomberg and IFC securities data. Includes stocks in the lower 30% operating profitability range in each country; companies weighted by float-adjusted market cap; rebalanced annually in June. OP for June of year  $t$  is annual revenues minus cost of goods sold, interest expense, and selling, general, and administrative expenses divided by book equity for the last fiscal year end in  $t-1$ . Fama/French and multifactor data provided by Fama/French.

Results shown during periods prior to each index's inception date do not represent actual returns of the respective index. Other periods selected may have different results, including losses. Backtested index performance is hypothetical and is provided for informational purposes only to indicate historical performance had the index been calculated over the relevant time periods. Backtested performance results assume the reinvestment of dividends and capital gains. Eugene Fama and Ken French are members of the Board of Directors of the general partner of, and provide consulting services to, Dimensional Fund Advisors LP.

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