



What Have We Learned?



Many of the Greatest Advancements in Finance Have Come from Academia

1952
Diversification and Portfolio Risk

HARRY MARKOWITZ
Nobel Prize in Economics, 1990

1966
Efficient Markets Hypothesis

EUGENE FAMA
Nobel Prize in Economics, 2013

1984
Term Structure of Interest Rates

EUGENE FAMA

2012
Profitability

ROBERT NOVY-MARX
EUGENE FAMA
KENNETH FRENCH

1964
Single-Factor Asset Pricing Risk/Return Model

WILLIAM SHARPE
Nobel Prize in Economics, 1990

1981
The Size Effect

ROLF BANZ

1992–1993
Value Effect and Multifactor Asset Pricing Model

EUGENE FAMA
KENNETH FRENCH

Innovations in Finance

Conventional Wisdom circa 1950

"Once you attain competency, diversification is undesirable. One or two, or at most three or four, securities should be bought. Competent investors will never be satisfied beating the averages by a few small percentage points."

Gerald M. Loeb, *The Battle for Investment Survival*, 1935

Analyze securities one by one. Focus on picking winners. Concentrate holdings to maximize returns.

Broad diversification is considered undesirable.

The Role of Stocks

James Tobin
Nobel Prize in Economics, 1981

Separation Theorem:
1. Form portfolio of risky assets.
2. Temper risk by lending and borrowing.

Shifts focus from security selection to portfolio structure.

"Liquidity Preference as Behavior Toward Risk," *Review of Economic Studies*, February 1958.

Single-Factor Asset Pricing Risk/Return Model

William Sharpe
Nobel Prize in Economics, 1990

Capital Asset Pricing Model:
Theoretical model defines risk as volatility relative to market.

A stock's cost of capital (the investor's expected return) is proportional to the stock's risk relative to the entire stock universe.

Theoretical model for evaluating the risk and expected return of securities and portfolios.

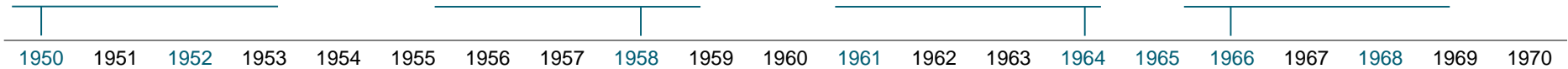
Efficient Markets Hypothesis

Eugene F. Fama

Extensive research on stock price patterns.

Develops Efficient Markets Hypothesis, which asserts that prices reflect values and information accurately and quickly. It is difficult if not impossible to capture returns in excess of market returns without taking greater than market levels of risk.

Investors cannot identify superior stocks using fundamental information or price patterns.



Diversification and Portfolio Risk

Harry Markowitz
Nobel Prize in Economics, 1990

Diversification reduces risk.

Assets evaluated not by individual characteristics but by their effect on a portfolio. An optimal portfolio can be constructed to maximize return for a given standard deviation.

Investments and Capital Structure

Merton Miller and Franco Modigliani
Nobel Prizes in Economics, 1990 and 1985

Theorem relating corporate finance to returns.

A firm's value is unrelated to its dividend policy.

Dividend policy is an unreliable guide for stock selection.

Behavior of Securities Prices

Paul Samuelson, MIT
Nobel Prize in Economics, 1970

Market prices are the best estimates of value.

Price changes follow random patterns. Future share prices are unpredictable.

"Proof That Properly Anticipated Prices Fluctuate Randomly," *Industrial Management Review*, Spring 1965.

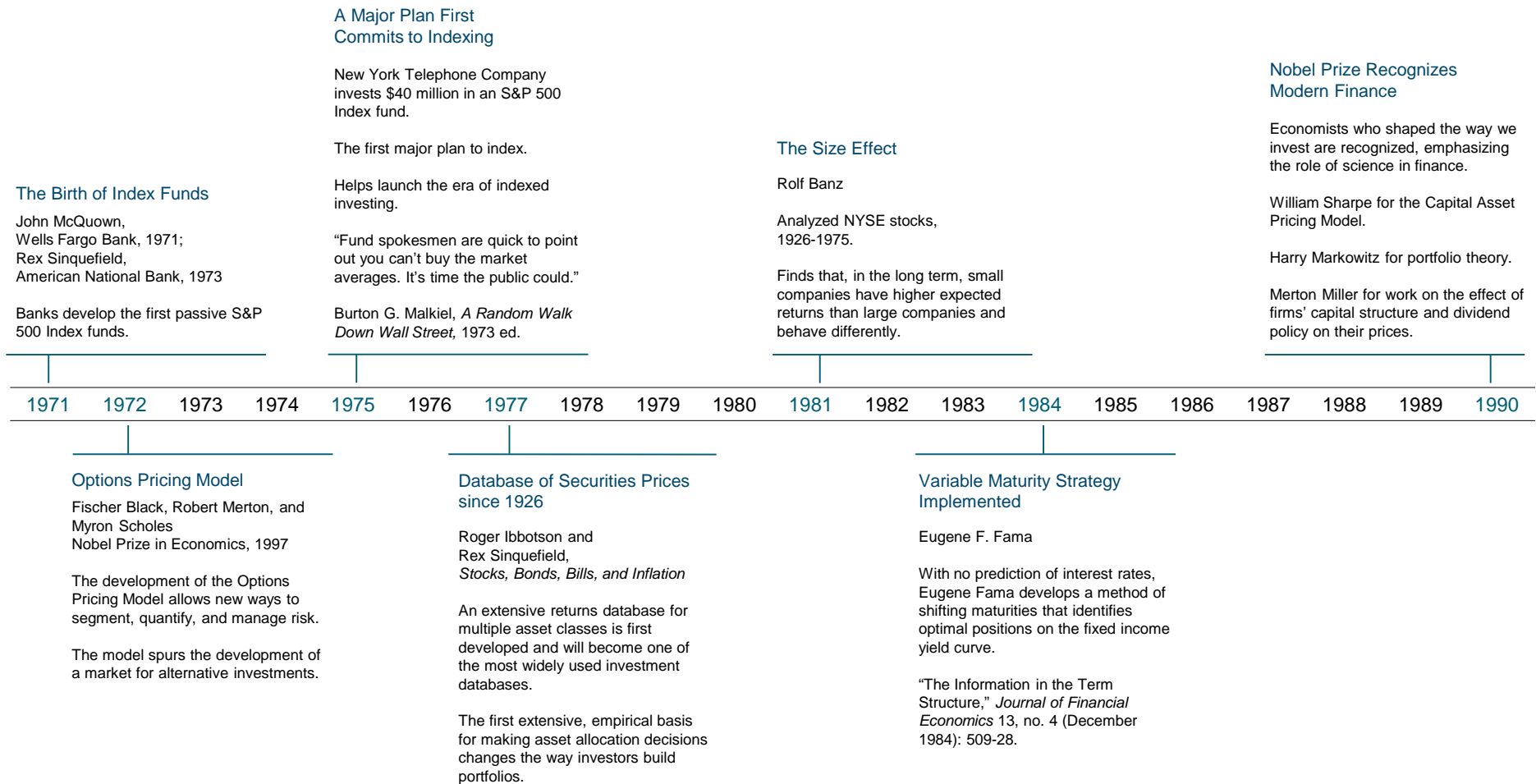
First Major Study of Manager Performance

Michael Jensen, 1965
A.G. Becker Corporation, 1968

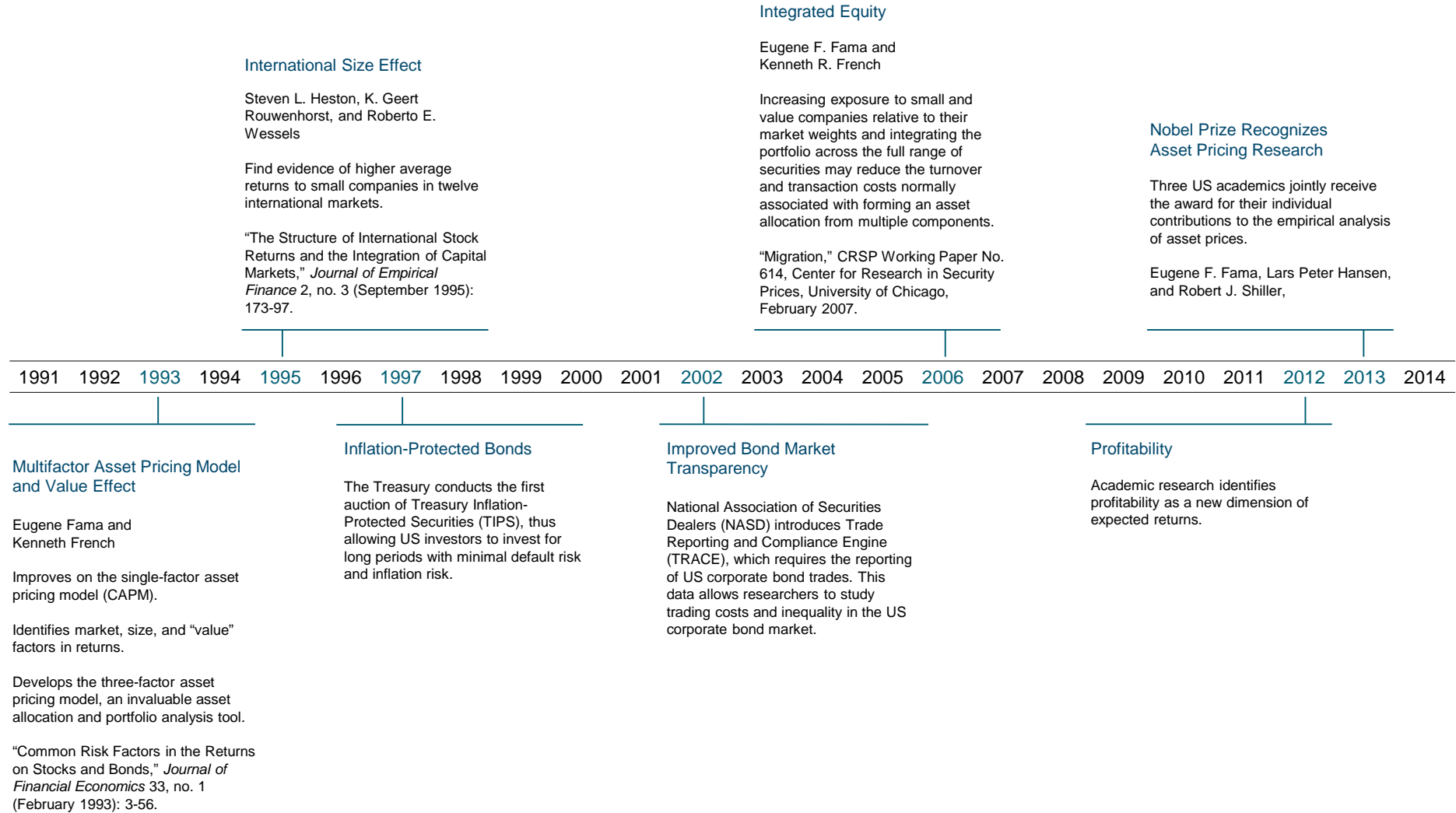
First studies of mutual funds (Jensen) and of institutional plans (A.G. Becker Corp.) indicate active managers underperform indices.

Becker Corp. gives rise to consulting industry with creation of "Green Book" performance tables comparing results to benchmarks.

Innovations in Finance



Innovations in Finance





What Is the Best Way to Invest?



The Dimensional Effect

Dimensions Point to Differences in Expected Returns

Academic research has identified these dimensions, which are well documented in markets around the world and across different time periods.



Diversification does not eliminate the risk of market loss. 1. Relative price as measured by the price-to-book ratio; value stocks are those with lower price-to-book ratios.

2. Profitability is a measure of current profitability, based on information from individual companies' income statements.



Dimensions of Expected Returns

Expected returns are driven by prices investors pay and cash flows they expect to receive

DIMENSIONS POINT TO SYSTEMATIC DIFFERENCES IN EXPECTED RETURNS



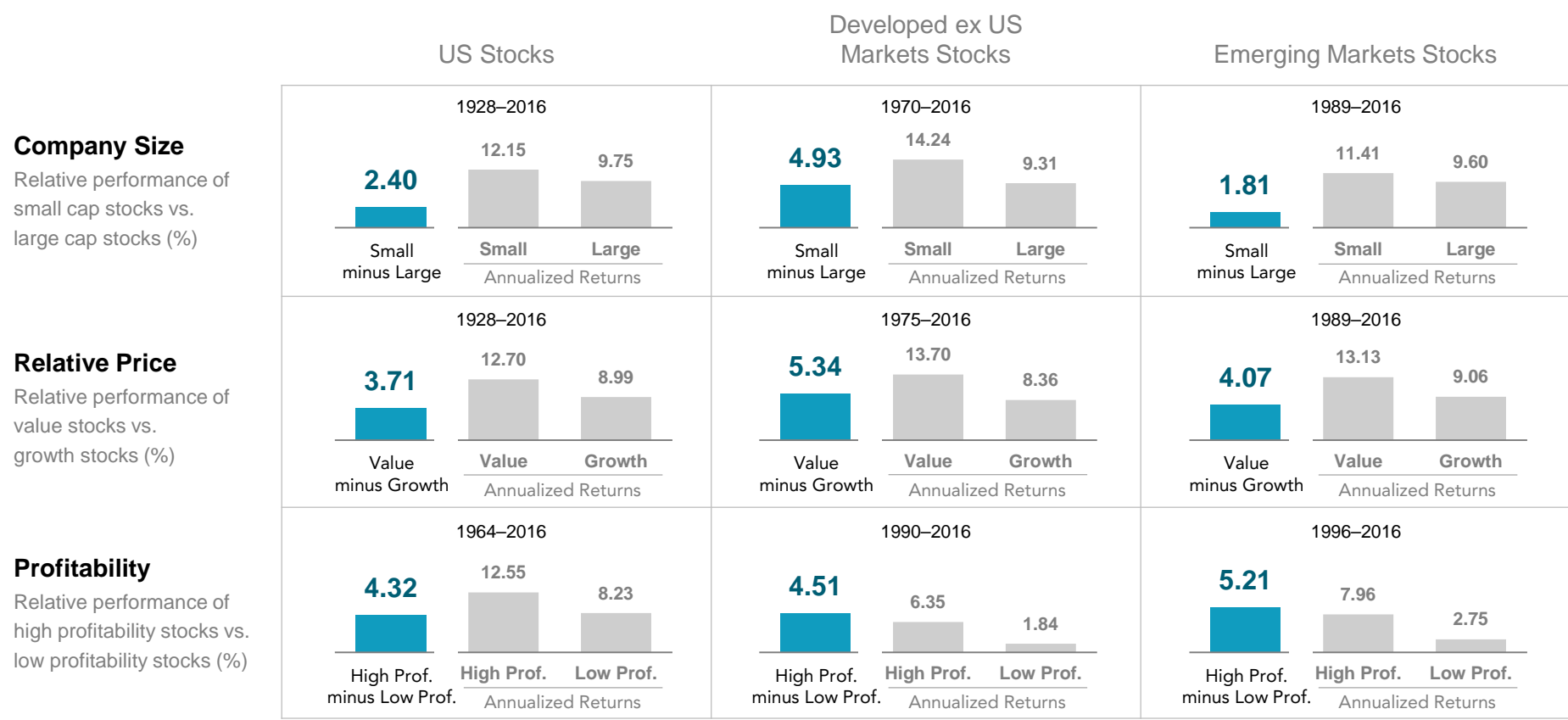
To be considered a dimension of expected return, a premium must be:

- Sensible
- Persistent
- Pervasive
- Robust
- Cost-effective

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Dimensions of Expected Returns

Historical premiums and returns (annualized): US, Developed ex US, and Emerging Markets



Information provided by Dimensional Fund Advisors LP.

In US dollars. US size premium: Dimensional US Small Cap Index minus S&P 500 Index. US relative price premium: Fama/French US Value Index minus Fama/French US Growth Index. US profitability premium: Dimensional US High Profitability Index minus Dimensional US Low Profitability Index. Dev. ex US size premium: Dimensional Intl. Small Cap Index minus MSCI World ex USA Index (gross div.). Dev. ex US relative price premium: Fama/French International Value Index minus Fama/French International Growth Index. Dev. ex US profitability premium: Dimensional International High Profitability Index minus Dimensional International Low Profitability Index. Emerging Markets size premium: Dimensional Emerging Markets Small Cap Index minus MSCI Emerging Markets Index (gross div.). Emerging Markets relative price premium: Fama/French Emerging Markets Value Index minus Fama/French Emerging Markets Growth Index. Emerging Markets profitability premium: Dimensional Emerging Markets High Profitability Index minus Dimensional Emerging Markets Low Profitability Index. Profitability is measured as operating income before depreciation and amortization minus interest expense scaled by book. Indices are not available for direct investment. Their performance does not reflect the expenses associated with the management of an actual portfolio. Past performance is not a guarantee of future results. Index returns are not representative of actual portfolios and do not reflect costs and fees associated with an actual investment. Actual returns may be lower. See "Index Descriptions" for descriptions of Dimensional and Fama/French index data. Eugene Fama and Ken French are members of the Board of Directors for and provide consulting services to Dimensional Fund Advisors LP. The S&P data is provided by Standard & Poor's Index Services Group. MSCI data © MSCI 2017, all rights reserved.

Dimensions of Expected Returns

10-year annualized premiums (2007–2016): US, Developed ex US, and Emerging Markets

	US Stocks	Developed ex US Markets Stocks	Emerging Markets Stocks
Company Size Relative performance of small cap stocks vs. large cap stocks (%)	<p>1.41</p> <p>Small minus Large</p>	<p>1.96</p> <p>Small minus Large</p>	<p>3.02</p> <p>Small minus Large</p>
Relative Price Relative performance of value stocks vs. growth stocks (%)	<p>-3.17</p> <p>Value minus Growth</p>	<p>0.31</p> <p>Value minus Growth</p>	<p>0.15</p> <p>Value minus Growth</p>
Profitability Relative performance of high profitability stocks vs. low profitability stocks (%)	<p>3.56</p> <p>High Prof. minus Low Prof.</p>	<p>2.62</p> <p>High Prof. minus Low Prof.</p>	<p>4.65</p> <p>High Prof. minus Low Prof.</p>

Information provided by Dimensional Fund Advisors LP.

All figures represent 10-year annualized compound returns (%) in US dollars. US size premium: Dimensional US Small Cap Index minus S&P 500 Index. US relative price premium: Fama/French US Value Index minus Fama/French US Growth Index. US profitability premium: Dimensional US High Profitability Index minus Dimensional US Low Profitability Index. Dev. ex US size premium: Dimensional Intl. Small Cap Index minus MSCI World ex USA Index (gross div.). Dev. ex US relative price premium: Fama/French International Value index minus Fama/French International Growth Index. Dev. ex US profitability premium: Dimensional International High Profitability Index minus Dimensional International Low Profitability Index. Emerging Markets size premium: Dimensional Emerging Markets Small Cap Index minus MSCI Emerging Markets Index (gross div.). Emerging Markets relative price premium: Fama/French Emerging Markets Value Index minus Fama/French Emerging Markets Growth Index. Emerging Markets profitability premium: Dimensional Emerging Markets High Profitability Index minus Dimensional Emerging Markets Low Profitability Index. Profitability is measured as operating income before depreciation and amortization minus interest expense scaled by book. **Indices are not available for direct investment. Their performance does not reflect the expenses associated with the management of an actual portfolio. Past performance is not a guarantee of future results. Index returns are not representative of actual portfolios and do not reflect costs and fees associated with an actual investment. Actual returns may be lower. See "Index Descriptions" for descriptions of Dimensional and Fama/French index data.** Eugene Fama and Ken French are members of the Board of Directors for and provide consulting services to Dimensional Fund Advisors LP. Dimensional indices use CRSP, Compustat and Bloomberg data. Fama/French indices provided by Ken French. The S&P data is provided by Standard & Poor's Index Services Group. MSCI data © MSCI 2017, all rights reserved.