

# SIZE AND STYLE BIASES IN POPULAR STOCK- MARKET INDICES

Fama and French (1993) showed that market, size and value factors explain the return and risk of diversified equity portfolios. Despite the discovery of additional factors in subsequent years, Mladina and Germani (2022)<sup>1</sup> showed empirically that these three factors are the genuine systematic risk factors in real-world equity portfolios.

The S&P 500, Dow Jones Industrial Average and NASDAQ Composite are the three most commonly cited US stock market indices in the financial media. We demonstrate each is simply a unique mix of the three factors, with varying sensitivities to market risk, small vs. large size biases, and value vs. growth style tilts. Exhibit 1 provides the results of regressions of each index's returns since inception through March 2024 on US market, size and value factors.

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**EXHIBIT 1 – FACTOR ATTRIBUTION OF POPULAR US INDICES**

Index Name	Inception Date	Alpha (t-stat)	US Market	US Size	US Value	Adjusted R <sup>2</sup>
<b>S&amp;P 500</b>	Feb-70	0.17% (0.99)	0.99	-0.19	0.02	0.99
<b>Dow Jones Industrial Average<sup>2</sup></b>	Oct-87	0.33% (0.43)	0.95	-0.22	0.15	0.91
<b>NASDAQ Composite</b>	Oct-03	0.83% (0.88)	1.11	0.18	-0.31	0.95

The alphas for each index are statistically insignificant (t-stat < 1.96), meaning there are no unexplained return premiums (i.e., no true, non-random alphas). And the high adjusted R<sup>2</sup> indicates the risk (variance) of each index is well-explained by its unique exposure to the three systematic risk factors. The factor betas (exposures) tell us the S&P 500 has a large cap bias (-0.19 size beta) with no meaningful style tilt (0.02 value beta). The Dow Jones Industrial Average also has a large cap bias (-0.22 size beta) but with a moderate value tilt (0.15 value beta). The NASDAQ Composite has higher sensitivity to market risk (1.11 market

1 Mladina and Germani, "[Stock-Market Risk Factors and Manager Performance](#)," *The Journal of Portfolio Management* (2022).

2 Total Returns for the Dow Jones Industrial Average in Morningstar Direct are first available in October 1987.

beta), along with a moderate small-cap bias (0.18 size beta) and material growth tilt (-0.31 value beta). When interpreting the reported returns of these popular indices, investors should be aware that they are explained by simple differences in the underlying factor mix.

To make these results more intuitive, we construct factor return benchmarks for each index from their respective mixes of factor betas. Exhibit 2 compares the annualized return and risk (standard deviation) of each index to those of its factor benchmark.

EXHIBIT 2 – POPULAR INDICES VS. FACTOR BENCHMARKS

Index Name	Index Return	Factor Benchmark Return	Index Risk	Factor Benchmark Risk
S&P 500	11.5%	10.9%	15.5%	15.3%
Dow Jones Industrial Average	10.5%	10.2%	15.2%	14.4%
NASDAQ Composite	12.5%	11.7%	17.8%	17.3%

The returns of the three indices are nearly identical to the returns of their respective factor benchmarks. The small observed return differences in Exhibit 2 are random because the alphas are random in Exhibit 1. The standard deviations of the three indices are also nearly identical to those of their respective factor benchmarks (though the risk of the Dow is a bit higher than its benchmark because it is less diversified). Factor exposures almost entirely explain the return and risk of these popular stock market indices over the long run.

The factor betas for each index have been remarkably consistent over any lookback period of the past twenty years, which is noteworthy given the rise of the so-called “Magnificent 7” stocks during the last decade. The “Magnificent 7” now comprise nearly one-third of the market value of the S&P 500, leading some to consider use of the S&P 500 Equal Weighted index in an attempt to capture broader breadth of the US equity market than the capitalization-weighted S&P 500. Exhibit 3 shows the results of our regression of S&P 500 Equal Weighted index returns on US market, size and value factors since index inception through March 2024.

EXHIBIT 3 – FACTOR ATTRIBUTION OF S&P 500 EQUAL-WEIGHTED

Index Name	Inception Date	Alpha (t-stat)	US Market	US Size	US Value	Adjusted R <sup>2</sup>
S&P 500 Equal-Weighted	Jan-71	0.01% (0.01)	1.07	0.07	0.29	0.95

Again we find that the alpha is statistically random, so there is no unexplained return premium. And the high adjusted R<sup>2</sup> indicates risk is well-explained by its underlying factor mix. The equal-weighted index has a more neutral size bias (0.07 size beta) than the standard S&P 500 (-0.19 size beta), but perhaps, surprisingly, it has a meaningful value tilt (0.29 value beta). In other words, there is nothing unique or different about the S&P 500 Equal-Weighted index; it is just another permutation of factors.

In fact we can closely replicate the return and risk of the S&P 500 Equal-Weighted index with a blend of the S&P 500 and Russell 2000 Value (small cap value) indices. For example, over the trailing ten-year period ending March 2024, the S&P Equal-Weighted index returned 10.9% (annualized) with 16.6% standard deviation, while a 70/30 blend of the S&P 500 and Russell 2000 Value returned 11.3% with 16.1% standard deviation — the return and risk are nearly identical.<sup>3</sup> However, the S&P 500 Equal-Weighted index requires far more turnover to rebalance, generally resulting in higher transaction costs and taxes for taxable investors.

International versions of the three factors also explain the return and risk of international stocks. The MSCI EAFE is perhaps the most popular international equity index. Exhibit 4 shows the regression results of the MSCI EAFE against international market, size and value factors from the 1990 inception of the international factors through March 2024.

EXHIBIT 4 – FACTOR ATTRIBUTION OF MSCI EAFE

Index Name	Factor Inception Date	Alpha (t-stat)	International Market	International Size	International Value	Adjusted R <sup>2</sup>
MSCI EAFE	Jul-90	-0.49% (-1.60)	0.98	-0.19	0.02	0.99

The alpha is random and the mix of factor betas well explains the return and risk of international stocks. The MSCI EAFE index has a large cap bias (-0.19 size beta) and neutral style orientation (0.02 value beta) when factors are constructed from international stocks only.

Global investors seek the diversification benefit of owning both US and international equities. Therefore, it is worth evaluating size and style biases of US vs. international indices when factors are constructed from global (i.e., US plus international) stocks. Exhibit 5 provides the factor betas for the S&P 500 and MSCI EAFE over the last ten years (ending March 2024) using global factors.

EXHIBIT 5 – GLOBAL BETAS

Index Name	10 YEARS			Adjusted R <sup>2</sup>
	Global Market	Global Size	Global Value	
S&P 500	1.00	-0.31	-0.12	0.96
MSCI EAFE	0.97	0.03	0.16	0.92

The S&P 500 has a mega-cap bias (-0.31 size beta) and modest growth tilt (-0.12 value beta), while the MSCI EAFE has a neutral size bias (0.03 size beta) and modest value tilt (0.16 value beta). An investor seeking broad diversification can eliminate latent size and style biases by owning global equity instead of having a heavy US bias.

Systematic risk factors almost entirely explain the returns of widely-referenced stock indices, as well as the returns of diversified mutual funds, exchange-traded funds, and separately-managed accounts. Investors should be aware of these exposures in their portfolios, as they are the fundamental drivers of equity return and risk.

3 A blend of 70% S&P 500 and 30% Russell 2000 Value minimizes tracking error to the index.

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