

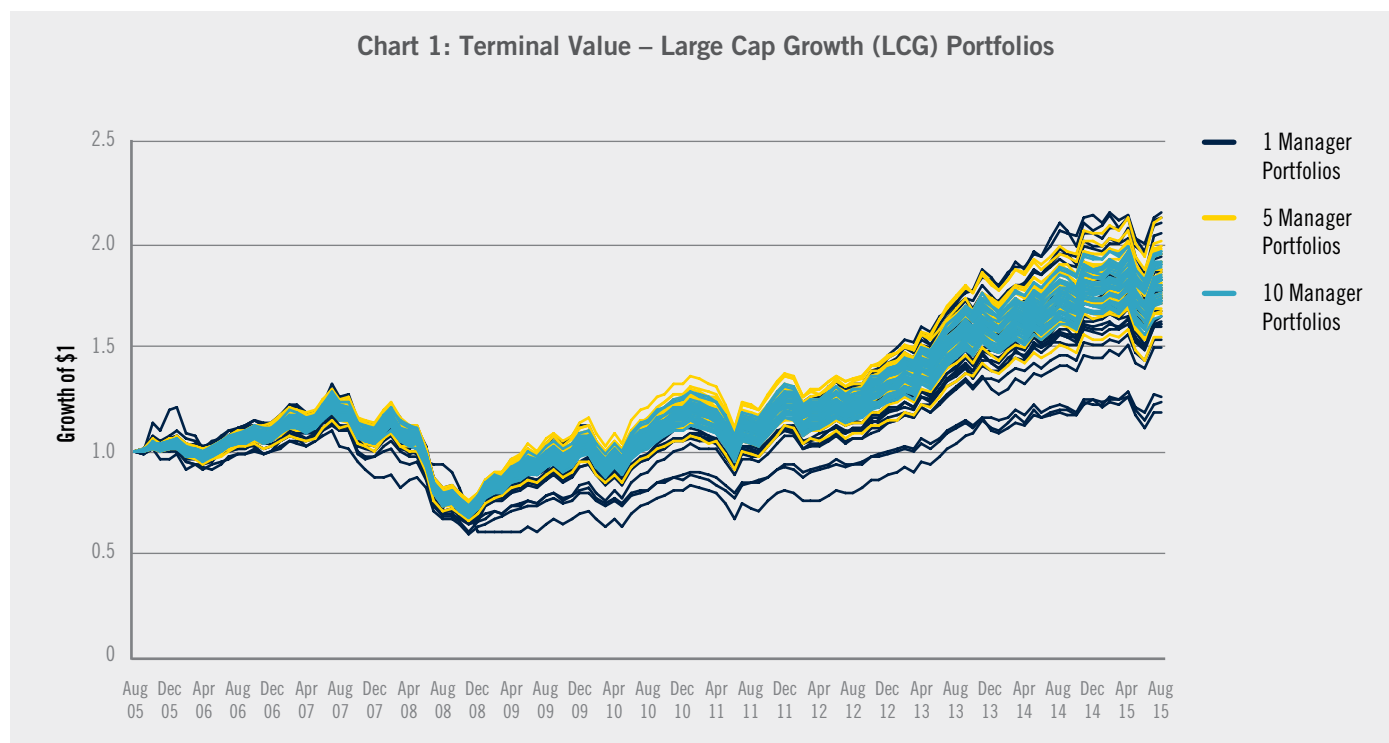
January 2016

Over Diversification: Fact or Fiction

Is a multi-manager single asset class structure simply an index fund in disguise?

Investors often face a number of key decisions when building an investment portfolio. Issues such as investment objective, time horizon, and risk tolerance are fairly standard; however, much less time is spent discussing portfolio construction and the appropriate number of investments to use when constructing a well-diversified portfolio. The benefits of diversifying across asset classes is well documented in the investment industry. However, there is much less documentation on the benefits of diversifying within asset classes. In this study we will demonstrate that an investor can benefit from a portfolio structure that diversifies across managers within a single asset class.

Proponents of the multi-manager single asset class structure will argue that an investor can dramatically reduce the risk of selecting an underperforming fund by simply diversifying across funds within an asset class. O'Neal & Fant (1999) (See Reference section on page 9) demonstrated that investors can dramatically reduce the variability of the terminal value of their investment portfolio by diversifying across funds within a single asset class (see Chart 1 below).



Source: Strategic Investment Research Group, Morningstar U.S. Mutual Funds Database. Performance is net of fees. Real performance as of August 31, 2015. Past performance is no guarantee of future results.

Opponents of this type of structure will argue that a multi-fund structure will result in each fund manager's active bets being potentially canceled out by the active bets of the other fund managers, resulting in little more than an expensive index fund.

This study will demonstrate that when combining multiple managers into a single asset class, the resulting portfolio still maintains a profile that is far more active than a comparable index fund.

Data

Beginning with the Morningstar Universe, mutual funds were sorted by Morningstar category. In an effort to control for survivor bias, all funds in existence as of September 2005 were included in the study with the following exceptions. In all cases only the oldest share class of a fund was used, with all other share classes excluded. Finally, funds were eliminated if Morningstar classified them as an index fund. Table 1 lists the specific Morningstar categories evaluated, as well as the number of funds in our universe after the screens were completed.

Table 1

MORNINGSTAR CATEGORY	TOTAL
Large Cap Growth (LCG)	597
Large Cap Blend (LCB)	498
Large Cap Value (LCV)	396
Mid Cap Growth (MCG)	293
Mid Cap Value (MCV)	106
Small Cap Growth (SCG)	290
Small Cap Value (SCV)	102
Foreign Large Blend (FLB)	178
Intermediate Term Bond (FI)	343
Emerging Market Equity (EM)	76
Total	2,879

Source: Morningstar U.S. Mutual Funds Database.

Methodology

For each of the 10 asset classes in the study, we randomly generated 5,000 portfolio combinations with between one and 10 funds and grouped them by the number of funds that they contained. Each group had an equal number of portfolio combinations (500).

To assess whether a combination of funds was "index like," we evaluated the tracking error of the resulting portfolio. Table 2 shows the benchmark used for each asset class.

In addition to tracking error, the study also considered the effects of a multi-fund single asset class structure on each randomly generated portfolio's excess returns.

See the Appendix for a more detailed explanation of our methodology.

Table 2

MORNINGSTAR CATEGORY	BENCHMARK
Large Cap Growth (LCG)	Russell 1000® Growth
Large Cap Blend (LCB)	Russell 1000®
Large Cap Value (LCV)	Russell 1000® Value
Mid Cap Growth (MCG)	Russell Mid Cap Growth®
Mid Cap Value (MCV)	Russell Mid Cap Value®
Small Cap Growth (SCG)	Russell 2000® Growth
Small Cap Value (SCV)	Russell 2000® Value
Foreign Large Blend (FLB)	MSCI EAFE
Intermediate Term Bond (FI)	Barclays Aggregate Bond
Emerging Market Equity (EM)	MSCI EM

Source: Strategic Investment Research Group.

Results

Table 3 shows the average annualized tracking error of the 500 random portfolios constructed for each group within each asset class. On average, tracking error across all Morningstar categories and single fund portfolios was approximately 5% annually. The funds with the highest tracking error fell into the Small Cap Value Morningstar category, and the funds with the lowest tracking error fell into the Intermediate-Term Bond Morningstar category. As expected, as additional funds are added to each portfolio, diversification causes average tracking error to fall. However, the marginal reduction in tracking error of each additional manager reaches a limit fairly rapidly (4–6 funds), and this effect is consistent across Morningstar categories. More importantly is the

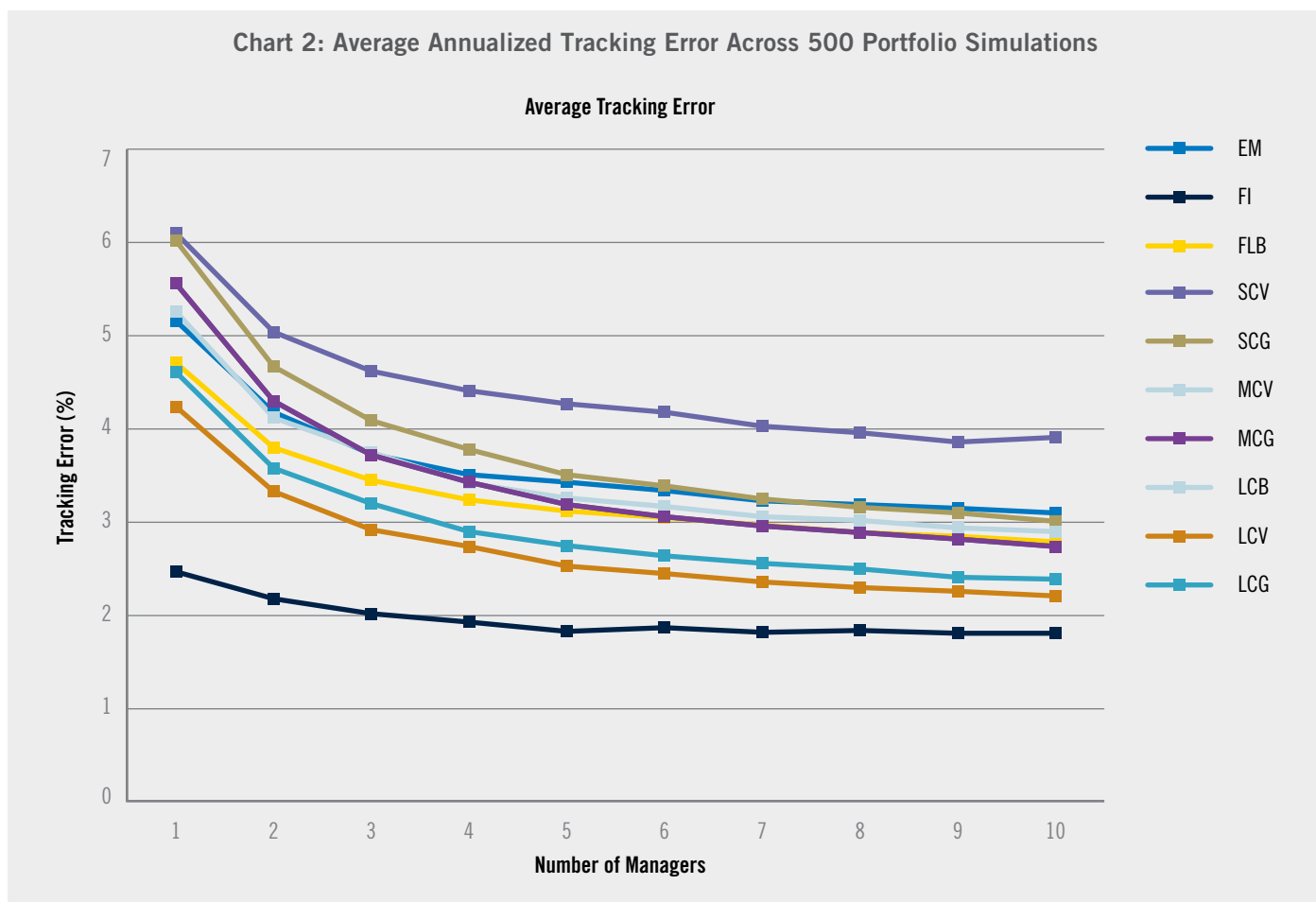
observation that as the reduction limit is reached, the average portfolio(s)' tracking error remains well above that of an index fund and stays as such even as more funds are introduced. This can be observed graphically on Chart 2.

As Chart 2 shows, tracking error does indeed fall as additional funds are added within a Morningstar category. While individual fund managers' active bets are being diversified by the active bets of the other managers, the marginal reduction in tracking error of the portfolio with each addition decreases rapidly and overall tracking error reaches a lower limit at a level well above what could be considered "index like."

Table 3: Average Annualized Tracking Error Across 500 Portfolio Simulations

NUMBER OF FUNDS MAKING UP EACH PORTFOLIO											
Morningstar Category		1	2	3	4	5	6	7	8	9	10
	LCG	4.61	3.58	3.20	2.90	2.75	2.64	2.56	2.50	2.41	2.39
	LCV	4.24	3.33	2.92	2.74	2.53	2.45	2.36	2.30	2.26	2.21
	LCB	5.56	4.30	3.72	3.43	3.19	3.06	2.96	2.89	2.82	2.74
	MCG	5.56	4.30	3.72	3.43	3.19	3.06	2.96	2.89	2.82	2.74
	MCV	5.26	4.12	3.75	3.42	3.26	3.17	3.06	3.02	2.94	2.90
	SCG	6.02	4.67	4.09	3.78	3.51	3.39	3.25	3.16	3.10	3.01
	SCV	6.10	5.04	4.62	4.41	4.27	4.18	4.03	3.96	3.86	3.91
	FLB	4.71	3.80	3.45	3.24	3.12	3.05	2.97	2.89	2.85	2.79
	FI	2.47	2.18	2.02	1.93	1.83	1.87	1.82	1.84	1.81	1.81
	EM	5.16	4.18	3.73	3.51	3.43	3.34	3.23	3.19	3.15	3.10
	Average	4.97	3.95	3.52	3.28	3.11	3.02	2.92	2.86	2.80	2.76

Source: Strategic Investment Research Group, Morningstar U.S. Mutual Funds Database, Russell, MSCI, Barclays. Past performance is no guarantee of future results.



Source: Strategic Investment Research Group, Morningstar U.S. Mutual Funds Database, Russell, MSCI, Barclays. Past performance is no guarantee of future results.

Table 4 on the next page shows the standard deviation of these tracking error observations. We can observe that the distribution of the tracking error observations across all Morningstar categories becomes narrower as managers are added to the portfolio. This is useful for investors who are looking to manage their tracking error within a specific range, as their confidence in the predicted tracking error of the asset class fulfillment will be higher. Within Large Cap Growth, for example, an investor investing in a single fund within the asset class could have realized an annualized tracking error of as low as 197 basis points, or as high as almost 1,100 basis points. By adding additional Large Cap Growth funds, an investor could dramatically decrease the dispersion of tracking error outcomes.

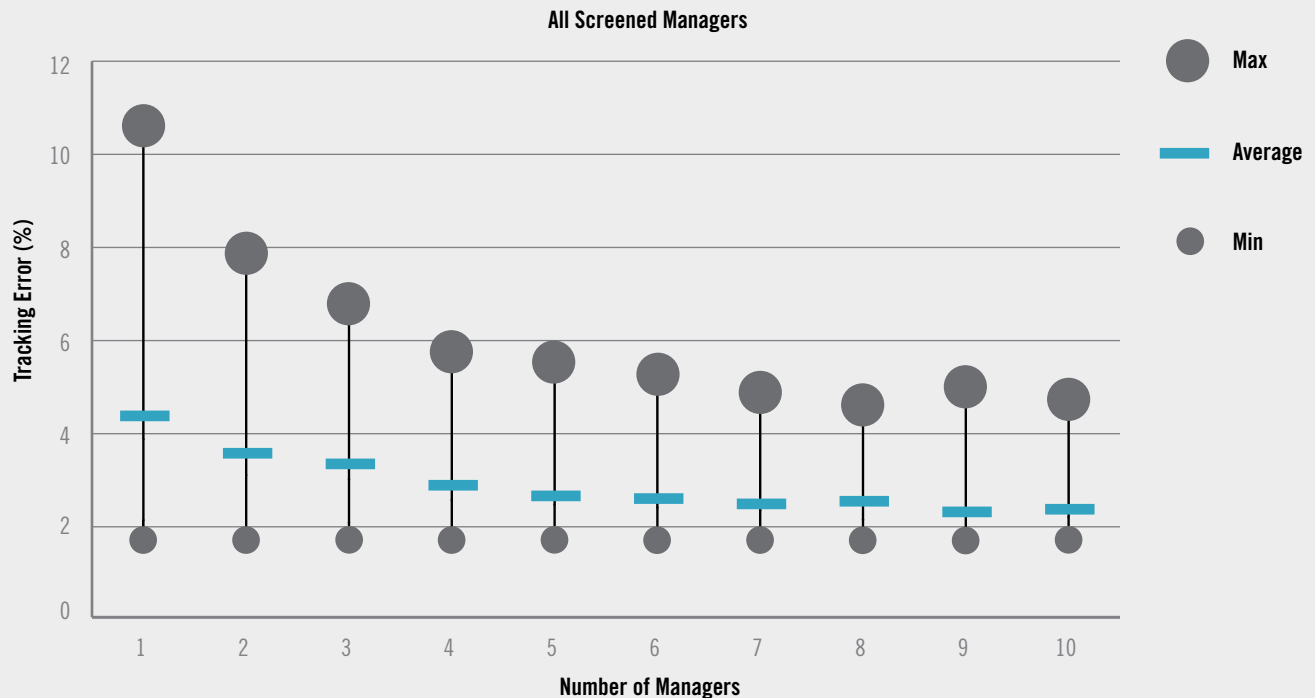
Table 4: Standard Deviation of Annualized Tracking Error Across 500 Portfolio Simulations

NUMBER OF FUNDS MAKING UP EACH PORTFOLIO											
Morningstar Category		1	2	3	4	5	6	7	8	9	10
	LCG	1.46	0.92	0.75	0.59	0.53	0.48	0.41	0.40	0.39	0.39
	LCV	1.65	0.99	0.73	0.62	0.52	0.47	0.43	0.39	0.36	0.34
	LCB	1.77	1.02	0.75	0.62	0.53	0.48	0.41	0.38	0.35	0.32
	MCG	1.77	1.02	0.75	0.62	0.53	0.48	0.41	0.38	0.35	0.32
	MCV	2.11	1.10	0.86	0.60	0.52	0.46	0.39	0.41	0.34	0.31
	SCG	2.82	1.66	1.17	0.98	0.84	0.74	0.64	0.60	0.53	0.50
	SCV	3.33	1.79	1.41	1.11	1.08	0.93	0.80	0.69	0.65	0.64
	FLB	2.00	1.22	0.80	0.75	0.63	0.51	0.47	0.39	0.37	0.32
	FI	1.53	1.26	0.93	0.79	0.63	0.65	0.56	0.52	0.50	0.47
EM	1.52	0.87	0.57	0.50	0.46	0.39	0.32	0.31	0.29	0.28	

Source: Strategic Investment Research Group, Morningstar U.S. Mutual Funds Database, Russell, MSCI, Barclays.

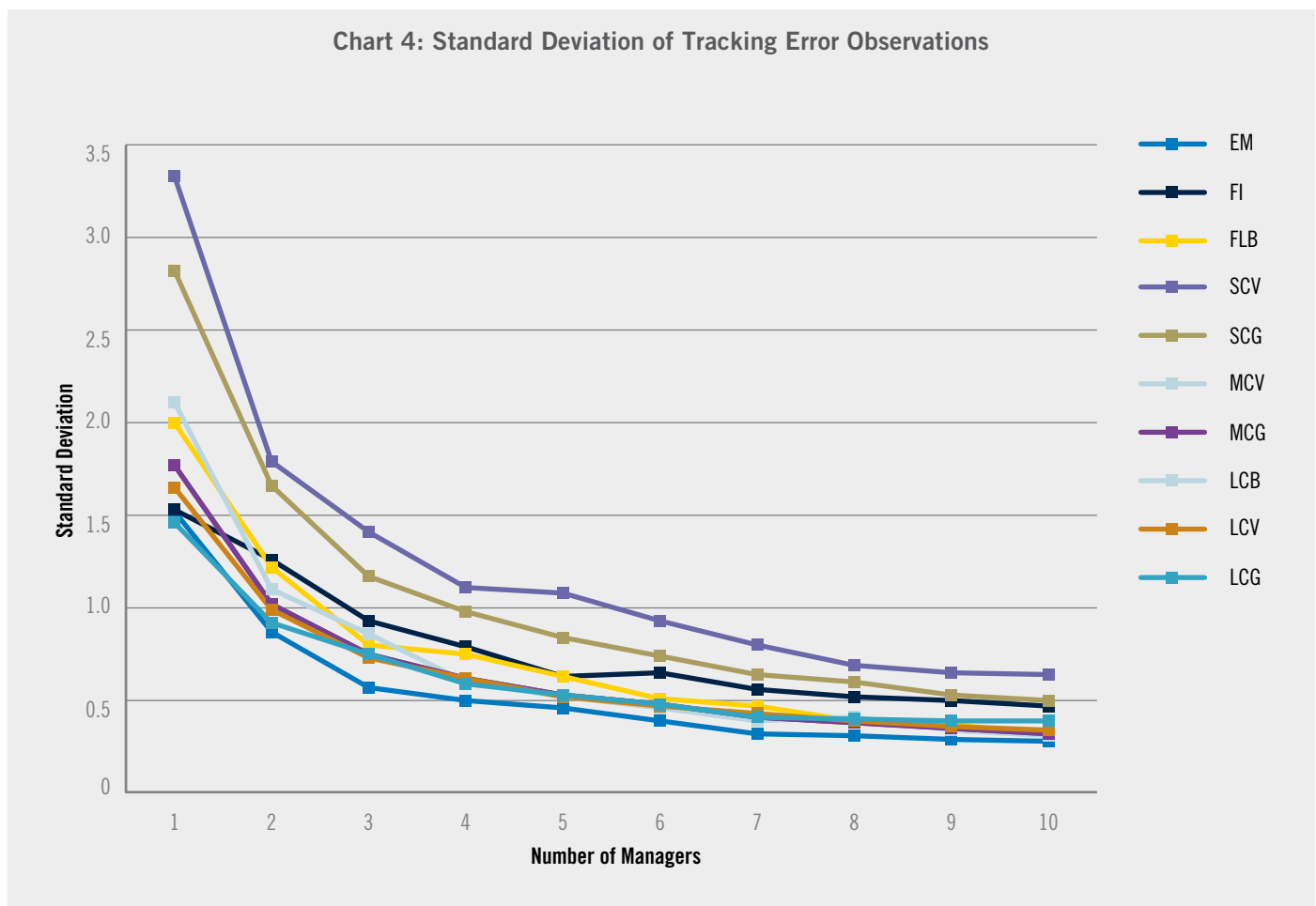
A portfolio of five managers within Large Cap Growth gives a range of 160 basis points of tracking error to 470 basis points of tracking error. This can be observed from Chart 3 below. An investor's appetite for benchmark risk can help guide the number of investments held in each category.

Chart 3: Tracking Error Observations Across 500 Portfolio Simulations in LCG



Source: Strategic Investment Research Group, Morningstar U.S. Mutual Funds Database, Russell.

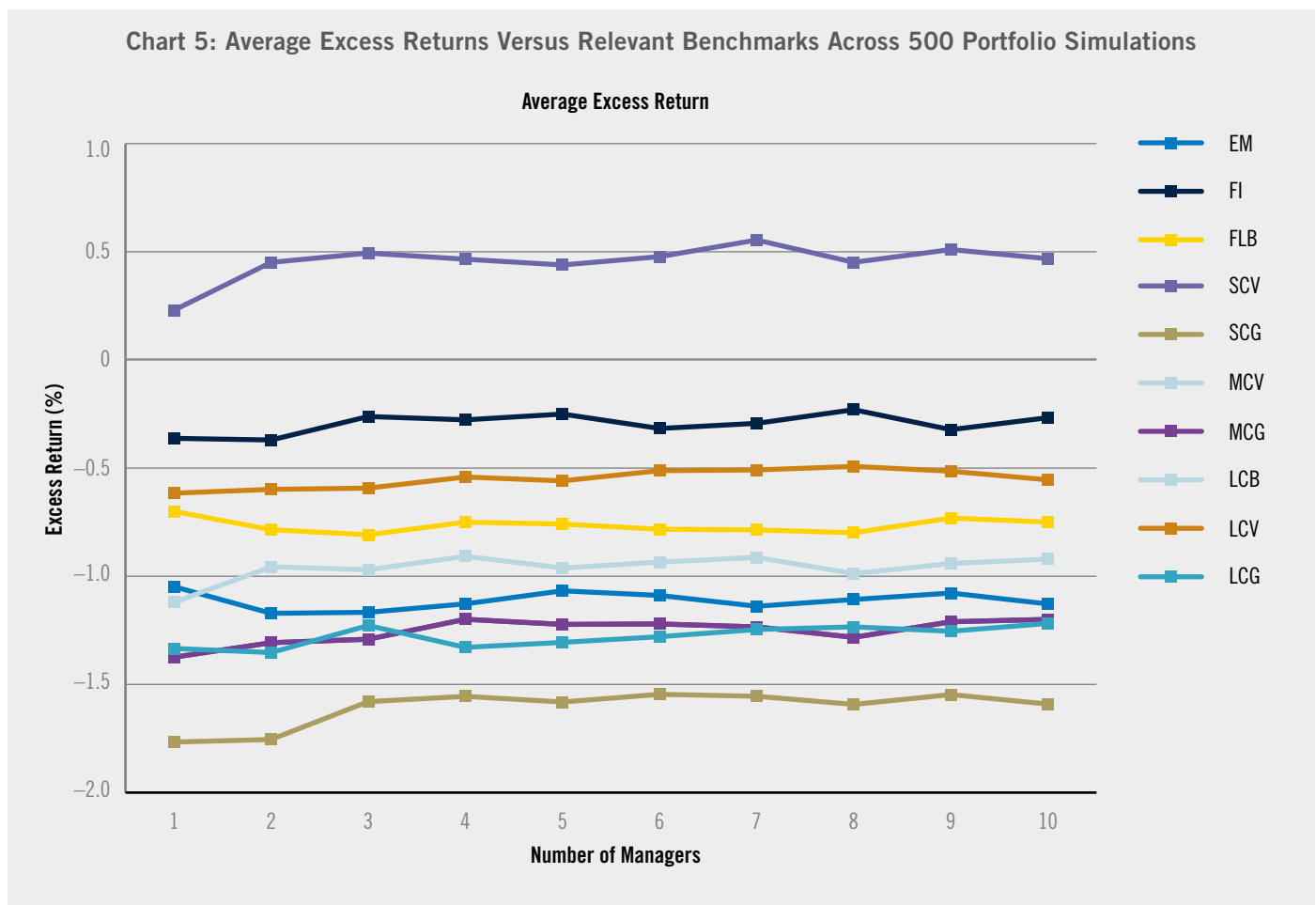
Chart 4 presents this same information graphically, providing guidance to the degree of certainty an investor may have in the predicted tracking error of their investment portfolio. A single fund portfolio investment is subject to a high degree of uncertainty. This uncertainty falls dramatically with each additional fund. Once again we see the marginal benefit reach a minimum in the 4–6 fund range, where the curve flattens.



Source: Strategic Investment Research Group, Morningstar U.S. Mutual Funds Database, Russell, MSCI, Barclays.

Last, we turn our attention to performance, evaluating the impact multiple managers have on the potential for outperformance relative to a benchmark. We observed both absolute and risk-adjusted metrics. For absolute performance relative to the benchmark, we are evaluating the excess returns delivered by the randomly generated hypothetical portfolios. Chart 5 shows the average excess returns of the 500 simulated portfolios across each asset class.

The first thing to note is that, on average, excess returns are negative, with the exception of Small Cap Value. This is not a surprising revelation as it has long been understood that the average mutual fund does not outperform the benchmark after fees. Furthermore, the underperformance of the average mutual fund is often roughly in line with the average fees of active mutual funds. This, of course, helps explain the attraction of index funds, although index funds are expected to underperform after fees as well.

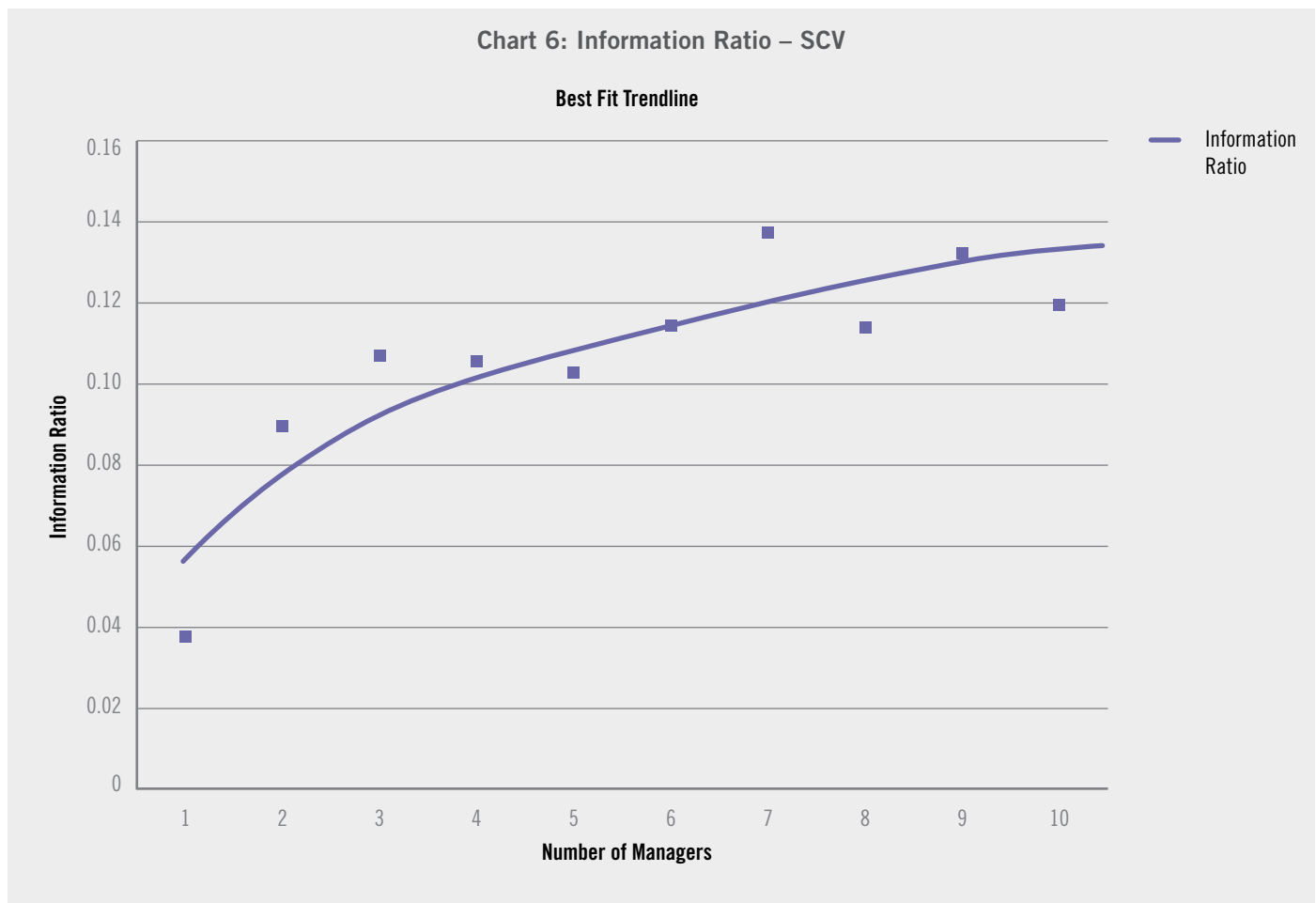


Source: Strategic Investment Research Group, Morningstar U.S. Mutual Funds Database, Russell, MSCI, Barclays. Past performance is no guarantee of future results.

It is important to point out that, regardless of the number of mutual funds in the portfolio, the average excess return stays roughly the same. Adding more funds does not deteriorate the expected excess return of the investments. Further, by evaluating excess return and tracking error together, investors can get a sense of how efficient their portfolio has been in beating the benchmark. This metric, referred to as the information ratio, is calculated by dividing the excess return over a period by the tracking error over that same period. Chart 6 plots a best-fit trend line of the average information ratio of the Small

Cap Value asset class. Small Cap Value was used in this example for the simple reason that it has positive excess returns. The calculation of information ratio can give incoherent results when excess returns for a particular period are negative.

The upward slope to the trend line demonstrates that an investor can realize a more efficient pattern of excess returns by diversifying across mutual funds within an asset class. Essentially, expected excess return remains constant while variability around that result declines.



Source: Strategic Investment Research Group, Morningstar US Mutual Funds Database, Russell.

Conclusion

Within this study, it has been demonstrated that, although average tracking error does fall as multiple investments are added within a single asset class, the decline in tracking error reaches a limit that is still well within what is expected from an active investment fund. This suggests that combining active investment funds within a single asset class does not leave investors with index-like return patterns. On the contrary, average excess returns are not affected by the additional investments, leading to a higher degree of portfolio efficiency.

Of course, there are other investor-specific considerations that may need to be addressed when determining the correct portfolio and number of investments. Issues such as risk tolerance, time horizon, portfolio size, due diligence costs, and breakpoint pricing may be part of the decision to add additional funds within an asset class, but the fear that combining mutual funds within an asset class will leave the investor with an expensive index fund is unwarranted. In fact, we believe that using 2–6 investments within an asset class may be optimal to more consistently achieve risk-reward goals.

Appendix

Methodology

Similar to the approach used by O’Neal (1999), groups of single asset class portfolios were constructed, each holding from 1 to 10 mutual funds sourced from the funds within our universe, for each Morningstar category listed in Table 1. For each portfolio, funds were randomly selected and equally weighted. The process was repeated 500 times for each group, with new funds randomly selected on each iteration. In the event that a fund’s history ended prior to the conclusion of the 10-year period being tested (i.e., the fund closed or was merged away), a new fund with additional history was selected at random as a replacement in the following period.

To assess whether a combination of funds was “index like,” an evaluation was made as to the tracking error of the resulting portfolio. Tracking error was calculated as the standard deviation of excess returns of the portfolio relative to the returns of an appropriate benchmark.

A different approach could have been to compare the resulting portfolio(s) to the universe of index funds within each category. However, with the exception of index funds benchmarked to the S&P 500, there were too few funds in each category to draw meaningful conclusions. As a reference point, an evaluation was made with regards to index funds benchmarked to the S&P 500 and it was discovered that over the 10-year period evaluated, tracking error of index funds benchmarked to the S&P 500 averaged 14 basis points on an annualized basis.

In addition to tracking error, the study also considered the effects of a multi-fund single asset class structure on excess returns. With each randomly generated portfolio, excess return was calculated as the annualized compound return over the period minus the annualized compound return of the benchmark over the period.

References

O’Neal, Edward S.; Fant, L. Franklin. 1999. “Do You Need More than One Manager for a Given Equity Style?” *The Journal of Portfolio Management*, Summer 1999, Vol. 25, No. 4: pp. 68–75.

Index and Average Definitions

Indices are unmanaged and an investment cannot be made directly into an index.

The [Barclays Aggregate Bond Index](#) represents securities that are SEC registered, taxable, and dollar dominated. The index covers the U.S. investment-grade fixed rate bond market, with index components for government and corporate securities, mortgage pass-through securities, and asset-backed securities.

The [Morningstar Diversified Emerging Markets Universe](#). Diversified emerging markets portfolios invest primarily in the stocks of emerging market countries.

The [Morningstar Foreign Large-Cap Blend Universe](#). Foreign large-blend portfolios invest in a variety of big international stocks. Most of these portfolios divide their assets among a dozen or more developed markets, including Japan, Britain, France, and Germany. These portfolios primarily invest in stocks that have market caps in the top 70% of each economically integrated market (such as Europe or Asia ex-Japan). The blend style is

assigned to portfolios where neither growth nor value characteristics predominate. These portfolios typically will have less than 20% of assets invested in U.S. stocks.

The [Morningstar Intermediate-Term Bond Universe](#).

Intermediate-term bond portfolios invest primarily in corporate and other investment-grade U.S. fixed-income issues and have durations of 3.5 to six years (or, if duration is unavailable, average effective maturities of four to 10 years). These portfolios are less sensitive to interest rates, and therefore less volatile, than portfolios that have longer durations.

The [Morningstar Large-Cap Blend Universe](#). Large-blend portfolios are fairly representative of the overall U.S. stock market in size, growth rates, and price. Stocks in the top 70% of the capitalization of the U.S. equity market are defined as large-cap. The blend style is assigned to portfolios where neither growth nor value characteristics predominate. These portfolios tend to invest across the spectrum of U.S. industries, and owing to their broad exposure, the portfolios' returns are often similar to those of the S&P 500 Index.

The [Morningstar Large-Cap Growth Universe](#). Large-growth portfolios invest in big U.S. companies that are projected to grow faster than other large-cap stocks. Stocks in the top 70% of the capitalization of the U.S. equity market are defined as large-cap. Growth is defined based on fast growth (high growth rates for earnings, sales, book value, and cash flow) and high valuations (high price ratios and low dividend yields). Most of these portfolios focus on companies in rapidly expanding industries.

The [Morningstar Large-Cap Value Universe](#). Large-value portfolios invest primarily in big U.S. companies that are less expensive or growing more slowly than other large-cap stocks. Stocks in the top 70% of the capitalization of the U.S. equity market are defined as large-cap. Value is defined based on slow growth (low growth rates for earnings, sales, book value, and cash flow) and low valuations (low price ratios and high dividend yields).

The [Morningstar Mid-Cap Growth Universe](#). Some mid-cap growth portfolios invest in stocks of all sizes, thus leading to a mid-cap profile, but others focus on midsize companies. Mid-cap growth portfolios target U.S. firms

that are projected to grow faster than other mid-cap stocks, therefore commanding relatively higher prices. The U.S. mid-cap range for market capitalization typically falls between \$1 billion – \$8 billion and represents 20% of the total capitalization of the U.S. equity market. Growth is defined based on fast growth (high growth rates for earnings, sales, book value, and cash flow) and high valuations (high price ratios and low dividend yields).

The [Morningstar Mid-Cap Value Universe](#). Some mid-cap value portfolios focus on medium-size companies while others land here because they own a mix of small-, mid-, and large-cap stocks. All look for U.S. stocks that are less expensive or growing more slowly than the market.

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The [Morningstar Small-Cap Growth Universe](#). Small-growth portfolios focus on faster-growing companies whose shares are at the lower end of the market-capitalization range. These portfolios tend to favor companies in up-and-coming industries or young firms in their early growth stages. Because these businesses are fast-growing and often richly valued, their stocks tend to be volatile. Stocks in the bottom 10% of the capitalization of the U.S. equity market are defined as small-cap. Growth is defined based on fast growth (high growth rates for earnings, sales, book value, and cash flow) and high valuations (high price ratios and low dividend yields).

The [Morningstar Small-Cap Value Universe](#). Small-value portfolios invest in small U.S. companies with valuations and growth rates below other small-cap peers. Stocks in the bottom 10% of the capitalization of the U.S. equity market are defined as small-cap. Value is defined based on slow growth (low growth rates for earnings, sales, book value, and cash flow) and low valuations (low price ratios and high dividend yields).

[MSCI EAFE Index](#) is a free-float adjusted market capitalization index that is designed to measure the equity performance of developed markets, excluding the U.S. and Canada.

MSCI Emerging Markets Index is a free float-adjusted market capitalization index that is designed to measure equity market performance of emerging markets.

The **Russell 1000 Index** consists of the 1,000 largest securities in the Russell 3000 Index. This large capitalization (market-oriented) index represents the universe of stocks from which most active money managers typically select. The Russell 1000 is highly correlated with the S&P 500 Index. The Russell 3000 Index is composed of the 3,000 largest U.S. securities, as determined by total market capitalization.

The **Russell 1000 Growth Index** measures the performance of those Russell 1000 companies with higher price-to-book ratios and higher forecasted growth values. The Russell 1000 Index consists of the 1,000 largest securities in the Russell 3000 Index. The Russell 3000 Index is composed of the 3,000 largest U.S. securities, as determined by total market capitalization.

The **Russell 1000 Value Index** measures the performance of those Russell 1000 companies with lower price-to-book ratios and lower forecasted growth values. The Russell 1000 Index consists of the 1,000 largest securities in the Russell 3000 Index. The Russell 3000 Index is composed of the 3,000 largest U.S. securities, as determined by total market capitalization.

The **Russell Midcap Growth Index** measures the performance of those Russell Midcap companies with higher price-to-book ratios and higher forecasted growth values. The stocks are also members of the Russell 1000 Growth index. The Russell Midcap Index measures the performance of the 800 smallest companies in the Russell 1000 Index.

The **Russell Midcap Value Index** measures the performance of those Russell Midcap companies with lower price-to-book ratios and lower forecasted growth values. The stocks are also members of the Russell 1000 Value Index. The Russell Midcap Index measures the performance of the 800 smallest companies in the Russell 1000 Index.

The **Russell 2000 Growth Index** measures the performance of those Russell 2000 companies with higher price-to-book ratios and higher forecasted growth values. The Russell 2000 Index consists of the smallest

2,000 securities in the Russell 3000 Index. The Russell 3000 Index measures the performance of the 3,000 largest U.S. companies based on total capitalization.

The **Russell 2000 Value Index** measures the performance of those Russell 2000 companies with lower price-to-book ratios and lower forecasted growth values. The Russell 2000 Index consists of the smallest 2,000 securities in the Russell 3000 Index. The Russell 3000 Index measures the performance of the 3,000 largest U.S. companies based on total capitalization.

The **S&P 500 Index** consists of 500 stocks chosen for market size, liquidity, and industry group representation. It is a market-value weighted index (stock price times number of shares outstanding), with each stock's weight in the Index proportionate to its market value. The "500" is one of the most widely used benchmarks of U.S. equity performance.

Definitions

Information Ratio is a risk-adjusted measure calculated using tracking error and excess return to determine reward per unit of excess risk. The higher the information ratio, the better the historical risk-adjusted excess performance.

Tracking Error is a statistical measure of the historical volatility of excess returns of a mutual fund or portfolio, usually computed using 36 monthly returns. More generally, a measure of the extent to which numbers are spread around their average.

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Investing in mutual funds involves risks. Some mutual funds have more risk than others. The investment return and principal value will fluctuate, and shares, when sold, may be worth more or less than the original cost, and it is possible to lose money. There is no guarantee that a fund's objectives will be achieved. The risks associated with each fund are explained more fully in each fund's respective prospectus. Asset allocation and diversification do not assure a profit or protect against loss in declining markets. Past performance is no guarantee of future results.

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