

A Tale of Two Small-Cap Benchmarks: 10 Years Later

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INTRODUCTION

Indices play a multifaceted role in investment management. Passive investors use indexed-linked investment products to gain exposure to particular investment universes, market segments, or strategies. Active investors use indices as benchmarks to compare actively managed funds to indices representing the active portfolio. Indices can also serve as proxies for asset class returns in formulating policy portfolios.

If indices can represent passively implemented returns in a given universe, then the risk/return profiles among various indices in the same universe should be similar. In large-cap U.S. equities, the [S&P 500®](#) and Russell 1000 have had similar risk/return profiles (9.65% versus 9.73% per year, respectively, since Dec. 31, 1993).¹ **However, in the small-cap universe, the returns of the Russell 2000 and the [S&P SmallCap 600®](#) have been notably different historically.** Since year-end 1993, the S&P SmallCap 600 has returned 10.44% per year, while the Russell 2000 has returned 8.78%. In addition, the S&P SmallCap 600 has also exhibited lower volatility (see Exhibit 1).

A study performed by S&P Dow Jones Indices (S&P DJI) in 2009 (Dash and Soe) showed that return differences were primarily due to the inclusion of a profitability factor embedded in the S&P SmallCap 600. A later update of the study in 2014 (Brzenk and Soe) confirmed the continuing existence of the quality premium.

This paper renews the study now that 10 years have passed since our original paper. In addition to the profitability criteria, we also extend the analysis to two additional index inclusion criteria—liquidity and public float—that are present in the S&P SmallCap 600 but absent in the Russell 2000. Our paper shows that all else equal, U.S. small-cap companies with higher profitability, higher liquidity, and higher investability tend to earn higher returns than those with lower profitability, liquidity, and investability. Observed together, these characteristics explain the potential performance advantage of the S&P SmallCap 600.

PERFORMANCE COMPARISON S&P SMALLCAP 600 VERSUS RUSSELL 2000

Since December 1993, the S&P SmallCap 600 has outperformed the Russell 2000 with lower volatility...

Since December 1993, the S&P SmallCap 600 has outperformed the Russell 2000 with lower volatility, resulting in a higher risk-adjusted returns. Exhibit 1 highlights the risk/return profiles of the two indices over various investment horizons.

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Exhibit 1: Risk/Return Profile		
PERIOD	S&P SMALLCAP 600	RUSSELL 2000
ANNUALIZED RETURN (%)		
1-Year	-6.75	-4.42
3-Year	10.54	10.36
5-Year	9.89	8.53
10-Year	14.00	12.47
20-Year	9.86	7.95
Since Dec. 31, 1993	10.44	8.78
ANNUALIZED VOLATILITY (%)		
3-Year	17.73	16.87
5-Year	16.33	16.35
10-Year	16.68	17.25
20-Year	18.54	19.53
Since Dec. 31, 1993	18.21	18.94
RETURN/RISK		
3-Year	0.59	0.61
5-Year	0.61	0.52
10-Year	0.84	0.72
20-Year	0.53	0.41
Since Dec. 31, 1993	0.57	0.46

For three- and five-year rolling excess returns, the S&P SmallCap 600 fared better 93.0% and 98.4% of the time, respectively.

Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 1993, to July 31, 2019. Index performance based on total return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

The rolling excess returns show the S&P SmallCap 600 outperforming the Russell 2000 with various success rates over different lengths of time. For the one-year rolling excess returns, the S&P SmallCap 600 outperformed the Russell 2000 nearly 68% of the time. Over longer horizon windows, the S&P SmallCap 600 fared better than the Russell 2000 93% of the time for the three-year period and over 98% of the time when the rolling window increased to five years (see Exhibit 2).

We can attribute the performance divergence to differences in the index construction.

The Russell 2000 is reconstituted annually at the end of June...

...whereas the S&P SmallCap 600 implements constituent changes on an as-needed basis.

To be eligible for the S&P SmallCap 600, companies must meet market cap, liquidity, public float, sector representation, and profitability measures.

Exhibit 2: S&P SmallCap 600 versus Russell 2000 Excess Return Summary

PERIOD	ONE-YEAR	THREE-YEAR	FIVE-YEAR
Number of Periods Outperformed	201	253	244
Number of Periods Underperformed	95	19	4
Total Periods	296	272	248
% of Periods Outperformed	67.9	93.0	98.4

Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 1993, to July 31, 2019. Index performance based on total return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

INDEX METHODOLOGY AND MARKET CAPITALIZATION

We attribute the performance divergence of the two small-cap benchmarks to differences in the index construction. In this section, we review the index methodology and market capitalization of the two indices.

The Russell 2000 represents 2,000 small-cap U.S. companies from the Russell 3000, which is made up of the 3,000 largest U.S. companies, as measured by their market capitalization. The index is reconstituted annually at the end of June, when securities are ranked according to their total market capitalization as of the last trading day of May. No constituent additions occur other than at the June reconstitution. During the course of the year, mergers and other corporate actions often reduce the number of Russell 2000 constituents.

In contrast, the S&P SmallCap 600 implements constituent changes on an as-needed basis. To be eligible for inclusion, companies must meet market capitalization, liquidity, public float, Global Industry Classification Standard® (GICS®) sector representation, and profitability measures. Constituent deletions may occur due to bankruptcy, mergers, acquisitions, significant restructuring, or substantial violations of one or more of the eligibility measures. Since S&P Dow Jones Indices does not follow a scheduled automatic approach, additions and deletions are less predictable. Exhibit 3 highlights the methodology differences between the two indices.

Exhibit 3: Index Methodologies

INCLUSION CRITERIA	S&P SMALLCAP 600	RUSSELL 2000
Financial Viability	The sum of the most recent four consecutive quarters' as-reported earnings should be positive, plus the most recent quarter ²	None
Liquidity	Requires annual trading turnover of at least 100% of shares outstanding and a minimum traded shares of 250,000 in each of the six months leading to the evaluation date	None
Public Float	At least 10% of shares publicly floated ³	At least 5% of shares must be publicly floated
Reconstitution of Stocks	Throughout the year, as corporate actions arise	Only once a year, except for IPOs
IPO Seasoning	6-12 months required	None
Domicile of Constituents	U.S. companies, based on multiple criteria such as fixed assets, revenues, listing, etc.	
Sector Classification	Global Industry Classification Standard (GICS)	Proprietary sector classification framework

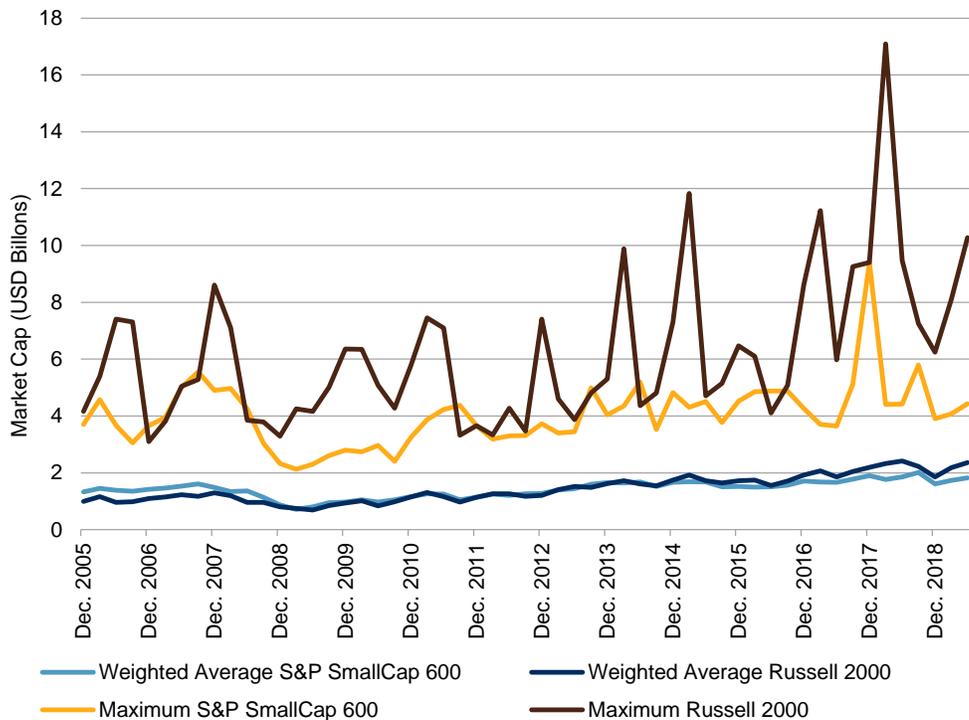
Source: S&P Dow Jones Indices LLC, FTSE Russell. Table is provided for illustrative purposes.

One might expect the Russell 2000 to have a smaller average market cap than the S&P SmallCap 600...

...however, the two small-cap indices have had similar weighted average market cap figures over time.

Exhibit 4 compares the market capitalizations of the two indices.⁴ A priori, one might expect the Russell 2000 to have a smaller average market capitalization than the S&P SmallCap 600. With 1,400 additional names, it could potentially venture into a much smaller capitalization range. This turned out not to be the case.

Exhibit 4: Historical Market Capitalizations



When we compare the market cap of the largest constituent, the Russell 2000 has had a noticeable upward bias.

Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 30, 2005, to June 28, 2019. Russell 2000 is represented by the iShares Russell 2000 ETF. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

The two small-cap indices have had similar weighted average market capitalization figures over time, meaning **there has been little overall difference in the sizes of the constituents**. However, when we compare the market cap of the largest constituent, the Russell 2000 has had a noticeable upward bias, especially farther from the annual June reconstitution. During these months, the largest companies in the Russell 2000 could be significantly larger than the average constituent, at times entering into mid- or even large-cap territory. This could be an important consideration for market participants expecting pure small-cap exposure from the Russell 2000.

Russell's annual June reconstitution process has been studied extensively...

IMPACT OF RUSSELL'S JUNE RECONSTITUTION

Russell's annual reconstitution process in June has been studied extensively, particularly regarding the downward price pressure exerted by the reconstitution. As winners from the Russell 2000 graduate to the Russell 1000, and losers from the Russell 1000 move down to the small-cap index, fund managers must sell winners and buy losers—thereby creating a negative momentum portfolio (Furey 2001).

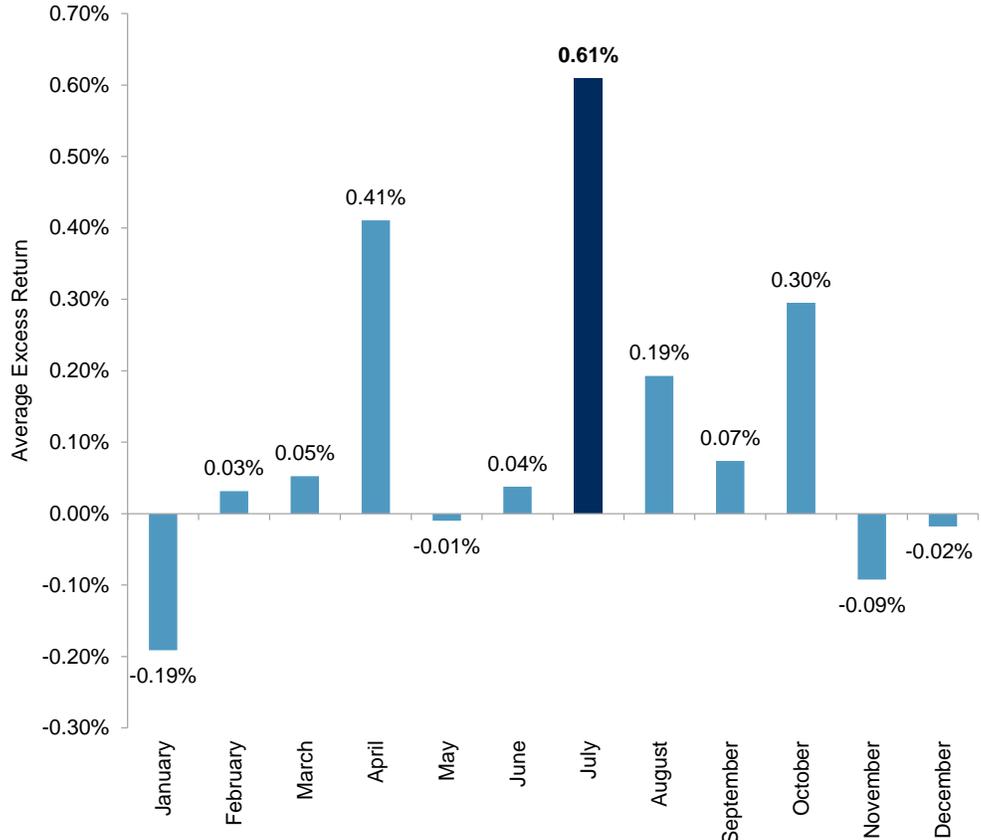
Jankovskis (2002) and Chen, Noronha, and Singal (2006) estimated that the predictable nature of the Russell rebalancing process biases the return of the index downward by an average of approximately 2% per year. Additionally, Chen, Noronha, and Singal (2006) found the rebalancing impact to be 1.3% per year.

...and our analysis, as well as others, have revealed that it tends to bias the index return downward.

Our analysis of the monthly excess returns of the S&P SmallCap 600 versus the Russell 2000 revealed a similar finding. We grouped the average excess returns from January 1994 through July 2019 by calendar month (see Exhibits 5a and 5b). The monthly excess returns for July were higher than any other month and were statistically significant (t-stat of 2.71) at a 95% confidence interval. July was also the only calendar month to have statistically significant excess returns.

Despite the statistical significance, the June rebalancing excess return premium appears to be declining. The premium measured roughly 0.84% 10 years ago and 0.68% 5 years ago. The moderation is expected, as Russell has made enhancements to its rebalancing process in order to lessen its impact. For example, eligible initial public offerings (IPOs) are now added to the Russell 2000 on a quarterly basis.

Exhibit 5a: Average Monthly Excess Return: S&P SmallCap 600 versus the Russell 2000



The monthly excess returns for July (0.61%) was higher than other months and were statistically significant.

Despite the statistical significance, the June rebalancing excess return premium appears to be declining...

Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 1993, to July 31, 2019. Index performance based on excess return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Exhibit 5b: T-Stats of Average Monthly Excess Return

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
T-Stat	-0.81	0.17	0.31	1.74	-0.05	0.24	2.71	1.28	0.43	1.29	-0.47	-0.07

Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 1993, to July 31, 2019. Index performance based on excess return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

...as the premium measured 0.84% 10 years ago and 0.68% 5 years ago.

However, the July reconstitution effect alone does not provide sufficient evidence for the S&P SmallCap 600's outperformance. As Exhibit 6 shows, the distribution of relative outperformance is spread throughout the year, which suggests that there are other drivers behind the S&P SmallCap 600's excess return.

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...which suggests there are other drivers behind S&P SmallCap 600's excess return.

Exhibit 6: Excess Returns by Calendar Year

YEAR	S&P SMALLCAP 600	RUSSELL 2000	EXCESS RETURN	NUMBER OF MONTHS S&P SMALLCAP 600 OUTPERFORMED RUSSELL 2000
1994	-4.77	-1.82	-2.95	4
1995	29.96	28.45	1.51	6
1996	21.32	16.49	4.83	10
1997	25.58	22.36	3.22	8
1998	-1.31	-2.55	1.24	9
1999	12.40	21.26	-8.85	4
2000	11.80	-3.02	14.82	8
2001	6.54	2.49	4.05	6
2002	-14.63	-20.48	5.85	8
2003	38.79	47.25	-8.46	4
2004	22.65	18.33	4.32	6
2005	7.68	4.55	3.13	7
2006	15.12	18.37	-3.25	5
2007	-0.30	-1.57	1.27	6
2008	-31.07	-33.79	2.71	8
2009	25.57	27.17	-1.60	5
2010	26.31	26.85	-0.55	6
2011	1.02	-4.18	5.19	9
2012	16.33	16.35	-0.02	7
2013	41.31	38.82	2.49	7
2014	5.76	4.89	0.86	6
2015	-1.97	-4.41	2.44	8
2016	26.56	21.31	5.25	7
2017	13.23	14.65	-1.41	4
2018	-8.48	-11.01	2.53	7
Annual Average	10.08	8.28	1.80	-

Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 1993, to Dec. 31, 2018. Index performance based on total and excess returns in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

IMPACT OF S&P SMALLCAP 600 INCLUSION CRITERIA

Because the S&P SmallCap 600 and the Russell 2000 differ considerably in their index construction, we examine the impact of three inclusion criteria—profitability (positive earnings), liquidity, and public float.

To estimate the impact of each criterion independently, as well as jointly, we form hypothetical portfolios applying each inclusion rule. We use the S&P United States SmallCap and Russell 2000 for the underlying universes.⁴ Similar to the Russell 2000, the S&P United States SmallCap

We examine the impact of three inclusion criteria—profitability (positive earnings), liquidity, and public float.

To be included in the S&P SmallCap 600, constituents are required to have positive earnings according to GAAP...

...for the most recent four consecutive quarters and the most recent single quarter.

comprises approximately 2,400 constituents and measures the smallest 15% of the listed public equity market in the U.S. by market capitalization.

We divide each universe into two groups (Group 1 and Group 2) based on each inclusion criterion. For each group, we form equal-weighted and cap-weighted portfolios. Similarly, we also equal weight and market cap weight the universe. We present the results of the equal-weighted portfolios in Exhibits 7-10 and include those of the cap-weighted portfolios in Appendix A (Exhibit 22) for reference.

To avoid survivorship bias, we include inactive and active securities. To minimize look-ahead bias, we lag the fundamental data by 45 days. Our testing period ran from December 2002 to December 2018 due to the quality of IWM holding data improving after December 2002. The portfolios are rebalanced monthly. Throughout the analysis, we use the 91-day U.S. Treasury Bill average discount rate as the risk-free rate.

Impact of the Profitability (Positive Earnings) Screen on Performance

New constituents entering the S&P SmallCap 600 are required to have positive earnings according to GAAP for the most recent four consecutive quarters and the most recent single quarter. Therefore, we group the S&P United States SmallCap and Russell 2000 universes as follows.

Group 1: Consists of securities that have positive earnings in most recent four consecutive positive earnings and the most recent quarter.

Group 2: Consists of the other securities that are not part of Group 1.

Exhibit 7 summarizes the impact of the profitability screen on performance. The security counts report the average number of constituents over the testing periods. When using the S&P United States SmallCap universe, 65% of companies fell into Group 1, while 63% of companies fell into Group 1 for the Russell 2000.

For the S&P United States SmallCap and Russell 2000 universes, Group 1 outperformed Group 2 and the underlying universe on an absolute return basis.

CATEGORY	S&P UNITED STATES SMALLCAP			RUSSELL 2000		
	GROUP 1	GROUP 2	UNIVERSE	GROUP 1	GROUP 2	UNIVERSE
Security Counts	1,607	852	2,460	1,233	726	1,959
Returns	12.19	9.34	11.68	12.28	9.09	11.52
Sharpe Ratio	0.71	0.38	0.59	0.68	0.36	0.56
T-Stat Alpha	3.03	-4.33	-	3.02	-4.20	-

Group 1 and Group 2 are hypothetical portfolios.

Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 2002, to Dec. 31, 2018. Russell 2000 is represented by the iShares Russell 2000 ETF. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

For both universes, Group 1 outperformed Group 2, as well as the underlying universe on an absolute return basis. After adjusting for risk, Group 1 had the highest Sharpe ratio, followed by the universe, with Group 2 coming in last. The t-stats of outperformance by Group 1 and underperformance by Group 2 were statistically significant for both groups at a 95% confidence interval. In other words, **profitable small-cap companies earned a positive return premium in the U.S.**

The S&P SmallCap 600 requires that at least 50% of shares be publicly floated...

Impact of the Investability (Public Float) Screen on Performance

The S&P SmallCap 600 requires that at least 50% of shares be publicly floated,⁵ while the Russell 2000 requires only 5% of shares to be publicly floated. As public float is one measure of investability for a security, we test its impact on small-cap returns by dividing the S&P United States SmallCap and Russell 2000 universes into two groups as follows.

Group 1: Consists of securities that have at least 50% of shares publicly floated.

Group 2: Consists of the securities that are not in Group 1.

...while Russell 2000 requires only 5% of shares to be publicly floated.

We report the impact of investability in Exhibit 8. For the S&P United States SmallCap universe, 91% of companies had at least 50% of shares publicly floated, while 81% of the Russell 2000 companies had at least 50% of shares publicly floated.

Although Group 1 outperformed Group 2 and the universe on an absolute return basis...

...after adjusting for risk, the portfolios had the same Sharpe ratio in the S&P United States SmallCap universe.

The S&P SmallCap 600 requires constituents' annual trading turnover be at least 100%...

...and stocks to trade a minimum of 250,000 shares the six months leading up to the reference date.

Exhibit 8: Impact of Investability (Public Float) on Performance (Equal-Weighted)

CATEGORY	S&P UNITED STATES SMALLCAP			RUSSELL 2000		
	GROUP 1	GROUP 2	UNIVERSE	GROUP 1	GROUP 2	UNIVERSE
Security Counts	2,237	222	2,460	1,595	364	1,959
Returns	11.75	11.07	11.68	12.04	9.39	11.52
Sharpe Ratio	0.59	0.59	0.55	0.59	0.42	0.56
T-Stat Alpha	0.58	-0.43	-	2.70	-2.58	-

Group 1 and Group 2 are hypothetical portfolios.

Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 2002, to Dec. 31, 2018. Russell 2000 is represented by the iShares Russell 2000 ETF. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

For both universes, Group 1 outperformed Group 2 and the universe on an absolute return basis. However, unlike with the profitability criterion, we see a few differences in investability between the two groups depending on the underlying universe. After adjusting for risk, Group 1 and Group 2 had the same Sharpe ratio in the S&P United States SmallCap universe; the t-stats of excess returns were not statistically significant at a 95% confidence level.

On the other hand, in the Russell 2000 universe, Group 1 had a higher Sharpe ratio than Group 2 and the universe. The Sharpe ratio of Group 1 was also identical to the Sharpe ratios of the two portfolios created from the S&P United States SmallCap. The t-stats of excess returns were also statistically significant.

Impact of the Liquidity Screen on Performance

The S&P SmallCap 600 requires that constituents' annual trading turnover be at least 100% and that a stock should trade a minimum of 250,000 shares in each of the six months leading up to the reference date. The Russell 2000 has no liquidity requirement. Again, we test for the impact of these liquidity criteria on small-cap returns by dividing the S&P United States SmallCap and Russell 2000 universes into two groups.

Group 1: Consists of securities that have at least 100% annual turnover and a minimum of 250,000 traded shares in each of the six months earlier.

Group 2: Consists of the other securities that are not in Group 1.

The results are illustrated in Exhibit 9. For the S&P United States SmallCap universe, about 70% of companies fell into Group 1, while for the Russell 2000 universe, about 67% of companies fell into Group 1.

While Group 1 outperformed Group 2 and the universe on an absolute return basis...

Exhibit 9: Impact of Liquidity (Annual Liquidity > 100% Outstanding Shares and > 250,000 Shares) on Performance (Equal-Weighted)

CATEGORY	S&P UNITED STATES SMALLCAP			RUSSELL 2000		
	GROUP 1	GROUP 2	UNIVERSE	GROUP 1	GROUP 2	UNIVERSE
Security Counts	1,733	727	2,460	1,320	639	1,959
Returns	12.14	10.23	11.68	11.95	10.34	11.52
Sharpe Ratio	0.58	0.59	0.60	0.54	0.56	0.56
T-Stat Alpha	0.41	-0.53	-	0.38	-0.37	-

Group 1 and Group 2 are hypothetical portfolios.
Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 2002, to Dec. 31, 2018. Russell 2000 is represented by the iShares Russell 2000 ETF. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

...Group 1 had lower Sharpe ratio after adjusting for risk.

While Group 1 outperformed Group 2 and the universe on an absolute return basis for both universes, Group 1 had a lower Sharpe ratio after adjusting for risk. The t-stats of excess returns for both groups across both universes were not statistically significant at a 95% confidence interval.

Impact of Profitability (Positive Earnings), Investability (Public Float), and Liquidity Screens on Performance

Lastly, we combine all three metrics and jointly test the overall impacts of profitability, investability, and liquidity on small-cap returns. Similar to previous exercises, we divide the S&P United States SmallCap and Russell 2000 universes into two groups.

Group 1: Consists of securities that satisfy the criteria of positive earnings, public float, and liquidity.

Group 2: Consists of the other securities that are not in Group 1.

We combine all three metrics and test the impacts of profitability, investability, and liquidity on small-cap returns.

Exhibit 10 shows the impact of profitability, investability, and liquidity measures combined. In the S&P United States SmallCap, 1,033 companies satisfied all criteria, while in the Russell 2000, 708 companies did.

Exhibit 10: Impact of Profitability, Investability, and Liquidity on Performance (Equal-Weighted)

CATEGORY	S&P UNITED STATES SMALLCAP			RUSSELL 2000		
	GROUP 1	GROUP 2	UNIVERSE	GROUP 1	GROUP 2	UNIVERSE
Security Counts	1,033	1,427	2,460	708	1,251	1,959
Returns	12.26	10.79	11.68	12.29	10.65	11.52
Sharpe Ratio	0.68	0.50	0.59	0.66	0.48	0.56
T-Stat Alpha	2.44	-3.35	-	2.49	-3.42	-

Group 1 and Group 2 are hypothetical portfolios.
Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 2002, to Dec. 31, 2018. Russell 2000 is represented by the iShares Russell 2000 ETF. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

Profitable and investable small-cap securities have earned higher risk-adjusted returns than those that are not and the overall universe.

For both universes, we observe that Group 1 outperformed Group 2 and the universe on an absolute return basis. The Sharpe ratios of Group 1 were higher than those of Group 2 and the underlying universe. The relative outperformance of Group 1 or underperformance of Group 2 was statistically significant at a 95% confidence interval.

This final analysis allows us to conclude that **small-cap securities that are profitable and investable, as measured by public float and trading volume, have earned higher risk-adjusted returns than those that are not** and the overall universe. Hence, the S&P SmallCap 600 had higher historical returns than the Russell 2000.

Our analyses show that the profitability and investability criteria effectively differentiate winners (Group 1) from losers (Group 2) in broad small-cap universes, with Group 1 significantly outperforming Group 2. An important implication of the finding is that having a larger broad universe to select from does not necessarily result in better outperformance. Instead, the outperformance in the small-cap equity space has come from companies that are profitable and investable (Group 1), as captured better in the smaller universe by the S&P SmallCap 600.

Impact of Profitability and Investability – Time Series Cumulative Returns

We demonstrate the hypothetical cumulative returns of the Group 1 and Group 2 portfolios and compare them against the underlying indices.

In this section, we demonstrate the hypothetical cumulative returns of the Group 1 and the Group 2 portfolios and compare them against the underlying indices. To be representative of actual investors' returns, we use market-cap-weighted returns. Our hypothesis is that the cumulative returns of the Group 2 portfolio should be lower than Group 1 and the underlying benchmarks.

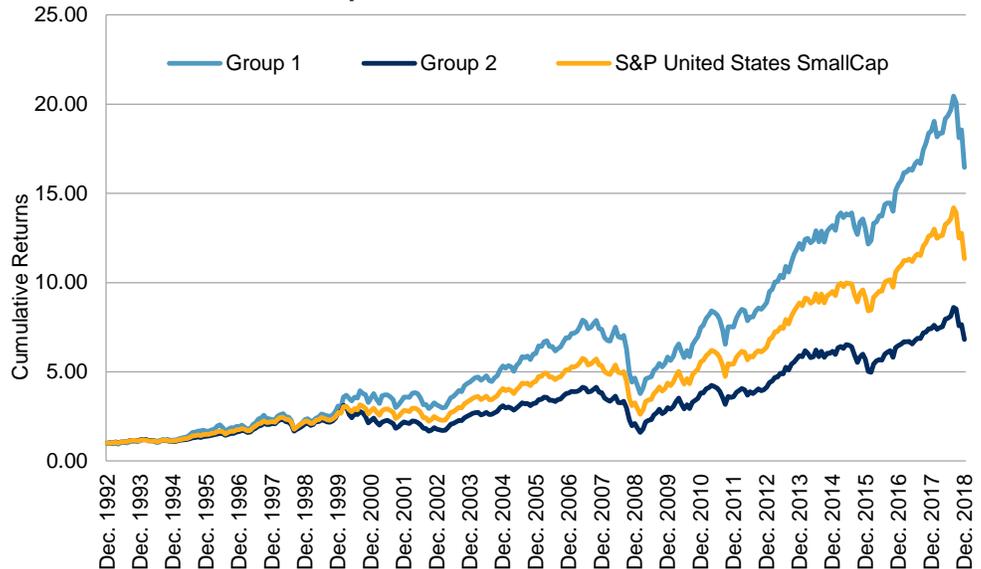
Group 1: Consists of securities that satisfy criteria of positive earnings, public float, and liquidity.

Group 2: Consists of the other securities not in Group 1.

Exhibits 11 and 12 show the cumulative values of the cap-weighted Group 1 and Group 2 portfolios formed from the S&P United States SmallCap and the Russell 2000 universes, against the returns of those underlying benchmarks.

Exhibit 11: Cumulative Returns – Group 1 and Group 2 Portfolios from the S&P United States SmallCap Universe

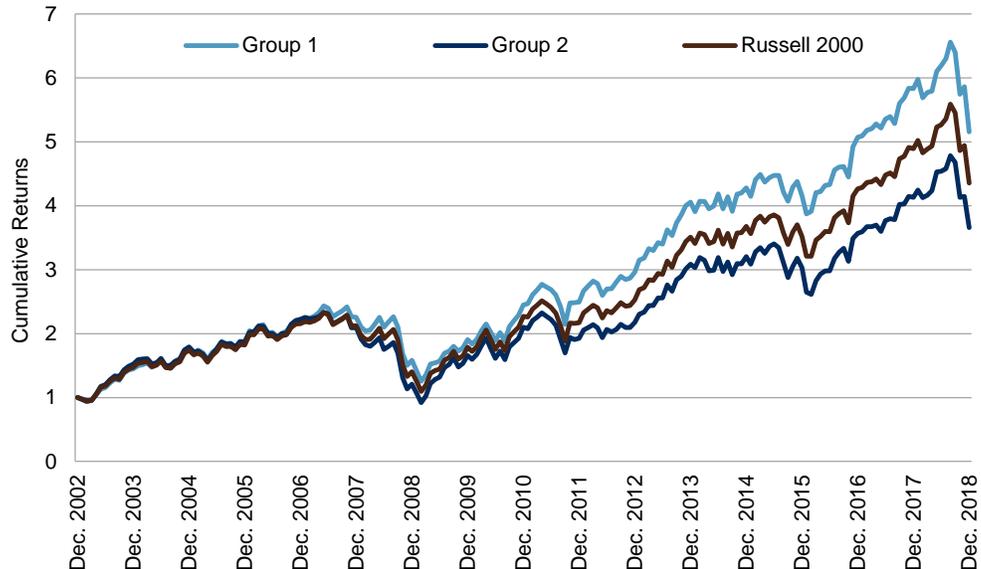
Portfolios of small-cap securities with profitability and investability screens outperformed those without and the underlying benchmarks.



Group 1 and Group 2 are hypothetical portfolios.
 Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 1992, to Dec. 31, 2018. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

Exhibit 12: Cumulative Returns – Group 1 and Group 2 Portfolios from the Russell 2000 Universe

Portfolios of small-cap securities that do not incorporate profitability and investability criteria underperformed the broad market.



Group 1 and Group 2 are hypothetical portfolios.
 Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 2002, to Dec. 31, 2018. Russell 2000 is represented by the iShares Russell 2000 ETF. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

We can see from the cumulative returns that over a long-term investment horizon, a portfolio of small-cap securities that have profitability and investability screens incorporated outperformed both the portfolio without those screens and the underlying benchmark. In addition, the portfolio of small-cap securities that do not incorporate profitability and investability criteria underperformed the broad market.

The S&P SmallCap 600 was historically overweight in Consumer Discretionary (1.66%) and Industrials (2.71%).

In contrast, it was underweight in Financials (-3.12%) and Health Care (-1.17%).

The average total effect was 0.70%, with over half of excess returns coming from security selection (0.43%).

SECTOR ATTRIBUTION

Performance attribution analysis allows for the bottom-up decomposition of excess returns between two portfolios into allocation and security selection decisions taken at a holdings level. In this section, we analyze the sources of excess returns between the two small-cap indices, grouped by sector.

We compute the annual average allocation and selection effects (and combine them to show the total effect) from December 2002 to December 2018 with the Russell 2000 as the benchmark and the S&P SmallCap 600 as the portfolio.^{4, 6}

Average sector weights showed that, compared with the Russell 2000, the S&P SmallCap 600 was historically overweight in Consumer Discretionary (1.66%) and Industrials (2.71%). In contrast, the index was underweight in Financials (-3.12%) and Health Care (-1.17%) relative to the Russell 2000.

Exhibit 13: Average Annual Sector Attribution

SECTOR	VARIATION IN AVERAGE WEIGHT (%)	ALLOCATION EFFECT (%)	SELECTION EFFECT (%)	TOTAL EFFECT (%)
Consumer Discretionary	1.66	0.02	0.25	0.27
Energy	0.09	0.13	0.13	0.26
Health Care	-1.17	-0.00	0.18	0.18
Industrials	2.71	0.04	0.05	0.08
Consumer Staples	0.37	0.02	0.06	0.08
Utilities	0.64	-0.00	0.07	0.07
Real Estate	-0.17	0.01	0.00	0.02
Financials	-3.12	0.08	-0.08	0.00
Materials	0.37	0.00	-0.06	-0.05
Communication Services	-0.48	-0.01	-0.05	-0.06
Information Technology	-0.88	-0.02	-0.12	-0.15
Total	-	0.27	0.43	0.70

Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 29, 2002, to Dec. 31, 2018. Russell 2000 is represented by the iShares Russell 2000 ETF. Companies unassigned a sector grouping are excluded from the analysis. Table is provided for illustrative purposes.

The average total effect was 0.70%, with more than half of excess returns coming from security selection (0.43%). The breakdown offers insight into the sources of performance differential. First, we see that the positive total effect was fairly widespread, with 8 of the 11 sectors exhibiting the effect over a long-term investment horizon. Consumer Discretionary and Energy sectors had the highest total effect on average (0.27%), while the Information Technology sector detracted on both allocation and security selection bases (-0.15%).

Second, if differences in sector weights were the only driver behind excess returns, most of the total effect would come from the allocation effect. However, we see that more than half of the outperformance came from the selection effect. Given that selection effect measures the value add of

If differences in sector weights were the only return driver, most of the total effect would come from the allocation effect...

...however, we see that more than half of the outperformance came from the selection effect

We use a four-factor regression model that combines market sensitivity, stock size, value, and quality.

security selection within a sector, the results showed that the methodology of the S&P SmallCap 600 led to better-performing securities.

FAMA-FRENCH FACTOR DECOMPOSITION

Prior S&P DJI research studies⁷ found that the profitability screen incorporated in the S&P SmallCap 600 methodology, specifically four consecutive quarters of positive earnings, has been the key driver of the return differential between the two small-cap indices.

A number of studies on U.S. small-cap indices have also had similar findings while using varying definitions of profitability. Ascioğlu and Mcdermott (2014) used the gross profitability margin—defined as gross profits scaled by assets—and found the S&P SmallCap 600 to have positive exposure to the factor, while the Russell 2000 had negative exposure. Asness, Frazzini, and Pedersen (2013) defined quality as companies that are safe, profitable, growing, and well managed. These authors showed that a quality-minus-junk (QMJ) factor has had statistically significant positive excess returns within the U.S. small-cap stock⁸ universe.

To further dissect the differences between the two indices, we use a four-factor regression model that combines the traditional three Fama-French factors (Fama and French 1993) with the quality factor. In the model, portfolio returns are explained using their exposures to four factors: sensitivity to the market (beta), size of the stocks in the portfolio (size), average weighted book-to-market ratio (value), and profitability (quality).

The risk premium for each factor is defined as follows:⁹

1. **Market Premium:** Represented by $(R_m - R_f)$, which is the return on a market-value-weighted equity index minus the return on the one-month U.S. Treasury Bill. It measures systematic risk.
2. **Size Premium:** Represented by small minus big (SMB), which measures the additional return from investing in small stocks. The SMB factor is computed as the average return on three small portfolios minus the average return on three big portfolios.
3. **Value Premium:** Represented by high minus low (HML), which measures additional return from investing in value stocks, as measured by high book-to-market ratios. It is calculated as the average return on two high book-to-market portfolios (value) minus the average return on two low book-to-market (growth) portfolios.
4. **Quality Premium:** Represented by QMJ, which measures the additional return from investing in quality stocks. The factor is calculated as the average return on two high-quality portfolios minus the average return on two low-quality portfolios.

The regression equation estimate is as follows.

$$R_{600} = \beta_{\text{market}}(R_m - R_f) + \beta_{\text{size}}(\text{SMB}) + \beta_{\text{value}}(\text{HML}) + \beta_{\text{quality}}(\text{QMJ})$$

Based on the regression coefficients, the S&P SmallCap 600 had positive exposure to the quality factor...

The coefficient for each factor, β , measures the sensitivity of S&P SmallCap 600 returns to the factor. Using the sample period from Dec. 31, 1993, to June 30, 2019, Exhibit 14 shows the regression results.

Exhibit 14: Four-Factor Regression Model Results						
FACTOR	S&P SMALLCAP 600			RUSSELL 2000		
	COEFFICIENT	STANDARD ERROR	T-STAT	COEFFICIENT	STANDARD ERROR	T-STAT
Intercept	-0.22	0.07	-2.89	-0.18	0.05	-3.31
Market	1.08	0.02	51.06	1.03	0.02	67.68
Size	0.78	0.03	30.98	0.79	0.02	43.22
Value	0.38	0.02	15.88	0.27	0.02	15.63
Quality	0.25	0.04	7.03	0.03	0.03	1.24

Source: S&P Dow Jones Indices LLC, Ken French for the market, size, and value factor data, AQR for quality factor data. Data from Dec. 31, 1993, to June 30, 2019. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Based on the regression coefficients, the S&P SmallCap 600 had positive exposure to the quality factor and was statistically significant at a 95% confidence interval (t-stat of 7.03). In contrast, the loading on the quality factor was small for the Russell 2000 and was not a statistically significant return driver.

...whereas the loading on the quality factor was small for the Russell 2000 and was not a statistically significant return driver.

FUNDAMENTAL RISK FACTOR ATTRIBUTION

Beyond the standard Fama-French factors, it is important to capture a complete set of risk exposures of the two indices. This allows for users of the two indices to attribute precisely where portfolio performance has come from, and whether the index earns a premium for taking on those risks.

Using a commercially available fundamental risk model, we measure the active exposures of the S&P SmallCap 600 relative to the Russell 2000.⁴ Exhibit 15 reports factor exposures on an average annual basis from 2002 to 2018.

Using a commercially available fundamental risk model, we measure the active exposures of the S&P SmallCap 600 relative to the Russell 2000.

The S&P SmallCap 600 had the highest positive tilt toward the profitability factor, with an average active exposure of 0.19...

...and the most negative tilt toward the leverage factor, at -0.15.

Exhibit 15: Annual Average Factor Exposures and Factor Impact of the S&P SmallCap 600 Relative to the Russell 2000

SECTOR	AVERAGE ACTIVE EXPOSURE	AVERAGE FACTOR RETURN	FACTOR IMPACT
Profitability	0.19	0.27	0.06
Earnings Yield	0.12	0.10	0.01
Size	0.04	-0.38	-0.03
Liquidity	0.03	-0.08	0.00
Exchange Rate Sensitivity	0.03	0.03	-0.00
Value	0.01	0.09	-0.00
Market	0.00	0.82	0.00
Industries	0.00	-0.00	-0.05
Medium-Term Momentum	-0.03	0.09	-0.00
Growth	-0.04	-0.05	0.00
Dividend Yield	-0.06	-0.04	0.00
Market Sensitivity	-0.08	0.06	0.00
Volatility	-0.11	-0.24	0.03
Leverage	-0.15	0.03	-0.01
Total	-0.04	0.00	0.02

Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 29, 2002, to Dec. 31, 2018. Russell 2000 is represented by the iShares Russell 2000 ETF. Index performance based on total return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

Compared with the Russell 2000, the S&P SmallCap 600 had the highest positive tilt toward the profitability factor, with an average active exposure of 0.19. Earnings yield came in next at 0.12. The results were in line when we consider the additional inclusion criteria of the S&P SmallCap 600. First, since companies must be profitable to be included in the S&P SmallCap 600, it is not surprising to see a strong profitability tilt. Similarly, earnings yield, which is portfolio-level earnings divided by price, leads to a higher percentage of companies in the S&P SmallCap 600 having higher positive earnings, thereby resulting in a higher numerator.

Conversely, factors with the most negative active exposures hinted to the higher quality and defensive properties of the S&P SmallCap 600. The index was most underweight to the leverage factor, at -0.15. This means companies in the S&P SmallCap 600 had less leverage, on average,¹⁰ compared with the Russell 2000. The market sensitivity and volatility factors showed high negative exposures as well, pointing to the S&P SmallCap 600 having less co-movements with the overall market and less return volatility.

Macro factors alone cannot explain the majority of stock returns.

EXPOSURES TO MACROECONOMIC VARIABLES

Macroeconomic exposures of equity benchmarks are important in formulating asset class return expectations across various market regimes. We want to understand if the two small-cap indices have different macroeconomic sensitivities due to their differences in risk/return profiles. Therefore, we analyze the two small-cap indices using a commercially available macroeconomic risk model.

However, macro factors alone cannot explain the majority of stock returns. Therefore, the risk model also includes equity and sectors factor groups to increase the accuracy of the relevant macro factor groups, which are the core macroeconomic and market-traded groups.

The factor loadings imply that during periods of rising or high consumer confidence, economic growth, and higher inflation...

...the S&P SmallCap 600 returns were more negatively sensitive to increases in these factors.

Exhibit 16: Annual Average Macroeconomic Factor Exposures and Factor Impact for the S&P SmallCap 600 Relative to the Russell 2000

FACTOR GROUP	AVERAGE ACTIVE EXPOSURE	AVERAGE FACTOR RETURN	FACTOR IMPACT
Core Macroeconomic	-0.33	-0.11	0.01
Confidence	-0.05	-0.21	-0.01
Economic Growth	-0.15	0.02	0.00
Inflation	-0.13	-0.14	0.02
Market-Traded	0.20	0.17	-0.00
Commodity	0.00	0.39	-0.00
Credit Spread	0.15	-0.00	0.01
FX Basket	-0.02	0.02	-0.01
Gold	0.01	0.40	0.00
Oil	0.00	0.24	0.00
Term Spread	0.06	-0.01	-0.00
Equity	0.13	0.18	0.02
Equity Market	0.00	0.63	-0.01
Equity Size	-0.07	-0.28	0.01
Equity Value	0.19	0.19	0.02
Sectors	0.02	-0.22	-0.02
Total	0.02	-0.04	0.00

Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 29, 2002, to Dec. 31, 2018. Russell 2000 is represented by the iShares Russell 2000 ETF. Index performance based on total return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosure at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

Within the core macroeconomic group, the factor loadings imply that during periods of rising or high consumer confidence, economic growth, and higher inflation, the S&P SmallCap 600 returns were more negatively sensitive to increases in these factors. It is not surprising that during those periods, investors are less likely to be concerned with higher-quality companies and may instead focus on lesser-quality companies with negative earnings.

The S&P SmallCap 600 had more exposure to the credit spread factor than the Russell 2000...

Within the market-traded factor group, the largest difference between the two indices was the credit spread factor, with the S&P SmallCap 600 having a positive exposure compared with the Russell 2000. The credit spread factor is defined as the spread between BAA and AAA rated U.S. corporate bonds and therefore can be partially used as a measurement of portfolio quality. The S&P SmallCap 600 had more exposure to the credit spread factor than the Russell 2000, thus if the spread widens, the S&P SmallCap 600 would be negatively affected less than the Russell 2000 would be.

Overall, the macroeconomic exposures aligned with our findings from prior sections in which the four-factor regression analysis and the fundamental risk model indicated that the S&P SmallCap 600 had a positive tilt to quality and a negative bias to volatility.

TURNOVER COMPARISON

...thus if the spread widened, the index would be less negatively affected than the Russell 2000 would be.

Turnover is a key consideration in any benchmark construction, as an index with lower turnover is preferable to one with higher turnover, all else equal. An index with lower turnover is less likely to incur transaction costs when implemented as an investment portfolio.

Exhibit 17 shows the annual turnover comparison of the S&P SmallCap 600 and Russell 2000 between 2003 and 2018. Over the 16-year period, the average annual turnover of the S&P SmallCap 600 was 13.34% versus 38.77% for the Russell 2000.

YEAR	S&P SMALLCAP 600	RUSSELL 2000
2003	12.02	30.13
2004	12.86	9.26
2005	12.83	50.43
2006	13.72	51.98
2007	16.26	76.22
2008	20.32	75.22
2009	14.02	34.96
2010	12.25	46.91
2011	12.80	41.59
2012	9.39	46.44
2013	11.79	23.60
2014	11.56	26.92
2015	13.14	35.32
2016	15.28	19.70
2017	12.92	30.23
2018	12.34	21.41
Average	13.34	38.77

Turnover is a key consideration in any benchmark construction, as an index with lower turnover is preferable to one with higher turnover.

Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 2002, to Dec. 31, 2018. Russell 2000 is represented by the iShares Russell 2000 ETF. Table is provided for illustrative purposes.

Over the 16-year period, the average annual turnover of the S&P SmallCap 600 was 13.34% versus 38.77% of the Russell 2000.

We assume 60 bps as the transaction costs for a hypothetical USD 1 billion small-cap portfolio.

With the turnover difference, the Russell 2000's annual performance would be lower by 30.51 bps due to rebalancing trading costs.

When implementing an index-linked investment portfolio, having an index with higher turnover as the underlying benchmark can result in potentially higher trading costs. The components of trading costs include brokerage costs (commissions), bid-ask spreads (Collver 2014), price impact (Frazzini, Israel, and Moskowitz 2018), and opportunity costs.

Therefore, we estimate the impact that higher turnover may have on a hypothetical, passive small-cap portfolio. Financial literature contains various ways of estimating trading costs. We follow an approach outlined by John Bogle, calculating trading costs as the portfolio purchase of stock plus the portfolio sales as a percentage of fund average assets.¹¹

We assume 60 bps as the transaction costs for a hypothetical USD 1 billion small-cap portfolio.¹² Given the turnover difference between the two indices, the Russell 2000's annual performance would be lower by 30.51 bps due to rebalancing trading costs (see Exhibit 18).

Our estimate of the performance drag due to trading costs is highly conservative, as it does not consider the impact of any potential front runs caused by market participants anticipating the Russell annual June reconstitution. On the other hand, the S&P SmallCap 600's as-need rebalancing process minimizes potential front runs.

Exhibit 18: Average Turnover and Trading Costs Comparison

CATEGORY	S&P SMALLCAP 600	RUSSELL 2000
Turnover (%)	13.34	38.77
Trading Costs (bps)	16.01	46.52

Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 2002, to Dec. 31, 2018. Russell 2000 is represented by the iShares Russell 2000 ETF. Table is provided for illustrative purposes.

IMPACT OF BENCHMARK SELECTION

Our analysis has highlighted that the differences in returns of the two small-cap indices has stemmed primarily from the quality screening criteria of the S&P SmallCap 600. The long-term performance difference is a reminder that investors should be aware of index construction differences, which have a meaningful impact on index returns. Philips (2011) demonstrated that within the same universe of active managers, using a different benchmark can mean the difference between an outperforming manager and an underperforming manager.

To determine the effect that benchmark choice can have on manager appraisal, we compare a universe of actively managed small-cap funds against the two benchmarks, using the returns from the University of Chicago's Center for Research Security Prices (CRSP) Survivorship-Bias Free U.S. Mutual Fund database. We removed the index funds, leveraged and inverse funds, and other index-linked products from the universe. In addition, when a given fund included multiple share classes in the initial

universe, the returns of the share class with the greatest assets were taken into consideration to avoid double counting.

To determine the effect that benchmark choice can have on manager appraisal...

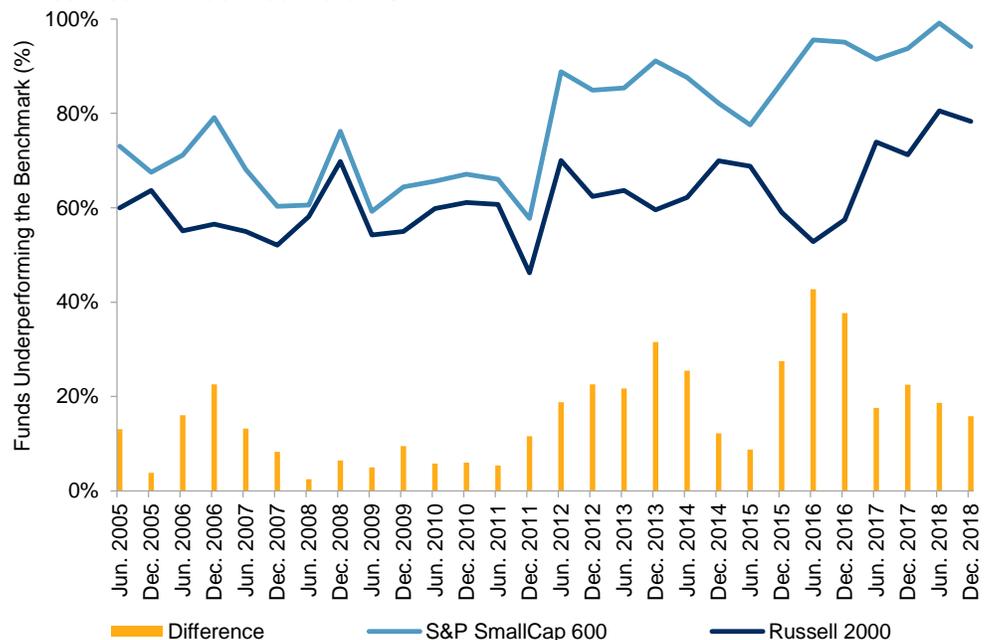
Exhibits 19 and 20 show the percentage of funds underperforming each benchmark, based on rolling three-year and five-year returns, respectively, on a semiannual basis from 2005 through 2018. The percentage of funds underperforming each benchmark varied considerably throughout the sample period.

Based on three-year annualized returns, 78% of funds underperformed the S&P SmallCap 600, on average, while roughly 62% underperformed the Russell 2000. Results were similar using five-year annualized returns, where approximately 79% underperformed the S&P SmallCap 600 and 63% underperformed the Russell 2000.

...we compare a universe of actively managed small-cap funds against the two benchmarks.

In both cases, the majority of active managers in the Lipper Small-Cap Core Fund universe underperformed both benchmarks. However, there was a significant difference in the percentage of funds underperforming the S&P SmallCap 600 versus the Russell 2000, as a higher percentage of managers underperformed the former. The yellow bars in Exhibits 19 and 20 represent the difference in the percentage of underperformance. The average annual difference was 16.16% and 16.59% for the three- and five-year holding period returns, respectively, which was statistically significant at the 95% confidence level (with a three-year t-stat of 8.26 and five-year t-stat of 9.43).

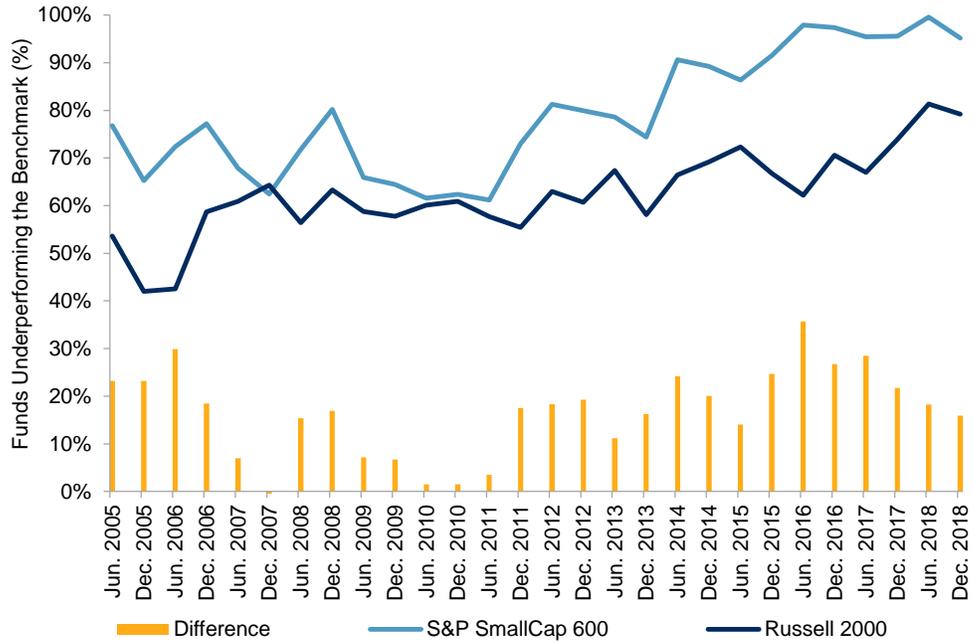
Exhibit 19: Percentage of Funds Underperforming the Benchmark Based on Three-Year Annualized Returns



Over the three-year period, 78% and 62% of funds underperformed the S&P SmallCap 600 and Russell 2000, respectively.

Source: S&P Dow Jones Indices LLC, FactSet, CRSP. Data from June 2005 through December 2018. Index performance based on total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

Exhibit 20: Percentage of Funds Underperforming the Benchmark Based on Five-Year Annualized Returns



The average annual difference was 16.16% and 16.59% for the three- and five-year holding period returns, respectively.

The average IR was negative for the universe when calculated using the S&P SmallCap 600 (-0.58)...

Source: S&P Dow Jones Indices LLC, FactSet, CRSP. Data from June 2005 through December 2018. Index performance based on total return in USD. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

The results in Exhibits 19 and 20 highlight the level of skills or investment insight needed to outperform a given small-cap benchmark. The information ratio (IR)—defined as the active return divided by active risk—provides a measure of a manager’s skills. We calculate the IRs of active small-cap funds with the Russell 2000 and the S&P SmallCap 600 as benchmarks. Using all the active funds in the Lipper Small-Cap Core Fund category as the underlying universe, we compute the monthly IR of the fund universe from December 1993 through December 2018(see Exhibit 21), using funds’ rolling three-year annualized returns.

...while it was positive when the benchmark was the Russell 2000 (0.05).

We saw a noticeable difference between the average IRs of the Lipper Small-Cap Core Fund Category when the benchmark was the S&P SmallCap 600 versus when the Russell 2000 was the benchmark. The average IR was negative for the universe when calculated using the S&P SmallCap 600 (-0.58), while it was positive when the benchmark was the Russell 2000 (0.05). However, we note that the IRs were not statistically significant at the 95% confidence level.

The negative average IR indicates that an average small-cap active manager was not able to generate excess returns consistently against the S&P SmallCap 600.

Most of the S&P SmallCap 600's excess returns stemmed from differences in index construction...

Exhibit 21: Summary Statistics of Lipper Small-Cap Core Funds

BENCHMARK	INFORMATION RATIO	INFORMATION RATIO T-STAT
S&P SmallCap 600	-0.58	-1.02
Russell 2000	0.05	0.13

Source: S&P Dow Jones Indices LLC, FactSet, Lipper. Data from December 1993 through December 2018. Index performance based on total return in USD. Past performance is no guarantee of future results. Table is provided for illustrative purposes and reflects hypothetical historical performance. Please see the Performance Disclosures at the end of this document for more information regarding the inherent limitations associated with back-tested performance.

CONCLUSION

The substantial return divergence between the S&P SmallCap 600 and the Russell 2000 is a widely documented and researched investment topic. Most of the S&P SmallCap 600's excess returns have stemmed from differences in index construction, such as the profitability, liquidity, and public float criteria that are absent in the Russell 2000. Fundamental and macroeconomic risk factor attribution analyses show that the S&P SmallCap 600 has had stronger bias to the quality factor and has performed better during market environments in which higher quality has outperformed lower quality.

We show that benchmark selection matters when it comes to distinguishing a successful manager from an unsuccessful one. The S&P SmallCap 600 has been the more difficult small-cap benchmark to beat of the two, with a higher percentage of actively managed small-cap funds underperforming it.

...such as the profitability, liquidity, and public float criteria that are absent in the Russell 2000.

APPENDIX A

Exhibit 22: Impact of Index Criteria on Performance for Cap-Weighted Portfolios						
CRITERIA	S&P UNITED STATES SMALLCAP			RUSSELL 2000		
	GROUP 1	GROUP 2	UNIVERSE	GROUP 1	GROUP 2	UNIVERSE
PROFITABILITY (POSITIVE EARNINGS)						
Security Counts	1,607	852	2,460	1,233	726	1,959
Returns	11.43	9.44	11.25	11.55	9.41	11.11
Sharpe Ratio	0.71	0.43	0.65	0.68	0.41	0.6
T-Stat Alpha	2.47	-3.65	-	2.63	-3.3	-
INVESTABILITY (PUBLIC FLOAT)						
Security Counts**	2,237	222	2,460	1,595	364	1,959
Returns	11.33	10.13	11.25	11.55	8.76	11.11
Sharpe Ratio	0.65	0.65	0.56	0.63	0.45	0.6
T-Stat Alpha	0.91	-1.21	-	2.91	-2.82	-
LIQUIDITY (ANNUAL LIQUIDITY > 100% OUTSTANDING SHARES AND > 250,000 SHARES)						
Security Counts**	1,733	727	2,460	1,320	639	1,959
Returns	11.62	9.8	11.25	11.51	9.5	11.11
Sharpe Ratio	0.65	0.65	0.65	0.6	0.56	0.6
T-Stat Alpha	0.07	-0.33	-	0.13	-0.41	-
PROFITABILITY, INVESTABILITY, AND LIQUIDITY						
Security Counts**	1,033	1,427	2,460	708	1,251	1,959
Returns	11.77	10.21	11.25	11.79	10.16	11.11
Sharpe Ratio	0.72	0.53	0.65	0.69	0.51	0.6
T-Stat Alpha	2.38	-2.95	-	2.6	-3.16	-

Group 1 and Group 2 are hypothetical portfolios.

Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 2002, to Dec. 31, 2018. Russell 2000 is represented by the iShares Russell 2000 ETF. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

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END NOTES

- ¹ Source: S&P Dow Jones Indices LLC, FactSet. Data from Dec. 31, 1993, to Dec. 31, 2018. Index performance based on total return in USD. Past performance is no guarantee of future results.
- ² Prior to 2014, S&P Dow Jones Indices' financial viability criteria required four consecutive quarters of positive earnings, instead of the sum of the past four quarters being positive.
- ³ A company meeting the unadjusted company market capitalization criteria is also required to have a security level float-adjusted market capitalization that is at least 50% of the respective index's unadjusted company level minimum market capitalization threshold. S&P Dow Jones Indices' public float criteria prior to July 2019 was at least 50% of shares must be publicly floated.
- ⁴ We use the holdings of iShares Russell 2000 ETF (ticker: IWM) as a proxy for the Russell 2000 universe.
- ⁵ S&P Dow Jones Indices' public float criteria prior to July 2019.
- ⁶ The allocation effect measures the effectiveness of over- or underweighting different sectors of the portfolio relative to the benchmark. The selection effect measures the effectiveness of selecting specific securities within a sector in the portfolio relative to the benchmark.
- ⁷ Soe and Dash (2009), Soe and Brzenk (2015)
- ⁸ The authors formed two size-sorted portfolios based on their market capitalizations. The median NYSE market equity serves a size break point between the two.
- ⁹ Expanded definitions and historical values are available on Ken French's website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.
- ¹⁰ Leverage is defined as the equal-weighted combination of debt-to-equity and debt-to-assets ratios in the Axioma US4 Fundamental Risk Model.
- ¹¹ Bogle (2014).
- ¹² Our estimate is on the conservative side. Edelen, Evans, and Kadlec (2013) used an average annual trading cost of 1.44% in the study. Bogle (2014) assumed transaction costs of 50 bps.

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