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BETA Investment Strategies

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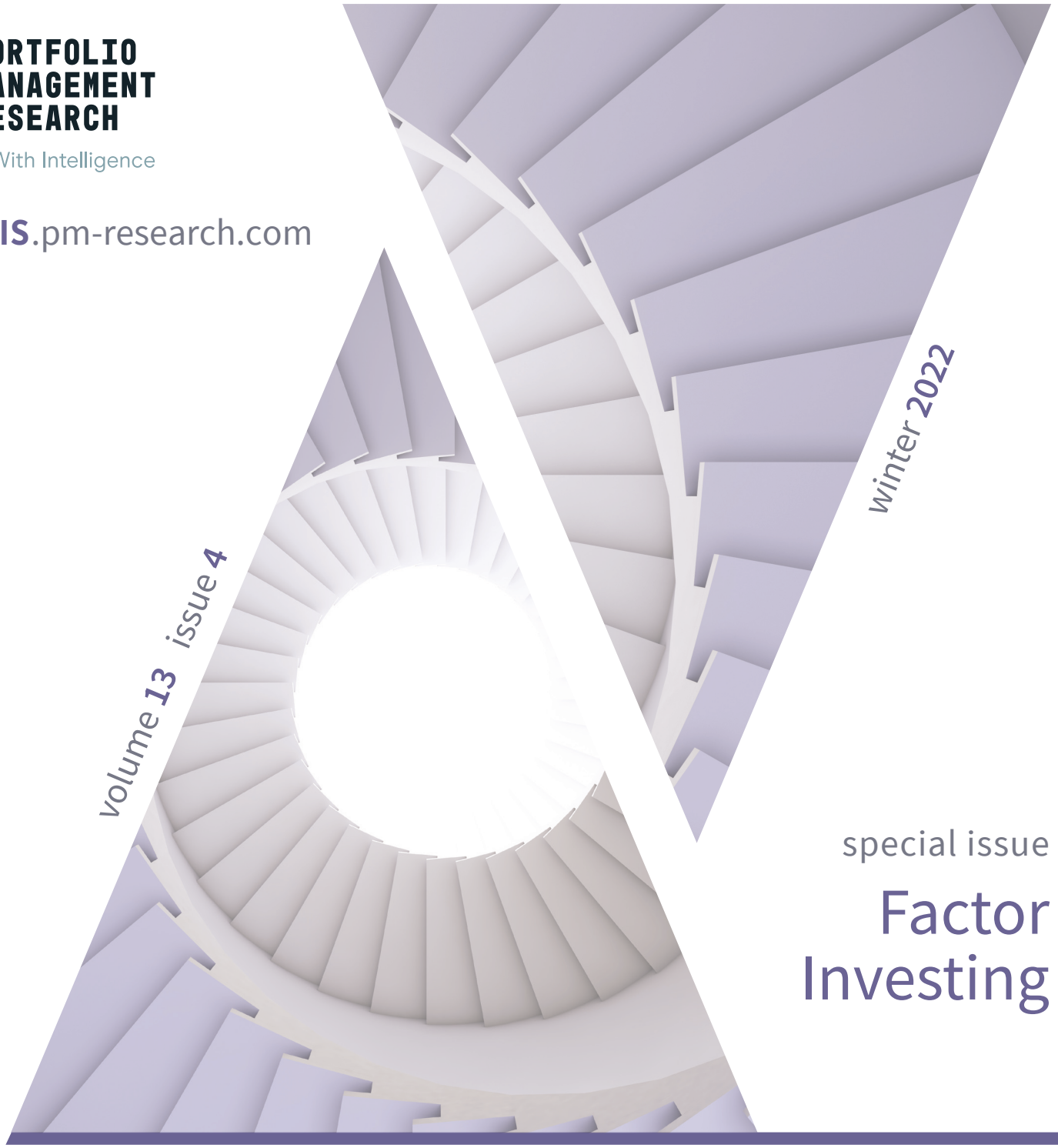

volume 13 issue 4

winter 2022

special issue

Factor Investing

Long-Only Value Investing:
Does Size Matter?

Jack Vogel

alpha architect

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Long-Only Value Investing:
Does Size Matter?

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KEY FINDINGS

- For a long-only value investor, size is not as important as is documented in long/short portfolios: Equally weighted large-cap value portfolios have historically earned similar returns as small-cap value portfolios.
- This finding is robust to different value measures and within different markets.
- Practitioners should split their value allocations across large-cap value portfolios (equal-weighted) and small-cap value portfolios, given these portfolios have zero overlap but similar historical returns, highlighting a potential diversification benefit.

ABSTRACT

The academic value factor (long cheap stocks, short expensive stocks) earns higher returns among small-cap stocks. When viewed through the lens of a long-only value investor, however, size is a less important factor. For example, equally weighted large-cap value portfolios have historically earned similar returns as small-cap value portfolios. This finding is robust to different value measures and markets. Despite realized returns being statistically similar, the liquidity profile of the two value portfolios is dramatically different: Equally weighted large-cap value portfolios have approximately 11 times (or more) the liquidity of small-cap value portfolios.

The academic value factor is a long–short portfolio formed by (1) going long value (cheap) stocks and (2) going short growth (expensive) stocks (Fama and French 1992, 1993). Research has found that the long–short value factor is generally stronger in smaller stocks. For example, several articles examine the impact of size on the value (and other) factors (Fama and French 2008; Hou, Xue, and Zhang 2020).[1] Asness et al. (2015, 12) directly test this idea and find that "by itself, value is surprisingly weak among large-cap stocks." However, none of these articles addresses how size affects the realized returns to *long-only* value portfolios, which is how many investors access the value premium.[2] We study long-only value portfolios and find that size is a less important factor.

As is the academic convention, studies on the value factor focus on long–short portfolios. However, the analysis of long–short portfolios may be less relevant

[1] By no means is this an inclusive list of all articles that examine the impact of size on various factors.

[2] For example, Vanguard's *long–short* fund, VMNFX, has assets under management (AUM) of nearly $290mm as of September 7, 2021, whereas its *long-only* value ETF, VTV, has AUM of $85bn—approximately 293 times the AUM of the long–short fund.

to practitioners who are more likely to invest in long-only factor portfolios versus long–short portfolios (e.g., see Blitz, Baltussen, and van Vliet 2020). The study of long-only portfolios is an essential topic for practitioners. Practitioners often assume that the takeaways from studies on zero-cost long–short portfolios are relevant to long-only factor investors. This assumption is incorrect: Long-only analysis can differ wildly from long–short analysis.

The central test within this article is to examine how size affects the performance of long-only value portfolios. To assess this question, we form portfolios that are not subject to outlier effects. Specifically, we examine equal-weighted (EW) large-cap value portfolios against small-cap value portfolios (without microcaps). An equal-weighting scheme eliminates the potential influence of a handful of mega-large-cap stocks from driving the results associated with VW portfolios.[3] We also eliminate microcap stocks, which can have a large impact on small-cap value portfolios. We find that EW large-cap value portfolios and small-cap value portfolios (both market-capitalization weighted and EW) earn statistically similar returns. Not only are the returns similar, but the equal-weight large-cap value portfolio also has vastly superior liquidity characteristics relative to the small-cap equivalent.[4] These results are not driven by systematically different factor profiles.

The critical implication of this research, and its importance to systematic value investors, is that smaller is not always better. In fact, given the significantly higher liquidity among EW large-cap value portfolios, the data suggest that value investors who prefer liquidity should prefer EW large-cap value portfolios.[5]

DATA

Our US sample includes stocks traded on the major stock exchanges (New York Stock Exchange [NYSE], American Stock Exchange [AMEX], and Nasdaq). Specifically, we examine the 3,000 largest companies based on market capitalization each year. We identify the 1,000 largest companies as "large-cap" companies.[6] The smallest 2,000 companies ranked on market capitalization are "small-cap" companies.

Our classification for size differs slightly from academic research conventions and aligns with practitioner conventions.[7] Many practitioners identify the Russell 1,000 Index as a broad large-cap index and the Russell 2,000 Index as a general measure of small-cap company performance.[8] In contrast, academic researchers split the data on NYSE size breakpoints, often using the NYSE 50th percentile for market capitalization as the cutoff point. As an example, Ken French's website shows that as of June 30, 2021, 870 companies were identified as "large." This number (870) is close to the top 1,000 companies we recognize as large.

As shown in Exhibit 1, the 1,000 largest companies have historically made up 91.22% (average) of the overall market capitalization of the 3,000 largest companies.

[3] As noted in the Performance Analysis section, this approach also eliminates the chance of one megacap stock having a large (10%+) weight in the portfolio.

[4] The equal-weighted large-cap value portfolios have a weighted average daily volume (ADV) of around 11 times greater than the market-cap-weighted small-cap value portfolios, as described in the Performance Analysis section.

[5] Of course, there are diversification benefits to allocating toward both equal-weighted large-cap value portfolios as well as market-cap-weighted small-cap portfolios.

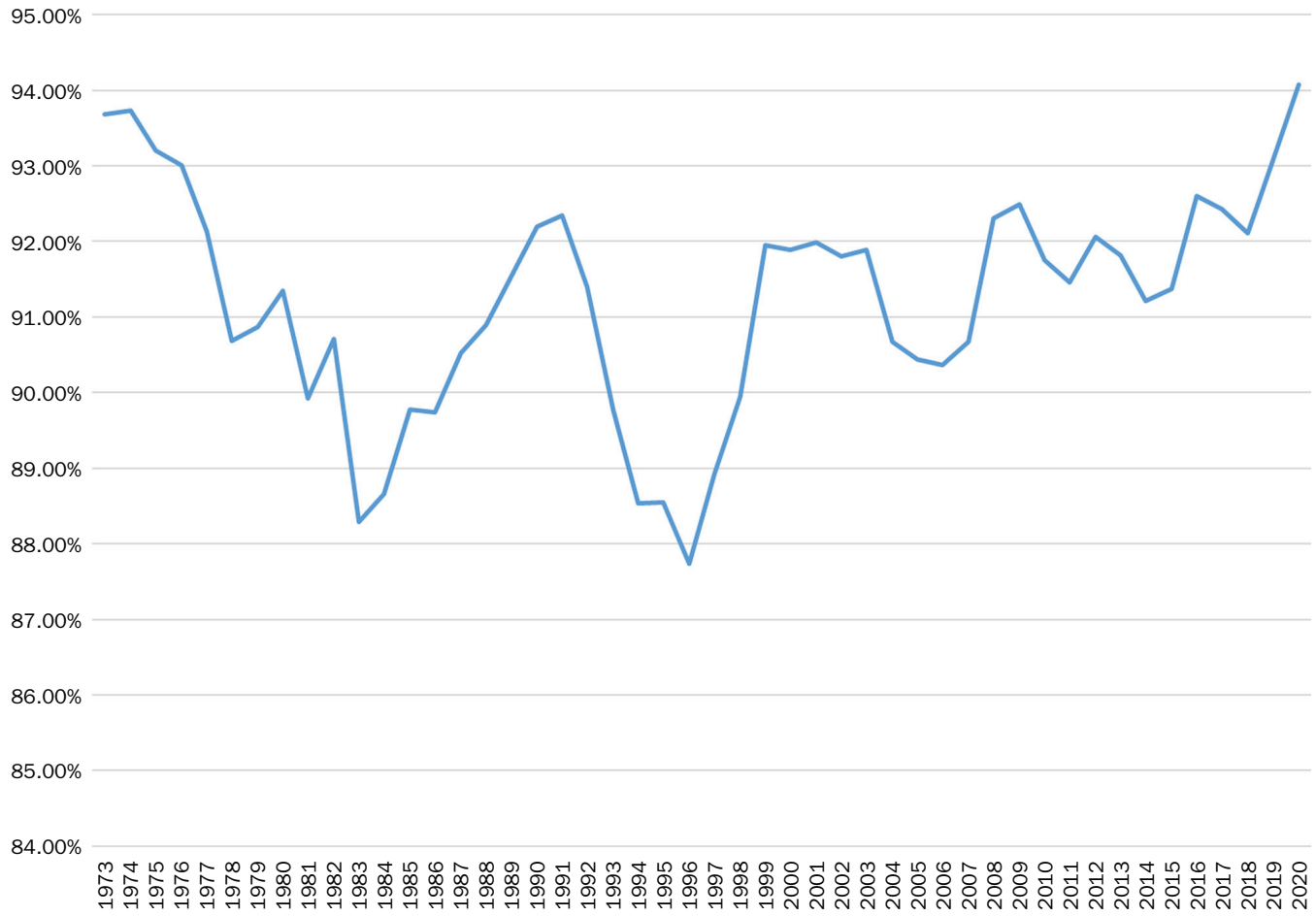
[6] Some practitioners may identify this sample as comprising mid-cap and large-cap companies. We agree but use the label "large" for simplicity.

[7] We look at more conventional academic constructs and find similar results. Please see the Robustness Tests section.

[8] Our large- and small-cap universe portfolios have similar returns to the Russell 1,000 and Russell 2,000 indexes, respectively, with correlations above 0.995 for both indexes.

EXHIBIT 1

Percentage of Market Capitalization of 1,000 Largest Companies over Time



NOTES: This exhibit plots the annual percentage of the total market capitalization captured by the 1,000 largest companies within the US Stock Market, among the 3,000 largest companies. The calculation is the following: (1) take the sum of the market capitalization of the 1,000 largest and (2) divide that number by the sum of the market capitalization of the 3,000 largest companies.

To test the performance of the various value portfolios across the large-cap and small-cap universes of US common stocks, we obtain the necessary accounting information from Compustat (annual data) and market data (returns, market value of equity) from CRSP.[9] We limit our sample to companies with ordinary common equity on CRSP and eliminate all REITS, ADRs, and closed-end funds. We incorporate CRSP delisting return data using the technique developed in Beaver, McNichols, and Price (2007). To be included in the sample, all companies must have a nonzero market value of equity as of June 30 of year *t* and be within the 3,000 largest companies on market capitalization. Performance is measured between July 1, 1973, and December 31, 2020.

The main tests in the article examine the relative performance of long-only value portfolios split within (1) the small-cap universe and (2) the large-cap universe. We divide each universe into either terciles (3 groups), quintiles (5 groups), or deciles (10 groups) on the various value measures. We follow a similar methodology to

[9] All fundamental data from Compustat are lagged at least three months to avoid lookahead bias. Lagging the data for four months (Hou, Xue, and Zhang 2020) has no substantive effect on the results.

Asness et al. (2015), who examine four measures of value—book-to-market (B/M), earnings-to-price (E/P), cash flow-to-price (CF/P), and dividend-to-price (D/P). We drop D/P because many companies pay zero dividends, leading to less cross-sectional dispersion for the D/P measure, and replace it with a more robust value metric—the enterprise multiple earnings before interest and taxes over total enterprise value (EBIT/TEV).[10] Loughran and Wellman (2011), Gray and Vogel (2012), and Crawford, Gray, and Vogel (2019) examine enterprise multiples and identify that this measure efficiently captures the value premium.

We use four valuation measures in our study, plus a composite measure proposed in Asness et al. (2015):

- B/M,
- E/P,
- Free Cash Flow-to-Price (FCF/P),
- EBIT/TEV,
- composite rank of the four measures.

The details for each variable and the article references for each value measure are in the appendix. The composite measure ranks each stock on each of the four variables within its respective small or large universe. A composite score (sum of ranks) is then re-ranked to generate the average (composite) rank. The portfolios are formed once a year on June 30. The portfolios are either (1) EW or (2) VW (also referred to as market-cap weighted). The EW portfolios assume a once-a-year equal weighting, as opposed to the standard academic monthly equal weighting. As discussed in the Robustness Tests section, the results are the same using both methodologies.

For developed international markets, which are the countries included in the Morgan Stanley Capital International (MSCI) Europe, Australasia, and the Far East (EAFE) Index, we use data from Factset and examine the period from January 1, 1994–December 31, 2020. Like the US data sample, all portfolios are formed on June 30 each year and held for 12 months.[11]

PERFORMANCE ANALYSIS

Large-Cap Value Portfolios versus Small-Cap Value Portfolios

Exhibit 2 presents the main results of our article. The analysis compares the historical performance of EW large-cap value portfolios against small-cap value portfolios, both EW and VW.[12]

Panels A, B, and C of Exhibit 2 present the average monthly return to each value portfolio across the five value metrics for the EW large-cap universe (Panel A), the VW small-cap universe (Panel B), and the EW small-cap universe (Panel C). Each row represents the universe splits into the top deciles, quintiles, or terciles for each value metric. For the large-cap universe of 1,000 stocks, this means selecting the top 100 stocks (decile), 200 stocks (quintile), and 333 stocks (tercile) for each value metric. For the small-cap universe of 2,000 stocks, this means selecting the top 200 stocks (decile), 400 stocks (quintile), and 666 stocks (tercile) for each value metric. Thus, there are 15 portfolios within each universe.

[10] In this article, we use EBIT/TEV, whereas some prefer to use EBITDA/TEV. The results in the article are quantitatively similar for both measures.

[11] We follow FactSet's recommendation and use a 6-month data lag for international data. We use trailing 12-month data in order of availability—quarterly, semi-annual, and annual data.

[12] All performance is gross of any fees or transaction costs.

EXHIBIT 2

Performance of US Value Portfolios

	E/P	EBIT/TEV	B/M	FCF/P	Composite	Average
Panel A: Large-Cap EW						
Decile Monthly Return	1.33%	1.36%	1.29%	1.28%	1.37%	
Quintile Monthly Return	1.29%	1.33%	1.23%	1.27%	1.30%	1.29%
Tercile Monthly Return	1.25%	1.29%	1.19%	1.23%	1.28%	
Panel B: Small-Cap VW						
Decile Monthly Return	1.35%	1.37%	1.29%	1.43%	1.42%	
Quintile Monthly Return	1.38%	1.37%	1.33%	1.36%	1.38%	1.36%
Tercile Monthly Return	1.33%	1.39%	1.32%	1.33%	1.37%	
Panel C: Small-Cap EW						
Decile Monthly Return	1.37%	1.44%	1.36%	1.46%	1.47%	
Quintile Monthly Return	1.38%	1.42%	1.35%	1.40%	1.40%	1.39%
Tercile Monthly Return	1.35%	1.43%	1.34%	1.36%	1.38%	
Panel D: Paired T-Test of Large-Cap EW and Small-Cap VW (p-values)						
Decile p-value	0.822	0.856	0.999	0.125	0.586	
Quintile p-value	0.327	0.607	0.356	0.267	0.367	
Tercile p-value	0.327	0.201	0.166	0.215	0.321	
Panel E: Paired T-Test of Large-Cap EW and Small-Cap EW (p-values)						
Decile p-value	0.686	0.425	0.597	0.099	0.380	
Quintile p-value	0.383	0.340	0.317	0.190	0.294	
Tercile p-value	0.315	0.136	0.168	0.168	0.313	

NOTES: This exhibit reports monthly returns and p-values for various US stock portfolios from July 1, 1973–December 31, 2020. Value portfolios are formed by splitting each universe (large-cap and small-cap) into deciles, quintiles, or terciles based on each value metric and weighting the portfolios by either value weighting or equal weighting the underlying positions. The five value metrics are E/P, EBIT/TEV, B/M, FCF/P, and a composite value measure. Panel A presents the average monthly returns to value portfolios within the large-cap universe (EW). Panel B presents the average monthly returns to value portfolios within the small-cap universe (VW). Panel C presents the average monthly returns to value portfolios within the small-cap universe (EW). Panel D presents the p-values from a paired t-test to examine the statistical significance between (a) a large-cap value portfolio (EW) and (b) a small-cap value portfolio (VW). Panel E presents the p-values from a paired t-test to examine the statistical significance between (a) a large-cap value portfolio (EW) and (b) a small-cap value portfolio (EW). "Average" represents an arithmetic average of the 15 portfolio returns. The * represents significance at the 5% level, while ** represents significance at the 1% level. "Average" represents an arithmetic average of a Panel.

Comparing Panel A against Panels B and C of Exhibit 2 shows the difference between large-cap and small-cap value portfolios. For example, the large-cap E/P value portfolio (decile, EW) returned 1.33% monthly. In contrast, the small-cap E/P value portfolio (decile) returned either 1.35% (VW—Panel B) or 1.37% (EW—Panel C) monthly. Hence, using the same methodology, one would have realized an extra 2 or 4 basis points a month by using the value factor within small-cap stocks. This process is completed for the 15 test portfolios. We find that the average monthly return to large-cap EW (1.29%) is very close to the small-cap value portfolios' monthly return, either 1.36% (VW—Panel V) or 1.39% (EW—Panel C).

Panels D and E examine the article's central question: Is there any significant difference in realized returns between the large-cap EW value portfolios and the small-cap value portfolios (either VW or EW)? To formally test for significant differences between the portfolios, we use a paired t-test. Panels D and E present the p-values for significant differences. Panels D and E of Exhibit 2 highlight no statistically significant differences across the 15 different value portfolios. In other words, historically, *there was no significant difference in returns* between a large-cap value portfolio that is EW compared to a small-cap value portfolio that is either market-cap weighted or equal weighted.

EXHIBIT 3

Market Capitalization Ratio (large-cap/small-cap)

	Composite	EP	EBIT/TEV	B/M	FCF/M	Average
Panel A: Large (EW) Market Capitalization/Small (EW) Market Capitalization (median)						
Decile	18.26	18.97	24.66	16.74	15.18	
Quintile	20.71	20.64	22.07	18.24	14.66	19.27
Tercile	20.33	20.79	20.88	18.81	18.13	
Panel B: Large (EW) Market Capitalization/Small (VW) Market Capitalization (median)						
Decile	12.29	11.88	16.10	10.65	10.37	
Quintile	13.61	13.61	14.60	11.55	10.31	12.74
Tercile	13.54	14.18	13.85	12.33	12.31	

NOTES: This exhibit presents the median ratio of a monthly time series that is computed by dividing (1) the position-weighted market capitalization of the large-cap value portfolios (floating equal weights) by (2) the position-weighted market capitalization of the small-cap value portfolios. Panel A uses floating equal weights for the small-cap value portfolio, while Panel B uses market-cap weights for the small-cap value portfolio. "Average" represents an arithmetic average of a Panel.

Value Portfolios' Liquidity

Exhibit 1 shows that the large-cap universe historically accounts for around 90% (or higher) of the overall market capitalization of the largest 3,000 companies. However, a formal analysis of the market-cap differences between the small-cap and large-cap value portfolios is warranted. We calculate a ratio of the position-weighted market cap of the large-cap portfolio (EW) against the small-cap portfolios (EW and VW). Exhibit 3 presents the median of this ratio over time. Panel A highlights that the large-cap value portfolios (EW) have a position-weighted market cap that is, on average, 19.27 times the small-cap value portfolio (EW). Panel B shows the average ratio is 12.74 times comparing large-cap value (EW) against the small-cap value (VW).

As Alquist et al. (2018) highlighted, size is a good proxy for liquidity. Thus, we would expect large-cap companies to have higher liquidity than small-cap companies. To formally test this hypothesis, we examine the average monthly trading volume of the various portfolios. Specifically, we compute a monthly ratio of the average daily volume (ADV) of the large-cap value portfolio (EW) divided by the ADV of the small-cap value portfolio for the 15 portfolios.[13] We measure ADV over the preceding month for each stock.

Exhibit 4 reports the results of this analysis. We present the median of the monthly time series of the ratios between the large-cap and small-cap portfolios. The median of the ratios is used to minimize the impact of outlier months. As shown in Exhibit 3, Panel A, the ADV of the large-cap portfolios is 18.72 times the ADV of the small-cap portfolios using the median ratio across time (EW—Panel A).[14] Panel B of Exhibit 4 shows the average ratio is 11.66 times comparing large-cap value (EW) against small-cap value (VW).

Why does this matter? We previously examined the performance of large-cap value portfolios (EW) and small-cap value portfolios (market-cap weighted) and found no significant difference. However, trading costs would arguably be much higher in the small-cap value portfolios (market-cap weighted) relative to large-cap value portfolios (EW).

[13] A time series of the ratio is used, as opposed to raw numbers, as the ADV will vary over time for both large-cap and small-cap stocks. So, a monthly ratio is one way to account for the time-series variation.

[14] The mean of the time series of the ratio shows that large-cap value portfolios have 5.43 times the ADV of small-cap value portfolios.

EXHIBIT 4

Average Daily Volume Median Ratio (large-cap/small-cap)

	Composite	EP	EBIT/TEV	B/M	FCF/M	Average
Panel A: Large (EW) Market Capitalization/Small (EW) Market Capitalization (median)						
Decile	17.82	13.81	20.71	17.99	17.35	
Quintile	18.04	12.66	20.50	15.46	17.16	18.72
Tercile	21.30	19.82	25.40	19.85	22.97	
Panel B: Large (EW) ADV/Small (VW) ADV (median)						
Decile	12.09	9.24	12.96	11.30	10.87	
Quintile	11.66	8.23	12.92	9.37	10.72	11.66
Tercile	12.52	12.31	15.54	11.38	13.85	

NOTES: This exhibit presents the median ratio of a monthly time series that is computed by dividing (1) the ADV of the large-cap value portfolios (floating equal weights) by (2) the ADV of the small-cap value portfolios. Panel A uses floating equal weights for the small-cap value portfolio, while Panel B uses market-cap weights for the small-cap value portfolio. "Average" represents an arithmetic average of a Panel.

Explaining the Performance

The previous section shows no relative performance difference between a large-cap value portfolio that is EW compared to a small-cap value portfolio that is market-cap weighted (or EW). Of course, there is a possibility that the construction of the portfolio leads to systematically different factor profiles. To assess this possibility, we look at the factor loadings and intercepts for a portfolio that goes long large-cap value (EW) and short small-cap value. We only present the results to the tercile long–short portfolios (using VW small-cap as the short portfolio) for ease of exposition.[15]

Panel A of Exhibit 5 presents the monthly alpha from regressions against multiple factors models, such as the Fama and French five-factor model (2016), the Fama and French five-factor model plus momentum (Asness 2014), the Carhart four-factor model (Carhart 1997), and the Hou–Xue–Zhang (2015) model. The monthly alphas are generally positive but not significant, regardless of the factor model assessed. The results are qualitatively similar for decile and quintile portfolios.

Panels B and C of Exhibit 5 present the factor loadings for the Fama and French five-factor model plus momentum (six-factor model). One notices a large and significant negative loading on the size factor. This finding makes sense, as the long–short portfolio is long large-cap value and short small-cap value—so, there is a size impact on the long–short portfolio, by construction.

Overall, the results from factor regressions (Panel A) correspond with the main finding of the article—large-cap EW value portfolios and small-cap value portfolios have statistically indistinguishable historical returns, even after accounting for additional factors.

An alternative method to understand why the performance of large-cap value (EW) might be similar to the performance of small-cap value is to examine the underlying valuation characteristics of the test portfolios. We create position-weighted (EW or VW) metrics for the large-cap and small-cap value portfolios. For example, if the large-cap E/P value portfolio has four stocks with E/P ratios of 10%, 12%, 14%, and 16%, this portfolio's large-cap (EW) E/P characteristic would be 13%. We compute this for all the portfolios (large and small) and weight accordingly (EW or VW). We then examine the annual ratio of the large-cap EW against the small-cap VW portfolio

[15] There are no significant differences in factor loadings across the decile and quintile portfolios or if we are using EW small-cap value portfolios.

EXHIBIT 5

Tercile Factor Loadings

	E/P	EBIT/TEV	B/M	FCF/P	Composite
Panel A: Tercile L/S Portfolio Monthly L/S Portfolio Alpha					
Tercile Monthly Six-Factor Alpha	0.03%	0.01%	0.04%	0.01%	0.03%
p-value	0.497	0.800	0.455	0.875	0.489
Tercile Monthly Five-Factor Alpha	0.05%	0.01%	0.06%	0.00%	0.03%
p-value	0.354	0.866	0.218	0.920	0.470
Tercile Monthly Four-Factor Alpha	0.01%	0.00%	0.00%	0.00%	0.01%
p-value	0.830	0.932	0.936	0.933	0.807
Tercile Monthly Alpha (Hou–Xue–Zhang)	0.03%	0.02%	0.02%	–0.01%	0.04%
p-value	0.596	0.661	0.782	0.909	0.462
Panel B: Tercile L/S Factor Portfolio Six-Factor Loadings					
Market-RF	0.04**	0.03**	(0.01)	0.07**	0.05**
SMB	(0.57)**	(0.56)**	(0.62)**	(0.56)**	(0.58)**
HML	0.01	0.02	0.01	0.00	0.04
RMW	(0.09)**	(0.04)*	(0.07)**	(0.04)*	(0.07)*
CMA	0.03	0.03	(0.06)	0.01	(0.01)
UMD	0.02	(0.01)	0.04**	(0.02)	0.00
Panel C: Tercile L/S Factor Portfolio Six-Factor Loading P-Values					
Market-RF	0.002	0.002	0.293	0.000	0.000
SMB	0.000	0.000	0.000	0.000	0.000
HML	0.641	0.328	0.818	0.901	0.094
RMW	0.000	0.033	0.003	0.050	0.003
CMA	0.438	0.379	0.103	0.792	0.867
UMD	0.090	0.544	0.001	0.070	0.878

NOTES: This exhibit reports monthly alphas, loading, and p-values for various US stock portfolios from July 1, 1973–December 31, 2020. The value portfolios are formed by splitting each universe (large cap and small cap) into terciles based on each value metric. The five value metrics are E/P, EBIT/TEV, B/M, FCF/P, and a composite value measure. Panel A presents the average monthly alpha and corresponding p-value for a long–short portfolio that is long a large-cap value portfolio (EW) and short a small-cap value portfolio (market-cap weighted) against each factor model. Panels B and C present the average monthly loading and corresponding p-value for the long–short portfolio against the five-factor plus momentum model (six-factor model). The * represents significance at the 5% level, while ** represents significance at the 1% level.

in Exhibit 6.[16] We compute a mean of each annual ratio, ignoring observations where one of the mean values is negative. For example, when sorting on B/M, the mean E/P of the value portfolio(s) is, at times, negative—in this instance, we exclude the ratio for that observation.

Exhibit 6 presents the results of this analysis, with each panel showing the mean for each value metric. For example, Panel A presents the mean ratio of (1) the large-cap value (EW) portfolio divided by (2) the small-cap value (VW) portfolio. While E/P is the sorting variable for these value portfolios in Panel A, the other metrics are also shown.

Panels A–D of Exhibit 6 show that small-cap value portfolios have "better" characteristics when categorizing stocks on one value measure. A value of above (below) 1 means that a large-cap portfolio has a higher (lower) value metric. For example, examining Panel C, we see that the decile value portfolios are cheaper on B/M metrics in small-cap stocks. However, while the B/M ratio for the quintile portfolio is 0.83, implying that the small-cap portfolio is cheaper, on the other three metrics, the small-cap ratio is above 1 (1.17 for EBIT/TEV, 1.89 for E/P, and 2.95 for FCF/P), implying that

[16] Results are qualitatively similar if using the small-cap EW portfolio.

EXHIBIT 6

Characteristic Ratio of Large-Cap Value (EW)/ Small-Cap Value (VW)

	EBIT/TEV	E/P	B/M	FCF/P
Panel A: E/P				
Decile	1.01	**0.84**	0.94	0.89
Quintile	0.96	**0.90**	0.95	2.78
Tercile	0.95	**0.94**	0.95	1.35
Panel B: EBIT/TEV				
Decile	**0.71**	1.36	0.90	1.85
Quintile	**0.77**	1.14	0.91	1.36
Tercile	**0.82**	1.05	0.92	1.93
Panel C: B/M				
Decile	1.49	3.08	**0.79**	20.32
Quintile	1.17	1.89	**0.83**	2.95
Tercile	2.38	1.69	**0.85**	3.04
Panel D: FCF/P				
Decile	1.98	0.95	0.92	**0.76**
Quintile	1.22	0.97	0.90	**0.82**
Tercile	1.01	0.99	0.90	**0.87**
Panel E: Composite				
Decile	**0.76**	**0.87**	**0.89**	**0.84**
Quintile	**0.83**	**0.91**	**0.90**	**0.88**
Tercile	**0.87**	**0.95**	**0.92**	**0.92**

NOTES: This exhibit reports the mean ratio of an annual time series that is computed by dividing (1) the annual position-weighted value characteristics of the large-cap value portfolios (EW) by (2) the annual position-weighted value characteristics of the small-cap value portfolios (market-cap weighted). The value portfolios are formed by splitting each universe (large cap and small cap) into deciles, quintiles, or terciles based on each value metric and weighting the portfolios by either value weighting or equal weighting the underlying positions. The five value metrics are E/P, EBIT/TEV, B/M, FCF/P, and a composite value measure. Panel A presents the ratio of the characteristics when sorting on E/P. Panel B presents the ratio of the characteristics when sorting on EBIT/TEV. Panel C presents the ratio of the characteristics when sorting on B/M. Panel D presents the ratio of the characteristics when sorting on FCF/P. Panel E presents the ratio of the characteristics when sorting on the composite value score. If a value portfolio's characteristic is negative for an observation, that year's ratio is excluded from the analysis. The blue highlight represents that a specific value metric was used as a sorting variable within that panel.

the small-cap value portfolio is more expensive on the other three metrics. While the composite value metric has ratios of below 1 in all instances, the average discount of large-cap stocks is only 12%. We consider this a relatively small deviation—for example, a P/E of 10 versus a P/E of 8.8. Given the importance of portfolio characteristics to predict expected returns, as shown by Daniel and Titman (1998), one would expect slightly stronger performance for small-cap value portfolios relative to large-cap value (EW) portfolios. This analysis is one-dimensional, and additional characteristics (such as quality) could explain return differences among small-cap and large-cap value portfolios.

Robustness Tests

Developed International Markets: Large-cap Value Portfolios (EW) versus Small-Cap Value Portfolios (VW). This section examines the performance of large-cap and small-cap value portfolios in developed international markets. We split this new universe on size (the same size buckets—1,000 and 2,000) and then form value portfolios into deciles/quintiles/terciles using the five value metrics.

Exhibit 7 presents the results on another universe of stocks, like Exhibit 2. Panels A, B, and C show the average monthly return to the large-cap value portfolios (EW-Panel A), small-cap value portfolios (VW-Panel B), and small-cap value portfolios (EW-Panel C). As can be seen, the returns between Panel A (large value) and Panels B and C (small value) are similar. Panel D presents the p-values from a paired t-test of significance between the large-cap (EW) and small-cap (market-cap weighted) value portfolios. Panel E shows the p-values from a paired t-test of significance between the large-cap (EW) and small-cap (EW) value portfolios. As can be seen, there is no statistical difference between the large-cap value portfolios (EW) and the small-cap value portfolios.

This out-of-sample result within developed international markets confirms the same effect within the US market—small-cap value portfolios (market-cap weighted) were not statistically different from large-cap value portfolios (EW).[17]

Subperiod Analysis

In this section, we split the US sample period into halves and examine the relative performance of small-cap value against large-cap value (EW). The first half runs from

[17] Additionally, in unreported results, we confirmed the same qualitative results using FactSet data within the US universe of stocks—there is no significant difference between large-cap value (EW) and small-cap value (market-cap weighted).

EXHIBIT 7

International Performance: Large Cap (EW) versus Small Cap

	E/P	EBIT/TEV	B/M	FCF/P	Composite	Average
Panel A: Large-Cap EW						
Decile Monthly Return	1.03%	1.01%	0.82%	1.01%	1.08%	
Quintile Monthly Return	0.95%	0.93%	0.78%	0.96%	0.97%	0.92%
Tercile Monthly Return	0.89%	0.86%	0.74%	0.88%	0.90%	
Panel B: Small-Cap VW						
Decile Monthly Return	1.18%	0.94%	0.92%	1.09%	1.16%	
Quintile Monthly Return	1.06%	0.91%	0.85%	1.05%	1.04%	0.99%
Tercile Monthly Return	0.98%	0.87%	0.81%	0.96%	0.96%	
Panel C: Small-Cap EW						
Decile Monthly Return	1.16%	0.93%	0.92%	1.11%	1.14%	
Quintile Monthly Return	1.07%	0.91%	0.86%	1.06%	1.06%	0.99%
Tercile Monthly Return	0.99%	0.89%	0.82%	0.97%	0.96%	
Panel D: Paired T-Test of Large-Cap EW and Small-Cap VW (p-values)						
Decile p-value	0.125	0.523	0.441	0.367	0.415	
Quintile p-value	0.178	0.794	0.406	0.204	0.430	
Tercile p-value	0.235	0.939	0.428	0.221	0.399	
Panel E: Paired T-Test of Large-Cap EW and Small-Cap EW (p-values)						
Decile p-value	0.217	0.542	0.417	0.283	0.575	
Quintile p-value	0.199	0.841	0.374	0.221	0.398	
Tercile p-value	0.220	0.796	0.404	0.216	0.438	

NOTES: This exhibit reports monthly returns and p-values for various developed international stock portfolios from January 1, 1994–December 31, 2020. Value portfolios are formed by splitting each universe (large cap and small cap) into deciles, quintiles, or terciles based on each value metric and weighting the portfolios by either value weighting or equal weighting the underlying positions. The five value metrics are E/P, EBIT/TEV, B/M, FCF/P, and a composite value measure. Panel A presents the average monthly returns to value portfolios within the large-cap universe (EW). Panel B presents the average monthly returns to value portfolios within the small-cap universe (VW). Panel C presents the average monthly returns to value portfolios within the small-cap universe (EW). Panel D presents the p-values from a paired t-test to examine the statistical significance between (a) a large-cap value portfolio (EW) and (b) a small-cap value portfolio (VW). Panel E presents the p-values from a paired t-test to examine the statistical significance between (a) a large-cap value portfolio (EW) and (b) a small-cap value portfolio (EW). "Average" represents an arithmetic average of the 15 portfolio returns. The * represents significance at the 5% level, while ** represents significance at the 1% level. "Average" represents an arithmetic average of a Panel.

July 1, 1973–March 31, 1997, while the second half runs from April 1, 1997–December 31, 2020. We generate the results for the US portfolios using the same approach as in Exhibit 2. The results are shown in Exhibits 8 (first half) and 9 (second half).

Examining the performance over the first half in Exhibit 8, we see a higher outperformance of small-cap value portfolios, with the VW portfolios having an average of 1.67% (Panel B) and the EW portfolios having an average of 1.71% (Panel C). This performance compares to the large-cap EW portfolios, with an average of 1.53% (Panel A). However, in Panels D and E, we again examine the statistical significance of this performance and again find no statistically significant outperformance (at the 5% level and below).

Turning our attention to the second half of the sample, we see almost no relative outperformance of small-cap value portfolios. Exhibit 9 shows the average performance of large-cap value (EW) to be 1.04% (Panel A) compared to small-cap value (VW) of 1.06% (Panel B) and small-cap value (EW) of 1.08% (Panel C). This relatively small outperformance of small-cap value portfolios relative to large-cap value (EW) is insignificantly different from one another in Panels D and E.

Thus, the subperiod analysis highlights that small-cap value portfolios were insignificantly different from the large-cap value portfolios (EW). In addition, the analysis

EXHIBIT 8

Performance of US Value Portfolios (first half of sample)

	E/P	EBIT/TEV	B/M	FCF/P	Composite	Average
Panel A: Large-Cap EW						
Decile Monthly Return	1.54%	1.55%	1.62%	1.49%	1.65%	
Quintile Monthly Return	1.53%	1.56%	1.53%	1.48%	1.57%	1.53%
Tercile Monthly Return	1.49%	1.51%	1.45%	1.45%	1.53%	
Panel B: Small-Cap VW						
Decile Monthly Return	1.59%	1.66%	1.66%	1.71%	1.77%	
Quintile Monthly Return	1.66%	1.66%	1.66%	1.64%	1.73%	1.67%
Tercile Monthly Return	1.62%	1.68%	1.64%	1.62%	1.69%	
Panel C: Small-Cap EW						
Decile Monthly Return	1.67%	1.74%	1.68%	1.78%	1.82%	
Quintile Monthly Return	1.69%	1.71%	1.66%	1.72%	1.76%	1.71%
Tercile Monthly Return	1.66%	1.73%	1.63%	1.68%	1.73%	
Panel D: Paired T-Test of Large-Cap EW and Small-Cap VW (p-values)						
Decile p-value	0.719	0.354	0.804	0.089	0.359	
Quintile p-value	0.292	0.398	0.333	0.117	0.178	
Tercile p-value	0.259	0.122	0.126	0.098	0.161	
Panel E: Paired T-Test of Large-Cap EW and Small-Cap EW (p-values)						
Decile p-value	0.428	0.158	0.713	0.054	0.236	
Quintile p-value	0.252	0.239	0.390	0.063	0.165	
Tercile p-value	0.215	0.087	0.214	0.062	0.132	

NOTES: This exhibit reports monthly returns and p-values for various US stock portfolios from July 1, 1973–March 31, 1997. Value portfolios are formed by splitting each universe (large-cap and small-cap) into deciles, quintiles, or terciles based on each value metric and weighting the portfolios by either value weighting or equal weighting the underlying positions. The five value metrics are E/P, EBIT/TEV, B/M, FCF/P, and a composite value measure. Panel A presents the average monthly returns to value portfolios within the large-cap universe (EW). Panel B presents the average monthly returns to value portfolios within the small-cap universe (VW). Panel C presents the average monthly returns to value portfolios within the small-cap universe (EW). Panel D presents the p-values from a paired t-test to examine the statistical significance between (a) a large-cap value portfolio (EW) and (b) a small-cap value portfolio (VW). Panel E presents the p-values from a paired t-test to examine the statistical significance between (a) a large-cap value portfolio (EW) and (b) a small-cap value portfolio (EW). "Average" represents an arithmetic average of the 15 portfolio returns. The * represents significance at the 5% level, while ** represents significance at the 1% level. "Average" represents an arithmetic average of a Panel.

highlights that over the past 24 years (Exhibit 9), large-cap value's performance was similar to small-cap value, but with around 11 times (and more) the liquidity of small-cap value stocks.[18]

Additional Robustness Tests

We run various robustness tests. The following is a description of the multiple tests performed:

1. *Equal-weighting procedure*: We used a "floating" equal-weight methodology, whereby the value stocks were equal weighted only once a year. This methodology was implemented to make a more "fair" comparison to the small-cap VW portfolios and to limit transaction costs. The standard academic approach to EW portfolios is to update the portfolio weights every month. We find no significant outperformance of small-cap value relative to large-cap value using monthly rebalanced value portfolios.

[18] In unreported results, the liquidity profile is similar across both halves of the sample.

EXHIBIT 9

Performance of US Value Portfolios (second half of sample)

	E/P	EBIT/TEV	B/M	FCF/P	Composite	Average
Panel A: Large-Cap EW						
Decile Monthly Return	1.11%	1.16%	0.97%	1.06%	1.10%	
Quintile Monthly Return	1.05%	1.10%	0.94%	1.06%	1.03%	1.04%
Tercile Monthly Return	1.01%	1.07%	0.94%	1.02%	1.04%	
Panel B: Small-Cap VW						
Decile Monthly Return	1.11%	1.09%	0.93%	1.14%	1.08%	
Quintile Monthly Return	1.09%	1.09%	0.99%	1.08%	1.03%	1.06%
Tercile Monthly Return	1.04%	1.10%	1.00%	1.05%	1.04%	
Panel C: Small-Cap EW						
Decile Monthly Return	1.08%	1.14%	1.04%	1.14%	1.11%	
Quintile Monthly Return	1.07%	1.13%	1.03%	1.07%	1.05%	1.08%
Tercile Monthly Return	1.04%	1.13%	1.04%	1.05%	1.03%	
Panel D: Paired T-Test of Large-Cap EW and Small-Cap VW (p-values)						
Decile p-value	0.964	0.599	0.829	0.580	0.925	
Quintile p-value	0.753	0.940	0.718	0.904	0.969	
Tercile p-value	0.795	0.766	0.647	0.836	0.978	
Panel E: Paired T-Test of Large-Cap EW and Small-Cap EW (p-values)						
Decile p-value	0.828	0.892	0.704	0.635	0.903	
Quintile p-value	0.929	0.831	0.573	0.944	0.887	
Tercile p-value	0.851	0.656	0.480	0.873	0.963	

NOTES: This exhibit reports monthly returns and p-values for various US stock portfolios from April 1, 1997–December 31, 2020. Value portfolios are formed by splitting each universe (large-cap and small-cap) into deciles, quintiles, or terciles based on each value metric and weighting the portfolios by either value weighting or equal weighting the underlying positions. The five value metrics are E/P, EBIT/TEV, B/M, FCF/P, and a composite value measure. Panel A presents the average monthly returns to value portfolios within the large-cap universe (EW). Panel B presents the average monthly returns to value portfolios within the small-cap universe (VW). Panel C presents the average monthly returns to value portfolios within the small-cap universe (EW). Panel D presents the p-values from a paired t-test to examine the statistical significance between (a) a large-cap value portfolio (EW) and (b) a small-cap value portfolio (VW). Panel E presents the p-values from a paired t-test to examine the statistical significance between (a) a large-cap value portfolio (EW) and (b) a small-cap value portfolio (EW). "Average" represents an arithmetic average of the 15 portfolio returns. The * represents significance at the 5% level, while ** represents significance at the 1% level. "Average" represents an arithmetic average of a Panel.

2. *Independent sorts*: We sorted the value portfolios into deciles, quintiles, and terciles after making the size cutoff. Thus, this is a dependent sort on value, which yields portfolios with the same number of companies in the portfolio each year. However, some, such as Fama and French (1993), use independent sorts, whereby the size and value cutoffs are generated among the entire sample. Using this size cutoff of the top 3,000 companies and conducting independent sorts, we find no significant outperformance of small-cap value relative to large-cap value.
3. *Using NYSE size cutoff*: We used the top 1,000 companies as large-cap stocks and identified the next largest 2,000 companies as small-cap stocks. Fama and French (1993) split the companies into large and small by using the NYSE's 50th percentile of size as the cutoff point. Using this size cutoff of the top 3,000 companies, we find similar results to the article's core finding.
4. *Including all companies*: We used the top 1,000 companies as large-cap stocks and identified the next largest 2,000 companies as small-cap stocks. However, some stocks are smaller than the 3,000th largest firm. Although these microcap stocks make up only an average of 0.81% of the US market capitalization over our time sample, we included them. We find no significant outperformance of small-cap value relative to large-cap value.

5. *Tying into Ken French's website results*: Some may read this article and seek to replicate the results using Ken French's website.[19] On his site, he has 2×3 splits on size and value. Similar to this article, there are 2×3 splits on B/M, E/P, and FCF/P. These portfolios are similar to the article's tercile tests, with a few changes in French's methodology: (1) all companies are included, (2) portfolios are EW monthly, (3) independent NYSE size cuts are used, (4) independent value NYSE cutoffs are used, and (5) to the best of our knowledge, Ken French's website does not use the Beaver, McNichols, and Price (2007) delisting returns adjustment.

   Using the data from Ken French's site, accessed on February 14, 2022, we find the following two results: (1) there is no significant difference between small-cap value VW against large-cap value EW, and (2) small-cap value EW significantly outperforms large-cap value EW across all three value measures—B/M, E/P, FCF/P. To identify what is causing the divergence in results, we first replicate the 2×3 portfolios, including all companies, using the NYSE independent size and value cutoffs.[20] Our replication effort yields a 98.5% correlation among the 36 portfolios (18 EW and 18 VW portfolios). Our replicated data corroborate the finding using Ken French's data—small-cap value EW outperforms large-cap value EW.

   This finding is different from our earlier tercile results, so we dig into the data to identify why we are getting a different conclusion. We find that microcap stocks, those identified as being below the 3000th largest firm, drive the significance. The significance between small-cap value EW and large-cap value EW goes away when running the same tests but only including the top 3,000 companies. Small-cap (EW) value's monthly average drops by 17 basis points when excluding companies below the 3000th largest firm.[21] To summarize, microcap stocks drive the divergence in small-cap EW results between our analysis and the analysis done via data on French's website.
6. *Large-cap value portfolios, market-cap weighted*: As opposed to equally weighting the large-cap value portfolios, what happens if we market-cap weight the portfolios? Here, we find a more-significant performance difference between large-cap and small-cap stocks. The average difference between large-cap value (VW) over the entire sample was 0.20% a month compared to small-cap value VW and 0.23% a month compared to small-cap value EW. In 9 out of 30 instances, the performance difference is significant at the 5% level, while the performance difference is significant in 20 of the 30 instances at the 10% level. The results are driven in part by occasional outliers tied to large-cap portfolios formed using a VW portfolio construction process. For example, using the top decile on E/P, there are more than 55 firm-year observations when a firm has a weighting of over 10% of the value portfolio when using market-cap weighting.[22] For example, on the June 30, 1983, rebalance, AT&T's weight within the E/P value portfolio was 27.1%. Equally weighting large-cap value portfolios, by definition, limits the initial weights of these positions and prevents outliers from driving the portfolio comparison results.

[19] https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

[20] In our replication efforts, we still include the delisting returns methodology as in Beaver, McNichols, and Price (2007). Also, note that this is different than the previous sections in that we not only include all companies and use the NYSE size cut, but we also use the NYSE means for value.

[21] A quick analysis of these stocks' average daily trading volume finds that these microcaps trade 54% less than the small-cap value EW portfolio, 76% less than the small-cap VW value portfolio, and 97% less than the large-cap EW value portfolio. Combined with only representing 0.81% of the US market capitalization over the entire sample, we feel that excluding these companies from the main results is warranted.

[22] There are more "monthly" observations.

7. *Tying the results back to the literature*: This article highlights that a *long-only* large-cap value portfolio, EW, has no significant difference from small-cap value portfolios, either VW or EW. However, this article is not saying that the academic value factor, a long–short portfolio, does not work better in small-cap stocks. In unreported results, we again find, similar to Asness et al. (2015), that the academic value factor, a long–short portfolio, is weak among large-cap stocks while showing better performance in small-cap stocks.

CONCLUSION

Based on prior academic research conducted in long–short portfolio analysis, some market participants believe that long-only value investing works better in small-cap stocks. Our research shows that this is not true in long-only value investing, which is how most practitioners allocate toward the value premium. Our primary research finding is that EW large-cap value portfolios and small-cap value portfolios are statistically similar from a return perspective. The data suggest that value investors with a liquidity preference should allocate toward EW large-cap value portfolios. It should be noted that these EW large-cap value portfolios will have more tracking error from the benchmark, which is generally market-cap weighted. If nothing else, the data suggest that practitioners should split their value allocations across large-cap value (EW) and small-cap value, because these portfolios have zero overlap but similar historical returns, thus highlighting a potential diversification benefit.

APPENDIX

VARIABLE DEFINITIONS FOR US DATA (CRSP/COMPUSTAT)

Value Measure	Numerator	Denominator
B/M	Similar to Fama and French (2001), Book equity = Stockholder's equity (SEQ) [or Common equity (CEQ) + Preferred stock par value (PSTK) or assets (AT) – Liabilities (LT)] – Preferred stock (defined below) + Balance sheet deferred taxes and Investment tax credit (TXDITC), if available. Preferred stock = Preferred stock redemption value (PSTKRV) [or preferred stock liquidating value (PSTKL), or preferred stock par value (PSTK)].	Market capitalization as of June 30.
E/P	Earnings = Earnings before extraordinary items (IB) – Preferred dividends (DVP) + Income statement deferred taxes (TXDI), if available.	Market capitalization as of June 30.
FCF/P	Similar to Novy-Marx (2012), FCF = Net income (NI) + Depreciation and amortization (DP) – Working capital change (WCAPCH) – Capital expenditures (CAPX).	Market capitalization as of June 30.
EBIT/TEV	EBIT = Operating income after depreciation (OIADP) + Nonoperating income (NOPI).	Similar to Loughran and Wellman [2011], TEV = Market capitalization (M) + Short-term debt (DLC) + Long-term debt (DLTT) + Preferred stock value (PSTKRV) – Cash and short-term investments (CHE).

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