The equal-weight tilt in managed portfolios

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Abstract

Active portfolios can be more concentrated or more diversified than the market portfolio. In the latter case, the result is likely to be a tilt toward equal weights, which has been shown to have a systematic impact on portfolio returns. To capture this tilt, we use the difference between returns on equal-weighted and value-weighted portfolios for the relevant universe; we call this difference Equal-Minus-Value, or EMV. Despite EMV's simplicity, its ability to explain mutual fund returns compares very favorably with that of the most popular performance evaluation factors. We therefore argue that EMV should be used in performance evaluation of broad market equity portfolios.

Keywords: asset management, mutual funds, performance evaluation

JEL codes: G11, G23

1. Introduction

The key goal in evaluating the performance of actively managed funds is to strip away those parts of performance achieved through simple and low-cost passive strategies. This is why Treynor (1965) controlled for the market ("MKT") in evaluating fund returns. It is also the reason the subsequent literature has controlled for portfolio tilts with respect to size, value ("SMB" and "HML", Fama and French, 1993), momentum ("UMD", Carhart, 1998), liquidity ("LIQ", Pastor and Stambaugh, 2003), beta ("BAB", Frazzini and Pedersen, 2014), quality ("QMJ", Asness, Frazzini and Pedersen, 2019), and profitability ("PMU", Novy-Marx, 2013), among others.

We argue that another systematic portfolio tilt has a strong claim to be used in fund performance evaluation: the tilt toward equal weights. To capture this we regress fund returns on another zero-investment portfolio that is long the equal-weighted portfolio and short the value-weighted one, which we call Equal-Minus-Value (EMV). We show that EMV has excellent ability to explain mutual fund returns, is simple to define alleviating model mining concerns (Harvey, Liu and Zhu 2016) and is cheaper to capture than most other commonly used performance evaluation factors.

A key reason to control for EMV is that it matters. Plyakha, Vilkov and Uppal (2012) show that portfolios of stocks randomly drawn from the S&P500 constituent list (effectively equal-weighted portfolios) outperform the index by 2.71 percent annually over 40 years. However, even controlling for market, size, value and momentum, Plyakha et al. (2012) show that randomly drawn portfolios outperform the market by 1.15 percent annually – a very economically significant amount, and more than enough to offset most mutual funds' management fees.

The reason we expect equally-weighted portfolios to outperform value-weighted ones is due to a combination of portfolio diversification and rebalancing, resulting in a return premium called the 'diversification return', the 'diversification benefit' or 'rebalancing premium', see Fernholz and Shay (1982), Booth and Fama (1992), Plyakha, Vilkov and Uppal (2015), Greene and Rakowski (2015) and Banner et al. (2018). While we refer the reader to the above papers for a full exposition of the diversification return, a simple example will illustrate the intuition. Suppose Stock A doubles in Year 1 and halves in Year 2, while Stock B does the opposite. A 50/50 buy-and-hold portfolio will produce zero return, while a 50/50 annually rebalanced portfolio will yield a 25% 'diversification return'. Of course, this example is characterized by a strong return reversal, raising valid questions about its generalizability. In fact, as several studies such as Fernholz (1998) and Hanke and Quigley (2014) demonstrate, the relative performance of a diversified portfolio compared to a passive market-weighted portfolio depends on changes in market concentration and the portfolio's diversification return. If the market becomes more concentrated, this diminishes and possibly even overwhelms the portfolio's diversification return, so that the portfolio's relative return suffers. However, under the plausible assumption that the market cannot concentrate forever, increasing market concentration is unlikely to dominate the diversification return for long, and the diversified strategy outperforms in the long run.

In order to capture the diversification return in active U.S. mutual fund returns, we include EMV alongside popular factors used to evaluate fund performance. The set of funds that we use comprises all funds benchmarked against the S&P 500 (around four-fifths of US equity funds' assets). We find that EMV is distinct from other factors, and that its ability to account for unexplained individual fund returns exceeds that of factors other than the market factor. We therefore argue that control for the equal-weight tilt should be a feature of equity portfolio performance evaluation.

2. Methodology and data

Our innovation is to evaluate fund performance with a factor capturing the diversification return that accrues to a regularly rebalanced, diversified portfolio – whether this is the result of a disciplined strategy to capture the diversification return or a side effect of a fund's stock selection. For performance evaluation to be meaningful, this factor should not only capture the diversification return well, but also be implementable cheaply. We therefore focus on the S&P 500 universe, and construct our factor simply as long the equal-weighted S&P500 and short the value-weighted S&P 500. Our full model adds EMV to previously referenced performance evaluation factors:

$$R_{it} - RF_t = \alpha_i + \beta_i^{MKT} MKT_t + \beta_i^{SMB} SMB_t + \beta_i^{HML} HML_t + \beta_i^{UMD} UMD_t + \beta_i^{LIQ} LIQ_t + \beta_i^{BAB} BAB_t + \beta_i^{QMJ} QMJ_t + \beta_i^{PMU} PMU_t + \beta_i^{EMV} EMV_t + e_{it}$$

[Table 1 here]

Table 1, Panel A summarizes the distribution of these return factors over the 1980-2009 period. Except for SMB, all these factors have delivered statistically significant returns over this period. While EMV's 20 basis points per month performance is lower than factors other than SMB, both its long and short components are much more diversified than those of the other zero-investment portfolios; accordingly its volatility is also substantially lower than theirs. As a result, EMV's performance is highly statistically significant (t-statistic = 2.30). Given the low turnover of the equal weighted portfolio,[1] its outperformance of the S&P500 by over two per cent annually is also highly economically significant.

[1] The turnover of the official (and quarterly rebalanced) S&P500 Equal Weighted Index over 2003-2012 was 24.7%, according to Zeng and Luo (2013).

Further, the final two rows of Panel A report the 12-month autocorrelation for EMV and the seven commonly used factors. EMV's autocorrelation (p-value = 0.054) is the only one whose statistical significance is close to conventionally accepted levels. To the extent that funds are diversified away from the market they will be exposed to the diversification factor. The persistence in the EMV return therefore suggests that funds' diversification returns are also likely to be persistent. Panel B of Table 1 shows the results of regressing EMV on the other factors, both individually and in combination. Although EMV is significantly related to most of the popular factors, close to half of the variation in the EMV return (roughly 44 percent) is not explained by them.

[Table 2 here]

Our fund sample comes from the CRSP Mutual Fund Database. Consistent with the literature, returns are net of annual management fees, but gross of initial and back-end charges. We use the Petajisto (2013) assignment of fund benchmarks. For these he uses either the official disclosed benchmark or if unavailable, he infers a benchmark from the fund's holdings. We start by retaining funds assigned to broad benchmarks: S&P 500, Russell 1000, Russell 3000, and Wilshire 5000. We do this because broad indices are obvious beneficiaries of the diversification return (while representing 71% of the assets of the Petajisto fund universe). As Table 2 indicates, there are 1,432 such funds. To have a homogenous fund sample and to avoid effects due to small and illiquid stocks, we further focus on the 1,229 funds benchmarked against the S&P 500. These funds account for approximately 83% of the total average assets of broad market funds (our conclusions do not change with all funds included).

3. Results

[Table 3 here]

To assess EMV’s use in evaluating fund performance, we summarize regressions for the 1,229 mutual funds in our sample on the excess return of the market (MKT) together with each of the factors (SMB, HML, UMD, LIQ, BAB, QMJ, PMU, EMV) in Table 3, where all the estimates and t-statistics are averages across the individual fund regressions. Our focus is on the incremental explanatory power of each factor relative to the single-factor market model. Thus, the average “contribution to R-squared” of 14.9% for the EMV factor means that the average residual variance from regressing fund returns on the market and EMV factors is 14.9% lower than the average residual variance from regressing fund returns on the market only. This quantity is comparable to those observed for the size and value factors (17.0% and 17.8%, respectively), and is much higher than the contribution to R-squared of the other five factors (2.3% to 9.9%). On this criterion alone, the EMV factor deserves consideration for inclusion among the factors used in fund performance evaluation. In addition, while all the factors are highly statistically significant, EMV’s t-statistic (20.84) lags behind only those of the market and size factors. The corresponding average coefficient of 0.2458 indicates that the average fund’s stock diversification goes about a quarter of the way towards that of the equal weighted portfolio.

The case for EMV is further strengthened if one considers its low implementation cost. The short side of EMV is fully offset by the holding of MKT. This means that to replicate the average actively managed S&P500 mutual fund’s EMV exposure, one can simply hold 0.9438-0.2458=0.6980 units of a value-weighted S&P500 ETF (costing less than 10 basis points per year) and 0.2458 units of an equal-weighted S&P500 ETF (costing about 20 basis points per year[2]). This is not the case for other performance evaluation factors; e.g. operationalizing the momentum factor, requires expensive shorting of distressed stocks and high turnover costs.

[Table 4 here]

Of course, given correlations between the candidate factors, a more relevant approach to assessing their relative explanatory power is to compare a model with all the factors included to that where one of the factors is omitted. Table 4 shows that removing the EMV factor results in that portion of the variance not explained by the model increasing by 7.85%. With the exception of the market factor, no other factors attain such explanatory power: momentum comes closest, with 6.45% contribution to the full-model R-squared. Further, the statistical significance of the EMV factor, with a t-statistic in excess of 30 in the full nine-factor model, is far ahead of those of the other factors. This suggests that exposure to the diversification factor is highly pervasive among mutual funds – more so than exposure to the other popular factors used to complement the market factor in assessing equity mutual fund performance.

4. Conclusion

We argue that actively managed mutual funds widely benefit from the so-called diversification return that accrues when diversification is combined with rebalancing. Since such diversification return can be captured without relying on a costly active strategy, we argue that it is important to isolate the diversification return component of mutual fund performance. To do so, we construct a diversification factor equal to the difference in returns between equal weighted and market-weighted portfolios, called EMV. We add EMV to a panel of other previously employed fund performance evaluation factors in order to investigate its ability to explain mutual fund performance. Of the seven prominent factors that have been used for fund performance

[2] E.g. Invesco's S&P500 Equal Weight ETF, see https://www.etf.com/RSP#overview.

evaluation, none matches EMV’s ability to account for otherwise unexplained fund performance. We therefore argue that EMV should be seriously considered for inclusion in mutual fund performance evaluation and risk management.

Our paper does not investigate the reasons why so many actively managed funds have a significant EMV tilt. One plausible reason is that such a tilt will naturally arise if managers act on noisy signals, and the precision of these signals has a tilt toward equal weights, in part because the number of analysts covering a given stock is much less than proportional to the stock’s market value. For example, as one goes from stocks at the bottom of the S&P500 index to those at the top, market capitalization increases roughly a hundredfold, but the number of analysts following the stocks increases only tenfold. If funds’ investments are driven in part by analyst coverage, their equal-weight tilt is likely to be unintentional rather than a deliberate exploitation of the outperformance of equal-weighted portfolios. A thorough investigation of this issue would require looking into the behavior of mutual fund portfolio holdings, which we leave to future research.

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Table 1. Descriptive factor return statistics

This table presents descriptive statistics and correlations for the return factors used in the empirical analysis: the excess return on the value-weighted (MKT) and equal weighted (EW MKT) portfolio, and the size (SMB), value (HML), momentum (UMD), liquidity (LIQ), betting-against-beta (BAB), quality-minus-junk (QMJ), profitable-minus-unprofitable (PMU), and market equally weighted-minus-value weighted (EMV) factors. Heteroskedasticity and autocorrelation consistent *t*-values based on White's robust standard error are *in italics*. ***, **, and * represent significance at the 1%, 5%, and 10% levels respectively. The sample period is 01/1980-12/2009. The results are based on monthly returns.

Panel A: Monthly factor return statistics

	MKT	EW MKT	SMB	HML	UMD	LIQ	BAB	QMJ	PMU	EMV
Mean	0.0056	0.0076	0.0013	0.0036	0.0065	0.0062	0.0105	0.0054	0.0053	0.0020
Med.	0.0097	0.0100	-0.0008	0.0037	0.0085	0.0040	0.0125	0.0053	0.0045	0.0002
Max.	0.1310	0.1848	0.2202	0.1387	0.1839	0.2101	0.1560	0.1231	0.0684	0.0906
Min.	-0.2218	-0.2621	-0.1639	-0.1268	-0.3472	-0.1014	-0.1567	-0.1253	-0.0633	-0.0458
St. Dev.	0.0448	0.0505	0.0319	0.0319	0.0483	0.0372	0.0374	0.0264	0.0235	0.0164
t-stat	2.36	2.85	0.79	2.16	2.57	3.16	5.32	3.88	4.29	2.30
Annual autocorr.	-0.083	-0.254	0.070	-0.066	-0.225	0.074	0.246	-0.219	-0.065	0.335
p-value	(0.632)	(0.144)	(0.688)	(0.705)	(0.195)	(0.669)	(0.157)	(0.207)	(0.707)	(0.054)

Panel B: Regressions of EMV on the other factors

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Const	0.0017	0.0014	0.0031	0.0021	0.0013	0.0029	0.0019	0.0009
	*2.20***	*1.73**	*4.02****	*2.27***	*1.19*	*3.27****	*2.06***	*1.35*
SMB	0.185							0.224
	*3.04****							*6.78****
HML		0.151						0.167
		*4.62****						*5.43****
UMD			-0.166					-0.162
			*-6.81****					*-7.90****
LIQ				-0.013				0.005
				-0.41				*0.28*
BAB					0.069			0.095
					*1.84**			*3.47****
QMJ						-0.177		-0.088
						*-2.88****		*-2.00***
PMU							0.014	0.129
							0.30	*3.15****
R^2	0.1297	0.0865	0.2398	0.0009	0.0246	0.0806	0.0004	0.5631

Table 2. All-equity broad market actively managed mutual funds by benchmark

This table presents information on the number of U.S. all-equity broad market actively managed mutual funds and their average total net asset values (TNA) in millions of dollars, by benchmark. Average TNA is computed as the sum of monthly TNA over 1980-2009 for each fund. Monthly TNA is equal to total assets minus total liabilities as of month-end. All data are from CRSP and Petajisto (2013); the sample period is 1/1980-12/2009.

Benchmark index	Number of funds	Number of funds (% of total)	Average TNA (in $ million)	Average TNA (% of total)	Average TNA (% of TNA for all funds in Petajisto, 2013)
Russell 1000	117	8.17%	122,069.01	10.80%	7.65%
Russell 3000	47	3.28%	22,802.84	2.02%	1.43%
S&P 500	1,229	85.82%	938,249.21	83.04%	58.83%
Wilshire 5000	39	2.72%	46,752.22	4.14%	2.93%
All	1,432		1,129,873.29		70.84%

Table 3. Average coefficients from one- and two-factor individual fund regressions

This table presents averages for the estimates from one- and two-factor models of the reported mutual fund returns over the 1980 to 2009 period. We include all actively managed equity mutual funds on the CRSP Mutual Fund database assigned to the S&P 500 benchmark by Petajisto (2013). Alpha is the intercept in a regression of monthly excess returns. The explanatory variables are the monthly returns of the Fama-French size (SMB), value (HML), and momentum (UMD) factors, the Frazzini and Pedersen (2013) betting-against-beta (BAB) factor, the Asness, Frazzini, and Pedersen (2013) quality-minus-junk (QMJ) factor, the Novy-Marx (2013) profitable-minus-unprofitable (PMU), and equally weighted-minus-value weighted (EMV) factors. 'ΔR^2 relative to (1)' in models (2) through (9) represents the difference between the model's R^2 and that of column (1) expressed as proportion of one minus the R^2 of model (1). ***, **, and * represent significance at the 1%, 5%, and 10% levels respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Alpha	-0.0004	-0.0008	-0.0002	-0.0005	-0.0005	-0.0004	0.0005	-0.0001	*-0.0010*
	*-5.67****	*-10.80****	*-2.54***	*-6.13****	*-7.82****	*-5.53****	*6.05****	*-1.25*	-14.11***
MKT	0.9658	0.9527	0.9559	0.9729	0.9645	0.9649	0.9099	0.9598	*0.9438*
	*216.00****	*228.64****	*243.17****	*194.73****	*213.66****	*249.80****	*244.33****	*217.59****	209.59***
SMB		0.1642							
		*21.65****							
HML			-0.0378						
			*-4.43****						
UMD				0.0138					
				*3.77****					
LIQ					0.0124				
					*5.15****				
BAB						0.0107			
						*2.20***			
QMJ							-0.1488		
							*-18.69****		
PMU								-0.0702	
								*-15.05****	
EMV									*0.2458*
									20.84***
R^2	0.8183	0.8492	0.8505	0.8334	0.8225	0.8341	0.8362	0.8248	0.8453
ΔR^2 relative to (1)		17.02%	17.75%	8.33%	2.34%	8.69%	9.85%	3.60%	14.88%
F-statistic		73.23***	77.05***	32.45***	8.54***	33.98***	39.03***	13.33***	62.43***

Table 4. Average coefficients from nine- and eight-factor individual fund regressions

This table presents averages for the estimates from nine- and eight-factor models of the reported mutual fund returns over the 1980 to 2009 period. We include all actively managed equity mutual funds on the CRSP Mutual Fund database assigned to the S&P 500 benchmark by Petajisto (2013). Alpha is the intercept in a regression of monthly excess returns. The explanatory variables are the monthly returns of the Fama-French size (SMB), value (HML), and momentum (UMD) factors, the Frazzini and Pedersen (2013) betting-against-beta (BAB) factor, the Asness, Frazzini, and Pedersen (2013) quality-minus-junk (QMJ) factor, the Novy-Marx (2013) profitable-minus-unprofitable (PMU), and equally weighted-minus-value weighted (EMV) factors. 'ΔR^2 relative to (1)' in models (2) through (9) represents the difference between the model's R^2 and that of column (1) expressed as proportion of one minus the R^2 of model (1). ***, **, and * represent significance at the 1%, 5%, and 10% levels respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Alpha	-0.0010	-0.0008	-0.0011	-0.0008	-0.0010	-0.0009	-0.0011	-0.0010	-0.0008
	*-12.98****	*-10.25****	*-15.73****	*-10.82****	*-13.37****	*-13.08****	*-15.36****	*-13.72****	*-10.45****
MKT	0.9287	0.9079	0.9445	0.9341	0.9276	0.9306	0.9391	0.9219	0.9565
	*280.69****	*261.69****	*260.46****	*275.93****	*284.31****	*288.80****	*261.09****	*267.44****	*277.87****
SMB	0.0700		0.1049	0.1193	0.0697	0.0707	0.0868	0.0555	0.1734
	*12.63****		*15.98****	*17.47****	*12.65****	*13.40****	*13.98****	*9.98****	*28.31****
HML	-0.0726	-0.1009		-0.0627	-0.0727	-0.0641	-0.0677	-0.0737	0.0052
	*-11.45****	*-14.56****		*-10.35****	*-11.30****	*-9.50****	*-11.32****	*-11.62****	*0.80*
UMD	0.0511	0.0660	0.0479		0.0518	0.0552	0.0484	0.0552	0.0006
	*15.11****	*17.46****	*14.86****		*15.26****	*16.75****	*15.19****	*16.41****	*0.20*
LIQ	-0.0052	-0.0055	-0.0001	-0.0042		-0.0031	-0.0064	-0.0036	0.0040
	*-3.08****	*-3.21****	*-0.05*	*-2.38***		*-1.79**	*-3.80****	*-2.05***	*2.23***
BAB	0.0158	0.0227	-0.0035	0.0317	0.0156		0.0111	0.0189	0.0212
	*5.00****	*7.60****	*-0.97*	*10.04****	*4.98****		*3.45****	*5.97****	*6.59****
QMJ	-0.0397	-0.0967	-0.0204	-0.0038	-0.0394	-0.0303		-0.0681	-0.0041
	*-6.77****	*-12.63****	*-4.01****	*-0.70*	*-6.82****	*-4.96****		*-13.22****	*-0.68*
PMU	-0.0346	-0.0033	-0.0350	-0.0589	-0.0349	-0.0392	-0.0553		-0.0591
	*-7.45****	*-0.67*	*-7.44****	*-11.99****	*-7.46****	*-8.34****	*-13.33****		*-12.36****
EMV	0.3139	0.3919	0.2448	0.1954	0.3137	0.3199	0.3102	0.3278	
	*30.71****	*34.61****	*22.11****	*19.22****	*30.44****	*31.03****	*30.39****	*32.60****	
R^2	0.9029	0.8995	0.8967	0.8967	0.9013	0.9001	0.9010	0.9004	0.8953
ΔR^2 relative to (1)		-3.47%	-6.42%	-6.45%	-1.70%	-2.94%	-1.97%	-2.59%	-7.85%
F-statistic		6.43**	16.31***	16.46***	0.11	4.38**	1.34	3.24*	21.34***