



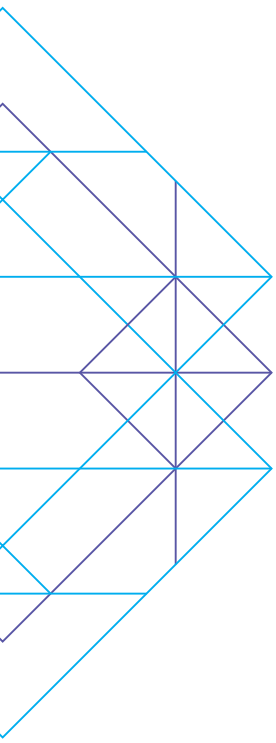
Active and Passive Investing — The Long-Run Evidence

Executive Summary

Active managers have faced challenging years of late. However, our study shows that the long-run evidence on collective active manager performance from several databases appears surprisingly good. Positive average alphas for delegated active managers may reflect true outperformance over 20 years, or reporting biases that overstate performance, or some mixture.

Further analysis reveals that active management has paid off especially well for large institutional investors, outside the United States and more generally in “dusty corners” of financial markets, and at times when common out-of-benchmark tilts fared well. Finally, we discuss the market impact of the shift toward passive investing and conclude it is limited to date.

A [companion paper](#) turns to other questions on active vs. passive investing: the market share between the two, the arithmetic of active management, and the fuzzy boundary between active and passive.



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Introduction

Active versus passive investing has been a hotly contested issue for decades, with a renewed interest in recent years. We address some of the questions central to the debate. This paper focuses on the long-run performance of active managers before briefly challenging the myth that the shift toward passive investing has already transformed the marketplace.

Our main section covers the empirical performance of delegated active managers as a group over 20 years. We find positive average alphas, even net of fees, for several groups of managers from different databases — especially for institutional and non-U.S. mandates. Although the performance was weaker over the last five to ten years, these results look surprisingly good to anyone familiar with evidence of negative average net alpha for active equity mutual funds in the United States. An optimist would view the positive alphas as true outperformance by delegated managers while a skeptic would trace them to various selection biases that can overstate reported returns. The jury is still out on whether such biases explain all of the long-run outperformance we report or just part of it.

We further analyze whether certain end investors, market contexts, or time periods are more likely to earn better expected active management returns. We find that large institutions, dusty corners of the market that are overlooked and hard to access, and periods when the benchmark lags are where most of the outperformance has resided.

In the final section, we briefly discuss some market implications of the growing shift toward passive. To date, we find only limited measurable impact on market behavior.

In a companion paper for our more meticulous readers, we first show that the passive revolution is not as advanced as sometimes claimed. The market share of passive investing is somewhere between 20% and 40%, depending on the asset class, region, and manager universe, as well as on definitional questions (e.g., how to treat ETFs or the large group of non-delegated active investors).¹ Next we explain why mere arithmetic does not doom active managers to underperform, so empirical analysis is worth conducting. Finally, we drill into some key definitions that are often used loosely: What does “active investing” or “active return” really mean?

1 In “Index Investing Supports Vibrant Capital Markets” (10/2017), BlackRock estimates total ownership levels of stock market capitalization using data from World Federation of Exchange Database, Securities Industry and Financial Markets Association, European Central Bank, Bank for International Settlements, HFR, Cerulli Simfund, iShares Government Bond Index, and McKinsey. All data as of 12/2016. Our companion report gives estimates of the active/passive share from many other sources. These vary by region (higher passive share in the United States and Asia than in Europe) and by asset class (higher passive share in equities than in fixed income). They can also differ between institutional funds and mutual funds and depend meaningfully on definitional details.

Relative Shares of Active/Passive and Delegated/Non-Delegated Investing

Before getting to the empirical evidence on performance, it is a useful preamble to address the market shares of active and passive investors as well as external and internal management.

A recent study by BlackRock estimates that 18% of all global equities are passively managed, but if we focus on the universe of delegated or external management, 38% is passive.² This study provides another startling number: More than half of all global equities (\$40tr out of \$68tr) is managed internally and thus not publicly measured in the way delegated external asset managers are. (The \$40tr includes retail, corporate, insurance, pension and official institution direct holdings.)

This factoid will be important when we explore the evidence of (delegated) active manager performance. Our companion piece discusses the so-called arithmetic of active management (Sharpe, 1991), which argues that active managers' higher costs doom them to collectively underperform passive managers. This argument can be challenged by recognizing that (i) passive investing also involves turnover and costs, and (ii) at most the arithmetic applies to the group of all active investors (whether institutional or retail, and whether delegated or non-delegated), not to just the subset of delegated active managers (see Pedersen, 2018). Taken together, it is thus conceivable that delegated active managers tend to outperform as a group at the expense of other investors.

² Refer to footnote 1.

Long-Run Empirical Evidence on Several Manager Universes

The old myth was that it is easy for experts to beat the market. Then the pendulum swung, as the combination of academic studies on U.S. mutual fund data and more recent industry evidence underscored the difficulty active managers experienced in trying to outperform their benchmarks on a consistent basis. The pendulum may have swung too far. We analyze the performance of delegated active managers from many investment universes and find, perhaps surprisingly, that they appear to have a positive long-term track record as a group. Any outperformance could be earned from passive managers or evolving markets or, perhaps more importantly, from the large, diverse group of non-delegated active investors. Or it could reflect selection biases that overstate reported manager returns.

We report evidence for many manager universes: equity mutual funds, institutional equity funds and institutional fixed income funds, hedge funds and private equity. (For all groups but private equity, we average two large liquid universes, such as the United States and international.) Besides comparing these different manager universes and investor types, we ask whether certain institutional

contexts (comparing markets) or certain environments (comparing time periods) are more conducive to active managers. This report studies active managers' performance as a group only and does not explore the opportunity and challenge of picking superior managers within each group.³

Exhibit 1 suggests that over the past 20 years, the average manager in all of the five universes we study delivered positive long-run active returns, net of fees.⁴ The results are especially impressive for institutional equity managers and hedge funds, with collective information ratios near 0.7. We focus here on net-of-fee alpha and information ratios (most relevant metrics for end investors), although some academics emphasize that gross alpha or the dollar value added are more relevant for measuring manager skill.⁵ We present results for the simple excess return over a benchmark, while the companion paper shows them for the beta-adjusted active return (CAPM alpha), which adjusts performance for differing levels of equity market risk taken by managers. Even accounting for the equity risk, we find significant positive alpha for institutional equity, hedge funds and private equity.

3 Inevitably, some managers have fared much better than the average, but such superior managers are notoriously hard to identify in advance based on systematic indicators. The main empirical finding in an extensive literature is mild performance persistence; when it comes to other publicly available systematic characteristics that seek to predict superior manager performance, there are few uncontested results in the literature (for some overviews, see, e.g., Jones-Wermers (2011), Elton, et al. (2012), Jones-Mo (2017), Bollen, et al. (2017)). Thus, it is not surprising that most credible manager selection services put little weight on the simple measures used in the literature. The main weight in due diligence is on highly subjective components, which can't be systematically tested for efficacy.

4 The outperformance is not statistically significantly different from zero for equity mutual funds or for institutional fixed income funds. Moreover, the point estimate is negative if we only look at U.S.-oriented mutual funds (and more so if we focus on the past five to ten years). It is worth remembering, though, that point estimates would be mildly negative also for passive managers, so simply comparing active managers to apparently costless index investments is unfair.

5 Refer to Berk and van Binsbergen (2015) and footnote 9 below.

Exhibit 1

Average Active Manager Performance in Five Broad Universes

January 1997 – June 2017

	Mutual Fund Equities	Institutional Equities	Institutional Fixed Income	Hedge Funds	Private Equity
Net/Gross	Net	Gross-50bp	Gross-25bp	Net	Net
Universe	Morningstar: U.S. & Intl	eVestment: U.S. & Intl	eVestment: Core Plus & Global Agg	CS & HFR	Cambridge

Simple Excess Returns vs. Benchmark

Benchmark	Equity Benchmark	Equity Benchmark	Bond Benchmark	T-Bill	Russell 3000
Average Outperformance (percent p.a.)	0.06	1.18	0.37	4.76	3.94
Active Risk (percent p.a.)	1.70	1.61	1.22	6.41	11.11
Information Ratio	0.04	0.73	0.30	0.74	0.35

Sources: AQR, Morningstar, eVestment, Credit Suisse, HFR, Cambridge Associates. Notes: All histories are from January 1997 to June 2017, except for the mutual fund series, which ends in December 2016. All manager composites are equal-weighted except for the CS HF index. Two large manager composites are averaged (except for in PE) to give the total universe for each column. Institutional manager returns are originally reported as gross returns, so we make them comparable with other net return series by subtracting assumed fees. Active Risk (tracking error) and Information Ratio are shown for equal-weighted composites, not for a single manager. (The average information ratio for a single manager is lower.) Past performance is not a guarantee of future performance. For illustrative purposes only.

Despite positive alphas above, inferences have tended to be colored by the experience of U.S. mutual fund managers with negative net alphas since as early as the 1960s (CRSP database).⁶ Most academic research as well as media attention has focused on this universe, with its less impressive track record. A skeptical reading of Exhibit 1 is that alpha estimates are boosted by biases related to voluntary reporting and by period-specific luck or randomness. As emphasized in the companion paper, many manager databases suffer from selection biases (e.g., survivorship and backfill), which may overstate reported returns. The jury is still out on the important question of whether the positive alphas in Exhibit 1 for the average active manager are due to reporting biases or to the true outperformance of delegated active managers over other investors whose performance is not

so publicly measured. Most likely it is some mixture of the two.

Luck should matter less over longer sample periods, which is why we focus on 20-year histories (while recognizing that selection biases might be worse in the old data). For example, the alpha estimates are lower during the past decade for equity funds⁷ but higher for fixed-income funds (not shown). The latter may reflect a lucky window as active fixed-income managers benefited from their structural credit overweights during the bull market after the Global Financial Crisis.⁸

Looking beyond all active managers as a group, we ask next whether certain investor types, market contexts or time periods can be associated with more likely active management success.

6 Fama French (2010) study all U.S. equity mutual funds from CRSP, excluding index funds, from 1962 to 2006. Readers may also refer to surveys mentioned in footnote 3.

7 We use the same data and time period outlined in Exhibit 1 and examine rolling two-year CAPM alphas.

8 AQR Alternative Thinking 4Q 2017 studies 195 active fixed income managers from the eVestment database from 1/1997 to 9/2017.

Which End Investors Are More Likely to Earn High Active Returns?

Exhibit 1 indicates that whatever performance metric is used, institutional investors with delegated equity managers collectively outperformed mutual fund equity managers. Moreover, hedge funds and PE funds — which have received large institutional investor allocations since 2000 — have earned even higher active returns. While institutional investors' edge might reflect greater reporting biases, we note that other studies using other databases concur on institutional managers' relatively strong active performance.⁹ The outperformance of hedge funds and PE funds is often explained economically by fewer constraints, ability to hire costly

talent, emphasis on less competitive market segments, etc. — but again, selection biases may have contributed.

Among institutional investors, larger institutions have performed better than smaller ones. Dyck-Pomorski (2011) document this result for North American pension funds¹⁰ while their literature survey reveals similar findings for endowments (NACUBO database) and other investor groups. Leippold-Ruegg (2018) provide global evidence and Garleanu-Pedersen (2017) a theoretical motivation for large institutions' edge.

9 See Dyck et al. (2013), Gerakos et al. (2016) and Leippold-Ruegg (2018) for such evidence. It may not be surprising that well-resourced institutions have achieved higher active returns than retail investors. This may not be a relevant comparison for the latter, however; the better question is whether institutional active managers can add value for their investors. While the evidence on net alpha is mixed, mutual funds have also offered positive gross alpha as a group and may well have outpaced retail investors' non-delegated investments. Moreover, Berk and van Binsbergen (2015) find even better results for mutual funds when they emphasize gross dollar value added as a measure of manager skill, include non-U.S. evidence also, and account for the costs of investable passive benchmarks in performance comparisons.

10 This paper studies 842 international defined benefit plans from the CEM Benchmarking database from 1990 to 2008, sorted by AUM. Large investors' edge partly reflects their ability to achieve lower fees from external managers. Their internal trading added most value if this effort was complemented by external managers. The main edge arose in private investments, both through larger allocations in them (during a sample period when privates outperformed public markets) and through better manager selections within the asset class.

What Are Good Contexts/Markets for Active Managers?

The classic answer is that dusty corners of financial markets, characterized by few active managers and fewer fundamental analysts, are less efficiently priced. Candidates include small/micro-caps, emerging/frontier markets, less-liquid fixed income markets, private assets, and the short side of long/short strategies.

For some supportive evidence, Dyck-Lins-Pomorski (2013) document higher active returns among emerging market and non-U.S. equity managers than among U.S. equity managers. Our own analysis of Morningstar and eVestment databases (drilling inside the composite results shown in Exhibit 1 above) concurs in that U.S. small-cap mandates and non-U.S. mandates have had higher active returns and information ratios than U.S. large-cap mandates. Leippold-Ruegg (2018) provide similar evidence and confirm that many end investors focus their active mandates in such markets while investing passively in large-cap U.S. equities.

One counterargument is that these dusty corners have higher fees, and they, too, have active losers.¹¹ Since every investor cannot pick a top-quartile manager, active managers' aggregate net performance could actually be worse in such high-fee contexts (unless they beat non-delegated investors by enough to offset the fees). Dusty corners also have less data and potentially greater reporting biases.

Beyond dusty corners, it may be worth seeking markets with a large pool of likely negative-alpha players. Using a poker analogy: *You'd rather play with patsies than with sharks.* Thus, one should look for markets with many unsophisticated investors (say, retail) and/or non-economically motivated participants (say, insurers that focus on regulatory capital efficiency or accounting gains/losses, and central banks with other policy goals that overrule profit-making objectives).¹²

11 For example, Fama and French have argued that Sharpe's arithmetic applies in every corner (see Fama-French Forum "Why Active Investing Is a Negative-Sum Game" (2009)).

12 This idea sounds plausible, but we have not seen any empirical studies to test it. Yet another answer would be to seek markets where rational investors are willing to pay up for liquidity provision or insurance provision. The latter logic points to strategies like merger arbitrage and volatility selling.

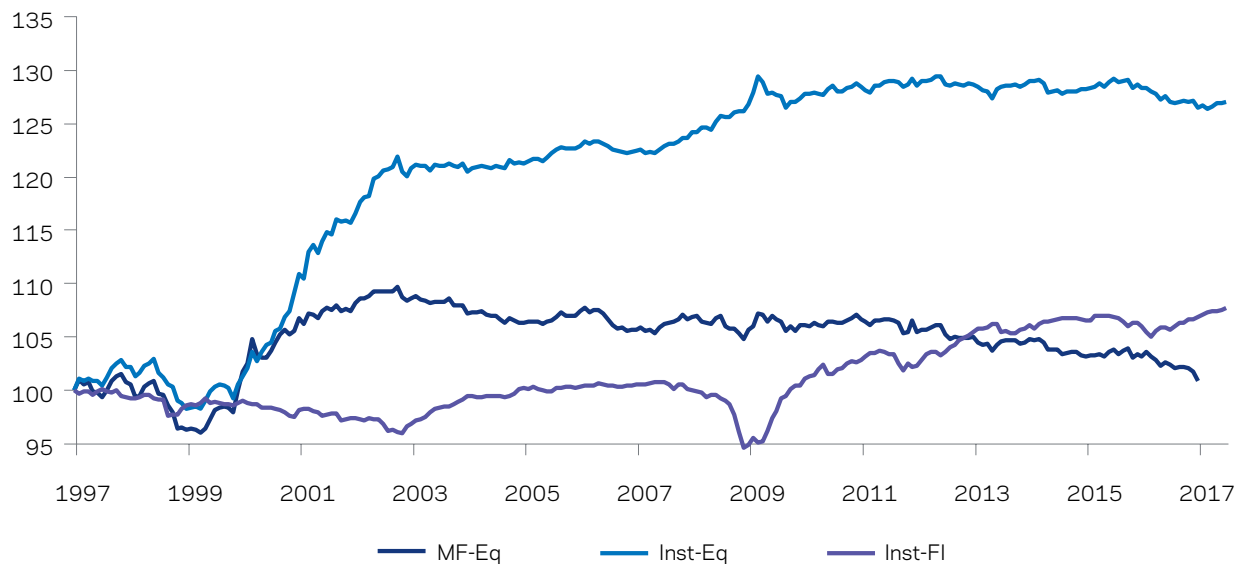
What Are Good Times/Environments for Active Managers?

Exhibit 2 shows that active manager performance has been less impressive during the past decade versus the preceding decade. While Exhibit 2 uses simple excess returns, we find similar patterns if we use the CAPM alpha as our measure of excess return. This holds for hedge fund and private equity managers, too. The 2010s seem to have been a tough time for all kinds of active managers, so the positive interpretations from Exhibit 1 would be much weaker if we studied a 10- to 15-year

sample period. The lone exception is active fixed-income managers, whose performance was aided by their typical off-benchmark high-yield positions during the credit-bullish environment after 2008 (see AQR, 2017).

Is this evidence of general alpha decay over time a sign of secularly ever more competitive markets? Or could it reflect something more cyclical or environmental and thus be more likely to revert?

Exhibit 2
Cumulative Outperformance of Mutual Funds and Institutional Funds
 1997 - 2017



Sources: AQR, Morningstar, eVestment. Notes: MF-Eq, Inst-Eq and Inst-FI are defined by general categories from Morningstar and eVestment. Details of all series are shown in Exhibit 1. All data are from January 1997 to June 2017, except for the mutual fund series, which ends in December 2016. All manager composites are equal-weighted except for the CS HF index. Institutional manager returns are originally reported as gross returns, so we make them comparable with other net return series by subtracting assumed fees. For illustrative purposes only. Past performance is not a guarantee of future performance.

To shed light on these questions, consider U.S. large-cap equity managers (as the media often does). Plausible reasons to characterize recent years as abnormally challenging for active equity managers include the equity bull market during a long economic expansion (giving a high bar to beat), or low stock dispersion and low stock market volatility (i.e., unexceptional opportunities). The relevant empirical evidence shows that active stock-pickers tend to outperform during recessions (providing some helpful downside protection), as well as in times of high dispersion between stock-specific returns (Kosowski, 2006)¹³, and especially during “differentiated declines” — when weak markets and wide dispersion coincide (Parikh et al., 2018). We may thus expect better performance from active managers when such more opportune environments arrive.

Measured active manager alpha can also reflect structural tilts, besides skillful security selection or tactical market timing. One type involves style-factor tilts, which are well-rewarded over time. The simple excess return we study here cannot disentangle publicly known alternative risk premia and proprietary alpha (and the same holds for the CAPM alpha). In contrast, a multi-factor alpha tries to isolate the factor exposures. For example, regressions of mutual fund or hedge fund composite returns often reveal statistically significant exposures to small-cap and momentum factors. For further discussion, see the companion paper.

Another type of structural tilt does not involve well-rewarded factors. Some common tilts may not be tactical, nor be deemed as classic skill, but when such structural tilts get a good or bad draw that lasts a few months or even years, it will look like alpha when measured by simple excess return. Thus, any interpretation of active manager performance should consider such tilts. Awareness of common structural tilts can help us better understand the measured alpha in the past and assess the likelihood that it persists.

Two examples will help. As noted above, many active fixed-income managers had a good draw in the 2010s as they benefited from their common off-benchmark tilts toward high-yield bonds. The reverse is true for U.S. large-cap equity managers who faced a bad draw. Regression results in **Exhibit 3** show that these managers — both mutual funds and institutional funds — tend to have three common out-of-benchmark tilts: small caps, foreign stocks, and cash. The graphs compare the rolling six-month excess returns with fitted values from the three-factor regression shown above them.¹⁴ The synchronous moves in the two lines (and regression R-squareds approaching 50% indicate that these three tilts together have explained a large part of U.S. active managers’ excess return variation over time. As all three tilts fared poorly in the 2010s — a bull market led by large-cap U.S. stocks — it was hard for active managers to beat U.S. large-cap indices.

13 This paper studies all non-sector, non-fund of funds U.S. equity mutual funds from the CRSP Survivorship Bias Free database from 1/1962 to 12/2005.

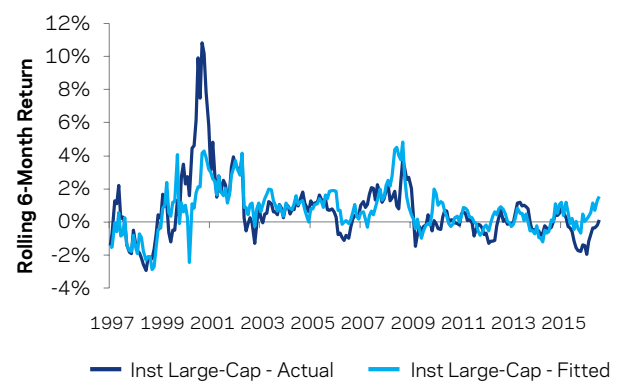
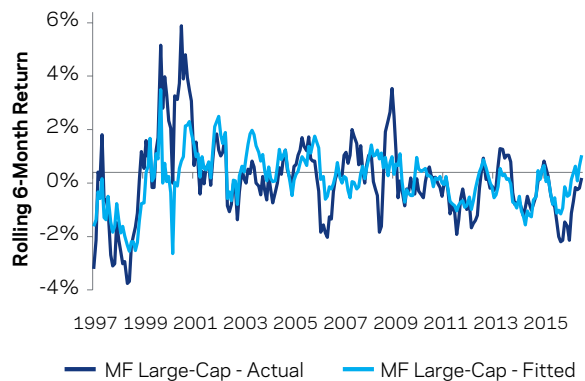
14 The fitted values track visually how well the three factors in Exhibit 3 can explain the six-month excess return of the active manager composite. Each data point reflects the three beta coefficients multiplied by the relevant explanatory factor. In recent years, all three factors contributed to negative active manager performance when small-caps, non-U.S. stocks and cash underperformed U.S. large-cap stocks.

Exhibit 3

Explaining U.S. Large-Cap Active Manager Performance with Three Common Tilts 1997 - 2016

Mutual Funds					
	Small Cap vs. Large Cap	International vs. U.S.	Cash vs. Large Cap	Alpha (%p.a)	R ²
Beta	0.11	0.07	0.03	-0.4%	0.44
t-Stat*	4.36	2.99	2.32	-0.94	

Institutional Funds					
	Small Cap vs. Large Cap	International vs. U.S.	Cash vs. Large Cap	Alpha (%p.a)	R ²
Beta	0.13	0.04	0.08	1.7%	0.48
t-Stat*	3.62	1.62	3.08	3.05	



*t-Stats reflect Newey-West adjustments.

Sources: AQR, Morningstar, eVestment. MF Large-Cap and Inst Large-Cap are defined by general categories from Morningstar and eVestment. Notes: Common out-of-benchmark tilts explain average active manager performance. Bold estimates have t-Stats greater than 1.96 or less than -1.96, denoting significance at the 95% confidence interval. Data from June 1997 to December 2016. This analysis is inspired by Constable and Kadnar (2015). For illustrative purposes only. Simulated data has inherent risks, some of which are disclosed in the end disclosures. Past performance is not a guarantee of future performance.

One lesson is that a lucky or unlucky period to common structural tilts can show up as measured alpha, but we should not expect such “alpha” to persist going ahead. The hopeful takeaway from this evidence is that the recent bad times for active equity

managers in the United States are at least partly environmental, making them more likely reversible than secular. Conversely, we have little reason to expect active fixed-income managers to keep producing as high excess returns as they did in recent years.

Implications of the Growing Share of Passive Investing

In this final section, we turn to an audience favorite: What has been the impact of greater passive investing on market behavior? While this topic has attracted much commentary,¹⁵ we briefly cover just a few angles, in part because many sub-questions are unanswerable or at least unquantifiable. First and foremost, we view this as a positive development for end investors — through lower fees and a raised bar for active managers. The presence of index funds appears to enhance competition for active funds.¹⁶

- Some observers worry about market quality in terms of price discovery (while others worry about liquidity or governance characteristics). While we agree that “too much” passive investing could hurt price discovery (as someone needs to incorporate the news and push prices in the right direction), we believe we are far from such levels. Experts often get asked what levels are problematic; common answers like 80% are inevitably guestimates. Also note the self-regulating nature of the shift toward passive: Less competition among fewer delegated active managers may help them find better opportunities, earn better returns, and then recover market share from passive managers.
- Whether the shift to passive has made markets more or less efficient depends on whether passive inflows mainly replace retail investors or their more skillful delegated active managers. Mauboussin’s

(2017) “paradox of skill” argument — it is harder to win when the average quality of players improves — presumes the former, so he claims that active investors are now facing tougher competition. Not so fast ... as an empirical question remains open. Using a poker analogy again: *Did the patsy or the shark leave the poker table?* It is hard to measure the net impact in practice, as both features have been part of the observed trend (retail investors have shifted from delegated traditional active managers to passive funds).

- One possible downside is that a shift from active stock picking to passive investing (as well as to ETFs and factor investing) could potentially lead to higher correlations between single stocks and higher systematic risk. Even here, some of the evidence does not seem consistent with the story; for example, the pairwise average correlations between stocks declined sharply in 2016–17.¹⁷

Overall, the market impact of increasing passive share still seems modest in the cases where we can quantify things. This is not surprising since markets remain far from being dominated by passive. We suspect that the trend toward passive will continue until we see stronger evidence of improving active manager performance or of passive investing hurting the markets. At that stage, end-investor flows should partly revert to active.

15 See, for just a few examples, Mauboussin et al. (2017), Bleiberg et al. (2017) and BIS (2018).

16 See Cremers et al. (2016).

17 Across top 1,100 U.S. stock universe as approximated in MSCI Barra’s GEM model universe as the top 20th percentile by market-cap and the top 15th percentile by trading volume.

Conclusion

Much ink has been spilled on questions related to active versus passive investing. This paper and its companion try to distinguish myths from realities and to sharpen readers' comprehension on some open questions. Empirical evidence indicates that delegated active managers have historically provided positive net value-added to investors in the long run even as a group, with stronger performance for institutional managers and outside the United States. However, these long-run results may be overstated or even largely explained by selection biases; further

research is needed to quantify their impact. Recent years have been especially bad for active equity managers in the United States, but at least part of this is environmental and thus should not be extrapolated into the future. Overall, active managers are not a dying breed, but the competitive pressures from passive investing require that they keep raising their game and/or lower their fees — a healthy development for investors. The market impact of the shift toward passive investing appears limited so far, and the shift is likely to be self-correcting if it goes too far.

References

- AQR (2017). Alternative Thinking 4Q17: The Illusion of Active Fixed Income Diversification.
- Berk, J., van Binsbergen, J. (2015), Measuring Skill in the Mutual Fund Industry, *Journal of Financial Economics*, 118(1), 1-20.
- BIS: Sushko, V, Turner, G. (2018). The Implications of Passive Investing for Securities Markets, *BIS Quarterly Review*, March.
- BlackRock Viewpoint: Novick, B., Cohen, S., Madhavan, A., Bunzel, T., Sethi, J., Matthews, S. (2017). Index Investing Supports Vibrant Capital Markets.
- Bleiberg, S.D., Priest, W.W., Pearl, D.N (2017). The Impact of Passive Investing on Market Efficiency, Epoch Investment Partners white paper.
- Bollen, N.P.B., Joenvaara, J., Kauppila, M. (2017). Hedge Fund Performance Prediction, SSRN working paper.
- Constable, N., Kadnar, M. (2015). Is Skill Dead?, GMO white paper.
- Cremers, M., Ferreira, M.A., Matos, P., Starks, L. (2016). Indexing and Active Fund Management: International Evidence, *Journal of Financial Economics* 120 (3), 539-560.
- Dyck, A., Lins, K., Pomorski, L. (2013). Does Active Management Pay? New International Evidence, *Review of Asset Pricing Studies* 3(2), 200-228.
- Dyck, A., Pomorski, L. (2011). Is Bigger Better? Size and Performance in Pension Plan Management, SSRN working paper.
- Elton, E.J., Gruber, M.J., Blake, C.R. (2012). Does Mutual Fund Size Matter? The Relationship Between Size and Performance, *Review of Asset Pricing Studies* 2(1), 31-55.
- Fama, E.F., French, K.R. (2010). Luck Versus Skill in the Cross-Section of Mutual Fund Returns, *Journal of Finance* 65(5), 1915-1947.
- Fama, E.F., French, K.R. (2009). Why Active Investing Is a Negative Sum Game, Fama-French Forum.
- Garleanu, N.B., Pedersen, L.H. (2017). Efficiently Inefficient Markets for Assets and Asset Management, forthcoming in the *Journal of Finance*.

- Gerakos, J., Linnainmaa, J., Morse, A. (2016). Asset Managers: Institutional Performance and Smart Betas, SSRN working paper.
- Jones, C.S., Mo, H. (2017). Out-of-Sample Performance of Mutual Fund Predictors, SSRN working paper.
- Jones, R.C., Wermers, R. (2011). Active Management in Mostly Efficient Markets, *Financial Analysts Journal* 67(6), 29-45.
- Kosowski, R. (2006). Do Mutual Funds Perform When It Matters Most to Investors? U.S. Mutual Fund Performance and Risk in Recessions and Expansions.” SSRN working paper.
- Leippold, M., Ruegg, R. (2018). Fifty Shades of Active and Index Alpha, SSRN working paper.
- Mauboussin, M. J., Callahan, D., Majd, D. (2017). Looking for Easy Games: How Passive Investing Shapes Active Management, Credit Suisse Global Financial Strategies.
- Parikh, H., McQuiston, K., Zhi, S. (2018). The Impact of Market Conditions on Active Equity Management, Forthcoming in the *Journal of Portfolio Management*.
- Pedersen, L. H. (2018). Sharpening the Arithmetic of Active Management, *Financial Analysts Journal* 74(1), 1-16.
- Sharpe, W.F. (1991). The Arithmetic of Active Management, *Financial Analysts Journal* 47(1), 7-9.

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