MORNINGSTAR®

Active Share Doesn't Live Up to Hype

An Unreliable Way to Forecast Winning Canadian Equity Funds

Morningstar Manager Research
17 January 2017

Christopher Davis
Strategist, Morningstar Canada
+416 484-7823
christopher.davis@morningstar.com

- From January 2001-December 2015, the average active share of actively managed funds in the Canadian equity Morningstar Category clocked in at 57%. Most Canadian fund investors held funds with much lower active share, however. On an asset-weighted basis, active share averaged 41% over the period.

- Canadian equity funds appeared less active than foreign equity funds over our study period. That is at least partly thanks to quirks in the Canadian benchmark. Funds with less-concentrated benchmarks tend to have higher active share. The Canadian market was significantly more concentrated by stock and sector relative to broad foreign-market benchmarks, helping explain why Canadian equity funds had lower active shares on average. Investors should evaluate active share within the context of funds of similar type.

- Active share hurt performance in one period and helped in another. More active funds generated lower excess returns and alphas on a gross-of-fees basis from 2001-10 and higher excess returns and alphas from 2006-15.

- Differences in relative performance were explained almost entirely by funds' style and factor exposure. After accounting for funds' exposure to the market beta, value, small-cap, and momentum factors, funds delivered little to no alpha across active share levels.

- High active share may not lead to better results, but it does help explain differences in returns. The distribution of performance outcomes, whether measured by excess return, alpha, or tracking error, widened as active share rose.

- Active share isn't active risk. Tracking error may reflect sector, style, or other factor bets that active share does not. Both measures belong in investors' tool kits.

- Higher active share did not increase volatility or lead to bigger losses in down markets. Canadian equity funds suffered similar levels of volatility and maximum drawdowns regardless of their active shares.

- Canadian equity funds became more expensive as active share rose. Because fund costs and future performance are negatively correlated, funds with high active share may be more likely to underperform after fees.

Executive Summary

Academic research tying high active share—a measure describing how different a fund's stock picks are from a benchmark—with future outperformance quickly popularized its appeal. In reality, active share hasn't been the holy grail its boosters often claim.

Using data from January 2001-December 2015, we examined historical active share levels among actively managed funds in the Canadian equity category relative to the bellwether S&P/TSX Composite Index. On average, active share changed little over the period aside from a one-time drop early on. Canadian equity managers exhibited lower active share than their counterparts in other categories, but the benchmark's sector and stock concentration help explain why.

We tested active share's predictive power in two 10-year periods, 2001-10 and 2006-15. We then divided each in two five-year periods. The first half provided an in-sample observation period in which we calculate active share and other measures of activeness, and the second half an out-of-sample evaluation period where we measured the results. Using gross-of-fee returns, we found higher active share was associated with relative underperformance in the 2001-10 period and relative outperformance in the 2006-15 period. These differences virtually disappeared after adjusting for the market, size, value, and momentum factors.

Higher active share may not ensure better results, but it is likely to lead to more extreme ones. We found a positive relationship between active share and a wider range of performance outcomes, though surprisingly there was no relationship between active share and volatility or maximum drawdowns. We detected a strong relationship between active share and tracking error, but it was not perfect. Thus, using them in tandem provides a fuller picture of a fund's active bets versus its benchmark. Last, even if higher active share were to lead to better outcomes, investors may not be able to reap the benefit. We found that funds with higher active share had higher fees, which means investors may not reap the reward that higher active share could bring.

Introduction

In medieval mythology, or at least in Monty Python movies inspired by it, King Arthur's knights endure numerous trials, including giants and beasts, in pursuit of the Holy Grail, a magical cup promising happiness, health, and abundance. In medieval lore, Sir Galahad finds the cup and ascends to heaven, though the 1975 movie ends when police cut the search short. As a myth, the latter tells a truer tale: The quest for a simple, single solution to life's problems is futile.

Fund investors search in vain for a grail of their own, one that reliably identifies skilled active managers. Returns-based measures of all sorts have been poor indicators of future success

because strong performance rarely sustains itself. Fundamentals-based metrics like turnover, manager tenure, portfolio concentration, and fund size have mostly fallen short as well.

In a 2007 paper, researchers Martijn Cremers and Attni Petajisto hailed active share, a clever new measure quantifying how different a fund is from a benchmark, as the exception. The paper, "How Active is Your Fund Manager? A New Measure That Predicts Performance," tied high active share to future outperformance.[1] The professors presented evidence demonstrating active U.S. equity funds with the highest active share—that is, those most unlike their benchmark—outperformed those with the lowest active share over 1983-2000 study period. Petajisto's 2013 follow-up paper updated the study with data through 2009 and found similar results.[2] In a 2015 paper, Cremers detected another positive link between high active share and better performance, this time among highly active funds with low portfolio turnover.[3] This is as close to a holy grail as it gets.

Not only did the measure make active share appear effective as a forecasting tool, it had the added appeal of being easy to understand conceptually: Funds with 100% active share look nothing like the index, those with 0% look exactly like it, and those in between look something like it. A fund with 60% active share exhibits 40% overlap with the benchmark, while 40% active share signifies the opposite. Next to tracking error, the standard deviation of excess returns relative to a benchmark, the math of active share is less difficult to grasp. Lastly, there is an intuitive explanation for why funds with high active share should outperform: Funds that look too much like the benchmark are unlikely to beat it.

Although a distinctive portfolio may be a necessary condition for outperformance, it alone is not sufficient. If it were, then unskilled investors could improve their odds by making bigger bets against their benchmark. Giving these investors a longer leash would likely result in worse outcomes. Even in the hands of skilled managers, a highly active portfolio is no assurance of success. William Sharpe's arithmetic of active management reminds us that every winning bet must be matched with a losing one and must underperform in aggregate after fees. This is true no matter the active share. While some highly active managers will outperform after fees, they can't do so as a whole.

Study Methodology

This paper intends to examine the relationship between active share and performance among actively managed open end funds in the Canadian equity category. Our dataset excludes index funds, Canadian-dollar hedged, and U.S. dollar share classes. Where there are multiple share classes, we use the oldest share class. We study the 15-year period from January 2001-December 2015. Because we want to study the predictive power of active share

1 Cremers, Martijn and Attni Petajisto, Jan. 15, 2007. "How Active Is Your Fund Manager? A New Measure That Predicts Performance."
2 Petajisto, Attni, July/August 2013. "Active Share and Mutual Fund Performance." Financial Analysts Journal, pp 73-93
3 Cremers, Martijn and Ankur Pareek, Dec. 1, 2015. "Patient Capital Outperformance: The Investment Skill of Highly Active Managers That Trade Infrequently."

disentangled from the impact of management fees, we use gross of fees returns. The active/share cost relationship is examined separately.

For every fund in our sample with portfolio data, we calculated active share monthly over our study period. Instead of assigning an active share benchmark to each fund, we used the most widely used proxy for the Canadian stock market, the S&P/TSX Composite Index. Applying the same active share benchmark across entire categories can result in misleading results when the index poorly reflects managers' opportunity set, but that is a lesser concern for our study. Canadian equity managers can invest outside of the TSX Composite universe to a limited degree. The category restricts foreign content to 10% of the portfolio, and mid- and small-cap funds have their own category. As such, the TSX Composite is a fair representation of managers' hunting ground.

We broke our study period into two 10-year increments, January 2001-December 2010 and January 2006-December 2015. We evaluated active share's predictive power by dividing each 10-year period into equal-sized in- and out-of-sample periods. As Exhibit 1 details, we use the first half—the observation period—to collect our five performance- and portfolio-based measures of activeness for each fund in our data set. We use the second half—the evaluation period—to examine the relationship between these measures and subsequent performance.

Exhibit 1 Study Periods, Data Points Used

Observation Period	Evaluation Period	
2001-06	**2006-11**	**2011-16**
	Observation Period	Evaluation Period
Observation Period	Evaluation Period	
Active share	Excess return	
Stock concentration	Tracking error	
Sector bets	Alpha	
Excess return	Active share	
Tracking error		
Alpha		

Source: Morningstar, Inc. Data as of 12/30/2016.

To answer the primary question of this paper, we ranked funds by their average active share in each observation period and grouped the funds into active-share quintiles. To calculate active share, a fund must have been alive during the entire observation period. Our study parameters also mean funds that launched after January 2001 or January 2006 were not included.

For funds that survive the evaluation period, we then calculate the average excess returns and tracking error (relative to the S&P/TSX Composite), in addition to alpha, by quintile. We do so over the observation and evaluation periods. To calculate alpha, we use a four-factor model to account for market, size, value, and momentum exposures, drawing upon historical Canadian stock return data from AQR.[4]

This paper also considers the relationship between active share and other portfolio-based measures of activeness. We used the percentage of assets in the top-10 holdings as a gauge of stock concentration and the industry concentration index, or ICI, to measure differences in sector concentration. (In this paper, we refer to these measures as "concentration" and "sector bets," respectively.) The ICI, developed by Kacperczyk, Sialm, and Zheng, describes a fund's sector concentration relative to the active-share benchmark.[5] Higher scores indicate larger sector bets versus the benchmark. We also consider the relationship between these measures and subsequent performance.

To help us put our findings in context, we studied historical active share levels in the category over the study period on an equal- and asset-weighted basis. To understand the impact of the Canadian benchmark's uniquely concentrated profile on active share, we compared it with broad market benchmarks in other asset classes. We calculated the average active share for funds in the U.S. equity, international equity, and global equity categories relative to the S&P 500, MSCI EAFE IMI Index, and the MSCI World Index. (We use the MSCI World instead of the broader MSCI ACWI IMI Index because we lacked the licensing rights to this data.) We compared these benchmarks to the S&P/TSX Composite's stock concentration (again using the percentage of assets in top-10 holdings) and sector concentration. To calculate the latter, we used a related measure to the ICI score called the Herfindahl-Hirschman index,[6] which is commonly used to measure market concentration. In our case, higher Herfindahl-Hirschman index values signify greater levels of sector concentration.

One inherent limitation of active share and other portfolio-based measures is that they require portfolio holdings to calculate. As such, this study only includes funds that reported portfolio data to Morningstar. The impact is minimal, though. Just three funds lacked portfolio data in the first observation period and four did in the second.

4 We calculated four-factor alpha using monthly data from AQR: www.aqr.com/data-sets. We regressed monthly fund returns against monthly returns of the market, SMB (small-cap), HML (value), and UMD (momentum) factors in the Canada, U.S., and Global universes. Because AQR data is expressed in U.S. dollar terms, we converted Canadian fund universe returns to U.S. dollars for use in our regression analysis.

5 Kacperczyk, Marcin, Clemens Sialm, and Lu Zheng. "On Industry Concentration in Mutual Funds," August 2005. The ICI is defined as the sum of the squared deviations of the value weights for each of the industry weightings held by the mutual fund, relative to the industry weights of the total stock market, wj,t wj,t . WM is the sector weighting of the category active share benchmark. In our case, we used sector weightings based on the 10 GICS sectors. The formula is as follows: $\sum(wfi,t\text{-}wmi,t)2$.

6 Hirschman, Albert, September 1964. "The Paternity of an Index." The American Economic Review, p. 561.

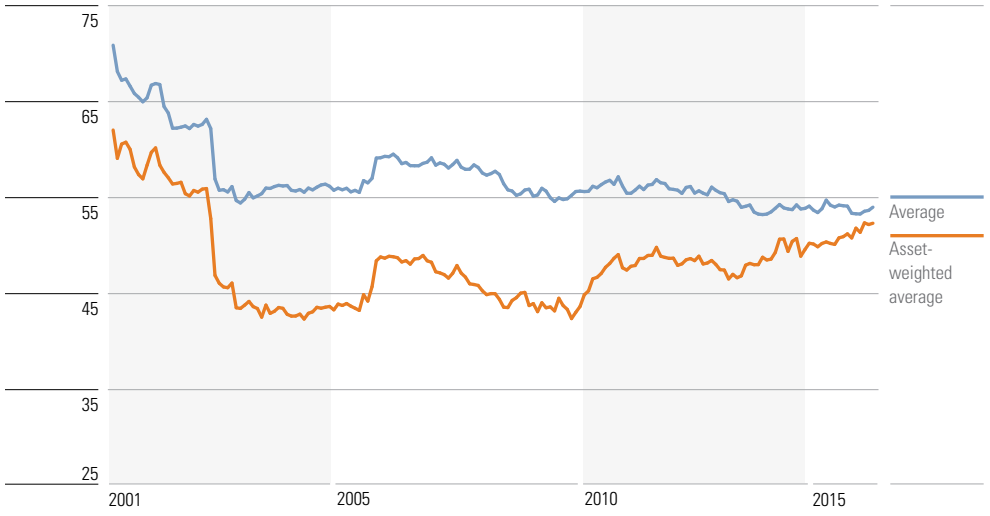
Have Canadian Equity Fund Managers Become Less Active?

Average active share was considerably lower at the end of the study period than at the beginning, falling from a high of 73% in January 2001 to 54% by December 2015, as Exhibit 2 demonstrates. Had our study period begun in 2003, changes in active share would appear more modest. Nearly the entire fall took place in the first two years of the study as one-time tech darling Nortel Networks went from 21% to 3% of the index. As the stock fell to Earth, so did active share.

The funds that Canadian investors held were less active on average over the 15-year period: While active share averaged 57% on an equal-weighted basis over the period, it averaged 41% on an asset-weighted basis. The difference has shrunk in recent years, though, with the asset-weighted active share at 47% in December 2015.

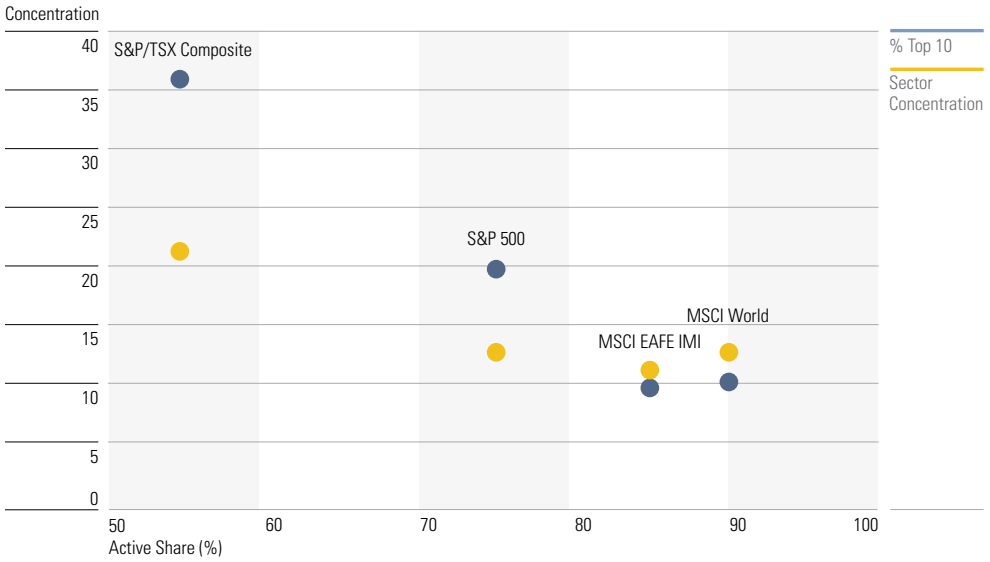
Of the broad categories we studied, Canadian equity funds had the lowest active share on average, while global equity funds posted the highest, and the U.S. and international categories fell somewhere in between. It looks as if active managers are more active abroad than at home, but this comparison ignores quirks in the category benchmarks. While foreign stock funds can deliver high active share without big stock or sector bets, and while holding a fraction of index constituents in foreign categories, the TSX Composite was more concentrated by stock and sector than the other category indexes we studied. And as Exhibit 3 illustrates, the more concentrated the benchmark, the lower active share was.

Exhibit 2 Average Active Share, 2001-2015



Source: Morningstar, Inc. Data as of 12/30/2016.

Exhibit 3 Active Share and Concentration, Major Market Benchmarks (January 2011–December 2015)



Source: Morningstar, Inc. Data as of 12/30/2016.

Active Share: A Fair-Weather Friend

Active share proved a weak and inconsistent predictor of future returns in our study, whether judged by excess returns (versus the S&P/TSX Composite) or four-factor alpha. Active share explained around 10% of the variability in excess returns and alpha (as measured by R-squared) in both periods, meaning other factors drove performance to a much greater degree.

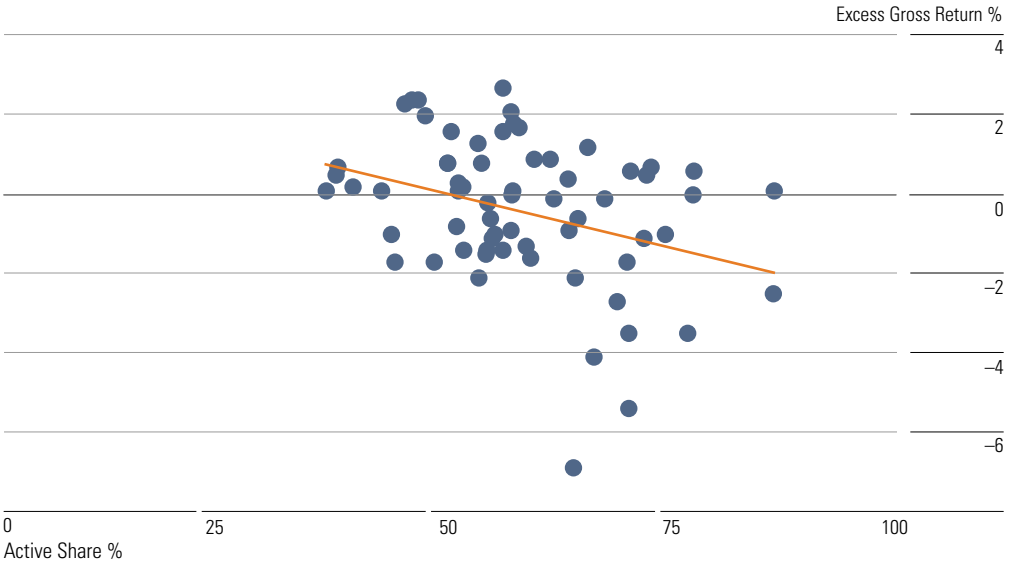
To the extent it mattered, active share was associated with diametrically opposed outcomes. Performance was about as negatively correlated with higher active share in the first evaluation period (2001-05) as it was positively correlated in the second evaluation period (2011-15). These relationships, which we plot in Exhibits 4, weren't especially strong—correlations were around negative 30% in the first period and about 30% in the second—but they were statistically significant.[7] The most-active quintile of funds averaged the lowest excess returns in the first period but the best in the second, as illustrated in Exhibit 5, which charts average excess return by active share quintile in both periods. Higher active share did not foretell better returns but it helped explain performance extremes.

7 T-statistic was -2.8 for excess returns in the first period, 2.7 for excess returns in the second period.

One might have expected wider outcomes in a period punctuated by the 2007-08 financial crisis and its immediate aftermath. This period was also marked by the worst recession since the Great Depression and unprecedented intervention by central banks. With broad, macroeconomic themes driving returns, stocks fell and rose together. With relatively high correlation and low dispersion across market sectors, the payoff from stock-picking was relatively low. The TSX Composite proved tough to beat: Funds in four of five active share quintiles lagged the index on average, with the least active outperforming modestly.

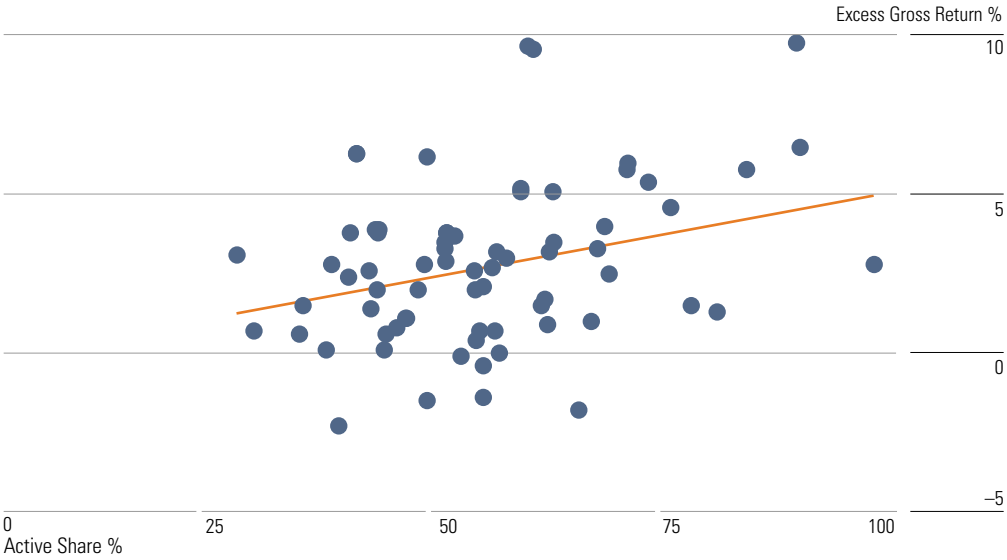
Active managers found the 2011-15 evaluation period to be more fertile ground. As correlations weakened and dispersion grew over this stretch, more differentiated portfolios generated a wider range of results. Put another way, the potential payoff from high active share was stronger in the second period than in the first. Funds delivered positive excess returns on average across all active-share quintiles, with the most active delivering the widest margin of outperformance. Investors benefit from higher active share in periods of high dispersion and vice versa.

Exhibit 4a Period One: Active Share (Observation Period) and Excess Return (Evaluation Period)



Source: Morningstar, Inc. Data as of 12/30/2016.

Exhibit 4b Period Two: Active Share (Observation Period) and Excess Return (Evaluation Period)



Source: Morningstar, Inc. Data as of 12/30/2016.

Exhibit 5 Excess Return and Alpha by Active-Share Quintile, 2001-2010

	Observation Period			Evaluation Period		# Funds	
Active Share Quintile	ActiveShare (%)	Excess Return	Alpha	Excess Return	Alpha	Obsevation Period	Eval Period
1	43.88	1.69	0.00	0.62	0.00	14	14
2	53.01	1.58	0.11	–0.48	–0.01	13	13
3	57.27	1.54	0.00	0.36	0.00	13	13
4	65.31	2.52	0.00	–1.39	–0.02	13	12
5	75.06	2.70	0.00	–1.22	–0.02	14	12

Source: Morningstar, Inc. Data as of 12/30/2016.

Exhibit 6 Excess Return and Alpha by Active-Share Quintile, 2006-2015

	Observation Period			Evaluation Period		# Funds	
Active Share Quintile	ActiveShare (%)	Excess Return	Alpha	Excess Return	Alpha	Obsevation Period	Eval Period
1	38.59	0.21	0.00	2.29	0.01	22	19
2	48.56	0.66	0.01	2.38	0.01	21	14
3	55.33	–1.04	–0.02	2.37	0.01	22	15
4	63.09	–1.10	–0.02	2.80	0.02	21	10
5	78.78	–1.30	–0.02	4.65	0.02	22	12

Source: Morningstar, Inc. Data as of 12/30/2016.

A Matter of Style

Whether or not higher active share boosted relative performance depended upon the market environment. Canadian equity funds became more value-oriented as their active shares climbed—for example, more-active portfolios fared better as value stocks outperformed from the 2011-15 period than when growth stocks led from 2006-10. Were we to adjust for differences in value exposure, we could find active share a more consistent guide to future performance. The same could be said for exposure to other factors like market beta, size, and momentum. A fund's alpha quantifies the portion of returns not explained by a fund's exposure to the factors.

Less surprisingly, funds across active share levels added little to no alpha on average in the 2006-10 evaluation period. For reasons described in the proceeding section, active managers had a tough time distinguishing themselves with stock-picking over this stretch. However, active managers turned in similar results from 2011-15 when the potential rewards from stock-picking were stronger. Over both periods, the data suggest style, not stock-picking skill, drove relative performance.

Exhibit 7 lists average factor exposures and alphas by active-share quintile.

Exhibit 7 Alpha and 4-Factor Beta Exposures, Evaluation Periods

	Period 1: 2006-10				Period 2: 2011-15			
Active Share Quintile	Market	Value	Size	Momentum	Market	Beta	Value	Momentum
1	1.01	0.03	–0.12	–0.02	0.96	0.04	–0.11	0.04
2	0.95	0.11	–0.13	0.01	0.98	0.02	–0.08	0.06
3	0.97	0.11	–0.12	–0.01	1.02	0.11	–0.12	0.08
4	0.96	0.16	–0.10	0.02	0.99	0.09	–0.13	0.05
5	0.90	0.16	0.03	0.08	0.93	0.14	–0.07	0.12

Source: Morningstar, Inc. Data as of 12/30/2016.

Active Share Doesn't Mean Active Risk

Describing activeness only in terms of how different a fund's holdings are from its benchmark's leaves out the possibility of other distinguishing characteristics, such as the style and factor bets discussed above, in addition to differences in sector or country exposure. A positive active share also tells us that a fund is different from its benchmark, but it does not say how.

We should be able to observe the cumulative effects of stock, style, sector, or other factor bets in performance. Tracking error, a measure of the volatility of a fund's excess returns, describes how much past performance deviates from benchmark results. The less a fund looks like its benchmark, the more its returns should deviate: A near-benchmark clone should

behave a lot like the index, while a concentrated portfolio with heavy sector concentrations likely will not.

Because tracking error and active share both describe how different a fund is from its benchmark, we would expect the relationship between the two measures to be strong. And it was: Tracking error and active share were 66% correlated in the first evaluation period and 67% in the second. This relationship was not perfect, though, suggesting each measure brings different qualities to an investor's tool kit. If the measures were driven by the same things, they would have moved in lock step. Together, active share and tracking error give a fuller picture of how funds differentiate themselves from their benchmarks.

Exhibits 12 and 13 on page 15 illustrates the correlations between measures of activeness used in this study.

Higher Active Share, Higher Volatility, Bigger Losses?

While higher active share went hand in hand with higher tracking error and wider swings in relative performance, it didn't necessarily contribute to higher volatility or vulnerability to losses. In fact, there appeared to be no relationship at all between active share and standard deviation or maximum drawdown in either evaluation period, as Exhibit 8 illustrates. In both periods, the most- and least-active quintile of funds exhibited similar levels of volatility and suffered nearly identical maximum drawdowns.

This finding is somewhat counterintuitive. We might expect the odds of a blow-up to increase along with active share. Low active share limits risk relative to the benchmark but not to the risks of the benchmark itself. Because the S&P/TSX Composite is highly concentrated by sector, funds with low active share will be, too. The benchmark's heavy exposure to the cyclical financials, energy, and basic materials sectors makes less-active portfolio susceptible to high volatility and large losses.

The most-active funds were significantly underexposed to the TSX Composite's dominant sectors. Our sector bet measure, the ICI score, was seven times higher in the highest active-share quintile than that of funds in the lowest quintile. Treading lightly in major market sectors requires heavier weightings in minor ones, such as telecom and staples, which tend to be more defensive in character. Rather than magnifying volatility, sector bets may moderate it. This effect is difficult to see in the data—more-active funds weren't less volatile—but overweighting defensive stocks may have helped tame other potential sources of volatility like heavier exposure to value stocks.

Exhibit 8 Standard Deviation and Maximum Drawdowns, 2006-10, 2011-2015

	Evaluation Period 1		Evaluation Period 2	
Active Share Quintile	Standard Deviation	Max Drawdown	Standard Deviation	Max Drawdown
1	16.9	–44.0	9.3	–19.4
2	15.5	–41.8	9.6	–18.0
3	16.3	–43.2	10.3	–21.6
4	16.4	–45.1	9.8	–18.3
5	16.2	–43.9	9.4	–20.0

Source: Morningstar, Inc. Data as of 12/30/2016.

Don't Forget About Fees

We used gross-of-fee returns in our study because we wanted to examine active share as a purely as a gauge of manager skill. What matters to investors, though, is whether managers deliver good enough returns to overcome their costs.

As Exhibit 9 demonstrates, Canadian equity funds become more expensive the more active they become. (The chart breaks down management expense ratios by distribution channel using the most recent management expense ratio data. Active-share quintile data uses a five-year average. We excluded do-it-yourself funds because the sample was too small to be meaningful.) Higher active share may increase the potential for stronger excess returns, but the investor won't benefit if higher costs eat the surplus. Because fund costs and future performance are negatively correlated, funds with high active share may be more likely to underperform after fees.

Some managers have used high active share as a justification for high fees. These managers, the argument goes, are truly active and worth the added expense. There may be instances where this is the case, but it also may be these managers take more risks relative to their benchmark because they must overcome their fee hurdles.

Exhibit 9 Management Expense Ratio by Active-Share Quintile

Active Share Quintile	Commission-based MER (%)	Fee-based MER (%)
1	2.2	1.0
2	2.4	1.2
3	2.4	1.3
4	2.4	1.3
5	2.6	1.6

Source: Morningstar, Inc. Data as of 12/30/2016.

Active Share Isn't a Holy Grail. So what?

Active share may not be the "new measure that predicts performance" as Cremers and Petajisto claimed in the title of their 2007 paper, but just because it is less useful than promised does not make it useless. It has given fund investors a simple way to understand the extent of a fund's active stock bets. Active share gives us no easy answers, but it can help us ask good questions about strategy, portfolio construction, and a fund's value proposition next to cheaper passive alternatives.

Flawed as active share may be as a gauge of future performance, other measures investors commonly use to identify skilled managers, such as the Sharpe or Information ratios, turnover, or manager tenure, also suffer from having little predictive value on their own. Measures like these are more meaningful together than apart. Similarly, using active share in concert with performance-based measures like tracking error and portfolio-based analysis of stock and sector concentration gives a better picture of how different a portfolio is from its benchmark. Incorporating these considerations with other research concerns, such as the depth of management's resources and the strength of its research and risk management practices, historical performance, and costs, paints a more vivid picture of investment skill.

Lastly, investors should resist the temptation to make holding less-active and more-active funds together an either/or proposition. If low (or in the case of index funds no) active share is beneficial in some markets and high active share in others, investors could reap diversification benefits from holding them in concert. They may be, as a 2016 U.S. presidential candidate might put it, better together.

Appendix

Exhibit 10 Observation and Evaluation Period Data, 2001-10

	Observation Period						Evaluation Period			# Funds	
Active Share Quintile	Active Share	Industry Concentration	% top 10	Excess Return	Alpha	Tracking Error	Tracking Error	Excess Return	Alpha	Observation Period	Performance Period
1	43.88	0.01	37.99	1.69	–0.02	1.32	0.83	0.62	0.00	14	14
2	53.01	0.01	39.87	1.58	–0.02	1.70	1.40	–0.48	–0.01	13	13
3	57.27	0.02	40.25	1.54	–0.01	1.56	1.43	0.36	0.00	13	13
4	65.31	0.03	44.29	2.52	–0.01	2.38	1.68	–1.39	–0.02	13	12
5	75.06	0.07	44.95	2.70	–0.02	2.98	2.44	–1.22	–0.02	14	12

Source: Morningstar, Inc. Data as of 12/30/2016.

Exhibit 11 Observation and Evaluation Period Data, 2006-15

	Observation Period						Evaluation Period			# Funds	
Active Share Quintile	Active Share	Industry Concentration	% top 10	Excess Return	Alpha	Tracking Error	Tracking Error	Excess Return	Alpha	Observation Period	Performance Period
1	38.59	0.01	43.16	0.21	0.00	0.83	0.9	2.29	0.01	22	19
2	48.56	0.01	42.84	0.66	0.01	1.02	0.89	2.38	0.01	21	14
3	55.33	0.02	44.48	-1.04	-0.02	1.51	1.09	2.37	0.01	22	15
4	63.09	0.03	45.08	-1.1	-0.02	1.68	1.09	2.8	0.02	21	10
5	78.78	0.07	44.49	-1.3	-0.02	2.8	1.59	4.65	0.02	22	12

Source: Morningstar, Inc. Data as of 12/30/2016.

Exhibit 12 Correlations and Measures of Active Management, Observation and Evaluation Periods, 2001-10

	Observation Period							Evaluation Period			
	Active Share	% Top 10	Industry Concentration	Excess Return	Tracking Error	# stocks	Alpha	Tracking Error	Excess Return	Active share	Alpha
Active share	1x										
% top 10 holdings	28	1									
Industry Concentration	2	15	1								
Excess Return	5	–20	6	1							
Tracking Error	81	22	–1	14	1						
# Stock Holdings	–48	–47	–9	–18	–49	1					
Alpha	3	32	–8	23	–18	–10	1				
Tracking Error	66	23	4	–18	78	–41	3	1			
Excess Return	–34	–22	5	32	–20	16	–6	–44	1		
Active share	76	15	5	9	73	–36	3	85	–38	1	
Alpha	–33	–13	–5	8	–14	13	–5	–37	91	–37	1

Source: Morningstar, Inc. Data as of 12/30/2016. Data as of 12/30/2016.

Exhibit 13 Correlations and Measures of Active Management, Observation and Evaluation Periods, 2006-15

	Observation Period							Evaluation Period			
	Active Share	% Top 10	Industry Concentration	Excess Return	Tracking Error	# stocks	Alpha	Tracking Error	Excess Return	Active share	Alpha
Active share	1										
% top 10 holdings	8	1									
Industry Concentration	3	28	1								
Excess Return	–38	–4	20	1							
Tracking Error	85	7	–9	–44	1						
# Stock Holdings	–40	–55	–10	19	–38	1					
Alpha	–37	–8	22	91	–37	20	1				
Tracking Error	67	9	42	–5	61	–36	–16	1			
Excess Return	33	4	46	5	25	–31	2	48	1		
Active share	84	18	21	–12	64	–39	–8	76	46	1	
Alpha	30	13	27	–12	19	–35	–10	25	82	31	1

Source: Morningstar, Inc. Data as of 12/30/2016.

About Morningstar's Manager Research Group

The analysis within this report is prepared by the person(s) noted in their capacity as an analyst for Morningstar's Manager Research Group. The Manager Research Group consists of various wholly-owned subsidiaries of Morningstar, Inc. including but not limited to Morningstar Research Services LLC, which is registered with and governed by the U.S. Securities and Exchange Commission. The opinions expressed within the report are given in good faith, are as of the date of the report, are not statements of facts, and are subject to change without notice. This report is for informational purposes only and has no regard to the specific investment objectives, financial situation or needs of any specific person(s). The Manager Research Group provides independent, fundamental analysis on managed investment strategies. Analyst views are expressed in the form of Analyst Ratings, which are derived through research of five key pillars—Process, Performance, Parent, People, and Price. Analyst Ratings are subjective in nature and should not be used as the sole basis for investment decisions. Analyst Ratings are not guarantees and are subject to change. Analyst Ratings are not nor should they be viewed as an assessment of a fund's or the fund's underlying securities' creditworthiness.

About Morningstar's Manager Research Group's Services

Morningstar's Manager Research Group's services combines fund research reports, ratings, software, tools, and proprietary data with access to Morningstar's Manager Research Group's analysts. It complements internal due-diligence functions for institutions such as banks, wealth managers, insurers, sovereign wealth funds, pensions, endowments, and foundations.

1 Toronto Street
Toronto, Ontario M5C 2W4