The Perils Of Portfolio Turnover

Updating earlier research for a decimalized world.

by David Blanchett

The average turnover in mutual funds has increased with time. According to John Bogle (*Common Sense on Mutual Funds* (2000), turnover has increased from 30 percent 25 years ago to nearly 90 percent today. Wermers (2000) has similar numbers.

Unlike publicly disclosed expense ratios, the costs associated with turnover are generally unknown, and are invisible to investors apart from their impact on overall performance. These expenses are nonetheless real, however, with both explicit (e.g., commissions) and implicit (market impact) costs that should be considered when selecting an investment.

A variety of research has been conducted seeking to quantify the impact of portfolio turnover (most notably Carhart 1997). However, with market developments like decimalization and the elimination of fixed minimum commissions, the timeliness of this research is questionable; some of it relies on data dating back as far back as the 1960s. The purpose of this paper is to update that analysis and quantify the pre tax costs (both, performance and risk) associated with portfolio turnover using actual mutual fund returns over a more recent sample period.

Literature Review

Carhart's *On Persistence in Mutual Fund Performance* is perhaps the most often cited article discussing the implications of portfolio turnover, as well as many other issues surrounding active management. Carhart tested the performance of three mutual fund strategies (aggressive growth, long-term growth, and growth and income) using a survivorship-free database covering January 1962 through December 1993. He found a turnover slope coefficient of -0.95, suggesting that for every 100-point increase in turnover, the annual return drops by 95 basis points (which he interprets as the net cost of trading).

Additional researchers have also noted the negative impacts of turnover. In his book, *Bogle on Mutual Funds* (1994), John Bogle estimated the cost of turnover to be approximately 1.2 percent for each 100 percent of turnover. Day, Wang, and Xu (2001) noted that a 1 percent relative increase in yearly turnover is associated with a 0.075 percent decrease in risk-adjusted performance. Dowen and Thomas (2004) noted that equity managers who trade less tend to produce greater returns (interestingly, fixed-income managers who trade more tended to produce greater returns). Sharkansky (2001) also noted the impact of turnover across a variety of equity (and fixed-income) categories, ranging from 124 bps per 100 percent of turnover for large cap equities to 255 bps for small-cap equities.

Two published studies, which are in the composite minority, have noted potential benefits from portfolio turnover. Bauman, Miller, Veit (2005) found that many investment advisors working for 13F institutions (i.e., pension portfolios) have the skill to identify and purchase stocks that generate a higher return per unit of risk than both the market and the stocks they sell. Wermers also found that high-turnover funds, although incurring substantially higher transactions costs and charging higher expenses, tend to hold stocks with much higher average returns than low-turnover funds. However, Day, Wang, and Xu (2001) noted a negative correlation between portfolio turnover and pre-expense performance for actively managed portfolios, suggesting that turnover rates for these funds are not driven by superior information.

The impact of turnover has also been noted for individual investors. Barber and Odean (2000) found an average annual portfolio turnover of 75 percent for U.S. investors using discount brokers, while Shu, Chiu, Chen, and Yeh (2004) uncovered an annual turnover of more than ten times that for Taiwanese investors. Barber and Odean noted that U.S. investors tended to hold small, high-risk securities, and that the risk-adjusted performance of the average investor lagged the market by 3.7 percent per year. Perhaps even more telling was the average 10 percent underperformance of the most active 20 percent of investors on an annual, risk-adjusted basis. Shu, Chiu, Chen, and Yeh noted that, while Taiwanese investors had positive abnormal returns from factor models, they would have earned better returns from a buy-and-hold strategy.

Although the tax implications of turnover are beyond the primary scope of this paper, they nonetheless represent explicit costs for taxable investors. Bogle (1994) discusses the impact of turnover in a variety of tax scenarios. Additional research by Peterson, Pietranico, Riepe, and Xu (2002) found that equity fund investors from 1981 to 1998 lost an average of approximately 2.2 percent annually to taxes, while more recent research by Longmeier and Wotherspoon (2006) found that lower turnover is significantly correlated with higher tax alpha, leading to higher after-tax investment returns.

The Costs Of Turnover

Turnover is a measure of trading activity and represents how often a portfolio manager buys and sells the aggregate value of a portfolio. Unlike expense ratios, which are an explicit cost of money management disclosed to mutual fund investors, turnover costs are not disclosed.

The four primary costs typically associated with turnover are:

1. The bid/ask spread: The bid price is the price at which you can sell a security, while the ask price is the price at which you can buy the security. The difference between these prices is known as the spread. Spreads have been decreasing over time as market volumes have increased. One notable event was the New York Stock Exchange's (NYSE's) conversion to decimal pricing in 2001. Previously, NYSE stocks were sold in fractional units of a dollar (e.g., 1/4, 1/8, 1/16, or 1/32), where the minimum spread was the minimum fraction in which the share was sold. For example, a security with a 1/32 spread had a minimum spread of $.03125. Now, spreads can be as low as a penny.
2. Commissions: Commission costs range based upon a variety of factors, such as the size of the trade, the type of the trade (e.g., limit versus market) and the exchange the security trades on (e.g. Nasdaq versus NYSE). Before 1975, there were fixed (and high) minimum commission rates; with the introduction of competitive pricing in 1975, commission costs have decreased dramatically. Individual

investors can now trade securities for as little as $6.99 per trade on popular Internet brokers like E*Trade.com; institutional investors can trade for even less.

3. Tax implications: Investors pay taxes on gains as they are realized within the portfolio. Therefore, the more frequently a portfolio manager trades, the more often an investor will have taxable income (assuming the portfolio is making profitable trades). The length of the holding period for securities in the fund is important. Gains (for taxable investors) on investments held for more than one year (i.e., long-term gains) are currently taxed at 15 percent, whereas short-term gains can be taxed as high as 35 percent. Exchange-traded funds limit this tax liability, but open-end funds do not.
4. Market Impact (also referred to as slippage): A portfolio manager who either seeks to buy or sell a large position in a security is likely to impact the market (usually, to his disadvantage). Despite the fact that total market volume has increased (for example, since 1997, the monthly dollar volume on the Nasdaq has more than doubled from $17.830 billion to $41.408 billion), securities that are thinly traded, such as domestic small-cap securities and certain international stocks, can experience dramatic price movements when large investors enter (or exit) a position.

The net impact for each of these costs will differ based upon the market exposure and the experience of the portfolio manager. See, for example, Keim and Madhaven (1997), wherein the authors note how trading costs differ with trader-specific factors such as investment style and order submission strategy, as well as stock-specific factors such as exchange listing (NYSE/AMEX versus Nasdaq). Through an empirical analysis, however, it is possible to determine the overall net impact of turnover on historical mutual fund performance.

Analysis

An empirical analysis was conducted analyzing the historical returns of mutual funds in order to determine the pre tax impact of turnover on portfolio performance. The annualized three-year performance for mutual funds, gross of fees, was reviewed: i.e., expense ratios were added back to the three-year annualized return for the analysis. Three-year performance was used since it represents the average investor holding period for mutual funds.[1] The time period selected to assess the impact of turnover should be based upon the average holding time in the actual investment. Using shorter periods (e.g., connecting annual periods) ignores the nature in which investors purchase mutual funds (i.e., they tend to hold the same fund), while using longer periods (e.g., ten years) increases the impact of survivorship bias and the potential for style drift during the test period.

Performance is measured in gross terms, since expense ratios represent an explicit cost that is a drag on performance. While investment management fees should be considered when quantifying the (ex-post) benefit of active management, the purpose of this paper is to quantify the costs of turnover, not to discuss the merits of active management. Mutual funds that have lower turnover rates also tend to have lower expense ratios (e.g., index funds); therefore, if expense ratios were not netted back in this analysis, part of the costs associated with turnover would actually be associated with the underlying expense ratio.

Three-year gross performance for six rolling calendar periods from 2001-2006 was considered for the analysis. This represented the longest period of complete data available to the author. While the overlap between periods is a potential concern (for example, the 2003 and 2004 three-year test periods would share two years), each calendar period is determined independently. Using multiple periods increased the available data set.

In order for an investment to be included in the analysis, it had to be a publicly traded, open-end mutual fund with performance, turnover, standard deviation (three-year), and expense ratio information available at the calendar year-end test date. All information was obtained from Morningstar. The "style" used for comparison purposes was the investment's asset category at the end of each calendar year (as defined by Morngingstar). In order for a mutual fund to be included in the test population, it must have had the same asset category for the previous three quarters as well. This screen was applied to minimize the impact of style drift during the test period. The mutual fund's turnover and expense ratio at the end of the calendar period was assumed to be constant for the entire three-year test period.

The mutual funds tested were limited to one share class per fund to ensure that those funds with multiple share classes were not overweighted compared to funds with fewer share classes. The share class with the lowest expense ratio and complete information was used. (Not limiting the test population to distinct investments is a common error in tests that address the historical benefits of active management in mutual funds.) The lowest expense ratio share class was selected since it is assumed to be the most efficient share class available (typically, this was the institutional share class, which tended also to have larger minimums than A, B, C, Investor, or Retirement share classes).

Outperformance, standard deviation and risk-adjusted performance (defined as the Modified Sharpe Ratio[2]) were considered. Standard deviation and the Modified Sharpe Ratio were included in order to determine whether or not there was a relationship between turnover and risk; i.e., whether or not higher turnover could be associated with lower risk, as was suggested by Bauman, Miller, Veit (2005). The risk-free rate used for the Modified Sharpe Ratio calculation is defined as the return on the 90-day Treasury bill over the appropriate test period (data obtained from Callan Associates).

The four primary test groups considered for the analysis, along with the subgroups that were reaggregated to determine the total group performance, are listed below:

1. Large-Cap Equity: Large Value, Large Blend, and Large Growth
2. Mid-Cap Equity: Mid Cap Value, Mid Cap Blend, and Mid Cap Growth
3. Small-Cap Equity: Small Cap Value, Small Cap Blend, Small-Cap Growth
4. International Equity: Foreign Large Value, Foreign Large

Figure 1

Number Of Mutual Funds Included In The Analysis						
Category	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Intermediate-term Bond	259	228	246	269	277	273
Intermediate Government	108	96	90	95	93	89
High Yield Bond	103	96	110	115	118	124
Large Growth	279	262	339	358	345	371
Large Blend	369	348	407	425	443	439
Large Value	254	233	238	268	270	292
Mid-Cap Growth	165	169	213	218	209	225
Mid-Cap Blend	61	57	82	99	106	129
Mid-Cap Value	95	78	74	71	77	79
Small Growth	171	182	203	208	201	193
Small Blend	80	68	115	130	138	155
Small Value	97	75	73	82	89	94
Foreign Large Growth	0	0	60	51	56	54
Foreign Large Blend	267	259	134	131	150	153
Foreign Large Value	0	0	41	41	49	52
Total	*2,308*	*2,151*	*2,425*	*2,561*	*2,621*	*2,722*

Blend, and Foreign Large Growth[3]

Since investment style is an important consideration when determining relative outperformance, investments were compared against other investments within the same category and then re-aggregated to determine the group performance. For example, all Large Blend funds were tested in one subgroup and all Large Value funds were tested in another subgroup; however, both were combined (on a weighted basis) to determine the aggregate Large Cap equity performance.

The combination weightings are based upon the number funds in the decile for each subgroup. For example, if there were ten Large Growth fund, five Large-Blend funds and five Large-Value funds in the Large-Cap Equity category, Large Growth would represent 50 percent of the group result for that decile and that period, while Large-Blend and Large-Value would each represent 25 percent of the total.

The number of mutual funds per asset category that met the previous conditions is included in Figure 1.

Although transaction costs differ considerably across foreign markets (see, for example Domowitz, Glen, and Madhavan, for the purposes of this analysis, it is assumed that all foreign equity mutual funds have similar market and country exposures.

Outperformance Results

Figure 2 contains the outperformance for each of the four test groups separated into deciles. The exact figures used for the chart are included in Figure 5. A best fit linear trendline, considering all groups (i.e., 40 data points), is included to understand the aggregate impact of turnover on outperformance. Below the chart is a table that lists the linear best fit trendlines, coefficient of determinations (R^2), and the slopes of the best fit trendlines for each of the groups tested.

There was a strong relationship between turnover and outperformance for each of the four equity groups tested, with coefficient of determinations (R^2) ranging from 0.3905 to 0.6861 (for Large-Cap Equity and Foreign Equity, respectively). The slope value represents the cost per 100 percent of turnover for each of the test groups. The cost of turnover increases for smaller market capitalizations (as could be expected), and was largest for foreign equity. The difference between Large-Cap Equity and Small-Cap Equity (61 basis points) is likely a reflection of the increased liquidity for large capitalization securities.

Standard Deviation Percentile Results

Figure 3 contains the percentile standard deviations for each of the four test groups. Unlike the previous outperformance chart, where the raw outperformance values were used, the standard deviation results were considered on a percentile basis. Using percentiles was important because the standard deviations varied considerably among the six different (three year) test periods, and because standard deviations cannot be combined as easily as raw outperformance (i.e., taking the average is not a correct way to combine them). Similar to the deciles, lower percentiles are considered to be better than higher percentiles. Below the chart is a table that lists the linear best fit trendlines, coefficient of determination (R^2), and the slopes of the best fit trendline for each of the groups tested. The exact figures are included in Figure 5.

Those investments with lower turnover rates tended to have lower standard deviations over the test period. Therefore, higher turnover can typically be associated with higher levels of variability, or risk. Similar to the outperformance results, small capitalization equities were more (negatively) affected by turnover than large capitalization equities, as can be seem from the slopes.

Figure 2

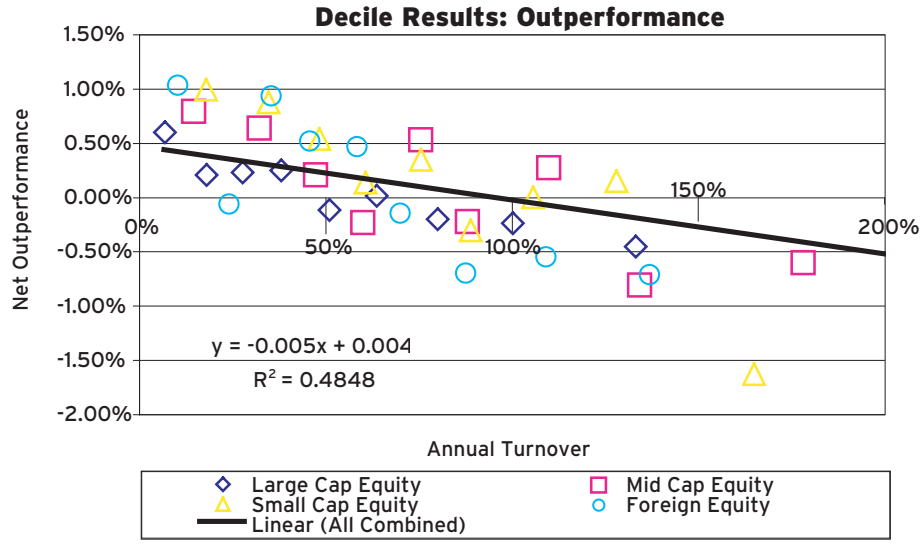


Figure 3

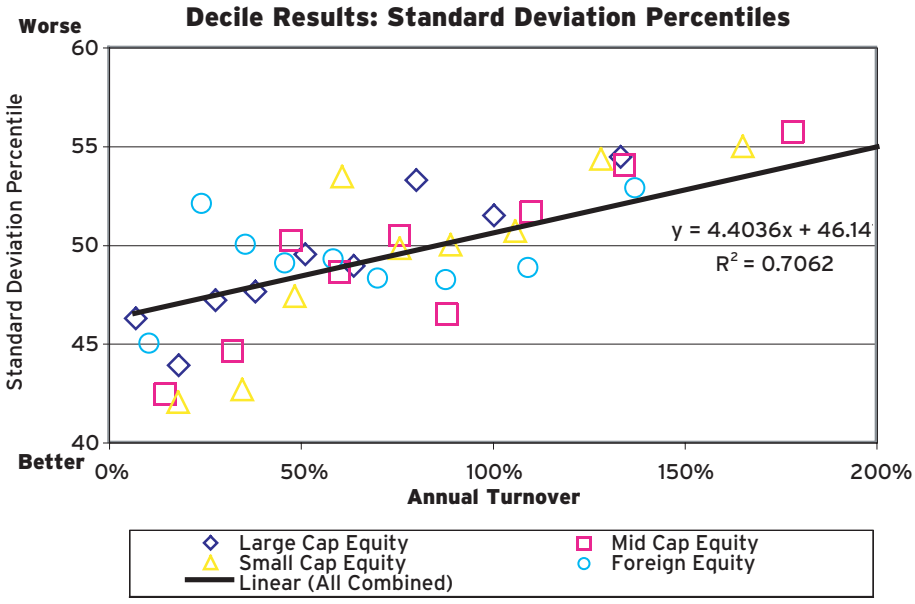
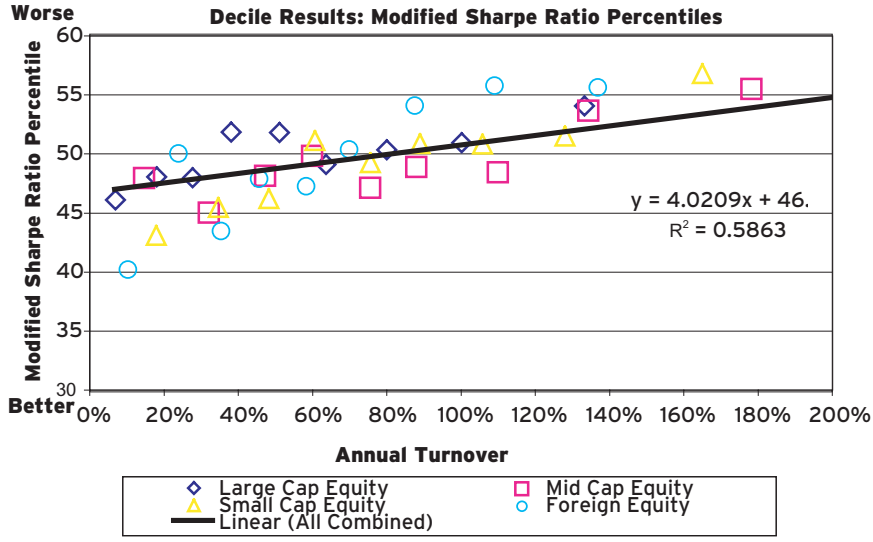


Figure 4



Sharpe Ratio Percentile Results

Figure 4 contains the Modified Sharpe Ratio results for each of the four test groups for each decile. Similar to the standard deviation results, these results are included on a percentile basis, where one is considered the best and 100 the worst. Below the chart is a table that lists the linear best fit trendlines, coefficient of determination (R^2), and the slopes of the best fit trendline for each of the groups tested. The exact figures are included in Figure 5.

As can be expected, since both outperformance and risk (as defined by standard deviation) were better for funds with lower turnover, those funds which tended to have lower turnover, had higher Modified Sharpe Ratios than those funds with higher turnover. Again, the slope (i.e., the impact of turnover) increased for smaller capitalization levels. While Bauman, Miller, and Veit contend that higher turnover can lead to higher risk-adjusted performance, the research conducted for this paper suggests this is not the case.

Conclusion

Investors who ignore the implications of turnover when selecting investments do so at their own risk. The research conducted for this paper suggests that portfolio turnover has a notable impact on performance, risk and risk-adjusted performance. Investments with higher turnover rates have lower returns and higher risk than those funds with lower turnover rates. Each 100 percent of turnover reduces (pre-tax) performance for Large-Cap equity, Mid-Cap equity, Smal-Cap equity, and International equity by 19 bps, 45 bps, 80 bps, and 98 bps, respectively. The average turnover loss for all categories was 48 basis points for each 100 percent of turnover. Including the tax impact of turnover for taxable investors would further increase the net cost of turnover on investor wealth.

Endnotes

[1] This figure is based upon a variety of sources. First, according to the 2006 ICI Factbook, the average broad redemption rate for long-term equity mutual funds from 1985-2005 implies a holding period of 2.78 years. Second, DALBAR's *Quantitative Analysis of Investor Behavior* (2003) found the average holding period for equity mutual fund shareholders was just 29.5 months, or 2.48 years. Third, a report by the Financial Research Corporation found the average holding period for a mutual fund to be 2.4 years. Finally, John Bogle references the three-year figure in a piece for the *Financial Analysts Journal*. (2005).

[2] The traditional Sharpe Ratio is calculated as follows: Return (Ret)—Risk Free (RF)/Standard Deviation (Std Dev). The Modified Sharpe Ratio is calculated as: (Ret-RF)/(Std Dev) ^ ((ABS(Ret-RF))/(Ret-RF)). It is important to use Modified Sharpe Ratio when performance is negative. To see why, assume you have two investments: Fund A and Fund B. Fund A has a return of -4 percent and a standard deviation of 4 percent, while Fund B has a return of -8 percent and standard deviation of 8 percent. Fund A is clearly the more optimal investment (higher return and lower standard deviation); however, assuming a risk-free rate of 4 percent, the traditional Sharpe Ratio calculation would for Fund A be -0.02, compared to -0.01 for Fund B. Therefore, based upon the traditional Sharpe Ratio, Fund B would be considered better than Fund A. However, using the Modified Sharpe Ratio calculation, the Sharpe Ratio for Fund A is -0.0032, compared to -0.0096 for Fund B, which correctly reflects the fact that Fund A outperformed Fund B.

[3] Morningstar changed its Foreign Stock asset category in the third quarter of 2003, subdividing the Foreign Stock category into Value Blend, and Growth. For the 2003 test group (since funds that drifted three quarters previous to classification were removed), as long as a fund is characterized as Foreign Stock for the first two quarters, it is not considered to have drifted for the calendar year.

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Appendix

Figure 5

Large Cap Equity					Mid-Cap Equity				
Decile	Turnover	Outperf	Std Dev Percentile	Sharpe Percentile	Decile	Turnover	Outperf	Std Dev Percentile	Sharpe Percentile
1	7.11%	0.59%	46.26	46.04	1	14.65%	0.79%	42.46	47.94
2	18.31%	0.20%	43.88	47.97	2	32.14%	0.64%	44.66	45.04
3	27.91%	0.22%	47.18	47.89	3	47.28%	0.21%	50.25	48.13
4	38.31%	0.24%	47.62	51.78	4	59.97%	-0.23%	48.67	49.84
5	51.31%	-0.12%	49.50	51.74	5	75.59%	0.53%	50.51	47.11
6	63.93%	0.01%	48.90	49.05	6	88.02%	-0.22%	46.51	48.90
7	80.24%	-0.21%	53.25	50.26	7	109.94%	0.27%	51.68	48.43
8	100.44%	-0.24%	51.47	50.87	8	134.31%	-0.81%	54.04	53.66
9	133.45%	-0.46%	54.44	53.98	9	178.23%	-0.60%	55.74	55.48
10	356.26%	-0.29%	58.72	52.40	10	384.11%	-0.97%	60.36	60.41
Small-Cap Equity					**Foreign Equity**				
Decile	Turnover	Outperf	Std Dev Percentile	Sharpe Percentile	Decile	Turnover	Outperf	Std Dev Percentile	Sharpe Percentile
1	18.20%	0.98%	42.02	43.04	1	10.28%	1.04%	45.06	40.20
2	34.89%	0.87%	42.65	45.40	2	23.93%	-0.06%	52.14	50.04
3	48.49%	0.53%	47.37	46.14	3	35.33%	0.94%	50.06	43.49
4	60.94%	0.13%	53.44	51.07	4	45.64%	0.52%	49.13	47.91
5	75.85%	0.34%	49.80	49.17	5	58.29%	0.47%	49.31	47.26
6	89.18%	-0.31%	50.00	50.81	6	69.87%	-0.14%	48.35	50.39
7	105.97%	-0.01%	50.68	50.75	7	87.52%	-0.69%	48.28	54.10
8	128.27%	0.14%	54.32	51.44	8	109.07%	-0.54%	48.89	55.81
9	165.25%	-1.63%	54.98	56.72	9	136.87%	-0.71%	52.92	55.63
10	310.25%	-1.16%	58.66	60.22	10	212.22%	-0.97%	60.04	60.93