

Corporate Longevity

Index Turnover and Corporate Performance

February 7, 2017

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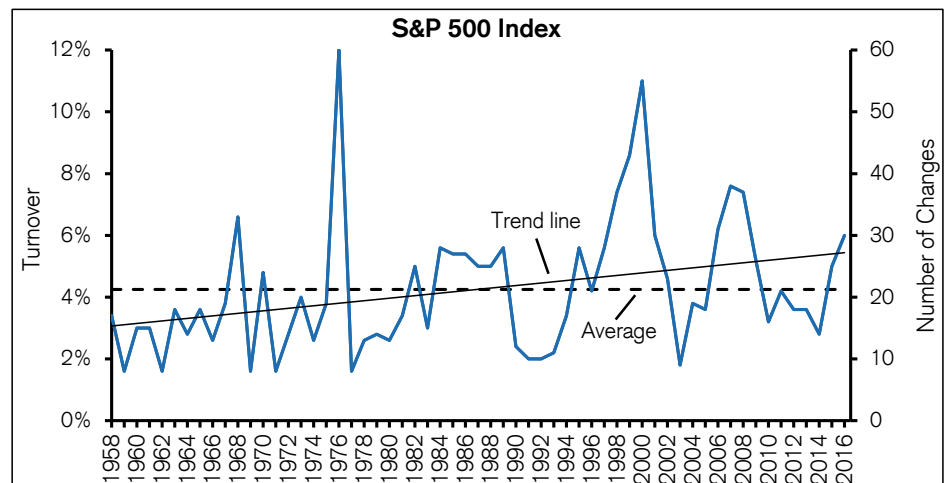
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Source: Jeremy Siegel and Credit Suisse.

Firms follow an “inexorable and irreversible movement towards the equilibrium of death.”

Kenneth Boulding¹

- Corporate longevity is an important consideration for investors as they assess valuation, position sizing within a portfolio, and the magnitude of sustainable competitive advantage.
- Turnover in the S&P 500 Index, a proxy for longevity, correlates to an index of innovation reasonably well but correlates to M&A activity even better.
- The trend for turnover in the S&P 500 and Fortune 500 is rising, but not dramatically. That turnover comes in waves better describes the data.
- Investors who compare their results to a benchmark need to appreciate how that benchmark changes. While most investors consider index funds to be passive, the indexes themselves vary quite a bit over time.
- The average total shareholder returns over the following year for the companies the committee removed from the S&P 500 but that continued to trade trounced those of the companies the committee added. The committee sells low and buys high.

Introduction

Clark Kerr, the former president of the University of California, noted that of the Western institutions established by 1520, only 85 existed almost a half millennium later. These include the Roman Catholic Church, the British Parliament, several Swiss cantons, and 70 universities. Each of these institutions represents a group of people who come together for a common purpose. Few companies, however, live a long time and those that do are generally in the beverage or hospitality business.² Why do cities and universities grow old and companies die young? Further, is the rate of corporate longevity shrinking, stable, or expanding?

Corporate longevity is relevant for investors for a number of reasons. First, researchers frequently use longevity as a proxy for the rate of innovation. Short corporate lives are associated with rapid innovation or what the economist Joseph Schumpeter called the “perennial gale of creative destruction.”³ Corporate lives are more fleeting if innovation is accelerating, which has implications for portfolio construction and the pattern of value creation. We will show that while there is a link between innovation and longevity, the level of mergers and acquisitions (M&A) explains longevity even better than innovation does.

Longevity also plays an important role in determining the size of the investable universe. The population of public companies rises with spin-offs and initial public offerings (IPOs) and falls with M&A and delistings as the result of bankruptcy. Because M&A has exceeded IPOs in the last two decades, the population of listed companies in the U.S. has dropped to levels last seen in the 1970s.

Finally, investors generally measure the returns for active money managers versus a benchmark index. These indexes change their composition as index committees add and subtract companies. Comparing the results of an active investment manager to a benchmark index makes sense because investors consider the returns of an index fund as an opportunity cost. Just as companies must earn a return on investment in excess of the opportunity cost of capital to create value, investment managers must beat their benchmark to add value.

There is a general sense that the rate of change is accelerating and that corporate longevity is shrinking. This assertion appears frequently in the business press. Our research shows a more nuanced picture. Indeed, a common measure of corporate longevity, turnover of the companies in the S&P 500, shows that longevity has lengthened in recent years. Here is a summary of the research:

Exhibit 1: Studies on Corporate Survival

Study	Sample	Survival
CS Global Financial Strategies	S&P 500	Implied survival of 24 years (1958-2016)
CS Global Financial Strategies	Fortune 500	Implied survival of 16 years (1955-2015)
Stangler and Arbesman	Fortune 500	Implied survival of 16 years (1955-2011)
Daepf, Hamilton, West, and Bettencourt	North American public companies	Typical half-life of 10 years, regardless of age or business sector (1975-2009)
CS HOLT	Global public companies with \$250M-plus market cap	Roughly one half survive 10 years (1965-2015)
U.S. Census	All U.S. establishments	Survival of roughly 75 percent for 1 year and 50 percent for 5 years (1977-2014)
Dunne, Roberts, and Samuelson	More than 250,000 U.S. manufacturing firms	Survival of roughly 65 percent for 5 years and 20 percent for 10 years (1963-1982)

Source: Credit Suisse. See endnotes for full list of sources.

The S&P 500 had a market capitalization of \$20.6 trillion as of January 31, 2017, which represents about 80 percent of the available U.S. market capitalization. The S&P 500 is a good proxy for the overall market because of its size.⁴ More than \$7.8 trillion worth of mutual funds are benchmarked to the S&P 500, with index assets making up 28 percent of that amount.⁵ Almost one-half of all actively-managed U.S. equity mutual funds, which control about 60 percent of total assets under management, use the S&P 500 as a benchmark.⁶

We examine the turnover in the composition of the S&P 500 to understand the causal drivers of additions and removals. We consider whether turnover in the S&P 500 is a reasonable proxy for innovation in light of these results. While we see an association between S&P 500 turnover and an index of innovation, M&A appears to have a larger influence on the changes than the innovation index does.

While researchers have analyzed the pattern of entry and exit, we go beyond this and analyze the characteristics of the companies coming and going. Specifically, we examine the total shareholder returns (TSR) for the three years before and the three years after a company is added to, or dropped from, the S&P 500. We also look at the cash flow return on investment (CFROI[®]) for the same population to gauge the quality of the businesses.

We find that the companies the committee adds to the S&P 500 have trailing TSRs and CFROIs that are above average. The companies the committee removes fall into one of two camps. Those that exit as the result of M&A have strong past TSRs and high CFROIs. Those that exit as the result of failure, or other factors, have weak TSRs and low CFROIs.

One intriguing finding is that in the 12 months following an action, the companies the committee removes from the S&P 500 but that continue to trade vastly outperform the companies the committee adds. This is consistent with regression toward the mean. The committee generally adds companies that have done well and have high embedded expectations, and removes companies that have done poorly and have low expectations. The stocks with low expectations go on to outperform the stocks with high expectations.

The population of the S&P 500, while economically large and significant, only represents a fraction of the broader economy. As a result, we also examine the Fortune 500 to see whether the turnover of the S&P 500 is consistent with that of other big companies. The Fortune 500 is a list of the largest companies in the U.S. measured by revenue. It includes private companies for which there are data. We also look at longevity for smaller companies via academic research and data from the U.S. Census Bureau.

The rate of change we see for the Fortune 500 is generally consistent with that of the S&P 500. For small companies, the entry rate is approximately 12-14 percent per year and the exit rate is about 10-12 percent. This means that for an economy that starts with 100 companies, around 12-14 new companies will enter each year and 10-12 will leave. The result is modest growth in the number of companies. There is substantial birth and death among young companies.

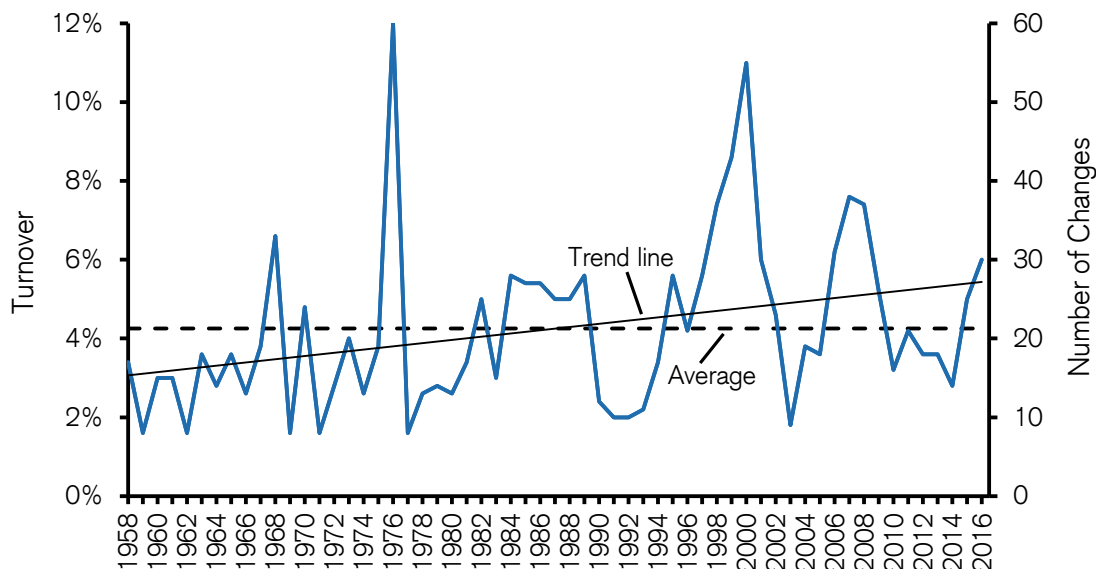
* CFROI[®] is a registered trademark in the United States and other countries (excluding the United Kingdom) of Credit Suisse Group AG or its affiliates.

The main question is, “Why do companies die?” Some die because of obsolescence, but most depart gracefully through M&A. The companies that the S&P 500 committee discards that continue to trade appear to present a small, but lucrative, investment opportunity.

What Causes S&P 500 Turnover?

Exhibit 2 shows the turnover in the constituents of the S&P 500 Index from 1958 to 2016. We use data from FactSet for 1991 through 2016 and from Jeremy Siegel, a professor of finance at the Wharton School of the University of Pennsylvania, for the prior years.⁷ Over this span, the average annual turnover rate was 4.2 percent, which means there were approximately 20 changes per year. The removal of one company and the addition of its replacement constitute one change. Appendix A explains how we track deletions and additions.

Exhibit 2: Turnover in the S&P 500 Index, 1958-2016



Source: 1958-1990: Jeremy Siegel, “Long-Term Returns on the Original S&P 500 Companies,” *Financial Analysts Journal*, Vol. 62, No. 1, January/February 2006, 18-31; 1991-2016: FactSet, S&P Dow Jones Indices, Credit Suisse.

The trend line in the annual turnover rate rises gently from the late 1950s and early 1960s, when the rate of change was a modest 3 percent, to an average turnover rate of about 4 percent over the past 5 years. Perhaps the most striking feature of exhibit 1 is that the turnover rate can swing wildly from year to year. For example, the annual turnover rate was as low as 2 percent and as high as 11 percent from 1991 through 2016.

What is the source of turnover? The high turnover in some periods, such as the dot-com bubble in the late 1990s or the financial crisis in 2008-2009, makes sense and may be indicative of changes in the underlying economy. But in most instances, the turnover tells us little about creative destruction.⁸

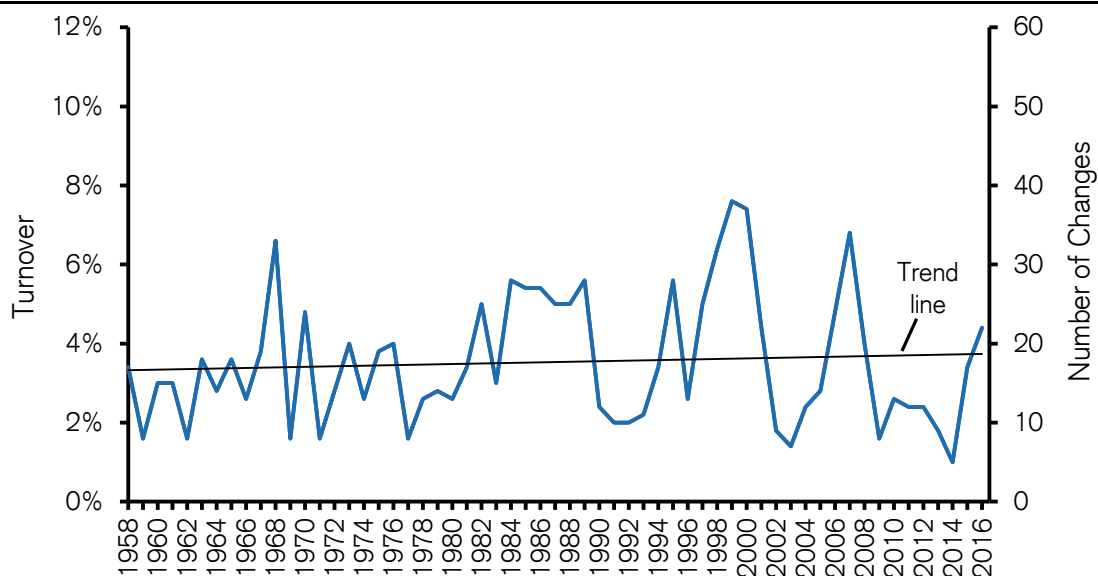
For instance, the huge spike in 1976 turnover was the result of the S&P committee removing 40 industrial, transportation, and utility companies and replacing them with financial stocks. Starting around 1996, the S&P committee started to manage the index more actively. Through much of the index’s history, the committee only modified the list of companies when it had to remove a stock for reasons including bankruptcy or acquisition. But over the past 20 years, the committee has been more proactive in removing firms that fail to effectively represent the industry in which they compete, or that fail to characterize the U.S. market.⁹

As a case in point, the index committee removed 7 companies in 2002 due to their “lack of representation.” This distinction most commonly refers to companies with market capitalizations at the low end of range for the index. In that same year, the committee replaced 7 non-U.S. companies because they failed to meet the selection criteria at that time. This is despite the fact that some of the companies had been in the index and its predecessors for 60 years. Without the change in methodology, 14 of the 23 total changes in 2002 would have been unlikely.

This example reveals that the S&P committee’s more active approach to managing the index explains about one-third of the turnover over the past 20 years. Exhibit 3 shows the hypothetical turnover for the S&P 500 assuming the S&P committee managed the index from 1996 to 2016 in the same way as it did from 1958 to 1995. We assume the committee would not have removed companies for “lack of representation,” low market capitalizations, failing to meet certain profit criteria, or being domiciled outside the U.S. We also exclude the 40 changes in 1976 that were purely to change the industry makeup of the index.

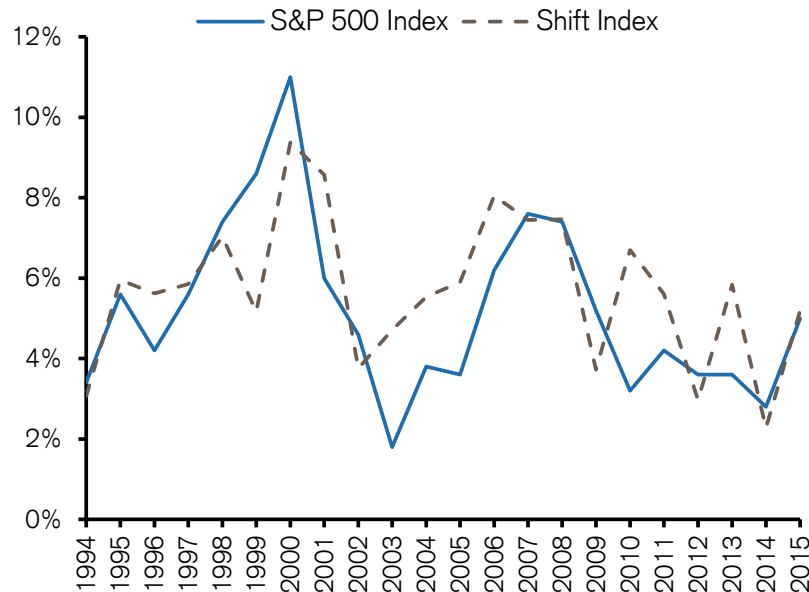
Without these changes, the gentle rise in turnover in exhibit 2 gives way to a nearly flat trend line. So what looks like evidence of creative destruction at first glance may simply be more proactive index management.

Exhibit 3: Hypothetical Turnover in the S&P 500 Index, 1958-2016



Source: Credit Suisse.

The change in the S&P committee’s approach to managing the index reveals the limitation of using turnover as a simple proxy for innovation. Yet there is a good fit between “The Shift Index,” a measure of innovation developed by consultants at Deloitte, and turnover in the S&P 500. Exhibit 4 shows the correlation between the change in the Shift Index and the turnover in the S&P 500 from 1994 through 2015. The correlation coefficient (r) is 0.65. The Shift Index has three component indexes. The “foundation index” captures public policy, infrastructure penetration, and technology performance. The “flow index” reflects virtual and physical flows, as well as amplifiers such as social media. The “impact index” takes into consideration markets, firms, and people. The Shift Index combines these components in an attempt to quantify economic change.¹⁰

Exhibit 4: The Shift Index and Turnover in the S&P 500 Index, 1994-2015

Source: Deloitte analysis (see: https://dupress.deloitte.com/content/dam/dup-us-en/articles/3407_2016-Shift-Index/DUP_2016-Shift-Index.pdf); FactSet; S&P Dow Jones Indices; Credit Suisse.

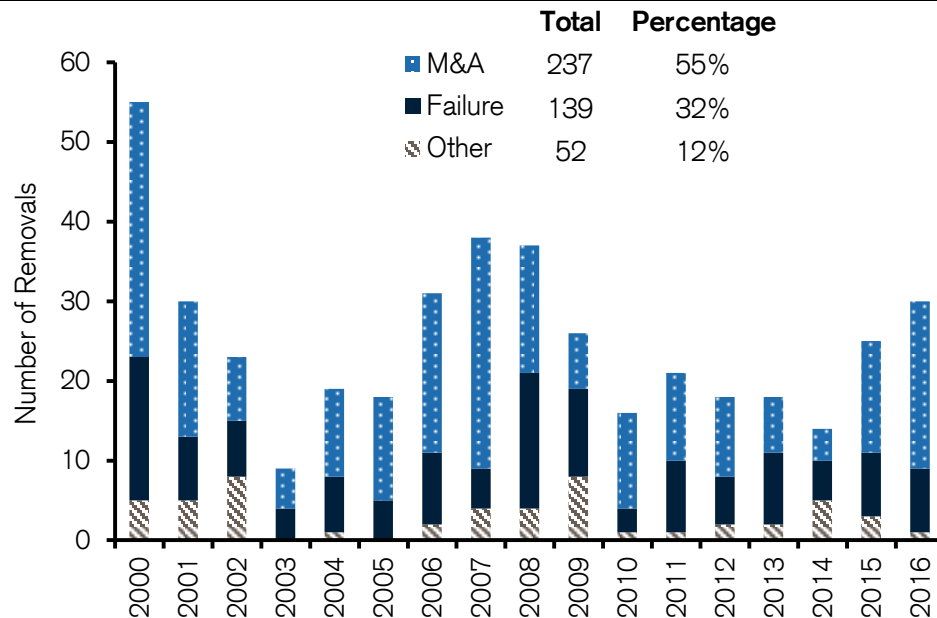
The question is whether anything explains turnover better than the Shift Index. To answer this, we examine why the committee removed stocks from the S&P 500. Appendix B provides a detailed discussion of the basis for additions to, and removals from, the index. Additions must meet specific criteria, but the committee has a fair amount of discretion in the decision to remove a company.

The grounds for removal fall into one of three categories: “M&A,” “Failure,” and “Other.” M&A includes mergers, acquisitions, and companies that go private. We exclude other strategic deals such as spin-offs to shareholders or other forms of dividing a company.

Failure primarily includes companies the committee dropped from the index following a bankruptcy filing or for failure to maintain a sufficient market capitalization.¹⁰

“Other” consists mostly of two groups. First are companies that realized a large decline in market capitalization for reasons unrelated to performance, including special dividends or spin-offs. Second are companies that the committee eliminated for having a domicile outside the U.S.

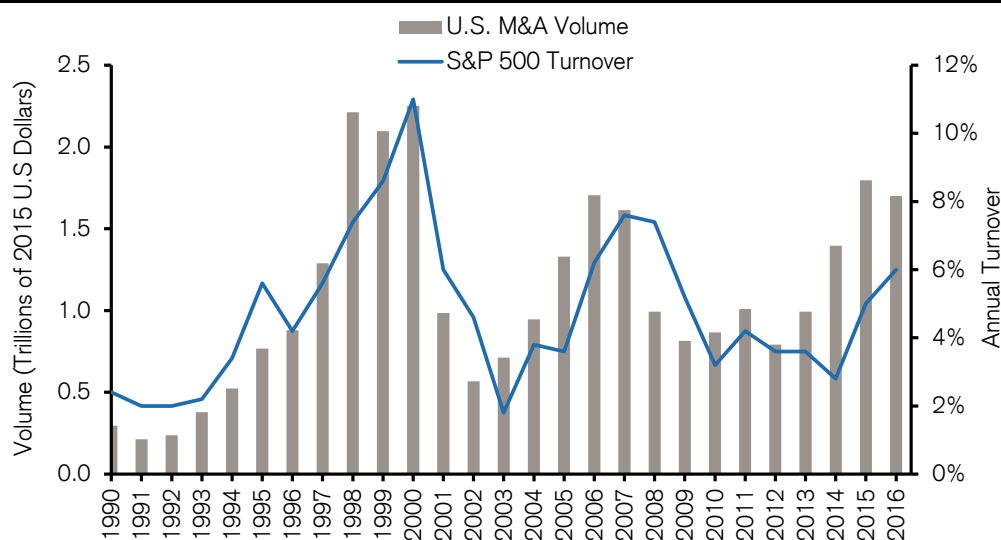
For 2000 through 2016, we categorize each removal from the index based on the information that S&P provides. This reveals that M&A, not failures, drives the majority of turnover in the index. Exhibit 5 shows that more than half the removals are the result of M&A, while only one-third are from failure. The other category is just over one-tenth of the sample. Most failures are the consequence of a decline in market capitalization, not bankruptcy. See Appendix C for a full log of these changes and the reasons for each removal.

Exhibit 5: Reasons for Removal from the S&P 500 Index, 2000-2016

Source: FactSet; S&P Dow Jones Indices; Credit Suisse.

Exhibit 6 compares U.S. M&A volume to index turnover from 1990 to 2016. There is a strong relationship between the two, with a correlation coefficient (r) of 0.79. We see that index turnover over the last 27 years peaks at the same time as M&A peaks in the late 1990s, again crests around the M&A wave in the mid-2000s, and accelerates in recent years alongside resurgent M&A.

An extensive body of research links M&A activity to a wide variety of factors, including stock prices, business sentiment, financing costs, tax rates, industry shocks, and even behavioral pressures on management teams.¹¹ While the rate of innovation certainly plays a role in M&A as well, it appears to be one among a handful of essential drivers.

Exhibit 6: S&P 500 Turnover and U.S. M&A Volume, 1990-2016

Source: Thomson Reuters; S&P Dow Jones Indices; Credit Suisse.

These categories reveal the limitations of simply associating turnover with creative destruction. For example, it is inaccurate to say that a company “failed” if the S&P committee removed it following a divestiture that shrunk the company’s market capitalization below a threshold level. Likewise, it is hard to say that creative destruction was the reason the committee removed a company after it was acquired for its strong growth and profitability.

The Characteristics of Companies Added to, and Removed from, the S&P 500

The next step of our study was an analysis of the characteristics of the companies the committee added and removed from the S&P 500 Index. We focused on two measures. The first is three- and one-year total shareholder return (TSR), relative to the S&P 500, before the change and one and three years following the change. TSR is the return an investor earns for a stock given the change in price and assuming that all dividends are reinvested.

The second measure is the three- and one-year cash flow return on investment (CFROI) before the change and one and three years following the change. CFROI is a measure of the return a company earns on the cash it invests in its business. Because CFROI is adjusted for inflation, you can compare it over time without fear of distortion. Appendix D provides detail on the sample sizes of the various categories.

Exhibit 7 summarizes our observations about TSR.¹² The S&P committee tends to add companies that have realized strong past stock returns. The companies added from 2000-2016 had an average relative TSR of 23 percent per year for the 3 years before inclusion, and 41 percent for the year prior to inclusion. The median returns, while more modest, are similarly high. The committee’s behavior is consistent with other investors: They buy high.¹³

Exhibit 7: Trailing and Future TSRs for Additions and Removals from the S&P 500, 2000-2016

		TSR Relative to S&P 500			
		-3 Year CAGR	-1 Year	+1 Year	+3 Year CAGR
Mean	Added	23%	41%	-2%	-3%
	Removed	-9%	3%	28%	3%
Median	Added	16%	26%	-3%	0%
	Removed	-5%	7%	4%	2%

Source: FactSet and S&P Dow Jones Indices.

The companies the committee removed had three-year returns that lagged the S&P 500 and one-year returns that were essentially equal to the index. Naturally, the TSRs reflect the reason the committee had to drop a company. (See exhibit 8.) For example, the companies that left as the result of M&A had average relative returns of 4 percent per year for three years and 28 percent for one year.

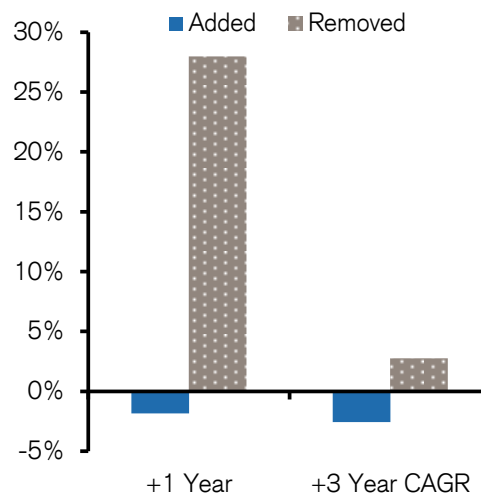
Companies that failed fared poorly prior to exclusion. Those companies had average relative TSRs of -32 percent per year for three years and -41 percent for one year. Companies that left the index for other reasons had returns roughly in line with that of the S&P 500. For each type, the median returns prior to removal are similar to those for the mean. Companies that were acquired had excellent relative TSRs, those that failed had poor TSRs, and the other companies performed about in line with the market.

Exhibit 8: Trailing and Future TSRs for Types of Removals from the S&P 500, 2000-2016

		TSR Relative to S&P 500			
		-3 Year CAGR	-1 Year	+1 Year	+3 Year CAGR
Mean	M&A	4%	28%		
	Failure	-32%	-41%	33%	3%
	Other	-4%	3%	20%	2%
	Universe	-9%	3%	28%	3%
Median	M&A	4%	25%		
	Failure	-30%	-48%	2%	2%
	Other	-3%	1%	8%	1%
	Universe	-5%	7%	4%	2%

Source: FactSet and S&P Dow Jones Indices.

However, the past is not prologue. Exhibit 9 shows that the average TSRs over the following year for the companies the committee removed but that continued to trade trounced those of the companies the committee added.¹⁴ One year after a change, the average relative TSR for the companies the committee added was -2 percent while the relative TSR for the companies removed was 28 percent. Despite the sharp divergence in the first year, the disparity does contract over three years. These results are consistent with prior research examining changes to the S&P 500 and Dow Jones Industrial Average.¹⁵ The S&P 500 Index committee buys high and sells low.

Exhibit 9: Relative TSRs Following Addition and Removal from the S&P 500, 2000-2016

Source: FactSet and S&P Dow Jones Indices.

Exhibit 10 shows the results for CFROI. The committee adds companies to the S&P 500 that have CFROIs well above the average. For the three years prior to addition these companies have an average CFROI of 15 percent, while the CFROI is an even higher 16 percent for the year prior to addition. These figures compare to an average CFROI of 9.2 percent for all U.S. companies during that period. The S&P 500 committee adds companies that have stock market returns and quality that are well above average.

The CFROIs of the deleted companies are the mirror image: They are below average. The mean CFROI for the three years prior to removal was 10 percent, and the CFROI in the year before removal was an even lower 8 percent. But, the average CFROIs for the removed companies belie the results based on why they were removed.

Exhibit 10: Trailing and Future CFROIs for Additions and Removals from the S&P 500, 2000-2016

		CFROI			
		-3 Year Avg	-1 Year	+1 Year	+3 Year Avg
Mean	Added	15%	16%	16%	15%
	Removed	10%	8%	1%	2%
Median	Added	12%	13%	13%	13%
	Removed	9%	8%	5%	5%

Source: FactSet; S&P Dow Jones Indices; Credit Suisse HOLT®.

Companies removed as the result of M&A had trailing three-year average CFROIs above the rest of the market. (See exhibit 11.) This is consistent with prior research that suggests firms with large free cash flows are attractive takeover targets.¹⁶ Companies removed because of failure had CFROIs below the average. The CFROIs for these companies in the one year and three years following removal, at around five percent (medians), are subpar businesses.

Exhibit 11: Trailing and Future CFROIs for Removals from the S&P 500, 2000-2016

		CFROI			
		-3 Year Avg	-1 Year	+1 Year	+3 Year Avg
Mean	M&A	12%	11%		
	Failure	7%	3%	-3%	1%
	Other	9%	9%	5%	4%
	Universe	10%	8%	1%	2%
Median	M&A	9%	9%		
	Failure	7%	6%	5%	5%
	Other	10%	10%	6%	4%
	Universe	9%	8%	5%	5%

Source: FactSet; S&P Dow Jones Indices; Credit Suisse HOLT®.

The S&P 500 committee adds stocks of companies that have achieved good recent TSRs and that are of above-average quality. Those companies continue to earn high CFROIs, but their stocks, on average, generate TSRs roughly in line with the market in the one and three years following addition.

There are two tales for the companies that the committee removes. The stocks of companies that are involved in M&A, which is a majority of removals, have TSRs and CFROIs that are well above the market prior to leaving the S&P.

The stocks of the companies categorized as failures, slightly below one-third of our sample, have abysmal TSRs prior to removal but superb TSRs after removal. The quality of these businesses, as measured by CFROI, is substandard throughout the period we measure.

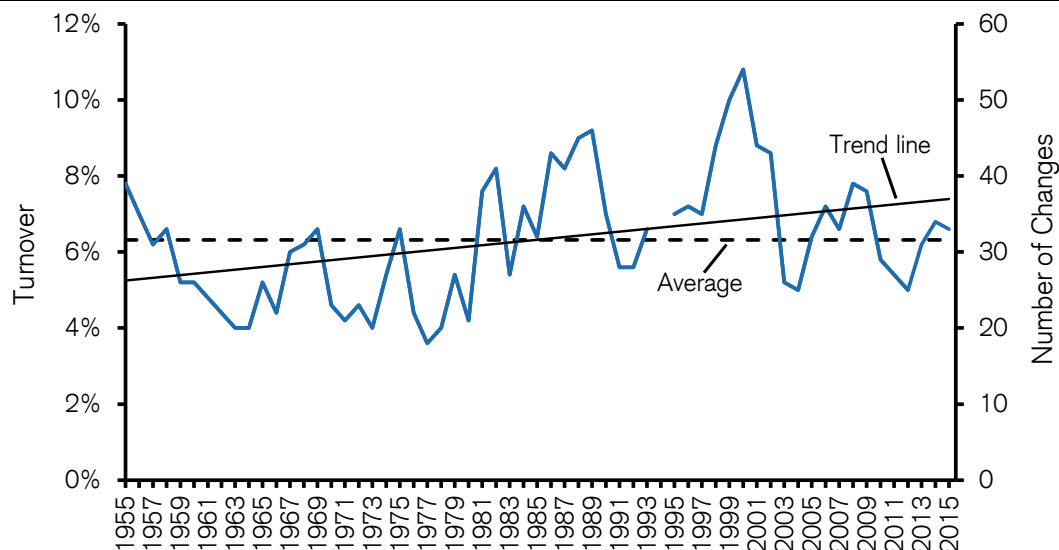
The stocks of the smallest group, companies categorized as “other,” have average quality prior to removal and earn TSRs roughly equivalent to that of the market before removal and better than the market after removal.

Evidence from the Fortune 500 Corroborates the S&P Experience

The S&P 500 includes many large companies in the United States and accurately reflects the broad stock market. To expand our analysis of longevity, we also examined the changes in the Fortune 500 over time. Published annually by *Fortune* magazine, the list includes the 500 largest U.S. companies ranked by revenues. Because it includes public, private, and mutual insurance companies, the Fortune 500 is a more complete list of America's largest companies.¹⁷ We estimate that roughly 315 companies are in both the S&P 500 and the Fortune 500.

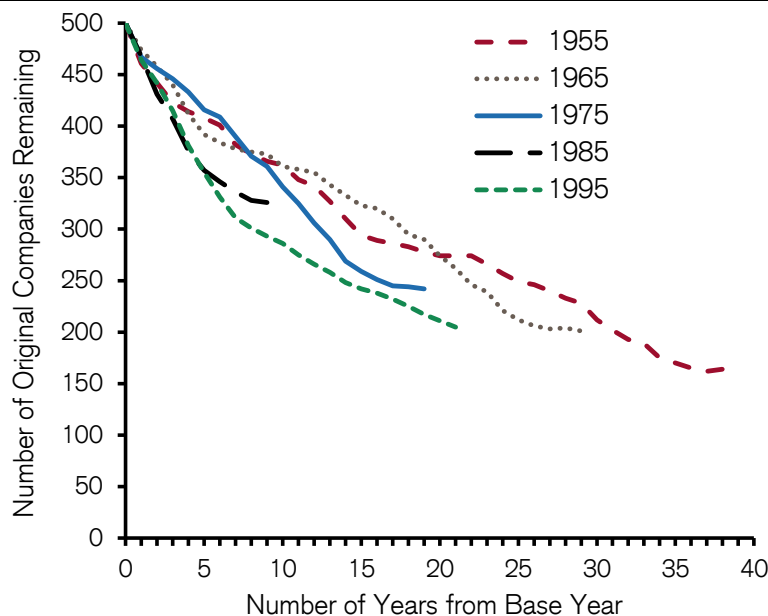
Exhibit 12 shows annual turnover in the Fortune 500 since 1955, the year *Fortune* first published the list. We see a pattern of turnover that is consistent with that of the S&P 500. On average, there are 32 changes per year, representing turnover of roughly 6 percent, above the S&P 500 at about 4 percent. Similar to the S&P 500, we see evidence of a modest rise in turnover. But the trend is down over the past 30 years.

Exhibit 12: Fortune 500 Turnover



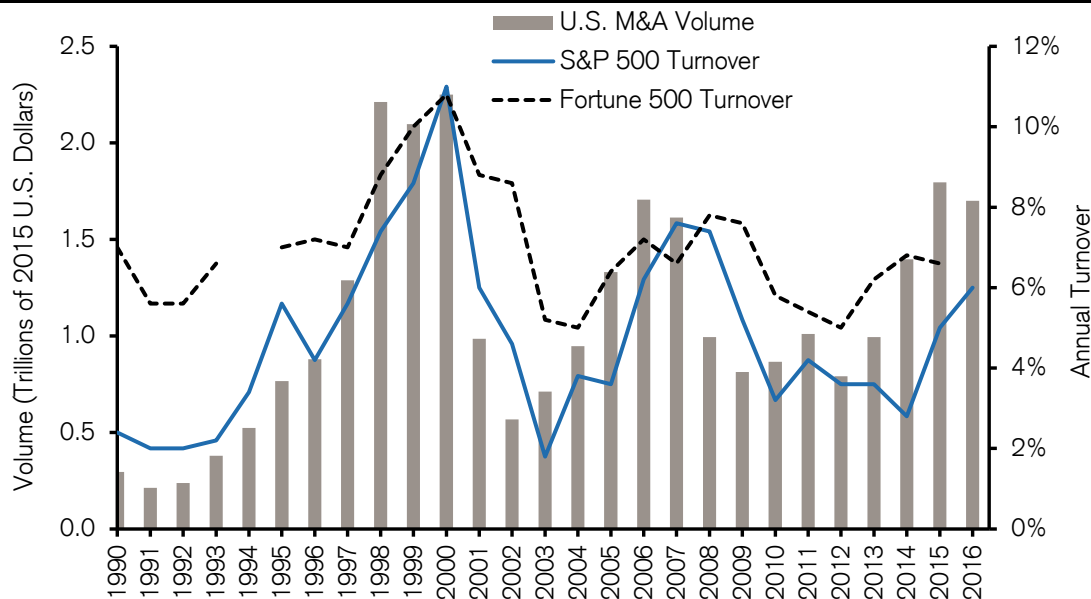
Source: Fortune and Credit Suisse.

Exhibit 13 presents another view of longevity for the companies on the list.¹⁸ We select five starting years—1955, 1965, 1975, 1985, and 1995—and track what number of the original 500 companies for those years remain on the list annually for subsequent years.¹⁹ For example, 362 of 500 companies on the 1955 list remained there 10 years later. After 15 years, only 294 of the 500 were still on the list. After 35 years, just 170 of the 500 made the list. The steeper the slope of the line's decline, the more rapidly companies disappear from the list. The lines that start at more recent dates do appear to drop faster, showing that there is indeed acceleration in turnover for the Fortune 500. It's harder to remain among the ranks of the largest companies today than it was in past generations.

Exhibit 13: Fortune 500 Longevity

Source: Fortune and Credit Suisse.

Exhibit 14 shows that Fortune 500 turnover, similar to S&P 500 turnover, tracks the M&A cycle closely. However, the correlation is not as high for the Fortune 500 as it is for the S&P 500. Since 1990, the annual turnover for the Fortune 500 had a correlation (r) to U.S. M&A volume of 0.58, which compares to 0.79 for S&P 500 turnover.

Exhibit 14: Turnover for the Fortune 500 and S&P 500 and U.S. M&A Volume

Source: Fortune; Thomson Reuters; S&P Dow Jones Indices; Credit Suisse.

Broadening the Sample—From Big to Small

We have focused on big corporations because they reflect the overall economy and represent a large fraction of the investable universe. Investors focus on those companies with good reason. In the U.S. today, there are 5.1 million total firms and only roughly 4,400 stocks trade on major exchanges.²¹

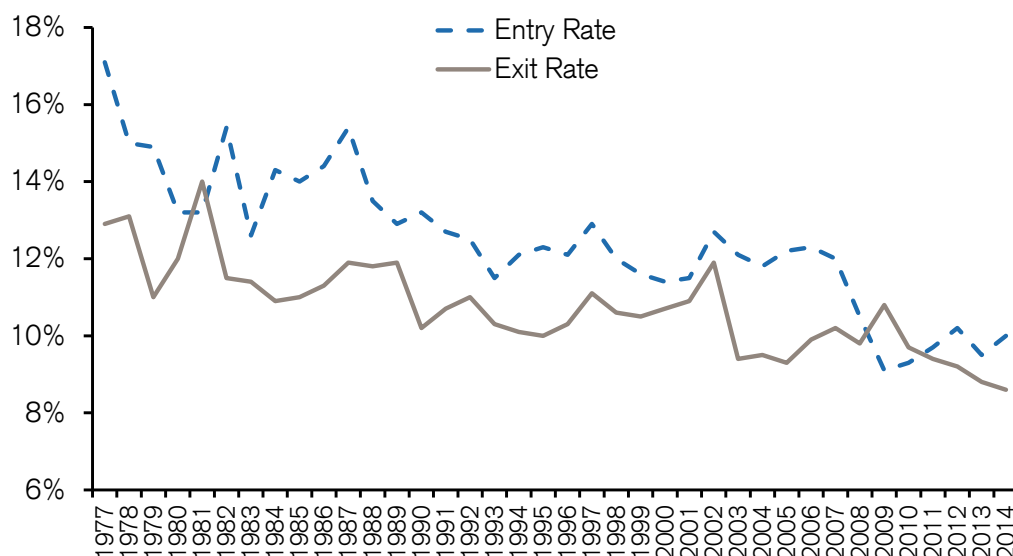
Timothy Dunne, Mark Roberts, and Larry Samuelson, a trio of economists, did a sweeping study of corporate longevity, including entry and exit rates. Their analysis of more than 250,000 U.S. manufacturing firms showed that roughly 35 percent of firms that enter an industry exit within 5 years, and that about 80 percent of entrants exit within 10 years.²²

Exhibit 15 shows the rate of entry and exit for U.S. establishments across all industries from 1977-2014, using the U.S. Census's Business Dynamics Statistics (BDS). Most studies on corporate demography use establishments, a rough proxy for firms, as the unit of analysis because that is the way the Census Bureau collects and reports the data.

A useful way to think about entry and exit is to imagine an industry with 100 firms today. Based on the average annual rates over the past decade, roughly 12-14 new firms will enter the industry and 10-12 firms will leave in one year. This leads to modest growth in the total number of firms on average. Because entry rates typically exceed exit rates, the number of establishments in the U.S. increases over time.

The most recent data disclosed by the BDS show that approximately 25 percent of establishments fail within the first year and just over one-half fail within five years.²³ Mortality rates are high for young companies and decline for companies that reach adolescence.

Exhibit 15: Establishment Entry and Exit Rates, 1977-2014 (United States)



Source: U.S. Census Bureau; Center for Economic Studies; Business Dynamics Statistics; Credit Suisse.

Why Companies Die (and Cities and Universities Live)

Imagine an ant colony with a nearby source of food. Foragers find the food source and use chemical signals to tell the other ants where to go to find the food. Call this exploitation. But some ants leave the chemical trail and wander around seemingly aimlessly. Call this exploration. Why would an ant ever leave the main trail to the food? If another rich food source appears, the colony wants to have a mechanism to find it. Ant colonies balance exploitation with exploration. But it gets even better: The rate of exploration is roughly correlated with the rate of change in the environment.

Our speculation is that a similar model can help explain why companies die. Successful companies generally have a core source of profits. For many reasons, corporate leaders tend to dedicate too many resources to exploitation of profits and not enough to exploration. Commonly, exploration requires a different structure than exploitation, causing companies to stumble. The best companies are those that can skillfully balance exploitation and exploration.²⁴

By contrast, cities and universities have less pressure to optimize, and hence are more capable of evolving and skirting failure. From a societal point of view, the rise and fall of individual companies may be healthy. But for an individual who is involved with a company on the decline, the pain is real.

Conclusion

Corporate longevity is important for investors for a handful of reasons. First, if longevity is contracting then investors need to rethink valuation, position sizing within a portfolio, and the magnitude of sustainable competitive advantage. Our analysis shows that while turnover in the S&P 500, a proxy for longevity, is reasonably well correlated to an index of innovation, the turnover is even better correlated to M&A activity. That innovation and M&A are linked makes sense, but we also know that other factors, including capital availability, stock prices, and the institutional imperative, influence M&A waves.

On balance, turnover for the S&P 500 and Fortune 500 is rising, but not at a dramatic rate. A better description is that turnover comes in waves. Further, changes in criteria contaminate the turnover results.

Another reason that investors need to understand longevity is to assess the risk of failure for stocks within their portfolio. This is especially pertinent for investors in value and small capitalization stocks. About one-third of the removals from the S&P 500 over time have been companies we categorize as failures. These companies have poor TSRs and below-average CFROIs. Since these stocks are often inexpensive, they can represent value traps. The data also show that young companies, which are generally small and private, tend to have a higher mortality rate than companies that make it to adolescence.

Finally, investors who have their results compared to a benchmark need to appreciate how that benchmark changes. While most investors consider index funds to be passive, the indexes themselves change quite a bit over time. Note that the S&P beats roughly 60 percent of active managers in an average year and does so without any trading, macro forecasting, or limits on position or sector size.

The S&P 500 committee presents a very attractive trading strategy. Using historical numbers, investors who bought the stocks that the committee removed from the S&P 500 (that still traded) and who sold short the stocks entering the S&P 500 would have earned a tidy excess return. It appears the S&P 500 committee behaves in a way that many investors do: It buys high and sells low.

Appendix A

Methodology for tracking deletions from, and additions to, the S&P 500

Deletion: Stock's CUSIP is not a part of index in Year (t_0) but that CUSIP was a part of index in Year (t_{-1})

Addition: Stock's CUSIP is a part of index in Year (t_0) but that CUSIP was not a part of index in Year (t_{-1})

Because many companies change their stock tickers and names following structural transformations such as acquisitions and break-ups, or even for purely cosmetic reasons, we need a way to identify changes to the index that are not based solely on a company's ticker or name. So, to identify additions and deletions to the index, we compare the CUSIPs of all members in one year to the CUSIPs in the following year. A stock's CUSIP allows us to trace a stock's lineage even if it has changed its name or ticker.

Determining the changes in the index range from the simple to the complex. For our period of analysis, some CUSIPs, such as that of Johnson & Johnson, were in the index every year and were tied to the same ticker and corporate name the whole time. Then there were examples like the CUSIP for Apple, Inc., which was tied to Apple Computer until the company changed its name in 2007. And finally, there were more complex examples that not only demonstrate the dynamic elements of our economy, but also show how the S&P committee tries to capture and reflect such change.

A merger is a good example. In December 1999, Monsanto and Pharmacia & Upjohn agreed to merge and form Pharmacia Corporation. In March 2000, S&P announced that it was going to remove Monsanto and Pharmacia & Upjohn from the S&P 500 Index and replace them with Pharmacia Corporation and Linear Technology. While this appears to be two changes to the index (i.e., two add/remove events), we only count it as one because Monsanto's CUSIP lived on in the combined entity. So, the only change is the replacement of Pharmacia & Upjohn (71694110) with Linear Technology Corporation (53567810).

Removed: Monsanto Company (71713U10) and Pharmacia & Upjohn (71694110)

Added: Pharmacia Corp (71713U10) and Linear Technology (53567810)

Treatment of Multiple Share Classes

We do not count the inclusion of additional trading lines of a company's stock as a change in the index. In March 2014, S&P revised how they treat companies with more than one class of common stock. Historically, companies could only be represented once in the index. The new methodology allows for multiple trading lines of a company's stock to be included in the index provided the lines meet certain requirements for liquidity and materiality. So, while there are still only 500 companies in the S&P 500, the index can now have more than 500 share lines. There are 505 share lines in the index as of February 6, 2017.²⁵

Determining Fiscal Years When Calculating Trailing and Future CFROIs

With knowledge of the month and year of the S&P's announcement, we estimate the most recent fiscal year for which results would have been known. That fiscal year constitutes the trailing "-1 year," and we base the other measurement periods off of that.

Appendix B

Here's a look at how S&P constructs and oversees the index. The criteria for additions are more straightforward than the grounds for removal. While the committee has some discretion in the companies they select, additions must satisfy a list of criteria for eligibility including standards for market capitalization, liquidity, domicile, public float, and earnings quality. Here are the attributes as of January 2017:²⁶

- **Universe:** Domiciled in the U.S.
- **Market Capitalization:** \$5.3 billion or greater.
- **Public Float:** A minimum of 50 percent of shares outstanding available for trading.
- **Financial Viability:** Positive reported earnings in the most recent quarter and over the most recent four quarters (in aggregate).
- **Liquidity and Price:** Highly tradable stocks with active and deep markets. More specifically, "the ratio of annual dollar value traded to float-adjusted market capitalization should be 1.00 or greater, and the stock should trade a minimum of 250,000 shares in each of the six months leading up to the evaluation date."

The grounds for removal, except in the case of M&A, are not as clear. For example, the committee may leave alone an index constituent that violates one of the criteria for addition, as meeting all the criteria is not necessary for continued membership. Through much of the index's history, the S&P committee only modified the list of companies when it had to remove a stock for reasons including bankruptcy or acquisition. But over the past 20 years or so, the committee started to manage the index more actively by removing firms that no longer effectively represented the U.S. market or the industry in which it operated.

S&P's primer on methodology reveals a tension between a passive and an active approach. On the one hand, S&P states that "turnover in index membership should be avoided when possible." On the other hand, S&P says it intends the index "to reflect the U.S. equity markets and . . . the U.S. economy" and to include "leading companies in leading industries." The S&P 500 Index does not simply include only the largest companies in the U.S., though, and many of its constituents are not in the top 500 as measured by either market capitalization or sales. To meet the goal of having the top companies, some turnover is clearly inevitable and prompts the S&P committee to continually revise the index.

Appendix C

Exhibit 16 is a log of all the changes in the S&P 500 Index from 2000-2016. When S&P announces multiple changes on one day, it generally does not necessarily pair a specific addition with a specific removal.

Exhibit 16: Changes to S&P 500 Index, 2000-2016

Announced	Implemented	Addition	Removal	Removal Type	Reason for Removal
2000					
12/29/1999	1/5/2000	Young & Rubicam	General Instrument Corp	M&A	Acquisition by Motorola
1/24/2000	1/28/2000	Harley-Davidson	Fleetwood Enterprises	Failure	Lack of representation
1/24/2000	1/28/2000	Biogen, Inc	Foster Wheeler	Failure	Lack of representation
1/26/2000	1/28/2000	Conexant Systems	Consolidated Natural Gas	M&A	Bought by Dominion Resources
3/8/2000	3/15/2000	Sabre Holdings Corp	Service Corp. International	Failure	Lack of representation
3/27/2000	3/31/2000	Linear Technology Corp	Pharmacia & Upjohn, Inc	M&A	Merger with Monsanto
3/29/2000	3/31/2000	Veritas Software	Pep Boys	Failure	Lack of representation
4/12/2000	4/17/2000	Altera Corp	Atlantic Richfield	M&A	Acquisition by BP Amoco
4/12/2000	6/5/2000	Convergys Corp	Times Mirror	M&A	Acquisition by Tribune Company
5/1/2000	5/4/2000	Siebel Systems, Inc	CBS Corp	M&A	Acquisition by Viacom
5/2/2000	5/9/2000	Maxim Integrated Products	Jostens Inc	M&A	Acquisition by Investcorp
5/3/2000	5/4/2000	Sapient Corp	Reynolds Metals	M&A	Acquisition by Alcoa
5/11/2000	6/16/2000	MedImmune Inc	Central & South West	M&A	Acquisition by American Electric Power
5/25/2000	6/2/2000	Agilent Technologies	NACCO Ind. Cl. A	Failure	Lack of representation
5/25/2000	6/21/2000	Sanmina Corp	Warner-Lambert	M&A	Acquisition by Pfizer
5/26/2000	5/31/2000	American Power Conversion	Mirage Resorts	M&A	Acquisition by MGM Grand
6/5/2000	6/7/2000	Starbucks Corp	Shared Medical Systems	M&A	Acquisition by Siemens
6/13/2000	6/20/2000	Tiffany & Co	Silicon Graphics	Other	Spins off large interest in MIPS Technologies
6/13/2000	6/16/2000	Novellus Systems	Champion International	M&A	Acquisition by International Paper
6/15/2000	6/16/2000	Charter One Financial	MediaOne Group Inc	M&A	Acquisition by AT&T Corp
6/19/2000	6/30/2000	Broadcom Corporation	GTE Corp	M&A	Merger with Bell Atlantic
6/21/2000	6/28/2000	Visteon Corp	IKON Office Solutions	Failure	Lack of representation
6/21/2000	6/28/2000	Mercury Interactive	Milacron Inc	Failure	Market cap changes
6/27/2000	6/30/2000	Qwest Communications Int'l	US West Inc	M&A	Merger with Qwest
7/6/2000	7/12/2000	Stilwell Financial	Kansas City Southern Ind	Other	Spins off Stilwell Financial
7/6/2000	7/14/2000	CIT Group, Inc	Union Pacific Resources Group	M&A	Acquisition by Anadarko Petroleum
7/19/2000	7/26/2000	JDS Uniphase Corp	Rite Aid	Failure	Lack of representation
7/20/2000	7/27/2000	Palm Inc	3Com Corp	Other	Spins off large interest in Palm
8/7/2000	8/21/2000	KeySpan Corp	New Century Energies	M&A	Acquisition by Northern States Power
8/23/2000	8/29/2000	Devon Energy Corp	Great A & P	Failure	Market cap changes
9/25/2000	9/29/2000	Avaya Inc.	Owens Corning	Failure	Lack of representation
9/25/2000	10/2/2000	Dynegy Inc	BestFoods Inc	M&A	Acquisition by Unilever
9/27/2000	10/3/2000	King Pharmaceuticals	Young & Rubicam	M&A	Acquisition by WPP Group
10/3/2000	10/18/2000	Nabors Industries	Mallinckrodt Inc	M&A	Acquisition by Tyco International
10/12/2000	10/16/2000	Power-One Inc	Unicom Corp	M&A	Acquisition by PECO Energy
10/16/2000	10/23/2000	BroadVision Inc	PaineWebber Group	M&A	Acquisition by UBS
10/25/2000	11/1/2000	NiSource Inc	Columbia Energy Group	M&A	Acquisition by NiSource
10/31/2000	11/1/2000	EOG Resources	Eastern Enterprises	M&A	Acquisition by KeySpan Energy
11/14/2000	11/21/2000	Forest Laboratories	Seagate Technology	M&A	Acquisition by Veritas
11/15/2000	11/16/2000	Starwood Hotels & Resorts	Armstrong World	Failure	Lack of representation
11/20/2000	11/24/2000	Chiron Corp	Fort James Corp	M&A	Acquisition by Georgia Pacific
11/27/2000	11/30/2000	Calpine Corp	Florida Progress	M&A	Acquisition by CP&L Energy
11/29/2000	12/11/2000	MetLife Inc	Seagram Co. Ltd	M&A	Acquisition by Vivendi
12/1/2000	12/1/2000	Robert Half International	Associates First Capital	M&A	Acquisition by Citigroup
12/4/2000	12/8/2000	Allegheny Energy Inc	Bethlehem Steel	Failure	Lack of representation
12/4/2000	12/8/2000	Ambac Financial Group	Crown Cork & Seal	Failure	Lack of representation
12/4/2000	12/8/2000	Intuit, Inc	Owens-Illinois	Failure	Lack of representation
12/4/2000	12/8/2000	Symbol Technologies	Grace (W.R.) & Co. (New)	Failure	Lack of representation

Announced	Implemented	Addition	Removal	Removal Type	Reason for Removal
12/5/2000	12/11/2000	QLogic Corp	Polaroid Corp	Failure	Market cap changes
12/5/2000	12/11/2000	Stryker Corp	Russell Corp	Failure	Market cap changes
12/5/2000	12/11/2000	Vitesse Semiconductor	Springs Industries Inc	Failure	Market cap changes
12/7/2000	12/13/2000	Aetna Inc. (New)	Aetna Inc. (Old)	Other	Aetna (old) sells financials business, spins off U.S. healthcare division, which becomes Aetna (new)
12/8/2000	12/12/2000	Kinder Morgan Inc	Nabisco Group Hldgs	M&A	Acquisition by RJ Reynolds
12/12/2000	12/21/2000	Fluor Corp.	Massey Energy	Other	Spins off Fluor
12/19/2000	12/29/2000	Applied Micro Circuits	Morgan (J.P.) & Co	M&A	Acquisition by Chase Manhattan
2001					
12/19/2000	1/12/2001	Noble Drilling Corp	Time Warner Inc	M&A	Acquisition by AOL
12/27/2000	1/30/2001	Jabil Circuit	Coastal Corp	M&A	Acquisition by El Paso
2/5/2001	2/7/2001	Univision Communications	Union Carbide	M&A	Acquisition by Dow Chemical
2/21/2001	2/26/2001	Citizens Communications	U.S. Bancorp	M&A	Acquisition by Firststar
2/27/2001	2/28/2001	Cintas Corporation	Summit Bancorp	M&A	Acquisition by FleetBoston Financial Corp.
3/26/2001	3/30/2001	Concord EFS Inc	Ceridian Corp	Other	Splits into Ceridian and Arbritron
3/27/2001	4/2/2001	Mirant Corporation	Briggs & Stratton	Failure	Market cap changes
3/27/2001	3/30/2001	Flserv Inc	Old Kent Financial	M&A	Acquisition by Fifth Third Bancorp
5/7/2001	5/11/2001	Pepsi Bottling Group	Adaptec, Inc	Other	Spins off Roxio
5/22/2001	6/4/2001	TMP Worldwide	CIT Group, Inc	M&A	Acquisition by Tyco International
5/30/2001	6/27/2001	John Hancock Financial	Harcourt General Inc	M&A	Tender offer from Reed Elsevier
6/19/2001	6/22/2001	Zions Bancorp	ALZA Corp. Cl. A	M&A	Acquisition by Johnson & Johnson
6/25/2001	6/29/2001	Rockwell Collins	Longs Drug Stores	Failure	Market cap changes
6/27/2001	7/6/2001	AT&T Wireless Services	Potlatch Corp	Failure	Market cap changes
7/30/2001	8/3/2001	Family Dollar Stores	Cabletron Systems	Other	Spins off large interest in Riverstone Networks
7/31/2001	8/6/2001	Zimmer Holdings	Timken Co	Failure	Market cap changes
8/1/2001	8/2/2001	PMC-Sierra Inc	Quaker Oats	M&A	Acquisition by PepsiCo
8/22/2001	8/30/2001	CIENA Corp	American General	M&A	Acquisition by AIG
8/27/2001	8/29/2001	AmerisourceBergen Corp	ONEOK Inc	Failure	Market cap changes
8/27/2001	9/4/2001	XL Capital	Wachovia Corp	M&A	Acquisition by First Union Corp
8/29/2001	8/31/2001	International Game Technology	BroadVision Inc	Failure	Lack of representation
9/17/2001	9/20/2001	Immunex Corp	Tosco Corp	M&A	Acquisition by Philips Petroleum
10/3/2001	10/9/2001	Equity Office Properties	Texaco Inc	M&A	Acquisition by Chevron
10/4/2001	10/9/2001	TECO Energy	Global Crossing Ltd	Failure	Lack of representation
11/1/2001	11/6/2001	Health Management Assoc	GPU Inc	M&A	Acquisition by FirstEnergy Corp.
11/27/2001	11/30/2001	Equity Residential Prop Tr	National Service Ind	Other	Spins off Acuity Brands
11/28/2001	11/29/2001	NVIDIA Corp	Enron Corp	Failure	Lack of representation
12/10/2001	12/14/2001	Jones Apparel Group	Homestake Mining	M&A	Acquisition by Barrick Gold
12/12/2001	12/12/2001	Genzyme Corp	Ralston-Ralston Purina Gp	M&A	Acquisition by Nestle
12/27/2001	12/31/2001	Waters Corporation	FMC Corp	Other	Spins off FMC Technologies
2002					
1/16/2002	1/16/2002	Plum Creek Timber Co.	Kmart	Failure	Lack of representation
1/23/2002	1/29/2002	ACE Limited	Mead Corp	M&A	Merger with Westvaco
1/23/2002	1/31/2002	Rational Software	Niagara Mohawk Power	M&A	Acquisition by National Grid Group
2/6/2002	2/8/2002	Marshall & Isley Corp.	Willamette Industries	M&A	Acquisition by Weyerhaeuser
5/2/2002	5/3/2002	First Tennessee National	COMPAQ Computer	M&A	Acquisition by Hewlett-Packard
5/10/2002	5/10/2002	American Standard	Sapient Corp	Failure	No longer meets standards of inclusion
5/13/2002	5/14/2002	BJ Services	USAirways Group Inc	Failure	Lack of representation
5/13/2002	5/14/2002	Apollo Group	WorldCom Inc.-WorldCom Group	Failure	Lack of representation
6/20/2002	6/26/2002	Simon Property Group, Inc	Conexant Systems	Other	Reorganization
7/9/2002	7/19/2002	Prudential Financial	Alcan Inc	Other	Not U.S. company
7/9/2002	7/19/2002	United Parcel Service	Barrick Gold Corp	Other	Not U.S. company
7/9/2002	7/19/2002	eBay Inc.	Inco, Ltd	Other	Not U.S. company
7/9/2002	7/19/2002	Electronic Arts	Nortel Networks Corp Hldg Co	Other	Not U.S. company
7/9/2002	7/19/2002	SunGard Data Systems	Placer Dome Inc	Other	Not U.S. company
7/9/2002	7/19/2002	Goldman Sachs Group	Royal Dutch Petroleum	Other	Not U.S. company
7/9/2002	7/19/2002	Principal Financial Group	Unilever N.V	Other	Not U.S. company
7/12/2002	7/16/2002	North Fork Bancorporation	Immunex Corp	M&A	Acquisition by Amgen
7/24/2002	7/24/2002	Anthem, Inc.	Conseco Inc	Failure	Market cap changes
8/7/2002	8/13/2002	Monsanto Co.	Palm Inc.	Failure	Market cap changes
8/14/2002	8/20/2002	Travelers Property Casualty Corp	Vitesse Semiconductor	Failure	Market cap changes
8/30/2002	9/3/2002	RJ Reynolds Tobacco	Conoco Inc	M&A	Merger with Phillips
11/13/2002	11/18/2002	AT&T Comcast Corp.	Comcast Class A Special	M&A	AT&T spins off broadband unit, merges it w/ Comcast to form AT&T Comcast
12/4/2002	12/11/2002	Quest Diagnostics	TRW Inc	M&A	Acquisition by Northrop Grumman

Announced	Implemented	Addition	Removal	Removal Type	Reason for Removal
2003					
2/19/2003	2/21/2003	AutoNation Inc.	Rational Software	M&A	Acquisition by IBM
3/11/2003	3/13/2003	Apartment Investment & Management Co	AMR Corp.	Failure	Market cap changes
3/19/2003	3/20/2003	McCormick & Company	HEALTHSOUTH Corp.	Failure	Allegations company violated securities laws
3/25/2003	3/28/2003	Symantec Corp.	Household International	M&A	Acquisition by HSBC Holdings
4/9/2003	4/15/2003	Federated Investors Inc.	Pharmacia Corp.	M&A	Acquisition by Pfizer
7/15/2003	7/16/2003	ProLogis	Mirant Corp	Failure	Bankruptcy
8/13/2003	8/19/2003	Medco Health Solutions Inc.	McDermott International	Failure	Market cap changes
9/23/2003	9/25/2003	Express Scripts	Quintiles Transnational	M&A	Taken private
11/6/2003	11/12/2003	BIOGEN IDEC	Biogen Inc.	M&A	Merger w/ IDEC becoming BIOGEN IDEC
2004					
2/23/2004	2/26/2004	M&T Bank Corp.	Concord EFS Inc.	M&A	Acquisition by First Data Corp
3/16/2004	3/24/2004	Caremark Rx	Tupperware Corp.	Failure	Market cap changes
3/25/2004	3/31/2004	E*Trade Financial	FleetBoston Financial	M&A	Acquisition by Bank of America
3/29/2004	4/1/2004	Affiliated Computer Services	Travelers Property Casualty	M&A	Acquisition by St. Paul Companies
4/19/2004	4/22/2004	Mylan Laboratories	Sprint PCS	Other	Sprint Corp eliminated Sprint PCS tracking stock
4/19/2004	4/28/2004	Valero Energy	John Hancock Financial Services	M&A	Acquisition by Manulife Financial Corp
4/26/2004	4/30/2004	Hospira Inc.	American Greetings	Failure	Market cap changes
6/24/2004	6/30/2004	Sovereign Bancorp	Union Planters Corporation	M&A	Merger with Regions Financial
6/26/2004	6/30/2004	Gilead Sciences	Bank One Corp.	M&A	Acquisition by JP Morgan Chase
7/26/2004	8/2/2004	Fisher Scientific	Thomas & Betts	Failure	Market cap changes
8/26/2004	8/31/2004	Coach Inc.	Charter One Financial	M&A	Acquisition by Royal Bank of Scotland
10/25/2004	10/29/2004	Laboratory Corp of America Holdings	South Trust Corp.	M&A	Acquisition by Wachovia
10/25/2004	10/26/2004	CIT Group	AT&T Wireless	M&A	Acquisition by Cingular Wireless
11/10/2004	11/30/2004	L-3 Communications Holdings	WellPoint Health Networks	M&A	Acquisition by Anthem
11/29/2004	12/2/2004	Freescale Semiconductor Inc.	Winn-Dixie	Failure	Market cap changes
12/8/2004	12/17/2004	Archstone-Smith Trust	Crane Co.	Failure	Market cap changes
12/8/2004	12/17/2004	News Corp.	Deluxe Corp.	Failure	Market cap changes
12/8/2004	12/17/2004	Compass Bancshares	Worthington Industries	Failure	Market cap changes
12/21/2004	12/28/2004	XTO Energy	PeopleSoft Inc.	M&A	Acquisition by Oracle
2005					
3/7/2005	3/11/2005	National Oilwell Varco	Power-One	Failure	Market cap changes
3/21/2005	3/24/2005	Sears Holdings Corp.	Sears Roebuck & Co.	M&A	Merger with Kmart (creating Sears Holdings)
6/22/2005	7/1/2005	D.R. Horton	Veritas Software	M&A	Acquisition by Symantec
6/28/2005	7/1/2005	Constellation Brands	Great Lakes Chemical	M&A	Acquisition by Crompton Corp
7/12/2005	7/21/2005	Weatherford Int'l	Toys "R" US	M&A	Taken private
7/26/2005	8/11/2005	Vornado Realty Trust	SunGard Data Systems	M&A	Taken private
8/4/2005	8/12/2005	Murphy Oil	Nextel Communications	M&A	Acquisition by Sprint
8/4/2005	8/10/2005	Tyson Foods	Unocal Corp.	M&A	Acquisition by Chevron
8/15/2005	8/18/2005	Public Storage	Delta Air Lines	Failure	Market cap changes
8/29/2005	8/29/2005	Coventry Health Care Inc.	May Dept. Stores	M&A	Acquisition by Federated Department Stores
9/26/2005	9/30/2005	Ameriprise Financial	Provident Financial	M&A	Acquisition by Washington Mutual
9/30/2005	10/3/2005	Lennar Corp.	Gillette Co.	M&A	Acquisition by Procter & Gamble
10/7/2005	10/10/2005	Patterson Companies Inc.	Delphi Corp.	Failure	Bankruptcy
11/14/2005	11/18/2005	Amazon.com	AT&T Corp.	M&A	Acquisition by SBC Communications
11/29/2005	12/1/2005	Genworth Financial Inc.	Calpine Corp.	Failure	Market cap changes
12/8/2005	12/15/2005	E.W. Scripps	Georgia-Pacific Group	M&A	Acquisition by Koch Industries
12/27/2005	12/30/2005	Viacom Inc. (New)	Visteon Corp.	Failure	Market Cap changes
12/27/2005	12/30/2005	Whole Foods Market	MBNA Corp.	M&A	Acquisition by Bank of America
2006					
1/3/2006	1/4/2006	Estee Lauder	Mercury Interactive	Failure	Delisting by Nasdaq
1/25/2006	1/31/2006	VeriSign Inc.	Reebok Int'l	M&A	Acquisition by Adidas-Salomon
1/25/2006	1/31/2006	Harman Int'l	Siebel Systems Inc.	M&A	Acquisition by Oracle
2/21/2006	2/24/2006	Barr Pharmaceuticals Inc.	Scientific-Atlanta	M&A	Acquisition by Cisco
3/1/2006	3/2/2006	Chesapeake Energy Corp.	Dana Corp.	Failure	Market cap changes
3/26/2006	3/31/2006	Google Inc.	Burlington Resources Inc.	M&A	Acquisition by ConocoPhillips
3/28/2006	4/3/2006	Kimco Realty Corp.	Jefferson-Pilot Corp.	M&A	Acquisition by Lincoln National
3/28/2006	3/31/2006	Boston Properties	Cinergy Corp.	M&A	Acquisition by Duke Energy
3/29/2006	3/31/2006	Dean Foods	Maytag Corp.	M&A	Acquisition by Whirlpool
4/11/2006	4/21/2006	Legg Mason	Guidant Co.	M&A	Acquisition by Boston Scientific
4/19/2006	4/19/2006	SanDisk Corp.	Chiron Corp.	M&A	Acquisition by Novartis
5/10/2006	5/17/2006	Embarq Corp.	Applied Micro Circuits Corp.	Failure	Market cap changes
5/25/2006	6/1/2006	Juniper Networks Inc.	Albertson's Inc.	M&A	Acquisition by SuperValu
5/31/2006	6/5/2006	Commerce Bancorp	Engelhard Corp.	M&A	Acquisition by BASF
6/22/2006	6/27/2006	CONSOL Energy Inc.	Knight-Ridder Inc.	M&A	Acquisition by McClatchy

Announced	Implemented	Addition	Removal	Removal Type	Reason for Removal
7/11/2006	7/17/2006	Windstream Corp.	Cooper Tire & Rubber Co.	Failure	Market cap changes
7/24/2006	7/31/2006	Realogy Corp.	Gateway Inc.	Failure	Market cap changes
7/24/2006	7/31/2006	Wyndham Worldwide Corp.	Cendant Corp.	Other	Cendant spins off Wyndham and Realogy
8/3/2006	8/10/2006	Chicago Mercantile Exchange Holdings	Kerr-McGee Corp.	M&A	Acquisition by Anadarko Petroleum
9/25/2006	9/29/2006	Western Union Co.	Andrew Corp.	Failure	Market cap changes
9/27/2006	9/29/2006	Smith International	Golden West Financial	M&A	Acquisition by Wachovia
10/30/2006	11/3/2006	Celgene Corp.	AmSouth Bancorp	M&A	Acquisition by Regions Financial
11/2/2006	11/9/2006	Fidelity National Information Services	Louisiana-Pacific Corp.	Failure	Market cap changes
11/6/2006	11/9/2006	CB Richard Ellis Group	Fisher Scientific	M&A	Acquisition by Thermo Electron Corp
11/13/2006	11/16/2006	Cognizant Technology Solutions	Alberto-Culver Co. (old)	Other	Splits up
11/15/2006	11/17/2006	Peabody Energy Corp	HCA Inc.	M&A	Taken private
11/21/2006	12/1/2006	DirectTV Group Inc.	Freescale Semiconductor Inc.	M&A	Taken private
11/22/2006	11/30/2006	IAC/InterActive Corp.	Lucent Technologies	M&A	Acquisition by Alcatel
11/23/2006	11/30/2006	Questar Corp.	North Fork Bancorp. Inc.	M&A	Acquisition by Capital One Financial
12/15/2006	12/19/2006	Terex Corp.	Navistar International	Failure	Delisting by NYSE
12/20/2006	12/29/2006	Spectra Energy Corp.	Parametric Technology	Failure	Market cap changes
2007					
1/2/2007	1/3/2007	ENSCO International	BellSouth Corp.	M&A	Acquisition by AT&T
1/3/2007	1/9/2007	AvalonBay Communities	Symbol Technologies	M&A	Acquisition by Motorola
1/31/2007	2/1/2007	Polo Ralph Lauren Corp.	Converse Technology	Failure	Delisting by Nasdaq
2/5/2007	2/14/2007	Hudson City Bancorp.	American Power Conversion	M&A	Acquisition by Schneider Electric
2/7/2007	2/21/2007	Integrus Energy Group Inc.	Peoples Energy	M&A	Acquisition by WPS Resources, which changes its name to Integrus
2/7/2007	2/9/2007	Varian Medical Systems	Equity Office Properties	M&A	Acquisition by Blackstone Group
2/26/2007	3/1/2007	C.H. Robinson Worldwide	Health Management Assoc.	Other	Market cap changes (after payout of special dividend)
3/12/2007	3/19/2007	Host Hotels & Resorts	Phelps Dodge	M&A	Acquisition by Freeport-McMoRan Copper & Gold
3/16/2007	3/20/2007	Developers Diversified Realty	Caremark Rx Inc.	M&A	Acquisition by CVS
3/22/2007	3/30/2007	Kraft Foods Inc	Sabre Holding Corp.	M&A	Taken private
3/27/2007	3/28/2007	Abercrombie & Fitch Co.	Univision Communications	M&A	Taken private
4/2/2007	4/9/2007	Assurant Inc.	Realogy Corp.	M&A	Taken private
5/22/2007	5/30/2007	MEMC Electronic Materials	Kinder Morgan	M&A	Taken private
5/30/2007	5/31/2007	Precision Castparts	MedImmune Inc.	M&A	Acquisition by AstraZeneca
6/21/2007	6/29/2007	Tyco Electronics	PMC-Sierra	Failure	Market cap changes
6/21/2007	6/29/2007	Covidien Ltd.	Sanmina-SCI Corp.	Failure	Market cap changes
6/21/2007	6/29/2007	Discover Financial Services	ADC Telecomm. Inc.	Failure	Market cap changes
6/25/2007	6/29/2007	General Growth Properties	Mellon Financial	M&A	Merger with Bank of New York
7/2/2007	7/6/2007	American Capital Strategies	Dollar General	M&A	Taken private
7/9/2007	7/11/2007	Akamai Technologies	Biomet Inc.	M&A	Taken private
8/16/2007	8/24/2007	Leucadia National Corp.	Keyspan Energy	M&A	Acquisition by National Grid Plc
8/30/2007	9/7/2007	Microchip Technology	Compass Bancshares	M&A	Acquisition by Banco Bilbao Vizcaya Argentaria
9/24/2007	9/26/2007	Tesoro Petroleum Co.	Maxim Integrated Products	Failure	Delisting by Nasdaq
9/24/2007	9/28/2007	Teradata Corp.	NCR Corp.	Other	Spins off Teradata
9/24/2007	10/1/2007	Expedia Inc.	Soletron Corp.	M&A	Acquisition by Flextronics
9/24/2007	9/25/2007	IntercontinentalExchange Inc.	First Data Corp.	M&A	Taken private
10/1/2007	10/5/2007	Noble Energy Inc.	Archstone-Smith Trust	M&A	Taken private
10/8/2007	10/9/2007	Expeditors Int'l.	TXU Corp.	M&A	Taken private
10/18/2007	10/26/2007	Titanium Metals Corp.	Bausch & Lomb Inc.	M&A	Taken private
10/18/2007	10/24/2007	NYSE Euronext	Hilton Hotels	M&A	Taken private
10/23/2007	10/25/2007	Jacobs Engineering Group	Avaya Inc.	M&A	Taken private
11/1/2007	11/8/2007	Pepco Holdings Inc.	Manor Care Inc.	M&A	Taken private
11/8/2007	11/16/2007	American Tower Corp.	ALLTEL Corp.	M&A	Taken private
11/8/2007	11/15/2007	Manitowoc Co.	Tektronix Inc.	M&A	Acquisition by Danaher
12/5/2007	12/13/2007	GameStop Corp.	Dow Jones & Co. Inc.	M&A	Acquisition by News Corp
12/19/2007	12/28/2007	Washington Post Co.	Temple-Inland Inc.	Other	Splits up
12/19/2007	12/31/2007	Total System Services	Synovus Financial	Other	Spins out Total System Services
12/20/2007	12/20/2007	Range Resources Corp.	Tribune Co.	M&A	Taken private

Announced	Implemented	Addition	Removal	Removal Type	Reason for Removal
2008					
1/17/2008	1/28/2008	Cameron International	Harrah's Entertainment	M&A	Taken private
3/20/2008	3/28/2008	Phillip Morris International Inc.	Circuit City Stores Inc.	Failure	Fails to meet consistent profit criteria
3/20/2008	3/31/2008	HCP Inc.	Commerce Bancorp	M&A	Acquisition by Toronto-Dominion Bank
5/22/2008	6/2/2008	Intuitive Surgical Inc.	The Bear Stearns Companies Inc.	M&A	Acquisition by JP Morgan
5/27/2008	6/5/2008	Southwestern Energy Co.	Trane Inc.	M&A	Acquisition by Ingersoll-Rand
6/3/2008	6/10/2008	Lorillard Inc.	Ambac Financial Group Inc.	Failure	Market cap changes
6/12/2008	6/20/2008	Massey Energy Co.	OfficeMax Inc.	Failure	Market cap changes
6/12/2008	6/20/2008	Cabot Oil & Gas Corp.	Brunswick Corp.	Failure	Market cap changes
6/24/2008	6/30/2008	Scripps Networks Interactive	E.W. Scripps	Other	Splits up
6/26/2008	6/30/2008	AK Steel Holding Corp.	Countrywide Financial Corp.	M&A	Acquisition by Bank of America
7/10/2008	7/17/2008	MasterCard Inc.	ACE Ltd.	Other	Redomesticates to Switzerland
7/24/2008	7/30/2008	DaVita Inc.	Clear Channel Communications Inc.	M&A	Taken private
8/13/2008	8/20/2008	Invesco Ltd.	IAC/InterActiveCorp.	Other	Splits up
8/25/2008	8/26/2008	CF Industries	Electronics Data Systems	M&A	Acquisition by Hewlett-Packard
9/9/2008	9/10/2008	Salesforce.com	Federal Home Loan Mortgage Corp.	Failure	Market cap changes (placed into conservatorship)
9/9/2008	9/10/2008	Fastenal Co.	Federal National Mortgage Association	Failure	Market cap changes (placed into conservatorship)
9/15/2008	9/19/2008	Harris Corp.	Lehman Brothers Holdings Inc.	Failure	Bankruptcy
9/22/2008	9/26/2008	Amphenol Corp.	Wendy's International Inc.	Failure	Market cap changes (too small even after acquisition by Triarc)
9/22/2008	9/22/2008	Pioneer Natural Resources Co.	Safeco Corp.	M&A	Acquisition by Liberty Mutual Group
9/26/2008	9/29/2008	Flowserve Corp.	Washington Mutual Inc.	Failure	Placed into receivership
9/29/2008	10/3/2008	Dr. Pepper Snapple Group Inc.	Wm. Wrigley Jr. Company	M&A	Acquisition by Mars
10/16/2008	10/21/2008	NASDAQ OMX Group Inc.	Dillard's Inc.	Failure	Market cap changes
10/28/2008	10/30/2008	Wisconsin Energy Corp.	MGIC Investment	Failure	Market cap changes
10/30/2008	11/5/2008	J.M. Smucker Co.	Terex Corporation	Failure	Market cap changes
11/7/2008	11/10/2008	People's United Financial Inc.	Unisys Corp.	Failure	Market cap changes
11/10/2008	11/13/2008	DENTSPLY International Inc.	Hercules Inc.	Failure	Market cap changes (too small even after acquisition by Ashland)
11/10/2008	11/13/2008	Wynn Resorts Ltd.	Ashland Inc.	Failure	Market cap changes (too small even after it acquired Hercules)
11/11/2008	11/12/2008	Cephalon Inc.	General Growth Properties Inc.	Failure	Market cap changes
11/17/2008	11/21/2008	Life Technologies Corp.	Applied Biosystems Inc.	M&A	Acquisition by Invitrogen forms Life Technologies
11/17/2008	11/18/2008	Stericycle Inc.	Anheuser-Busch	M&A	Acquisition by InBev
11/26/2008	12/1/2008	The Dun & Bradstreet Corp.	Liz Claiborne Inc.	Failure	Market cap changes
11/26/2008	12/3/2008	Republic Services Inc.	Allied Waste Industries Inc.	M&A	Acquisition by Republic Services
12/11/2008	12/18/2008	Equitable Resources Inc.	Transocean Inc.	Other	Redomesticates to Switzerland
12/18/2008	12/22/2008	McAfee Inc.	Barr Pharmaceuticals Inc.	M&A	Acquisition by Teva
12/23/2008	12/31/2008	FLIR Systems Inc	National City Corp.	M&A	Acquisition by PNC Financial Services Group
12/23/2008	12/31/2008	Owens-Illinois Inc	Wachovia Corp. (New)	M&A	Acquisition by Wells Fargo
12/23/2008	12/31/2008	SCANA Corp	Merrill Lynch	M&A	Acquisition by Bank of America
2009					
12/29/2008	1/5/2009	Iron Mountain Inc.	UST Inc.	M&A	Acquisition by Altria
1/22/2009	1/29/2009	Health Care REIT	Sovereign Bancorp.	M&A	Acquisition by Banco Santander
2/13/2009	2/25/2009	Diamond Offshore Drilling Inc.	Weatherford International Ltd.	Other	Redomesticates to Switzerland
2/24/2009	3/3/2009	Ventas Inc.	Jones Apparel Group Inc.	Failure	Market cap changes
2/24/2009	3/3/2009	Hormel Foods Corp.	American Capital Ltd.	Failure	Market cap changes
3/5/2009	3/16/2009	Northeast Utilities	Tyco International Ltd.	Other	Redomesticates to Switzerland
3/18/2009	3/27/2009	Time Warner Cable Inc.	Developers Diversified Realty Corp.	Failure	Market cap changes
3/18/2009	3/26/2009	O'Reilly Automotive Inc.	Noble Corp.	Other	Redomesticates to Switzerland
3/25/2009	4/1/2009	Denbury Resources Inc.	Rohm and Haas Co.	M&A	Acquisition by Dow Chemical
5/21/2009	6/30/2009	Western Digital	Embarq Corp.	M&A	Acquisition by CenturyTel
5/28/2009	6/4/2009	FMC Technologies Inc.	Covidien Ltd.	Other	Redomesticates to Ireland
6/1/2009	6/2/2009	DeVry Inc.	General Motors Corp.	Failure	Bankruptcy
6/4/2009	6/30/2009	Quanta Services Inc.	Ingersoll-Rand Company Ltd.	Other	Redomesticates to Ireland
6/22/2009	6/25/2009	MetroPCS Communications Inc.	Tyco Electronics Ltd.	Other	Redomesticates to Switzerland
7/17/2009	7/24/2009	Red Hat Inc.	CIT Group Inc.	Failure	Market cap changes
8/11/2009	8/18/2009	FMC Corp.	Centex Corp.	M&A	Acquisition by Pulte Homes
8/24/2009	8/31/2009	CareFusion Corp.	The Manitowoc Company Inc.	Failure	Market cap changes
8/28/2009	9/8/2009	Airgas Inc	Cooper Industries Ltd.	Other	Redomesticates to Ireland
10/1/2009	10/15/2009	First Solar Inc	Wyeth	M&A	Acquisition by Pfizer
10/29/2009	11/3/2009	Priceline.com	Schering-Plough Corp.	M&A	Acquisition by Merck & Co.

Announced	Implemented	Addition	Removal	Removal Type	Reason for Removal
12/11/2009	12/18/2009	Cliffs Natural Resources Inc	KB Home	Failure	Market cap changes
12/11/2009	12/18/2009	Mead Johnson Nutrition Co	MBIA Inc.	Failure	Market cap changes
12/11/2009	12/18/2009	Ross Stores Inc	Dynegy Inc.	Failure	Market cap changes
12/11/2009	12/18/2009	SAIC Inc	Convergys Corp.	Failure	Market cap changes
12/11/2009	12/18/2009	Visa Inc	Ciena Corp.	Failure	Market cap changes
12/15/2009	12/22/2009	Roper Industries Inc	ENSCO Int'l	Other	Redomesticates to U.K.
2010					
1/21/2010	1/28/2010	NRG Energy	Sun Microsystems Inc	M&A	Acquisition by Oracle
1/26/2010	2/12/2010	Berkshire Hathaway B	Burlington Northern Santa Fe Co	M&A	Acquisition by Berkshire Hathaway
1/29/2010	2/8/2010	Urban Outfitters	Affiliated Computer Services	M&A	Acquisition by Xerox
2/16/2010	2/26/2010	Discovery Communications Inc	Pepsi Bottling Group Inc	M&A	Acquisition by PepsiCo
2/22/2010	2/26/2010	Helmerich & Payne Inc	IMS Health Inc	M&A	Taken private
3/3/2010	3/12/2010	ONEOK Inc	Black & Decker Corp	M&A	Acquisition by The Stanley Works
3/18/2010	4/29/2010	Cerner Corp.	BJ Services Company	M&A	Acquisition by Baker Hughes Inc.
6/22/2010	6/25/2010	CarMax, Inc.	XTO Energy Inc.	M&A	Acquisition by ExxonMobil Inc.
6/23/2010	6/30/2010	QEP Resources Inc	Questar Corp.	Other	Spins off QEP Resources
7/8/2010	7/14/2010	Ace Limited	Millipore Inc.	M&A	Acquisition by Merck KGaA
8/19/2010	8/26/2010	Tyco International Ltd.	Smith International Inc.	M&A	Acquisition by Schlumberger Ltd.
11/10/2010	11/16/2010	Ingersoll-Rand Plc	Pactiv Corporation	M&A	Acquisition by Reynolds Group Holdings
12/9/2010	12/17/2010	F5 Networks Inc.	The New York Times Co.	Failure	Market cap changes
12/9/2010	12/17/2010	Netflix Inc.	Office Depot Inc.	Failure	Market cap changes
12/9/2010	12/17/2010	Newfield Exploration Co.	Eastman Kodak Co.	Failure	Market cap changes
12/9/2010	12/17/2010	Cablevision Systems Corp.	King Pharmaceuticals Inc.	M&A	Acquisition by Pfizer Inc.
2011					
12/22/2010	1/3/2011	Motorola Mobility Holdings, Inc	Meredith Corp	Failure	Market cap changes
1/11/2011	1/14/2011	Noble Corp	QLogic Corp	Failure	Market cap changes
1/26/2011	2/28/2011	Covidien Plc	McAfee Inc.	M&A	Acquisition by Intel Corp.
2/16/2011	2/25/2011	Joy Global Inc.	Allegheny Energy Inc.	M&A	Acquisition by First Energy
3/24/2011	3/31/2011	Edwards Lifesciences	Qwest Communications	M&A	Acquisition by CenturyLink
3/29/2011	4/1/2011	BlackRock	Genzyme Corp.	M&A	Acquisition by Sanofi-Aventis
4/20/2011	4/27/2011	Chipotle	Novell, Inc.	M&A	Taken private
5/24/2011	6/1/2011	Alpha Natural Resources, Inc.	Massey Energy Company	M&A	Acquisition by Alpha Natural Resources
5/26/2011	6/2/2011	ProLogis Inc.	ProLogis	M&A	Acquisition by AMB Property (then renamed ProLogis Inc.)
6/23/2011	6/30/2011	Marathon Petroleum Corp	RadioShack Corp.	Failure	Market cap changes
6/27/2011	7/5/2011	Accenture plc	Marshall & Ilsley Corp.	M&A	Acquisition by Bank of Montreal
9/21/2011	9/23/2011	The Mosaic Company	National Semiconductor Corp.	M&A	Acquisition by Texas Instruments
10/11/2011	10/14/2011	TE Connectivity Ltd.	Cephalon Inc.	M&A	Acquisition by Teva Pharmaceutical Industries
10/24/2011	10/31/2011	Xylem Inc.	ITT Corp.	Other	Spins off Xylem
11/18/2011	11/22/2011	Cooper Industries	Janus Capital Group	Failure	Market cap changes
12/8/2011	12/16/2011	BorgWarner Inc.	AK Steel Holding Corp.	Failure	Market cap changes
12/8/2011	12/16/2011	Perrigo Co.	Monster Worldwide Inc.	Failure	Market cap changes
12/8/2011	12/16/2011	Dollar Tree Inc.	MEMC Electronic Materials Inc.	Failure	Market cap changes
12/8/2011	12/12/2011	AGL Resources Inc.	Nicor Inc.	M&A	Acquisition by AGL Resources
12/14/2011	12/20/2011	TripAdvisor Inc.	Tellabs Inc.	Failure	Market cap changes
12/22/2011	12/30/2011	WPX Energy Inc.	Compuware Corp	Failure	Market cap changes
2012					
3/12/2012	3/13/2012	Crown Castle International Corp.	Constellation Energy Group	M&A	Acquisition by Exelon Corp.
4/2/2012	4/3/2012	Fossil, Inc.	Medco Health Solutions Inc.	M&A	Acquisition by Express Scripts
4/23/2012	4/23/2012	Phillips 66	Supervalu Inc.	Failure	Market cap changes
5/10/2012	6/5/2012	Lam Research	Novellus Systems	M&A	Acquisition by Lam Research
5/17/2012	5/24/2012	Kinder Morgan	El Paso Corp.	M&A	Acquisition by Kinder Morgan
5/21/2012	5/24/2012	Alexion Pharmaceuticals	Motorola Mobility	M&A	Acquisition by Google
6/21/2012	6/29/2012	Monster Beverage	Sara Lee Corp.	Other	Splits up
6/25/2012	6/29/2012	Seagate Technology	Progress Energy Inc	M&A	Acquisition by Duke Energy
7/26/2012	7/30/2012	Ensco plc	Goodrich Corporation	M&A	Acquisition by United Technologies
8/29/2012	9/4/2012	LyondellBasell	Sears Holdings Corporation	Other	Below public float threshold
9/24/2012	10/1/2012	ADT Corp	Lexmark Int'l Inc	Failure	Market cap changes
9/24/2012	9/28/2012	Pentair Ltd.	DeVry, Inc.	Failure	Market cap changes
9/25/2012	10/1/2012	Kraft Foods Group	Alpha Natural Resources	Failure	Market cap changes
10/1/2012	10/4/2012	PetSmart, Inc.	Sunoco Inc.	M&A	Acquisition by Energy Transfer Partners
11/26/2012	11/30/2012	Dollar General	Cooper Industries	M&A	Acquisition by Eaton Corp.
12/5/2012	12/11/2012	Garmin Ltd.	R.R. Donnelley	Failure	Market cap changes
12/18/2012	12/21/2012	Delphi Automotive	Titanium Metals	M&A	Acquisition by Precision Castparts
12/20/2012	12/31/2012	AbbVie Inc.	Federated Investors Inc B	Failure	Market cap changes

Announced	Implemented	Addition	Removal	Removal Type	Reason for Removal
2013					
2/7/2013	2/15/2013	PVH Corp	Big Lots Inc	Failure	Market cap changes
4/24/2013	4/30/2013	Regeneron Pharmaceuticals Inc	Metropcs Communications Inc	M&A	Merger with T-Mobile USA
5/3/2013	5/8/2013	Macerich Co	Coventry Health Care Inc	M&A	Acquisition by Aetna
5/16/2013	5/23/2013	Kansas City Southern Inc	Dean Foods Co	Other	Spins off WhiteWave
6/3/2013	6/6/2013	General Motors Company	Heinz H.J. Co	M&A	Taken private
6/14/2013	6/21/2013	Zoetis Inc	First Horizon National Corp	Failure	Market cap changes
6/20/2013	6/28/2013	News Corporation Class A	Apollo Group Inc	Failure	Market cap changes
7/1/2013	7/8/2013	Nielsen Holdings NV	Sprint Nextel Corp	Other	Deal results in public float below threshold
9/7/2013	9/10/2013	Delta Air Lines	BMC Software Inc	M&A	Taken private
9/11/2013	9/20/2013	Vertex Pharmaceuticals Inc	Advanced Micro Devices	Failure	Market cap changes
9/11/2013	9/20/2013	AMETEK Inc	SAIC Inc	Failure	Market cap changes
10/21/2013	10/28/2013	Transocean Ltd	Dell, Inc.	M&A	Taken private
10/28/2013	11/1/2013	Michael Kors Holdings Ltd	NYSE Euronext	M&A	Acquisition by NYSE Euronext
11/22/2013	11/29/2013	Allegion plc	Penney J.C. Inc	Failure	Market cap changes
12/4/2013	12/9/2013	General Growth Properties Inc	Molex Inc	M&A	Taken private
12/11/2013	12/20/2013	Alliance Data Systems Corp	Abercrombie & Fitch Company	Failure	Market cap changes
12/11/2013	12/20/2013	Mohawk Industries Inc	JDS Uniphase Corp	Failure	Market cap changes
12/11/2013	12/20/2013	Facebook Inc	Teradyne Inc	Failure	Market cap changes
2014					
1/16/2014	1/23/2014	Tractor Supply Company	Life Technologies Corporation	M&A	Acquired by Thermo Fisher Scientific
3/11/2014	4/3/2014	Google Inc. Class C	N/A	N/A	N/A
3/14/2014	3/21/2014	Keurig Green Mountain, Inc.	WPX Energy, Inc.	Failure	Market cap changes
3/26/2014	4/1/2014	Essex Property Trust, Inc.	Cliffs Natural Resources Inc.	Failure	Market cap changes
4/24/2014	4/30/2014	Under Armour, Inc.	Beam, Inc.	M&A	Acquisition by Suntory Holdings
4/24/2014	4/30/2014	Navient Corp	SLM Corp	Other	Splits up
5/5/2014	5/7/2014	Avago Technologies Limited	LSI Corporation	M&A	Acquired by Avago Technologies
6/12/2014	6/20/2014	Cimarex Energy Co.	International Game Technology	Failure	Market cap changes
6/24/2014	6/30/2014	Affiliated Managers Group, Inc.	Forest Laboratories, Inc.	M&A	Acquisition by Actavis
6/27/2014	7/1/2014	Martin Marietta Materials, Inc.	United States Steel Corporation	Failure	Market cap changes
7/30/2014	8/6/2014	Discovery Communications, Class C	N/A	N/A	N/A
8/14/2014	8/18/2014	Mallinckrodt Plc	Rowan Cos. Plc	Other	Does not meet new market cap criteria
9/12/2014	9/19/2014	United Rentals, Inc.	Graham Holdings Co.	Other	Does not meet new market cap criteria
9/12/2014	9/19/2014	Universal Health Services, Class B	Peabody Energy Corporation	Failure	Market cap changes
10/29/2014	11/4/2014	Level 3 Communications, Inc.	Jabil Circuit, Inc.	Other	Does not meet new market cap criteria
12/1/2014	12/4/2014	Royal Caribbean Cruises Ltd.	Bemis Company, Inc.	Other	Does not meet new market cap criteria
2015					
1/21/2015	1/26/2015	Endo International Plc	Covidien Plc	M&A	Acquisition by Medtronic
1/23/2015	1/26/2015	HCA Holdings, Inc.	Safeway Inc.	M&A	Taken private
3/9/2015	3/11/2015	Skyworks Solutions, Inc.	PetSmart, Inc.	M&A	Taken private
3/13/2015	3/20/2015	SL Green Realty Corp.	Nabors Industries Ltd.	Failure	Market cap changes
3/13/2015	3/20/2015	Hanesbrands Inc.	Avon Products, Inc.	Failure	Market cap changes
3/13/2015	3/20/2015	Equinix Inc	Denbury Resources Inc.	Failure	Market cap changes
3/13/2015	3/17/2015	Henry Schein, Inc.	CareFusion Corporation	M&A	Acquisition by Becton, Dickinson and Company
3/17/2015	3/20/2015	American Airlines Group, Inc.	Allergan, Inc.	M&A	Acquisition by Actavis
3/27/2015	4/6/2015	Realty Income Corporation	Windstream Holdings, Inc.	Other	Spins off assets
6/9/2015	6/11/2015	Qorvo, Inc.	Lorillard, Inc.	M&A	Acquisition by Reynolds American
6/19/2015	6/30/2015	Baxalta, Inc.	QEP Resources, Inc.	Failure	Market cap changes
6/19/2015	6/19/2015	WestRock Co.	MeadWestvaco Corporation	Other	Merger with Rock-Tenn creates WestRock Co.
6/23/2015	7/1/2015	Columbia Pipeline Group Inc	Allegheny Technologies Incorporated	Failure	Market cap changes
6/26/2015	6/30/2015	J.B. Hunt Transport Services, Inc.	Integrus Energy Group, Inc.	M&A	Acquisition by Wisconsin Energy Corp.
7/6/2015	7/8/2015	Advance Auto Parts, Inc.	Family Dollar Stores, Inc.	M&A	Acquisition by Dollar Tree
7/14/2015	7/17/2015	PayPal Holdings Inc	Noble Corporation plc	Failure	Market cap changes
7/24/2015	7/28/2015	Signet Jewelers Limited	DIRECTV	M&A	Acquisition by AT&T
8/10/2015	9/18/2015	Twenty-First Century Fox, Class B	N/A	N/A	N/A
8/10/2015	9/18/2015	News Corporation Class B	N/A	N/A	N/A
8/10/2015	9/18/2015	Comcast Corporation Class A Special	N/A	N/A	N/A
8/27/2015	8/28/2015	Activision Blizzard Inc	Pall Corporation	M&A	Acquisition by Danaher
8/27/2015	9/2/2015	United Continental Holdings, Inc.	Hospira, Inc.	M&A	Acquisition by Pfizer
9/30/2015	10/7/2015	Verisk Analytics Inc	Joy Global Inc.	Failure	Market cap changes
10/27/2015	10/30/2015	Hewlett Packard Enterprise Co.	Hudson City Bancorp, Inc.	M&A	Acquisition by M&T Bank
11/9/2015	11/17/2015	Synchrony Financial	Genworth Financial, Inc. Class A	Failure	Market cap changes
11/12/2015	11/18/2015	Illumina, Inc.	Sigma-Aldrich Corporation	M&A	Acquisition by Merck KGaA
11/23/2015	11/27/2015	CSRA, Inc.	Computer Sciences Corporation	Other	Spins off SCRA
12/22/2015	12/28/2015	Church & Dwight Co., Inc.	Altera Corporation	M&A	Acquisition by Intel

Announced	Implemented	Addition	Removal	Removal Type	Reason for Removal
2016					
12/28/2015	1/4/2016	Willis Group Holdings	Fossil Group Inc.	Failure	Market cap changes
1/13/2016	1/15/2016	Extra Space Storage Inc.	Chubb Corporation	M&A	Acquisition by ACE Ltd.
1/22/2016	1/29/2016	Federal Realty Investment Trust	Broadcom Corporation Class A	M&A	Acquisition by Avago Technologies Ltd.
1/26/2016	1/29/2016	Citizens Financial Group, Inc.	Precision Castparts Corp.	M&A	Acquisition by Berkshire Hathaway
2/16/2016	2/19/2016	Concho Resources Inc.	Plum Creek Timber Company, Inc.	M&A	Acquisition by Weyerhaeuser Co.
3/1/2016	3/3/2016	American Water Works Company, Inc.	CONSOL Energy Inc.	Failure	Market cap changes
3/24/2016	3/29/2016	Centene Corporation	Ensco plc	Failure	Market cap changes
3/24/2016	3/29/2016	Hologic, Inc.	Pepco Holdings, Inc.	M&A	Acquisition by Exelon Corp.
3/28/2016	4/1/2016	Foot Locker, Inc.	Cameron International Corporation	M&A	Acquisition by Schlumberger Ltd.
4/7/2016	4/15/2016	Ulta Salon, Cosmetics & Fragrance	Tenet Healthcare Corporation	Failure	Market cap changes
4/8/2016	4/8/2016	Under Armour, Inc. Class C	N/A	N/A	N/A
4/19/2016	4/22/2016	Global Payments Inc.	GameStop Corp. Class A	Failure	Market cap changes
4/26/2016	5/2/2016	Acuity Brands, Inc.	ADT Corporation	M&A	Acquisition by Apollo Global Management
5/3/2016	5/4/2016	UDR, Inc.	Keurig Green Mountain, Inc.	M&A	Acquisition by JAB Holding Company
5/10/2016	5/12/2016	Alaska Air Group, Inc.	SanDisk Corporation	M&A	Acquisition by Western Digital Corp.
5/13/2016	5/17/2016	Digital Realty Trust, Inc.	Time Warner Cable Inc.	M&A	Acquisition by Charter Communications
5/18/2016	5/20/2016	LKQ Corporation	Airgas, Inc.	M&A	Acquisition by Air Liquide SA
5/24/2016	5/27/2016	Arthur J. Gallagher & Co.	Coca-Cola Enterprises	M&A	Merges w/ foreign Coca-Cola bottlers, resulting in foreign domicile
5/27/2016	6/2/2016	TransDigm Group Incorporated	Baxalta, Inc.	M&A	Acquisition by Shire plc
6/21/2016	6/23/2016	Fortune Brands Home & Security	Cablevision Systems Corporation Class A	M&A	Acquisition by Altice NV
6/23/2016	6/30/2016	Albemarle Corporation	TECO Energy, Inc.	M&A	Acquisition by Emera Inc.
6/23/2016	7/1/2016	Fortive Corp.	Columbia Pipeline Group Inc	M&A	Acquisition by Columbia Pipeline Group Inc.
6/29/2016	6/30/2016	Alliant Energy Corp	AGL Resources, Inc.	M&A	Acquisition by Southern Co
8/25/2016	9/2/2016	Mettler-Toledo International Inc.	Johnson Controls Inc.	M&A	Merger with Tyco International forms Johnson Controls International
8/25/2016	9/2/2016	Johnson Controls International	Tyco International PLC	M&A	Merger with Johnson Controls forms Johnson Controls International
8/31/2016	9/7/2016	Charter Communications, Inc. Class A	EMC Corporation	M&A	Acquisition by Dell Corp.
9/20/2016	9/22/2016	Cooper Companies, Inc.	Starwood Hotels & Resorts Worldwide	M&A	Acquisition by Marriott International Inc.
9/27/2016	9/30/2016	Coty Inc. Class A	Diamond Offshore Drilling, Inc.	Failure	Market cap changes
10/24/2016	10/31/2016	Arconic Inc.	Alcoa Inc.	Other	Alcoa splits into Arconic and Alcoa
11/29/2016	12/1/2016	Envision Healthcare Corp.	Legg Mason, Inc.	Failure	Market cap changes
11/29/2016	12/1/2016	Mid-America Apartment Communities	Owens-Illinois, Inc.	Failure	Market cap changes

Source: FactSet; S&P Dow Jones Indices; Credit Suisse.

Appendix D

Exhibits 17 and 18 show the sample sizes for the data in exhibits 7-11. There were 428 total changes, so most of the calculations closely reflect the full sample. Because the removed companies were acquired or went bankrupt, there are no TSR or CFROI data in +one- and +three-years. The companies the committee removed for market capitalization declines or “other” generally have +one- and +three-year figures. For the -three- and +three-year calculations, we include only the companies that have data for the full three years.

Exhibit 17: Sample Size for S&P Changes

	TSR				CFROI			
	-3 Year CAGR	-1 Year	+1 Year	+3 Year CAGR	-3 Year Avg	-1 Year	+1 Year	+3 Year Avg
Added	287	371	391	280	364	408	395	334
Removed	408	419	176	141	360	362	193	132

Source: FactSet; S&P Dow Jones Indices; Credit Suisse HOLT®.

Exhibit 18: Sample Size for “Removal” Categories

	TSR				CFROI			
	-3 Year CAGR	-1 Year	+1 Year	+3 Year CAGR	-3 Year Avg	-1 Year	+1 Year	+3 Year Avg
M&A	224	230			200	200		
Failure	134	137	123	97	118	118	108	87
Other	50	52	48	39	42	44	42	36

Source: FactSet; S&P Dow Jones Indices; Credit Suisse HOLT®.

Endnotes

- ¹ Kenneth E. Boulding, *A Reconstruction of Economics* (New York: John Wiley & Sons, 1950), 38.
- ² Clark Kerr, *The Uses of the University: Fifth Edition* (Cambridge, MA: Harvard University Press, 2001), 115.
- ³ Joseph A Schumpeter, *Capitalism, Socialism and Democracy* (New York: Harper & Row, 1942).
- ⁴ Ebenezer Asem and Shamsul Alam, "The Role of the S&P 500 Index Constituents in Tracking the U.S. Equity Market," *International Journal of Economics and Finance*, Vol. 4, No. 12, December 2012, 15-22.
- ⁵ See <http://us.spindices.com/indices/equity/sp-500>.
- ⁶ Martijn Cremers, Antti Petajisto, and Eric Zitzewitz, "Should Benchmark Indices Have Alpha? Revisiting Performance Evaluation," *Critical Finance Review*, Vol. 2, No. 1, 2012, 1-48.
- ⁷ Jeremy Siegel, "Long-Term Returns on the Original S&P 500 Companies," *Financial Analysts Journal*, Vol. 62, No. 1, January/February 2006, 18-31.
- ⁸ Richard Foster and Sarah Kaplan, authors of the book *Creative Destruction*, are among the most prominent proponents of the point of view that turnover reflects creative destruction. The authors examine the average tenure of a company in the S&P 500 over time and conclude that the rate of churn has accelerated. Their study spans from the late 1920s through the late 1990s. Because the S&P 500 wasn't formed until 1957, they use the S&P 90 as a proxy in the early years. They show that turnover increased from about 1.5 percent in the 1920s and 1930s, an average lifespan of about 65 years, to nearly 10 percent in 1998, an average lifespan of 10 years. Foster and Kaplan attribute this increase in the rate of change to Peter Drucker's notion of the "Age of Discontinuity" and Joseph Schumpeter's theory of creative destruction. These frameworks, the authors argue, show how markets promote discontinuity by having new, more innovative entrants replace old, weaker companies. See Richard Foster and Sarah Kaplan, *Creative Destruction: Why Companies That Are Built to Last Underperform the Market—And How to Successfully Transform Them* (New York: Random House, 2001).
- ⁹ Messod D. Beneish and Robert E. Whaley, "S&P 500 Index Replacements: A new game in town," *Journal of Portfolio Management*, Vol. 29, No. 1, 51-60, Fall 2002.
- ¹⁰ "2016 Shift Index: The Paradox of Flows: Can Hope Flow from Fear?" *Deloitte Center for the Edge*, 2016. See https://dupress.deloitte.com/content/dam/dup-us-en/articles/3407_2016-Shift-Index/DUP_2016-Shift-Index.pdf.
- ¹¹ Peter Clark and Roger Mills argue that merger waves generally pick up steam alongside an improving economy, in large part because this increases the availability of financing. The authors attribute the biggest flurry of activity to behavioral factors, or what Warren Buffett likes to call the "institutional imperative." CEOs see their peers doing deals and feel compelled to do deals of their own, even if valuations have already risen beyond levels that are attractive. See: Peter J. Clark and Roger W. Mills, *Masterminding the Deal: Breakthroughs in M&A strategy and analysis* (London: KoganPage, 2013); Jarrod Harford attributes merger waves to industry shocks, an increase in capital liquidity, and a reduction in financing constraints. See Jarrod Harford, "What Drives Merger Waves?" *Journal of Financial Economics*, Vol. 77, No. 3, September 2005, 529-560. Researchers also demonstrate a link between merger activity and share prices. See Ralph L. Nelson, *Merger Movements in American Industry: 1895-1956* (Princeton: Princeton University Press, 1959), and Roger Clarke and Christos Ioannidis, "On the relationship between aggregate merger activity and the stock market: some further empirical evidence," *Economics Letters*, Vol. 53, No. 3, December 1996, 349-356.
- ¹² To minimize the impact of the announcement on the stock price, we measure TSR as follows: For trailing returns, our ending point is one full day before the announcement (e.g., the trailing one-year return would be 366 days before the announcement through 1 day before the announcement). For future returns, our starting point is 1 day after the announcement.
- ¹³ Scott D. Stewart, CFA, John J. Neumann, Christopher R. Knittel, and Jeffrey Heisler, CFA, "Absence of Value: An Analysis of Investment Allocation Decisions by Institutional Plan Sponsors," *Financial Analysts*

Journal, Vol. 65, No. 6, November/December 2009, 34-51; Andrea Frazzini and Owen A. Lamont, "Dumb Money: Mutual Fund Flows and the Cross-Section of Stock Returns," *Journal of Financial Economics*, Vol. 88, No. 2, May 2008, 299-322; and Amit Goyal and Sunil Wahal, "The Selection and Termination of Investment Management Firms by Plan Sponsors," *The Journal of Finance*, Vol. 63, No. 4, August 2008, 1805-1847.

¹⁴ Beneish and Whaley observed a similar pattern when they examined the trailing TSRs of stocks deleted from and added to the S&P 500 Index from 1996-2001. They found that stocks deleted from the index had average abnormal returns of -77 percent over the two years prior to removal, while stocks added to the index saw average abnormal returns of 290 percent for the two years prior to their introduction.

¹⁵ Kalok Chan, Hung Wan Kot, and Gordon Tang examined changes in the S&P 500 from 1962 to 2003 and found that added and deleted stocks both delivered strong long-term results and that the average abnormal return for the deleted stocks exceeded those of the added stocks. They attribute the positive results for added stocks to "increases in institutional ownership, liquidity, and analyst coverage, and a decrease in the long-term shadow cost," and for deleted stocks to "a rebound in institutional ownership and liquidity after stock deletion." They note that "the long-term operating performance declines for added stocks and increases slightly for deleted stocks subsequent to the year of stock addition or deletion (year *t*)," suggesting that "firms are added to the index during their peak performance stage and cannot sustain this performance in the long-run. In contrast, firms are deleted from the index during their worst performance stage but tend to recover somewhat in the long term." See: Kalok Chan, Hung Wan Kot, Gordon Y.N. Tang, "A comprehensive long-term analysis of S&P 500 index additions and deletions," *Journal of Banking & Finance*, Vol. 37, No. 12, December 2013, 4920-4930. Anita Arora, Lauren Capp, and Gary Smith found similar results for the Dow Jones Industrial Average. The authors examined all additions and deletions to the Dow since 1928, excluding changes due to M&A or due purely to a name change. They created two portfolios, one of added stocks and one of deleted stocks, and then tracked their performance, accounting for changes to the Dow over time. The authors found the deleted stocks, with annual returns of 15.9 percent, handily beat the added stocks, with annual returns of 11.5 percent. The authors conclude that the results are statistically significant and cannot be explained by Carhart's four-factor model (CAPM, size, valuation, and momentum). See Anita Arora, Lauren Capp, and Gary Smith, "The Real Dogs of the Dow," *Journal of Wealth Management*, Vol. 10, No. 4, Spring 2008, 64-72.

¹⁶ Michael C. Jensen, "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers," *American Economic Review*, Vol. 76, No. 2, May 1986, 323-329.

¹⁷ Full for a full description of how *Fortune* chooses the list, see: <http://beta.fortune.com/global500/>.

The years in our chart reflect the year of the financial results, not the year that *Fortune* published the list. For example, we count the 2016 *Fortune* 500 to be 2015 because the list published in 2016 largely reflects financial results for the year 2015. We exclude 1994 because *Fortune* changed its methodology that year, which led to a significantly high turnover number. To better represent changes in the U.S. economy, *Fortune* began to include service firms in its *Fortune* 500 list instead of listing them separately.

¹⁸ We follow the presentation of Dane Stangler and Sam Arbesman, "What Does *Fortune* 500 Turnover Mean?" *Ewing Marion Kauffman Foundation*, June 2012.

¹⁹ We are only able to track nine years following 1985 because *Fortune* changed its methodology in 1994 by expanding beyond industrial, energy, and manufacturing firms to include service firms as well.

²⁰ Leslie Hannah, "Marshall's 'Trees' and the Global 'Forest': Were 'Giant Redwoods' Different?" in Naomi R. Lamoreaux, Daniel M. G. Raff and Peter Temin (eds.), *Learning by Doing in Markets, Firms, and Countries* (Chicago: The University of Chicago Press, 1999), 253-293.

²¹ U.S. Census Business Dynamics Statistics (September 2016 release containing data through 2014) and The World Bank (data through 2015).

²² Timothy Dunne, Mark J. Roberts, and Larry Samuelson, "Patterns of firm entry and exit in U.S. manufacturing industries," *RAND Journal of Economics*, Vol. 19, No. 4, Winter 1988, 495-515 and Timothy Dunne, Shawn D. Klimek, Mark J. Roberts, and Daniel Yi Xu, "Entry, Exit, and the Determinants of Market Structure," *RAND Journal of Economics*, Vol. 44, No. 3, Fall 2013, 462-487.

²³ Brian Headd, Alfred Nucci, and Richard Boden, "What Matters More: Business Exit Rates or Business Survival Rates?" *BDS Statistical Brief*, U.S. Census Bureau, 2010.

²⁴ Charles A. O'Reilly, III and Michael L. Tushman, *Lead and Disrupt: How to Solve the Innovator's Dilemma* (Stanford, CA: Stanford University Press, 2016).

²⁵ S&P Dow Jones Indices, "S&P Dow Jones Indices Announces Changes in Treatment of Multiple Share Classes in U.S. Indices and Revises Previously Announced Treatment of Google Stock Split," March 11, 2014. See https://www.spice-indices.com/idpfiles/spice-assets/resources/public/documents/81745_multisharecgoogle2.pdf.

²⁶ S&P Dow Jones Indices, "S&P U.S. Indices: Methodology," January 2017. For the latest methodology, see <http://www.spindices.com/documents/methodologies/methodology-sp-us-indices.pdf>.

Sources for exhibit 1: Credit Suisse; Credit Suisse HOLT; Dane Stangler and Sam Arbesman, "What Does Fortune 500 Turnover Mean?" *Ewing Marion Kauffman Foundation*, June 2012. Madeleine I. G. Daepf, Marcus J. Hamilton, Geoffrey B. West, and Luís M. A. Bettencourt, "The mortality of companies," *The Royal Society Publishing*, Vol. 12, No. 106, April 1, 2015; U.S. Census Bureau, Center for Economic Studies, Business Dynamics Statistics; Timothy Dunne, Mark J. Roberts, and Larry Samuelson, "Patterns of firm entry and exit in U.S. manufacturing industries," *RAND Journal of Economics*, Vol. 19, No. 4, Winter 1988, 495-515 and Timothy Dunne, Shawn D. Klimek, Mark J. Roberts, and Daniel Yi Xu, "Entry, Exit, and the Determinants of Market Structure," *RAND Journal of Economics*, Vol. 44, No. 3, Fall 2013, 462-487.

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