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Why Corporate Longevity Matters

What Index Turnover Tells Us about Corporate Results

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

Kenneth Boulding[1]

- 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, 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 pattern.
- 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.

Introduction

Nothing lasts forever. Kongo Gumi long held the distinction of being the world's oldest surviving firm. The Japanese company, a builder of Buddhist temples, was founded in A.D. 578 and survived until 2006. Amid a decline in business and ballooning debt, the firm finally went into liquidation. Takamatsu Construction preserved the name by acquiring the company, but the streak of longevity was snapped.[2]

Kongo Gumi's 1,428-year life as an independent company was incredibly rare. About one-half of all public companies die within ten years of being listed, and almost all succumb before reaching 50 years. The characteristic age of a listed company in the United States is about 8 years old.

The issue of corporate longevity is relevant for investors for a number of reasons. First, longevity is frequently used as a proxy for the rate of innovation. The idea is that when the economy sees a great deal of "creative destruction," companies will come and go at a rapid rate as the new replaces the old.[3] To the degree that it does reflect on the rate of innovation, longevity has implications for portfolio turnover and the shifts in valuation. As we will see, there does appear to be a link between longevity and innovation, but mergers and acquisitions (M&A) explain turnover even better.

Longevity is also important for investors because it affects portfolios directly through the risk of death. For example, the committee that determines the S&P 500 Index removed 81 stocks as the result of failure in the 10 years ended 2013. These include Eastman Kodak, Lehman Brothers, and Circuit City, all formerly held in high esteem. The hazard of owning a company that fails is especially relevant for value investors. The question we must answer is, "Why do most companies cease to exist?"

Finally, the returns for active money managers are generally measured versus a benchmark such as the S&P 500, which changes in composition as companies enter and leave the index. Comparing results of an active manager to a benchmark makes sense because investors correctly consider 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, so too must active managers.

The S&P 500, with a market capitalization of $16.7 trillion as of March 31, 2014, represents about 80 percent of the available U.S. market capitalization and closely reflects the results of the overall market.[4] More than $5.7 trillion is benchmarked to the S&P 500, with pure index funds representing a little over one-quarter of that amount.[5] Said differently, almost 40 percent of actively-managed U.S. equity mutual funds use the S&P 500 as a benchmark, representing well over 50 percent of assets under management.[6]

Investors generally call a fund "passive" if it mirrors an index like the S&P 500. But the composition of the S&P 500 itself varies over time, in large part reflecting the issue of corporate longevity. As a result, understanding the criteria that the S&P 500 Index committee uses, as well as the changes in the index over time, can give investors insight into how to beat the benchmark.

In this report, we start by examining the turnover in the composition of the S&P 500, with a goal of understanding the causal factors behind the additions and removals. In light of these results, we consider whether turnover in the S&P 500 is a reasonable proxy for innovation. We find that while we can link turnover to an index of innovation, M&A appears to have a larger influence on the changes.

While others have analyzed patterns of the entries and exits, we take an additional step by analyzing the characteristics of the companies coming and going. In particular, we examine the total shareholder returns (TSR) for the three years before and the three years after a company is either 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 high trailing TSRs and above-average CFROIs. The companies it removes fall into two camps. Those that leave as the result of M&A have strong trailing TSRs and attractive CFROIs, whereas those dropped due to failure or other factors have poor TSRs and CFROIs.

One intriguing finding is that in the 12 and 36 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 reversion to the mean. The committee generally adds companies that have done well and that have high embedded expectations, and removes companies that have done poorly and hence have low expectations. This sets up the scenario where the low expectations stocks outperform the high expectations stocks.

The population of the S&P 500, while economically large and significant, only represents a fraction of the broader economy. As a result, we study the Fortune 500 to see whether the turnover of the S&P 500 is consistent with that of other large companies. The Fortune 500 is a list of the largest companies in the U.S. ranked by revenue and 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 general rate of change we see for the Fortune 500 is consistent with 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 in an economy that starts with 100 companies, each year around 12-14 new companies will enter the economy and 10-12 will leave, resulting in modest growth in the number of companies. There is a great deal of birth and death in young companies.

Corporate longevity is a key consideration for investors, but the crux of the issue is why companies die. Some do indeed die as the result of obsolescence, but most bow out gracefully via a merger with another entity. And those companies that are discarded from the S&P 500 and that still trade may present a small, but lucrative, investment opportunity.

What Causes S&P 500 Turnover?

Exhibit 1 shows the turnover in the S&P 500 from 1958 through 2013. We use data from Compustat for 1991 through 2013 and rely on data 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 about 4 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 tracked deletions and additions.

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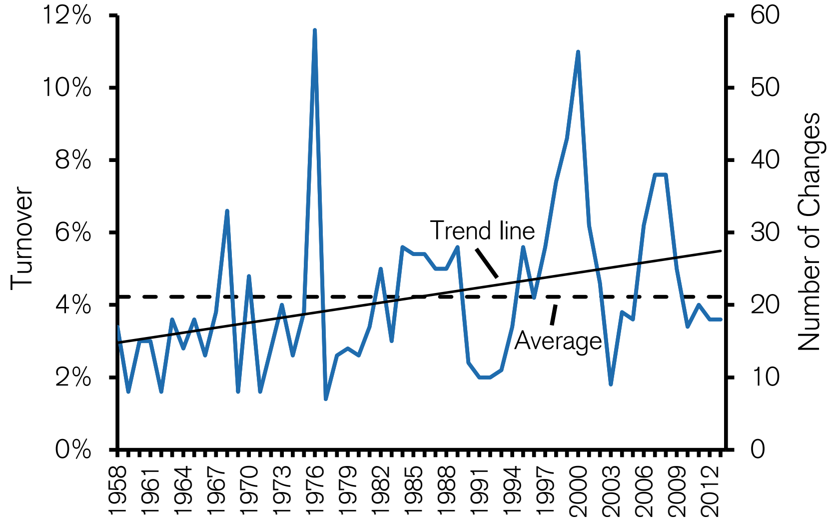
[*] CFROI® is a registered trademark in the United States and other countries (excluding the United Kingdom) of Credit Suisse Group AG or its affiliates.

Exhibit 1: Turnover in the S&P 500 Index, 1958-2013



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; 1991-2013: FactSet, S&P Dow Jones Indices, Credit Suisse Research.*

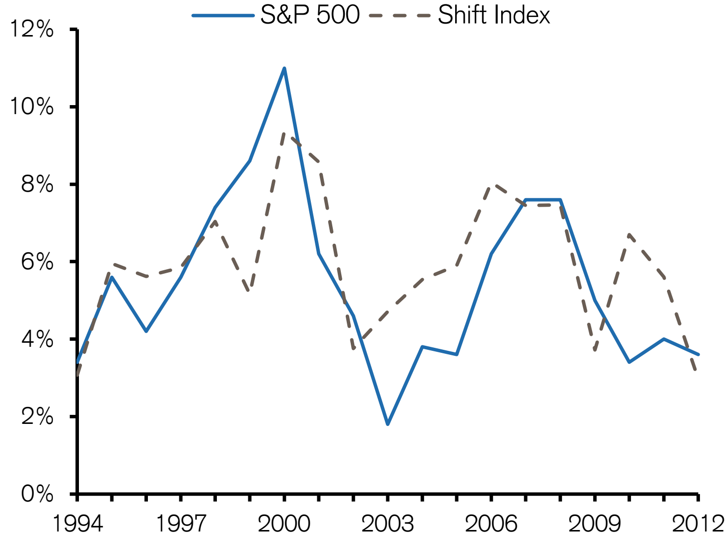
The trend line indicates a gentle rise in the annual turnover rate from the late 1950s and 1960s, when the rate of change was a modest three percent, to today's turnover rate of about four percent. Perhaps the most striking feature of Exhibit 1 is that the rate of turnover swings a great deal from year to year. To illustrate, the turnover rate was in the range of 2 to 11 percent, or 9 to 55 changes per year, from 1991 through 2013.

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, make sense and may be indicative of change in the underlying economy. But in other instances, turnover tells us nothing at all about creative destruction.

For example, the huge spike in 1976 was the result of S&P removing 40 industrial, transportation, and utility companies and replacing them with a like number of financial stocks. In 2002, the index committee removed seven non-U.S. companies because they failed to meet the selection criteria at that time—even though some of the companies had been in the index for 60 years. There were eight changes in 2009 as the result of companies moving their corporate headquarters outside the U.S. in anticipation of a revision in tax laws. These cases underscore the limitation of simply using turnover as a proxy for innovation.[8]

That said, there is a good fit in recent years between The Shift Index, a measure of innovation developed by consultants at Deloitte, and turnover in the S&P 500. Exhibit 2 shows the relationship between a change in the Shift Index and turnover in the S&P 500 from 1994 through 2012. The correlation coefficient (*r*) is 0.65. The Shift Index is itself made up of 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. Together, these indexes are meant to quantify broader economic change.[9]

Exhibit 2: The Shift Index and Turnover in the S&P 500 Index, 1994-2012



Source: Deloitte analysis (see: http://dupress.com/articles/the-burdens-of-the-past/?id=us:el:dc:dup595:awa:tmt), FactSet, S&P Dow Jones Indices, Credit Suisse Research.

The question is whether any other phenomenon explains turnover, and hence longevity, even better than the Shift Index. To answer this, we examined 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 while the committee has greater discretion in the decision to remove a company.

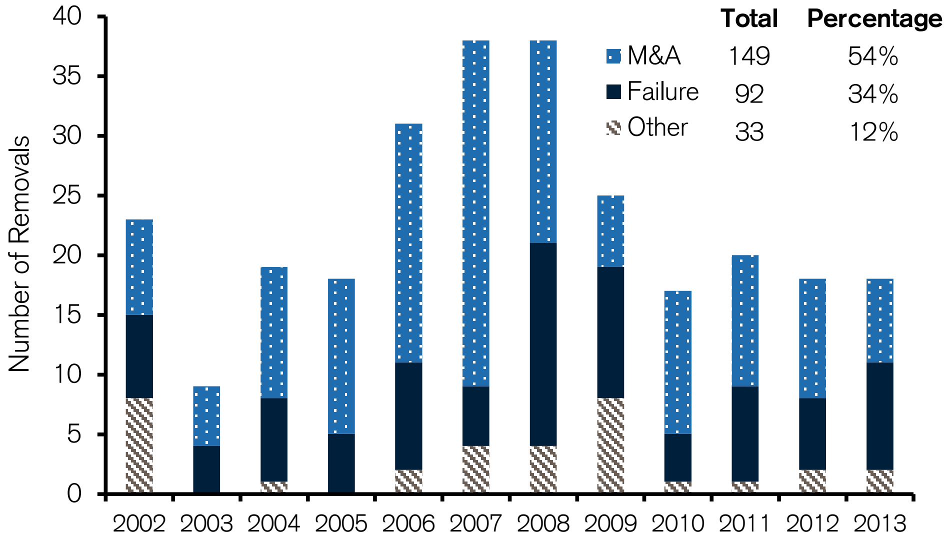
The grounds for removal from the S&P 500 fall into three categories: "M&A," "Failure," and "Other." M&A includes mergers, acquisitions, and companies that go private. We exclude other strategic deals such as spin-offs to shareholders or other forms of dividing a company.

Failures consist primarily of companies the committee dropped from the index following a bankruptcy filing or for failure to maintain a sufficient market capitalization.[10]

The "Other" category 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. The second group includes companies that S&P removed for moving their domiciles outside the U.S.

We systematically place each removal from the index, from 2002-2013, into a category based on the information that S&P provided. This analysis reveals that M&A, not failures, drives the majority of turnover in the index. Exhibit 3 shows that more than half the removals are the result of M&A while only about one-third are from failure. The other category was just over one-tenth of the sample. Most failures were 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 3: Reasons for Removals in the S&P 500 Index, 2002-2013

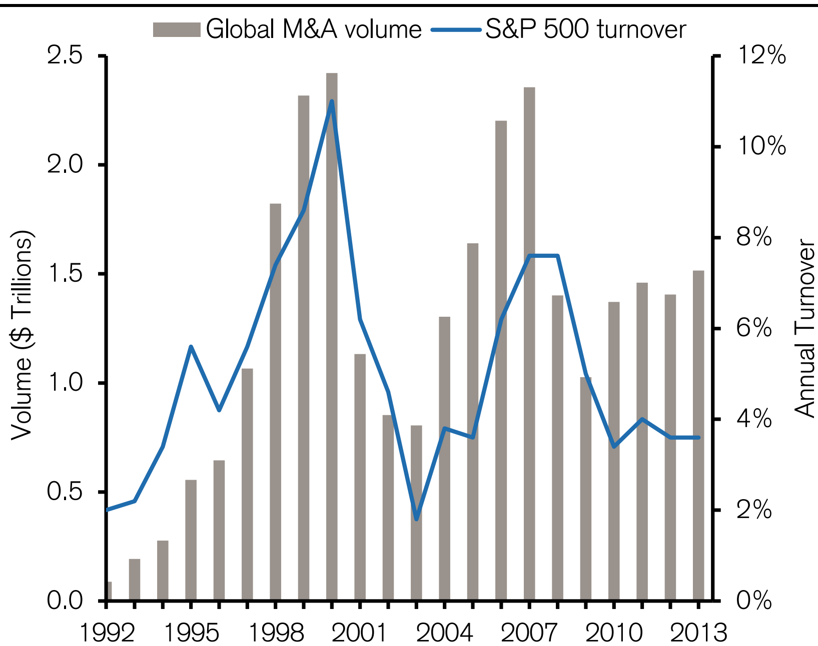


Source: FactSet, S&P Dow Jones Indices, Credit Suisse Research.

Exhibit 4 compares global M&A volume to index turnover from 1992 to 2013. There is a good correlation between the two. More formally, the correlation coefficient (*r*) is 0.73 using global M&A volume and 0.78 using U.S. M&A volume. We see that index turnover over the last 20 years peaks at the same time as M&A peaks in the late 1990s, and again crests around the M&A wave in the mid-2000s.

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 4: S&P 500 Turnover and Global M&A Volume, 1992-2013



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

These categories reveal the limitations of simply associating turnover with creative destruction. For example, it is not accurate 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's hard to say that creative destruction was the reason the committee had to remove 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 added and removed from the S&P 500. In particular, 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. We subtract the return for the S&P 500 from each company's TSR to calculate relative TSR.

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 5 summarizes our observations about TSR.[12] To begin, the S&P committee tends to add companies that have shown strong past stock price results. The companies added in the 12 years ended in 2013 had an average relative TSR of 29 percent per year for the 3 years before inclusion and of 28 percent for the year prior to inclusion. The median returns, while more modest, were similarly high. In this way, the committee behaves in a way that is consistent with other investors—they seek success.[13]

Exhibit 5: Trailing and Future TSRs for Additions and Removals from S&P 500

		TSR Relative to S&P 500			
		-3 Year CAGR	-1 Year	+1 Year	+3 Year CAGR
Mean	Added	29%	28%	-1%	2%
	Removed	-1%	0%	38%	27%
Median	Added	18%	23%	-3%	1%
	Removed	-3%	5%	5%	0%

Source: FactSet, S&P Dow Jones Indices.
Note: The data cover all changes to the index from 2002-2013.

The companies that were removed had three- and one-year returns that were essentially equal to the S&P 500. Naturally, the TSRs reflect the reason the committee had to drop a company. (See Exhibit 6.) The companies that left as the result of M&A had average relative returns of 9 percent for three years and 23 percent for one year. Most of the companies that leave the S&P 500 do so after having outperformed the index itself.

Companies that failed, of course, fared poorly prior to exclusion. Those companies had average relative returns of -24 percent for three years and -39 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 are similar to those for the mean. So, companies that were acquired had excellent relative TSRs, companies that failed had poor TSRs, and the other companies performed in line with the market.

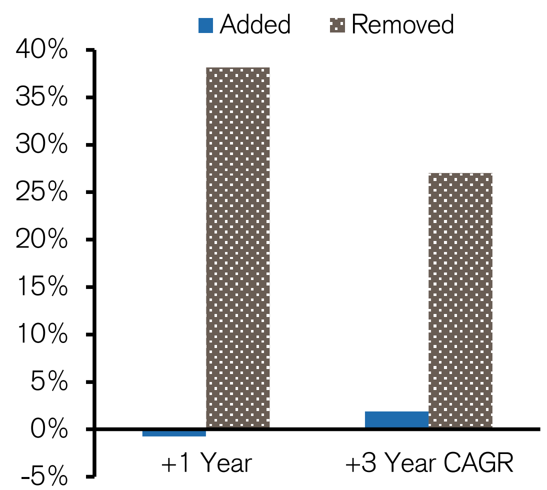
Exhibit 6: Trailing and Future TSRs for Types of Removals from S&P 500

		TSR Relative to S&P 500			
		-3 Year CAGR	-1 Year	+1 Year	+3 Year CAGR
Mean	M&A	9%	23%		
	Failure	-24%	-39%	47%	35%
	Other	-1%	2%	18%	5%
	Total	-1%	0%	38%	27%
Median	M&A	6%	23%		
	Failure	-25%	-46%	4%	-1%
	Other	0%	-4%	8%	1%
	Total	-3%	5%	5%	0%

Source: FactSet, S&P Dow Jones Indices.

But the past is not prologue. Exhibit 7 shows that the average TSRs for the companies the committee removed from the S&P 500, but that continued to trade publicly, 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 -1 percent while the TSR for the companies removed was 38 percent. The results held for three years as well, with added companies up 2 percent and deleted companies up 27 percent relative to the market per year. 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 7: Relative TSRs Following Addition and Removal from the S&P 500



Source: FactSet, S&P Dow Jones Indices.

Next, exhibit 8 shows the results for our second measure, 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 15.6 percent, while the CFROI is an even higher 16.6 percent for the year prior to addition. These figures compare to an average CFROI during that period of around 9 percent. The S&P 500 committee adds companies that have stock market returns and quality that are well above the 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 7.5 percent, and the CFROI in the year before removal was an even lower 4.2 percent. But, the average CFROIs for the removed companies belie the results based on why they were removed.

Exhibit 8: Trailing and Future CFROIs for Additions and Removals from S&P 500

		CFROI			
		-3 Year Avg	-1 Year	+1 Year	+3 Year Avg
Mean	Added	15.6%	16.6%	15.4%	15.2%
	Removed	7.5%	4.2%	6.1%	6.2%
Median	Added	12.3%	13.3%	13.1%	12.0%
	Removed	7.7%	6.8%	5.4%	5.3%

Source: FactSet, S&P Dow Jones Indices, Credit Suisse HOLT®.
Note: The data cover all changes to the index from 2002-2013.

Companies removed as the result of M&A had trailing three-year average CFROIs above the rest of the market. This is consistent with prior research that suggests firms with large free cash flows are attractive takeover targets.[16] This means that the companies removed because of failure or "other" had CFROIs way below the average. The CFROIs for these companies in the one year and three years following removal, at around six percent, are consistent with businesses that are subpar in quality.

In summary, 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.

Of the companies removed, there are two tales. The stocks of companies that are acquired, which represent 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 above 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.

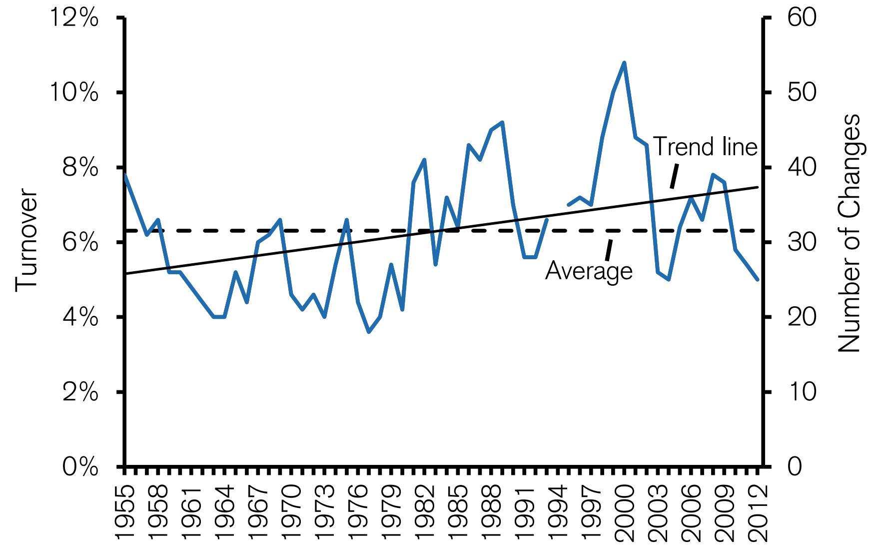
The stocks of the smallest group, companies categorized as "other," have below-average quality and earn TSRs roughly equivalent to that of the market prior to removal and fare somewhat better following removal.

Evidence from the Fortune 500 Corroborates the S&P Experience

The S&P 500 includes many large companies in the Unites States and reflects the broad stock market well. 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 as well as private and mutual insurance companies, the Fortune 500 does a better job of capturing America's largest companies.[17] We calculate that roughly two-thirds of the companies in the index and the list overlap.

Exhibit 9 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 the S&P 500. On average, there are 32 changes per year, representing turnover of roughly six percent, above the S&P 500 at about four percent. Similar to the S&P 500, we see evidence of a modest rise in turnover. But the trend is flat over the past decade and down sharply if we start at 2000.

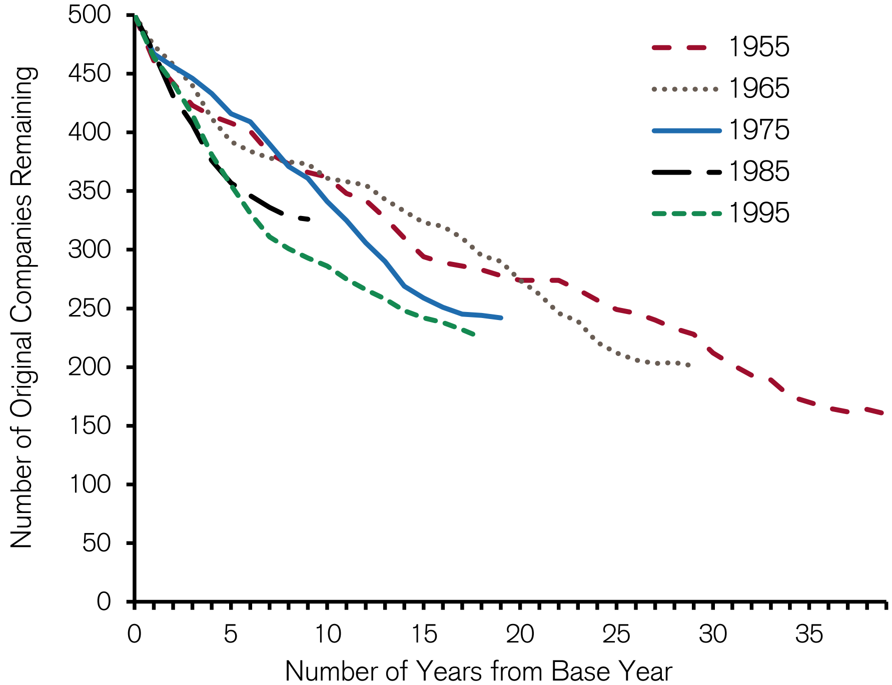
Exhibit 9: Fortune 500 Turnover



Source: Fortune, *Credit Suisse Research.*

Exhibit 10 presents another view of longevity for the large 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.

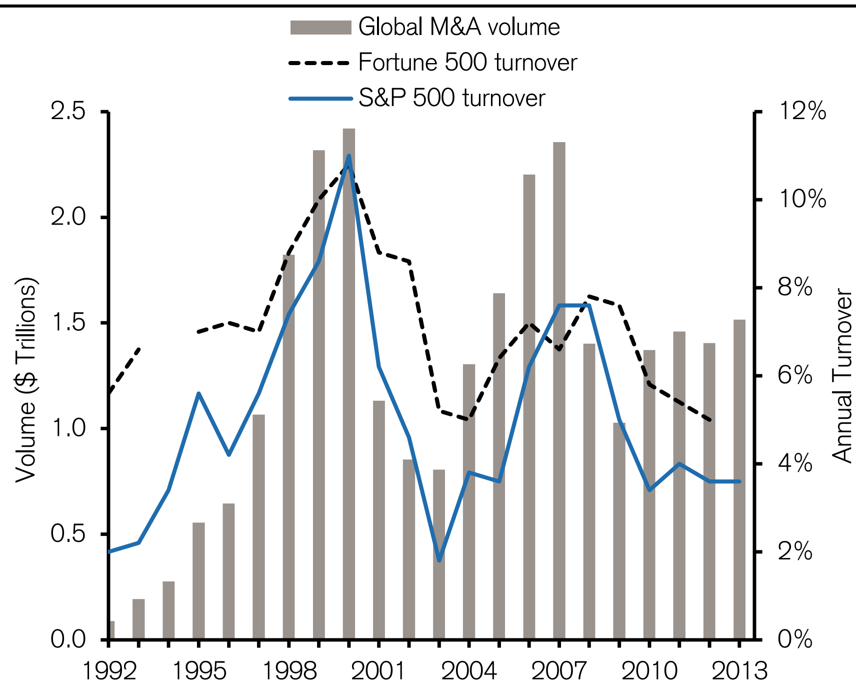
Exhibit 10: Fortune 500 Longevity



Source: Fortune, *Credit Suisse Research.*

Exhibit 11 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 1992, the annual turnover for the Fortune 500 had a correlation (*r*) to global M&A volume of 0.42 and of 0.58 to U.S. M&A volume. This compares to correlations in the 0.70s for S&P 500 turnover.

Exhibit 11: Turnover for the Fortune 500 and S&P 500 and Global M&A Volume



Source: Fortune, *FactSet, S&P Dow Jones Indices, Credit Suisse Research.*

Leslie Hannah, a professor at the London School of Economics, studied corporate longevity in detail.[20] Hannah started with the 100 largest companies in the world, as measured by market capitalization, in 1912 and figured out where they were in 1995. He found that 52 companies had survived and 48 had disappeared. Of the survivors, 19 remained in the top 100. Of those that disappeared, 29 went bankrupt or suffered a similar plight, including liquidation, bankruptcy protection, extensive corporate breakup, or nationalization.

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 are focused on those companies with good reason. In the U.S. today, there are 5.7 million total firms and just more than 5,000 stocks trade on major exchanges.[21]

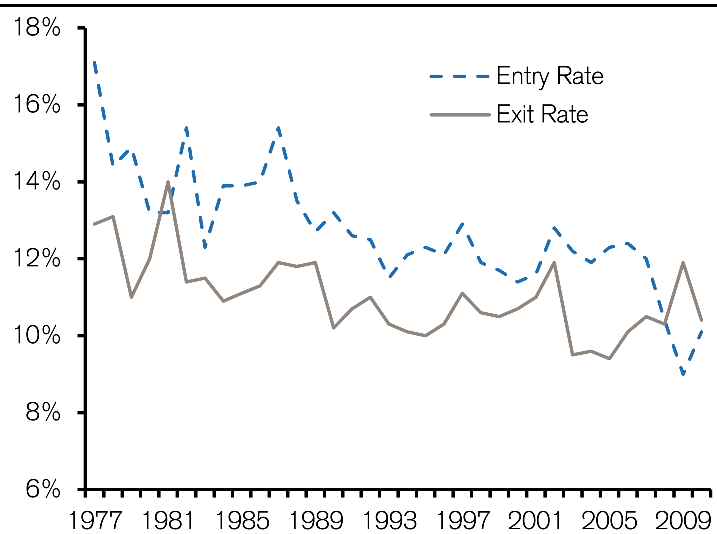
The pattern for the largest firms also exists for smaller firms and, if anything, the issue of longevity is more acute for small firms. Timothy Dunne, Mark Roberts, and Larry Samuelson, a trio of economists, did a sweeping study of corporate longevity, including entry and exit rates. Their analysis of 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 12 shows the rate of entry and exit for U.S. establishments across all industries since 1977, 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 12: Establishment Entry and Exit Rates, 1977-2010 (United States)



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

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 rate that is dramatic. 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, 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.

Endnotes

[1] Kenneth E. Boulding, *A Reconstruction of Economics* (New York: John Wiley & Sons, 1950), 38.
[2] David Pilling, "Kongo Gumi: Building a future on the past," *Financial Times*, October 19, 2007; James Olan Hutcheson, "The End of a 1,400-Year-Old Business," *BloombergBusinessweek*, April 16, 2007.
[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] Antti Petajisto, "Active Share and Mutual Fund Performance," *Working Paper*, December 15, 2010. See also, Antti Petajisto, "Active Share and Mutual Fund Performance," *Financial Analysts Journal,* Vol. 69, No. 4, July/August 2013, 73-93.
[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] "Shift Index Methodology," *Deloitte Center for the Edge*, November 2013. See www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/TMT_us_tmt/us_tmt_ShiftIndexReport_Methodology_111313.pdf.
[10] Removal for more discretionary reasons, such as a diminished market capitalization, is a fairly recent development. A small number of failures were delisted by an exchange or failed to meet profit criteria.
[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] Messod Beneish and Robert 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. See Messod Beneish and Robert E. Whaley, "S&P 500 Index Replacements: A new game in town," *The Journal of Portfolio Management*, Vol. 29, No. 1, 51-60, Fall 2002.

[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 15.8 percent, handily beat the added stocks, with annual returns of 11.4 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, "Do Stocks Added to the Dow Outperform the Stocks They Replace?" *Working Paper* at http://www.claremontmckenna.edu/fei/papers/pdf/DowAdditions.pdf.

[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://money.cnn.com/magazines/fortune/fortune500/2013/faq/?iid=F500_fl_method
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 2013 Fortune 500 to be 2012 because the list published in 2013 largely reflects financial results for the year 2012. 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 (2011) and Dan Strumpf, "U.S. Public Companies Rise Again," *The Wall Street Journal*, February 5, 2014.
[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.
[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] S&P Dow Jones Indices, "S&P U.S. Indices: Methodology," February 2014. See http://www.spindices.com/documents/methodologies/methodology-sp-us-indices.pdf.

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 Standard & Poor's 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)

Methodology for determining which fiscal years to use in calculating trailing and future CFROIs:

The year in which the committee makes a change to the index is the first year of the trailing CFROI calculation. For example, here's how we calculate trailing and future CFROIs for a company that the committee added or removed at any point during 2004.

-3-year: Average of fiscal years 2002-2004
-1-year: Fiscal year 2004
+1-year: Fiscal year 2005
+ 3-year: Average of fiscal years 2005-2007

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 March 2014:[24]

- **Universe**: Domiciled in the U.S.
- **Market Capitalization**: $4.6 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 company 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.

S&P made an important change to its methodology in 1996. 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. This change alone explains a significant portion of the increase in turnover. We estimate that a meaningful fraction of the removals over the past decade would not have occurred absent this methodological change.

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 "500 of the top companies in the leading industries of the U.S. economy." 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

Here is a log of all the changes in the S&P 500 Index from 2002-2013. When S&P announces multiple changes on one day, it generally does not pair a specific addition with a specific removal.

Announced	Implemented	Addition	Removal	Removal "Type"	Reason for Removal
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 & Ilsley 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	Losses for a number of quarters
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 Philips
11/13/2002	11/18/2002	AT&T Comcast Corp.	Comcast Class A Special	M&A	AT&T spun off broadband unit, then merged it w/ Comcast to form AT&T Comcast
12/4/2002	12/11/2002	Quest Diagnostics	TRW Inc	M&A	Acquisition by Northrop Grumman
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	AMR Corp.	Failure	Market cap changes
3/19/2003	3/20/2003	McCormick & Company	HEALTHSOUTH Corp.	Failure	Allegations that 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	Merged with IDEC to become 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	Acqusition 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

Announced	Implemented	Addition	Removal	Removal "Type"	Reason for Removal
			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. (Value)	Sears Roebuck & Co. (Value)	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	Providian 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	Scripps (E.W.) 'A'	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-PilotCorp.	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 Neworks 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
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	Split up (Cendant spun 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 Corp.	Alberto-Culver Co. (old)	Other	Split up
11/15/2006	11/17/2006	Peabody Energy Corp	HCA Inc.	M&A	Taken private
11/21/2006	12/1/2006	DirecTV 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.	Comverse 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	Integrys Energy Group Inc.	Peoples Energy	M&A	Acquisition by WPS Resources, which changed its name to Integrys
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

Announced	Implemented	Addition	Removal	Removal "Type"	Reason for Removal
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 - A	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 Fincl. Svcs.	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 SA
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	Spun off Teradata
9/24/2007	10/1/2007	Expedia Inc.	Solectron 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	Split up
12/19/2007	12/31/2007	Total System Services	Synovus Financial	Other	Spun out Total System Services
12/20/2007	12/20/2007	Range Resources Corp.	Tribune Co.	M&A	Taken private
			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	Failed 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	Split 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	Redomesticated 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	Split 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 (as company placed into conservatorship)
9/9/2008	9/10/2008	Fastenal Co.	Federal National Mortgage Association	Failure	Market cap changes (as company 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)

Announced	Implemented	Addition	Removal	Removal "Type"	Reason for Removal
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 (forming 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	Redomesticated 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
12/29/2008	1/5/2009	Iron Mountain Inc.	UST Inc.	M&A	Acquisition by Altria
2009					
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	Redomesticated 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	Redomesticated 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	Redomesticated 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	Redomesticated 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	Redomesticated to Ireland
6/22/2009	6/25/2009	MetroPCS Communications Inc.	Tyco Electronics Ltd.	Other	Redomesticated 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	Redomesticated 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.
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	Redomesticated 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	Spun 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.
12/22/2010	1/3/2011	Motorola Mobility Holdings, Inc	Meredith Corp	Failure	Market cap changes

Announced	Implemented	Addition	Removal	Removal "Type"	Reason for Removal
2011					
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	ProLogis	M&A	Acquisition by AMB Property (then renamed ProLogis)
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	Spun 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	Split 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 Holding 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
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	Spun 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 giving SoftBank majority ownership 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 A	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

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

Appendix D

Exhibits 13 and 14 show the number of data points for Exhibits 5-8. Since there were 274 total changes, most of these calculations have data for nearly the full sample. For removals there aren't data points for TSR and CFROI in +1 and +3 years for those companies that disappeared, including those that were acquired or went bankrupt. The companies the committee removed for market capitalization declines or "other" do have +1- and +3-year figures.

Exhibit 13: Sample Size for S&P Changes

	TSR Relative to S&P 500				CFROI			
	-3 Year CAGR	-1 Year	+1 Year	+3 Year CAGR	-3 Year Avg	-1 Year	+1 Year	+3 Year Avg
Added	215	238	273	260	265	272	254	214
Removed	266	273	123	111	255	257	136	105

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

Exhibit 14: 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	145	148			134	135		
Failure	90	92	87	76	88	89	74	58
Other	31	33	31	31	33	33	30	27

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

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