Stability of Excellence: Revealed Patterns in Tobin's q-Ratios

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Abstract

Much has been written about characteristics of excellent firms, but little attention has been given to the possibility that excellence, once attained, is the result of a random process. This study uses market valuation concepts to construct a single measure of the multiple dimensions of excellent asset management to test the stability of excellence for a large sample of firms over a 20-year period. The findings suggest that firms are unable to sustain excellence from year-to-year, but excellence is maintained over longer run holding periods. The results also help explain findings in other studies where excellent firms have subsequently provided low rates of return to investors.

Introduction

Over a decade ago, Peters and Waterman (1982) (hereafter noted as P&W) first published their best-selling book, *In Search of Excellence*: *Lessons from America's Best-Run Corporations*. The premise of the P&W study is that factors leading to excellent performance can be identified and generalized. P&W recognized multiple attributes of excellent firms to include sustained financial performance measured by accounting rates of return, asset value, and growth. While the P&W study is the best known of its type, similar studies appear in the management literature.[1] All these studies use small samples of firms and assess excellence by multiple ad hoc measures. Case-study interviews, rather than statistical analysis, are employed to identify the reasons why "excellent" companies move ahead of their competition. But these studies have not examined whether, once companies have been found to be excellent, they continue to maintain their advantages. Random shifts in the rankings of excellent firms or systematic reversion back to industry norms over time remain as distinct possibilities.

Several authors use small samples of firms considered in management studies to be excellent and test whether these firms subsequently perform well for investors. A key premise for this research is that managerial performance is directly related to shareholder returns. Clayman (1987) finds that excellent firms in the P&W study do not remain excellent when judged by the risk-adjusted rates of return the investors achieve. Clayman also finds that the P&W firms subsequently deteriorate according to the measures P&W use to judge excellence, suggesting a form of mean reversion in firm performance. While the P&W firms were judged to be "excellent" based on accounting numbers and management attributes that might be admirable, evidence of sustained excellence of asset management from a shareholder's perspective is missing. This point was confirmed in a subsequent study of Kolodny, Laurence, and Ghosh (1989).

The findings of Clayman and Kolodny, Laurence, and Ghosh are supported in an earlier study by Granatelli and Martin (1984). Granatelli and Martin show that firms considered to be among the best managed firms by a panel of specialists appointed by *Financial World* subsequently are poor investments. In a more recent study using the same criteria for excellence found in the Granatelli and Martin paper, Lauterbach and Vu (1992), using short-run event study methods, find a reversal of risk-adjusted returns soon after a firm receives recognition. These findings of reversals in investor rates of return suggest a potential reversion in a firm's asset management performance.

Existing studies of excellence and stability of excellence have several limitations. First, what is needed is a well-defined measure of excellent asset management that uses a longer-run market valuation benchmark, so that a firm is not placed into or out of the ranks of excellent firms by a recent measure. Unless financial markets are grossly inefficient, all available information about a firm's performance should be reflected in the valuation of the firm's debt and equity. A single measure of excellence also makes it possible to use time series methods to study patterns of excellence. The measure should not penalize a firm for factors beyond the control of management, such as industry and macroeconomic interactions. Second, a large sample of firms is required to analyze various degrees of excellence versus normal performance. Third, a long period of analysis is needed to allow for consistently good performance that might not be among the best in any single period, but that dominates other firms over time. Finally, to capture market perceptions of excellence, an alternative to risk-adjusted rate of return methods based on short-run investment horizons is needed.[2] From an investment perspective, excellent returns occur only if a firm becomes recognized as excellent and is subsequently valued more highly over the holding period used to measure returns.

The purpose of this study is to use an alternative approach for measuring and testing the stability of excellence. The results of the research answer fundamental questions about whether excellence, once identified, offers any meaningful information about future asset management. A measure of the capitalized value of a firm's asset management, Tobin's q-ratio, is introduced to the study of excellence and is used to analyze the serial patterns of excellence for a large cross-section of firms. Tobin's q-ratio is a market based valuation measure capturing multiple dimensions of firm performance. Tests are conducted to determine if there is a propensity for measures of excellence to be random variables, random walks, or to regress back to a normal level of performance. Finally, rankings of portfolios of firms categorized by measures of excellence are tested for stability in subsequent ten-year periods. Unlike prior studies, this study uses a large sample of firms (1,729) listed continuously for 20 years in the Compustat Data Files.

Measuring Excellence: Tobin's Q-Ratio

While the definition of "excellence" may include a variety of subjective characteristics, efficient market valuation of a firm should take into account all relevant information. If managed effectively, a firm's market valuation as an ongoing concern should exceed the replacement cost of its assets. In this context, Tobin's q-ratio provides a good measure of excellence, since it represents the ratio of the market value of the firm's assets (measured by the value of stocks, bonds and preferred stock) to replacement costs of the firm's assets.[3] In a competitive environment, the q-ratio should approach one, since an absence of barriers to entry would eliminate the ability to maintain excess rents. If excellence can be maintained, a firm could consistently achieve a high q-ratio relative to its competition. If excellence is transitory, a firm's q-ratio would gravitate back to a level consistent over time with the competitive benchmark.

The q-ratio of a firm is a function of financial accounting ratios used by P&W as well as the firm's risk. Both balance sheet and income statement information are captured by the q-ratio.[4] A number of papers use q-ratios to measure market capitalization of the firm's management of tangible and intangible assets over time (see for example, Stevens and Jose, 1992; Stevens, 1990; and Solt and Statman, 1989). Unlike short-run return measures, the q-ratio represents a longer-run equilibrium measure capturing both risk and return dimensions.[5] The q-ratio also reflects market perceptions of less quantifiable dimensions of performance, to the extent that market value is affected.

Tobin's q-ratio for each firm in this study is constructed every year for a 20-year period from 1973 through 1992. Procedures for measuring q-ratios are taken directly from earlier work (see Jose, Nichols, and Stevens (1986), Lindenberg and Ross (1981), and Smirlock, Gilligan, and Marshall (1984)). The numerator of q is measured as the market value of financial claims against the firm. The denominator of q is measured by estimating the replacement cost of the firm's assets. (A more detailed discussion of measurement procedures is provided in Appendix A.) The 20 years of q-ratios for each of 1,729 firms listed continuously in the Compustat Data Files provide the raw data for the analysis of excellence.

The time series of q-ratios for each firm is affected by macroeconomic and industry factors beyond the control of management. For example, firms in the construction industry have high/low q-ratios for macroeconomic reasons, to the extent that construction performance varies with the economic cycle.[6] To isolate excellent performance from industry conditions, q-ratios are normalized by dividing the firm q-ratio by the relevant industry q-ratio for each year of the study. In this way, a firm with a high q-ratio relative to all other firms in the same industry classification will have a high industry-adjusted q, even if the overall industry is out of phase with the market.

To calculate industry q-ratios, the following classifications are used to group firms into six industries by Standard Industrial Codes: Construction (1500-1750), Manufacturing (2000-4000), Natural Resources (0000-1400), Professional Services (6500-9000), Retail/Wholesale (5000-6000), and Services (4001-4999). Firms in the financial services industry (6001-6499) are excluded from the study, because it is difficult to construct q-ratios for firms whose assets are primarily financial. For each year, the average q-ratio for each industry group is constructed and used as a benchmark.

To illustrate industry-related influences on q-ratios, market-adjusted q-ratios are also constructed. In each year, the average q-ratio for the entire sample of firms (1,729) is used as the benchmark to create a market-adjusted q measure. If there are no industry influences, firms in one industry classification would not have lower market-adjusted q-ratios than firms in another industry classification. Table 1 provides a summary of q-ratios, adjusted and unadjusted, for each of the industry classifications.

A comparison of market-adjusted q-ratios in Table 1 shows that Professional Services firms tend to have higher valuation premiums relative to the market, and Construction firms tend to have lower valuation premiums. Unless we adjust q-ratios for this difference, the best of the Construction firms will be at a disadvantage in any ranking or comparison of firms, even if they manage their construction-related assets well. Adjusting the ratios for industry classifications places all firms on an equal basis for comparison. With the industry adjustment, "excellence" is defined as being the best (having the highest q) within an industry grouping for a given period.

Time Dimensions of Excellence

The notion that a firm's performance is driven to a normal level has a long history. Classical economists hypothesized that competition would equalize rates of return over time, as new entrants were attracted to businesses with above-average rates of return in any endeavor. Below-average rates of return will not attract new investment, reducing supply relative to demand in the output market until the rate of return approaches a normal level. A slightly different version of this process is the "follow-the-leader" behavior that prevents industry leaders from sustaining their advantage, causing them to gravitate back to an industry performance benchmark. In the follow-the-leader scenario, excellence could be sustained only by developing strategies and management factors that competitors could not imitate.

As a practical matter, analysts often assume that above-average performance will not be sustained and will regress back to a lower, more normal level. Cohen, Zinbarg, and Zeikel (1987, p. 352) describe a three-stage variable growth model used in security analysis, in which above-average growth rates for a firm move back to an average growth rate in a gradual three-stage process.[7] Investment strategies based on buying (selling) stocks with a low (high) price-to-earnings ratio also assume that market-determined performance measures display this reversion to the mean.[8]

Table 1
q-ratio Summary Statistics by Industry Classification for 1,729 Firms for the Period from 1973 through 1992.

Industry	Number of Firms	Unadjusted q-ratio	Market Adjusted q-ratio	Industry Adjusted q-ratio
Construction	41	1.41 (.59)	.88 (.36)	1.0 (.39)
Manufacturing	1031	1.48 (.81)	.94 (.52)	1.0 (.55)
Natural Resources	124	1.74 (.65)	1.09 (.41)	1.0 (.39)
Professional Services	206	1.95 (.87)	1.24 (.56)	1.0 (.44)
Retail/Wholesale	221	1.59 (.81)	1.01 (.52)	1.0 (.49)
Services	106	1.58 (.70)	.99 (.44)	1.0 (.44)
Total Sample	1729	1.58 (.81)	1.0 (.52)	1.0 (.51)

Note: Standard deviations of the 20-year q-ratios for each industry are provided in parentheses.

Several empirical studies offer evidence in support of nonstationary performance measures, but the time series process takes different forms. Cohen, Zinbarg, and Zeikel (1987) report the results of a Salomon Brothers study showing that low (high) return-on-equity firms subsequently achieve high (low) return-on-equity.[9] De Bondt and Thaler (1985) find an autoregressive process for price-to-earnings ratios, consistent with the view that investors should buy (sell) low (high) price-to-earnings stocks. An extensive literature describes a "higgledy-piggledy" growth process with earnings changes distributed randomly over time (see for example, studies by Little (1966), Brealey (1983), and Lintner and Glauber (1978)). With randomly changing earnings, unlike mean-reverting earnings, past earnings are uncorrelated with future earnings. According to the higgledly-piggledy findings, the distribution of future earnings changes will be the same for all stocks (random walk).

Time series q-ratios make it possible to test alternative hypotheses about the stability of "excellence." A firm's q-ratio at time t reflects the market's perception of the firm's earnings potential, growth rate, risk, and related policies. Thus if a firm sustains "excellence" in asset management, sustaining favorable expectations, the firm keeps a high q-ratio. If excellence is mean-reverting, the firm's q-ratio regresses back to an underlying mean value. If excellence is random around a stationary mean, probability statements can be made about future performance. Finally, if excellence is a random walk, there is no tendency for an underlying mean, and future values of q are random around the last observation. The tests used to analyze these alternative time series patterns are outlined in the next section.

Tests For Random, Random Walk, And Autoregressive Excellence

The data summarized in Table 1 make it possible to test for alternative serial relationships in q-ratios. A nonparametric approach is chosen, because the q-ratios have outliers that would distort the results of parametric procedures.[10]

Nonparametric procedures are sensitive to small variations affecting rankings, but an analysis of the data reveals ample variability of q-ratios in all industry groupings. For example, the smallest standard deviation in industry-adjusted q-ratios is .39 around a benchmark mean of 1.0. In every year, firms are ranked by industry-adjusted q-ratios and decile rankings are created, with rankings ranging from 1 (high) to 10 (low). Over the twenty-year period, the average annual ranking of each firm is computed; the summary results are reported in Table 2.

Firms with the highest average annual adjusted q-ratio ranking are grouped into the first decile of the table. The summary data of Table 2 demonstrate that there is movement in the annual rankings. While some firms maintain their high rankings, over the twenty-year period the top decile of firms averaged a ranking of 2. Also, the

Table 2
Summary Statistics by Decile Rankings for 1,729 Firms Ranked by Industry-Adjusted q-ratios for the Period from 1973 through 1992.

Decile Rank Based on 20 Year Average	Average Annual Rank	Average Annual Industry Adjusted q-ratio
1	2.0	1.84 (.59)
2	2.9	1.55 (.32)
3	3.6	1.40 (.30)
4	4.3	1.16 (.10)
5	5.1	0.98 (.11)
6	5.9	0.83 (.11)
7	6.7	0.70 (.08)
8	7.3	0.60 (.05)
9	8.0	0.53 (.03)
10	9.1	0.42 (.07)

Note: Standard deviations are in parentheses.

variability of adjusted q-ratios is highest in the top deciles, suggesting instability in the adjusted q-ratios of the highest ranking firms.

For a detailed analysis of the time series properties of the adjusted q-ratio rankings for each firm, the following autoregressive model is considered:

Rank (t) = (a) Rank (t-1) + (1-a) Ave. Rank + error (t) (1)

The model implies that a firm's rank in period t regresses back to the mean ranking at a rate of (1-a). Depending on the value of a, the model is either a random variable model (a=0), a random walk model (a=1), or an autoregressive model with a regression to the mean at a rate of $0<a<1$.[11] Equation (1) becomes an empirical model of the following form:

Rank (t) = a + b Rank (t-1) + error (t) (2)

where a is a constant equal to (1-a) Ave. Rank, and b is the estimate of a. For each firm in the sample, a regression of the form of equation (2) is conducted to determine if the firm's adjusted q-ratio ranking is a random variable (b=0), a random walk (b=1), or an autoregressive process over time. The procedure recognizes that different firms may have different time series patterns of "excellence." After estimating 1,729 time series regressions of the form specified in equation (2), firms are grouped into either random variable, autoregressive, or random walk categories. Table 3 provides a summary of the statistical results for each grouping.

Each of the three possible time series processes are well represented, with autoregressive q-rankings making up the largest group. Of the three different time series models, the random variable group has the highest industry-adjusted q-ratio and the lowest variability of rankings over the 20-year period. For these firms, "excellence" is

Table 3
Time Series Regression Results for the Autoregressive Model of Decile Ranks Based on Industry-Adjusted q-ratios.
($Rank_t = a + b\ Rank_{t-1} + error_t$)

Model	Number of Firms	Average Intercept	Average Slope	Average Industry Adjusted q-ratio	Average Standard Deviation of Annual Rank
Random Variable	521	3.99 (3.12	.17 (0.79 [3.63	1.1	1.54
Auto Regressive	651	2.25 (1.93	.612 (3.32 [2.11	.91	1.69
Random Walk	495	0.6 (0.77	.870 (6.52 [0.97	.9	2.05

Notes: The t-statistic for the hypothesis that the coefficient equals zero is in parentheses
( ). The t-statistic for the hypothesis that the slope coefficient equals one is in brackets [ ]. For the random walk model, the intercept is not significantly different from zero and the slope coefficient is not significantly different from one. The asterisk (*) indicates a coefficient that is statistically significantly greater than zero.

represented by a q-ratio that is higher than the industry benchmark (industry-adjusted q-ratio greater than 1). While the industry-adjusted q-ratio varies randomly around a higher mean ranking, the firms in this group tend to maintain superior market valuation of their asset management with relatively less movement into other ranks (low average standard deviation). For these firms, the underlying mean performance is a better estimate of future performance than the last observed measure.

Hypotheses of mean-reverting performance are confirmed for a large subset of firms (651). These firms tend to underperform the industry (industry-adjusted q < 1). While they may reach higher rankings, they have a tendency to revert back to a lower performance benchmark. The random walk subset has the highest variability of annual rankings. For these firms, the last observed value of the industry-adjusted q-ratio ranking is the best estimate of future ranking.

Longer-Run Repetition of Excellence

Test results in the previous section suggest that the period-by-period movements in industry-adjusted q-ratio rankings vary. In this section, a test of consistency over a longer run is constructed. For two consecutive 10-year periods, firms are ranked as either high, medium, or low in a rank ordering of industry-adjusted q-ratios. If q-ratio rankings are random and independent, the ranking in the first 10-year period will not affect the ranking in the second 10-year period.

The test procedure results in nine possible combinations of the high, medium, and low rankings for two periods. The null hypothesis is that successive rankings in the two 10-year periods are independent and random, resulting in equal numbers of firms in each of the 9 different cells (sample proportion of .111). The actual groupings for the 1,729 firms into the nine cells are shown in Table 4.

The null hypothesis of equal proportions of firms in each of the nine cells is easily rejected by a Chi-square test. The Chi-square test is based on deviations of the observed frequencies of firms in the nine cells from their expected frequencies. The computed Chi-square of 734.26 is much larger than the critical value of the Chi-square statistic, at the .01 level of significance and 8 degrees of freedom (20.90).[12]

Table 4
Combinations of High, Medium, and Low Groupings
Based on Consecutive 10-Year Industry-Adjusted q-ratio Groups.

'73-'82 Group	'83-'92 Group	Number of Firms	Industry Adjusted q-ratio	Proportion of 1,729 Firms
High	High	377	1.66	.218*
High	Medium	167	1.24	.096
High	Low	32	1.06	.018*
Medium	High	172	1.26	.099
Medium	Medium	262	0.87	.152*
Medium	Low	143	0.72	.083*
Low	High	27	0.88	.016*
Low	Medium	148	0.64	.086*
Low	Low	401	0.49	.232*

Note: The asterisk (*) indicates that the proportion is significantly different from a proportion of .1111 = (1/9), implied by a random process. A two-tailed test at the 5% level of significance is used.

The Chi-square test allows a rejection of the hypothesis that the consecutive 10-year rankings are random and independent for the nine groupings overall. However, it does not provide a test for each of the nine cell groupings. The Chi-square test could lead to a rejection if only two of the cells had observed frequencies with high deviations from the expected frequency. For a more specific analysis, a difference in proportions test is conducted for each of the nine cells. The null hypothesis is that the observed proportion equals the expected proportion (.1111), consistent with a random and independent distribution of the nine combinations of rankings.[13] The asterisks in Table 4 identify cell groupings that are statistically significantly different from .1111.

Some of the nine groupings in Table 4 have much higher proportions of firms than expected under a random/independent distribution of firms. Consistent 10-year rankings are much more common than expected under the null hypothesis. Firms that are either high, medium, or low in the first 10-year period tended to remain in the same ranking. Firms moving from top to bottom or bottom to top in the rankings are much less frequent than would have been predicted by chance. The High-Low, Low-High, Medium-Low, and Low-Medium groupings have significantly lower than expected proportions.

The findings in Table 4 suggest that "excellent" firms remain excellent when viewed over longer periods of time. The findings also suggest that problem firms remain problem firms and mediocre firms remain mediocre. Over the longer time periods of performance measurement there is no evidence that "excellence" is random.

Conclusions

This study uses a single measure of excellent performance (Tobin's q-ratio) and explores the time series patterns of this measure for a large sample of firms over a 20-year period. After normalizing the q-ratio with industry benchmarks, time series models of annual q-ratio rankings provide information about the shorter-run annual adjustment of the measure of excellence. Finally, longer-run adjustments of the performance measure are tested for successive 10-year periods.

The findings of the study show that there is high variation in the performance rankings from year to year. Large subsets of firms follow either random variable, random walk, or autoregressive time series models. Firms with a random variable time series tend to have higher measures of excellence. If excellence is studied over short-run periods, sustained excellence over subsequent years is not likely for any of the time series models, given the volatility of annual rankings. But when a longer period is used to measure excellence, consistent performance in consecutive periods is common. For example, of the 576 firms with high rankings in the first 10-year period, 377 remained high in the rankings in the next 10-year period. This same consistency is found for firms remaining in the low ranking and the medium ranking.

Several key points are made in this study:

First, it is not surprising that in previous studies by Clayman (1987) and by Kolodny, Laurence, and Ghosh (1989) excellent companies do not provide good investment returns in subsequent periods. Over short-run holding periods, market valuation premiums for excellent firms are likely to fall. Only for random walk firms would subsequent valuation premiums not be expected to be lower once an excellent performance is achieved.[14] Even for these random walk firms, valuation premiums are as likely to fall as to rise. This study suggests that for short holding periods, bad companies (low q ranking relative to mean ranking) offer potential for good short-run investment performance if they are in the autoregressive or random variable groupings.

Second, from the standpoint of longer-run investment, firms with low market valuation premiums (low q) that subsequently receive valuation premiums are rare. This study shows that for longer holding periods, few firms fit the category of a bad company (low adjusted q-ranking) becoming a good company (high valuation premiums resulting in a high ranking).

Third, for longer-run holding periods, market valuation premiums are maintained in a consistent manner. Excellent firms tend to maintain excellence, in terms of market valuation of asset management relative to industry competition. This pattern holds for medium and low ranking firms as well. Good companies remain good companies and bad companies remain bad companies. This finding opens the possibility that excellence is not driven by short-run management changes. 🕮

❄❄❄ Footnotes ❄❄❄

1. See Kaplan (1990), Pears (1992), and Peters and Austin (1985).
2. Roll (1978) and Ross (1977) have argued that an inability to appropriately estimate systematic risk may make risk-adjusted comparisons spurious. Also, the analysis of rates of return over short-run periods immediately following a given date (especially event studies) assumes a very short-run investment horizon of the investor.
3. For the original development of the ratio, see Tobin (1969, 1978) and Tobin and Brainard (1977).
4. See Stevens (1986) for a complete development of relationships between q-ratios and traditional measures of firm performance.
5. Returns must be adjusted for risk, but Tobin's q is based on market prices that are already determined by a risk-return tradeoff.
6. Different industries perform better (worse) during specific phases of the market cycle. Some of the time series variation of a firm's q-ratio will be due to an interaction of market conditions with the firm's industry. The need to normalize a financial measure to account for this time series variation is commonly recognized in the analysis of price-to-earnings ratios.

For example, see Cohen, Zinbarg, and Zeikel (1987, pp. 357-358).
7. Cohen, Zinbarg, and Zeikel also describe a mean-reverting process for industries (1987, p. 369-373). Since a fundamental factor driving a firm's stock price is the expected growth rate of future earnings, the mean-reverting growth models suggest that market valuation measures will also have a mean-reverting process.
8. The literature on the low price-to-earnings approach to investing is extensive. See Fuller, Huberts, and Levinson (1993) for a recent analysis of the issue.
9. Fraumeni and Jorgenson (1980) found that differences in the rate of return on equity were stable over time, contrary to the Salomon findings.
10. Parametric procedures assume that q-ratios are normally distributed about their mean. Outliers in the cardinal q-ratio data distort the mean, making tests of mean-reversion spurious. A distribution-free approach is provided by ranking firms by q-ratio measures and using ordinal (ranking), rather than cardinal (q-ratio values) data for the time series analysis.
11. For a more complete discussion of the model in equation (1), see Collins, Ledolter, and Rayburn (1987) and Clinebell, Kahl, and Stevens (1994).
12. See Hamburg (1977, pp. 313-320).
13. See Hamburg (1977, pp. 275-280).
14. For a random variable or autoregressive model, "high" q-ratios are likely to be followed by lower q-ratios. For a random walk model, the following q-ratio may be higher, lower, or the same.

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