Betas and Their Regression Tendencies: Some Further Evidence

by

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In [1], I proposed a model to interpret the behavior of beta coefficients over time. Without going into every detail, that model hypothesized that the beta coefficients of a set of securities at two points in time could be interpreted as drawings from a multivariate normal distribution. The beta coefficients were defined as strictly stationary between two points in time if (a) the marginal distributions of the beta coefficients in each cross section had the same mean and standard deviation and (b) the correlation coefficient between the betas in the two cross sections was 1.0.[1] The article [1] itself contained evidence that beta coefficients were not strictly stationary over time and tended to regress towards 1.0 over time.[2]

Haltiner, Elgers, and Hawthorne [2] have hypothesized that one of the reasons for this regression tendency is that the cross-sectional standard deviation of the beta coefficients for a given set of firms may decline over time even if the cross-sectional standard deviation of the betas of all securities in existence at each point in time were constant. Although this type of phenomenon would not create any post-selection bias in the tests conducted in [1], which were carefully formulated to avoid such a bias, it would have real economic meaning to an investor who wished to select a portfolio of extreme risk, either high or low, on the basis of historical data. Such an investor would find subsequently that his portfolio would have a less extreme risk than originally thought. This result would follow even if the correlation coefficient between the historical betas and the subsequent betas of those companies which survived were 1.0.

This hypothesis deserves to be tested, and Haltiner et al. do examine it over the twenty-one years ending in June 1975. After removing the effect of measurement error, they find some support for it; but their results are not strong (significance at the 5 percent level in one case and at the 10 percent level in two other cases[3]). To provide more extensive evidence, I have estimated, after removing the effect of measurement error, the cross-sectional standard deviations of the true beta coefficients for NYSE stocks in successive seven-year periods from 1926 through 1975 as a function of the length of prior listing on the NYSE:[4] namely, no requirement as to prior listing, listed for at least 7 prior years, and listed for at least 14 prior years.[5]

These estimates show, for instance, that in the 1933-1940 period the cross-sectional standard deviation of the betas for those securities listed in the prior seven years (0.525) was greater than that for all securities whether listed in prior years or not (0.503). This result is, of course, inconsistent with their hypothesis.[6] Of the six seven-year periods in which data are available, half are consistent and half are not consistent with their hypothesis. If companies are required to be listed for fourteen prior years, the estimates are consistent with their hypothesis in four out of five periods. But even this result has an 18.75 percent chance of occurring under the null hypothesis that prior listing has no effect.[7]

While this longer period provides little support for their hypothesis, it may be that the cross-sectional standard deviations of betas for all securities, regardless of prior listing, have steadily decreased over time. Those results in Table 1 which impose no prior listing requirement, however, do not support this possibility. In three out of the six seven-year periods from 1933, the cross-sectional standard deviation was less than in the prior seven-year period

and in the other three, greater. While the level of cross-sectional standard deviations currently is less than it was in the thirties, most of this reduction occurred in the forties and fifties and thus could not explain a persistant regression tendency over time.

Finally, Haltiner et al. observe that a regression tendency due to a correlation of less than 1.0 should work both in a forward and backward direction (assuming that changes in the cross-sectional standard deviations are not too great). Indeed, their finding that the regression tendency does work in both directions is consistent with a correlation of less than 1.0. More direct evidence that the correlations are less than 1.0 is provided in Table 2 which displays estimates of the correlation coefficients between the true betas in successive seven-year periods.[8] Although their observation that the regression tendency due to less than perfect correlation should work in both directions may have some pedagogical merit and does provide an additional test, it should be emphasized in closing that an investor would be almost exclusively concerned with the forward-looking aspect of the regression tendency -- the primary concern of the original paper.

FOOTNOTES

[1] [1], p. 790.

[2] While one of the tests relied heavily upon the assumption of normality, a second test did not require the assumption.

[3] Even these significance levels overstate the signficance since their tests are not independent.

[4] As in the original article, the variance of the true betas in a particular cross section was estimated as the difference between the cross-sectional variance of the estimated beta coefficients and the average of the squares of the standard errors of the estimates. Unlike the original article, the market return was measured by the Standard and Poor's Composite Index adjusted for dividends rather than by Fisher's Combination Link Relative. All other calculations were the same, and all possible NYSE stocks with complete data for the appropriate calculations were included.

[5] Listing status was determined by the availability of NYSE prices. Thus, the length of prior listing for a company with some missing data would be understated.

[6] The ranking of the cross-sectional standard deviations of the true beta coefficients in the last three seven-year periods as given in Table 1 is slightly different from the ranking of the adjusted variances in [2]. Indeed, the rankings in Table 1 themselves change according to the prior listing requirement. What all this suggests is that small differences between the cross-sectional standard deviations should not be taken too seriously.

[7] This probability is calculated under the assumption of an equal probability binominal distribution.

[8] These estimates were obtained by dividing the sample covariance between the estimated betas in successive periods by the appropriate standard deviations in Table 1. A simple extension of a proof in [1, p. 790] can be used to show that, as long as measurement errors are independent, the sample covariance between the estimated betas in two cross sections will be an asymptotically unbiased estimator of the covariance between the true betas.

REFERENCES

1. Marshall E. Blume, "Betas and their Regression Tendencies," Journal of Finance (June 1975).

2. James R. Haltiner, Pieter T. Elgers, and William H. Hawthorne, "Beta Regression Tendencies: Statistical and Real Causes," Journal of Finance, this issue.

Table 1

Estimated Standard Deviations of True Beta Coefficients
of Individual NYSE Securities in Successive Seven-Year Periods
from July 1926 through June 1975
According to Length of Prior Listing

Date of Period	Standard Deviation		
	Prior Listing Requirement		
	None	Past 7 years	Past 14 years
7/26-6/33	0.477		
7/33-6/40	0.503	0.525	
7/40-6/47	0.465	0.495	0.461
7/47-6/54	0.347	0.353	0.361
7/54-6/61	0.268	0.261	0.267
7/61-6/68	0.313	0.301	0.295
7/68-6/75	0.321	0.303	0.292

Table 2

Estimated Correlation Coefficients of True Beta Coefficients of Individual NYSE Securities between Successive Seven-Year Periods from July 1926 through June 1975

Dates of Periods	Correlation Coefficient
7/26-6/33 and 7/33-6/40	0.69
7/33-6/40 and 7/40-6/47	0.78
7/40-6/47 and 7/47-6/54	0.76
7/47-6/54 and 7/54-6/61	0.88
7/54-6/61 and 7/61-6/68	0.78
7/61-6/68 and 7/68-6/75	0.80