THE 80-YEAR PROBLEM:

EXAMPLE AND MATHEMATICS

True Alpha	Correlation to Benchmark	Time to Measure
1%	.90	80 years
1%	.94	48 years
1%	.98	16 years
2%	.90	20 years
2%	.94	12 years
2%	.98	4 years
3%	.90	>8 years
3%	.94	>5 years
3%	.98	<2 years

This table shows the sensitivity of measurement to assumptions about alpha and correlations. The first line indicates that if a manager had a true alpha of 1% and returns which had a correlation coefficient of r=.90, then 80 years would be required to assess whether the manager was adding value if you required 1 standard deviation of statistical significance. (To make measurement matters worse, the time goes up by the square of the standard deviation of statistical significance — i.e., for 2 standard deviations the time is 320 years, or 2^2 x 80 years!)

The formula for the table was*: *Time to Measure* $T = \frac{\sigma_{pm}^2}{\alpha^2}$.

where T = the time needed to determine whether a manager produced a long-run alpha that was statistically greater than the return of the benchmark at the level of one standard error (84%), $\sigma_{pm}^2 = \sigma_p^2 + \sigma_m^2 - 2\sigma_p\sigma_m r_{pm}$ = the covariance of the difference between the two portfolios, α = the difference in returns, and r_{pm} = the correlation between portfolios p and m.

The first line of the table was calculated with a simple assumption — the annual standard deviation is 20% for a managed portfolio and the benchmark. The calculations were: *Time to Measure* $= \frac{\sigma_{pm}^2}{\alpha^2} = \frac{\sigma_p^2 + \sigma_m^2 - 2\sigma_p\sigma_m r_{pm}}{\alpha^2} = \frac{(.2)^2 + (.2)^2 - 2(.2)(.2)(.9)}{(.01)^2} = \frac{.04 + .04 - 2(.036)}{.0001} = \frac{.008}{.001} = 80$ *Years*