M2

[Measuring Risk]

Source: 1997 1Q *TIFF Funds*

Prize Winning Provenance

Many years ago, a kindly professor decided to challenge the way the world looked at an important aspect of corporate finance: the appropriate ratio of debt to equity in a company's capital structure. He succeeded and ultimately received a Nobel Prize in Economics for his efforts. Recently, this same gentleman decided to challenge the way the world looks at an important aspect of investing: the concept of risk. Actually, he decided to join forces with a woman many years his junior for whom an improved definition of risk had become an obsession. The gentleman's name is Franco Modigliani; the woman is his granddaughter, Leah. Never lacking in marketing savvy, Ms. Modigliani's colleagues at Morgan Stanley have dubbed the new risk measure that she and her grandfather have devised "M2." Ironically, the Modiglianis' chief aim in devising this new tool was to concoct a more intuitively appealing measure of investment risk than the long-time favorite, which was invented by another Nobel laureate, Bill Sharpe.

Sharpe Thinking

Although it was Sharpe's work on the so-called Capital Asset Pricing Model that won him his Nobel, the method he devised to adjust returns for the risk incurred in producing them has had perhaps more practical significance for investors. A portfolio's "Sharpe Ratio" is calculated by subtracting the risk-free rate (typically, the yield on 91-day Treasury bills) from the portfolio's total return and then dividing this number by the standard deviation of the portfolio's returns. Whether standard deviation is a meaningful measure of investment risk is a question to which we return below; for now, we simply note that, from his original vantage point in academe's ivory tower, standard deviation struck Sharpe as the single best measure of risk. [1] In the absence of other logical methods of relating return to risk, Dr. Sharpe's approach swept the field, and money managers throughout the world now reflexively trumpet favorable Sharpe Ratios (the higher the better) during periods when they underperform their benchmarks. Moreover, due in part to the Sharpe Ratio's broad acceptance, standard deviation itself has become a widely accepted definition of investment hazard.

Adjusting for Risk

Like the Sharpe Ratio, the Modiglianis' new statistic seeks to measure how well portfolios (or mutual funds) perform after adjusting for risk. To make this adjustment, the two M's lever or delever a portfolio until its volatility (as measured by standard deviation) matches that of its benchmark. Differently put, for a portfolio whose historical volatility has been less than its benchmark's, they expand the portfolio by leveraging it at an assumed borrowing rate; and for a portfolio whose volatility has been greater than its

benchmark's, they contract it and invest the hypothetical proceeds at an assumed yield. (The assumed interest rate for both borrowing and lending is the yield on short-term Treasury bills.) This adjustment produces a portfolio-specific "equity share" — a leverage ratio that equates the portfolio's risk to that of its benchmark. The portfolio's actual return is then multiplied by its "equity share," and the product of this calculation (dubbed "M2") is compared to the benchmark's actual return to determine whether the portfolio has out- or underperformed the benchmark on a risk-adjusted basis.

Intuitive to Whom?

As noted above, the Modiglianis' chief aim in devising M2 was to concoct a more intuitively appealing risk measure than the Sharpe Ratio. After slogging through the preceding paragraph, many readers may be asking the question: intuitively appealing to whom? The answer can be found in the table below, which is adapted from the Morgan Stanley report in which Leah Modigliani first described M2. As can be seen, when actively managed portfolios are rank-ordered using both devices — the Sharpe Ratio and M2 — the rankings are identical, but the Modiglianis' method produces a number to which most investors can readily relate: a risk-adjusted return expressed in conventional percentage terms (see Column 3). In contrast, Sharpe's method produces an abstract ratio (i.e., units of return per units of risk taken) that is of limited utility to lay investors seeking to compare different portfolios' performance (see Column 5).

Relevance for TIFF Members

Having worked with many governing boards for whom Sharpe Ratios have proven more confusing than clarifying, we wanted our readers to know about the Modiglianis' improved method of evaluating risk-adjusted performance. That said, it is by no means clear that standard deviation is an ideal or even appropriate measure of risk for perpetual life institutions. To be statistically valid, the standard deviation figure on which both the Sharpe and Modigliani methods rely presupposes a return series comprising at least 30 observations. Alas, money managers still open to new assets or clients after 30 years in business are unlikely to merit scrutiny in the first place because big money typically finds its way to truly talented managers long before 30 years elapse. Indeed, given compensation norms in the money management profession, the most talented managers usually hang up their cleats well in advance of their thirtieth year on the field. Shortening the measurement period from years to quarters expands the universe of managers to which volatility-based risk measures might theoretically be applied, but there's something odd at best in using 90-day risk measures to allocate the permanent capital of an endowed institution. Moreover, since the typical foundation employs multiple managers, the correlation of managers' returns arguably matters more in terms of total fund risk than the volatility of individual managers' results.

Alternate Risk Measures

One nice thing to be said about both the M2 and Sharpe methods is that they are robust enough to accommodate multiple definitions of risk. For example, many investment

professionals whose early training instilled a near-religious belief that "risk" means total variance now freely confess that downside variance better describes what their clients seek to avoid. [2] Moving forward, it will be interesting to see whether any single method of evaluating risk becomes the near-universal favorite that the Sharpe Ratio has become over the last two decades. Interestingly, the SEC seems determined to push the money management industry toward a universal measure of investment risk, at least with respect to regulated mutual funds. By definition, such an effort seems destined to fail, as the SEC itself has reason to recognize: when it elicited public comment on the issue not long ago, it was bombarded with literally thousands of letters, in which dozens of differing definitions of risk were extolled. In addition to the usual suspects (standard deviation, beta, price/earnings or price/book ratios, etc.), the exercise rounded up several noteworthy alternatives. These included concentration ratios (e.g., the percentage of a mutual fund's total assets that its top five or ten holdings comprise or the percentage invested in one economic sector); maximum downside risk over defined periods ranging from 30 days to three years; and — one measure we especially like — downside risk during specific market shocks. For example, investors considering various bond funds would do well to ask how each fund held up when the Federal Reserve removed the punch bowl from a rip-roaring party in the bond market in early 1994.

Risk-Adjusted Returns

	[1]	[2]	[3]	[4]	[5]	[6]	
	10-Year Average Annual Total Return	Equity Share	M2	Risk-Adjusted Excess Return	Sharpe Ratio	Risk-Adjusted Rank	
						M2	Sharpe Ratio
Benchmark: S&P 500	15.2	100%			0.70		
Income Fund of America	12.2	175%	16.9	+1.7	0.81	1	1
Fidelity Puritan	12.5	148%	15.7	+0.5	0.73	2	2
Fidelity Magellan	16.2	84%	14.9	-0.3	0.67	3	3
AIM Constellation	19.2	59%	14.5	-0.7	0.64	4	4
Vanguard Windsor	14.0	93%	13.8	-1.4	0.59	5	5
T. Rowe Price New Horizons	16.3	65%	13.4	-1.8	0.57	6	6
20th Century Vista Investors	15.2	52%	11.9	-3.3	0.46	7	7
T-Bill	5.6						

[1] Based on quarterly returns for the 10 years ending Q4 1996. Source for quarterly returns: Morningstar Inc.

[2] Equity Share = leverage ratio that causes each mutual fund's volatility to exactly equal the benchmark's volatility.

[4] Risk-Adjusted Excess Return = M2 minus the benchmark return.

Source: Morgan Stanley

No Easy Answers

Of course, just because a bond manager had the good sense — or good luck — to throttle back on duration prior to the market break in 1994 doesn't guarantee that he will make timely duration shifts in the future. In the final analysis, no amount of number-crunching can prove conclusively that a money manager posting strong numbers has been skillful rather than lucky. Indeed, no amount of scrutiny — whether qualitative or quantitative — can furnish such proof, because a researcher can never know with certainty the true motives underlying a manager's actions: what a manager claims were calculated bets might in fact have been blind gambles. In light of these facts, prudent investors do with tools such as M2 what they do with the managers that such tools purportedly help them choose among: they diversify. Instead of placing total faith in a single risk measure, they examine risk through multiple prisms — secure in the knowledge that none captures fully the complete picture.

Endnotes

1. Standard deviation is a measure of dispersion. When a money manager says that his typical portfolio has a "standard deviation of 15," he means that in two-thirds of all measurement periods the portfolio's return is likely to be within 15% of its long-term mean or average. Thus, if the portfolio's average return is 15%, its actual return in any given measurement period has a two-thirds probability of being more than 0% but less than 30%. Two standard deviations describe the range of outcomes comprising 95% of all expected results. Three standard deviations describe the percentage of readers of this piece whose eyes will likely glaze over reading this footnote (>98%).

2. Total variance is synonymous with "standard deviation" or "volatility" as used above; downside variance focuses solely on returns that fall short of an investor's target, which can be expressed in either absolute or relative terms.