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Insights from a Pioneer in Portfolio
Theory and Practice: A Talk with
Nobel Laureate William F. Sharpe, PhD



Architect of the capital asset pricing model. Creator of the Sharpe ratio for investment performance analysis. One of the fathers of modern portfolio theory. Contributor to the binomial method for the valuation of options, the gradient method for asset allocation optimization, returns-based style analysis for evaluating the style and performance of investment funds.... The list goes on. The world of financial economics has been shaped by the pioneering work of William F. Sharpe, Ph.D., work that was recognized, along with that of Harry M. Markowitz and Merton M. Miller, with the Nobel Memorial Prize in Economic Sciences in 1990. Dr. Sharpe, who is the STANCO 25 Professor of Finance, Emeritus, at Stanford University's Graduate School of Business, has authored numerous articles for professional journals as well as six books, including *Portfolio*

Theory and Capital Markets (1970 and 2000), *Asset Allocation Tools* (1987), *Investments* (1999), and *Fundamentals of Investments* (2000). His seventh book, *Asset Prices and Portfolio Choice*, based on a series of lectures presented at Princeton University in May 2004, is scheduled for publication in 2006.

In late 2004, Dr. Sharpe talked with members of the *Journal of Investment Consulting's* Editorial Advisory Board about the development of some of his noted theories, their applicability in today's markets, and areas of financial economics that he believes need further exploration. Taking part in the discussion were Edward Baker, the *Journal's* editor-in-chief, of Alliance Capital Ltd., London and San Francisco; Ronald Kahn of Barclays Global Investors Services, San Francisco; Tony Kao of General Motors Investment Management, New York; Matthew Morey of Pace University, New York; and Meir Statman of Santa Clara University, California. This interview is the third in the *Journal's* Masters Series, which presents topical discussions with leading experts and visionaries in finance, economics, and investments.

INSIGHTS FROM A PIONEER IN PORTFOLIO THEORY AND PRACTICE: A TALK WITH NOBEL LAUREATE WILLIAM F. SHARPE, PH.D.

ED BAKER: Thank you for agreeing to be part of the *Journal's* Masters Series. We, of course, are all familiar with your work and excited about the opportunity to discuss it with you. Matt, you wanted to start off with a question about the capital asset pricing model [CAPM].

MATT MOREY: Given all that has happened in the world of economics and finance since you first developed the CAPM forty years ago, how relevant do you think the model is today?

BILL SHARPE: It seems to me that two major conclusions came out of the CAPM and that those two conclusions are still relevant today. The first of these is what I call the market risk/reward theory, which basically says that an investor can achieve a higher expected rate of return only by taking more market risk; that is, the irreducible risk that remains even if the investor diversifies holdings all over the globe using all types of investments. The corollary of that theory—or the second major conclusion—holds that investors shouldn't take nonmarket

risk unless, for example, they need to hedge human capital or they are capable of making predictions superior to those already embedded in market prices. So if we go back to the first, very simple CAPM, those are the two major conclusions: expected returns are related to beta, and investors need to diversify broadly so that they bear only beta risk.

I think those are still very good conclusions and continue to be relevant today. Someone would have to come up with a strong argument to counter them. Do I think these conclusions can be obtained in more realistic or broader contexts? Of course. While the CAPM/mean-variance paradigm is not my model of first choice these days, it still produces—with some caveats—reasonable results on asset pricing. It does produce results that are obviously inconsistent with reality when it comes to portfolio choice predictions; that is, which investments investors will choose and in which proportions. However, that doesn't mean the CAPM has become irrelevant for asset pricing.

MEIR STATMAN: By way of rejoinder, what about the multibeta model you wrote about many years ago? Is it still the case that a risk that can be diversified is not priced, or would a multibeta model imply that some of those nonrisk factors will be priced?

BILL SHARPE: That raises two issues: First, the research of Eugene Fama and Kenneth French, which—to oversimplify—says that, relative to their beta values, small capitalization equities perform better than large capitalization, and that value stocks outperform growth stocks. I recently commented on this research in the second lecture for my latest book,¹ arguing that these conclusions, even in the long historic period, were predominantly an artifact of relatively small stocks in a small corner of the market. Second, many models—assuming rational, informed investors—can yield premiums for something other than beta relative to the whole market. However, that's not what we see in the Fama/French model, which argues that these factors affect expected returns and is agnostic as to whether they reflect risk premiums or not.

MEIR STATMAN: Do you think that the mathematical elegance of CAPM has created such a high standard that we

will always feel as if we are “princes who have been chased out of the land,” i.e., when other models are introduced, they are always found to be too messy or too difficult to calculate, or have too many variables, etc.? Would we be better off with less elegant models that are closer to the real world?

BILL SHARPE: First of all, I'm not sure that the CAPM is all that elegant—it's fairly simple. Be that as it may, in my new book I rely quite heavily on simulations; that is, I create people, give them securities to trade, and tell them to check back when they're finished. Then I see what prices they have set and what the true probabilities, risk, and returns are. It's both simple and elegant, and I find that teaching people using a framework like this is very easy. Some of the more complex models can be quite trivial in this format. I think that this approach can be elegant but also allows for generalities in important ways. That being said, once you get into cases involving disagreement or complex utility functions, you have to keep hammering away and doing more simulations. If you continue to get qualitatively similar results, the weight of the evidence causes you to think that you may be on to something. I think there's a lot to be said for this approach, for both pedagogical and research purposes. We've got computers now—why not use them?

RON KAHN: How do you view all of the so-called anomalies that academics have brought up over the past ten years or so?

BILL SHARPE: An easy answer to that is to say, referring to the old aphorism, if you torture the data hard enough, it will plead guilty to anything you like. To demonstrate this, I ask students to set up a spreadsheet in which the market as a whole has, let's say, a risk premium over cash of 5.5 percent and a standard deviation of 18 percent, so you know exactly what the risk premium of the market as a whole is—not just a piece of the market, but the whole thing. Then I ask them to generate a series of fifty years of data randomly from that distribution and compute the average historic premium. After repeating that step 1,000 times, they can see what a fifty-year record might look like in a world

where the premium is truly 5.5 percent. Of course, as we all know, you can easily generate plenty of scenarios in which you observe 0 percent, or 2 percent, or 20 percent over fifty years. The moral of the story is that even if the gods are kind and distributions never change—which is improbable—and even if you have lots of data, you can still be far off on the premium for the whole market. Anyone who thinks that looking at empirical data will produce a resolution to the question of whether the premium on small growth stocks is different from that of large value stocks with any degree of precision is just kidding himself. I'm very skeptical of the findings in historic data related to averages. As a result, I'm fairly dismissive of much of the anomaly literature. I like to think I know something about this topic, because I understand how frail empirical averages are as indicators of historic expectations and, *a fortiori*, current expectations.

RON KAHN: So is your argument that returns are so “noisy” that it's almost guaranteed that historical data will find what look like anomalies?

BILL SHARPE: When one thinks about the amount of investigation of historical data that has been conducted, and the tiny, tiny percentage of results that have been published, one has to realize that this percentage can't be a purely random sample. We know what the selection bias is: results that look like anomalies get published. That's not to say we shouldn't read the literature, think about it, and ask ourselves if there's some reason why, in a reasonably competitive market, one should expect this “anomaly” to happen in the future with sufficient certainty to actually justify putting clients' money into a particular strategy.

MEIR STATMAN: How do you address the argument that this cuts both ways; that is, if you cannot reject theories because of noisy returns, theories become religion, where faith replaces scientific inquiry?

BILL SHARPE: I think that's a valid argument—one that I don't dispute. If you look at the studies done by Gary Brinson et al, broadly diversified portfolios of risky securities within countries and, even more important, across

countries have performed better on average over the long term than portfolios that have no risk. To some extent, if you take stocks, bonds, and cash, there is at least an ordering of the long-term average returns. I think that part of the theory is reasonably secure. We know, of course, that much of the argument for diversification can be made just with arithmetic. That is, the return on the average dollar—or yen or euro—is the same before cost whether actively or passively managed, and the return after cost is greater for the average passively managed dollar than for the actively managed dollar just because the costs are higher for the latter. So simple arithmetic gives you at least some reason to diversify and also to be skeptical about putting too much of your money in active management or chasing anomalies.

ED BAKER: Does that lead you to the conclusion that the markets are efficient?

BILL SHARPE: No, I don't think we'll ever know the answer to that. It does lead me to the conclusion that in giving investment advice, it's probably a good idea to assume that the markets are reasonably close to efficient. Of course, you have to define what you mean by efficient. In the sense we've been discussing, I think that assumption is worth making.

RON KAHN: When we think about potential reasons that we might believe the markets are inefficient, behavioral finance certainly seems to provide the primary arguments. What is your view of behavioral finance?

BILL SHARPE: I've been a great fan of behavioral psychology for many years, as well as the resulting work in behavioral economics and behavioral finance. In fact, I've been working with colleagues on some experimental studies in a portfolio context with real subjects—about 250 people. I think some wonderful work is being done in this field. But it is important to differentiate between the expectation that behavioral finance is going to tell us new things about asset prices and the expectation it will tell us new and useful things about portfolio choice—both how people do make portfolio choices and how you can help people make better choices. People at my company, Financial Engines, are working not only to

understand how people select investments based on the ways various alternatives are framed, but also how to improve the way the alternatives are framed so that people can make decisions that are in their best interests. Certainly behavioral finance is crucial to this. In his book *The Wisdom of Crowds*,² James Surowiecki makes the argument that a market full of partially informed, somewhat irrational investors can't yield the same prices—and therefore the same risks and rewards—as a market full of fully informed and extremely rational investors. Robert Merton and Zvi Bodie recently published a paper³ in which they talk about their idea of building financial institutions into models endogenously, but they take the position that financial institutions will do their best in the pursuit of profit to make the markets close enough—in asset pricing terms—to what you would get in a simple, frictionless market, even though the institutional setting doesn't even exist in most asset pricing models. Do I think that twenty years from now we're going to say, "Aha! Because of behavioral finance, we now have a different model of asset pricing"? I'm not sure, because as we all know, you can pick one part of the behavioral finance literature and predict one asset pricing result, then pick another part of the literature and predict the opposite. It's not as if there's a body of behavioral theory that leads you to a particular asset pricing model.

ED BAKER: What about venture capital investing in a world where the only risk taking that's rewarded is systematic, say, a venture capitalist who puts all his focus on one opportunity? Is that complete folly?

BILL SHARPE: Venture capital is an incredibly important part of the whole engine that creates value, productivity, and social welfare. I also think it's well enough organized that while general partners may have concentrated positions, if you take a realistic look at the fact that each partner may be in several partnerships and each partnership has several companies, even general partners are not all that concentrated. However, they are certainly more concentrated than, say, the General Motors pension fund.

ED BAKER: But surely, at a certain level, some people have a concentrated risk?

BILL SHARPE: Well, for example, I have a concentrated risk in my company. There are clearly situations where there is a benefit to having people take concentrated positions. When you look at venture-financed portfolio companies, you see some people with seriously concentrated positions for good reasons—those people presumably can affect the value of their company, especially in the early stages. The point is to find the right trade-off between bad investment policy and good incentive policy.

TONY KAO: Over the past twelve months, we've had a lot of discussions in our business about policy portfolios. Driving this discussion is the issue of the way we use optimization. Obviously, constraints are necessary, but on the other hand, they can drive the results, which form the policy portfolio. What is your view of how practitioners use optimization, and how does this apply to individual investors?

BILL SHARPE: I have a term that I may have invented in this context called "macroconsistency." The idea is that you have a set of estimates—for example, in the mean-variance context, expected returns, risks, and correlations. The question is: Are the estimates macroconsistent? What I mean by that is if everyone in the world used those estimates, in whatever way they chose, would the markets clear? In a simple CAPM setting, a set of forecasts is macroconsistent if expected returns are proportional to beta values. However, it's a much broader idea. Most boards, when they set policy, or financial advisers, when they establish a policy for an individual investor, are doing so in a long-term, efficient-market context. With some exceptions, they say, "If we were investing in index funds and the markets were efficient, here's what we would do." In that hierarchical scheme, however, they'd then say, "Well, we're not investing in index funds and the markets really aren't efficient," so all of the variations that come from those ideas tend to come back to the policy portfolio. If you take the premise that the policy portfolio ought to reflect an index-fund, efficient-market kind of allocation, then it seems to me you have to argue that the predictions should be macroconsistent.

TONY KAO: How does this framework differ from that of Fischer Black and Robert Litterman?

BILL SHARPE: It doesn't. Fischer and Bob started with the CAPM, and then they perturbed that based on an individual's views about market inefficiency. They dealt more with predictions than preferences. That was the starting point, and I first did some of that "reverse optimization" back in the early 1980s. The point is that most institutional policy portfolio studies and many personal financial planning exercises don't impose the criterion of macroconsistency. Here's a simple way to tell if this criterion is being used: Ask the question, "Do the forecasts take into account the current market values of the asset classes?" If they don't, the forecasters cannot even know whether the forecasts are macroconsistent. In other words, macroconsistent forecasts must have the character that total demand equals total supply for each asset. Since we measure everything in terms of value, we have to know the current value of the stocks in Japan, the values of the U.S. equity market, the U.S. bond market, and so on. That's how we express our policy. You have to know current asset market values before you can make a set of macroconsistent forecasts.

MEIR STATMAN: Are you saying that you should start with the allocation of the overall global portfolio and, from there, infer expected returns? That differs from the traditional way of using the mean-variance framework; that is, Harry Markowitz advised investors to begin with estimates of expected returns, variances, and covariances and use the mean-variance optimizer to identify the optimal asset allocation.

BILL SHARPE: Remember that Markowitz's work was all normative; that is, if you have predictions, here's what to do with them. I'm talking about using equilibrium theory, be it a version of the CAPM or the approach of Arrow and Debreu,⁴ to make predictions to be used in normative work. In other words, for advising people on portfolio choice you should take into account relationships from a positive model as to how prices are set. As I said, the simple test is to ask the person who has produced the set of items intended to go into your optimizer, "In producing these forecasts, did you take into account the current market values of these asset classes?" If the answer is "No," or even "Not explicitly," then neither of

you has any way to know if the forecasts are macroconsistent. Now let me add a caveat to my answer to Meir, and that is, am I saying that you should just take the world market portfolio and back off expected returns from the CAPM relationship? You can, but I prefer to use a more complex equilibrium approach to make sure that expected returns, risks, and correlations are coherent with one another and take into account the current market values of asset classes on a monthly basis.

MATT MOREY: Since you mentioned policy setting and asset allocation, I wanted to ask if you think the advice provided by the financial services industry adds value for investors in the long run?

BILL SHARPE: Again, you always have to ask, "Compared with what?" Needless to say, those of us involved in the financial advice or management business for individual investors tend to compare ourselves with the most horrible alternatives. Basically, I think financial advisers add value in two areas. First, they can help an investor be adequately diversified—if you will, move up to Markowitz's efficient frontier. Second, advisers can help investors get to the right places on the frontier for their circumstances or, using terms from the Markowitz world, get to the right risk/reward combination for their risk tolerance. In the real world, of course, financial advisers look at other holdings and additional aspects of the investor's circumstances. A full financial planning situation involves insurance, heirs, medical conditions, employment, taxes, the spouse's investments, and many other factors. In my upcoming book, I characterize investors as having preferences, positions, and predictions: preferences including attitudes toward risk and return, and preferences for spending money now versus leaving it to the children; positions meaning the investor has a certain job, owns a house, etc.; and predictions meaning the belief that a certain company or sector will do well or poorly. I think financial advisers add the most value in dealing with the specifics of an investor's positions and preferences and somewhat less value in bringing superior predictions to the table, because market prices incorporate predictions that are often as good as one can get.

ED BAKER: That brings me to the question of whether, in a CAPM world, risk aversion is really the only issue for a financial adviser?

BILL SHARPE: That's right. The only issue that differentiates investors in a simple CAPM world is that you have one risk aversion, and I have another. It's all about mean and variance, so there's really only one parameter. It can be wealth-dependent, but that's about as much as you can get out of that model.

ED BAKER: In mid-2004, we talked with Robert Shiller for a previous Masters Series article.⁵ In his view, it's not so much risk aversion as risk perception, and that's what varies from investor to investor and from context to context.

BILL SHARPE: There's a subtlety in that argument that Bob is much better at explaining than I am. One interpretation is a difference in predictions, having to do with how one processes information. I think you must pull people back from the framework of thinking about the act of buying stocks now to more abstract ideas such as if this is the way you've invested and this is the way you're planning to invest, here's the chance that you will be able to live better than scenario A in your retirement, and here's the chance you'll be able to live better than scenario B, and here's an alternative strategy that gives you x percent chance of living better than A and y percent change of living better than B. Information should be put into a very meaningful, long-term context, rather than a discussion of standard deviations or even expected returns, because next year's returns don't mean much to most thirty-five-year-olds. In that way, people can internalize the risk/reward trade-offs and make sensible decisions predicated on the predictions that go into the typical set of Monte Carlo simulations, but the individual investor is taken out of the prediction process, and the "experts" are given that function. I think this can work, based on feedback from experiments, focus groups, and several years of experience at Financial Engines. Of course, many financial advisers use a similar process.

ED BAKER: Several companies have tried to build so-called "life-style" funds to match certain investors' risk

tolerance characteristics. Do you think that's a sensible approach?

BILL SHARPE: Some people define a "life-style" fund as a fixed risk tolerance fund through time, and "life-cycle" or "life-stage" as one where risk tolerance adjusts downward as time goes on. I assume you're talking about the latter, for example, a "retire in 2030" fund. While I think the basic idea is useful, the problem is that it's a cookie-cutter approach, and the question remains whether the investor can do well enough by picking one of, say, fifteen funds, where there are just five age groups and three different levels of aggressiveness from which to choose. I think a better approach performs optimization at the level at which the investor is actually going to invest—for example, the specific mutual funds in a 401(k) plan, and that takes into account as much of the investor's personal information as it's possible to obtain. If the approach is, "You're thirty-five, so here's the fund for you," that may not be nearly personal enough. Even if there is a rich enough menu of life-cycle funds for an investor to find a close-to-optimal strategy, the investor may still need help selecting the right one. However, assuming that the cost can be kept under control, my question would be: Why not get as personalized a strategy as you can?

MEIR STATMAN: Does personalized also mean looking for alphas, or does it mean just tailoring the strategy to investors' financial conditions and needs?

BILL SHARPE: I think the best approach combines an extensive analysis of mutual fund performance relative to the best benchmarks one can build for each fund, and predictions of future performance relative to those benchmarks, taking into account empirical evidence about the relationship between future performance before costs, or gross alpha, and past performance, residual risk, and other factors. Once you have made the best possible prediction of a fund's future gross alpha you can subtract predicted expenses to obtain an estimate of the net alpha to the investor. So in answer to your question about whether personalized includes looking for alphas, yes, certainly in terms of net returns, but they are often negative because of expenses, given

the fact that the best estimates of gross alphas tend to be small—sometimes negative and sometimes positive.

ED BAKER: Certainly many people believe it's worthwhile to look for alpha, and there's an industry full of people who try to help investors find such managers. The Sharpe ratio has become widely used as a way to discover those managers and assess whether they will continue to deliver results. Do you think that's a misapplication of this work?

BILL SHARPE: In many cases, yes. Let me define some terms so that we're all talking about the same thing. If you go back to my first paper on this topic, I presented a measure that I called the reward-to-variability ratio. The idea was that if you had two alternatives, in particular, your whole portfolio and Treasury bills, and you could take positions in any size, then you should look at the ratio of the expected difference between the two returns divided by the standard deviation of the difference between the returns. In my 1966 article, the alternatives were your whole portfolio or risky securities or cash, and, given the fact that you could adjust the amount in these alternatives, selecting a portfolio with the highest ratio uniformly produced better opportunity sets than picking any with lower ratios. That idea was enshrined by Treynor and Black, in an article⁶ that suggested calling the measure the Sharpe ratio. Today when people use the term "Sharpe ratio," in most cases they mean reward-to-variability using the difference between the return on an investment and that of Treasury bills.

ED BAKER: The term is also often used to mean something minus a benchmark.

BILL SHARPE: That's what I want to differentiate. When the term is used to refer to something minus a benchmark, where the benchmark can be anything, I think that is more commonly called the information ratio. Whatever you call it, an information or reward-to-variability ratio is only as good as the benchmark. I tried to clear this up in a *Journal of Portfolio Management* article in 1994.⁷ The whole rationale for using a reward-to-variability ratio is that you can choose the scale. Any time you take the difference between two returns, that's

a zero investment strategy because you're long one asset class and short the other. Let's say that you have two alternative investment strategies, and one has a higher reward-to-variability than the other. When choosing between the two, at any scale, you want to pick the one with the higher ratio. That's part of the basic economics behind why this ratio can be interesting. I think many of the conditions, even for an information ratio, may not be met in actual practice. Certainly, if you are evaluating an investment that is intended to be a piece of a portfolio, you want to evaluate it against a passive benchmark that in some sense has the same exposure to relevant factors. If you're looking at historical data, you want to look at not only the average difference, but also the standard deviation of the difference, and if you're determined to have just one number to look at, take the ratio.

It is unfortunate when people use the original version of the ratio—return minus Treasury bill return—for a fund that's going to be part of a portfolio. Obviously, if you're evaluating fund A, which is going to be put in a portfolio of funds, you should take into account not only its expected return and its risk, but also its correlation with other funds in the portfolio. A measure that has only risk and return can't deal with the correlation as well. So any setting in which the correlations are important can't be summarized in a number that takes into account only mean and standard deviation. The exception would be residual risk. Most models assume that all residual risks are uncorrelated. If this is true, then there are no correlations to be taken into account. Another case arises when a true hedge fund is being evaluated. If such a fund has no factor exposures, the correct benchmark is Treasury bills, and the Sharpe ratio may be a perfectly good measure. However, you must make sure the condition is met, since many hedge funds are in fact correlated with various asset classes.

ED BAKER: Do you think that all of these measures are just a waste of time in trying to identify a manager who can be expected to deliver future performance?

BILL SHARPE: First of all, I think it's imperative that performance is measured, and second, that it's measured relative to appropriate benchmarks. If you say, "Well, if I measure performance at all, that's stupid because, if

nothing else, managers incur costs,” you still need to find out if they’ve delivered something for the costs they’ve incurred. And if you’re measuring a small growth manager who never buys anything but small growth stocks, you have to measure him or her relative to a small growth index, or you’ll never have any chance of figuring out if his or her performance has been, meaningfully, good or bad.

TONY KAO: Speaking of appropriate benchmarks, when you wrote your article on style analysis, did you have any expectations that this approach would become so widely used in portfolio construction, performance measurement, manager evaluation, and so on?

BILL SHARPE: Let me give you some history that may shed some light on this. In 1986, I set up a small firm to work with pension fund sponsors. I was trying to build a factor model that would apply across all the investments in a typical large pension fund. At the time, there were the Barra models for equities, various models for bonds, and so on, but I wanted to develop one factor model with which we could look at the pension fund, focusing basically on the tasks of the pension staff and board. As I tried to figure out how to approach this, I started with the thought that there was no way that I could build a fundamentals-based model *à la* Barra that could cover everything in a fully consistent way. If Barra hadn’t been able to do it, my four employees and I weren’t going to do it. So my first answer to the problem was to try regression analysis. I regressed the returns of my clients’ managers on indexes of asset class returns that I thought might work well, and I got total garbage—from implied holdings of -300 percent a year to +500 percent. It was meaningless. So I thought, “Well, that’s it for that idea. What am I going to do now?” I did know that almost all the managers had only long positions in asset classes, so I decided to add in some lower bounds of zero and run the data through a QP [quadratic programming] model. Voila! Out came results that seemed quite plausible. I started sending the results out to the sponsors, who shared them with their managers, and we entered a period where it just seemed that I could do magic. I even played a game: you send me returns for ten managers, without any identification,

and I’ll send you my estimates of their styles. Then you see how well they line up with your perceptions. This approach seemed to be working fairly well, and then we conducted several experiments in conjunction with Barra to find useful new indexes that could make the process as informative as possible. Five of the indexes now called the Barra/S&P indexes came out of this work. So much for the early history of style analysis in the 1980s. I must admit that I was then and continue now to be amazed by the quantity of useful information that comes out of this quite simple and parsimonious use of small amounts of data.

In answer to your question about whether I had anticipated that this model would become so widely used, the answer is no. In fact, there was a period when Frank Russell, which shared the rights to use the software that I had developed in 1988, chose not to use it and even published articles suggesting that this was not a particularly useful approach. My view is that there is obviously room for all kinds of analysis, and this quick and not-so-dirty procedure can provide a lot of helpful information. I had been thinking of developing software to make the technique available more widely when Ken Winston showed me software that was already well along in development. My thinking was just that it was great to have it out there and available, which is why I had published a journal article describing the approach in detail. I did have a good notion that it would be used, since it was useful and people were working on it commercially, but I must admit I’m very pleased that it’s used as much as it is.

TONY KAO: In terms of hedge funds, you’ve said the proper benchmark is T-bills. What about style analysis for hedge funds?

BILL SHARPE: I actually started doing style analysis of hedge funds in the 1980s, when the Commonfund was one of my consulting clients. They invested in some of the earliest hedge funds. We started running these funds through our style analysis software, although obviously we had to slack off on the lower bounds to capture short positions. A certain amount of artistry was involved. Very early on, we began to get a good sense of what hedge fund managers were doing and found out that

relatively few were truly factor-neutral. They might or might not have been market-neutral, but they certainly weren't factor-neutral. At Financial Engines, we don't see many hedge funds because there aren't very many in 401(k) plans, but we do analyze all of the mutual funds that are hedge funds. Is style analysis the perfect answer for hedge funds? Probably not, but you do get a lot of useful information. A number of academic researchers have investigated applications of style analysis for hedge funds using more sophisticated benchmarks with very informative results.

RON KAHN: I wanted to ask a follow-up question to Ed's question about the Sharpe ratio. What do you think of the various downside risk measures, and has that been a useful direction for research?

BILL SHARPE: I think you have to differentiate between the portfolio as a whole and a piece of the portfolio. When you deal with a piece of the portfolio, you obviously have a problem in that the downside risk of a portfolio is simply a function of the downside risks of its components. I'm a great believer in getting the whole probability distribution or, in the case of a portfolio, a joint probability distribution. I continue to aspire to show an investor the entire probability distribution for the portfolio, although some would say that ordinary 401(k) investors are overwhelmed by this and that you have to use summary statistics, such as a downside measure, in addition to a threshold measure. If you are going to show investors only two numbers, you must be sure that those two capture elements of both risk and return. Typically, investors want to see the chance that they'll have better than an acceptable or comfortable threshold of retirement living and the chance that they'll have more than a downside outcome at which they'd be fairly miserable. They can select those in various ways, but the latter is certainly a type of downside measure.

ED BAKER: Please tell us about the excitement of winning the Nobel Prize for economics in 1990 and how that has changed your life.

BILL SHARPE: To answer the second question first, it means I get invited to participate in interviews such as

this, and it's always fun to share my opinions with others. Would these kinds of opportunities have happened without the prize? I have no way to do an experiment to find out. As far as the excitement, I had figured that based on the record, the Nobel committee would not include financial economics in the domain for the economics prize. So I had virtually dismissed the idea of a prize in my area of work. As a result, I wasn't even paying attention to the timing of the announcement. We were at a conference in Arizona, and the call came at 3:30 a.m. It was completely unexpected and, of course, a heady and phenomenal experience: going to Stockholm, where the Nobel Prizes are regarded as the Super Bowl is in the United States and the prize winners are like rock stars, waving from the back of the limos, people standing at the entrance of the Grand Hotel, trying to get autographs and take photos. How does winning the prize change your life? Needless to say, it doesn't change the attitudes of your colleagues—they are just as critical of you as they ever were. You certainly receive more attention and more invitations, but I like to think that I would have received at least some of the invitations anyway. The simple way to summarize my experience is that if you get offered a Nobel Prize, take it!

MATT MOREY: Looking ahead, what innovations do you see in the financial industry?

BILL SHARPE: We are in this wonderful period when it has finally become academically respectable to work on problems that are important to individual investors. For a long period in my career, that type of work was considered "personal finance," to be dealt with at lower academic levels. Now some of the best minds in financial economics are working in this field. But much remains to be done. What are the problems that we need to address? They are, basically, the problems of investing over time and in particular, since human beings are mortal, the problem of accounting for mortality. At the moment, the good work in the area posits a return-generating process; for example, assuming that returns are independently and identically distributed or that returns of stocks revert to a mean, that the inflation rate follows a GARCH process, and so on. Given such assumptions, people work to determine optimal strategies. However, it

bothers me that these return processes don't come from any underlying equilibrium market process, but from empirical data that may or may not be completely germane. We need to get serious about multiperiod equilibrium; that is, how do preferences and productive opportunities come together to determine the behavior of asset prices over time? If we had a better handle on the answer to that question, we could better advise investors concerning the way in which they organize financial affairs over their lifetimes. When I think about the problems of a seventy-year-old, which is easy for me because I have empirical data, the biggest issues concern your investment portfolio, Social Security, Medicare, annuities, and long-term care policies. But what about your house? How does a couple make decisions that take into account possible differences in mortality and illness? And what about possible heirs? Many of these issues loom at least as large or possibly larger than decisions concerning portfolio investment and spending out accumulated wealth. Good financial advisers are aware of this and know how to deal with such issues, but it is complicated, and financial economics can be very helpful in developing better solutions in this area. Financial institutions can help also, and we're beginning to see more response from institutions as baby boomers near retirement and the demographics lead to huge shifts in the location of wealth.

ED BAKER: Bob Shiller also touched on some of those issues, but his focus was more on insurance-related innovations.

BILL SHARPE: We need to think more carefully about the ways that we can combine mortality insurance with risk taking. Variable payout annuities do this in certain ways now, but we may need more creative approaches. A lot of interesting work remains to be done on understanding the role of downside protection (as I discuss in my new book), including ideas for payout functions that are nonlinear in market returns, in combination with mortality insurance. At the end of the day, I'm sure we will see some new products in this area. Dr. Shiller is very forceful in his view that you can hedge much of the capital risk, such as that associated with owning a home, through reverse mortgages and so on. Institutions have

already come up with a number of responses to this concern. However, investors must also take into account factors such as the amount of time they can stay in their homes before moving to a retirement facility and their desire to retire to a specific geographic area, which necessitates a hedge against consumption desire rather than a hedge against financial needs. Because much of the research on these problems has been done by people for whom retirement is a distant prospect, it may be that some issues have not yet been addressed as well as they might be.

ED BAKER: That's an excellent point, because consumption preferences are frequently not included in the financial problem.

BILL SHARPE: That's because these problems are difficult—difficult in terms of eliciting information from the client and difficult in terms of obtaining data and modeling it. Again, I think that Shiller has made some excellent points over the years and that the financial industry can help in this.

RON KAHN: You've addressed academic research issues, but I wanted to ask you about areas where you see deficiencies in financial industry research; that is, what issues need to be addressed, or gaps filled, although there may not be major distinctions between academic and industry research.

BILL SHARPE: Let me use that as a springboard for some final thoughts on an issue that bothers me a great deal. Think about this: until fairly recently, the way in which we dealt with retirement in this country, and most Western countries, was based on the fact that you worked, you retired, you got your checks from the government and maybe your employer, you died, your spouse got checks, your spouse died, and that was it. Basically, in effect, people in their working years were buying—to put it in simple financial terms—deferred annuities, some of which were indexed, like Social Security, and some not indexed, like certain pension plans, but all of which were essentially fixed annuities. People were well acquainted with this scenario. Then we shifted to a defined contribution environment where

people could choose to invest different amounts at different levels of risk and return. Unfortunately, in many cases, people didn't know what they were doing. People now have the option to buy an immediate annuity when they retire, but the evidence from this country and from countries that have done this longer than the United States is that, by and large, they don't. This may be, at least in part, due to the fact that individual annuities are priced to take into account adverse selection, assuming that those who buy payout annuities are likely to live longer than those who do not. So we have had three sea changes as we moved from one regime toward another; that is, the need to determine one's ability to save, the desire to take risk in the pursuit of higher returns, and the decision concerning the extent of annuitization after retirement. Much of the public discussion focuses on the first two aspects, to the neglect of the latter. So the question is: Why are people not buying annuities now when they previously seemed to be comfortable with a system in which they did buy them? Mortality risk seems like the most obvious gain through trade; that is, my death is relatively uncorrelated with yours, so we should both be better off by pooling that risk. If you're asking what the financial industry can do, my answer is that it can think about solutions to this issue, and I'd like to see research in behavioral finance that would help people better understand the trade-offs in the choices they make after retirement.

ED BAKER: Thank you for spending this time with us. It was hugely interesting, and we all look forward to reading your new book in the near future.

William F. Sharpe, Ph.D., who has been a member of the Stanford University faculty since 1970, previously taught at the University of Washington (1961–1968) and the University of California at Irvine (1968–1970). A past president of the American Finance Association, he is cofounder of Financial Engines (1996), a firm that provides online investment advice and management for individual investors, and currently serves on its board. Dr. Sharpe received his B.A., M.A., and Ph.D. in economics from the University of California at Los Angeles. He is also the recipient of a Doctor of Humane Letters, Honoris Causa, from DePaul University, Chicago, Ill.; Doctor Honoris Causa from the University of Alicante in Spain and from the University of Vienna in Austria; and the UCLA Medal, that university's highest honor.

ENDNOTES

1. On May 10–12, 2004, at the Bendheim Center for Finance at Princeton University, Dr. Sharpe presented a series of three lectures titled “Equilibrium,” “Diversity,” and “Protection,” which will be published under the title *Asset Prices and Portfolio Choice* by Princeton University Press in 2006. A draft of this book is available on Dr. Sharpe's Web site at www.wsharpe.com.
2. James Surowiecki, *The Wisdom of Crowds: Why the Many Are Smarter Than the Few and How Collective Wisdom Shapes Business, Economics, Societies, and Nations* (New York: Doubleday, 2004).
3. Robert C. Merton and Zvi Bodie, “The Design of Financial Systems: Towards a Synthesis of Function and Structure,” NBER Working Paper No. W10620 (July 2004).
4. Kenneth Arrow and Gerard Debreu, “Existence of a Competitive Equilibrium for a Competitive Economy,” *Econometrica* 22, no. 3 (1954).
5. “Irrational Exuberance and Behavioral Finance: A Conversation with Robert J. Shiller, Ph.D., about Integrating Investing and the Social Sciences,” *Journal of Investment Consulting* 7, no. 1 (summer 2004): 10–20.
6. Jack L. Treynor and Fischer Black, “How to Use Security Analysis to Improve Portfolio Selection,” *Journal of Business* (January 1973): 66–85.
7. William F. Sharpe, “The Sharpe Ratio,” *Journal of Portfolio Management* (fall 1994): 49–58.



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