Market Efficiency and Active Management: A Non-Random Talk with Burton G. Malkiel, PhD
In 1973, Burton G. Malkiel published his views about the efficiency of the financial markets in the book entitled *A Random Walk Down Wall Street*, now regarded as a classic in the field. In an efficient market, Dr. Malkiel suggested, stock prices quickly reflect the latest information, and—because news is unpredictable and random—so too are the changes in stock prices. The intervening thirty years have seen the rise of proponents of behavioral finance and challenges to the concept of the efficient market, including arguments that the markets are often irrational and that stock prices are in fact partially predictable based on historical patterns. In “The Efficient Market Hypothesis and Its Critics,” which appears in the Winter 2003 issue of the Journal of Economic Perspectives, Dr. Malkiel addresses these challenges and refutes claims that events such as the 1987 stock market crash and the Internet bubble of 1999–2000 are evidence of market inefficiency. The eighth edition of Dr. Malkiel’s *A Random Walk Down Wall Street* was published in 2003, as was his newest book, *The Random Walk Guide to Investing: Ten Rules for Financial Success*.

In the following interview, Dr. Malkiel, who currently serves as the Chemical Bank Chairman’s Professor of Economics at Princeton University, talked with members of the Journal of Investment Consulting’s editorial advisory board about market efficiency and the role of active management. Taking part in the discussion were Edward Baker, the Journal’s editor-in-chief; Mark Anson, chief investment officer of CalPERS; Ronald Kahn, global head of equity research, Barclays Global Investors; Matthew Morey of Pace University, New York; and Meir Statman of Santa Clara University, California.

The interview with Dr. Malkiel marks the first in the Journal’s new Masters Series, a regular feature that presents topical discussions with leading experts and visionaries from the world of finance, economics, and investments. The interviews, led by members of our editorial advisory board, will focus on the Masters’ work, both past and present, providing insights into their thoughts on current trends and issues and their contributions to the profession of investment consulting. We believe that our readers will find these discussions to be a valuable addition to their Journal reading.

**MARKET EFFICIENCY AND ACTIVE MANAGEMENT:**

**A Non-Random Talk with Burton G. Malkiel, Ph.D.**

**Ed Baker:** We’re delighted that you accepted our invitation to be our first Master. We’ve all reviewed your recent paper in the *Journal of Economic Perspectives* and found it to be a great read, as always. It certainly stimulated a lot of thought and questions. So let’s get started.

**Ron Kahn:** To put our discussion in some perspective, I’d like to begin by asking how you think the markets have changed since *Random Walk* was first published in 1973, and have these changes affected your view of market efficiency?

**Burton Malkiel:** For one thing, the markets have become more and more institutionalized. Institutions are now responsible for 90 to 95 percent of trading. In recent years, the influence of hedge funds has increased, and it’s been estimated that, at certain times, most of the trading has been done by these funds. The markets have also changed because of the variety of new derivatives being used by both institutions and individual investors.

Essentially, I think that, if anything, all of these factors have made the markets more efficient. For example,
hedge funds are trying, on a leveraged basis, to make a nickel because an underlying stock is mispriced relative to the derivatives contract or because the market has not yet caught up to an event such as an earnings surprise or stock split. Based on this information, these funds come right into the market and quickly take a position. In this way, the hedge fund is ensuring that new information is reflected in the stock price without delay. Factors like this have changed the market, and I think the result of the changes is that the market is more efficient today than it was in 1973.

**Meir Statman:** In your recent article, you make the distinction between market efficiency from the perspective of “price equals value” in individual stocks and market efficiency from the standpoint of investors’ collective judgment, in that some participants may become less than rational in trying to beat the market. According to your definition, the markets can be efficient even if they sometimes make errors in valuation, which was certainly true during the Internet bubble of 1999–2000. But is it possible that hedge funds and others sometimes act in a way that increases the gap in price and value? Aren’t we losing something by confusing those two notions of market efficiency?

**Burton Malkiel:** As you know, people differ with respect to the degree of efficiency they believe exists. I refer to myself as a random walker with a crutch. I’m willing to admit that the markets make mistakes. However, Eugene Fama wouldn’t agree with me. He would not use the word “bubble,” and in the latest edition of *Random Walk*, I refer to the 1999–early 2000 period as the biggest bubble of all time. Multiple trillions of dollars were lost, and I agree with you that, in this instance, the institutions and hedge funds were actually guilty of making it worse. It appears to me from the data I’ve seen that hedge funds, to the extent they were market timing, were momentum-driven and therefore couldn’t be counted on to sell short the Internet stocks that, in retrospect, were obviously over-priced. So I admit the market gets it wrong sometimes. However, what always brings me back to the concept of efficiency is the fact that nobody can know in advance when the market has it wrong.

This might be an appropriate point to talk about market timing. This strategy now has backing among many academics—John Campbell and Robert Shiller, for example—so should investors try to market time? My answer is very simple: Never! Here’s the problem. Bob Shiller argues that the market was irrationally exuberant in 1992. When Alan Greenspan later made his famous speech using that phrase, the Dow was at the 5000 level. Between the time of that speech and now, the market has returned annually close to 8 percent. So, while I’m willing to admit that the market gets it wrong sometimes and occasionally overshoots, investors never know until after the fact when it has crossed that point into irrational exuberance.

**Matt Morey:** Speaking of irrational exuberance, did the market events of the 1990s—like the Internet bubble—change your definition of market efficiency? Do you think an efficient market can provide a way to valuate stocks rationally?

**Burton Malkiel:** The Internet bubble was clearly concentrated in one part of the market—the high-tech sector—and you might argue that what happened in that sector supports the idea of an irrational market, that is, prices did not accurately reflect value during that period of time. As a result, too much capital flowed into Internet-related stocks. So the stock market may have temporarily failed as an efficient allocator of capital. Fortunately, instances like this are the exception rather than the rule. One of the problems with rational valuation—that is, pricing stocks as the present value of the expected future income stream—is that it’s not easy to do, particularly when there’s no technology that can estimate the future growth rate of a company with any degree of precision.
For example, if eBay goes down $3 or $4 in trading today, does that mean that eBay was in fact in a bubble earlier in the week? Will it eventually bounce back? I don't think we can know. The price of eBay stock obviously reflects investors' view that the company will grow at a substantial rate. In fact, this is a question I use on exams: Is eBay overpriced or underpriced? If we assume that eBay is appropriately priced, what is the implied growth rate of earnings per share likely to be? It's difficult to predict future growth rates, and the market will continue to make mistakes.

However, the fact that we know in retrospect that the market made a mistake during 1999–2000 doesn't mean that the market is inefficient—or that we should change our definition of efficiency—because we didn't know beforehand that the market was going to make a mistake. I don't think anybody can prove definitively whether eBay is appropriately priced or not today. If next year, however, eBay is selling at $10 per share, people will say, “Boy, what a bubble!” How could you assume that eBay could grow at 23 or 24 percent a year for the next 10 years? It's simply not possible for anyone to say with precision what the right growth-rate estimate is.

Again, I think this is an area where people such as Gene Fama wouldn't agree with me. During early 2000, one could have argued that market prices were crazy. I actually said this in an op-ed piece in the Wall Street Journal published at that time. I looked at the growth rate implicit in Cisco's price, which I estimated had to be 15 to 25 percent a year for twenty years in order to justify the price. If the GDP grew at 5 percent annually over this same period, then in twenty years, Cisco would be bigger than the GDP. So it was easy to see that the growth rate implicit in Cisco's price was just unreasonable. In that sense, I argued that Cisco was inappropriately valued when it had a market cap well above $500 billion in early 2000. So that's where I'm a random walker with a crutch—I'm willing to say that at certain times, prices appear to be wrong even before the fact. Any reasonable analyst would have agreed with me about Cisco and, in fact, it was the momentum—the feedback loops that Bob Shiller talks about—that was responsible for the market prices. I'm distinguishing price from value here. Again, this gets back to the admission that the market can be wrong.

Mark Anson: While we're on the subject of market mistakes, one of the observations I've made in looking back at the stock market crash of 1987 was the extremely low implied equity risk premium in the market at that time. Back then, investors thought stocks were virtually riskless compared with long-term Treasury bonds. Many of those investors had portfolio insurance, and I believe that's part of the reason why the equity risk premium approached zero. If you have insurance, you don't have to worry about risk. Then we all saw what a failure portfolio insurance could be. Was it rational for the market to believe so strongly in portfolio insurance?

Burton Malkiel: I think this was actually another instance of temporary market inefficiency. In fact, we got too smart for our own good. We really did think that sophisticated derivatives could take some of the risk out of the market. That was a mistake, because we later realized that everyone can't get out of the door at once, and when everybody tries to get out of the door at once, nobody gets out. It was an irrational period, and we recognize now that it was irrational. One of the effects of 1987 is that portfolio managers today don't use portfolio insurance the way they did then because they know now that portfolio insurance doesn't work the way they thought it did. It was a learning experience. It goes back to the fundamental premise we started with: The market is not always right. However, when we learn of systematic things we've done wrong, we don't do them again.

Meir Statman: In earlier editions of Random Walk, you talked about picking stocks. One of your examples involved the fact that you had noted a rise in the rate of burglaries, which resulted in increased buying of home security stocks. So, do you dabble in stocks? Did you buy the home security stocks as a result of your observation? Given your earlier example, did you sell Cisco short? Or do you stay away from making bets on individual stocks?

Burton Malkiel: Nobody who spends a lifetime working on Wall Street, serving on boards, and studying these issues as an academic does so without some sort of a gambling instinct. While the stock market may be somewhat of a casino, it’s a lot better than Atlantic City.
or Las Vegas, because the odds really are in your favor—that is, there’s a long-term uptrend in the stock market. So, do I buy some individual stocks? Yes, I do. I also go to Las Vegas and Atlantic City—I like to gamble. But as a trustee for family trusts, or a member of the investment committee for various foundations, and in my own 403(b), I believe in indexing stocks, bonds, and real estate. Essentially all of my investments are indexed. This is a direct consequence of my belief that the markets are efficient and that, therefore, investors holding broadly diversified portfolios indexed to the market should earn returns equal or superior to that achieved by the experts. Then, on the side, I buy individual stocks simply because it’s fun.

When *Random Walk* was originally published in 1973, I couldn’t advise investors to buy index funds, because index funds didn’t exist at that time. In fact, one of the things I said in the book was there ought to be index funds. So I advised buying closed-end funds. That was my favorite strategy then—and not because I thought the managers of these funds were going to outperform. I actually thought that would not be the case. Instead, I thought that if you could buy assets at sixty cents on the dollar, your portfolio would benefit. I thought that presented an inefficiency that could be exploited.

There’s an old joke about efficiency—the professor and the graduate student find a $100 bill on the ground. The graduate student stoops to pick up the bill, and the professor says, “Don’t bother. If it really were a $100 bill, it wouldn’t be there.” My advice is a little different—I say to pick it up right away because it surely won’t be there for long! With respect to closed-end funds, the discounts have largely closed. The ones that still are trading at discounts usually also have very high expense ratios, so it’s not clear that there’s any inefficiency left to exploit. As a result, I don’t currently see a benefit in closed-end funds. I also don’t think there are a lot of individual stocks that appear to be crazily priced right now. My advice today to investors in search of better performance would definitely be to buy a very broad-based index fund.

**Matt Morey:** What about anomalies such as the January effect? Don’t they represent some inefficiencies in the market that could be exploited?

**Burton Malkiel:** I think that anomalies, like the $100 bill, don’t last for long. To the extent they do exist, they are soon corrected, and I believe this is true of most of the so-called “predictable” patterns and anomalies that have been discussed in the literature, such as the January effect or the differences among asset classes like small cap/large cap or value/growth. There are always mistakes to be made. However, if the market were to systematically make mistakes, if it were systematically irrational, then we should be able to find some professional investment managers who could consistently exploit these patterns and consistently win. However, the professionals don’t win every time, and they weren’t even a countervailing force in the Internet bubble. The pros—and even the hedge funds—became momentum investors who perpetuated the bubble, rather than counterbalancing it.

**Ed Baker:** In my personal experience in the active management industry, I’ve seen a number of professional managers who have consistently added value, maybe not every year, but over the long term; that is, managers and teams that are able to provide consistently superior performance, even on a risk-adjusted basis. If the markets are indeed efficient, how do you explain the estimated $6 trillion invested in actively managed equity strategies? What is the place of active management in an efficient market?

**Burton Malkiel:** Let me take the initial part of your statement first, because I don’t agree with you. The area where we have accurate, complete data on performance is mutual funds. Obviously, this data doesn’t include all the private funds, but I’ve been on enough investment committees and seen enough consultant reports to believe that my view holds true there as well. The fact is that if your strategy is to buy the mutual fund with the best return last year—or over the previous two or three or five years—you cannot find any one single strategy that consistently outperforms. There simply is no consistency in performance. In fact, it is quite the contrary, at least in the mutual fund area.

To illustrate, in my new book I ask, “What would have happened if, at the beginning of 2000, you had bought the twenty best performing funds, that is, the
twenty funds that outperformed in 1997, 1998, and 1999? These were the funds written up in all the financial magazines. As we know now, while these funds performed twice as well as the S&P 500 on the way up, their losses were about three times worse on the way down. There’s no question in my mind that a little bit of performance persistence does exist. In the area of style, for example, value will be in for a couple of years, then growth may be in after that. However, this persistence is not dependable. I don’t find that there is any way to consistently pick the best mutual fund. It’s like finding a needle in the haystack. My view is that investors should just buy the whole haystack.

So the next part of your question is: If the markets are efficient, why is $6 trillion actively managed? First of all, as I understand it, about 25 percent of institutional money is indexed, and about 10 percent of individual investors’ assets. Now, why is only 10 percent of individual money indexed? That’s something I’ve spent my life trying to change! The reason the figure is only 10 percent is a rational one: It’s more difficult for individual investors to find a broker willing to sell low-cost index funds, rather than actively managed funds, because of the difference in commissions to be made on the sale. On the institutional side, am I disappointed that it’s just 25 percent? Yes, but on the other hand, given the lag between academic discovery and events in the real world, I’m actually thrilled that it’s 25 percent. These things take time.

RON KAHN: Is there a “right” number for the amount of money institutional funds should have indexed? Should it be 100 percent?

BURTON Malkiel: That’s the paradox about market efficiency. If the market were 100 percent indexed, who would do the active management to make the market efficient? I don’t know the answer to your question about the “right” percentage, but I would say if 95 percent of the market were indexed, I’d start to worry. However, with only 25 percent of institutional money and 10 percent of individual money indexed, I don’t worry at all. In fact, I think it could easily be 50 percent, maybe even 75 percent.

Again, this paradox—often called the Grossman/Stiglitz paradox—says markets can’t be perfectly efficient, or there would be no incentive to uncover the information that drives market prices. Someone has to be quickly taking positions to ensure that the new information gets into the market in a timely fashion. That’s where I think active management, especially of hedge funds, serves a very useful purpose. To get back to Ed’s question about the place of active management in an efficient market, there definitely has to be some active management in order to make the markets efficient.

ED BAKER: Getting back to the performance of actively managed funds, Roger Edelen formerly of The Wharton School has written a paper documenting that much, if not all, of mutual funds’ underperformance can be attributed to the combination of high fees and the impact of providing daily liquidity to investors. You say you have not looked at institutional separate accounts, where evidence shows that fees are much lower. I think that if you looked at these accounts in a systematic way, you’d find different evidence on the returns of active managers.

BURTON Malkiel: First of all, I don’t accept that the provision of daily liquidity has to necessarily impair mutual-fund returns. As a director of Vanguard, I know how this works. The Vanguard 500 index fund and the Vanguard
Total Stock Market Viper, which is indexed to the Wilshire 5000, have to provide daily liquidity, so they need cash reserves. These funds ensure that they are always 100 percent invested by transacting in the futures market with very little cost. So I don’t agree that daily liquidity has to impair returns. What hurts returns are high fees.

**RON KAHN:** Don’t you think there’s a price that every investor in aggregate should pay to make sure that markets are efficient, or reasonably efficient?

**BURTON Malkiel:** Absolutely. For example, the hedge funds that are doing merger arbitrage have costs. These funds have experts researching and reviewing issues such as the likelihood of the SEC or FTC nixing a specific merger, or the European Commission coming down like a ton of bricks on a multinational merger. The hedge fund managers have to pay for this expertise, so there’s no question that there must be enough profit to cover this expense.

**ED BAKER:** But we all know that individual investors sell at exactly the wrong time. This forces the mutual funds to accept prices not to their liking, which results in a definite drain on performance. So it isn’t just a cash accumulation effect, but the fact that retail investors are momentum investors, and they buy and sell at the wrong times.

**BURTON Malkiel:** I don’t see that it’s any different with index funds. In fact, the market timers and momentum investors are more likely to want to invest in an index fund. I think the impact of the buying and selling is exactly the same. Yet, according to my data, the index fund outperforms the typical active manager by about 200 basis points, of which 150 points are attributable to the extra expense of management fees. The other 50 points can be attributed to the trading costs associated with turnover, since the typical active manager turns over the portfolio 100 percent each year. In my opinion, institutional investors on the whole significantly underestimate transaction costs.

I certainly do agree that institutional accounts perform better than individual accounts, because their expense ratios are lower, and institutional separate accounts won’t perform as badly as mutual funds. However, if I had good data on institutional separate accounts, my hypothesis would be that they would underperform—not by as much as mutual funds—but they would underperform by their expense differential. Institutions can index funds for one or two basis points. Even an institution is going to be charged 20 to 40 basis points for active management, and it’s going to lose additional points due to portfolio turnover. Unfortunately, we don’t have this data, but I’ve heard enough anecdotal evidence to believe that the difference between 200 basis points for the active management of retail mutual funds and 50 or so basis points for the active management of institutional separate accounts is not likely to be enough to prove that active management works.

**MARK Anson:** At CalPERS, we’re besieged by people from active-management shops offering us products. Every day it seems there are more and more actively managed products for pension funds to consider. Is it inefficient for these managers to believe they can beat the market, or is it inefficient for us as investors to put our faith in their ability to beat the market?

**BURTON Malkiel:** It’s inefficient for you as investors to put your faith in the managers. It’s certainly not inefficient for the managers—they are well paid for their efforts. From my experience serving on the Princeton investment company board and working with endowments, here’s how I would advise institutional investors: Investors get paid for accepting illiquidity. There’s no question that the private markets and the real estate markets tend to be less efficient. While CalPERS can’t invest in the same ways Princeton does because it doesn’t have the same infinite time horizon, Princeton has only a minority of its holdings in marketable common stocks. Most of the holdings are in nonmarketable assets.
because we know we will be paid for accepting illiquidity. That, to me, is not an inefficiency in the market. Looking for these types of opportunities is where I think institutions ought to spend their time, not in trying to get the best active managers.

**Mark Anson:** Let me follow up on that. For nonmarketable securities—real estate, private equity, venture capital—are you saying that it’s not that they’re inefficient as much as the fact that there’s an additional risk premium for the lack of liquidity?

**Burton Malkiel:** Absolutely. However, I think they also tend to be inefficient in the sense that thousands of people are trying to judge whether a specific stock is appropriately priced. On the other hand, only a handful of people may be looking at whether this office building is appropriately priced. In that sense, the market for some of these securities is probably also less efficient.

**Matt Morey:** So what value do investment managers offer the industry? One of the things that’s been talked about is the advice that these managers offer their clients. Is the managers’ advice worth paying for?

**Burton Malkiel:** Some advice is worth paying for. Of course I just suggest people read my book, and they’ll get the asset-allocation advice they need. But there’s no question that unsophisticated investors can do some very imprudent things. I know of people who have held tax-exempt bonds in their Roth IRAs. Basically, they ended up converting tax-exempt income into taxable income. So there’s an instance where a professional investment adviser can be helpful. Or say you’re planning to send your child to college in two years. You shouldn’t have that tuition money invested in the stock market because you don’t know what rate of return you will get over those two years. I think that, in general, individual investors don’t know how to match their portfolio allocations to their financial needs, and an investment adviser can help them review their options. The investor with a fixed obligation in a few years really needs to immunize by buying securities with a duration equal to the length of his planned holding period, and that’s a place where professional advice can be very helpful.

**Ed Baker:** What about those managers that are involved only with active management? You appear to be consistent in offering the view that it’s impossible for active management to achieve its goal of rewarding investors. If that is true, what role do active managers have, if any?

**Burton Malkiel:** Many people would actually say I’m inconsistent. As I mentioned earlier, I’m on the board of Vanguard, which offers actively managed as well as index funds. People ask how I can be a director of a firm that has actively managed funds? I answer that by pointing out that, just as I recommend diversification for individuals, from a business standpoint I don’t want to be a director of a company that has all of its eggs in the index basket. So while Vanguard offers actively managed funds, they negotiate very firmly with active managers on fees. Ideally, this results in an ability to offer the consumer a much better “bang for the buck,” in that the Vanguard funds should have lower expense ratios.

**Ed Baker:** When I say “role,” I’m referring to a benefit or value that active managers might provide to the investment community as a whole.

**Burton Malkiel:** Well, I’ll go back to what I said before: The paradox of market efficiency is that, if everybody indexed, there would be nobody to make the market efficient. To the extent that there is a value-added role for active managers, it lies in the fact that we must have some of these managers to make the market efficient.

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**Meir Statman:** As we know, lotteries provide negative alphas as well as risk. Isn't it possible that some people buy actively managed funds for the same reasons they buy lottery tickets?

**Burton Malkiel:** That's right, and I think actively managed funds are a better deal than a lottery ticket. The way I explain it is that it's like telling people Santa Claus doesn't exist. Some people just want to believe, and for those people—leaving aside the issue of fees for a moment—active funds are a better product than a slot machine. They are better than anything Atlantic City or Las Vegas offers, and it's certainly better than going to the racetrack, where the expected return is a negative 20 percent.

Here's another thought: Take my wife's portfolio, for example. She inherited a sizable amount of Merck stock from her grandmother, and the cost basis is essentially zero, so she's not too keen about selling it. Now, if she is going to invest an IRA, she probably shouldn't choose a stock index fund, because she doesn't need a fund that invests in everything. Instead, she should invest in something that would help to diversify a portfolio overbalanced in healthcare. That's possibly another case where an actively managed fund would be of value.

**Ron Kahn:** Don't you agree that this situation would also be a good role for a financial adviser, because it's more of a tax and diversification issue?

**Burton Malkiel:** Yes, it is, and that's really what I see as the appropriate role. I tell the story in my new book about a woman who worked at Enron. She was absolutely delighted because she was smart enough to put her entire 401(k) in Enron stock. There she was, in her mid-fifties with almost $2 million and ready to retire and travel. Then Enron went bankrupt, and she lost her job. She had the income from her work, her livelihood, and her entire portfolio invested in the same company. Helping people to understand risk and its ramifications and to avoid situations such as this—that's an appropriate role for an investment adviser. My point again, though, is that the woman would have been even better off if, had she chosen to consult an adviser, she had been advised to diversify with an index fund rather than a mutual fund.

**Meir Statman:** This raises the question of whether an asset-pricing model should include factors other than proxies for risk. Do factors such as social responsibility and the propensity of investors to buy the so-called “admired” companies play a role in determining correct asset pricing?

**Burton Malkiel:** With respect to an asset-pricing model, there absolutely ought to be other factors. My first candidate, as I indicated before, would be liquidity or marketability, because there's no question investors get paid for bearing illiquidity. I also think “admired” companies could play a role, but you should be very careful about that. Remember, Enron was one of the most admired companies in the country, and Ken Lay was considered a mastermind.

**Ron Kahn:** Actually, I was referring to the negative relationship between admired companies and expected returns.

**Burton Malkiel:** Well, I’m not sure you should do that either. Some companies may be justly admired, and
others may not be. I’m sure there are other factors that should be a consideration in an asset-pricing model, but it’s not easy to determine what they are. Liquidity is something I’m virtually sure about.

**ED BAKER:** If factors other than the fundamental characteristics of companies and risk factors influence asset pricing, wouldn’t that introduce the potential for active managers to add value?

**BURTON Malkiel:** If you take what I’m virtually sure exists, which is the premium for illiquidity, I think there’s no question that if you’re Princeton University—or Yale, Harvard, Stanford—and you have a long time horizon, and you want to exploit this premium, then you do need active managers. On broadly diversified mutual funds, there’s a spread of maybe 400 to 500 basis points that encompasses the performance of almost all of the portfolios. When you’re in the private markets, these spreads are much wider. That’s why I believe these markets are much less efficient. If you want to try to get a premium for illiquidity, you definitely want the best active manager you can find.

Dr. Burton Malkiel is also a director of The Vanguard Group of Investment Companies; Prudential Insurance Company of America; BKF Capital Group; and The Jeffrey Company, a private investment firm. He sits on the investment committee for the American Philosophical Association and is a past president of the American Finance Association and a past appointee to the Council of Economic Advisors. He holds a B.A. and M.B.A. degree from Harvard, and a Ph.D. from Princeton University. He began his career in the investment banking department of Smith Barney & Co.