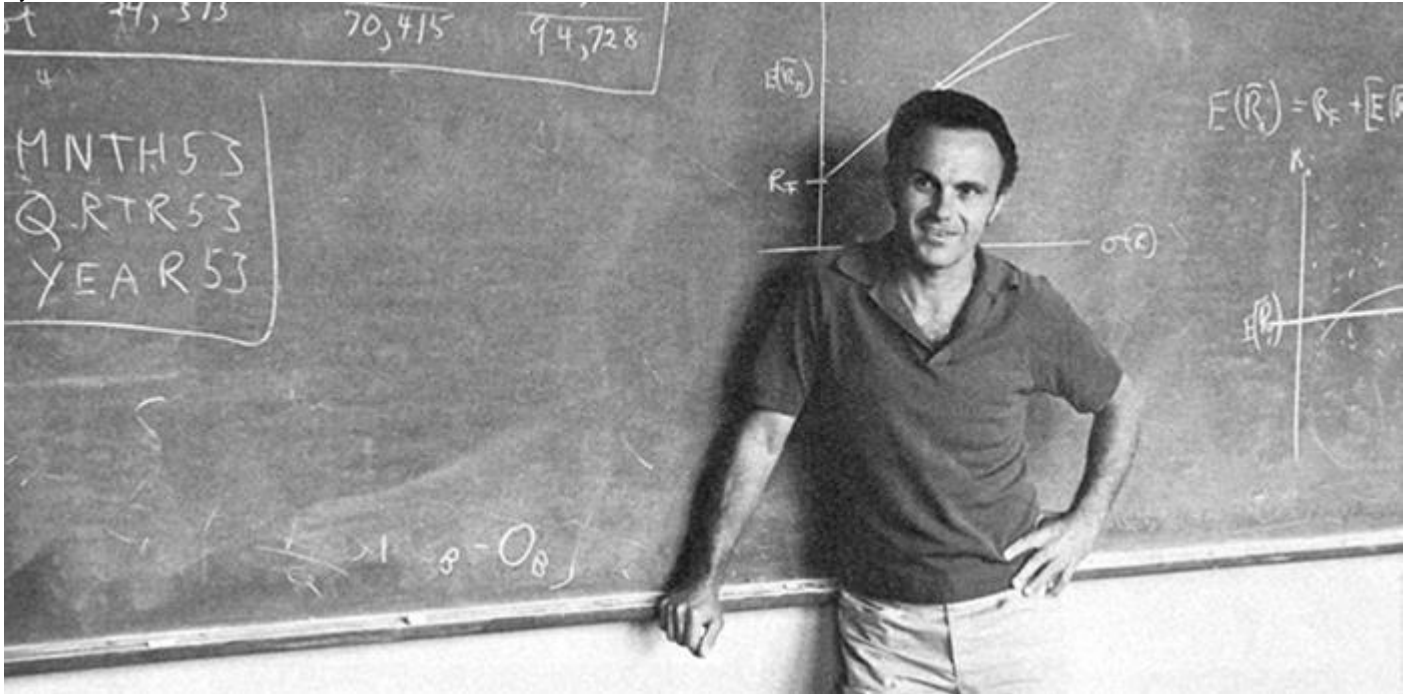


# A Father of Modern Finance

**Eugene F. Fama, the consummate researcher in his 50 years at Booth, changed the way generations look at the stock market. His rigorous standards have elevated the work of students and colleagues.**

By Rebecca Rolfes



An undergraduate at Tufts University in 1959, **Eugene F. Fama**, had moved on from a major in French to economics and was a newlywed in need of an income. The late Harry Ernst, an economics professor who had a stock market forecasting service on the side, hired Fama to devise ways to anticipate changes in stock market prices.

The formulas Fama came up with worked with historical data but never worked when he tested them going forward. It took him a while to figure out the problem, but when he did, he reshaped finance.

Fama, by 1964 a PhD student at Chicago Booth, figured out that you can't beat the market because prices already incorporate the information in easily available signals. Competing traders will seize on any reliable piece of information that prices will rise tomorrow and bid up prices today until they reflect that knowledge. Fama quickly realized that this simple insight had important and unanticipated implications for finance.

His dissertation, "The Behavior of Stock Market Prices," followed by "Efficient Capital Markets: A Review of Theory and Empirical Work," published in the **Journal of Finance** in 1970, revolutionized empirical work in finance and the understanding of financial markets. Fama's work provides the intellectual underpinnings for passively-managed and indexed mutual funds - paving the way for a new approach to investing. That philosophy says that neither luck nor smarts will make you a better investor, and active management provides no additional value. Buying a basket of stocks that reflects the market will yield better results than selectively picking stocks.

Fama, now Robert R. McCormick Distinguished Service Professor of Finance, earned tenure at age 26. He has stayed at Booth for his entire teaching career, save two years at the Catholic University of Leuven in Belgium. He has written 105 papers and two books, spanning asset pricing, corporate finance, monetary economics, and related subjects. "When I have an idea, I beat it to death," Fama said in his 2010 autobiography, *My Life in Finance*. He has taught at Booth for more than 50 years.

Fama credits the late **Harry Roberts, AB '43, MBA '47, PhD '55**, a distinguished professor of statistics at Booth, with the best advice he ever got. "His basic principle was that you do empirical work to learn from the data," Fama said in a recent interview. "No hypothesis that you ever test is strictly true, and significance levels and other things that people talk about are basically descriptive. You shouldn't take them too seriously. In the end, it's basically just a matter of, 'Did you learn something from the data?' That has been my guiding principle in empirical work all this time."

Fama's research always has been deeply empirical. He was one of the first academics to use computers. He created his own early database and later used data from the Center for Research in Security Prices (CRSP). (See "Putting CRSP on the Map.") Rather than proving that this or that should happen, Fama looks at what is happening. His gift is to see clarity in the cacophony of data. And when the facts don't bear out current theories, including his own, he is not shy about pointing it out.

## EFFICIENT BUT RANDOM

In a perfectly efficient market, stock prices already incorporate available information that defines the value of a company. As Fama pointed out, market prices are not perfectly efficient. Early studies found that inside information, such as a not-yet-released earnings announcement, is not fully reflected in market prices. Bans on insider trading are reasonably effective. Consequently, market efficiency is a matter of degree - not a carved-in-stone truth, but an organizing principle for empirical work.

The simple idea of market efficiency has subtle and unexpected implications. If markets are efficient, technical trading systems should not work. Markets should be as unpredictable as coin flips. Fama and the generation of researchers he inspired went out to test the rules that traders use, and found their power to forecast returns is infinitesimal. If markets are efficient, active fund managers should not be able to consistently outperform simple indices, once correcting for luck - which is hard to do as unlucky managers don't advertise their results. When they looked at the data, Fama and his fellow researchers found that the average active manager underperforms passive indices, the number that reliably beat indices is minuscule, and good past performance vanishes quickly.

Fama continually looks at the data in new ways. For 30 years the study of active management centered on the search for persistence: do managers that did well in the past continue to do well in the future? In 2012, Fama with longtime coauthor Kenneth French, professor of finance at the Tuck School of Business at Dartmouth College, reexamined the data with a new test: do we see more high-performing managers than we should due to chance, if no manager had any skill? The answer is that we do, but they are few - and more than offset by a corresponding number of managers that perform below market averages.

"People would be a lot more skeptical if they understood that there is an incredible amount of chance in the results that you observe for active managers," Fama said. "So the distribution of outcomes is enormously wide - but that's exactly what you'd expect by chance with lots of active managers who hold imperfectly diversified portfolios. The really good portfolios contain a lot of really lucky picks, and the really bad portfolios contain a lot of really unlucky picks as well as some really bad ones." Fama himself is a passive investor. "I don't trust anyone else to interpret the data better than myself," he once told a writer from Ibbotson Associates, the financial research firm. "So I don't believe the opportunities are there to beat the market."

Much of the financial services industry wishes that these facts weren't true. If technical analysis, stock picking, and active management add no value, what is the benefit of the hefty fees paid by investors for portfolio management, newsletters, or investing advice? If a Wall Street "master of the universe" who reaps huge profits is merely lucky, or assuming an undue amount of risk, why should he be paid so much? That, in part, is the reason that Fama and the evidence for market efficiency are so hotly debated and remain a lightning rod for criticism. Whenever there is a financial downturn of any size and, more importantly, any duration, a host of critics pop up to say, "See, I told you Fama was wrong. Markets are inefficient. This is chiefly a result of misunderstanding what he says. Or, according to **Clifford Asness, MBA '91, PhD '94**, it's due "largely to idiocy."

Asness is managing principal of Greenwich, Connecticut-based investment firm AQR Capital Management, which he founded with **John Liew, AB '89, MBA '94, PhD '95**. Asness was Fama's teaching assistant starting in 1988, and Fama supervised his PhD. "The efficient market hypothesis does not tell you that the market will always be right," Asness said in an interview. "There's a lot of randomness in the world. Economic activity varies, and stock prices should fluctuate unpredictably as booms and recessions come and go," he said.--

Stock volatility brings out Fama's critics. "Gene has the thickest skin of anyone I know," French said. "I have been at seminars where someone insults him and he just shrugs it off."

But the notion that efficiency equates to stability is simply wrong. "People say, 'There was a crisis. That means the market is not efficient,'" said **John H. Cochrane**, AQR Capital Management Distinguished Service Professor of Finance. "That's ridiculous. If markets never crashed, that would be inefficiency. Then you could earn a guaranteed profit with no risk. The theory says markets should be efficient - markets should aggregate the information that real people have - not clairvoyant, reflecting information nobody has. There's nothing in the fact of a big crash that's inconsistent with an efficient market."

Understanding volatility was a major part of the financial research in the 1980s and led to one of the first big revisions of the efficient markets view. Fama all along explained that a test of market efficiency required a "model of market equilibrium," an understanding of the equilibrium premium that investors can earn by taking on risk. For a long time, researchers found no evidence that this risk premium changed over time. But subsequent work by researchers, including Fama and French, changed that. Risk premiums vary by quite a lot over time. As Fama explains: "Economically, there is no reason why the expected return on the stock market has to be the same through time."

## BENCHMARK RESEARCH

Although Fama's theories now are accepted as truth in many investing circles, they began as the conjectures of a group of quant-oriented academics. Other economists might have taken note, but the average investor would still be none the wiser.

John A. "Mac" McQuown showed up on campus the Monday morning after Thanksgiving in 1963. With an engineering degree from Northwestern University and a Harvard MBA, McQuown was sure that Wall Street's conventional wisdom was wrong. He was looking for the sort of clarity in finance that he had gleaned from his early training in mechanical engineering. That morning, he met Fama, the late **James H. Lorie, PhD '47**, and the late finance professor **Merton Miller**, winner of the 1990 Nobel Memorial Prize in Economic Sciences. At that time, like Fama, Roberts, and **Lester Telser, AM '53, PhD '56**, Miller was part of the "Chicago gang" of academics who were looking for patterns in stock prices.

"Gene was presenting data about the statistical distribution of common stock returns," said McQuown, founder of San Francisco analytics firm KMV, now part of Moody's Corp. "That was at the center of work we were doing at Wells Fargo."

McQuown would become director of management sciences at Wells Fargo & Co. in San Francisco the following year and launch the first index fund in 1971. "I can't take credit for it," he said. The index fund, he explained, emerged equally out of the brains of Booth (then GSB) professors **Myron Scholes, MBA, '64, PhD '70**, winner of the 1997 Nobel Memorial Prize in Economic Sciences, and the late **Fischer Black**. "Gene introduced me to Myron, who introduced me to Fischer. I just persuaded management to go along with it."

The index fund was the way to play in an efficient market. If active management provided no value and there was no way to beat the market, a well-assembled, passively managed index fund was the answer. Called "un-American" in their early days, today's passively managed funds represent an estimated 20 percent of the mutual fund market with \$16 trillion invested.

When economist and writer Burton G. Malkiel published *A Random Walk Down Wall Street* in 1973, he popularized the concept of market efficiency with mainstream investors. He also made ubiquitous an idea that was still looked on skeptically by traditional investment professionals. After all, in every other field, experienced professionals outperform dartboards. You wouldn't pick a random lawyer or doctor, and you wouldn't just take one of everything at a wine store. The fact that markets are remarkably efficient and that index funds outperform active funds is deeply counterintuitive and was much more so at the time.

## BIG DOLLARS

Efficient-market theories made a big impression on a young **David Booth, '71**, whose first course at Chicago was a finance class taught by Fama that used as a text the rough draft of what would become *The Theory of Finance* by Fama and Miller. Booth was concerned at the apparent difficulty of the class, but Fama promised Booth it would be "the most practical" course he would ever take.

"The relationship changed my life," recalled Booth, who was Fama's teaching assistant before he gave up the idea of finishing a PhD and pursuing a career in academia. Instead, he went on to found Austin, Texas-based Dimensional Fund Advisors Inc. In 2008, he donated the school's naming gift.

Dimensional is a pure example of Fama's research in action. Booth founded the investment firm in 1981 with **Rex Sinquefeld, '72**, out of frustration at the established financial services industry's failure to embrace the well documented empirical results of efficient market research.

Booth was interested in the promise of small company stocks, which reap higher returns than large company stocks; and value stocks, which have lower prices relative to book value but which generate higher returns than growth stocks, on average. But the premiums earned by small stocks and value stocks posed a challenge to the primary existing model for the measurement of risk and the relation between risk and expected return. Fama and French led the way in developing a new model.

The traditional capital asset pricing model (CAPM) uses only beta - the measure of systemic risk compared to the market as a whole - to explain the returns of a portfolio or a single stock. But researchers including Fama and French found that small and value stocks earned returns that could not be explained by market betas, so Fama and French added size and book-to-market factors to devise the "three factor model." By using a portfolio of value stocks and small stocks along with the market return, Fama and French could account for a wide variety of apparent "inefficiencies."

"Fama was both Newton and Einstein," Cochrane said. "He led the basic development of finance, and its second big revolution, integrating the zoo of anomalies that threatened its foundations. I can't think of anyone else who has done something like that." The three-factor model (now sometimes adding a fourth factor, momentum) has become the standard risk-adjustment model in academic research and practical applications, in place of the CAPM.

"This model became kind of the skeleton of all [Dimensional's] products," Fama said. "They've used that model to expand into markets around the world."

Other firms, notably Asness's AQR, now apply versions of this model and credit Fama with their founding philosophies. They demand rigorous empirical research for new products and understand that investing can reward the bearing of understood risks.

Dimensional lives and breathes the Chicago school of thought. Its board of directors included Fama, McQuown, and more recently French.

"I have seen Gene at least once a quarter for 32 years," McQuown said. "There has certainly never been a board with anywhere near that duration."

Fama's research meanwhile fuels product development for Dimensional. "He and Ken French have done a lot of work on dimensionality and that is the basis of our investment approach," Booth said. The 1992 Fama-French paper, "The Cross-Section of Expected Stock Returns," published in the *Journal of Finance*, led to the creation of Dimensional's value fund.

"One of the first things they teach you in economics is the notion of comparative advantage," Booth said. "Anyone with a skill maximizes the work of the whole group. My advantage is running the firm and his is thinking the right thoughts."

The truth, as Fama would say, is in the numbers. Dimensional Fund Advisors, founded in the bedroom of Booth's New York apartment, is a \$300 billion firm. "In the last five years," Booth said, "individual investors have pulled \$500 billion out of mutual funds. In that same period we had positive flows into our funds."

## COLLABORATION

Fama and his colleagues are quick to share credit for what is often collaborative work. It is almost impossible for a lone researcher to realize a truly big idea. Different points of view and areas of expertise are necessary to fully realize a major research project - not to mention sharing the immense workload. That same collaboration and collective input form the basis of the famous Chicago workshop system. Fama is the first among equals when it comes to contributing and refining new research in progress. At the finance workshop, Fama sits at one head of the U-shaped table and no one else, colleagues say, sits in his chair, even if he is out of town. Faculty members dissect research in progress, sometimes from other faculty members, sometimes from PhD students, sometimes from visitors. The rules are simple: ideas must stand. If an idea does not make sense, attendees say so. All ideas need refining, but to the uninitiated, the process can seem in Fama's words, "cruel."

"This is a rough environment in terms of doing research," he said. "People don't coddle one another." Fama recalled what he considered routine morning exchanges with Fischer Black, when Black was on the Chicago faculty, witnessed by Fama's former research assistant, then-PhD student, the late **Jim MacBeth, PhD '75**. "One time Fischer left, and Jim said to me, 'You know I'm from Kansas. When people from Kansas talk to one another that way, one of them usually ends up getting shot.'"

**Campbell Harvey, PhD '86**, professor of finance at Duke University's Fuqua School of Business, experienced a nerve-wracking moment when he presented a paper at the Chicago seminar. "After about 20 minutes, it was clear that there were some issues, with most of the criticism coming from Merton Miller. There was this long silence," Harvey recalled. "I'm just kind of standing there wounded and then Fama said to the group, 'OK, you don't like his approach. Fine. What's a better one?'"

What had been one of the most painful moments in Harvey's academic life became one of the most productive, he said. "This is a key lesson from Gene, that it's better to take that research risk, and yes, sometimes it won't work out, but you'll learn something anyway."

Another Fama legacy lies in his writing. French noted Fama's written work is meticulous. "Every sentence he writes is precise and correct," French said. "That is the hallmark of his work."

Cochrane added that Fama defined how one makes an argument and writes papers on finance. "He also has a superb seminar style that the rest of us should emulate better," he said. "When you hear presentations at conferences, I time it, and it's usually an hour of motivation and chit-chat before you hear anything substantive. Gene starts with, 'Here's Table 1,' and everyone is listening."

"Gene has been the intellectual leader of the finance group, and with that, much of the school for his 50 years here," Cochrane said. "Developing the great faculty, the no-nonsense intellectual environment, the culture of openness and honesty, much of that comes from Gene. The tradition that we value only the quality of work - that there is no ideological bias and your work can agree or disagree with Gene and efficient markets - that comes from Gene too. He doesn't care where the facts lead as long as it's well done, convincing work."

## PASSIVE INVESTING, ACTIVE TEACHING

Fama nurtured several generations of Booth-educated economists. Dating back to the mid-1960s, he has been the dissertation advisor for more than half of Booth PhD candidates, Cochrane estimates.

"I came to the University of Chicago knowing that it was a great research institution," Harvey said, "and I had assumed that there would be this tradeoff between research and teaching. Great research is often said to come at the expense of teaching. I learned very quickly that just wasn't the case. The best researchers were also the best teachers."

Harvey had never seen a reading list like the one for Fama's course. But the approach to those papers was different from other professors. "He was able to extract the key idea very easily and effectively communicate the new insight to the class," Harvey said. "It wasn't just reading the paper like anybody can read the paper but really understanding what the contribution was. He knows all the different angles, and he is able to communicate them so lucidly that the paper comes alive. You're kind of taken into the research process and definitely into the mind of the professor, and that's very powerful."

Because new research comes out all the time, Fama does not simply convey information in his classes. Instead, "My goal is to get them to think critically about stuff," he said. "Just because it's written on paper doesn't mean it's right, or because it's published in a good journal doesn't mean there aren't things that can be done better or that there aren't real problems with it. It's just a critical attitude that I want them to take away and the ability to learn on their own in the future."

**Robert Stambaugh, MBA '76, PhD '81**, who taught finance at Booth for five years and is now a finance professor at the Wharton School of the University of Pennsylvania, took Fama's class in his first year at Booth.

"He was tough and uncompromising in his devotion to the rigor of the subject," Stambaugh recalled. "Gene was always very good at communicating an enthusiasm for the subject and for research - the fact that research was exciting, empirical research in particular."

Cochrane's office is down the hall from Fama's, and students on the way to Fama's research class often stop there first. "They're sort of taking a deep breath before they go in," Cochrane said. "There's always this, 'What am I going to say to Gene?' moment." Commenting on Fama's research-projects class, he added, "It's not them sitting at the foot of the master. The master is there to help them refine their ideas. They have to write a paper, and they have to come in every week and tell him what they've done. Not only are the students engaged, but he has to be engaged. Gene doesn't dial anything in. Anything Gene does, he does right or he doesn't do it at all."

When Asness was deciding on a dissertation topic, he chose price momentum strategy - buying stocks after they've gone up on the idea that they will continue to rise a bit. "I went and asked what he thought of it," he recalled. Because that theory didn't jibe with the efficient market model, Asness said, "I mumbled the last part, that it works very well."

"A closed-minded professor would have said, 'That's not for us,'" Asness recalled. "Instead, precisely what he said to me was, 'If it's in the data, write the paper.' It's become one of the anomalies of finance and is annoyingly effective for an efficient market believer. He may not have liked the result, but he did not dismiss it."

Fama makes no small plans and he doesn't accept them from his students. Harvey once went to his office to pitch ideas for several papers and Fama said, "Nope," Harvey remembered. "I said, 'Excuse me?' And he said, 'It's not a big idea.'" This not only saved Harvey years of potentially wasted research time, but, he said, was empowering and informative of his own approach to teaching and to research. "What he was saying was, 'You're capable of the big idea.' I walked out of there thinking, 'OK, all I need is to keep thinking, and I will have the big idea.'"

Fama's body of work is enormous, and his productivity continues. He is what McQuown calls, "a fountainhead of output. He works as hard today as he did 50 years ago."

Speaking at the June 15 Booth convocation ceremony, Fama told graduates to get into a field where work is a pleasure. "I love my work," he said. "I have no intention of ever stopping as long as I am breathing, and I may even do it after that." v

## Putting CRSP on the Map

In 1960, the late Booth professors **James H. Lorie, PhD '47**, and **Lawrence Fisher, AM '55, PhD '56**, had the idea for a database of stock prices that tracked stock market behavior. After graduate students put in hours to record month-end stock prices dating back to 1926 and began to update them monthly, the Center for Research in Securities Prices (CRSP) was born.

Fama appreciated CRSP's potential early on. "Gene was one of the first to start using computers to do empirical research in finance," said **John Cochrane**, AQR Capital Management Distinguished Service Professor of Finance. "He was one of the first down there at night with his punch cards."

Fama recalled that Lorie worried that CRSP wasn't being used by anybody, and he wanted a paper that showed how useful it could be. "His worries were misplaced because CRSP came to dominate empirical research," Fama said.

Fama came up with the idea for what became the first event study, "The Adjustment of Stock Prices to New Information," published with Fisher; **Michael C. Jensen, MBA '64, PhD '68**; and **Richard W. Roll, PhD '68**. Their research analyzed stock price changes and subsequent returns that resulted from a specific event such as a merger or, in the case of their study, stock splits. Such studies are now common practice and stock price reactions are quoted when there is any major event, such as an earnings announcement, corporate reorganization, or a major capital investment.

The paper "started a revolution in accounting and economics as well as finance," according to a paper from the University of Illinois at Chicago.

The study was groundbreaking, and CRSP has never looked back. Today the center has a staff of 78 and a healthy product lineup. It enjoys a strong reputation for its clean data, which lends itself to back testing, performance measurement, benchmarking, securities analysis, and other research. Last year it began marketing investable indexes. Fama is the chairman of the CRSP board.

"That paper marked the beginning of the widespread use of this analytic approach and our data," said **David Barclay**, CRSP's chief operating officer.

Before then, it was possible to do regression analysis, for instance, but armies of grad students had to work on calculators. "I don't know what professors did before 1963," said **David Booth, '71**, founder of Dimensional Fund Advisors Inc. "The world changed pretty quickly. It was the beginning of critical work."

## Location, Location, Location

For 25 years, Eugene F. Fama's office suite mate was **Douglas W. Diamond**, Merton H. Miller Distinguished Service Professor of Finance and codirector of the Fama-Miller Center for Research in Finance. Diamond recently reflected on their friendship and collaboration.

**Chicago Booth Magazine:** Why did you jockey to be Eugene Fama's suite mate when you came to Booth in 1979?

**Diamond:** He's one of the godfathers of finance. He and Merton Miller were the soul of the place, but Miller had his own private office. I got to see a lot of Fama. It was location, location, location. That was the center of the universe in finance. For a young whippersnapper, that's where you want to be.

**CBM:** What was it like to work with him?

**Diamond:** He was in the office six to seven days a week. I found this pretty impressive as a 25-year-old. He set an example that to this day everyone in the finance group follows. Come in, collaborate, and talk to each other. We do workshops and seminars where you give a presentation, and others in the department poke holes in it. It's in the spirit of collegiality, so that we all help each other. That's one of the reasons the work is so good when it gets published. We've all been over it and over it. Fama reads the papers in advance and usually does his critique in writing - he's precise. Even though he would never admit to being a mentor, he mentors by example. Do serious research. Work hard on it. Don't cut corners. He's a great scholar and encourages others to be as well.

**CBM:** Why does he not like being called a mentor?

**Diamond:** His attitude is, because we hire good people who know what they're doing, we should get out of their way and let them do it. He and Merton Miller set the tone for the group. That's one of the reasons the finance group is such an important part of the school: they set high standards. The vast part of his work is empirical. I'm a theorist. My work is a lot closer to Miller's than to Gene's. But he gave me more information than anyone in the world. Early on, I was working on banking theory, and he was one of my most insightful critics and shared a lot of insights with me.

**CBM:** One usually thinks of academia as more competitive and territorial than that.

**Diamond:** He's serious and focused. But competitive? There are not too many people in the room who could compete with him.

**CBM:** His colleagues and students from all points in his career say, "I was there at the most exciting time." Is that true of your experience with him?

**Diamond:** I would say that his research has been exciting for the last 50 years. Some of the things he's most famous for are not even his best stuff. The event study was a big deal. Gene has always come up with original things; he does not do what others are doing. That's always exciting.

## Investment Advice from Eugene Fama

- "Passive managers don't react to active managers. They just hold cap-weighted indexed portfolios, which are totally immune to the actions of active managers. So if active managers win, it has to be at the expense of other active managers, which means that, before all costs, active management is a zero-sum game. That's not hypothesis, that's arithmetic."
- "The efficient market theory is one of the better models in the sense that it can be taken as true for every purpose I can think of. For investment purposes, there are very few investors that shouldn't behave as if markets are totally efficient."
- "Markets are efficient, but there are different dimensions of risk and those lead to different dimensions of expected returns. That's what people should be concerned with in their investment decisions and not with whether they can pick stocks, pick winners and losers among the various managers delivering basically the same product."
- "In general, past performance doesn't predict future performance."



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