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# » A DIALOGUE WITH NOBEL LAUREATE HARRY MARKOWITZ:

## OPPORTUNITIES & CHALLENGES IN APPLYING FINANCIAL TECHNIQUES DURING A CRISIS

Wednesday, September 25, 2013

## EXECUTIVE SUMMARY

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# A Dialogue with Nobel Laureate Harry Markowitz: Opportunities & Challenges in Applying Financial Techniques During a Crisis


**KEYNOTE SPEAKER**

**Harry Markowitz** | Nobel Laureate in Economics; Principal, Harry Markowitz Company

**DISTINGUISHED PANELISTS**

**Peter Gilhuly** | Partner, Latham & Watkins LLP; Manager West Coast Insolvency Practice

**David Mordecai, Ph.D.** | President, Risk Economics, Inc. and Senior Advisor, Compass Lexecon

**Richard Roll** | Distinguished Professor, Joel Fried Chair in Applied Finance, UCLA Anderson School of Management

**Anil Suri** | CIO of Multi-Asset Class Modeled Solutions & Head of Investment Analytics, Merrill Lynch Wealth Management

**MODERATOR**

**Jack Friedman** | Chairman, Directors Roundtable


## OVERVIEW

Modern Portfolio Theory (MPT), developed by Harry Markowitz in the 1950s and broadly embraced by the financial community, uses various inputs, including expected returns, to help investors choose a portfolio based on their risk/return "efficient frontier" and preferences. Professor Markowitz argued that financial engineering, not MPT, is responsible for recent financial crises, including the 2008 crisis. The other panelists agreed with the idea of diversification that is inherent in MPT as well as MPT's emphasis on creating a portfolio with the lowest amount of risk for a particular return.

Other important investment perspectives discussed include having a holistic framework to help investors protect their standard of living while also aspiring to wealth, understanding the basic ideas of systemic risk and correlation of risks, and being familiar with the practical difficulties of valuing assets during a bankruptcy.

## CONTEXT

Professor Markowitz explained the basics of Modern Portfolio Theory, described how financial engineering differs from MPT, and shared his view of the causes of recent financial crises. The other panelists expounded on MPT and offered their perspectives on applying various financial techniques during a crisis.

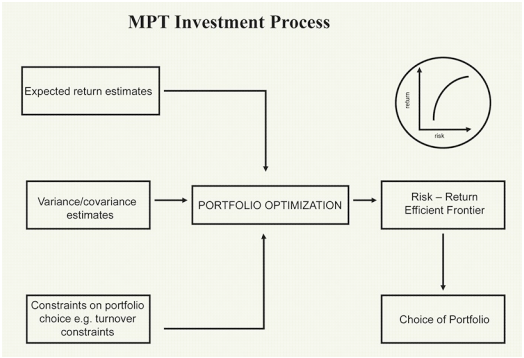
## KEY TAKEAWAYS

### Yes, the Modern Portfolio Theory (MPT) does work even during financial crises.

In the aftermath of the 2008 financial crisis, portfolio theory (and Professor Markowitz personally) were criticized for causing the crisis. To respond to the misinformed critics, Professor Markowitz discussed, "Does MPT Work During Financial Crises?" He explained what **portfolio theory** is, how it is supposed to work, and how it is used; described what **financial engineering** is and how it is used, and assessed the role of each in three major financial crises.

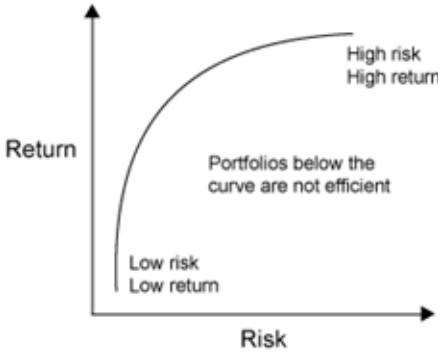
***Portfolio Theory***

At the heart of portfolio theory is portfolio optimization. As is shown below, there are inputs into this optimization, as well as outputs.




- **Inputs:** the inputs are estimates (by a model or analysts) of expected returns of securities, expected variances/covariances, and constraints on the portfolio. Constraints might be upper bounds on the amount of a portfolio that can be invested in a "risky" asset class such as emerging markets or commodities. (Other types of constraints include turnover and liquidity constraints.) An asset class is viewed as risky if there is uncertainty about the estimates or if there is volatility.

- **Outputs:** One of the outputs is a risk/return tradeoff curve (shown below), also referred to as the efficient frontier. An investor, possibly with the help of an advisor, can choose their desired point on this frontier curve. Depending on an investor's life stage and personal preferences, this might be a point with low risk and low return, or with high risk and high return, or any other point on the curve.




### *Financial Engineering*

The portfolio theory begat the Capital Asset Pricing Model (CAPM), which begat Option Pricing Theory (including the Black-Scholes-Merton Option Pricing Model), which in turn begat Financial Engineering. Key uses of Black-Scholes and other option pricing models are:

1. To value standard options, e.g., puts and calls;
2. To devise synthetic options, e.g., portfolio insurance;
3. To help design (and evaluate exotic derivatives and other new financial structures.

Uses 2 and 3 can be thought of a "financial engineering."

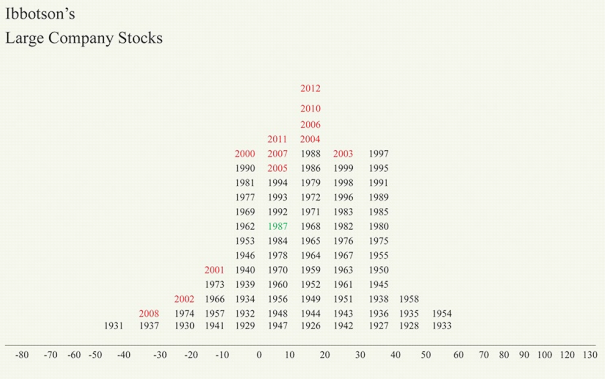
### *Financial Crises*

In looking at the stock market crash of 1987 (Black Monday), at Long-Term Capital Management (LTCM), and at the market decline of 2008, none of these crises refute the Portfolio Theory.

- **1987.** This crash was based on holders of portfolio insurance (first, the big brokers) doing what their models told them to do, which was sell. In fact, the formula said to sell $10 billion, which crushed the market by $5 billion. The model had assumed a continuous, liquid market, but the model was wrong. This was a self-inflicted Black Swan.
- **LTCM.** LTCM used the MPT. But LTCM assumed liquid markets, went short the liquid side of many markets, went long the illiquid side, was highly leveraged, and was unable to respond when a default by Russia caused a flight from illiquid assets and a demand for liquidity. LTCM would not have had a problem had it not been so highly leveraged.
- **2008.** In the crisis of 2008, there were enormous investments in highly leveraged mortgages, with leverage added at every step in the process. In addition, the financial products being sold were so complex that no one knew their direct and indirect exposures. There was a special problem with CDSs (credit default swaps). These products were called "CDSs" instead of "insurance" to avoid the reserve requirements of insurance. However, because CDSs insure *correlated* risks, they actually needed even *greater* reserves. (Insurance companies have reserves for deaths, which are fairly uncorrelated, yet CDSs had no reserves even though they essentially were a form of insurance for corporate distress, which is in fact a correlated risk.)

Further, 2008 was not an outlier. It was 2.5 standard deviations, and 2 or more standard deviations should happen 2.5% of the time, which is once every 40 years.

> "You have got to have a one out of forty year once in a while, and 2008 was only the second worst year in sixty-one years. It was tied for second worst."
>
> » Harry Markowitz




This analysis shows that MPT has worked as the theory holds. Those who stayed in the market after 2008 have survived, and those who rebalanced should be extremely happy. The MPT doesn't promise high returns with no risk; that's not possible. But it also didn't cause the most recent financial crisis; that can be attributed to financial engineering.

## Modern Portfolio Theory is actually quite conservative, though the inputs can be imperfect.

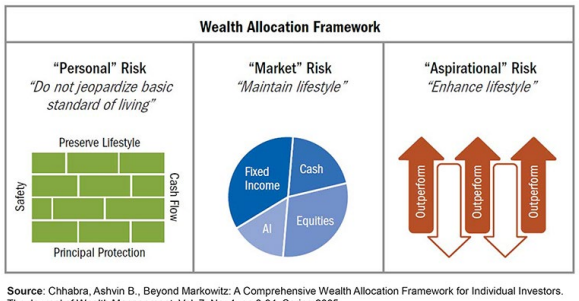
Professor Roll argued that Modern Portfolio Theory is extremely conservative and is just the opposite of taking a great deal of risk. It stresses that the best portfolios are highly diversified and that investors shouldn't put all of their eggs in one basket, which is what many "experts" advocated prior to Professor Markowitz.

> "Portfolio Theory is one of the most conservative theories you can get because it minimizes volatility for any given level of return you want to achieve. It gives you the lowest risk portfolio you can get, which is the whole point of mean variance optimization."
>
> » Professor Richard Roll

However, while MPT produces a portfolio with a minimum level of risk, in the 2008 crash two important assets were missing from most portfolios: 1) human capital, which is never included in portfolios because no one knows how to value it; and 2) real estate. Their exclusion, in Professor Roll's view because they can't be measured, is a defect in applying this theory. Also, the inputs to optimize a portfolio are subject to estimation errors. With those caveats, there is nothing wrong with the model, but the inputs into the model are far from perfect. (Professor Markowitz stressed that uncertainty and estimated volatility should be part of the model.)

## Many of the ideas of the Modern Portfolio Theory are actively put into everyday practice.

Anil Suri described how Merrill Lynch's CIO Ashvin Chhabra has developed a Wealth Allocation Framework that builds on many of Professor Markowitz's and Professor Roll's ideas and puts them into practice. This framework incorporates key ideas in asset pricing, risk management, and behavioral finance into a cohesive set of financial advisor practices and provides a way to prioritize. The framework helps individual investors think about their financial goals, their preferences, and the risks that they face.




Source: Chhabra, Ashvin B., Beyond Markowitz: A Comprehensive Wealth Allocation Framework for Individual Investors. The Journal of Wealth Management, Vol. 7, No. 4, pp 8-34, Spring 2005. Available at SSRN: http://ssrn.com/abstract=925138

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This framework, shown above, has three key components:

- **Personal risk.** Each person has a desire not to fall behind in terms of their basic lifestyle and standard of living.
- **Market risk.** Each person wants to keep up with the average level of growth in the economy.
- **Aspirational risk.** Everyone has aspirational goals to make it rich and achieve an enhanced lifestyle.

This framework helps reconcile and deliver on an individual's simultaneous desire for downside protection, along with the desire for upside opportunities. The framework also takes real estate into account, as well as human capital, which is often the source of wealth creation through business ownership or various incentive plans. It also respects that many people have various "mental accounts," such as funds for investment, different funds for educational expenses, and so on. This framework is not necessarily prescriptive; it is a set of organizing principles which are very consistent with a great deal of academic research. Especially during periods of volatility and crisis, using this framework to think about these three buckets is quite useful.

> "The Wealth Allocation Framework helps individuals prioritize goals, manage risks, and allocate assets to achieve personally meaningful financial outcomes."
>
> » Anil Suri

## All models can and sometimes tend to fail. They key is to understand why, when, and how they fail.

David K.A. Mordecai explained that when "bad things" happen and those bad things are coupled, they can sometimes contribute to systemic market effects. In practice, there are no *perfect hedges*, and arbitrage is not riskless. At the systemic level, since derivatives do involve contingent borrowing and lending, i.e. credit extension, they are not "a zero sum game." In actuality, there are no riskless assets (e.g., even sovereign fixed income instruments and currencies are exposed to inflation risk). Financial intermediation involves system-wide lending, but not at a risk-free rate.

Regarding diversification, when markets decline and capital comes under pressure, correlations tend toward one, meaning that the benefits of diversification are diminished; this is a primary contributor to the nature of systemic problems. Professor Markowitz agreed that during crises all correlations tend to go toward one because there is systematic risk and greater volatility.

### In bankruptcies, assets have to be valued immediately.

Peter Gilhuly provided a different perspective—that of an attorney with expertise in bankruptcy proceedings. In bankruptcy, valuing an asset is critical, and as Mr. Gilhuly said, "We have to figure these things out today." The problem is that determining a valuation at an exact moment in time when the market is broken and various valuation theories have failed is incredibly difficult. The court looks at all types of valuation methodologies including discounted cash flow, comparables, precedent transactions, and even market capitalization, if it exists. Yet, these valuation methods are imperfect. To clear the market, assets are sold at a price that someone is willing to pay. The buyers are often quants who have crunched the numbers, determined the value of an asset, and buy it for a song.

Professor Markowitz replied that there are people who are doing forward-looking estimates of expected returns and looking at the volatility. Some people are good at this and some people are not. Those who are good will survive. Professor Markowitz also noted that security analysts offer opinions on whether to buy, sell, or hold, but they don't make estimates of expected returns.

## OTHER IMPORTANT POINTS

- **Additional information.** *Risk-Return Analysis: The Theory and Practice of Rational Investing (Volume One)* by Harry Markowitz and Kenneth Blay.
- **Predicting the market.** Jack Friedman told a story of how a group of students was adamant that they could predict the stock market. They had reached this conclusion the day before the 1987 market crash, which they failed to predict.

### THE DIRECTORS ROUNDTABLE

The Directors Roundtable organizes the pre-eminent worldwide programming for corporate directors and their advisors. It has created the leading forum for Directors to discuss their cncerns with peers and distinguished experts. The challenging topics focus on key developments, regulations, and pragmatic solutions directly impacting their company and their roles. Since 1991, it has organized more than 600 events worldwide. The Directors Roundtable is a civic group whose activities are co-hosted, so no fee to attend has ever been charged. To learn more, visit: http://www.directorsroundtable.com.

### THE LAURENCE AND LORI FINK CENTER FOR FINANCE & INVESTMENTS

The Laurence and Lori Fink Center for Finance & Investments serves as a bridge between academia and industry in the field of finance. The Center sponsors research, teaching, and the application of financial knowledge in the global corporate and investment communities. The Fink Center's mission is to connect students, alumni, faculty, and the investment community to transform fundamental knowledge into applicable practices that benefit today's global economy.

The Fink Center takes a leadership role in recruiting and retaining outstanding faculty and scholars. The Center works with faculty to expand UCLA Anderson's capability to publish innovative work and effectively disseminate cutting-edge research. The Center also supports promising Ph.D. and MBA students and serves as a bridge to the industry through the development of its future finance leaders. To this effort, the Center hosts investment conferences, stock pitch competitions, and networking events. Relationships with the Center's Advisory Board, on which Larry Fink has served as chairman since 2006, help foster interaction between students, alumni, faculty, and prominent experts in the field of finance. To learn more, visit: http://www.anderson.ucla.edu/centers/fink.

## SPEAKER BIOGRAPHIES

**Harry Markowitz | Nobel Laureate in Economics; Principal, Harry Markowitz Company**

Dr. Markowitz has applied computer and mathematical techniques to various practical decision making areas. In finance: in an article in 1952 and a book in 1959 he presented what is now referred to as MPT, "modern portfolio theory." This has become a standard topic in college courses and texts on investments, and is widely used by institutional investors and financial advisors for asset allocation, risk control and attribution analysis. In other areas: Dr. Markowitz developed "sparse matrix" techniques for solving very large mathematical optimization problems. These techniques are now standard in production software for optimization programs. Dr. Markowitz also designed and supervised the development of the SIMSCRIPT programming language. SIMSCRIPT has been widely used for programming computer simulations of systems like factories, transportation systems and communication networks. In 1989 Dr. Markowitz received The John von Neumann Award from the Operations Research Society of America for his work in portfolio theory, sparse matrix techniques and SIMSCRIPT. In 1990 he shared The Nobel Prize in Economics for his work on portfolio theory.

**Jack Friedman | President, Directors Roundtable Institute**

Jack Friedman is an executive and attorney active in diverse business and financial matters. He has appeared on ABC, CBS, NBC, CNN and PBS; and authored business articles in the *Wall Street Journal*, *Barron's*, and the *New York Times*. Mr. Friedman received his MBA in Finance and Economics from the Harvard Business School and a J.D. from the UCLA School of Law.

**Peter Gilhuly | Partner, Latham & Watkins LLP; Manager West Coast Insolvency Practice**

Peter Gilhuly is a corporate restructuring and bankruptcy partner in Latham & Watkins' Los Angeles office where he is responsible for managing the West Coast Insolvency Practice of the firm. Mr. Gilhuly represents debtors, buyers, hedge funds, private equity funds, first and second lien holders, creditors' committees and boards of directors.

He has been cited as a leading bankruptcy attorney in *Chambers USA* 2012-13; recognized as "an exceptional bankruptcy lawyer" by *The Legal 500 US 2013*; appointed in 2012 to the Advisory Committee of the ABI on Reform of Chapter 11; named in 2012 and 2011 to the *Daily Journal's* annual list of "Top 100 Attorneys in California"; named by *The Deal's Bankruptcy Insider* as the most active bankruptcy M&A lawyer in the US 2003-2008; and inducted into the American College of Bankruptcy in 2008.

From 2009 to 2012, Mr. Gilhuly has spoken at Harvard Business, UCLA Business and UCLA Law Schools. In 2010, at the invitation of the French Ministry of Justice, Mr. Gilhuly made a presentation on Chapter 11 in Paris to international insolvency groups. Mr. Gilhuly is a frequent speaker at ABI and similar conferences. Mr. Gilhuly is Chair of Latham's Client Credit Counsel Committee. He received his JD from Harvard Law School in 1990 and his BA from Wesleyan University in 1983.

**David Mordecai, Ph.D. | President, Risk Economics, Inc. and Senior Advisor, Compass Lexecon**

David K.A. Mordecai is President and co-founder of Risk Economics, Inc., a New York City based advisory firm, which specializes in the application of computational economics to the proprietary development and scalable implementation of robust modeling and data analytic frameworks for valuation, strategic and systemic risk analysis, and dynamic asset-liability management.

As Senior Advisor, as well as Member of the Advisory Committee, for Compass Lexecon, David serves as an expert on loss causation and economic damages related to financial institutions governance, and complex issues within securities, derivatives, reinsurance, and commodities markets, as well as market structure within a broad range of sectors.

During his thirty year tenure in the financial services industry, David has served as a Managing Director at Swiss Re, and Senior Advisor to the Head of Swiss Re Financial Services, Managing Director at a multi-strategy hedge fund with $10 Billion of assets under management, Vice President of Financial Engineering/Principal Finance at AIG, and a Director at the rating agency Fitch. David has served as an advisor on systemic risk issues to the Federal Reserve, the IMF, and the CFTC, and as an advisor on hedge fund valuation issues to the International Organization of Securities Commissions (IOSCO). David was the founding Editor-in-Chief of the Journal of Risk Finance, a quarterly peer-reviewed research publication, which addresses topics in financial risk intermediation.

Dr. Mordecai is the principal scientist and lead investigator at the RiskEcon® Lab for Decision Metrics and Visiting Scholar at the Courant Institute for Mathematical Sciences at New York University. He holds a joint appointment as Senior Research Scholar for Computational Economics of Commerce, Law and Geo-Politics at NYU Stern Graduate School of Business. He is also an adjunct professor of applied mathematics at Courant, and a Fellow and member of the Advisory Board of the Mathematical Finance Program at Courant. He holds a Ph.D. with concentrations in Econometrics/Statistics and Economics/Industrial Organization from the University of Chicago and an M.B.A. in Finance from the NYU Stern School of Business.

**Richard Roll | Distinguished Professor, Joel Fried Chair in Applied Finance, UCLA Anderson School of Management**

Richard Roll joined the UCLA faculty in 1976 and currently holds the Joel Fried Chair in Applied Finance at UCLA Anderson. He is also a principal of the consulting firm, Compensation Valuation, Inc. Previously, Professor Roll was on the faculty at Carnegie-Mellon University, The European Institute for Advanced Study of Management in Brussels, and Hautes Etudes Commerciales. In the early 1960's, while at the Boeing Company, he worked on the 727 at and wrote the operating manual for the first stage booster of the Saturn moon rocket. Additionally, during 1985-87, he was a vice-president of Goldman, Sachs & Co., where he founded and directed the mortgage securities research group.

Professor Roll has been a consultant for many corporations, law firms, and government agencies, and has served on several boards. He has published two books and more than 100 articles in peer-reviewed journals. He has won the Graham and Dodd Award for financial writing four times and the Leo Melamed Award for the best financial research by an American business school professor. He is the past president of the American Finance Association and is a fellow of the Econometric Society. He received his Ph.D. from the University of Chicago; his MBA from University of Washington; and his BAE from Auburn University.

**Anil Suri | Managing Director, CIO of Multi-Asset Class Modeled Solutions & Head of Investment Analytics, Merrill Lynch Wealth Management**

Anil leads the development of frameworks and solutions for retirement investing, goals-based wealth management, behavioral finance, asset allocation, systematic portfolio management and performance measurement across traditional, market-linked and alternative investments. Anil has been with Merrill Lynch since 2004, where he was previously Head of Investment Strategy & Analytics in the Alternative Investments area and a Senior Investment Strategist on the Merrill Lynch Research Investment Committee (RIC). Anil's research has been published in the *Journal of Wealth Management* and discussed in *Barron's* and *The Wall Street Journal*. His prior experience includes roles as a senior AI strategist at Citigroup, trader at Credit Suisse and management consultant at McKinsey. Anil earned an M.B.A. with honors from the Wharton School of the University of Pennsylvania, an M.S.E. from Princeton University and a B. Tech. from the Indian Institute of Technology at Delhi.