

# Black Litterman Model

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2018/4/2

# Who is Fischer Black?

- Born: 11 January 1938 in Georgetown, Washington DC, USA
- Died: 30 August 1995 in New York, USA
- Black graduated from Harvard College in 1959 and received a Ph.D. in applied mathematics from Harvard University in 1964
- In early 1994, Black was diagnosed with throat cancer.
- [https://en.wikipedia.org/wiki/Fischer\\_Black](https://en.wikipedia.org/wiki/Fischer_Black)

Nobel Prize laureates left to right:  
Fischer Black, Myron Scholes, and Robert Merton



# His key Contributions

- Fischer Black & Myron Scholes, "The Pricing of Options and Corporate Liabilities", *Journal of Political Economy* (1973).
- F. Black & R. Litterman, "Global Portfolio Optimization", *Financial Analysts Journal* vol. 48, no. 5, pp. 28–43 (1992).
- Fischer Black, "Universal Hedging: Optimizing Currency Risk and Reward in International Equity Portfolios", *Financial Analysts Journal*, Vol. 51, No. 1:161-167(January/February 1995).

# The Pricing of Options and Corporate Liabilities

## **The Pricing of Options and Corporate Liabilities**

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Fischer Black

*University of Chicago*

Myron Scholes

*Massachusetts Institute of Technology*

If options are correctly priced in the market, it should not be possible to make sure profits by creating portfolios of long and short positions in options and their underlying stocks. Using this principle, a theoretical valuation formula for options is derived. Since almost all corporate liabilities can be viewed as combinations of options, the formula and the analysis that led to it are also applicable to corporate liabilities such as common stock, corporate bonds, and warrants. In particular, the formula can be used to derive the discount that should be applied to a corporate bond because of the possibility of default.

# Global Portfolio Optimization

## Global Portfolio Optimization

**Fischer Black** and  
**Robert Litterman**

*Quantitative asset allocation models have not played the important role they should in global portfolio management. A good part of the problem is that such models are difficult to use and tend to result in portfolios that are badly behaved.*

*particular view influences portfolio weights, in accordance with the degree of confidence with which he holds the view.*

Investors with global portfolios of equities and bonds are generally aware that their asset allocation decisions—the proportions of funds they invest in the asset classes of different countries and the degrees of currency hedg-

These unreasonable results stem from two well recognized problems. First, expected returns are very difficult to estimate. Investors typically have knowledgeable views about absolute or relative returns in only a few markets. A standard optimization model, however, requires them to provide expected returns for all assets and currencies. Thus investors must augment their views with a set of auxiliary assumptions, and the historical returns they often use for this purpose provide poor guides to future re-

# Universal Hedging

1985–1994

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## Universal Hedging: Optimizing Currency Risk and Reward in International Equity Portfolios

Fischer Black

In a world where everyone can hedge against changes in the value of real exchange rates (the relative values of domestic and foreign goods), and where no barriers limit international investment, there is a universal constant that gives the optimal hedge ratio—the fraction of your foreign investments you should hedge. The formula for this optimal hedge ratio depends on just three inputs:

- The expected return on the world market portfolio.
- The volatility of the world market portfolio.
- Average exchange rate volatility.

The formula in turn yields three rules:

- Hedge your foreign equities.
- Hedge equities equally for all countries.
- Don't hedge 100 per cent of your foreign equities.

This formula applies to every investor who holds foreign securities. It applies equally to a U.S. investor holding Japanese assets, a Japanese investor holding British assets, and a British investor holding U.S. assets. That's why we call this method "universal hedging."

Because it reduces risk for both sides, currency hedging provides a "free lunch."

### Why Not Hedge All?

If investors in all countries can reduce risk through currency hedging, why shouldn't they hedge 100 per cent of their foreign investments? Why hedge less?

The answer contains our most interesting finding. When they have different consumption baskets, investors in different countries can all add to their expected returns by taking some currency risk in their portfolios.

To see how this can be, imagine an extremely simple case, where the exchange rate between two countries is now 1:1 but will change over the next year to either 2:1 or 1:2 with equal probability. Call the consumption goods in one country "apples" and those in the other "oranges."

Imagine that the world market portfolio contains equal amounts of apples and oranges. To the apple consumer, holding oranges is risky. To the orange consumer, holding apples is risky.

The apple consumer could choose to hold only

# Robert Litterman(born 1951)

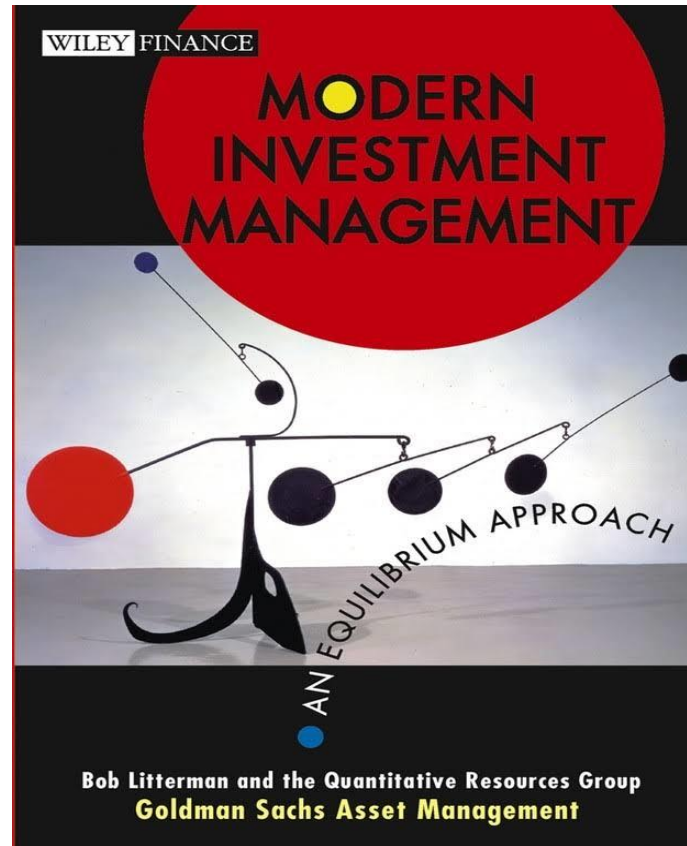
- Founding Partner, Kepos Capital
- ROBERT LITTERMAN is chairman of the Risk Committee and a founding partner of Kepos Capital, a systematic global macro firm. He retired in 2009 from a 23-year career at Goldman, Sachs & Co., where he served in research, risk management, investments and thought leadership roles.
- He co-developed the Black-Litterman Global Asset Allocation Model with the late Fischer Black, and headed the firm-wide risk function and the Quantitative Investment Strategies Group in the Asset Management division.
- Litterman received a Ph.D. in Economics from the University of Minnesota in 1980.



# Robert Litterman




# Modern Investment Management: An Equilibrium Approach(2004)



# The key insights of Black Litterman Model

- Market Equilibrium
- Investor's Views
- Reversed Engineering

Dr. Litterman has done the job !



**Quantitative Investing**

**Ibbotson Asset Allocation Conference**

**Robert Litterman**  
**March, 2008**

The image shows a dark blue rectangular slide with white and orange text. In the top left corner, there is a small white square containing the Goldman Sachs logo and the text 'Asset Management' below it. The main body of the slide features the title 'Quantitative Investing' in large orange font, followed by 'Ibbotson Asset Allocation Conference' in a slightly smaller orange font. At the bottom, the speaker's name 'Robert Litterman' and the date 'March, 2008' are listed in orange font.