Black-Litterman model: Colombian stock market application

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Modern Portfolio theory

Weighted combination of assets.
Diversification is the aim of selecting a collection of investment assets that has collectively lower risk than any individual asset.

Markowitz Model (1950)

Attempts to maximize portfolio expected return for a given amount of portfolio risk.

Assumes that investors are rational and markets are efficient.
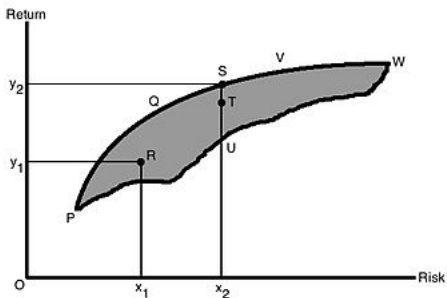
Markowitz Model Problems

- Amount of Required Input Data
- Extreme Portfolio Weights
- Sensitivity of Portfolio Weights

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Black-Litterman Mathematical Model

The aim of the Black-Litterman (BL) model is to assign some specific assets and its weights in a portfolio according to different views. Its final equation is:

$$w = \hat{\Pi}(\delta\Sigma_p)^{-1} \tag{1}$$

However, as Equation 1 shows this model supposes the expected returns and finds the weight of the chosen assets.

# Black-Litterman (1991, 1992) Mathematical Model

Equation 1 is found through reverse optimization of the original equation, which uses the selected portfolio to discover the future returns.

$$\Pi = \delta\Sigma w \tag{2}$$

Notice that Equation 1 operates with estimated values, while Equation 2 does it with the original ones. The returns estimate is obtained by the following equation, which is named the BL Formula

$$\hat{\Pi} = \Pi + \tau\Sigma P^T[(P\tau\Sigma P^T) + \Omega]^{-1}(Q - P\Pi)$$

Black-Litterman Model Steps
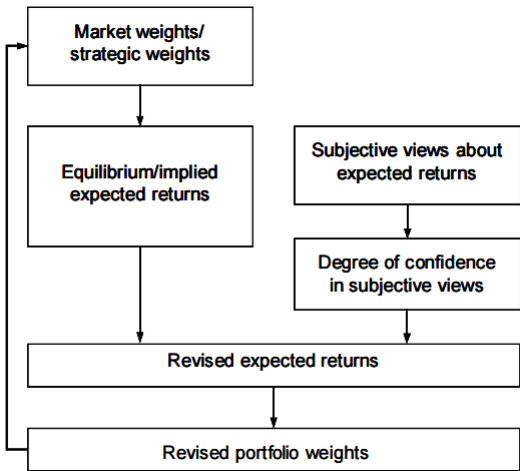
[Drobetz, 2001]

Black-Litterman vs Markowitz

Firstly, the BL model attempts to combine the original Markowitz model with subjective views of analysts. Therefore, the former would be more accurate because it is not only based on the historical data, but also on the experts predictions.

Example

The example shown uses monthly returns in Swiss francs from the Dow Jones STOXX indices for European sectors from June 1993 to November 2000. In some cases, the investor does not know the expected returns for every sector so that this example uses a expected return of 13.93%, which is the value-weighted average annual return over the sample period.

Example
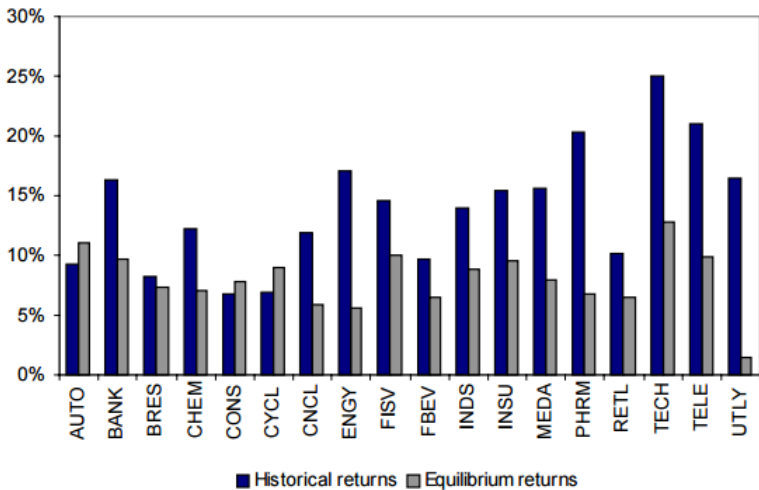
[Drobetz, 2001]

Example
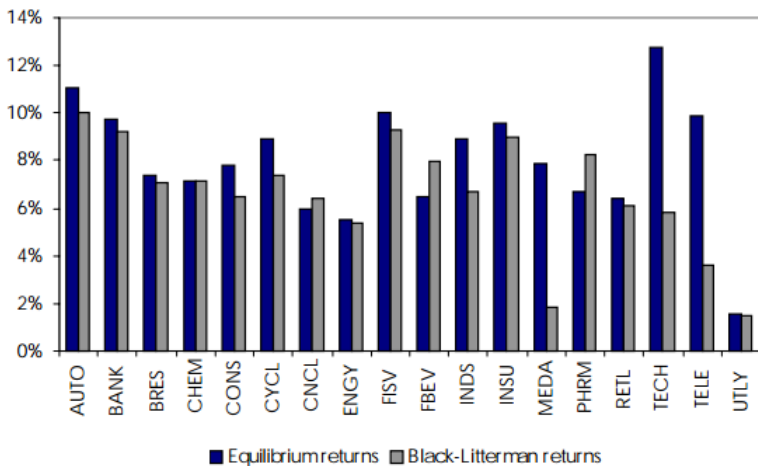
[Drobetz, 2001]

Requirements

- Initial weights according to the Equilibrium Model
- Data from January, 2008 to July, 2015. In-sample and out-sample data to check the validity of the model
- *Opinions* from the analysts taken from Bloomberg database.

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Our Project

The aim of our project is to adapt the BL model to the colombian stock market to create an optimal portfolio and compare its results to the COLCAP Index.
Although there has been some studies about this model on the colombian market, nobody has develop it as we wish to accomplish.

Our Project

Questions?

Work references I

📄 Black, F. and Litterman, R. (1992).
Global portfolio optimization.
Financial Analysts Journal, 48(5):28–43.

📄 Black, F. and Litterman, R. B. (1991).
Asset allocation: combining investor views with market
equilibrium.
The Journal of Fixed Income, 1(2):7–18.

📄 Drobetz, W. (2001).
How to avoid the pitfalls in portfolio optimization? putting the
black-litterman approach at work.
Financial Markets and Portfolio Management, 15(1):59–75.

Work references II

📄 Markowitz, H. (1952).
Portfolio selection.
The journal of finance, 7(1):77–91.