

# Optimal Hedge Ratio and Hedging Effectiveness

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## 1 Github account

<https://github.com/sieunyi/Hedge.git>

## 2 Tentative package name and title

Optimal hedge ratio and its hedging effectiveness (Hedge)

## 3 Short description of context/necessary background

"Hedge" is a package to analyze whether futures are an effective tool for hedging and how effective they are based on the calculated optimal hedge ratio. Investors want to minimize their risk of returns and hedging with futures price is one common way to offset the price volatility due to their high correlation. The optimal hedge ratio is calculated through minimizing the semi-variance of investors' return, a method to derive the downside risk reducing. While the variance measures the volatility of the asset returns, semi-variance only considers the negative fluctuations of the returns neutralizing all values above the mean, or above an investor's target return. After obtaining the optimal hedge ratio, hedging effectiveness is going to be calculated by comparing the two strategies of "Hedging" and "No hedging" for the portfolio.

## 4 Short description of intended functionality

### 4.1 The planned functions will do following process:

- 1) Transform the raw time series data into stationary test their stationarity
- 2) Calculate the objective function of the investors: the returns of the investors who buy one spot and take a short position on one respective commodity futures.
- 3) Obtain the optimal hedge ratio by minimizing the semi variance of the objective function.
- 4) Calculate the hedging effectiveness when hedging by substituting the optimal hedge ratio
- 5) Compare this hedging effectiveness to the portfolio when there is no hedging.

### 4.2 Required inputs:

- 1) Spot price of the product that the investors want to hedge
- 2) Futures price of the respective commodities
- 3) Period of windows that they want to hedge for

### 4.3 Output:

- 1) Optimal hedge ratio over time using semi-variance minimization
- 2) Hedging effectiveness over time (comparison between "Hedging" and "No Hedging" strategy)

## 5 Reference

Hull, J. (2008). Options, futures and other derivatives (7th ed.). Upper Saddle River, NJ: Prentice-Hall.  
Lien, D., Tse, Y. K. (2000). Hedging downside risk with futures contracts. Applied Financial Economics, 10, 163–170.