Jet Oil Cross Hedging Example

Disclaimer
The example provided is purely for illustration and should not be construed in any way as a recommended trading strategy or current market conditions. The reader should verify current contract specifications and other relevant information before using these techniques and products.

Introduction

Cross hedging is used to hedge the derivative contracts on a different asset or commodity than the cash position. Cross hedging is more complicated and riskier than direct hedging due to the higher basis risk. However, when hedgers don't have available hedging instruments exactly corresponding to the hedging item is often.

Cross hedging includes some steps:

1.   To find the right derivative correspondent to the hedged asset

2.   To calculate the optimal hedge ratio

3.   To make a hedging assessment and calculate hedging effectiveness before and after the hedge.

The cross-hedging techniques nowadays are broadly used in currency risk mitigation when using liquid futures contracts to hedge payment or acceptance of another currency. However, one of the most popular cross hedging practices is hedging jet fuel price fluctuation by airline companies. Jet fuel or kerosene fuel constitutes 10-20% of airline costs, and a 5% change in fuel price affects profitability considerably. Jet fuel is a refined product of crude oil, and its price is highly correlated with the prices of crude oil and other refined products. In fig.1, you can see Jet Fuel & Crude oil prices.
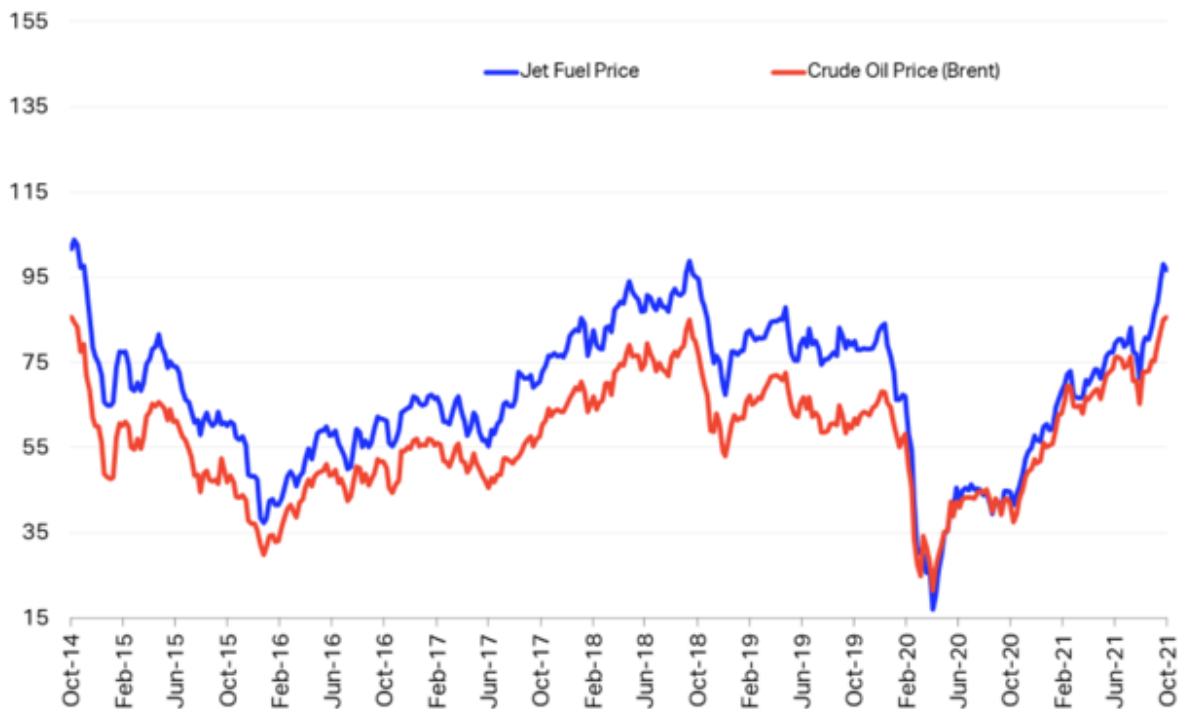

Fig 1. Jet Fuel & Crude Oil Price ($/barrel) Source: Platts, Datastream

First, you can visually see that both commodities are highly correlated, and crude oil and other refined derivatives can be an appropriate solution to cross-hedge aviation kerosene. Second, crude oil and jet fuel prices are highly volatile. Airlines are severely affected by this instability and have to defend against this commodity risk.

The main problem with hedging jet oil is that there are no liquid derivatives contracts on the commodity exchanges in North America or Europe. Airlines use the following hedging approaches and techniques:

- Cross-hedge directly the commodity itself using the futures contract on another basis active. The most popular hedging item for cross hedging is heating oil future contracts.

• To use for cross hedging a basket of commodities highly correlated with jet fuel.

• To use the futures contract on kerosene in Asia markets, Tokyo, for example, is less favorable for North American and European companies due to the jet oil price differences and currency risk exposure.

• The most popular hedging approach widely used by air companies today is to develop an OTC hedging strategy with financial institutions. It may be, for example, forward, option, collar or commodity Swap agreement, etc.

Cross hedge example

An airline is going to hedge purchase of 10,000 metric ton of jet fuel in three months using future contracts.

Qs = 10,000 metric tonnes = 3,302,500 gallons

For this example, the price benchmark is the U.S. Gulf Coast Kerosene (spot) current price (Oct - 29-2021) is 2.33 $ per gallon.

s = $2.33 per gallon

The company can hedge jet oil purchase by using heating oil future contract:

  o *HOG22 (Feb 22) 93 calendar days before expiration.*
  o *The notion for one contract Qf = 42,000 gallons.*
  o *The current price F = $2.4142 per gallon (End-of-Day) price for Oct -29-2021*

The standard deviation of the rate of change in jet fuel prices: $\sigma_{(ROCs30)} = 8.82\%$

The standard deviation of the rate of change in heating oil future prices: $\sigma_{(ROCf30)} = 7.84\%$

The correlation is $(\rho_{s/f}) = 0.98644$ (high positive correlation between jet oil and heating oil future prices)

$\beta sf = (\rho_{s/f}) * (\sigma_{(ROCs30)}) / \sigma_{(ROCf30)}) = 1.11$

The optimal hedge ratio calculation:

*Hedge ratio = βsf * (s/f) = 1.071*

The optimal number of heating oil futures (HOG22) for hedge 10,000 metric ton of jet fuel:

*N = βsf * {(Qs *s)/ (Qf *f)} = 1.071*{(3,302,500*2.33)/ (42,000 *2.4142)} = 84.21 ≈84 futures*

Note: An example was used U.S. Gulf Coast Kerosene, but in current practices, the airline can use another jet fuel type, which is less correlated with NYMEX Heating Oil future and weaker basis.

Pay attention that all calculations have been done according to historical prices. We try to appreciate and predict the results of the hedge according to math calculation. However, future price fluctuations, standard deviations, correlation, hedge ratios may change. Also, it should be taken into account that we do not use the identical underline active for hedging, making additional difficulties with basis estimation.

Partially the uncertainty may be mitigated by using the basket of goods strongly correlated with jet fuel prices.

An example of this basket can be used for cross-hedging:

Commodity	Coefficient of correlation (ρ), 3 months
Brent Crude Oil (London Petroleum Exchange, LME) or Intercontinental Exchange (ICE)	0.948
Light Sweet Crude Oil WTI (NYMEX)	0.923
Heating Oil (NYMEX)	0.987
Unleaded regular gas (NYMEX)	0.971
Liquid Propane Gas (NYMEX)	0.884