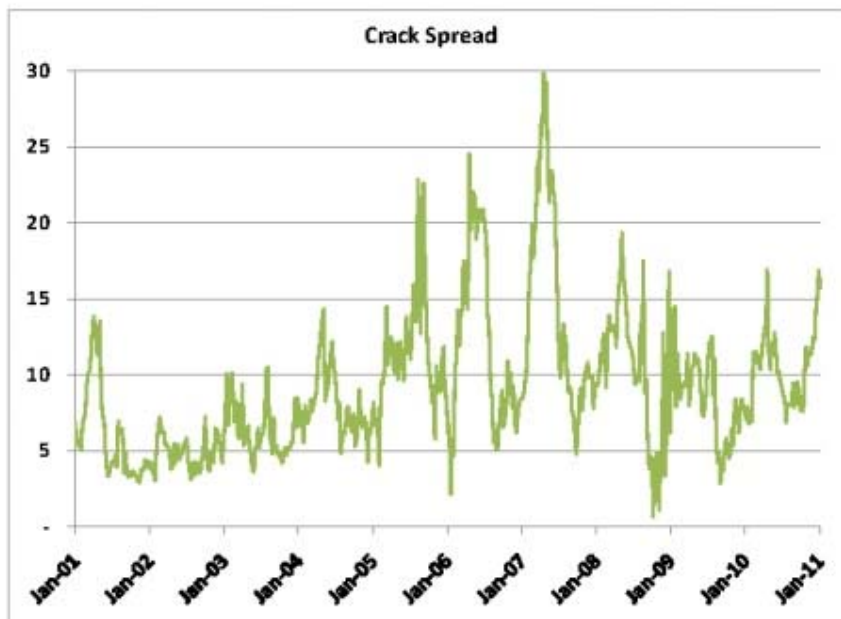


## Jet Fuel and Basis Risk<sup>1</sup>

Many airlines attempt to hedge some portion of the future cost of jet fuel. In large part, they do this by purchasing futures contracts on crude oil, the feedstock for producing jet fuel, or on heating oil, a refined product that is slightly different from jet fuel. The prices of the three commodities are correlated, but only imperfectly. In the long run, if the price of crude oil goes up significantly, the price of the refined products must also go up. But in the short run, the relationship is erratic as the following chart shows:



The spread graphed is the difference between the price of the refined products produced from a barrel of oil and the price of the barrel of oil. The chart shows the most widely quoted version of the crack spread, the 3:2:1 spread—i.e., 3 barrels of crude oil yields 2 barrels of gasoline and 1 barrel of heating oil. Clearly this spread swings significantly through time.

This is a classic case of basis risk, which is just the volatility in the differential between two related commodities or between one commodity for delivery at different locations or on different delivery dates. Basis risk undermines the effectiveness of hedging. Airlines that used crude oil futures to hedge their jet fuel prices are finding that the hedges can lose money at the very same time that jet

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<sup>1</sup> This note is adapted from J.E. Parsons and A.S. Mello, "The Perils of Hedging the Price of Jet Fuel," <http://bettingthebusiness.com/2011/02/03/the-perils-of-hedging-the-price-of-jet-fuel/>

fuel prices are going up. This is exacerbating the cash flow volatility that the hedge is designed to reduce.

Basis risk is a familiar fact of life. If you know that a hedge involves basis risk, the right strategy involves a smaller hedge ratio. For example, suppose that in the absence of basis risk the optimal hedge ratio would be to buy forward 75% of next year's fuel purchases. Then, in the presence of basis risk, the correct strategy is to buy forward a smaller proportion, 40% say, of next year's fuel purchases. Of course, reducing the size of the hedge limits the amount by which the hedge will reduce the volatility of the company's cash flows. But that reduction in effectiveness is just a reflection of the reality that the perfect hedge is not available. So achieving a deeper reduction in volatility is just not possible.

Why hedge using crude oil contracts? Why not hedge using the real thing, jet fuel contracts? If jet fuel contracts were available at the same 'cost' as crude oil contracts, then clearly this would be a better alternative. Some airlines, such as Delta and JetBlue, do include jet fuel contracts as a part of their hedging strategy. The problem is that the jet fuel market is smaller than the crude oil market, and constructing a financial contract indexed to the jet fuel price is 'costlier' than constructing a financial contract indexed to crude oil. Cost in this case is the real expense incurred by financial institutions who manufacture the financial product—including any profit they can extract. It is built into the bid-ask spread on the future, which itself may be volatile. When airlines choose the mix of contracts that make up their hedging strategy, they have to factor in the 'cost' paid for each type of contract and find the cheapest mix. They then have to weigh the total 'cost' of hedging against the benefits in order to arrive at their chosen hedge ratio.