Making bets with other people's money

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It looks like once again, investing in commodities is in the news. Let me relate my encounters with commodity traders.

First, let me give an example of hedging commodity risk. Suppose you are running a big petrochemical plant, which uses natural gas as feedstock. A big risk is the cost of natural gas. If you want to hedge your exposure to an increase in the cost of gas, you can buy a call option on gas. A call option gives you the right, but not the obligation, to buy gas (from the option seller) at some fixed strike price K, at some time T in the future. Suppose S is the spot price of gas at time T.

At time T, then one of two things happen

- $S > K$: you exercise the option, and get gas for price K
- $S < K$: you let the option expire, and buy gas on the spot market[1]

Effectively, you have put a ceiling of K on the price you will pay for gas.

Of course, you have to pay a fee for this insurance. Many times the call option will expire out of the money (i.e. $S < K$), but that's OK, you often expect to lose when you buy insurance (think of your house insurance).[2]

Many companies use options to hedge the risk of energy commodities (e.g. natural gas, oil, electricity). Of course the option seller does not want to assume the pure risk of providing this insurance. A standard method for hedging the risk of a short position[3] in an option is to use *delta hedging*, which we teach in third year undergraduate courses. Essentially, you construct a hedging portfolio which consists of an offsetting amount of the underlying asset and an amount in a risk-free bank account. The hedging portfolio moves in the opposite direction to the value of the short option position, and requires frequent rebalancing. The trick is to do this in the cheapest way possible. The initial cost of setting up this hedging portfolio is the premium charged for this insurance.

The standard model that is used in undergraduate courses assumes that assets follow a random, but well behaved, process[4]. This model is not too bad for stocks, but is very poor for modelling energy commodities (natural gas, electricity, oil). These commodities often show sudden spikes in prices, which are at odds with a simple random process. A better model is based on a jump

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[1] Why pay $K > S$ for gas, when you can buy it for S?

[2] I always think it is hilarious when you hear financial commentators state that "company XYZ lost money on its hedging program last quarter", which is like telling a homeowner that they lost money on their house insurance last year, since their house did not burn down.

[3] A short position means you have sold the option contract. A long position means you have bought the contract.

[4] Returns are random, but prices move a small amount in small periods of time.

diffusion process, i.e. most of the time, the prices follow a well behaved random process, but every now and then, the price jumps (either up or down).

So, how do you hedge a call option on an underlying asset which has jumps? In 2006, my colleagues and I figured out a way to use a hedging portfolio which consisted of a number of short term option contracts, which we would use to hedge a long term contract.[5] Our simulation studies showed that this reduced the risk substantially, compared to simple delta hedging.

I presented a paper on this topic at a conference in Calgary, in the summer of 2006. During the question period after the talk, a well-dressed guy in a suit gave me a hard time[6]

"Your hedging strategy is too complicated. No practitioner would be interested in this."

Many years of experience dealing with industry guys taught me not to get into an argument here. I nodded politely and went off to lunch.

At lunch, I sat down next to a gas trader. He seemed quite interested in my talk. After lunch, he invited me up to see his trading floor. He said that they were very cognizant of jump risk in the gas market. He then showed me how he hedged jump risk. It turned out that what he was doing was an approximation of the method I described in my talk. I was very happy about this: my theoretical method was actually being used (approximately) every day by this guy. We congratulated ourselves for being so clever.

I then pointed out that he obviously did not think it was too complicated to (at least approximately) hedge jump risk. Clearly, this was at odds with the comments from the guy in the suit at my talk. My new trader friend replied

"You don't know him? That was Brian Hunter."

Hunter was the head gas trader for Amaranth Advisors (a hedge fund). In 2005, his trades netted Amaranth $1 billion. He received a $100 million bonus[7]

Now we come to the interesting part of the story. Four months after my Calgary talk, Hunter's trades lost $6 billion.[8] Amaranth folded. [9] After many lawsuits, Hunter eventually settled with the Commodity Futures Trading Commission in 2014, for a penalty of $750,000. As pointed out in the press, the penalty was less than the value of Hunter's car collection, which included a Ferrari F430 Spider and a Bentley Arnage.[10]

So what's the takeaway message here? In spite of their name, most hedge funds don't actually hedge.[11]

A standard strategy is to ignore the jump risk, i.e. low probability events that have a big impact. Then, using simple delta hedging will show abnormal returns for several years. During this time, large bonuses are paid. Eventually, the jumps happen, and the trade blows up.

[5] "Calibration and hedging under jump diffusion," Review of Derivatives Research, Volume 9, Issue 1 (2006) 1-35.

[6] In Calgary, at the time, it was usually easy to identify people's occupations by their attire. Engineers wore ties, geologists dressed like graduate students, and quants wore *business casual*. This guy had a nice suit but no tie. So, I couldn't place him.

[7] For some entertainment, use a search engine with the key words *Amaranth, Brian Hunter.*

[8] "Betting on the Weather and Taking an Ice Cold Bath," New York Times, September 29, 2006, `https://www.nytimes.com/2006/09/29/business/29insider.html`.

[9] "The Trader Who Went to Lunch and Never Came Back," Globe and Mail, July 27, 2007. `https://www.theglobeandmail.com/report-on-business/the-trader-who-went-to-lunch-and-never-came-back/article4095362/`

[10] "The Rogue Trader Who Got Away With It,", Newsweek, September 17, 2014. `https://www.newsweek.com/rogue-trader-who-got-away-it-271105`

[11] Actually, this is not entirely true. Hedge fund traders would often joke about the *Rio* hedge. This was a one way ticket to Rio de Janeiro, which you kept stashed in your desk, to be used if your trades *blew up*. It is very hard to extradite someone from Brazil.

This is an example of what is known as an asymmetric payoff. Also known as *heads I win, tails you lose*. I make big bets with your money, and if the bet pays off, I collect a handsome bonus. If the bet turns out bad, well, its not my money.

Investing in commodity hedge funds often exposes you to hidden tail risks. This tail risk is actually beneficial for short term traders. If you must invest in a commodity hedge fund, how are you managing the tail risk? Can you even identify the tail risk? This sort of thing is a minefield for long term investors.