

# Commodity Futures

February 27, 2014

## Introduction

Commodities are primarily traded in futures markets. These are an agreement now to pay a particular price for a particular commodity at some set date in the future. These markets are mostly exchange traded and are therefore the quantities to be supplied and the dates at which this will be done are standardised. Standardisation makes the contract more widely applicable and increases liquidity. The difference between the underlying risk that is to be hedge by these contracts and the futures is called the *basis risk*.

The futures market is divided into two types of activity: hedging and speculation. The hedgers aim to reduce risk by locking in the price that they will buy or sell the commodity in the future. For example, the oil hedgers will be oil companies, airline companies and other producers and users of oil and related products. The speculators taking a position in the market because they believe that they can make a profit from price movement. Keynes and Hicks argued that futures prices would tend to trade at a discount to the spot price because speculators would require some payment for taking risk from the hedgers.

The US Commodity and Futures Trading Commission (CFTC), a regulatory body, requires that all participants in the futures market categorise themselves as *commercial* with some underlying business interest in the

## Pricing futures contracts

The price of a futures contract should be equal to the cost of buying the commodity now and storing it until the delivery date. For a financial security where the only cost is the cost of finance, the  $F(t, T)$  futures price for time  $T$ , valued at  $t$ , where  $t < T$  is equal to,

$$F(t, T) = S(t) \times (1 + r)^{(T-t)}$$

or, in continuous time,

$$F(t, T) = S(t)e^{r(T-t)}$$

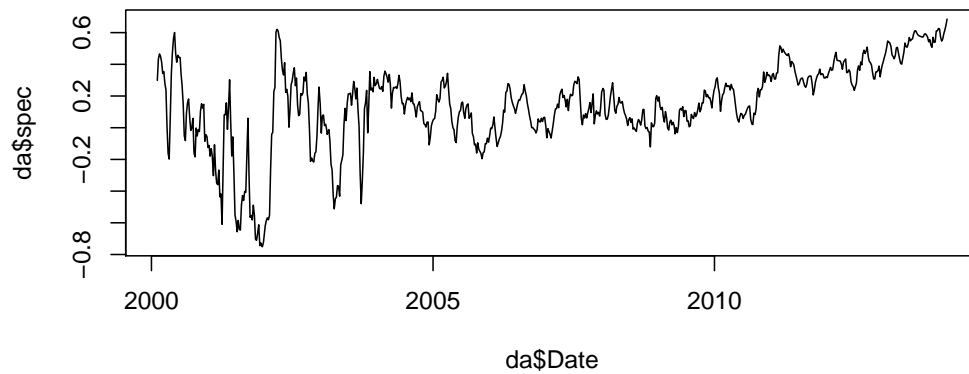
For other futures, storage costs, income in the form of dividends and coupons and any other benefits that accrue from the holding of the commodity. This may be particularly important if there are large storage costs involved for commodity.

```
require(xts)

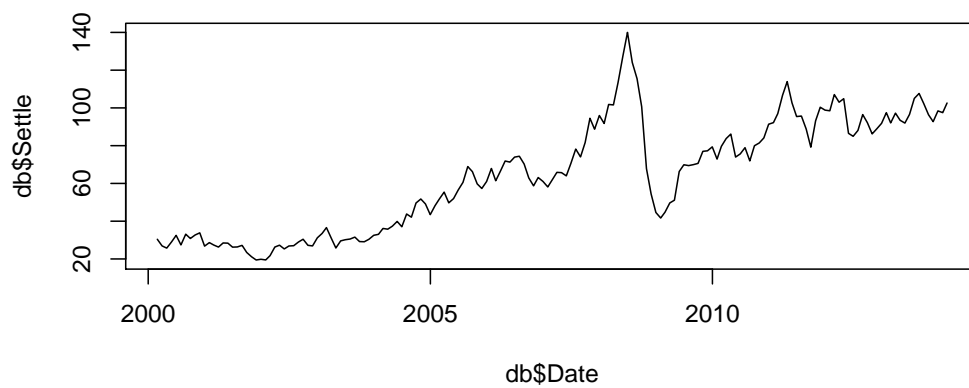
## Loading required package: xts
## Warning: package 'xts' was built under R version 3.0.2
## Loading required package: zoo
##
## Attaching package: 'zoo'
## The following object is masked from 'package:base':
##
##      as.Date, as.Date.numeric

da <- read.csv("http://www.quandl.com/api/v1/datasets/CFTC/CL_F_L_ALL.csv?&trim_
  colClasses = c(Dates = "Date"))
db <- read.csv("http://www.quandl.com/api/v1/datasets/OFDP/FUTURE_CL1.csv?&auth_
  colClasses = c(Date = "Date"))
da$spec <- (da[, 3] - da[, 4])/(da[, 3] + da[, 4])
da$hedge <- da[, 6] - da[, 7]
par(mfrow = c(2, 1))
plot(da$spec ~ da$Date, type = "l", main = "Oil price and Speculative Positions")
plot(db$Settle ~ db$Date, type = "l", main = "Oil and ")
```

### Oil price and Speculative Positions



### Oil and



```
head(db)
```

| ##   | Date       | Open   | High   | Low    | Settle | Volume | Open.Interest |
|------|------------|--------|--------|--------|--------|--------|---------------|
| ## 1 | 2014-02-28 | 102.04 | 102.90 | 101.58 | 102.59 | 196518 | 320864        |
| ## 2 | 2014-01-31 | 97.97  | 98.39  | 97.10  | 97.49  | 268687 | 314926        |
| ## 3 | 2013-12-31 | 99.25  | 99.39  | 98.15  | 98.42  | 127689 | 267603        |
| ## 4 | 2013-11-30 | 92.33  | 93.90  | 92.06  | 92.72  | 159719 | 341643        |
| ## 5 | 2013-10-31 | 96.62  | 97.03  | 96.03  | 96.38  | 267311 | 354643        |
| ## 6 | 2013-09-30 | 102.46 | 102.76 | 101.05 | 102.33 | 242415 | 314427        |

Delivery...

Supply and Demand

Trade the spread