Futures Contracts

CFRM 522

Introduction to Trading Systems (007b)

- Greyserman & Kaminski, <u>Trend Following with Managed Futures</u>, Ch 2

- Clenow, <u>Following the Trend</u>, Ch 2

- Both are in our course bibliography

- Both are available online from the UW library

- Both are **<u>reading assignments</u>**

A Forward Contract

- An agreement between two counterparties (the buyer and the seller)…

- …to exchange a certain good or commodity (the underlying) for a determined price (the forward price)…

- …agreed on at the beginning of the contract (agreement time)…
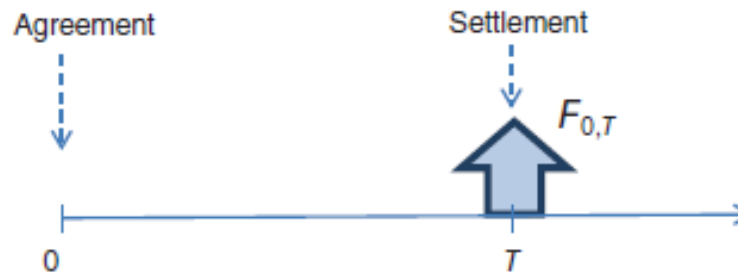
- …and delivered at maturity (at settlement).

FIGURE 2.1 A schematic of the cash flows for a forward contract.

G & K, p 28

- Counterparty Risk:
    - One of the counterparties defaults on the obligation
    - The other counterparty will be forced to take delivery or sell on the spot market, most likely, at unfavorable prices

- Liquidity Risk:
    - Example from book (G & K): 3-month forward for 10,000 bushels of particular type of corn
    - After one month the distributor (purchaser) decides to stop creating a product (eg corn flakes) that includes this particular type of corn
    - The distributor will need to find a way to get out of the contract or find another party who may take over the contract if possible
    - Distributor could simply take delivery of corn but would then depend on reselling the corn on the spot market at delivery
    - Bilateral forward contracts, especially those with nonstandard terms, may be very illiquid.

- Chicago Board of Trade (CBOT)
  - Opened in 1848
  - Farmers came to trade goods and to ensure the future value of their goods

- Futures Contracts
  - Designed to alleviate the core issues of traditional forward contracts:
    - ➢ counterparty risks
    - ➢ illiquidity
  - A forward-like contract with a value that depends on the future value of a good or commodity (the underlying)
  - Futures contracts are standardized, transferable, and exchange traded
  - the current contract value is contingent on the future value of the specific underlying asset

- Futures contract holders take a position (_long or short_) in a specified amount of underlying with a specific delivery or maturity

- All participants must maintain a margin account
  - All positions are marked to market at the end of each trading day

  - Margin requirements may be increased for daily losses

  - Margin requirements may be reduced for daily gains

  - Prevents defaults

  - Allows prices to follow the current market prices for future delivery
    - In contrast to forward agreements that can be difficult to price daily
    - The futures price will slowly converge to the spot price as maturity approaches

- The current futures price is the price today for delivery of the underlying asset at a prespecified date in the future

I'LL GLADLY PAY YOU TUESDAY FOR A HAMBURGER TODAY.

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- The no-arbitrage valuation as seen at time 0 of a forward deal on some underlying asset is

$$F(T) = S_0 \, e^{rT}$$

where $F(T)$ is the value of the asset at time T, S_0 is the spot price of the asset (time 0), and r is the risk free rate over $[0, T]$.

- The no-arbitrage argument is an ideal theoretical result

- Other factors can influence a futures contract price:

  - Hedge premiums

  - Cost of Carry

- Futures markets participants:
  - Hedgers
  - Speculators

- Example: Southwest Airlines
  - Hedges fuel costs in the future by locking in prices now
  - Willing to pay a premium for this "insurance"
  - Speculators will sell in exchange for this premium
 - As more speculators enter the market, the premium will decrease

- Most futures contracts will be closed out or rolled over prior to expiration

- As a result, delivery is rarely taken

- However, the cost of carry, or in particular cost of storage for commodities, must still be reflected in the price

- As noted in Clenow, natural gas storage is extremely expensive

- The shape of the curve you get if you plot the price of each successive delivery month in a graph (as of today)

- The price of an asset to be delivered in one month is generally quite different from the price of the same asset to be delivered in six months

- Term structure of heating oil (Fig 2.3):
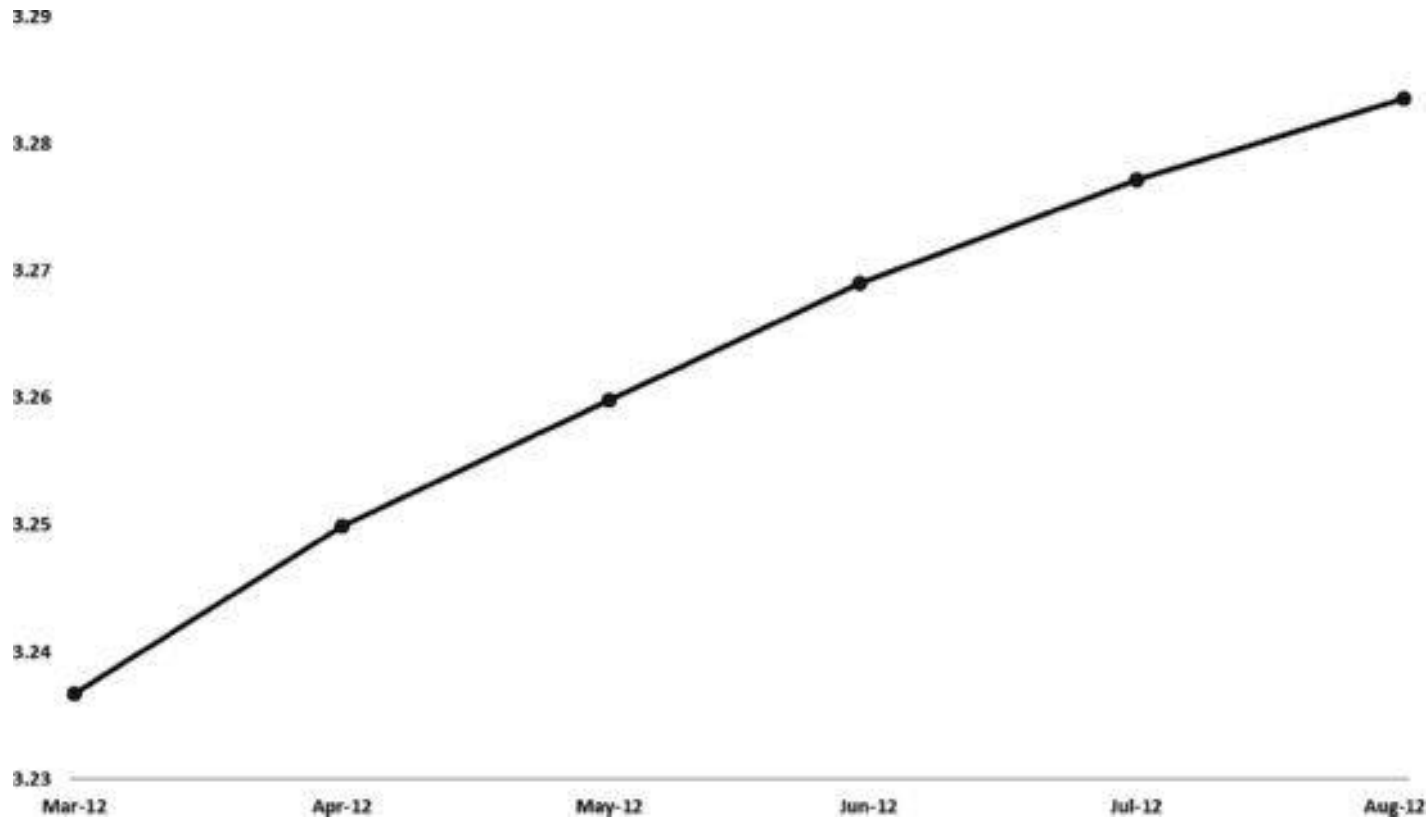
- A term structure chart that slopes upwards such as this one is said to be _in contango_

- Upward direction of prices can be attributed to:
  - Cost of Carry/Storage Costs (namely commodities)
  - Hedge premiums
  - Interest rates (main effect for financial futures – no storage costs)

- In some instances, the term structure can take on a downward slope and such a situation is called _backwardation_
  - Seasonal effects
  - Interest rate conditions (eg inverted yield curve)
  - Unusual storage cost situations

- In addition, a term structure can exhibit both contango and backwardation

Queen, 1976

- When backtesting trading strategies using futures, we will need historical price data

- However, futures contracts are of limited lifespans (intervals of months), and price anomalies can occur close to expiration

- The current price of two contracts with the same underlying but different months will always be different

- This is reflected in the term structure of futures prices

- Usually, the price of a later contract will be higher than an earlier contract (a contango situation)

- Primarily related to hedging and carry costs

- Referred to as a *basis gap*

- We require a consistent roll method that will result in meaningful time series data
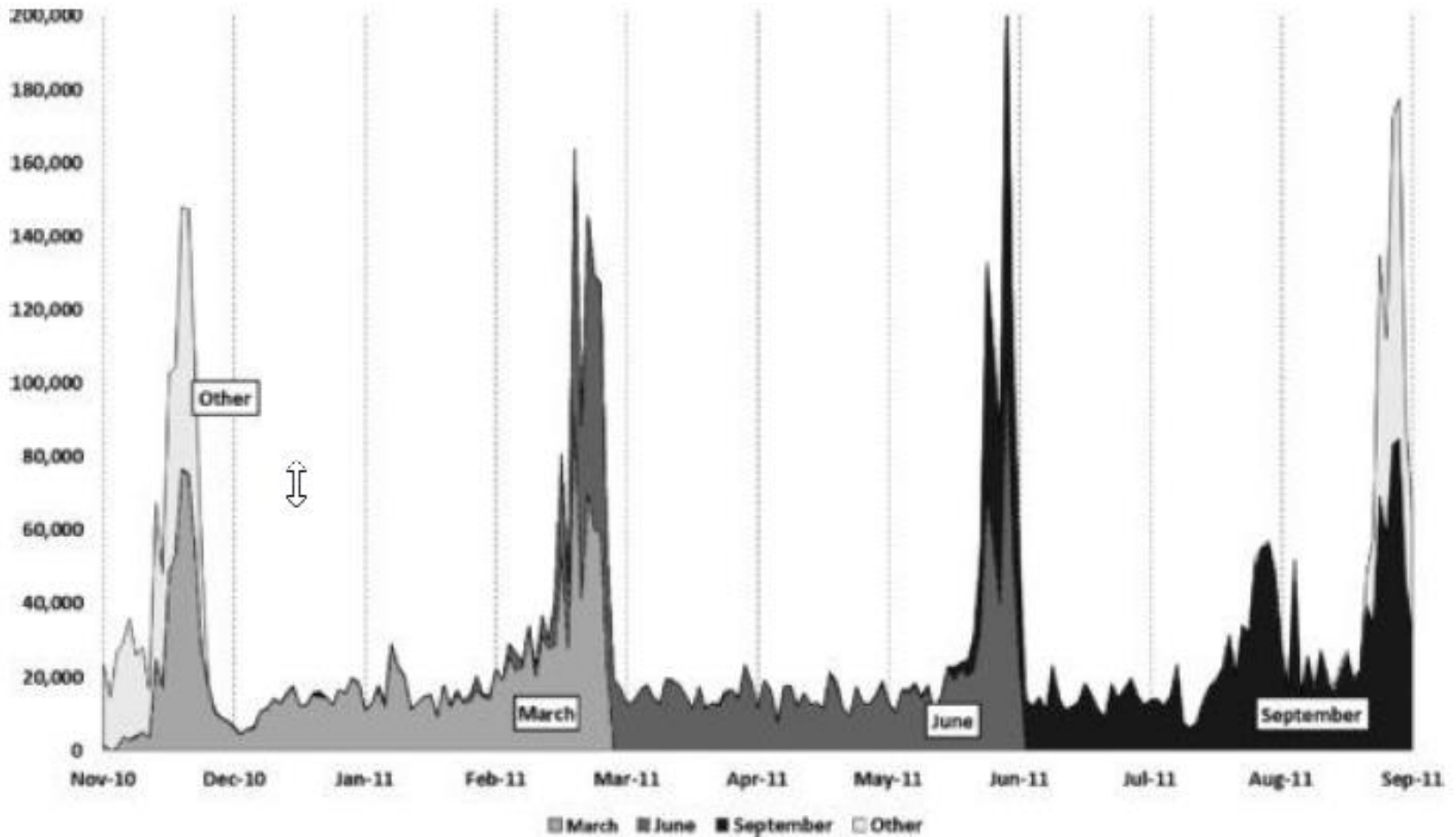
- Month to month open interest (p 24, Clenow):

Figure 2.1 Open interest moving from month to month
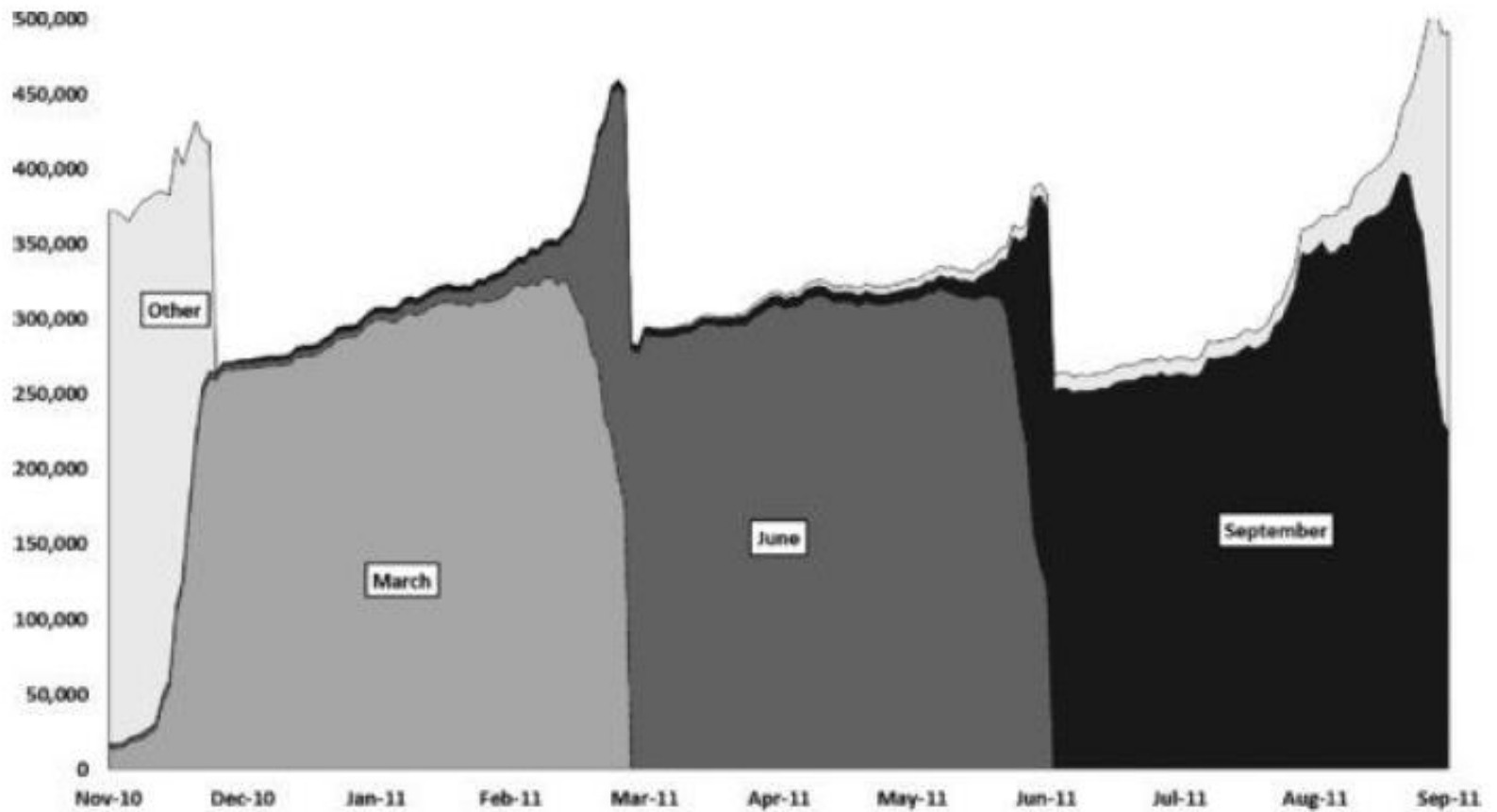
- Volume spiking at rollover times (p 25, Clenow)

- Common rolling methods:
  - Use the volume, the open interest (total number of contracts held at the end of the trading day) or both in combination and then roll when a new contract has higher open interest and/or volume.
  - Require a couple of consecutive days or higher values before rolling
  - Roll on the first day one contract exceeds another

- In the end, this does not make a huge difference as long as you make sure you stay with a highly liquid contract and are aware of how and when to roll

- Interactive Brokers provides data as a "continuous contract", which we will use; for more information:
  - https://www.interactivebrokers.com/en/software/tws/usersguidebook/technicalanalytics/continuous.htm#To_chart_the_continuous_future_in_a_chart
  - http://www.quintuitive.com/2015/06/30/interactive-brokers-now-supports-continous-futures/

- Example (from IB URL on previous slide): To generate a normalized historical data series for the above sequence, call CL MAY'15 as Contract A and CL APR'15 as Contract B. Then follow the steps below:

    1. Take the closing price of Contract B and Contract A on 20150317.

    2. Calculate the ratio of *closingPrice*(Contract A)/*closingPrice*(Contract B).

    3. Multiply all Contract B data for 20150317 and all prior dates by this ratio. This results in the adjusted time series of Contract B having the SAME closing price on 20150317 as Contract A.

    4. Repeat for prior months.

- QuantConnect

    - Has intraday futures data going back to 2007 (only available within a logged in session; cannot download)

    - Has normalizing functions available to construct continuous contract data series

- Agricultural Commodities
  - Azuki red beans (Tokyo TGE), Lumber (Chicago CME), Soybeans (CBOT)
  - Internal correlation between these different markets is not particularly high
  - Highly driven by adverse weather in an important production region, crop results, inventory reports etc
  - Seasonality is also a factor to consider: effects on supply/demand

- Non-agricultural commodities
  - Crude oil, heating oil, natural gas, copper, silver
  - Fuel-related contracts:
    - High contango (particularly natural gas)
    - Seasonality
    - Typically traders are not concerned with dealing the actual physical commodity, but the hedging method is still theoretically valid for pricing

- Non-agricultural commodities (cont'd)
  - Metals:
    - ➢ Silver has a fairly high correlation to gold, but has more industrial use and in many respects different drivers of performance

- Currencies
  - Crosses against the USD
  - A growing number of non-USD crosses, such as the Euro/Yen future

- Equity Indices
  - SP500, Nasdaq 100, FTSE 100, Nikkei 225

  - Largest futures sector in terms of number of available instruments and the easiest for most people to relate to.

  - Buying a basket of stocks in a well-defined market is a very straightforward concept

  - The percentage moves of the underlying indices are published daily on news websites, TV screens, and in newspapers

  - The interest rate is the main driver of the term structure shape because there is no physical storage required for hedging

  - Single stock futures are not very helpful in diversified futures strategies

- Interest Rates
  - Range from 30-day loans to 30+ year bonds
  - Often used to fill in rates in term structures beyond 1-year LIBOR
  - Fairly low level of volatility
  - However, the longer durations always have a greater volatility than the shorter ones

- Swap Futures (aka Futurized Swaps)
  - New exchange-traded variants of swap contracts, meant to mimic swaps
  - More liquidity than OTC, and practically eliminates counterparty risk
  - In response to new regulations in the US and Europe post-2008(Aldridge)
  - Swap rates also can fill in rates in term structures beyond 1-year LIBOR

- Delivery codes (months):

Month	Code
January	F
February	G
March	H
April	J
May	K
June	M
July	N
August	Q
September	U
October	V
November	X
December	Z

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Andreas Clenow – Following the Trend

- Year: A single digit denotes delivery year and the assumption is that it is the either the current or next possible matching year (depending on the month – eg
  - October 2021 -> year = 1 (this year)
  - February 2021 -> year = 2 (next year)

- The full code is the combination of the ticker, month, and year

- Comex Gold with delivery month June 2012 would usually be designated GCM2: GC (ticker) + M (June) + 2 (2012)

- We will get more practice with this, using IB futures data

- *Managed Futures* is the topic of both the G & K and Clenow books

- Traders/managers in this field are often referred to as

  - Commodity Trading Advisors (CTAs)

  - Trend followers

  - Managed futures traders

- Manage diversified portfolios of futures

- The focus of our own strategies in this course will mostly be single-asset cases, but it is worth reading the material in these two texts about managed futures

- You might work for such a firm one day…

- There are also options on futures

[END]