**Trade types**

An immediate or cancel is a trade that is either fully OR partly filled immediately then cancelled

A fill or kill is a trade that is FULLY filled or cancelled

An OCO (one cancels the other) is used for whe nmaking 2 markets in assets that are very alike so to avoid exposure (since you ppl take one side of the bet in shocks like ask or bid). So if my ask gets filled in one market the other ask is cancelled in the other market.

**Trading mechanics**

The fucking traders must write each trade they made if it's not electronic trading (so over the phone, you gotta).

We calculate a theoretical value for an option and disseminate (send out) a bid below that value and an offer The edge we collect, the difference between our theoretical value (theo) and the price we bought/sold collecting this spread (“edge”)

Traders learn to be precise and accurate with their words as any confusion can cause unintended consequences.

Over the Counter (OTC) trades happen ‘off-floor’ and are transacted directly from one party to another. The first party will call the other and ask for a contract with non-standard specifications. The parties agree to the price and specifications (expiry date, strike, multiplier, etc.) and trade directly with one another. The big difference between these markets and exchange listed contracts is that OTC trades have significantly more counterparty risk because there is nothing ensuring that the firm you are trading against will honor their side of the contract or has the funds to back the deal if it goes bad.

*Exchanges:*

NYMEX: energy (oil, gas)

ICE: Main products are Brent & WTI Oil

**Forward vs Future**

A forward is an agreement to supply X at price Y (both parties know what happens on the agreed day, so there is no volatility for BOTH). Basically, it is a future, but on the OTC.

Forwards: Private (OTC), customizable (non-standardised), less regulated, higher counterparty risk, settlement by delivery or cash, fixed price.

Futures: Exchange-traded, standardized, highly regulated, lower counterparty risk, marked-to-market daily, prices fluctuate.

The FORWARD IS:

(time value of money, smart discounting) where S = spot, r = interest rate, t = years, F = forward

**Order book**

Bid offset - So if the spread is large enough around the theo of either call or put then you trade options (not specific here) through an algorithmic trading strategy.

Quote bid offset – spread required to quote the options

**Multipliers:**

This formula right here comes with experience like it becomes natural:

**Profit or Loss (P&L) = points (tick/increment edge) *x* quantity (contracts traded) *x* multiplier**

**IMPORTANT**

So the multiplier on oil futures is 1000 (barrels)

Typically, the multiplier on options is 1 future (but it may not be though)

For oil futures contracts, such as those for West Texas Intermediate (WTI) crude oil, which are traded on the New York Mercantile Exchange (NYMEX), the tick size is specified by the exchange. As of my knowledge cutoff date in 2023, the tick size for WTI crude oil futures is:

Tick Size: $0.01 per barrel

Since a standard WTI crude oil futures contract represents 1,000 barrels of oil, each tick movement (i.e., a price change of $0.01 per barrel) equates to a monetary value of:

Monetary Value of One Tick: $0.01 per barrel x 1,000 barrels = $10

***This means that for each tick movement in the price of a WTI crude oil futures contract, the value of the contract changes by $10.***

***So if WTI goes up by $1, then the future contract goes up by $1000***

So it aint like u made 1 dolla, nah you made 1000 dolla.

It's important to note that different oil contracts (such as Brent crude oil) or different exchanges might have varying tick sizes.

1.4

So if underlying price is below the strike the call option is OTM. If it’s equla to the strike then it’s ATM and above the strike it is ITM. ITM doesn’t maen you make money by excercising the option cause the cost of buying the option is overlooked in this OTM ATM ITM labelling.

**The long call spread is buying the lower strike call and selling the higher strike call.** The short is the flipside. And you know how the diagram moves if you have a cost involved. Then you can ez calcualte everything from breakeven point to max loss.

**The long put spread is you sell the lower strike put and you buy the higher strike put.** The short is the flipside.



***So remember that you buy the low strike call and you sell the low strike put.***

***Bro the X axis is the underlying price***

***The spot price is the current underlying price***

Option value= Intrinsic value +Extrinsic value

Intrinsic value (call) = max (0, underlying price – K)

Intrinsic value (call) = max (0, K – underlying price)

**C-P = Current underlying price (S) – PV(K)**

The P-C-P spits the value of one option provided u got the other option’s value (live theo).

***The toughest part, in my mind, is to clear your positions once you exploit an arbitrage. Say you went long synthetic future and short regular future for the arbitrage identified. That will only bank the arbitrage but won’t automatically clear your position. If you close them, you pay hella fees. So the best would be if you could essentially make some other trades that would take the opposite side of your current positions built so that you return to net 0 positions in any asset AND that are stand-alone, meaning the trades have nothing to do with the previous arbitrage, they just look to make you some profit by either market making or another arbitrage opportunity and MIRIFICALLY happen to offset your current positions (so to bring you back to no positions at all).***

The theo of a spread call/put is derivred fro mthe theos of the options. If there is a mismatch you trade it. Now they said to bank the edge you close the position.

**BULL/BUY (same diagram for both => so should have similar payoffs => could be arbitrage)**

call spread (buy low K call)

put spread (buy low K put)

**BEAR/SELL (same diagram for both => so should have similar payoffs => could be arbitrage)**

call spread (buy high K call)

put spread (buy high K put)

Whenever you want to polt diagrams if you work with calls please start from left to right. If you work with puts please start right to left.

***STRAGLE = BUY PUT (AT LOW STRIKE) BUY CALL (AT HIGH STRIKE)***

***STRADDLE = BUY PUT AND CALL AT THE SAME STRIKE***

Then you have ratio spreads say 1x2. Say you BUY (BULL) a 1x2 call spread, means you buy 1 low K call and sell 2 high K calls.

You calculate the price at which u can get the spread off the market (bid, ask) and you calculate the theo of the spread. As long as there is edge you get in the trade.

**REVERSALS/CONVERSIONS (THE SYNTHETIC FUTURE)**

**A white board with a drawing on it

Description automatically generated**

**For the same strike: Call delta + |Put delta| = 1**

**This is also kinda enforcing that you can see delta as the probability of the option finishing ITM cause either the put or call will or they both finish ATM.**

If the underlying goes from 100 to 101 and the delta was 0.3 on the call (daaa) and the call was worth $1 then the price of the call moved to $1 + delta \* change in the underlying = 1+ 0.3 \*1= $1.3.

I mean delta = change in option/change in underlying => ***change in option = delta \* change in underlying***

And like you can have minus chane in underlying and minus delta (in case of put). IDK why the guy from the book only looked at positive and it ckinda helped me understand why call delta is positive and put delat is negative BUT on paper whrn u calculate you can have negative change in the underlying.

**TO HEDGE USING DELTA**

If u buy calls you then must sell the underlying to hedge. You need to sell delta\*nr of call units.

If you buy puts you must buy the underlying ti hedge. You need to buy delta\*nr of put units. (You don’t care about the sign aight like overlook it u care about the quantity and u know what u need to do as in I got puts then damn I gotta buy the future)

**The delta of a book = sum (delta \* unit of option) – over all options (keep signs as they should be)**

On the thoe of a book you + the theo of smth you sell and – the thoe of smth you buy.

So for a straddle with put and option theos equl the theo of the straddle is 0.

**MOST IMPORTANT THING**

As a market maker you chase delta 0. Say we begin from such a position. Now because the underlying price changes, right, you will have to rehedge.

A diagram of a number of numbers

Description automatically generated with medium confidence

This is where I learnt the following from but the nubers are upadated like dleta net was different than 0.

Say we start from left. The increase in price leads to higer delta exposure (through the options held i.e. calls here). Now we neeed to sell futures to bring net delta back to 0. You see the change in delat was caused by gamma (so 1\*gamma = change in delta). Now you need to sell 6 futures (cause futures have +1 delta always daa). Or you can think of (units of options \* gamma i.e. 100\*0.06=6 and sell cause was increase in delta).

As an aside the change in price uses the average of deltas from left to right cause you know where delta is heading before the actual increase in price cause you have gamma so take average deltas (then price = price + delta \* 1 (underlying change))

Now for when the price decreases they rounded the gamma cause you should have had +30.5 delta exposure through options. And everything else follows the same line of thought.

(This might only apply to calls but follow the logic) The reason they rounded is for you to see the profit made. If you look at the trades and observe the cycle you will always sell futures when the price of the future goes up and always buy futures when the price of the future goes down. This way you make money and stay delta neutral. So the question is why not always be long gamma? Why not do just what I said forever? Well, the reason for that is because the price of the options which we haven’t really thought of at all so far in the above explanations doesn’t stay the same. Like look at the picture and you can see that the options (that form the position ok u got it) price at the begining is the same as the one at the end. Well that doesn’t happen because of the time decay (given by theta). So now you need to balance gamma and theta because my P&L is formed of the trades made + the options value. So I now have to think if I ware to go long gamma what gamma and price change would I need to beat the theta. Note you can go short gamma. Obviously assuming you know theta. And obviously assuming the future price will move +1 then -1. Well this is A LOT of assuming. So that’s how shit gets complex otherwise everyone would do it.

**“A long gamma portfolio will, all other factors held constant, profit when the P&L from underlying movement exceeds the amount of theta paid. Similarly, a short gamma portfolio will, all other factors held constant, profit when the theta collected exceeds the amount lost due to movement in the underlying.” - Akuna**

A screenshot of a white paper

Description automatically generated

We did not cover what made gamma change in value. Cause you use gamma to derive the change in delta. yOu ain’t got the changed delta. So what causes gamma change??? We covered that: implied volatility and where the the strike sits so this means the actual future price is a factor (ATM, ITM, OTM). Then you will also have the time to expiry, interest rate….

A graph with arrows pointing at the same line

Description automatically generated with medium confidence

As an observation if delta was a static propety of an optioj you wouldn’t need to rehadge cause it wouldn’t change (assuming you don’t sell options or add more) cause delta through options = nr of options \* delta.

But because gamma exists (which makes delta dynamic), you must rehedge literally all the time.

Gamma is positive if you long option and gamma is negative if you short option.

**THETA**

So theta is dynamic. Doesn’t change by much if you far from expiry but changes a lot if you days from expity.

A screenshot of a graph

Description automatically generated

Say you have a value of -0.5 theta for a call/put of 10 theo right now, this means that the theo of the call/put at the end of the next 24 hours starting now will be 9.5. I say call/put cause the theo is the same for both if they have the same strike.

You pay theta if you are long an option.

You receive theta if you are short an option.

***THEO OF A CALL SPREAD = THEO OF BOUGHT CALL – THEO OF SOLD CALL***

A diagram of a normal distribution

Description automatically generated

Volatility is annualized in general.

They say t = 252 (trading days)

of logarithmic returns

**VEGA**

Put vega = call vega (if we talk about the same strike)

A screenshot of a computer

Description automatically generated

Basically, here you look at changes in implied volatility. For 1 point change the price change is 1\*vega. Better put *price change = IV change \* vega*

A diagram of a graph

Description automatically generated with medium confidence

**Vomma**

the rate of change of vega in response to changes in volatility. So in an earlier exercise you saw that vega was constant 0.04. That doesn’t happen ok pretty much like (delta-gamma).

A black background with white text

Description automatically generated

A screenshot of a computer

Description automatically generated

Put-call parity is C-P = U-K, actually, it makes sense cause you look at the PRESENT VALUE OF THE CALL =THEO, so the present value of the strike is the strike itself cause I FINNA SELL THE CALL NOW type shit.

***So, this means that U-K= intrinsic value & P=extrinsic value.***

**RHO**

Change in option price / change in carry cost (interst rate icluded)

A screenshot of a computer

Description automatically generated

A white background with black text

Description automatically generated

Just to know when its said points (as in change) it is percentage points so 1 point = 0.01