**SKEW RISK**

A flat skew means that all calls/puts (u treat them independently) trade at the same implied volatility regardless of the strike. Positive skew is when the ITM and OTM have higher implied volatility than the ones closer to the center (which is ATM). A negative skew means the implied volatility is higher at the center (so closer to ATM) and lower at the wings (like well ITM and OTM).

These skews can change like u can go from flat to positive to negative and changes in skew affect option spread prices. Typically the skew is a linear or curvilinear function.

In practice option traders value OTM options higher than the BSM model suggests. They trade as if there is a higher implied volatility compared to the log-normal probability from the BSM.

Another example is some commodity option markets devalue OTM puts with negative skews.

**TIME SPREAD RISK**

A **vertical spread** involves buying and selling two options of the same type (both calls or both puts) with the **same expiration date** but **different strike prices**.

A **horizontal spread**, also known as a calendar spread, involves buying and selling two options of the same type (both calls or both puts) with the **same strike price** but **different expiration dates**.

Goal: Maximize profit by capturing the time decay difference between the short-term and long-term options. You sell the short-term option and buy the long-term option.

**Time delta risk** = charm

**Time vega risk** = A position composed of 2 different contract months risks having the implied volatility spread of the different months’ change. The implied vol of a time spread is by no means constant and exposes a time option spread to price risk. Aight so the other example we had the spread was 6. Now, suppose both calls have the same implied volatility and this vol increased by 10%. The long-term option is more sensitive to changes in vol than the short-term one. Now suppose both calls increased in value but obv not equally. So the spread increases. And that is that, it is just the ris kof the spread changing given a change in the implied volatility. Sensitiveity is given by how close you are to the expiration date aight so you can imagine that if I pick multiple pairs of calls with different dates between the pairs I mean you will have different changes in the spread given a 10% implied vol increase.

**Position Risk Profiles**

The "carryover" of an option position refers to keeping or rolling an existing option position into a new time period or expiry date, rather than closing it out. You extend potential gains or manage risks by shifting an option to a later expiry.

As a prudent trader, I don’t get involved in unlimited risk options (short puts/calls/straddles…)

You must calculate the catastrophic risk profile of the carryover position. Plus you look at the risk associated with delta (so you look at the price of the underlying nad option and swings in these) and vega (look at implied volatility and the swings in it0).

It literally is if everything goes against you in the wors way what is your loss (is it capped)? And in reality you need software to analyse your position risk. Apparently you could do som catasropthic risk calculations quickly ok and prudent traders are epected to do that so ask Chat how to do it.

If you lost $15 on the option this means the broker will debit you $15000 (15\*1000). Total loss = loss on option \* multiplier of option-future (assumed here it’s 1) \* multiplier of future-underlying (1000 barrels).

WHAT I SUGEGST YOU DO HERE IS LOOK FOR PYTHON LIBRARIES (SINCE ALL OF THIS IS CONTEXT SPECIFIC, MAYBE ASSUME AN OPTION POSITION LIKE STRADDLE OR SMTH, PLAY AROUND)

**Synthetic option market making**

A screenshot of a computer

Description automatically generated

He als otalks about some arbitrage with the syntethics and the implications of the cost of carry (inlcuding the interest rate, maybe he only talks about the interest rate though) in this.

Strategy: Like hold undervalued debit synthetics and sell overvalued credit synthetics. An idealsituation would be to sell the ITM option at the full non-discounted synthetic value and buy the actual option. By doing this you would establish a net credit position that earns risk free interest. Essentially this goal entails doing ITM call and OTM put conversions and ITM put and OTM call reversals. **And he also talks about keeping an inventory of large OTM options against which large synthetic credit trades may be made at any time. (NGL KINDA USEFUL BUT TRICKY)**

**Boxes**

Consider the same expiration date. For a single-point strike spread, if the 100-101 put spread is trading for 0.55, then the 100-101 call spread should theoretically trade at 0.45, with the box spread value summing to one point (the difference between the strike prices).

Basically what happens here is you try to simultaneously buy and sell synthetic futures. So you will go bull call spread and bear put spread. Say we consider the $100 and $101 strikes. The bull call spread = buy the 100 call and sell the 101 call. The bear put spread = buy the 101 put and sell the 100 put. Now, if you did that, you just bought the 100 synthetic future and sold the 101 synthetic future. **The theoretical value of a box spread equals the difference between the strike prices** (here the difference is $1). As a result, the **box spread = bear put spread + bull call spread** OR **box spread = bull put spread + bear call spread. Suppose we only look for a box spread of $1. If you know the current trading price of the put/call spread (market data), you can derive the other. If there is a mismatch, then there is arbitrage.**

Net credit strategies involve creating synthetic futures positions by combining ITM and OTM options. Practically, you must do **conversions (short position) with deep ITM calls and reversals (short position) with deep ITM puts**. **AND by being long OTM calls and puts (inventory), you can earn interest**. What I got is that you wanna create those synthetic futures with options that are OTM and deep ITM. So, imagine the strike difference would be big for simplicity.

So an optimum box, even one covering loads of contracts (like the 2 synthetic futures above explained) spread over all different strikes (as you can imagine, you can extend the play to 2 points spread and, say, a point spread, but the $4-$5, not the same $100-$101) doesn’t contain future contracts. **The goal is to exploit the option market arbitrage, the synthetic futures arbitrage**.

**Concept Overview:**

1. **Synthetic Futures:**
   * **Short Synthetic Future (Conversion):** Selling a deep ITM call and buying a deep ITM put.
   * **Long Synthetic Future (Reversal):** Buying a deep ITM call and selling a deep ITM put.
2. **Net Credit Positions:**
   * **Net Credit Strategy:** A strategy that results in a net inflow of premium when initiated.
3. **Interest Earnings:**
   * **Holding OTM Options:** By holding long OTM options as inventory, you can potentially earn interest or benefit from changes in implied volatility.

**PIN Risk**

***In a conversion, reversal, or box, the option trader is not subject to any of the major risks considered before (skew, delta, Vega, theta). Might be somer rho risk but overall synthetics are virtually risk-free.***

However, there is this expiration risk (pin risk) its basically the overnight uncertainty around the price sicne the excercising on the day before expiry shows a very small + or – from the strike. So whe nthe market opens the price might fluctuate enough to not make u money.

Market makers are prudent so risk neutralization is preferred over risk speculation. It’s a business and a science ok.

**Calendar spread risk**

Time spreads are significantly influenced by the cost of carry in oil markets.

2 calls/puts with the same strike but different expiry dates. Short the nearest and buy the furthest. => create a calendar spread

=

=

**On strategy**

The single-month positions that fit the conditions of both limited risk (LRO) and delta neutrality are: the long straddle/strangle. The long and short butterfly, and the long wrangle. Bare in mind it actually matters where the underlying price is in choosing the strikes.

**The long straddle**

* Assume underlying price = 100
* Buy a 100 put + buy a 100 call
* Earns money if it expires away from the strike which implies you PRAY for price swings in the underlying and high vega (option price change due to increased implied volatility)
* The risk is if the above doesn’t happen + you have theta risk
* Of all this is the most exposed to vega risk (it’s the mak or break factor)
* Impractical for a market maker who needs to make a market (like you just buy)

**The long butterfly**

* Assume underlying price = 100
* Buy a 90 call + sell two 100 calls + buy a 110 call
* Earns money if you are close to the middle strike (i.e., 100 in this case)
* Has positive theta in the selling region
* Has negative risk to gamma and vega

**The short butterfly**

* Basically it is shit: it has all the disadvantages of the long straddle without the potential to earn catastrophic profits
* Long butterfly is preferred

**The long wrangle**

* Assume underlying price = 100
* Long two 95 puts + short one 100 put + short one 100 call + long two 105 calls
* You earn money if at expiration you are at the wings far away for the strikes and some in the middle apparently
* You have positive risk to gamma + vega
* You have lower theta risk compared to the straddle, sometimes even neutral in the center
* Sensitive to skew risk

In short, the long butterfly and long wrangle are the preferred choices for single-month strategies. That is, of course, if the actual probability of the underlying price change is semilog normal (remember the early assumption on price changes?).

**Time spreading**

Right now, we depart from the single-month strategies.

A time spread is always changing as front months expire, back months become front-months and new months begin trading. A market maker is rolling over his time spreads constsntly.

1.A long butterfly is the prudent market-making strategy for the front-month leg of any time spread. Why? I guess cause ppl sell the center strike options once contracts move into front-month status (within less than 1 month to expiration) to capture the most time decay profit and as a market maker you take the other end like you buy and become long vega (which means you inherit higher negative theta risk, I derived this from him saying u can’t have positive (vega, gamma)-[ve seen coupled together] and theta risk). As a result, the goal of the front-month position should be to minimize negative theta risk. The long butterfly is the only LRO-DN strategy that allows a trader to do this.

2.There is no point in holding positive theta positions in back-months where theta risk is low and decay minimal. It would be better to be positive vega. So, the long wrangle strategy is preferred for back-month positions.

Now, if you combine 1 and 2, you get a limited risk DN time strategy that holds a long butterfly in the front month and a long wrangle in the back month.

**Broker order flow and open interest**

The life cycle of an option contract (i.e., back to front month).

So, I am talking about the order flow for options. So, 90% of the time, the broker initiates a trade, and you, as a market maker, mainly trade with brokers. So, your goal is to know what positions the broker is taking (is he a net buyer/seller, is he in equilibrium, is he taking a bull spread, or a bear spread). The trend of broker net order flow will often last several weeks or months. If you monitor the market structure, you can understand where pressure on prices comes from and how it affects implied volatility. Safe market making involves finding a limited-risk option carryover position around which to make a market + price competitively in the direction of the broker order flows.

When you buy, you accumulate positions, and when u sell, u liquidate positions. You need to understand the supply and demand for the option (basically at all strikes and if u God for each month). If u also good you know which participant does what (that is in a pit, think OTC).

Open interest is the total number of outstanding option contracts that have not been settled or closed. For open interest, we talk about initiators because as long as you are asking for a position (long or short), you initiated a new contract. So, in open interest, we look at the pairing of buyers and sellers. If one side is an initiator and the other a liquidator (like I wanna buy an option but ain’t got none and the seller wants to sell me that option AND HE HAS THE OPTION IN HIS HANDS) then open interest doesn’t change. Think of it this way, the seller passed his contract to the initiator (me), so no new contract was created. Now if both the buyer and the seller are initiators (meaning the buyer wants to buy smth he doesn’t have and the seller wants to short smth he doesn’t have), then the open interest increases. Why? Cause you, in fact, create a contract between the 2. Conversely, if both are liquidators (the buyer wants to buy to get rid of his short, and the seller wants to sell to get rid of his long), then open interest decreases. Why? Cause the exchange of contracts kills the bond between participants (like now, they both have no position, mere citizens who don’t own shit). It might be easier to think they were both initiators in the first place, right? So, a contract between the 2 was created (+1 contract on the market). Now, they literally did the opposite (the ex-buyer became seller, and the ex-seller became buyer) and killed the contract like there is no relationship between the parties anymore (-1 contract on the market).

If u good, you figure out supply and demand on a daily basis and all u gotta do is keep track of broker order flows (trades) and open interest (typically by strike). And you need to do it to adjust your bid/ask spread. Say you spot massive liquidation or accummulation.

**Trading fences**

A bull fence is when you sell a put (lower strike) and a call at a different strike.

A bear fence is you buy the put (lower strike) and sell the call a t different strikes.

Now that leaves you with unlimited risk (downside interested in hedging) so you use futures to hedge.

For the bull fence, you sell futures, and for the bear, you buy futures.

**MAKING MARKETS**

**The real skill in market-making is your ability to maintain a DN LRO carryover position.** **When dealing with a carryover position in options trading, the delta of the carryover position refers to the delta of the new position after it has been rolled over to a new expiration date or strike price. Say the delta of the 50 June call you now have is 0.6 and you sell the call as it approaches expiry to buy the 50 September call which has a 0.5 delta. SO the carryover delta position is 0.5 like the next position’s delta. And you strive to have a constant delta when rolling over. For that, you make frequent delta + vega risk adjustments, and the easiest way to do it is through an option spread.**

**HIGH VOLATILITY IN THE UNDERLYING IS TYPICALLY ACCOMPANIED BY HIGH TRADING VOLUME PERIODS WHICH MAKES MORE MONEY + VOLATILITY IN THE UNDERLYING WIDENS THE SPREAD OFFERED FOR THE OPTIONS which makes more money too. The width of the spread is also a function of the volume of options traded and the level of competition (other market makers). Higher volume and competition mean a tighter spread.**

**Also, the spread is tighter in the front months and wider in the back months. That’s because the front-month options are more traded.**

One contract = one lot

The lingo for making a market is “$2.30 at $2.50, 20 by 50.” This means a $2.30 bid for 20 lots with 50 lots offered at $2.50.

This would happen if the option’s fair value was 2.40 at the time when I made the market (say that the underlying price was $100 at that exact time).

There are 3 markets you can make:

1. for an asset
2. for a spread
3. for a time spread

Tips: Go long before short and remian net long more options than those short.

For making a market for a spread, just know that the value of the spread is the difference between the true values of the options. So, a bull call spread = true value of lower strike call – true value of higher strike call.

**Adjusting delta**

1 You can adjust delta with futures as you knew but that leaves you with the possibility of frequent wipsaw losses during the day.

A better way to adjust delta is to use options. You’d buy puts in a falling market/ buy calls in a rising market in positive theta ranges.

A favourable delta adjustment occurs when puts or calls are misprices with respect to each other. You ‘d buy the cheaper alternative and turn it into an opposite put/call synthetically.

So from what I can tell you would want to look at the market, if the market is rising then puts will be cheaper and if the market is declining then calls will be cheaper. Buy the cheaper option and synthetically create the other option through a future. This is arbitrage. Now how does this help with delta adjustment idk??? Maybe you do this in anticipation of needing the option you create synthetically at some point to adjust your delta.

**The implieds**

Knowing the direction of implied volatility as an options trader is like knowling the direction of price for a futures trader. Similar to price, implied volatility can have seasonal variations (seasonality). Most likely to anticipate futrue implied vol from payin attention to the market structure (broker net order flows and open interest).

**Skew risk revisited**

As an options trader you always want to know where the ATM straddle is trading both in terms of the price but also in terms of the implied volatility.

There are 2 skews: a put skew and a call skew. The skew shows how implied volatility varies across put/call strikes. The degree of skew is related to option expiration cycles. Options that are furthest from expiration (+6 months) present a flat skew. The ones in the middle range (3-6 months) have a more U (I mean like more flat though not perfect U) skew (flat ATM and curved at the wings). The closest options to expiration (less than 3 months) have an even more pronounced U (not perfect though).

**P&L**

It is best to divide total P&L into P&L from daily carryover positions broken down by each cycle separately (e.g., May, July, December) + P&L from daily trades. The first one is a result of your skill to maintain a DN LRO position. The second is about your ability to profitably make a market. Obviously, the bulk has to come from the second.

**Mistakes**

So it emphasizes the importance of queue priority. Brokers would sometimes come into the ring and immediately do a large quantity of single-strike options spread. You need to trade first in the string because when you hedge in the future first you get to alter the price while cashing in, the late to the party traders don’t cash in no more cause you did that and drove the price up or down. Sometimes the late to the party can incur losses so if you are late you might as well stay away.

Another is to accumulate a negative vega position by being too exposed to one type of option. You should look for corresponding option spreads to trade off some of that risk. In reality, you could be delta neutral as required, but your vega risk is lopsided. The general rule is to remain net long vega.