UltraNP User Manual

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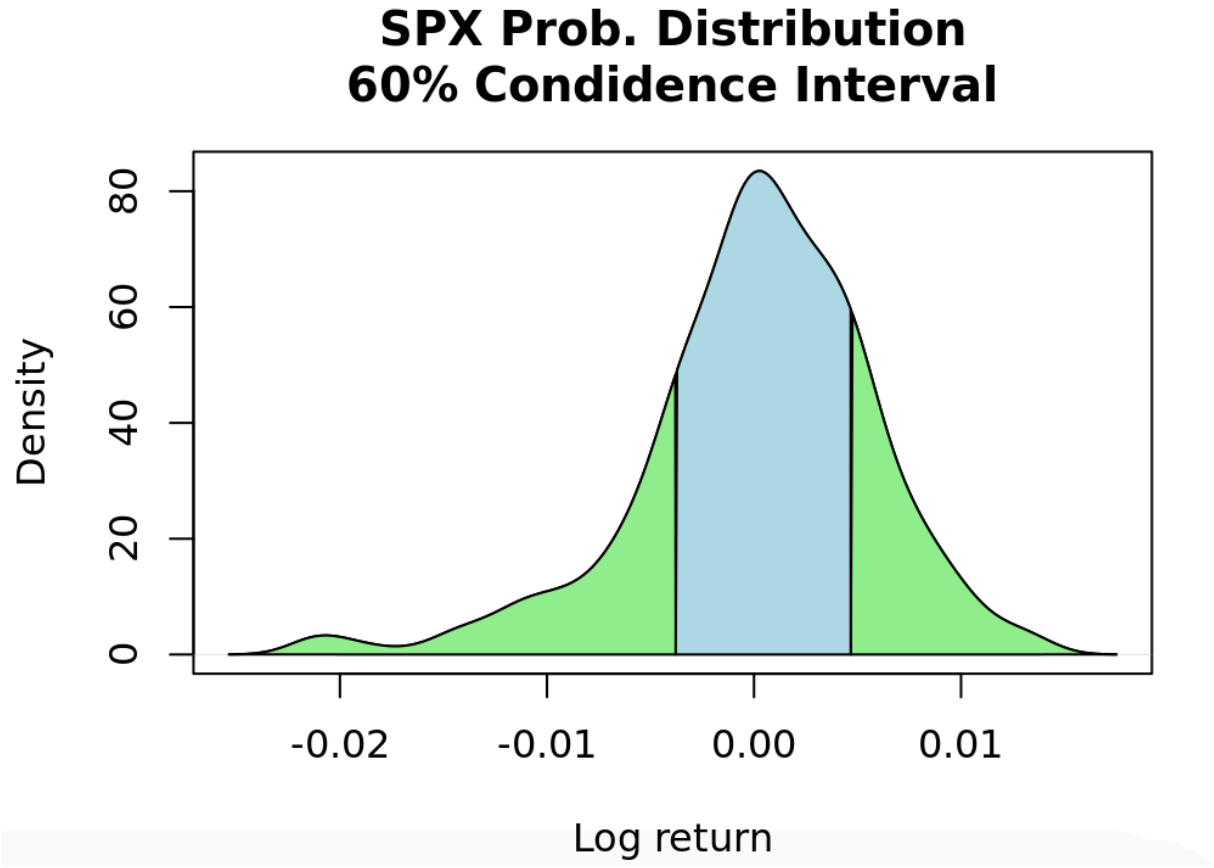
Introduction

UltraNP is a trading system that seeks to exploit statistical arbitrage of SPX options that expire the next day. The system combines two different “tails”, one consisting of a put spread (the left tail), and one consisting of a call spread (the right tail) to create a mostly non-directional trade for the next day. The system is designed to be traded every day after the market closes, usually around 4:13 PM EDT (the peculiar time frame will be clear in the In Depth portion of this document) and the position is allowed to expire the next day no matter what (we don’t have early stops or early closings of any kind).

UltraNP is a signaling system driven by a machine learning engine that has been trained with data from January 2008 up to Dec 31, 2019. The reason for the early cutoff of training data is to allow enough years for evaluation of the system. In other words, the period from Jan 2020 up to now (Mar 2024) is all free of any kind of overfitting of data.

The output of the neural net is a Non-Parametric Probabilistic Distribution function of SPX log returns for the next session (the NP in the name). Having a PDF is very convenient because we can compute arbitrary confidence intervals for SPX. In this particular implementation of UltraNP we are using the 60% confidence interval for SPX returns. What this means is that the tails we are playing are placed at the limits of the 20% probabilities each (20% of the returns will be below the left tail and 20% of the returns will be found above the right tail).



Historical Returns

Since Jan 2020 until Mar 18 2024, the system has had a Max Drawdown of $3,204 per contract and a total cumulative gain (without reinvestment of profits) of $31,183

Monthly performance

```
##    2020 2021 2022  2023 2024
## 01 1134  897  897  1431 3663
## 02  773  214  463  -630 1693
## 03 -154 1218  567   990 -147
## 04  887  616  749  -235 1348*
## 05  284 -386 1962  1722  901*
## 06 1733  649 -171 -2877   NA
## 07 -971  947  721  1572   NA
## 08 -503   25 -809  1076   NA
## 09  442  556 -646  -604   NA
## 10  953 -598 -451  2661   NA
## 11 -178  319  680  2029   NA
## 12 -798 1058 3134   377   NA
```

Anual performance

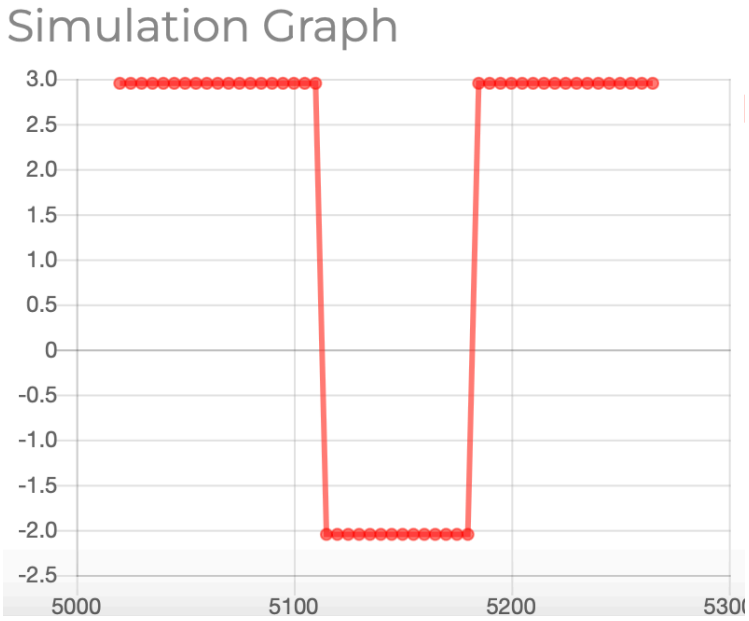
```
## 2020 2021 2022 2023 2024
## 3602 5515 7096 7512 7458
```

*Results from the augmented signaling net. We switched in April to a signaling neural net instead of the naive heuristic.

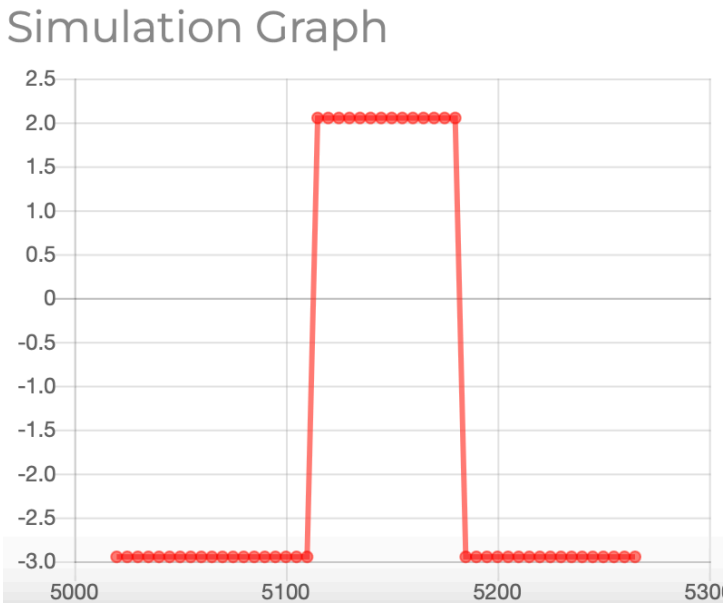
A first look into UltraNP

Depending on the buy/sell signal for the tails the system can create four different types of aggregate position:

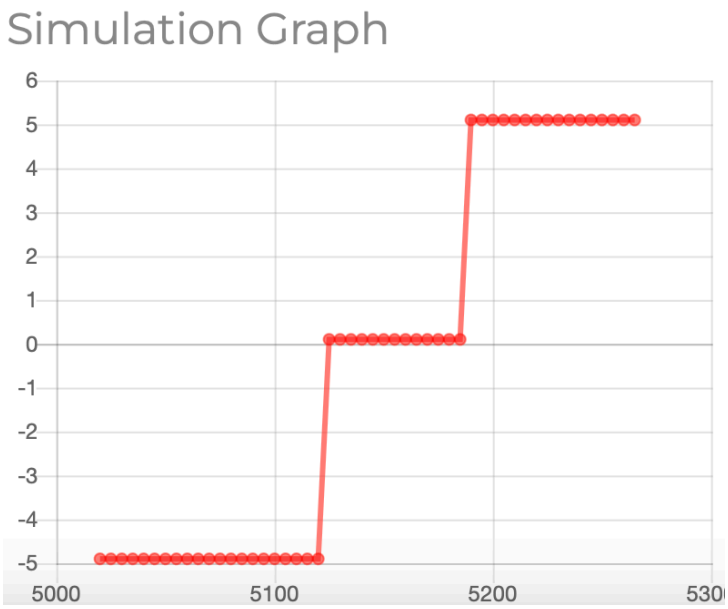
- A debit Iron Condor. If the system produces a buy signal for both tails, we end up with a debit Iron Condor where the position wins if the market moves more than the limits of the outer strikes (see figure). This a pure non directional trade, that bets that SPX will move more (up or down) than priced by options.



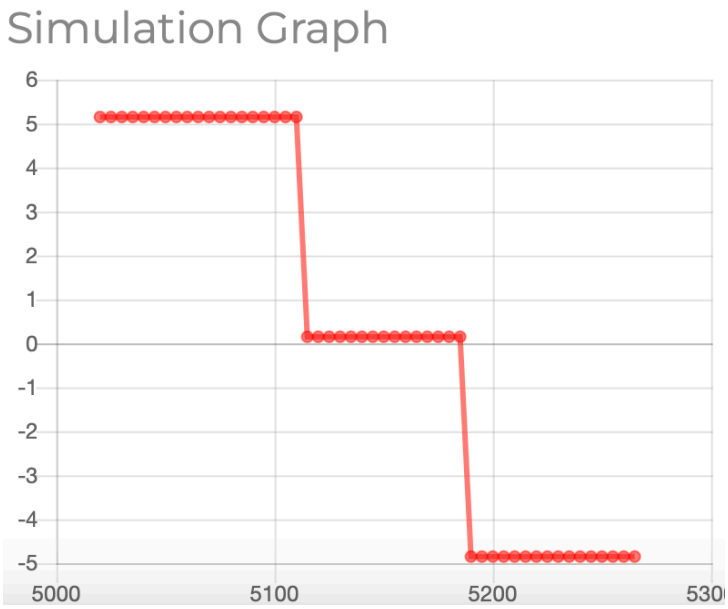
- A credit Iron Condor. If the system produces a sell signal for both tails we get a credit (short) Iron Condor where the position wins if the market closes inside the range defined by the inner strikes of the spreads (see figure). This is also a pure non directional trade that profits if the market moves less than priced by options.



- A long binary risk reversal. This is actually a non-standard name for the position and happens when the system produces a sell signal for the left tail, and a buy signal for the right tail. In this case the final position is neutral-bullish, and makes some money if SPX closes within the inner strikes of the spreads (that is the neutral) part, however it makes a full gain if the market closes above the outer strike of the right tail. The system has a max loss if it closes below the outer strike of the left tail (see figure).



- A short binary risk reversal. Another made up name for the position and we get this configuration the the system produces a buy signal for the left tail and a sell signal for the right tail. The final position is neutral-bearish and make some small of mount if SPX closes within the inner strikes of the spread (this is the neutral part). If SPX closes below the outer strike of the left tail we get max gain, and conversely we get a max loss if SPX closes above the outer strike of the right tail (see figure).



Structure of the trade

The tails of system are made of just regular vertical spreads expiring the next day spaced at 5 points interval (when possible). You can enter each spread individually if you prefer, but it is simpler to enter both spreads at the same time if your Broker allows it (most brokers do). An example of the tails is given here (obtained from the GO Variance Center):

For the left tail:

And for the right tail:

In the previous example, the system is recommending selling the left tail and buying the right tail. Which will result in a long risk reversal final position. Remember that the position is neutral-bullish, so it will make some money ($0.15) if SPX finishes between 5125 and 5190 the next session (that is the neutral interval), and it will make more money ($5.15) if it costs above 5195 the next session. If SPX closes below 5120, the system will have a full loss of $4.85 instead.

Trading Times and Frequency

The system generates a trade every day, so we are taking 5 trades per week most of the time (we only skip trades when the market is closed). All trades expire the next trading session, which could be the next day, or in the case of weekends/holidays it could be several calendar days ahead.

We need to wait for 4:00 PM EDT so the tails are fully defined for the next day as the system uses the official closing SPX price as reference. However the ideal time to enter the trade is at exactly 4:13 PM EDT, there is a reason for such an unusual time that will be explained in detail in the In Depth section of this guide. Now, it is very hard to get an execution at exactly 4:13 PM EDT so the trade can be started a few minutes before (or even later). Personally I start working the trade at around 4:10 PM EDT. Once the trade is on, we let it run until the next day, there are no stops, or early closings, the system is designed to be all or nothing. The next day we'll let the position expire no matter what. The good thing about using SPX options is that they are cash-settled so the whole affair will be really simple. If we make money with the trade we'll get cold hard cash in our accounts.

As a rule of thumb, most of the time the statistical arbitrage is very clear between options' prices and the system, however in certain days they are almost the same. On those days, we will see the system oscillating a lot after the market closes (the futures and options keep trading) in a day like that it is better to skip the trade as it will be really hard to anticipate what the official trade will be at 4:13 PM EDT.

Nominal Cost, Risk and Net Profit

For the purposes of this trade we are going to use the convention that Nominal Cost = Max Risk of the position, and because max risk changes depending of the signals we have three different scenarios for Nominal Cost:

- For the **Debit Iron Condor** Max Risk = debit paid. This is the simplest of the trades and our risk is limited to the debit paid for the position which, by definition (and you will see this later on in the In Depth section of the document) is always less than $2.0 per contract. This means that max net profit for the position is always more than $3.0 per contract.

- For the both the **Long Risk Reversal**, and **Short Risk Reversal**, Max Risk = $5.0 - Credit received. Those trades are the ones with more risk, as the credit received is usually very small, typical Max Risk values oscillate between $4.3 to $4.9. Also, because these type of trades have 2 different profit areas, net profit can be either the credit received (small amount ranging from $0.10 to $0.70 typically) or $5.0 plus credit received (from $5.1 to $5.7 per contract).

- Finally, for the **Credit Iron Condor** Max Risk = $5.0 - credit received. By definition, credit received will be always bigger than $2.0 so Max Risk will be always less than $3.0. Net Profit for this position is just the credit received which usually oscillates between $2.1 to $2.6.

Practical Considerations

The optimal time to enter the trade is around 4:13 PM EDT (after the market closes) but we can start working on the order a short time after 4:00 PM EDT. The reason is that the strikes of the trade are mostly set after the market closes and the only thing that could change is just the BUY/SELL signal per leg. A good heuristic to work this order is the following:

- Once the market closes create an order (don't send it yet) with the suggested strikes and structure at that time.
- Around 4:10 PM EDT double check if the order remains the same and make changes whenever appropriate.
- Remember that the mid point displayed is the fair price of the position but in order to assure a quick fill we need to improve mid by some amount (otherwise the order could sit there for a long time waiting for a fill). I usually improve the price by $0.05 and send the order (improving means paying $0.05 more for a debit, or receiving $0.05 less than mid for a credit). If the improved mid is not filled fast, then I go for a second $0.05 round of improving (so $0.1 in total from mid) and with that the order usually fills right away.
- We don't have early stops, or work the trade in any other way, once we get a fill we let the position expire the next day.

Remember that the system uses SPX weekly options (that expire in the afternoon), a**void standard SPX options at all costs**! This is more important around the third Friday of every month when some brokers can confuse users with the options they are listing. Always make sure that the trade is done with the SPXW family of options (the weeklies).

Recommended Size

Even though the nominal cost per trade is very low (ranging from $150 to $480) we need to remember that this is an statistical arbitrage trade, so we should expect a string of failures at any given time. This means we need to have a buffer to absorb a string of losses and also to have some spare cash to do several more trades.

A good starting point is to use the Max Drawdown of the system (which is $3,200) as an starting value and then add a nice buffer to it. Personally I would recommend a buffer of $5,000 per contract for UltraNP, and even with that it would be an aggressive system (I'm comfortable with the risk reward for that kind of sizing).

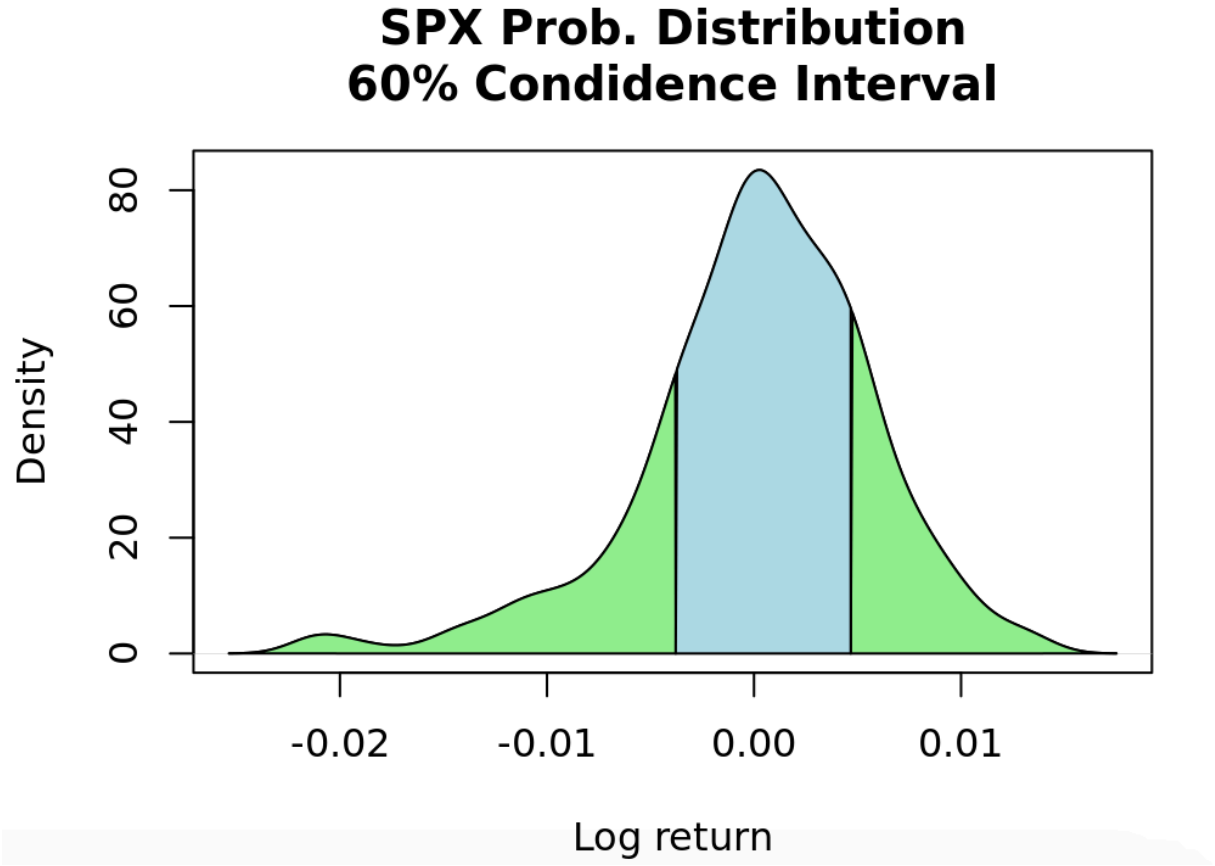
Points to consider

The trade is executed with "SPXW" options which refer to SPX options with daily afternoon expirations (as opposed to old archaic "standard" options that expire the third Friday of every month in the mornings). Don't be alarmed if you can't find SPXW in your broker's software, just use the normal SPX symbol but make sure that you are referring to the PM expiring ones (some brokers call those the "weekly" family). Please check with your broker to make sure you are using the afternoon expiring options (this more critical the third Friday of every month to avoid confusion with the standard options).

In the GO room I tend to skip some trades mostly for peace of mind reasons (if I judge the trade to be too risky or I don’t fell comfortable with it). You are free to ignore my executive overrides, also for reference, the systematic trade (taking every single trade without my personal overrides) has outperformed consistently the trades I take in the room.

UltraNP In-Depth Statistical Arbitrage

Having a probabilistic distribution is very useful because we can compute confidence intervals of arbitrary width. In the case of UltraNP we compute the 60% confidence interval for SPX log-returns for the next session



The light blue area is the 60% confidence interval and the light green area are the tails of the distribution. What this means is that the neural net things that returns inside the confidence interval will happen with 60% frequency, and returns outside it will happen with 40% frequency.

The core of the strategy then is to price SPX binary options as close to the tails as possible and use a specialized signaling system to compensate from after hours moves and next day implied variance. The reason is that SPX futures might move quite a bit after the close affecting options prices. This repricing is most critical around earnings season when we can get huge gaps due to some megacompany results (like NVDA reporting). Implied Variance for the next day is computed from options prices and helps to compensate for anticipated events (like Fed meetings, CPI data, NFP data among others).

We are not using the simple heuristic anymore, instead the system is fully driven by neural nets to make a decision.

SPX Binary options replication

An astute reader will have realized by now that there are no SPX binary options that are centrally cleared and that trade in public markets in the US (they used to exist, but CBOE discontinued them a long time ago). That is why we need to do a replication strategy for the binaries.

Given the high value of the SPX index (More than 5000 points right now), using a vertical spread that is 5 points wide is a decent approximation. The width of the spread is just 0.1% (or less) of the strike so it can work as an imperfect binary option. Of course replicating like this introduces other errors as well due to the fact that we can find strikes spaced at 5 points most of the time (instead of the exact levels predicted by the net).

Remember that now we are using a specialized signaling system to make the BUY/SELL decisions for each leg. The signaling net takes into account several factors that are missing from the original naive heuristic including:

- After hours moves are now included in the decision: (ES mini futures keep trading after 4:00 PM EDT and that influences options prices).
- The new system also includes the implied variance for the next session using all options prices for next day.
- And finally, the imperfect replication is also included in the decision as the probabilities for the rounded strikes can differ substantially from the ideal 20% base line.

Notice that decision to buy or sell is independent for each tail and that is the reason the full position can take four different configurations (as explained in the introduction).