

# Modeling the Jelly Roll

The option position known as the Jelly Roll is comprised of a short near month and long far month risk reversal. It can be established using different or identical strikes, and becomes profitable as theta decay causes the premium differential of the options to widen. Our demonstration position will be established using SPX options trading on the CBOE.

On 10/29/2010 the following prices existed:

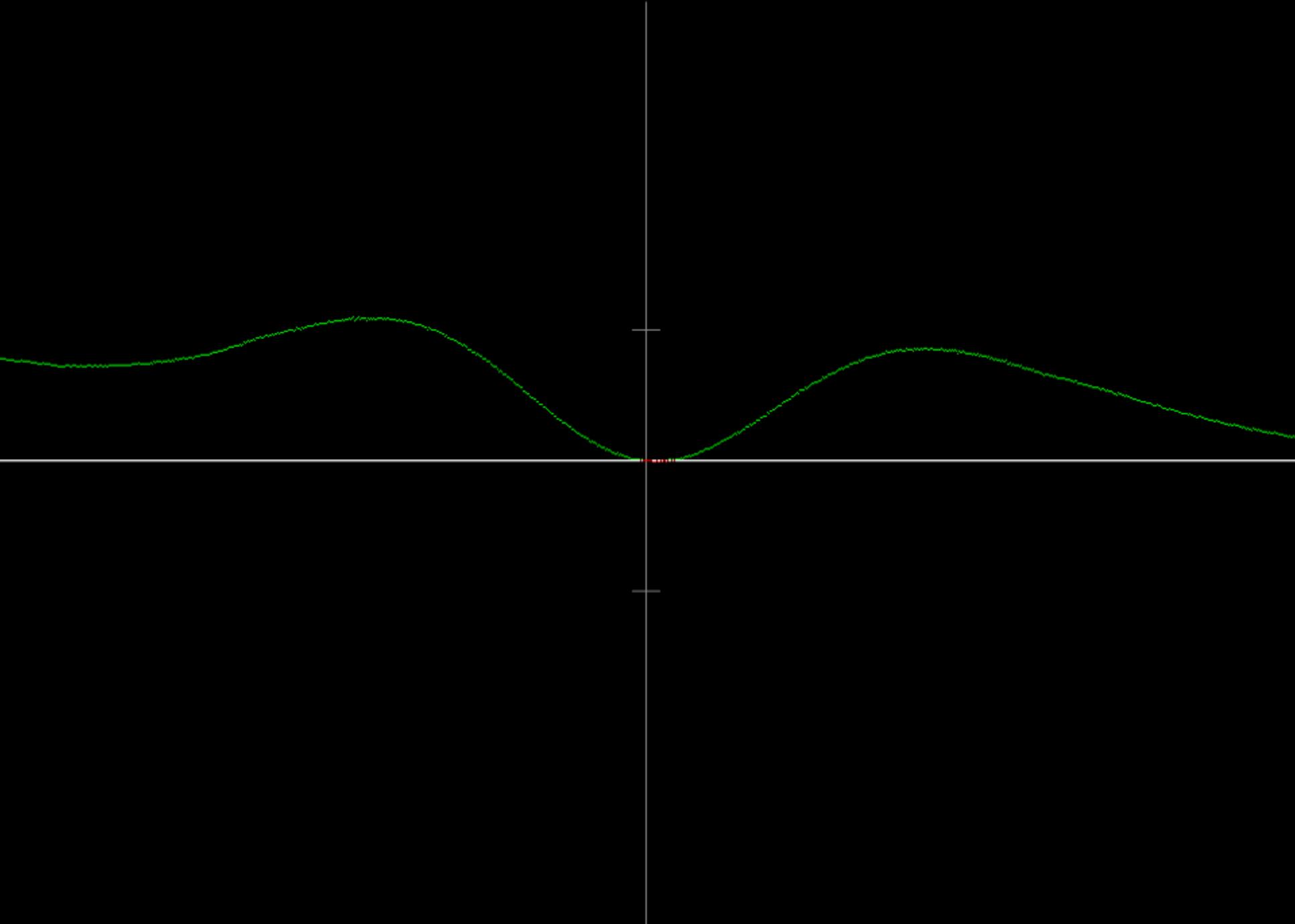
- SPX Index: 1183.26
- 1180 Strike November: STO 100 Calls @ 22.20, BTO 100 Puts @ 20.90 – Credit: 1.30
- Days until expiration: 21
- 1180 Strike December- BTO 100 Calls @ 33.10, STO 100 Puts @ 33.40 – Credit: .30 – Total Credit: 1.60
- Days until expiration: 49

The initial position:

92375

117975

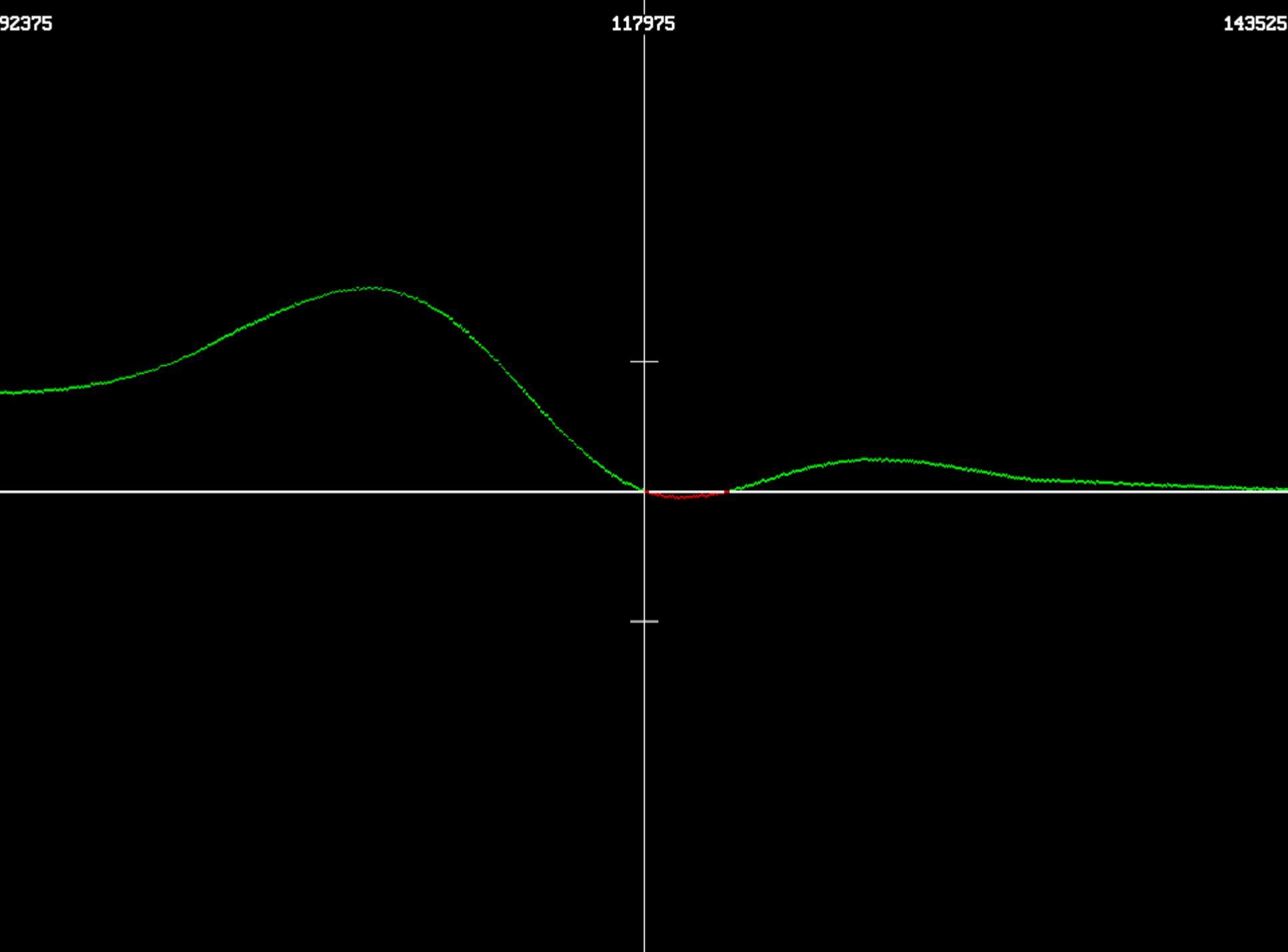
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The disadvantage of the Black Scholes option pricing formula is the assumption of a constant volatility across the entire domain of strikes. In reality, volatility tends to rise as prices fall, and decrease as prices rise. Adding a dynamic (stochastic) volatility algorithm to the model gives us a more accurate picture of the future.

While superior to a deterministic time and state dependent volatility function, the stochastic model is unable to incorporate supply and demand considerations that are driven by market sentiment. This will become a factor in the final outcome of our trade.

The initial position of our Jelly Roll now looks like:

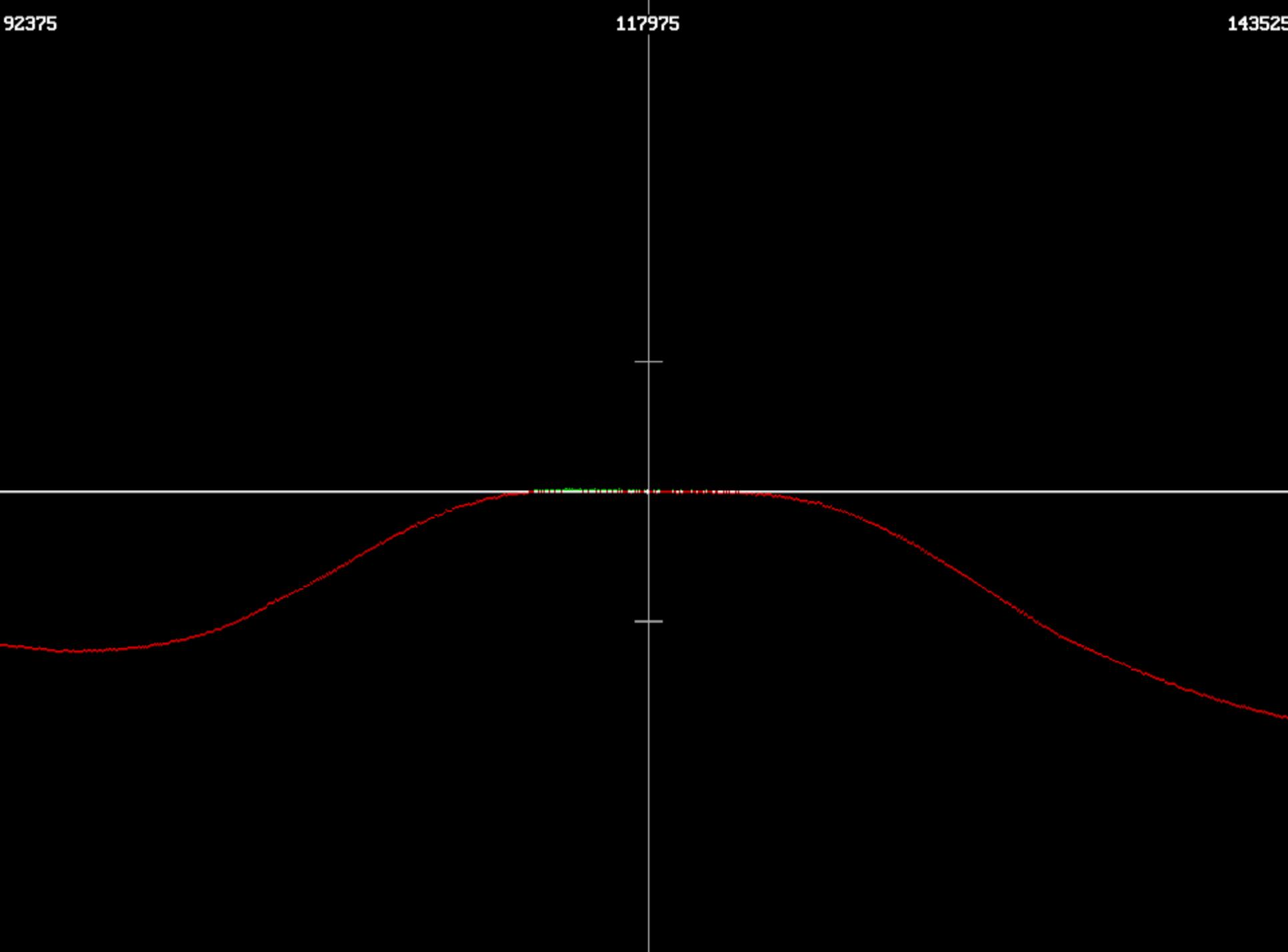


Narrowing premiums on the upside have led to a flattening of the price curve, while conversely, rising volatility on the downside causes a widening of the premium differential and thus a larger payoff. It is important to note that this position should be established for a credit, especially in the front month.

For example, if ES futures options were used instead of cash SPX:

- ES Futures: 1179.75
- 1180 Strike November: STO 100 Calls @ 21.50, BTO 100 Puts @ 21.75 – Debit: .25
- Trading days until expiration: 21
- 1180 Strike December- BTO 100 Calls @ 33.25, STO 100 Puts @ 33.50 – Credit: .25 – Total Credit: 0
- Trading days until expiration: 49

The position would look like:



The dramatic difference in the price curve is due to the quarterly expiration of the futures. When the near term cash options expire, the December futures will not be equal to SET. A profitable conversion or reversal cannot be established using cash SPX options and Dec futures due to this variance. Therefore, while the Dec cash options tend to use the Dec futures as their underlying, the cash Nov SPX will be trading against the SPY.

A synthetic long (or short) could also be created using XSP options, but this is apparently not being done due to a lack of liquidity.

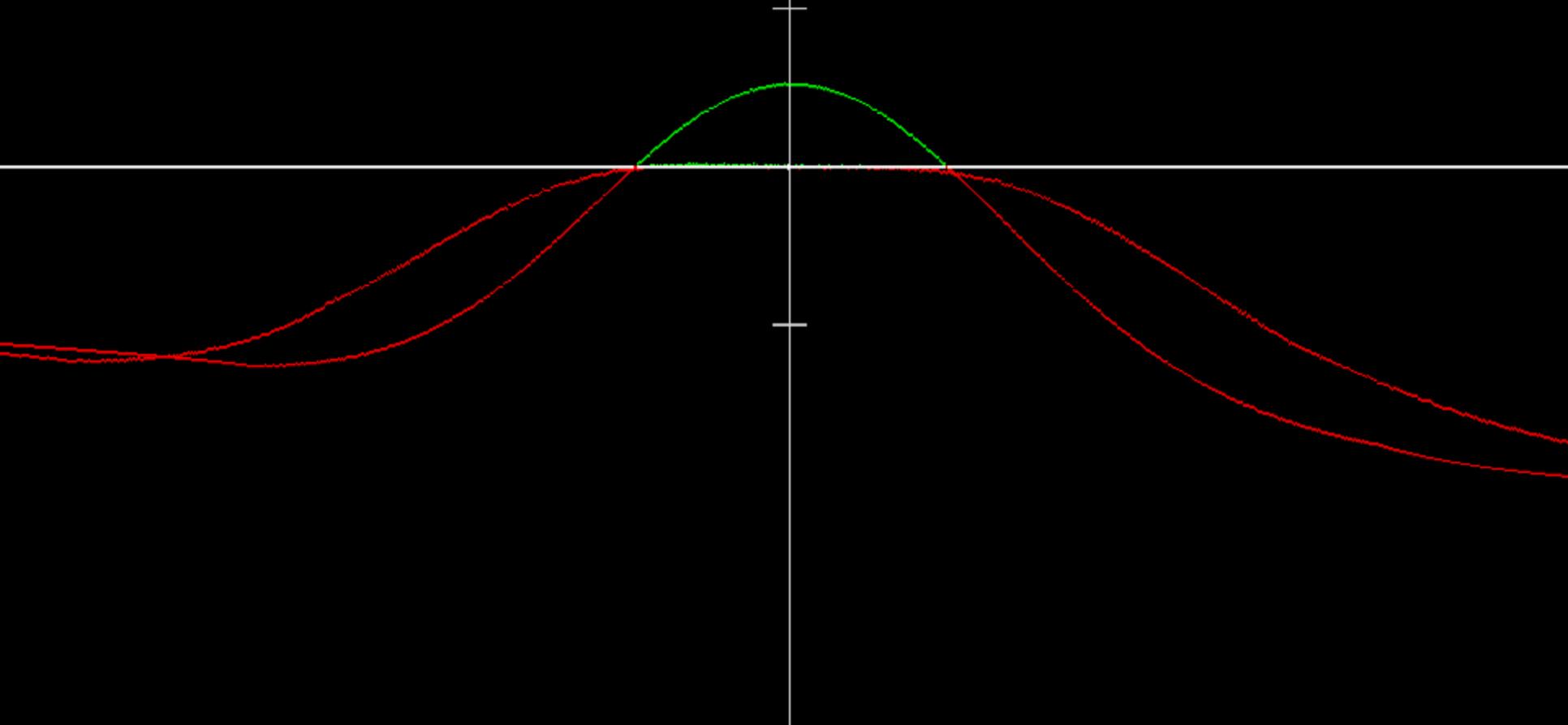
Now, back to the futures:

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At Front Month Expiration:



The position is now almost identical to a short horizontal spread, thereby defeating the purpose of the Jelly Roll, which is to arbitrage premium differentials across time. Although we can unwind the position at any point, it **MUST** be closed at near month expiration, otherwise it becomes a stand alone long synthetic underlying – a pure risk play.

Now let's look at the ATM greeks:

Blue = Delta: 0

Yellow = Gamma: .006

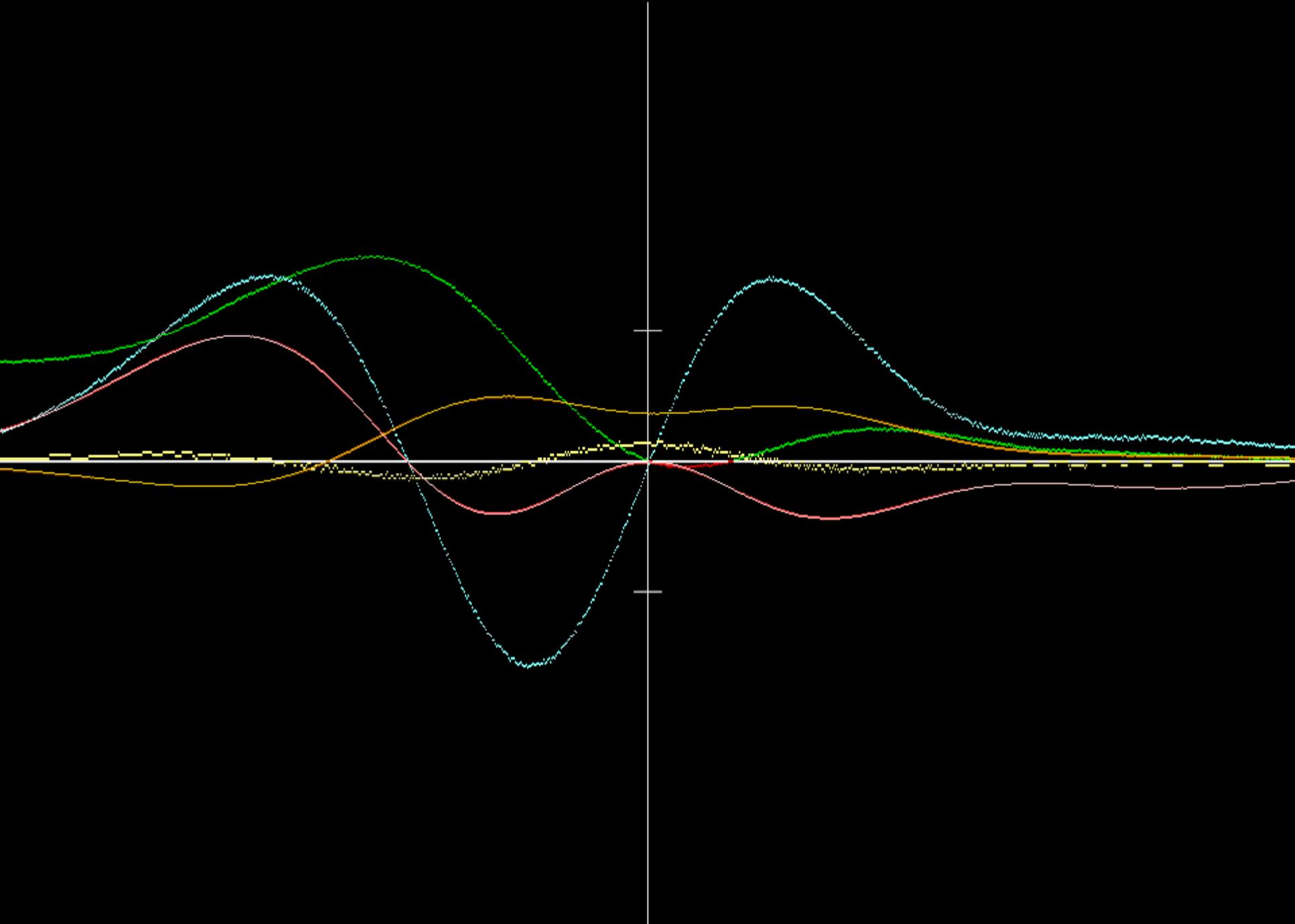
Brown = Theta: 3.57

Pink = Vega: 0

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We start out vega and delta neutral, with positive gamma and positive theta. This is unusual, theta and gamma are normally mirror opposites. On account of having received a credit on both sides of the position, positive theta from the sold options is overpowering negative theta from the longs.

After 7 days the SPX has reached 1225.85

At this point the model predicts a profit of 42.00, or \$4,200.00 for the entire position:

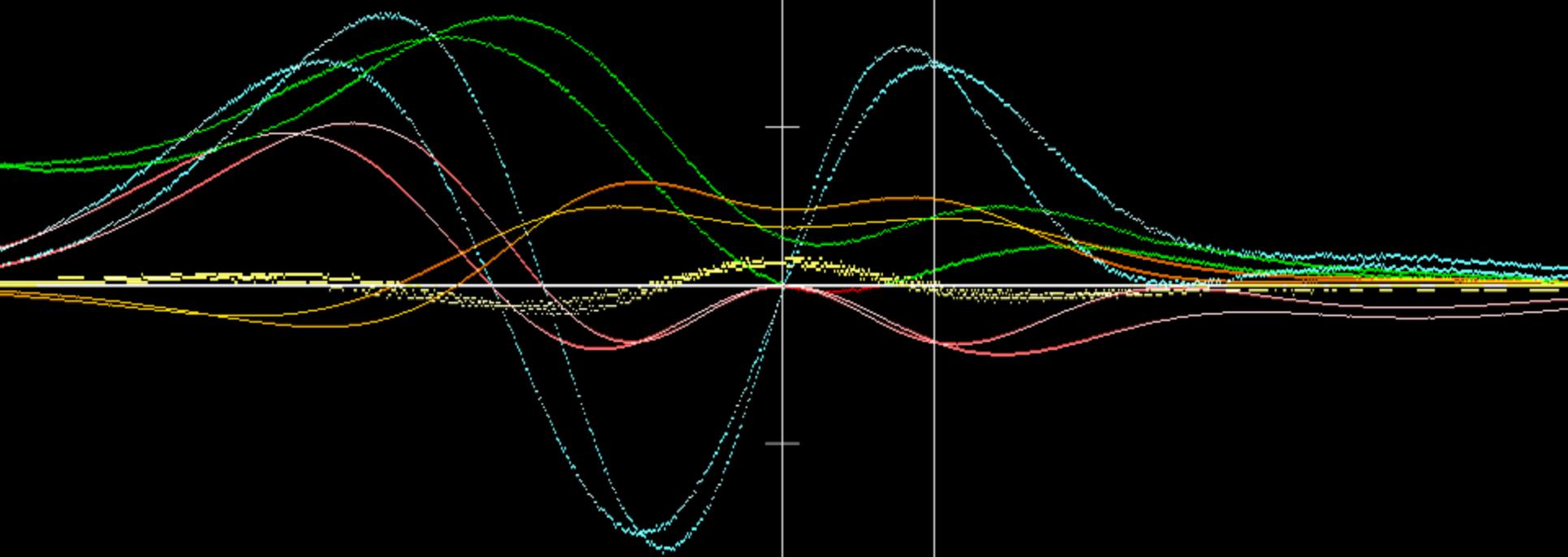
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122585

\$4,200



The actual profit at this point is \$4000.00

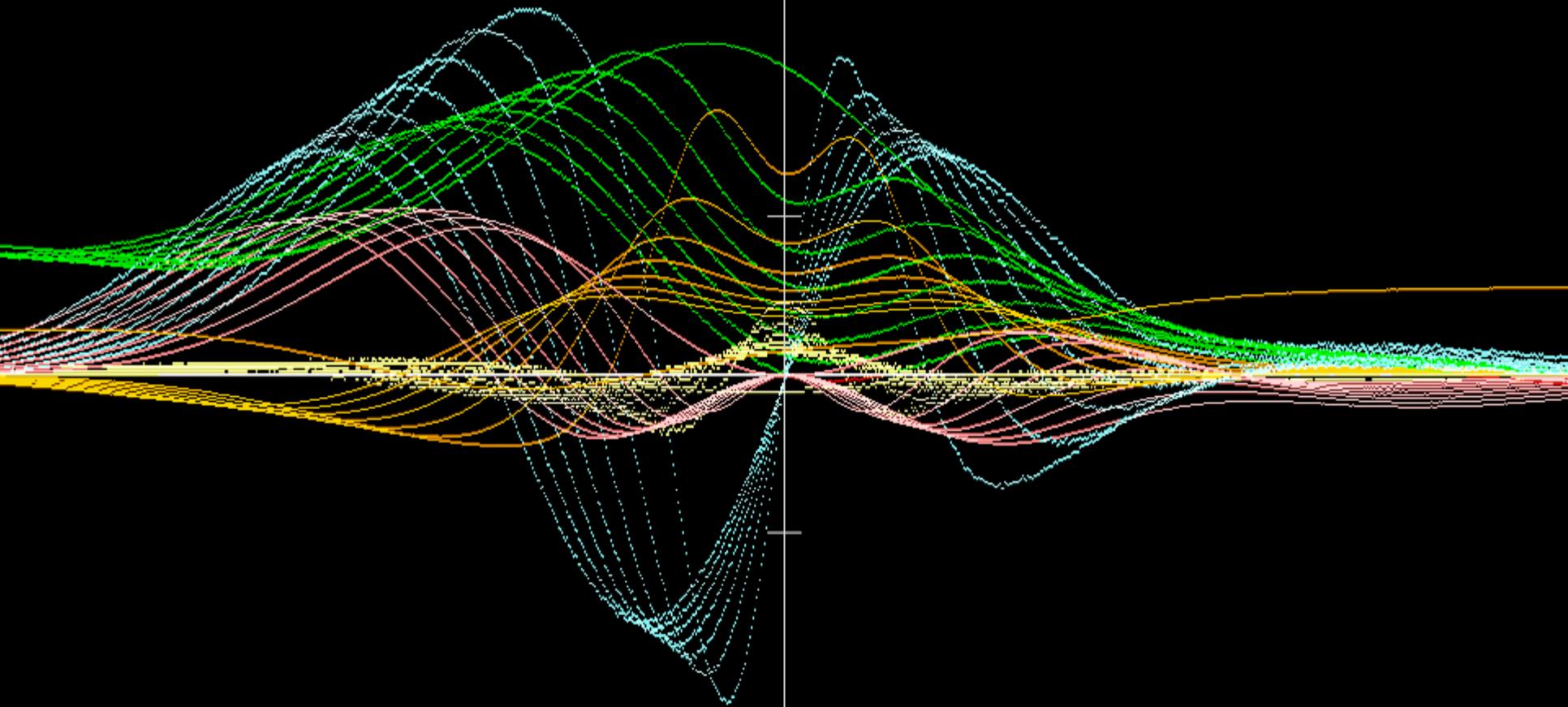
- Short Nov 1180 call = 46.80
- Long Nov 1180 put = 3.30
- Long Dec 1180 call = 55.50
- Short Dec 1180 put = 13.20
- Profit on Dec position = 426,000.00
- Loss on Nov position = -422,000.00
- Total = 4,000.00

Looking at the entire predicted future of the Jelly Roll:

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After calculating the position forward at three day intervals, we can see a sharp increase in gamma, theta, and overall price as we approach near term expiration.

With this information in hand, a decision is made to proceed until near term expiration.

On the 19<sup>th</sup> the AM SET comes in at 1195.73 and the November options go off the board. The sold Nov 1180 call finishes at 15.73, a gain of 6.47, the bought Nov 1180 put expires worthless, a loss of 20.90, a total of -\$144,300

We STC the bought Dec 1180 call at 33.65, a gain of .55, and BTC the sold Dec puts at 14.50, a gain of 18.90, a total of \$194,500 for an overall profit of \$50,200

Our model predicted:

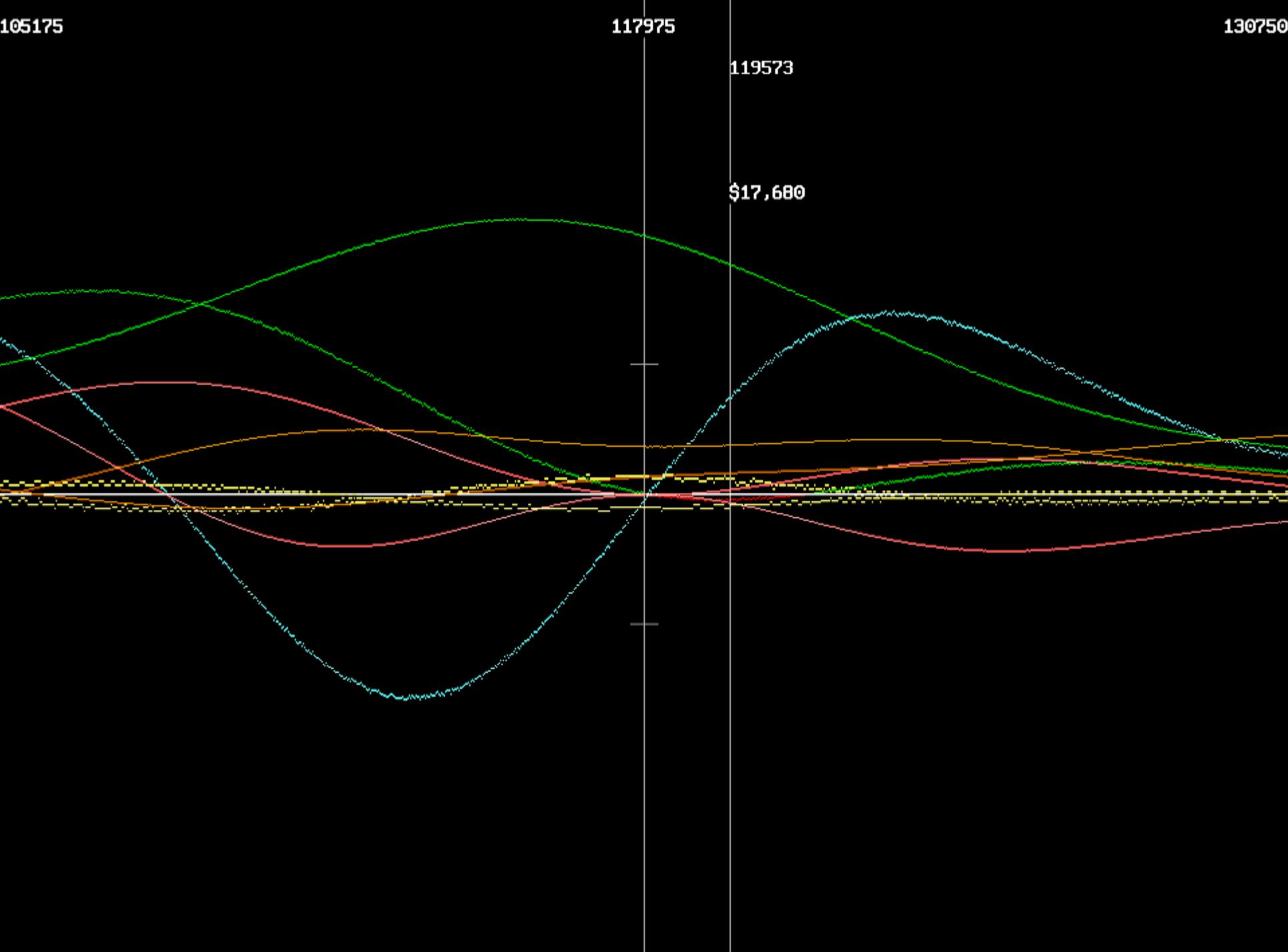
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119573

17,680



The model predicted a profit of \$17,680. Why the huge difference?

Most of the answer lies in the calculation of the sold December puts. The Dec 1180 put was predicted at 16.80 with a volatility of 18%, but was repurchased at 14.50, with a 16.63% volty. From 1225.85, the index moved down to 1195.73 and yet volatility still managed to decline.

Although the model attempts to predict the future mathematically, realtime prices are often the result of trader sentiment, an anomalous component. In this case it worked to our advantage, but could have easily gone the other way.