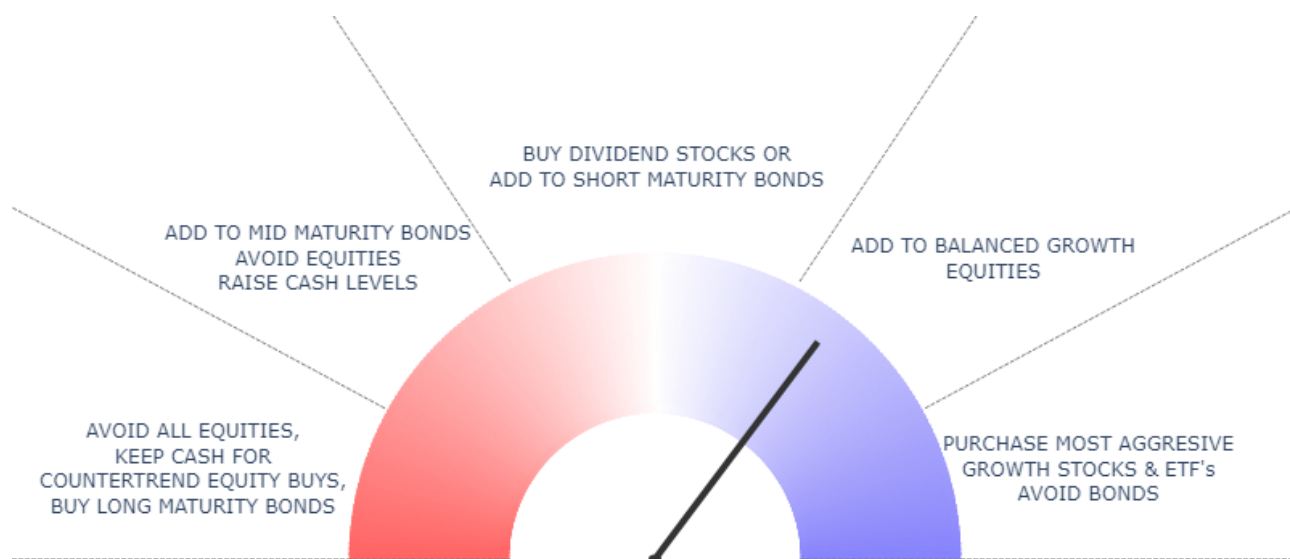
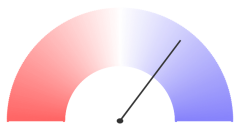




Model Score: 41.0

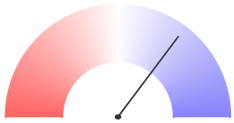
Daily Change: 0.0

Stance: Risk-On

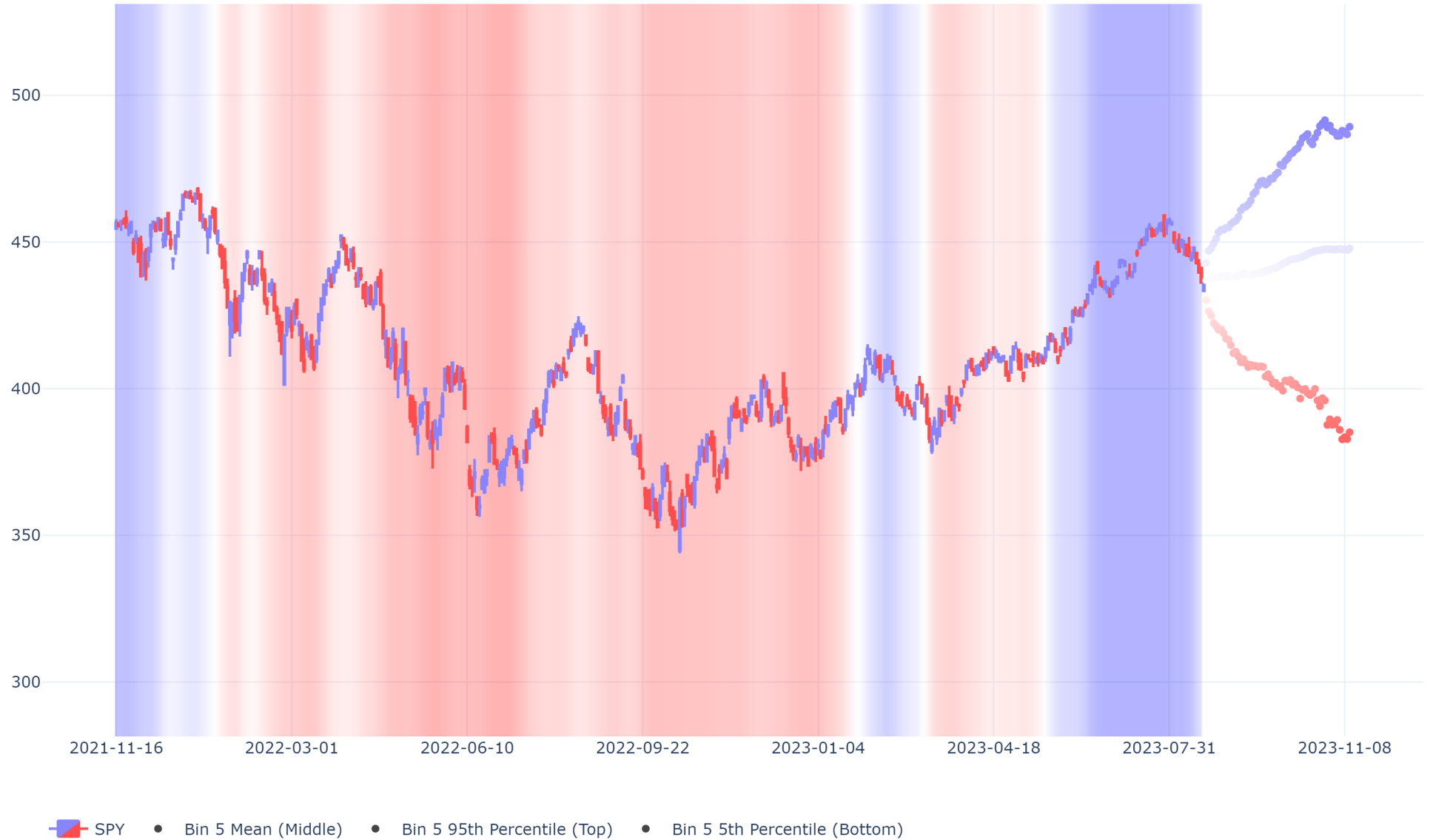
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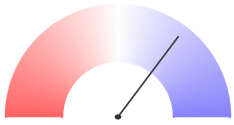
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August 21, 2023

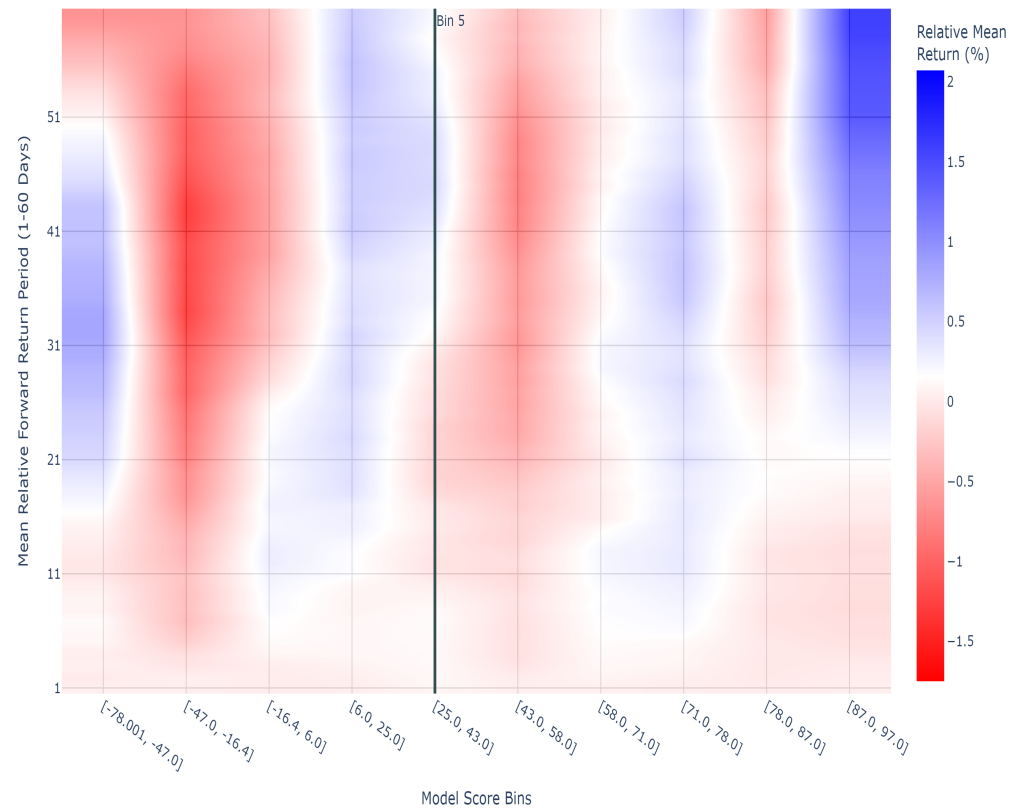


Model Score Derived SPY Price Ranges

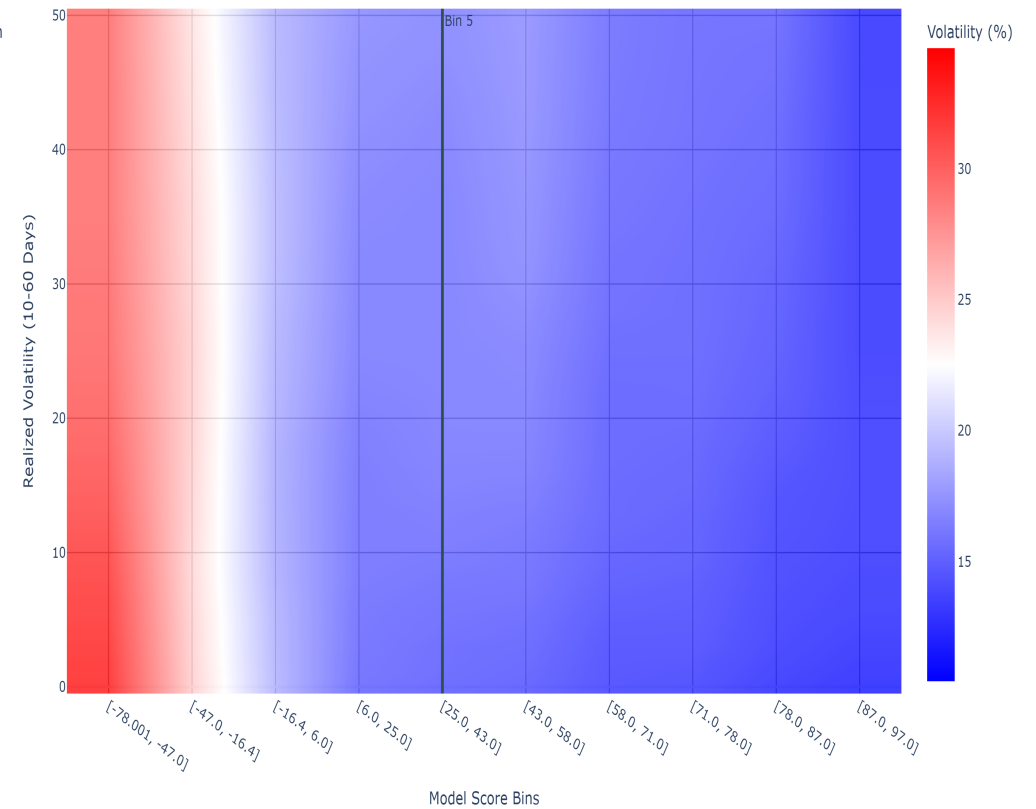


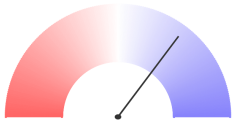


SPY Mean Relative Forward Return by Model Score Bin map



S&P500 Forward Realized Volatility by Model Score Bin map

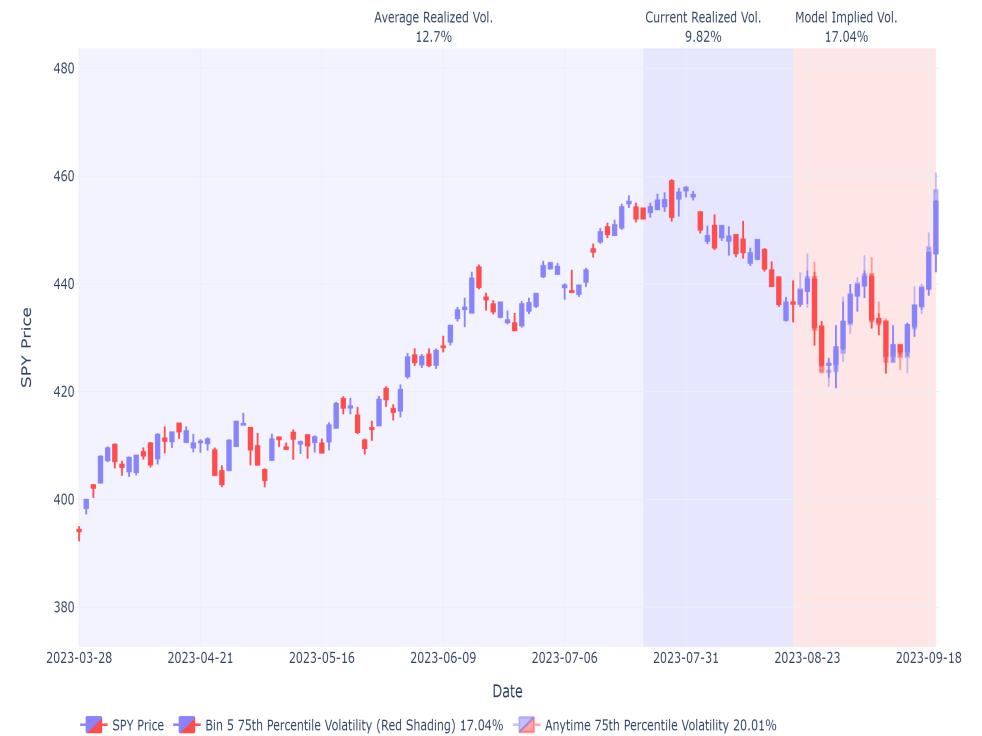


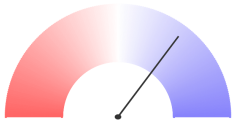


Model Bin Implied Mean Volatility

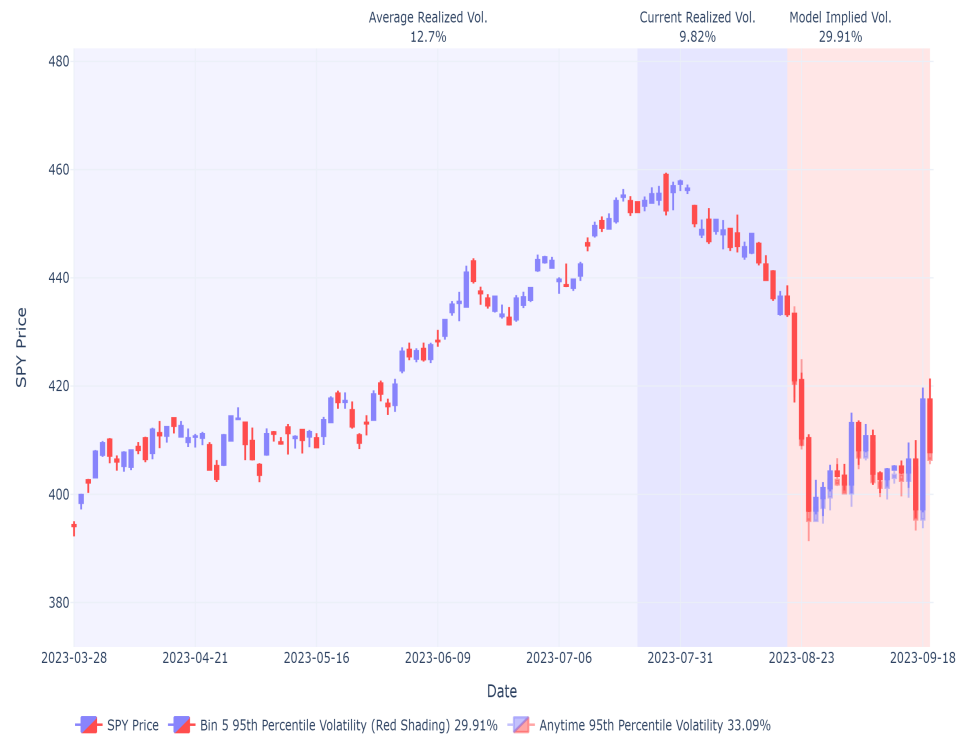


Model Bin Implied 75th Percentile Volatility

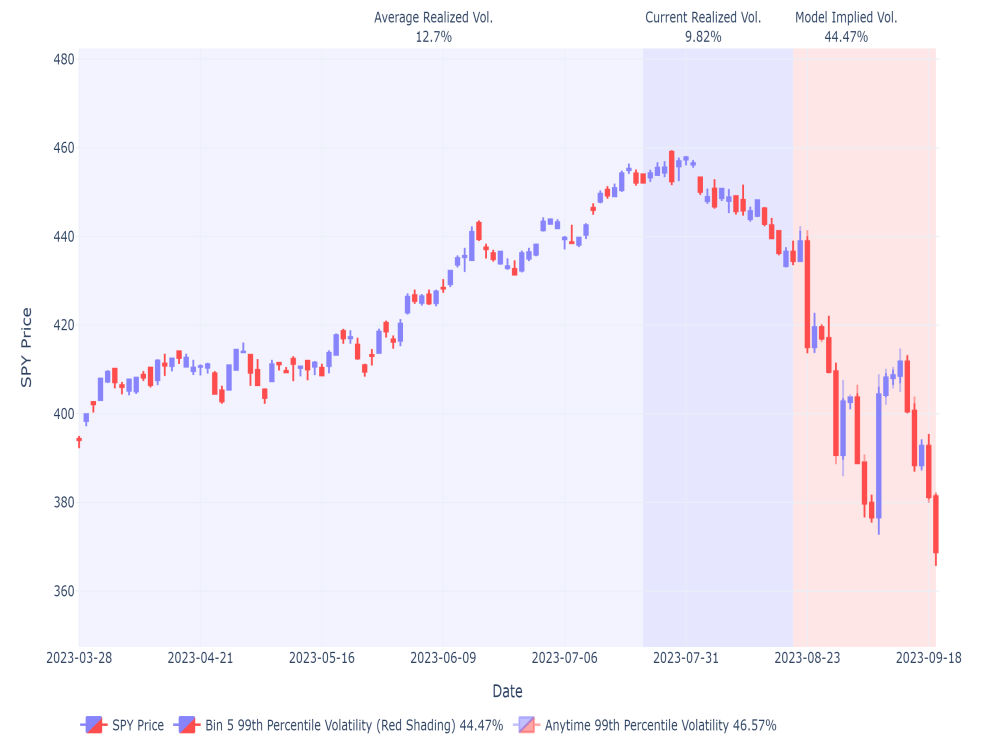


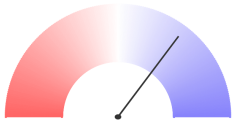


Model Bin Implied 95th Percentile Volatility

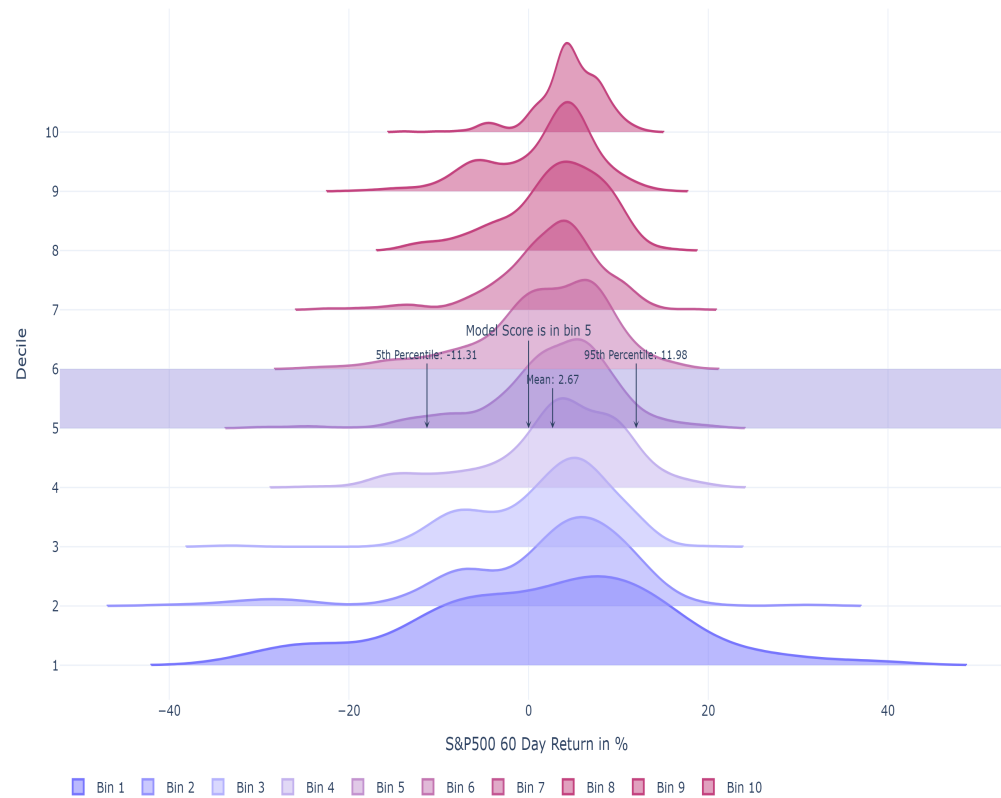


Model Bin Implied 99th Percentile Volatility

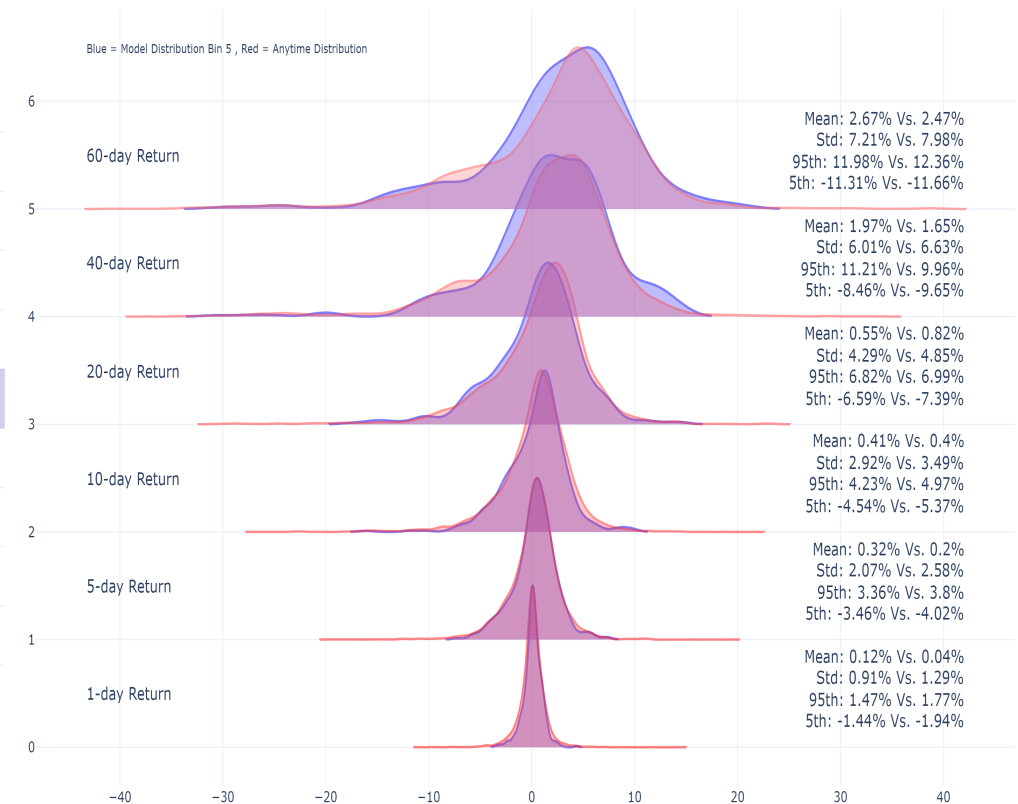


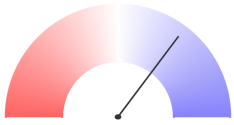


SPY 60 Day Return Distributions by Each Model Bin



SPY Multi Day Return Distributions by Current Model Bin





This report is for informational purposes only and should not be considered as investment advice. RiskDials is not liable for any decisions or actions based on the information provided in this report.

Chart 1 - Model Score Derived SPY Price Ranges

The Model Score Derived SPY Price Ranges presents two main pieces of information, the historical SPY price (candlesticks) and associated model score bin (background heatmap) as well as the forecast based on the model score bin.

1. Candlesticks and Heatmap: The candlesticks and heatmap allow a visual representation of historical price and the model score range through history.

- Heatmap Color: The heatmap color denotes the bin that the model was trading in through history. Deeper blues indicate strongly positive model scores while deeper reds indicate strongly negative model scores, on average.

2. Model Score Bin Forecast: The model score bin displays a forecast range using a mean return, 95th percentile return, and 5th percentile return.

- Mean Return: The historical average return for the SPY ETF associated with the current model score bin.

- 95th Percentile: Indicates a return that you would expect, based on history, to be exceeded just 5% of the time.

- 5th Percentile: The return that you would expect lower just 5% of the time.

- Color Shading: Positive returns will receive blue shading while negative returns will receive red shading. The mean return line is indexed to the 5th and 95th percentile lines - if the range of values between the 95th and 5th percentile returns is large the mean return line is likely to appear a neutral white. This helps explicitly show the lesser significance of the mean return forecast.

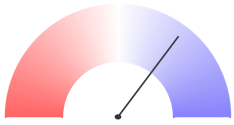


Chart 2&3 - Model Score Relative Returns and Volatility Maps

These maps quantify both relative returns (return in excess or deficit of normal SPY returns) and realized volatility (how much price can be expected to move around) for each of the 10 model bins.

1. Relative Returns Maps: The relative returns map calculates SPY returns for each day from 1-60 days as well as each model bin. This allows us to very quickly detect where returns may be more positive or more negative than normal, and on what time-period those returns occur on.

- Heatmap Color: Deeper blues indicate stronger positive relative returns. Deeper reds indicate stronger negative relative returns. Lighter blues, whites and lighter reds indicate returns are closer to normal market returns.

2. Volatility Maps: The volatility maps calculate SPY realized volatility for each period from 10 day realized volatility to 60 day realized volatility and for each model Bin.

- Heatmap Color: Deeper blues indicates lower realized volatility in a given model score bin. Deeper reds indicates higher realized volatility.

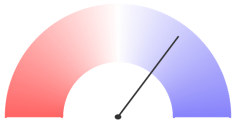


Chart 4 to 8 - Model Bin Implied Volatilities

These four candlestick charts simulate expected realized volatility based on the model score bin and compare them to a symmetric scenario of normal market realized volatility.

These charts are useful for identifying when expected realized volatility is materially different from normal market volatility.

1. The charts presented each show the mean, 75th, 95th and 99th percentile volatilities for the current market bin, respectively.

- Background Color Shading: Each candlestick chart is presented with a light blue (the average realized volatility to date (as shown on the chart)), a medium blue (the average realized volatility of the past 21 trading days) and a red (the expected realized volatility contrasted to the normal market volatility).

- Candlestick Color Shading: The historical candlesticks are presented in the blue/red combination. Similarly the model derived volatility forecast candlesticks are in the same shade. The normal market volatility candlesticks are compared in a translucent shade.

- Candlestick Forecast Divergence: A model Bin is particularly important when its volatility forecasts differ materially from the normal market volatility. This phenomenon is evident in both the more bullish and bearish deciles when the candlesticks exhibit significantly different returns and ending points.

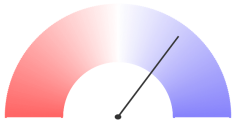


Chart 9 and 10 - Model Bin Return Distributions

The Model Bin Return Distributions visualize return asymmetries and biases of SPY returns and volatility. Two charts are presented. The first chart depicts SPY 60 day returns for each Model Bin (1-10). The second chart depicts multi-time period returns (1-60 days staggered) for the current Model Bin.

1. SPY 60 Day Returns by Model Bin

- This chart shows the point in time SPY returns at 60-days forward broken out in each row by model Bin. The top of the chart shows Bin 10, the most bullish model score range. The bottom of the chart shows Bin 1, the most bearish model score range. A peakier distribution with less values distributed widely amongst the X axis eg. Bin 10 indicates a more predictable bullish distribution. A flatter, wider distribution is indicative of a more volatile Bin and where point in time estimates are more unpredictable eg Bin 1.

2. SPY Multi Period Returns By Current Bin

- This chart filters the data by the current Model Score Bin - and then plots multi period returns from each day from 1 days staggered to 60 days. The chart compares each periods return to the markets normal returns during that period to highlight similarities and anomalies.

