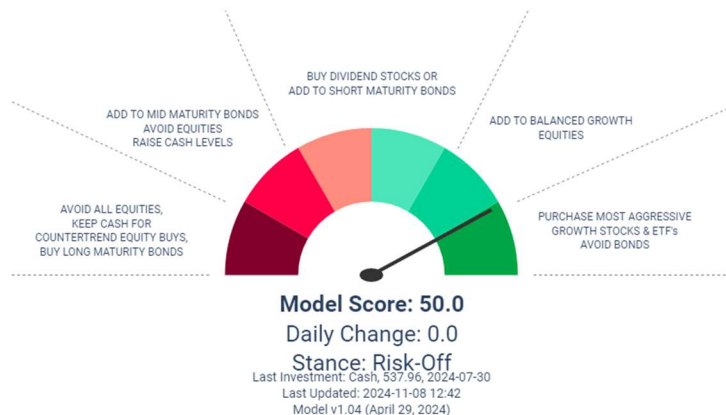*Classifying Risk Regimes for the S&P500*

Risk-On | Risk-Off

1 December 2024

This primer aims to cover the main drivers behind Riskdial model. The primer will cover:

1. **What is the Riskdial?**
2. **Drivers**
3. **Features: Spread Ratios**
4. **Features: Volatility Spreads**
5. **Model Risks and Limitations**

Model Score: 50.0
Daily Change: 0.0
Stance: Risk-Off
Last Investment: Cash, 537.96, 2024-07-30
Last Updated: 2024-11-08 12:42
Model v1.04 (April 29, 2024)

What is the Riskdial?

First, what the Riskdial is not. The Riskdial is **not a model that is meant to earn returns in excess of the market**. The model is not designed to catch tops or bottoms. **The model is a Risk model with a mandate to** avoid periods of high volatility**.** More specifically…

The model's premise is that **if money is flowing into one asset, it must flow out of another**. The Riskdial tracks this money flow via intermarket trend measurements between **Risk-On** assets like the S&P500 with **Risk-Off** assets such as Bonds. These relationships are quantified into a single score, providing a measure of whether investors are moving money towards **Risk-On** assets or **Risk-Off** assets. In essence, when a **Risk-On** asset outperforms a Defensive asset, the model yields a positive score; conversely, underperformance results in a negative score. A smoothed model score determines the model stance as well as buy and sell execution.

Riskdials Model

During periods where investors are favoring Defensive assets over Risky assets, **Risk-Off**, the volatility of SPY returns is considerably higher. One-day SPY returns have historically fallen within +- .84% of the average spy return of .05%. During **Risk-Off** periods, 1-day SPY returns have historically fallen with +- 1.4% of the average SPY return. The first chart (left) shows this dynamic with the **Risk-Off** distribution encapsulating the **Risk-On** distribution.
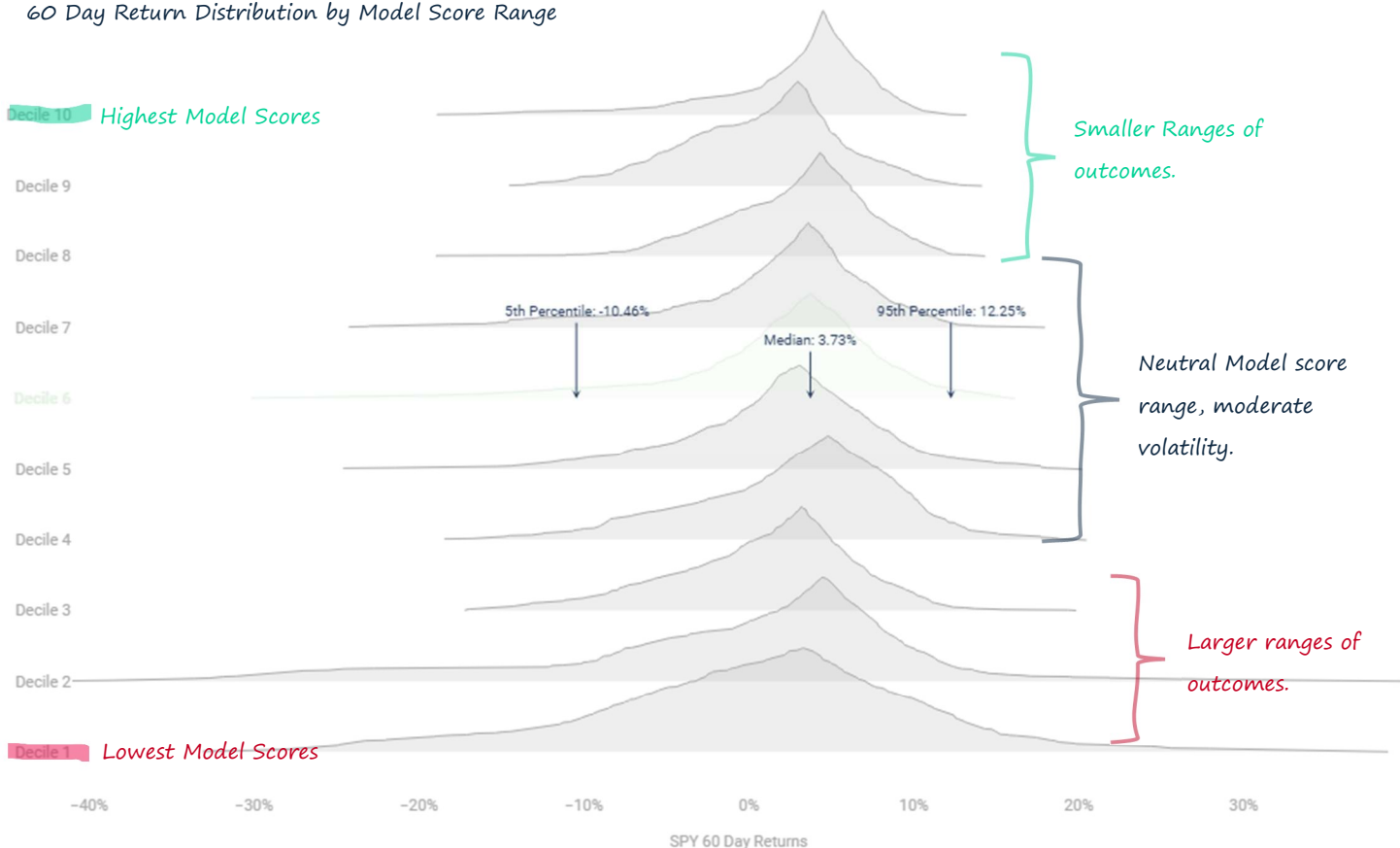

SPY 1-Day Returns Risk-On Vs. Risk-Off

Risk-On Standard Deviation of Returns: 0.84%

Risk-Off Standard Deviation of Returns: 1.40%

The *Risk-On* distribution fits well within the *Risk-Off* distribution.

SPY 60-Day Returns Risk-On Vs. Risk-Off

Risk-Off Median return lower (though still positive)

Risk-On Standard Deviation of Returns: 4.48%

Risk-Off Standard Deviation of Returns: 7.67%

10% of the time the SPY will return -10% or lower over 60 days while in *Risk-Off*.

Over longer-timeframes, such 60 days (right chart), we can not only see the larger volatility in the **Risk-Off** regime, but also the lower median returns and higher proportion of negative returns. While the S&P 500 has never lost more than 10% in a 60-day period during **Risk-On** regimes, it loses 10% approximately 10% of the time in Risk-Off regimes based on historical overlapping data.

The chart below displays return distributions across model score ranges. Unlike the pronounced skewness observed in the **Risk-On** and **Risk-Off** regimes, the distributions across score ranges are more balanced, suggesting that the regime is generally more predictive than the score. However, some general patterns can still be observed, as annotated on the chart.


60 Day Return Distribution by Model Score Range

Decile 10 *Highest Model Scores*

Decile 9

Decile 8

Decile 7

5th Percentile: -10.46%   95th Percentile: 12.25%

Median: 3.73%

Decile 6

Decile 5

Decile 4

Decile 3

Decile 2

Decile 1 *Lowest Model Scores*

Smaller Ranges of outcomes.

Neutral Model score range, moderate volatility.

Larger ranges of outcomes.

SPY 60 Day Returns

Drivers

The Riskdial closely tracks intermarket trends, with a key focus on the correlation between S&P 500 sectors. The heatmap below, generated on October 18, 2024, illustrates the 30-day correlation of each sector's returns with the overall S&P 500. **Red hues** indicate strong correlations, while **Blue hues** signify weaker correlations, providing a clear visualization of the primary drivers behind the S&P 500's price movements. The sectors are sorted from highest to lowest correlation based on the most recent data. Notably, this heatmap reveals…

Risk-On Sectors, Technology (XLK) and Consumer Discretionary (XLY) returns consistently have the highest correlation to SPY returns.

Risk-Off Sectors, Consumer Staples (XLP) and Utilities (XLU) returns consistently have the lowest correlation to SPY returns.

100-Day Rolling Correlation of Returns to SPY of Each Sector SPDR ETF
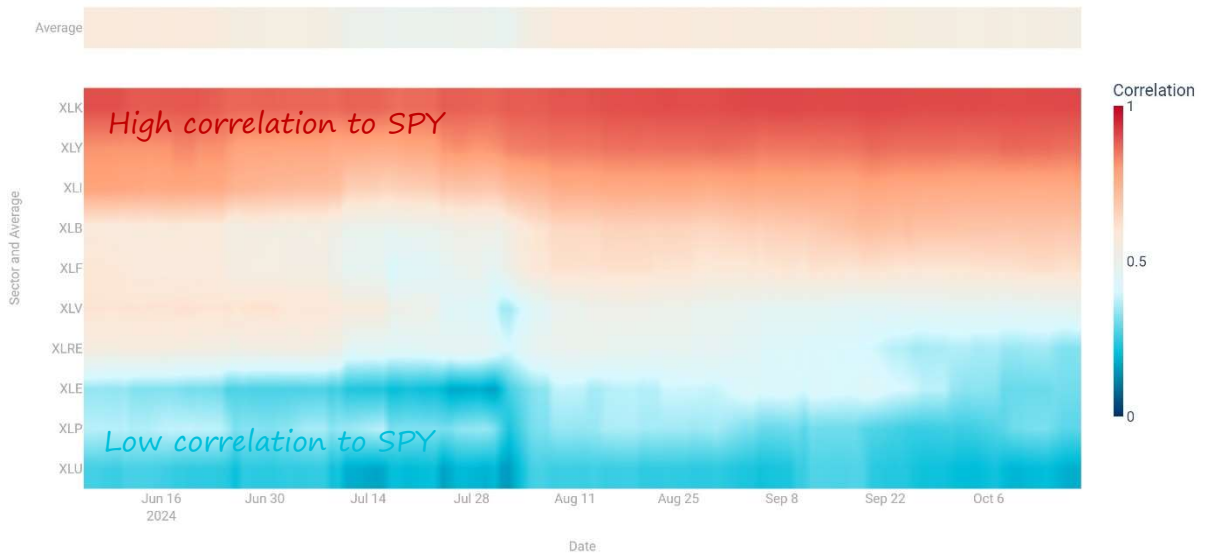
These sectors also generally have low correlation with each other as shown on the matrix below.

S&P 500 Sector 100 Day Correlation Matrix

The Average Correlation is: 0.36
The Strongest Pair is: XLI - XLF (0.79)
The Weakest Pair is: XLE - XLP (-0.09)
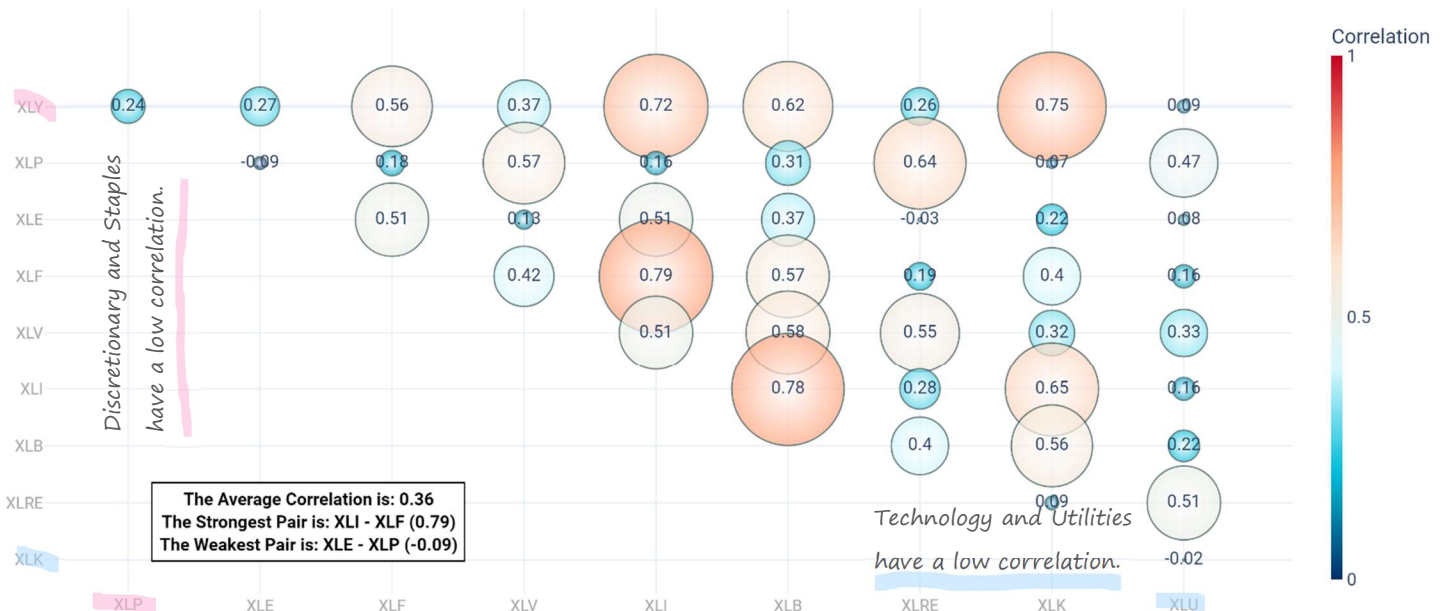
Thus, the main drivers of S&P500 price action are the Technology and Consumer Discretionary sectors. While these relationships can and do break over shorter term periods, we believe that these correlations should continue to hold, on average, for the foreseeable future, after all, XLK is America: Givanovic, N. (2017, June 18). *XLK we regard as the most important segment of the American market… it is what America is good at: software, high tech, and all the goods we associate with America… If you think about the States, you think about Microsoft, Apple, and XLK.*

Since the turn of the century Technology stocks via XLK have had consistent and highly positive correlations to S&P500 daily returns. The correlations have strengthened over time with technology stocks daily return having a .9 correlation to the SPY daily return.

Technology Vs. S&P 500 1-Day Returns by Decade
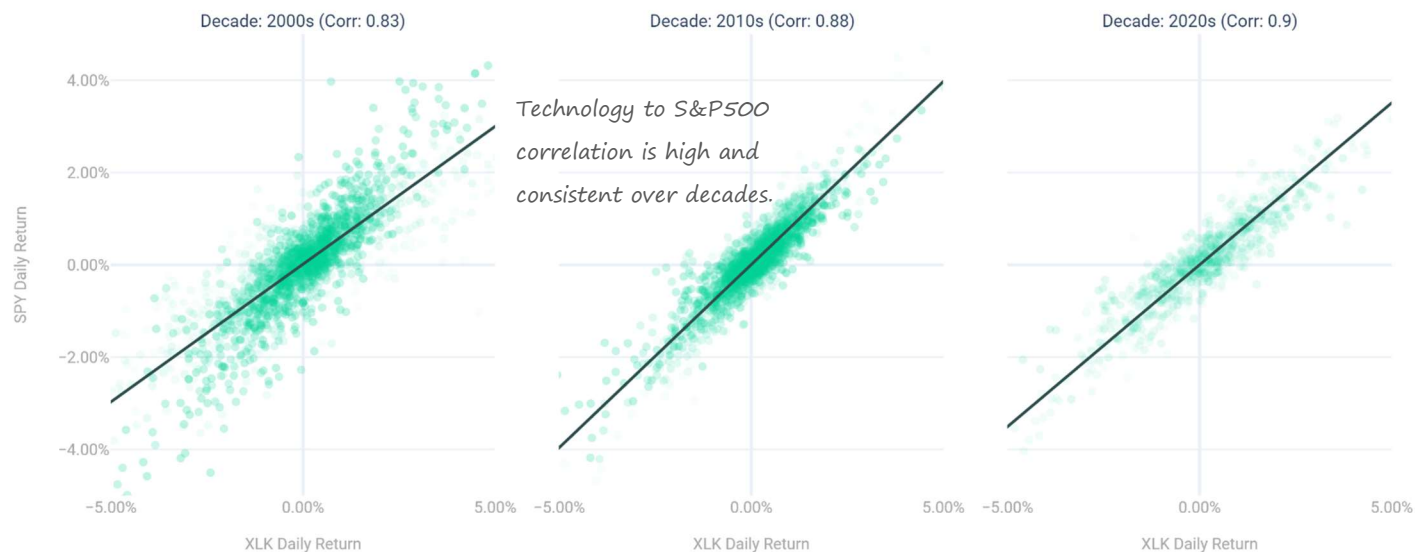
Consumer discretionary stocks have consistently shown a highly positive correlation since the 2000s.

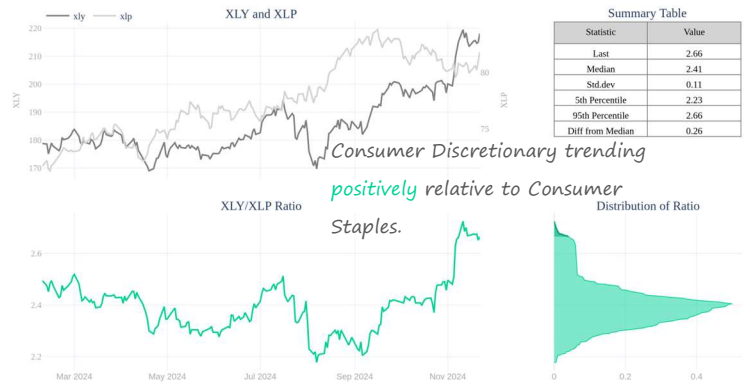## Consumer Discretionary Vs. S&P 500 1-Day Returns by Decade
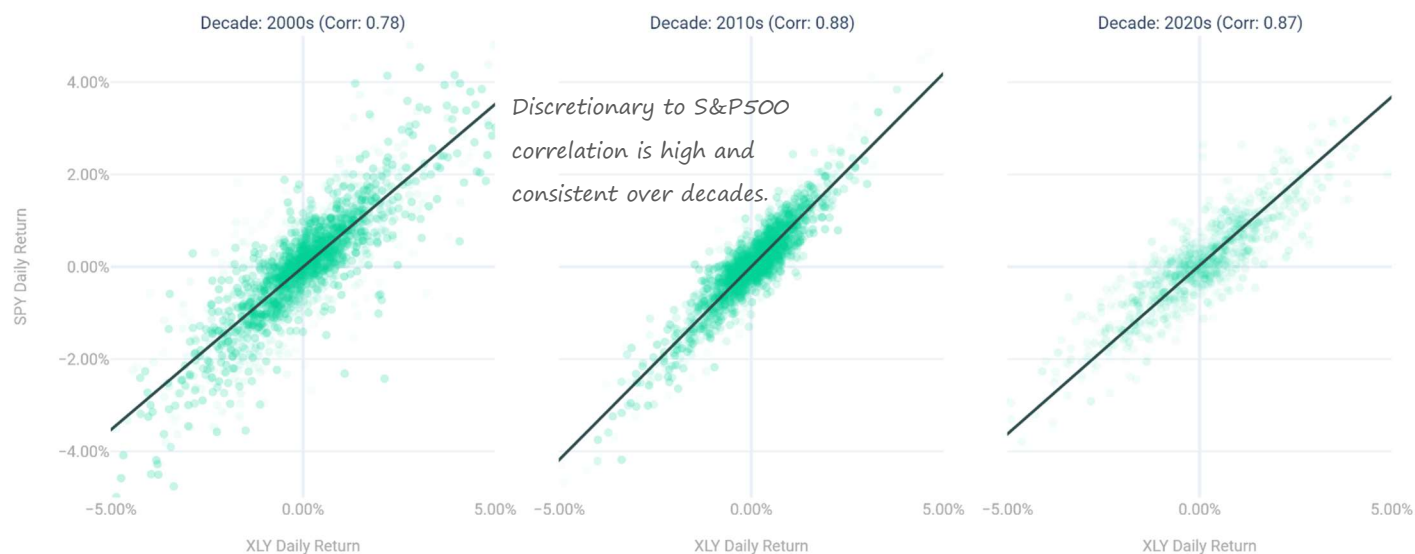
Spread Ratios

Having identified the sectors with the highest and lowest correlations to the S&P 500, we can create **spread ratios** to analyze relative trends (money flow) between **Risk-On** and **Risk-Off** sectors. Comparing Consumer Discretionary (XLY) to Consumer Staples (XLP) and Technology (XLK) to Utilities (XLU) allows us to quickly assess risk appetite.
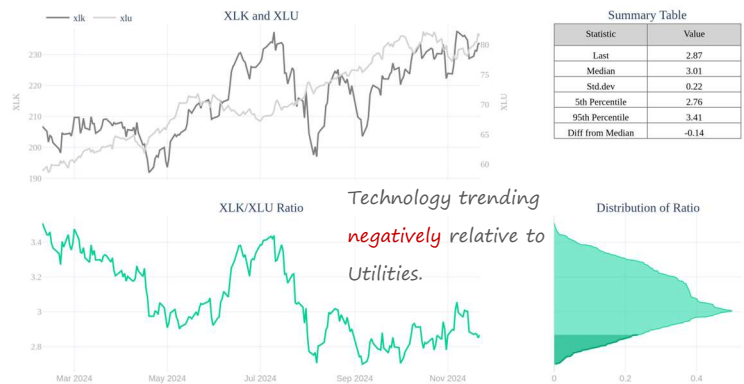
The first chart on the right compares Consumer Discretionary to Consumer Staples. The top left pane shows the outright prices, while the bottom left displays the ratio between them. Currently, the ratio stands at 2.43, above its median (as represented by the peak of the distribution in the bottom right). With the ratio near its highs for the last 200 trading days, the Riskdial Model classifies this spread as **Risk-On**, indicating that investors are favoring Consumer Discretionary stocks over Consumer Staples.

XLY to XLP Ratio Analysis

Summary Table	
Statistic	Value
Last	2.66
Median	2.41
Std.dev	0.11
5th Percentile	2.23
95th Percentile	2.66
Diff from Median	0.26

Consumer Discretionary trending positively relative to Consumer Staples.

Next, we look at Technology (XLK) to Utilities (XLU). The top left pane shows the outright prices of XLK and XLU, while the bottom left displays the ratio between them. Currently, the ratio stands at 2.82, well below its median after peaking around 3.43 during a strong rally earlier in 2024. With the ratio near its lows of the past 200 trading days, the Riskdial Model classifies this spread as **Risk-Off**, indicating that investors are showing a preference for Utilities over Technology stocks.
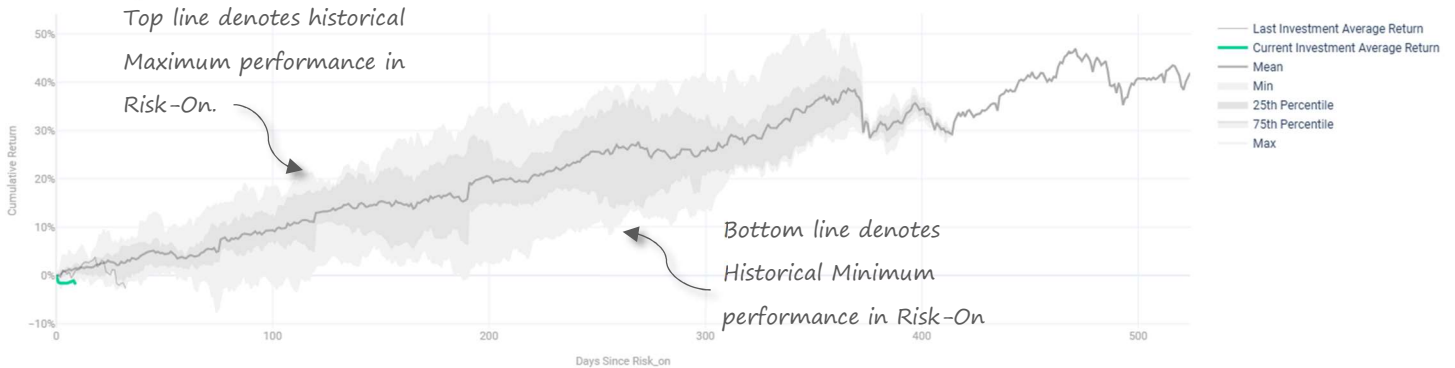
To track the overall performance of a basket of **Risk-On** and **Risk-Off** ratios since the stance switch, we compare the current return since the model switched stances to historical returns. This allows us to identify any abnormalities from normal performance.

XLK to XLU Ratio Analysis

Summary Table	
Statistic	Value
Last	2.87
Median	3.01
Std.dev	0.22
5th Percentile	2.76
95th Percentile	3.41
Diff from Median	-0.14

Technology trending negatively relative to Utilities.

Risk-On Performance Bands (Average Performance of Risk-On/Risk-off Ratios)

The Model is currently in Risk-On

Top line denotes historical Maximum performance in Risk-On.

*Bottom line denotes Historical Minimum performance in Risk-On*

Volatility Spreads

We track two main volatility metrics in the model, the **Volatility Risk Premium** (VRP) and **Volatility Term Structure** (VTS).

The VRP quantifies the cost of securing one-month protection for an investment portfolio using the implied volatility of S&P 500 options, relative to the realized volatility observed over the preceding month. This concept aligns with the general principle that insurance usually requires a premium to compensate the risk that the sellers are taking. When the spread between the VIX and 21-day Historical Realized Volatility is positive, it indicates a volatility risk premium—protection is priced higher than recent volatility levels. Conversely, a negative spread reflects a lack of volatility risk premium, implying that relative to the prior month's volatility, the price of insurance is comparatively low.

We track the VTS via the VIX index relative to the 3-month VIX index i.e. VIX divided by VXV. Normally the VIX index is lower than the 3 Month VIX index a condition called **contango**. When the VIX is higher than VXV the term structure is **backwardated**, a strong indication of elevated future realized volatility and an indication that market participants need immediate protection.
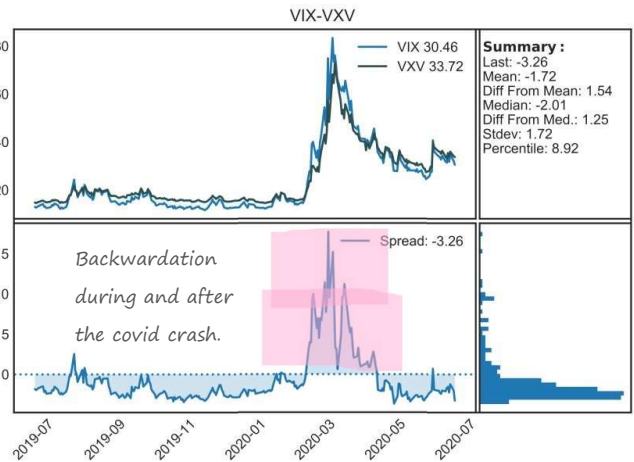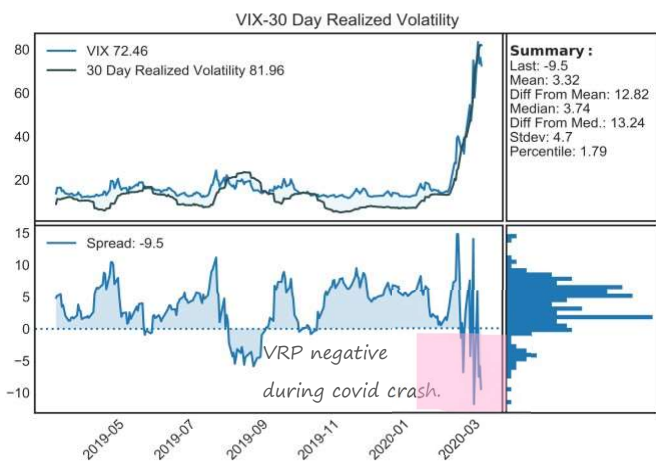
The charts above illustrate VRP and VTS leading up to and during the COVID crash. Throughout the crash, VRP remained consistently negative and VTS persistently backwardated. In highly volatile marker periods, these patterns are typical. As such, the Riskdial designates these conditions, a negative VRP and a backwardated VTS, as **Risk-Off** periods.
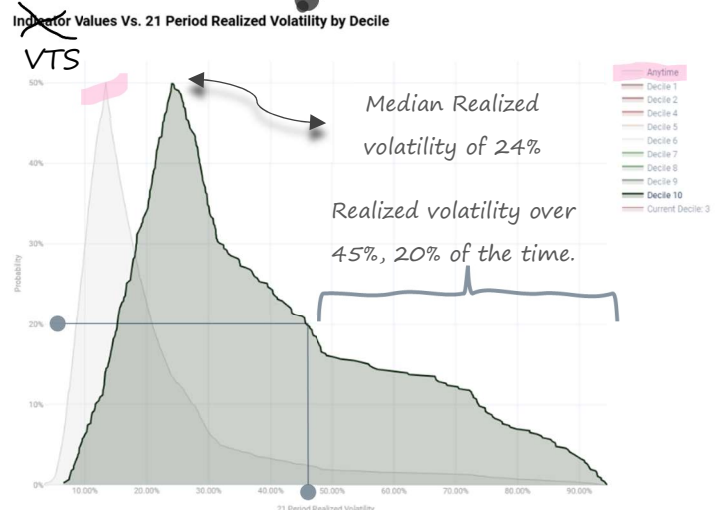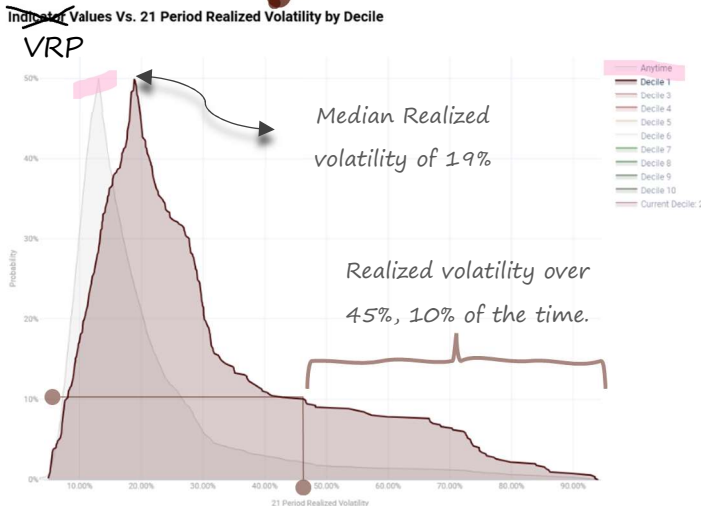
**Model Risks and Limitations**

We have developed the Riskdials model using features that we believe effectively predict volatility across various asset classes. However, we acknowledge that all models entail inherent risks. Below, we outline the **model risks** we anticipate.

Spread Ratios Correlation Breaks… There is a near certain probability past relationships will change in the future as the market itself evolves. The most reported on example of such a change is the relationship between long-term bonds and stocks.

For example, in the 1970s to 1990s increasing 30 Year Bond yield *(bond prices down)* resulted in *negative* daily returns in the S&P500. That dynamic flipped in the 2000s and 2010s where an increasing 30 Year Bond yield resulted in *positive* S&P500 returns. Since the COVID crash the net correlation has been nearly 0. Bonds are no longer the diversifier they were in the 2000s and 2010s.

30-Year Bond Yield Changes vs. S&P 500 1-Day Returns by Decade
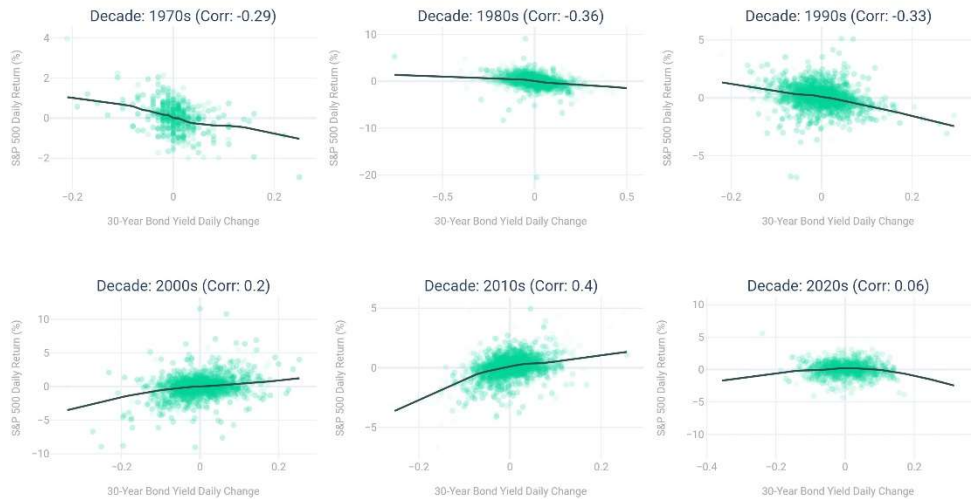
That brings us to the next risk, **Concentration Risk.** The Technology sector and more specifically the Magnificent 7 are a notable portion of the entire S&P500 and as such these stocks should and are, in-fact, amplifying returns on the S&P500. The chart below highlights the amplification dynamic. The X axis is S&P500 sector correlations which are filtered to be below .3. The Y axis highlights the 1-day SPY return. There have been 6 days in 2024 where concentration Risk has materialized, primarily concentrated in July and early August during the Yen debacle. The presence of concentration risk suggests that the model will deviate from historical performance, demonstrating amplified returns on both the upside and downside.

Evolution of 10-Day Sector Correlation vs SPY 1-Day Return
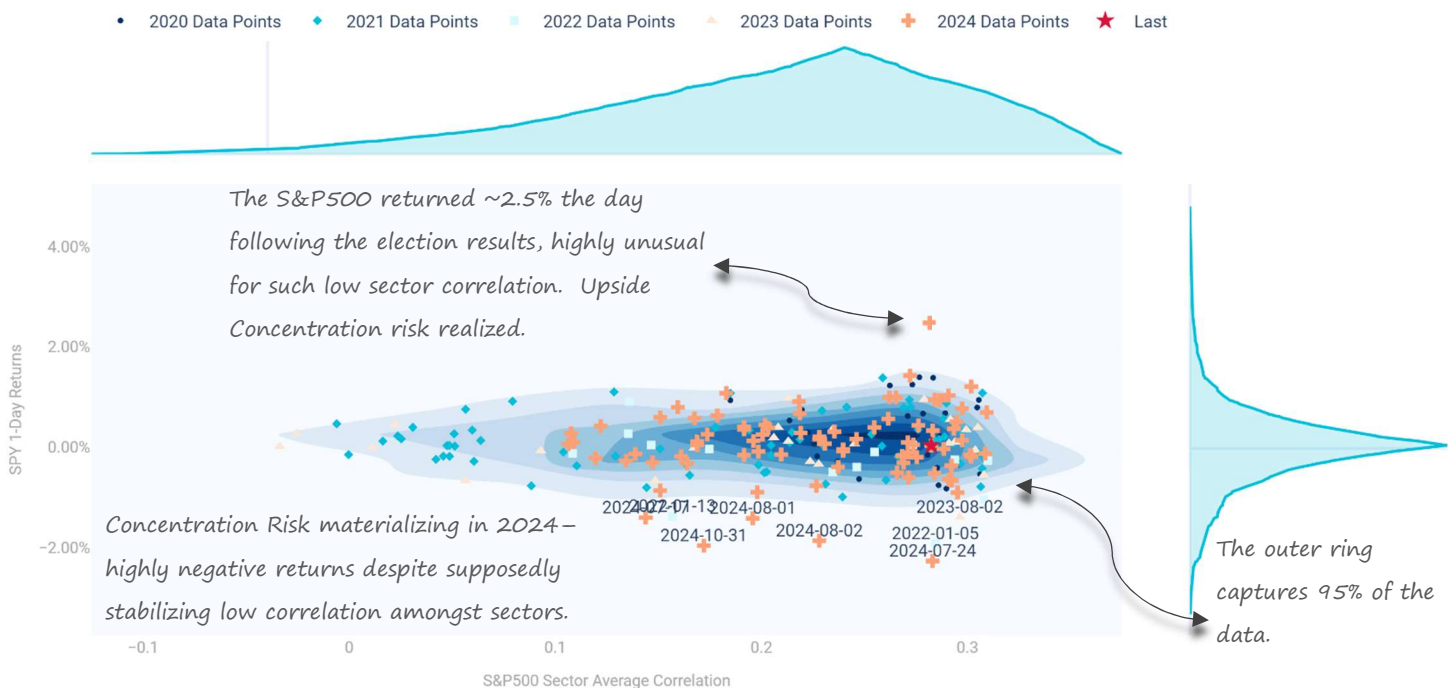
Timeframe Bias: Over the entire range of the model history, the 2008 bear market significantly impacts model performance (positively). Subsequent bear markets have been rather shallow either from a drawdown perspective or from a total time perspective. The model is designed to avoid the most volatile periods in the market, and while it does that precisely, it is slow to turn back into **Risk-On**.

We can see this in the equity curve to the right. With a starting point of January 1, 2010, the model from an absolute returns perspective underperforms by nearly 60%.* So why is this underperformance happening…?
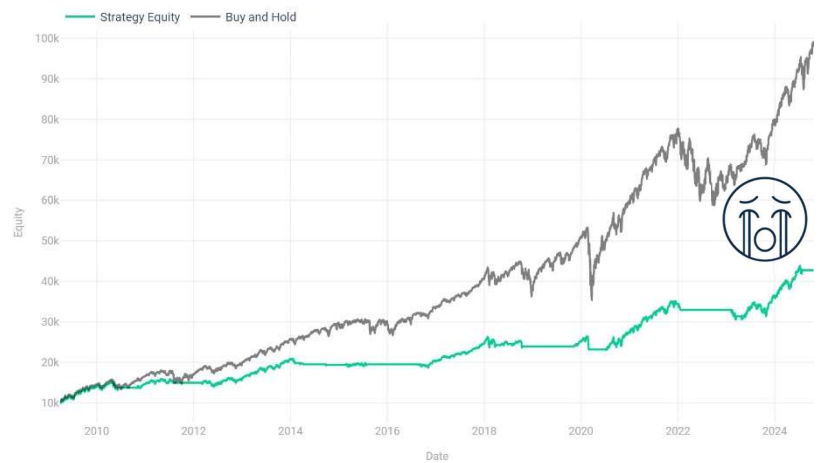
In 13 of the historical **Risk-Off** classifications by the model, 11 instances have seen the S&P500 close higher than where the model entered **Risk-Off** by a median of 6.53%. This is shown on the chart below where there

Model Equity Curve

only 2 Risk-Off periods where the S&P500 did not close higher than where the model entered include the Great Financial Crisis in 2008 and the interest rate hiking cycle of 2022.

## SPY Drawdowns Each Time Riskdials Model Switches to Risk-Off

Red shading denotes periods where the model score turned highly bearish
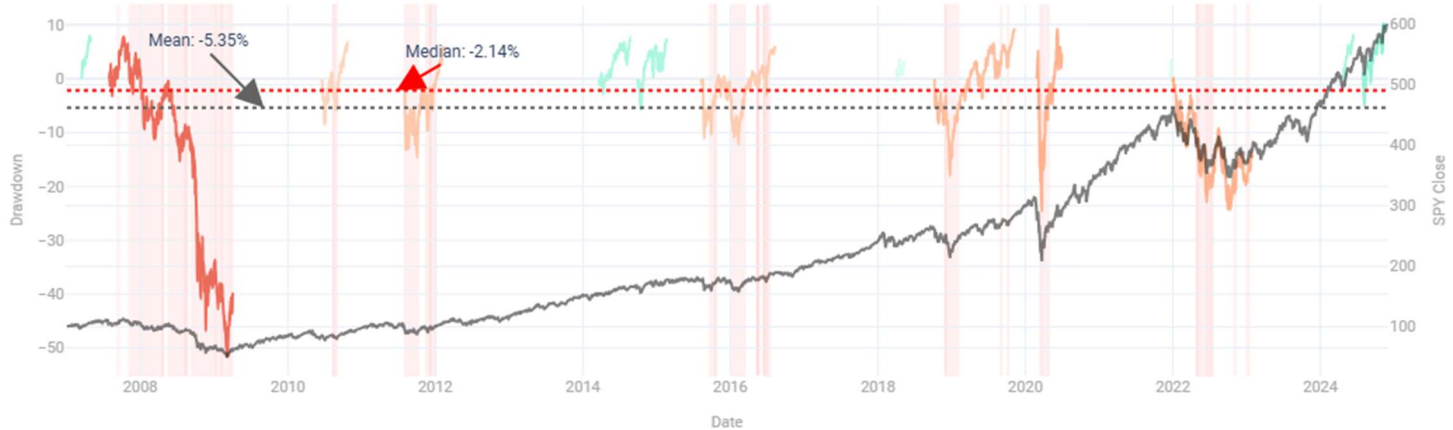
The explanation for this (at least historically) boils down to what happens during and after the **Risk-Off** event. At the start of or leading up to **Risk-Off** events S&P500 average sector correlations have historically tended to spike – stocks sell off together. After the initial spike average correlations remain high indefinitely. At 100 days into the **Risk-Off** the median correlation is about .72. During the recovery, **stocks continue to rise in tandem and the risk metrics that are most predictive of volatility stop warning well after bottoms have established themselves.**

A significant portion of this performance gap can be closed by building a portfolio of Risk-Off assets. The Riskdial maintains an equity or cash position to ensure signal clarity.
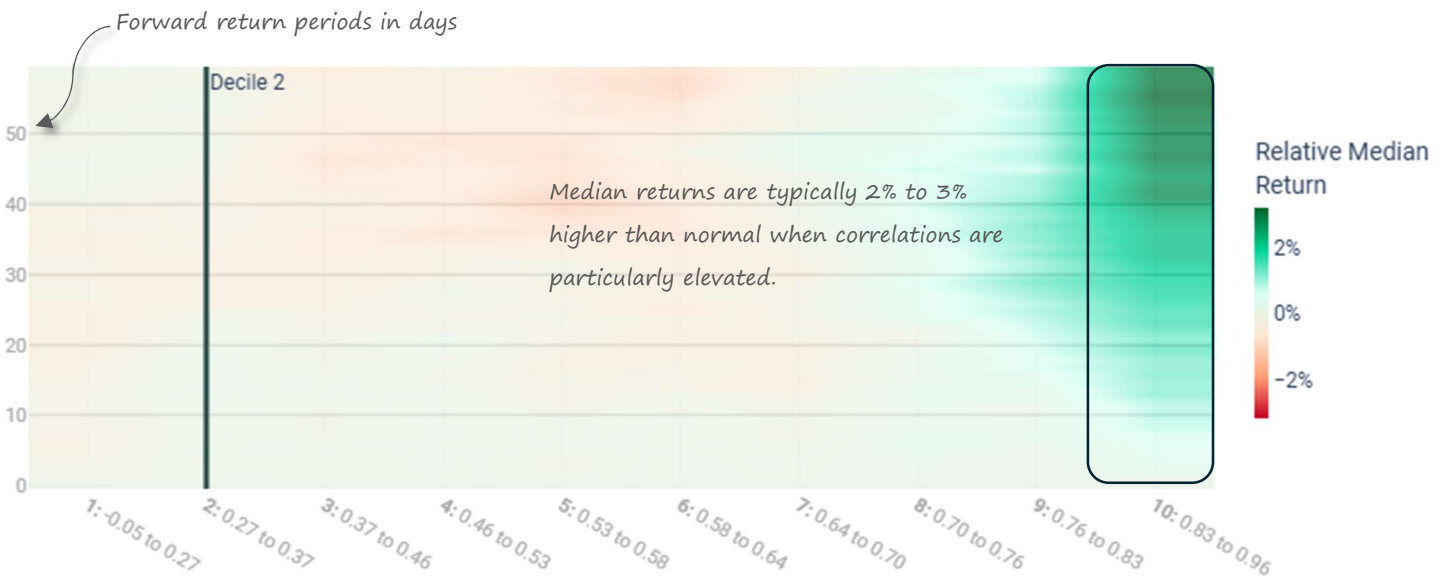
100 Day S&P500 Sector Correlations T-100 to T+100 Risk-Off Signals

S&P500 Sector correlations typically spike during Risk-Off and then remain elevated for an extended period.
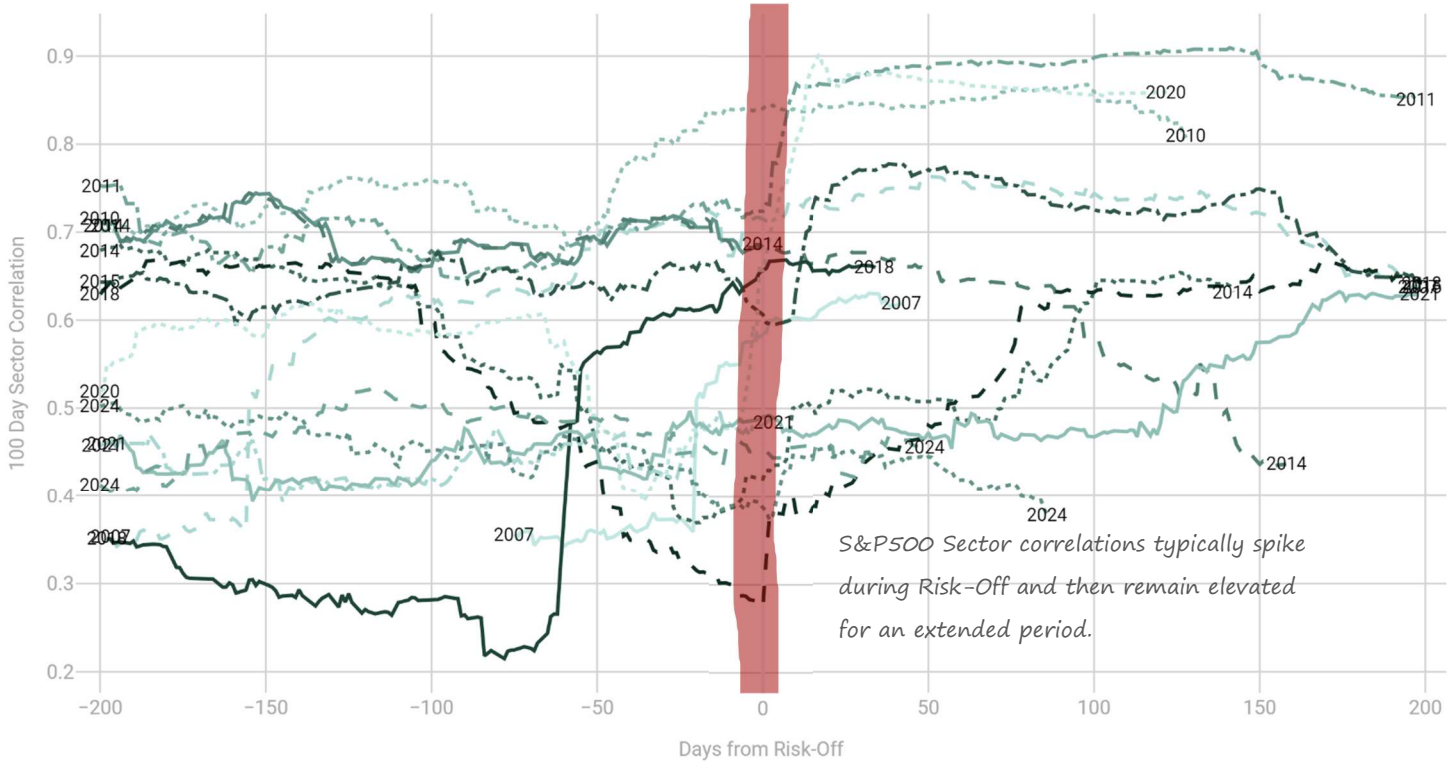
What does it mean if money flows into all sectors simultaneously, well after the bottom of a **Risk-Off** event? The premise that, **if money is flowing into one asset, it must be flowing out of another** is… less true (at least from an inter-sector perspective) … **There is a lot more signal from sector spread ratios when correlations are lower rather than when they are higher…**

When sector correlations are high, we can make a few historical observations. Relative median returns are highest over multiple timeframes. While the S&P500 returns a median 3.76% over 60 days normally, the S&P500 returns a median of 6.8% when correlations are above .83. This makes sense, when everything is 'bid' at once, the positive returns should be higher. However, we should be skeptical of that dynamic because…

SPY   Sector Correlation

1 to 60 period Median Relative returns Across ~~Indicator~~ Values and Timeframes

Forward return periods in days

Median returns are typically 2% to 3% higher than normal when correlations are particularly elevated.

The level Risk is the highest, especially over a ~1-month period. The period we've analyzed, spanning from around 2005 to the present, has largely been dominated by a 'buy-the-dip' environment, with notable exceptions like the 2008 financial crisis and the 2020 COVID crash. Can that continue indefinitely into the future? Possibly... Will it, probably not... Correlations should first be used as an expectation of future volatility rather than an indicator of the direction of future returns. While normal 95th percentile 1 month realized volatility is about 31.5%, 95th percentile realized volatility when correlations are above .83 is over 60%.

1 to 60 period 95th Percentile Relative Realized Volatility Across Indicator Values and Timeframes
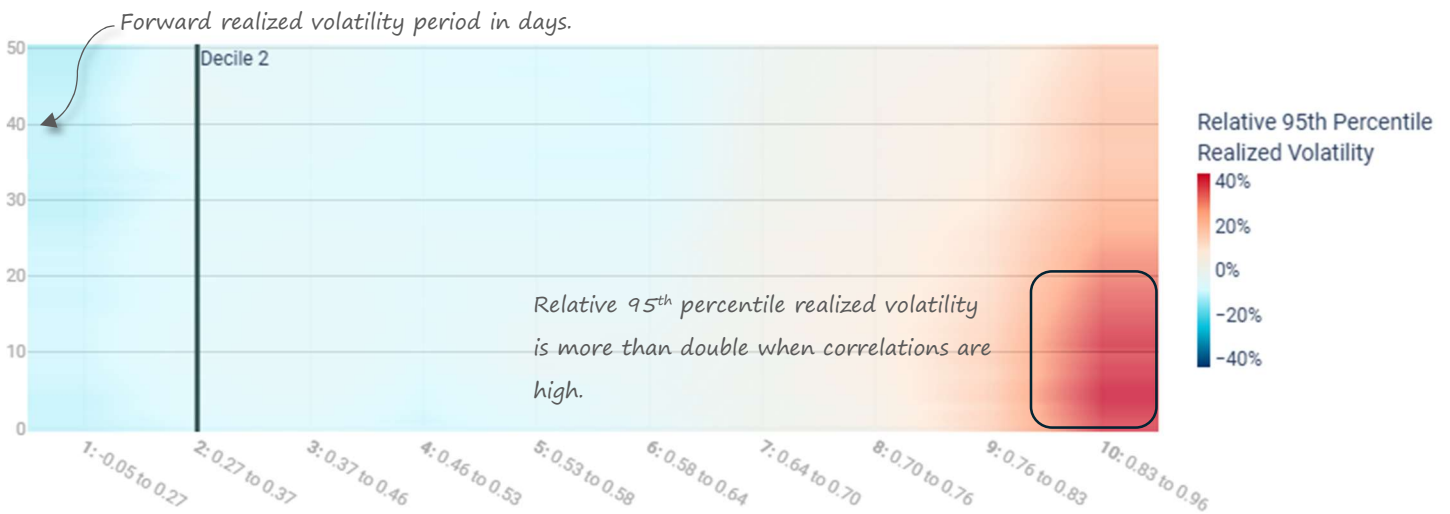
Take the 2020 market crash for example. Short-term correlations hit ~ .9 on February 27th, closer to the start of the crash than the end – much better at predicting realized volatility than future returns.

S&P500 Sector Average Correlations
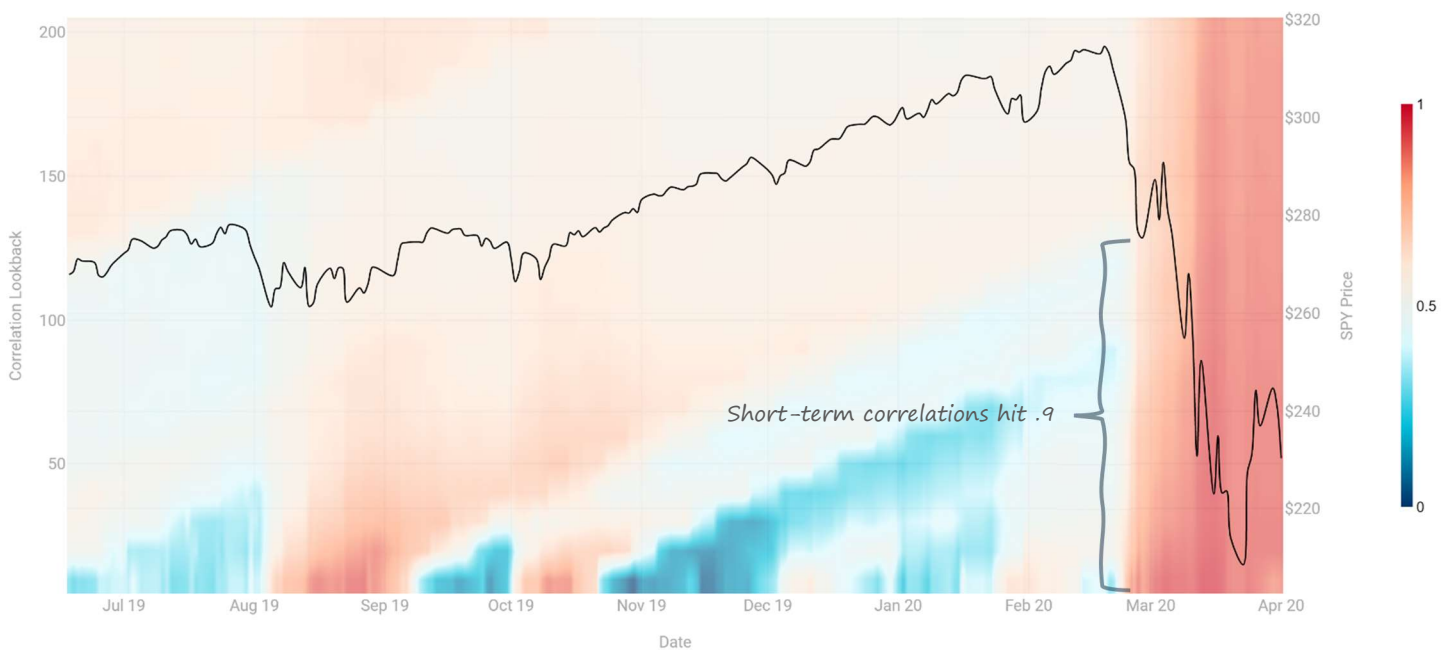
There you have it, the Riskdials model. While the inputs themselves are not overly complex, they are carefully chosen to fulfill a clear mandate: to avoid periods of high volatility by classifying **Risk-On** and **Risk-Off**.

"All models are wrong, but some are useful." – George E. P. Box

We hope this model proves to be a useful addition to your investment process.

Get in touch with us

robson@tradewell.app