J.P.Morgan

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Cross Asset Volatility

Option skew implied risk parity performance update

- In a recent report, we discussed how to obtain implied correlation and beta between US equities and Treasuries using listed options on the SPY and TLT ETFs. To briefly summarize, under some simplifying assumptions, the implied correlation is a function of the risk neutral skew, which can be computed using exchange listed options.

$$\rho = \left(\frac{SKEW_{TLT}}{SKEW_{SPY}}\right)^{\frac{1}{3}}$$

- Moreover, we also showed that the risk parity portfolio constructed using all implied measures (volatility and correlation) outperforms a prototypical benchmark using historical 1M realized measures. In this report, we provide an update of the performance and further discussion on the properties of the skew implied portfolio.
- **Performance:** A comparison of the two portfolios are shown below, assuming a 10% target volatility and monthly rebalance. 'Since April' shows the performance since the publication of our initial report in April. As we can see, the risk neutral (implied measures) portfolio outperformed in Sharpe ratio terms across all horizons.
- What is the driver for the outperformance? It is not because the implied measures have higher predictive power of future realized measures. As discussed previously, implied correlation, as well as implied volatility, appear to embed substantial risk premium and are therefore biased estimators of future realized values. It is also not because the risk neutral portfolio is short the tails in exchange for higher Sharpe, as the skewness of the risk neutral measure portfolio is in line to superior compared to the physical measure portfolio.

Table 1: Comparison of physical and risk neutral risk parity portfolios

	Physical				Risk Neutral			
Annualized	Return %	Volatility %	Sharpe	Skewness	Return %	Volatility %	Sharpe	Skewness
Since 2007	13.5	12.7	1.06	-0.7	8.4	7.1	1.19	-0.7
10y	12.6	10.1	1.25	-0.9	10.3	7.2	1.44	-0.8
5y	14.9	13.9	1.07	-1.0	11.2	8.1	1.37	-0.9
2y	14.1	15.0	0.94	-1.2	10.5	9.0	1.17	-1.3
1y	8.6	12.1	0.71	-0.2	6.8	6.7	1.02	0.0
Since April	29.5	10.1	2.93	-0.3	23.8	6.4	3.70	0.1

Source: J.P. Morgan

- We find the physical measures to be more volatile and employ more leverage (note that we have not included transaction and financing costs in the back tests above), as seen in Figure 1. Short-term realized measures are by definition sensitive to recent observations, which directly results in high volatility of the portfolio weights. Yet, this sensitivity is also desirable in order to incorporate new information in a timely manner. As a result, practitioners often employ ad hoc shrinkage and smoothing methods in order to strike a balance between portfolio stability and up-to-date information.
- On the other hand, portfolio weights formed by implied measures already systematically incorporate those two aspects: new information is instantaneously incorporated into the implied measures, and the implied risk premium results in portfolio weights that are generally more conservative. Another aspect that is equally important is the mean reversion pricing of implied measures. That is, when volatility and correlation spike during stress periods, implied measures tend to price in some degree of mean reversion, and therefore lead to less extreme de-risking. As an example, in Apr 2020, the total exposure spiked, as seen in . In contrast, the risk neutral portfolio weights remained stable, ultimately leading to better risk-adjusted returns.

- We have observed an interesting divergence between the two portfolios in the most recent data point. The physical portfolio increased weights overall, with a bias towards equities, as a result of the low realized volatility. However, the risk neutral portfolio has dialed down the risk, as the implied risk premium remains elevated.

- Figure 1. The increase in weights may seem counterintuitive at first glance, since volatility of both assets surged. However, because the realized bond/equity correlation turned deeply negative in Mar/Apr, extreme weights were necessary to maintain the target volatility. In contrast, the risk neutral portfolio weights remained stable, ultimately leading to better risk-adjusted returns.

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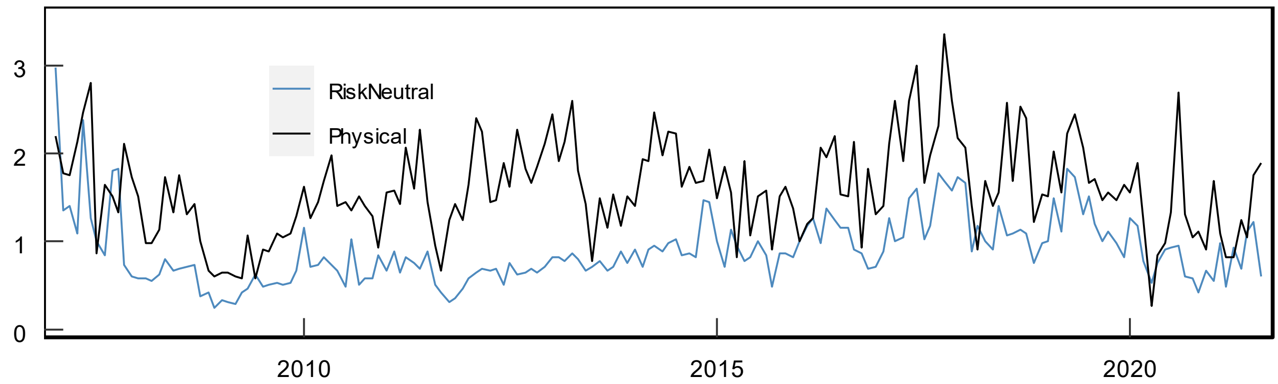
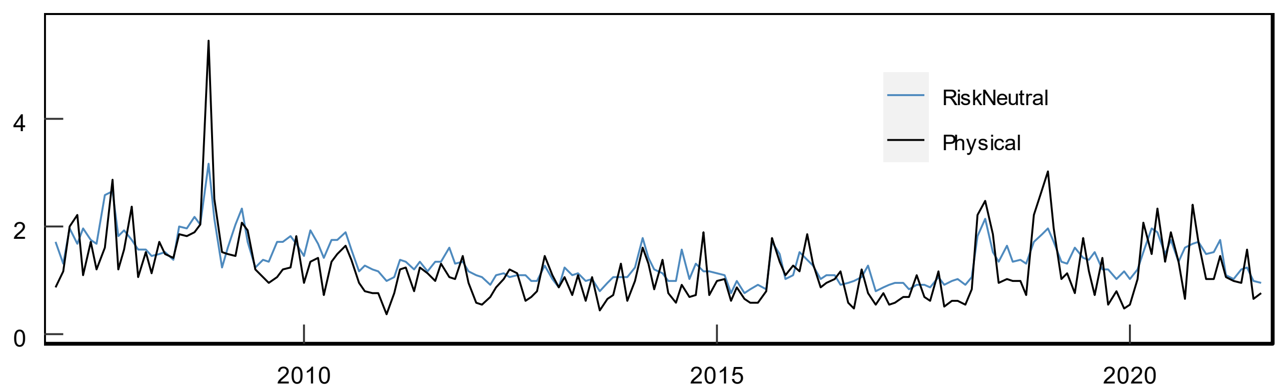
Figure 1: Total exposure (SPY + TLT notional)



Source: J.P. Morgan

- The weight allocation is also more stable for the risk neutral measure portfolio at the individual asset level, as seen by the weights of TLT as a ratio of SPY in Figure 2. An interesting observation here is that the risk neutral portfolio allocates slightly more to bonds than does the physical portfolio. We believe this is due to the richer implied vol premium on SPY than on TLT.

Figure 2: Bond weights as a ratio of equity weights



Source: J.P. Morgan

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Put Sale. Investors who sell put options will own the underlying asset if the asset's price falls below the strike price of the put option. Investors, therefore, will be exposed to any decline in the underlying asset's price below the strike potentially to zero, and they will not participate in any price appreciation in the underlying asset if the option expires unexercised.

Call Sale. Investors who sell uncovered call options have exposure on the upside that is theoretically unlimited.

Call Overwrite or Buywrite. Investors who sell call options against a long position in the underlying asset give up any appreciation in the underlying asset's price above the strike price of the call option, and they remain exposed to the downside of the underlying asset in the return for the receipt of the option premium.

Booster. In a sell-off, the maximum realized downside potential of a double-up booster is the net premium paid. In a rally, option losses are potentially unlimited as the investor is net short a call. When overlaid onto a long position in the underlying asset, upside losses are capped (as for a covered call), but downside losses are not.

Collar. Locks in the amount that can be realized at maturity to a range defined by the put and call strike. If the collar is not costless, investors risk losing 100% of the premium paid. Since investors are selling a call option, they give up any price appreciation in the underlying asset above the strike price of the call option.

Call Purchase. Options are a decaying asset, and investors risk losing 100% of the premium paid if the underlying asset's price is below the strike price of the call option.

Put Purchase. Options are a decaying asset, and investors risk losing 100% of the premium paid if the underlying asset's price is above the strike price of the put option.

Straddle or Strangle. The seller of a straddle or strangle is exposed to increases in the underlying asset's price above the call strike and declines in the underlying asset's price below the put strike. Since exposure on the upside is theoretically unlimited, investors who also own the underlying asset would have limited losses should the underlying asset rally. Covered writers are exposed to declines in the underlying asset position as well as any additional exposure should the underlying asset decline below the strike price of the put option. Having sold a covered call option, the investor gives up all appreciation in the underlying asset above the strike price of the call option.

Put Spread. The buyer of a put spread risks losing 100% of the premium paid. The buyer of higher-ratio put spread has unlimited downside below the lower strike (down to zero), dependent on the number of lower-struck puts sold. The maximum gain is limited to the spread between the two put strikes, when the underlying is at the lower strike. Investors who own the underlying asset will have downside protection between the higher-strike put and the lower-strike put. However, should the underlying asset's price fall below the strike price of the lower-strike put, investors regain exposure to the underlying asset, and this exposure is multiplied by the number of puts sold.

Call Spread. The buyer risks losing 100% of the premium paid. The gain is limited to the spread between the two strike prices. The seller of a call spread risks losing an amount equal to the spread between the two call strikes less the net premium received. By selling a covered call spread, the investor remains exposed to the downside of the underlying asset and gives up the spread between the two call strikes should the underlying asset rally.

Butterfly Spread. A butterfly spread consists of two spreads established simultaneously – one a bull spread and the other a bear spread. The resulting position is neutral, that is, the investor will profit if the underlying is stable. Butterfly spreads are established at a net debit. The maximum profit will occur at the middle strike price; the maximum loss is the net debit.

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