EQR HEDGING WITH VIX

A Pair Trading Approach for ES/NQ/RTY and VX ETFs

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Background

Observations & Assumptions

When the indexes like S&P 500, NASDAQ-100, or Russell 2000 are rising, the VIX will decline, and vice versa. So VIX can be used to hedge for the long positions of the above indexes. It can build a pair position to profit from the spread, which is basically a mean reversion system.

2	@ES	2,816.25	-1.08%
3	@NQ	8,950.75	-1.42%
4	@RTY	1,218.70	-1.21%
5	@VX	34.70	5.39%
6	ETF		
7	SPXL	32.47	-3.22%
8	TQQQ	68.41	-4.54%
9	UDOW	48.45	-3.16%
10	UPRO	34.36	-3.43%
11	URTY(HE	21.07	-4.18%
12	Inversed		
13	SDOW(H	35.25	3.22%
14	SPXS(HE	10.97	3.20%
15	SPXU	16.58	3.37%
16	SQQQ(HI	11.53	4.63%
17	SRTY(HE	20.41	4.45%
18	TVIX(HB	201.50	9.51%

Figure 1: %Net Changes on 05/15/2020

Pair Picking

Pick the most bullish (if it is a bull day at pre-market open) or least bearish one (if it's a bear day at pre-market open) from SPXL, TQQQ, or URTY, combined with TVIX to form the pair. For example, from Figure 1, it shows the SPXL is the least bearish one this morning, it declined -3.22%, and the TVIX was rising 9.51% at the same moment. Therefore, we picked SPXL/TVIX as the pair for today's trading.

%Net Change Differences

%Net Change of TVIX is 9.51%, %Net Change of SPXL is -3.22%, the ratio is 9.51%/3.22%=2.95, which is a typical relationship between the two legs of the pair regarding the %Net Change. The back-testing results showed this ratio normally can range from around 2.0 to 3.5.

Capital Ratio

To build the mean reversion system, the capital invested in each leg of the pair should be proportionally to the ratio calculated above, i.e., 2.95 in this case. Let us use this ratio to calculate the shares for each leg of the position below, assume we want to have 10 shares of TVIX at the entry:

Bull leg TVIX: 10 shares at price $201.50 = $2015 equity balance for entry.

Bear leg SPXL: 2.95 * $2015 = $5944.25 equity balance for entry, i.e., at the price of $32.47, the shares for this leg is $5944.25/$32.47 = 183 shares.

So, the pair position established will include 10 shares of TVIX and 183 shares of SPXL, the total equity balance will be $2015 + $5944.25 = $7959.25

Indicator

An indicator to track the spread of the %Net Change for the two legs of the pair is developed, the calculation of the spread is defined as below,

%Net Change Spread = R*%Chg1 + %Chg2

where ***R*** is the capital ratio, which is 2.95 in this case; ***%Chg1*** is the %Net Change of SPXL, and ***%Chg2*** is the %Net Change of TVIX. The timeframe for this indicator is 5 minutes.

Figure 2: %Net Change Spread Indicator (5 minutes chart)

From Figure 2 the 5 minutes chart, it can be seen that the indicator works like an oscillator, which moves back and forth around the mean. To trade the pair, entry at the valley of the spread and exit at the peak. For example, the points of 1, 3, 6, and 8 are entry opportunities, and the peaks of 2, 4, 5 and 7 are exit points.

When the market volatility is high, the spread moves higher and when the volatility is low, the spread moves lower. The narrow range is between [-2, 2], the wide range could be above 10 or below -10. The middle range around [-5, 5] could be a good area to find trades.

Weekdays Cycle

There is a weekdays cycle for the spread ranges, normally Tuesday, Wednesday and Thursday when the market volatility is high, the range of the spread is expanding to [-5, 5] or wider, which will be easier to find good trades.

Monday and Friday normally have low volatility, when the range could shrink to [-4, 4] or narrower. Such as today is Friday, from Figure 2 it shows that during most of the time in the trading session the range is between [-2, 2], until in the last 15 minutes approaching the close, it dropped below -3 and formed a valley.

Intraday Hourly Cycle

The spread could move from a valley to a peak within 15 minutes till two hours during the day session. So, a typical trade should hold the position about 15 minutes till about 2 hours, but 15 minutes till 60 minutes is preferred. Figure 2 can demonstrate the hourly cycle.

Entry

Time of Entry

The valleys of spread appear frequently around 8:20, 8:45, 9:05, 9:15, 9:30 AM Central at the open, and 15-30 minutes before close, or 5-15 minutes after close.

Entry Pattern #1

Entry when the breakout direction is not clear, and the valley of spread is detected.
This is a scalping pattern, the best entry times are around 15 minutes before or after regular session open, and 5-30 minutes before or after session close, when the valley of spread appears quickly and then recovered quickly within 15-45 minutes

1) Around 15 minutes before or after the regular session open at 8:30 AM Central when a valley of spread appears.

2) Around 5-30 minutes before or after the regular session close at 3:00 PM Central when a valley of spread appears.

Entry Pattern #2

Entry when the expected trend has been established, and the spread is below or close to mean, the lower the better. Add to the position at bull leg pullback.

This is a swing pattern, normally after 9:05 AM Central, when the trend of the day is established. It could last for about at least 30 minutes till several hours, most likely it gets deep pullback or reversal before 11:30 AM Central. Entry at the valley around 9:05 AM Central is one of the most profitable setups for this approach.

Another good setup is at the early afternoon around 1:00 PM to 2:00 PM Central when the afternoon trend is established, but it's harder to find a valley of spread to entry and it could got trapped sometime, although it does not happen frequently.

Exit

Time of Exit

When a good entry is taken at the valley of spread, normally it will revert to mean or even higher within 15 minutes till about 2 hours. Especially in the morning session when the market is more active, it takes about 15 minutes to 1 hour to get a profitable trade done.

Exit Pattern #1

This is the scalping exit when the trend direction is not clear. There will be quick in and out opportunities when entry at the spread sharply drops 2%-5% and then exit at its reversion to mean or better, which will have 2%-5% profits expected.

Exit Pattern #2

This is the swing exit when the bull leg trend is established, and higher profits are expected (5% or more). To exit this trade, first wait for the bull leg trend stabilized, and the spread moved back at least 2% off the low. When the trend is approaching parabolic stage, get out the bear leg first and then wait for one real/big breakout bar of the bull leg and exit all, or if the trend reversal is detected, exit without waiting.

Risk Management

Risk/Reward

The risk expected is 1%-3% if the spread keeps dropping after entry; and the profits expected is 1%-10% and most likely between 2%-5% to get a better winning rate.

Stop Loss

Stop loss is not necessary for a strict mean reversion system. Being frequently stopped out will violate the ability of the system to make profits when it is supposed to come back to mean but it had been stopped out before it did.

While in some extreme market conditions, the system we have right now did not behave as a mean reversion system, at least at intraday level. In this case, the stop loss is needed to protect intraday positions. An example which happed on March 20, 2020 is illustrated below in Figure 3.

To handle this kind of cases, what I did before is to hold the position overnight and exit the next day when the spread moved back.

Figure 3: Spread does not revert to mean at extreme market condition

Profit Taking

The quick scalping profit taking is preferred, 2% to 5% is fairly good for a trade lasting less than two hours. It is reliable and has less risk exposure.

The swing trading profit taking is also good if the trend is running normally and the market did not be manipulated too much. But it is harder to manage the trade, including the entry and exit. Also, try to play swing trades in the afternoon session could get easily trapped.

Summary

This is a low risk exposure strategy if the hedging from VIX to the major indexes is running normally. But unfortunately, it has extreme market conditions this year when the strategy does not work, at least for

intraday trading. The back-testing with 5 years historic data did not detect those conditions, that is why I did not setup a stop loss rule when I initially designed the system.

I started investigating this strategy from the end of last year and put into live trading since early February 2020. Overall, it is a reliable approach, the downside risk is limited, and it is easy to get entry and exit setups. 80% or more of the trades can be done intraday without overnight position holding. There are several times I got trapped in the afternoon entries when the spread created lower lows approaching session close, the next day when the spread moved back to mean the position can exit with small losses or even better.

The only trade I got trapped and messed up was the one at March 20, 2020. There are two reasons caused the big losses:

First, the system did not design a stop loss plan to handle the extreme market conditions when the spread moved too far from the mean and cannot come back the same day or the next day.

Second, when I got trapped, I tried different approach to save the trade but unfortunately it did not work as expected. Even worse, it enlarged the losses compared to the original mean reversion system.

Future Work

1) Evaluate the stop loss parameters for the extreme market conditions.
2) Back test the strategy with stop loss included, compared to the strategy without stop loss before.
3) Investigate when the extreme market conditions will occur. How to detect it and avoid trading on it.