Tail risk hedging with VIX calls

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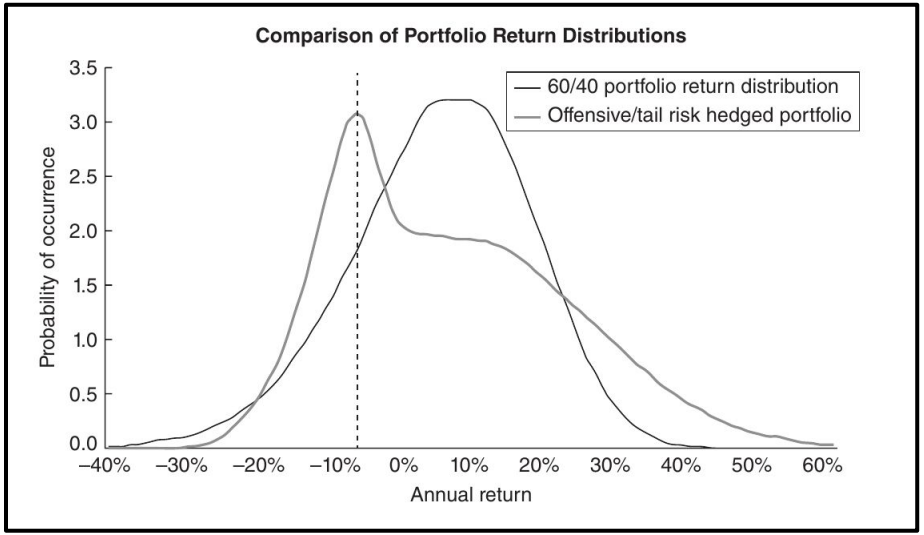
Why hedge?

- Protect from market downturns
- Tune remainder of portfolio more aggressively
- Allow for more leverage



Return distribution of 60/40 portfolio of stocks/bonds vs. actively hedged portfolio. The median return of the hedged portfolio is lower, but its expected return is higher

Vineer Bhansali, “Tail Risk Hedging”

Direct vs. indirect hedging

- Direct hedge: protect portfolio from > x% loss over a time frame
  - Hedge a SPY portfolio with a SPY put 10% OTM
  - Easy to calculate costs and breakeven point
- Indirect hedge: bet on an instrument correlated to the risks you want to hedge
  - Volatility, currency pair, etc.

- Why use VIX calls?
  - Convexity
  - Liquidity in a crisis
  - Small contracts = easy to scale

Inspiration: VXTH

- Index developed by CBOE
- Portfolio holds mostly S&P500
- Variable allocation to 1-month 30-delta VIX calls
- Hedge pays off with market downturn and volatility spike
    - Convexity of VIX calls is key!

Forward value of VIX	Portfolio hedge allocation
X <= 15	0%
15 > X <= 30	1%
30 > X <= 50	0.5%
X > 50	0%

Green: Hedged portfolio
Black: SPX benchmark

Inspiration: VXTH

March 2020: hedge pays off. Sold the VIX calls and “bought the dip” at exactly the right time

Green: Hedged portfolio

Black: SPX benchmark

Project goals: Areas to improve

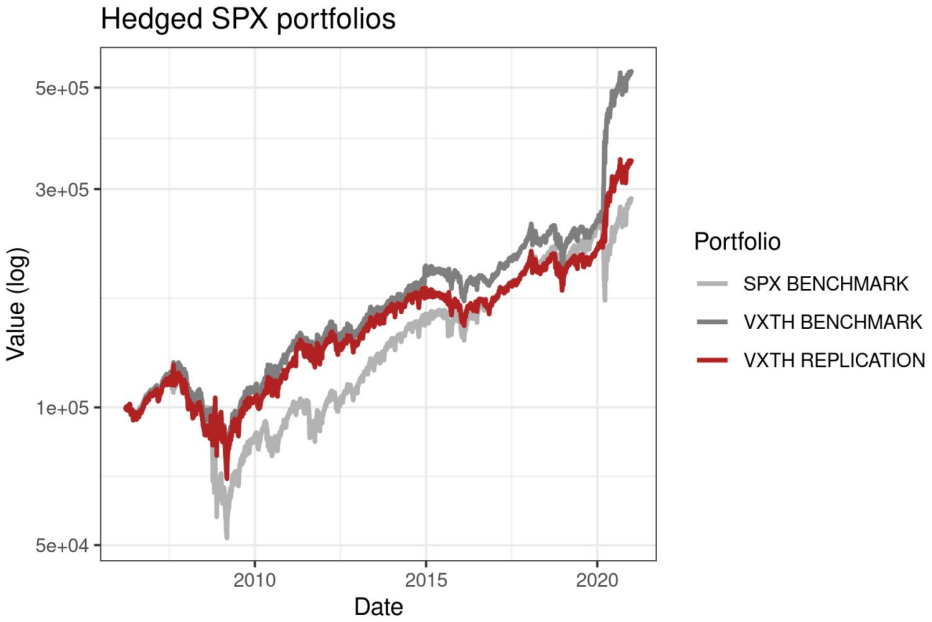
- Active monetization: What multiple to sell at?
- Study best option delta
  - Low delta = more convex = higher payoff when it goes ITM, but more likely to be worth 0
- “Ladder” of VIX calls over many months: reduce timing luck
- Better signals for entering/exiting hedge trades
  - What signals are correlated with future volatility?
- Frequent rebalancing?
- Accurate accounting of transaction costs
  - Spread, possible fills, option transaction costs

I’m looking something that I can live trade and add to an existing portfolio by the end of the class

Current work

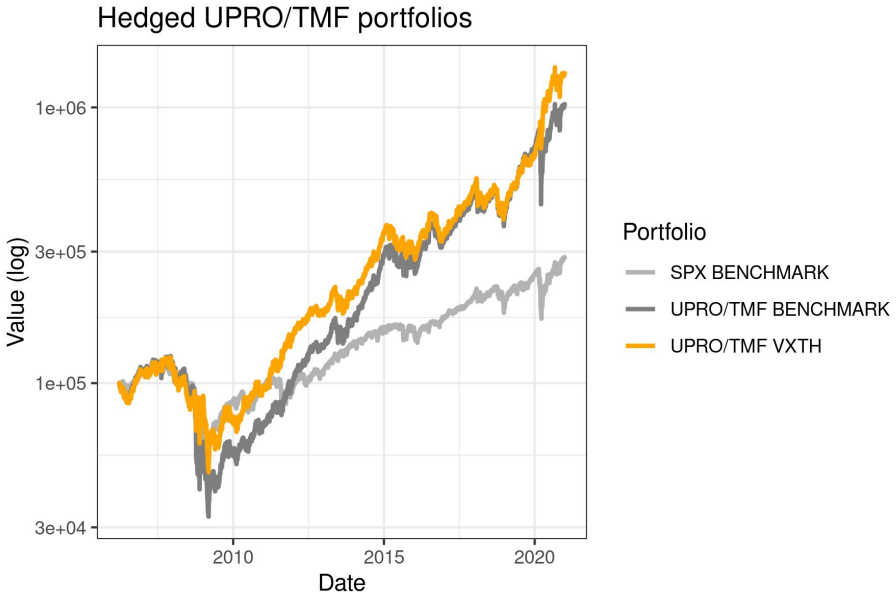
- Backtested/replicated VXTH from 2006-2020
  - Not perfect, but it mirrors the main trends
- Added VIX call hedge to leveraged portfolio holding UPRO (3x SPY)and TMF (3x 20yr+ bonds)
  - The “HEDGEFUNDIE” portfolio
  - Improvements on all calculated metrics

VXTH replication



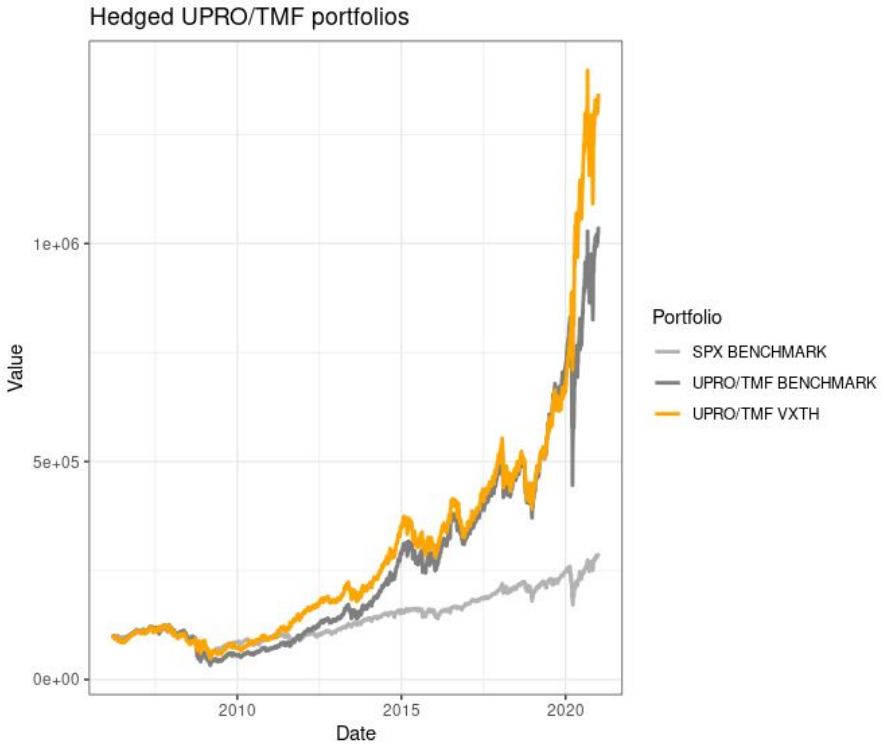
	SPX	VXTH (benchmark)	VXTH (replicated)
CAGR	7.49	12.2	8.8
Sharpe ratio (Annualized)	0.49	0.67	0.66
StdDev (Annualized)	15.2	18.3	13.5
Worst drawdown	52.5%	37.4%	35.1%

Leveraged portfolio with hedge



	SPX	UPRO/TMF	UPRO/TMF + VXTH
CAGR	7.49	17.1	19.2
Sharpe ratio (Annualized)	0.49	0.70	0.87
StdDev (Annualized)	15.2	25.0	22.4
Worst drawdown	52.5%	70.9%	57.2%

Leveraged portfolio with hedge



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Transaction costs

Today, April 27, 2021

- VIX at 17.5
- Option transactions are $0.65 to open, $0.65 to close, free to close if they expire worthless!

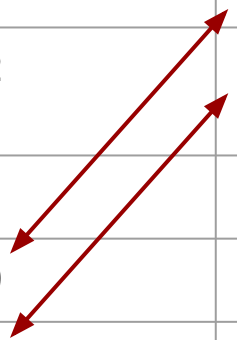
Expiration	Delta	Strike	Bid	Ask	Spread	Spread %	Open cost %
5/19	30	24	1.00	1.05	0.05	4.88%	0.63%
5/19	20	28	0.65	0.70	0.05	7.41%	0.96%
5/19	10	37.5	0.30	0.35	0.05	15.38%	2.00%
6/16	30	29	1.50	1.60	0.10	6.45%	0.42%
6/16	20	37.5	0.85	0.90	0.05	5.71%	0.74%
6/16	10	50	0.45	0.50	0.05	10.53%	1.37%
7/21	30	35	1.60	1.70	0.10	6.06%	0.39%
7/21	20	42.5	1.05	1.15	0.10	9.09%	0.59%
7/21	10	60	0.45	0.55	0.10	20.00%	1.30%

I got filled for one contract at 1.55 here

Transaction costs included in the model

- Option transactions cost $0.65 to open, $0.65 to close
- Assume worst case where we buy at ask, sell at bid

Portfolio	Sharpe ratio Previously	Sharpe ratio Worst case	CAGR Previously	CAGR Worst case
SPX + hedge	0.66	0.56	8.8	7.53
UPRO/TMF + hedge	0.87	0.80	19.2	17.8
SPX alone	0.49		7.49	
UPRO/TMF alone	0.70		17.1	



Thank you!

Much more work to be done.