LIBERTYROAD
CAPITAL

Covered Call Strategies in the Bitcoin Options/Volatility Markets

An Analysis of Passive versus Semi Active versus Active Covered Call Strategies

David Russell Thompson - CEO

July 2023

TABLE OF CONTENTS

1. Executive Summary

"Lots of folks confuse bad management with destiny."

— Kin Hubbard

This analysis looks at Covered Calls in the Bitcoin market. It directly compares passive strategies against strategies that are either partly or completely actively managed. It is the second paper in a series that looks at Covered Calls in the Bitcoin market. Unlike the first paper[1], which utilised the LibertyRoad AI and Machine Learning algorithms to run simulated returns, this paper looks at real world returns in four live trading strategies. It also uses the LibertyRoad Treasury Covered Call product for analysis which has been live since November 2021 and is returning around 10% p.a and 5% annualised volatility. This is different from the full volatility product that has been live since January 2020 that was used in the first paper and has returned 28.90% annualised with an annualised volatility of 22.4%. The Treasury product is a much lower targeted volatility product with a higher trade signalling filter, and is therefore a much more suitable programme for a comparison overview.

The paper concludes that passive strategies are "up the stairs down the elevator". They perform, until they don't and when they go wrong, it erases all gains and more. There is clearly real alpha being delivered from actively or semi actively managed strategies. Both return and volatility are materially better from some form of a professionally managed strategy. Since early 2021 Passive Covered Calls have returned nearly -10% annualised negative returns with a negative Sharpe Ratio. LibertyRoad's Treasury product has returned 10% positive annualised returns over the same period with a +1.76 Sharpe ratio. That being said, the major actively managed strategy in the market, run by one of the oldest and largest firms in the market, returned -32% annualised in the last 13 months with a Sharpe Ratio of -1.65. Clearly the investment process in any active management strategy is very important.

Leverage is not considered. So for any investor, no more calls will be written than the underlying position. Returns quoted are all alpha returns i.e., the return from the Bitcoin Covered Call strategy is in Bitcoin and irrespective of the movement in the underlying.

[1] Active versus Passive Management in Covered Calls in the Digital Asset Markets. D R Thompson 2022

Covered Call Strategies are extremely well understood, but like anything in life there are a myriad of ways to express and implement them. Currently in the digital asset markets, ways of exploiting and enhancing yield are very popular and salient. This short paper aims at concisely identifying the types of strategies available to investors, and unashamedly promotes the LibertyRoad Treasury Covered Call Strategy as a unique professionally managed product which is best in class and brings real value to investors who are seeking a genuine means of making passive Bitcoin work for them.

Passive strategies such as Ribbon sell 1-week low Delta calls each Friday. Coins are locked up until maturity and "you pay your money and take your chance". No laddering of maturity or strikes are carried out, options are not bought back, and delta hedging is not employed.

Semi Active strategies, ladder the strikes and the maturity, and stagger the selling dates. No delta hedging or buying back of options is carried out.

Active strategies vary tremendously. LibertyRoad's Active strategy employs Artificial Intelligence and Machine Learning to sell the most profitable calls, with the highest Theta[2] and the lowest Gamma[3]. Therefore, the Theta/Gamma ratio is an important factor in selling any option.[4] Attention is also paid to buying back options when the Theta/Gamma ratio becomes unattractive. Options strikes are laddered both in terms of strike and maturity, and Delta hedging is actively employed to minimise the downside risks.

Historically the perception is clearly that Covered Call strategies lose money in bull markets. LibertyRoad has proved this is not the case. In June 2023 for example Bitcoin enjoyed a 14% rally and the strategy was flat. A 14% fall in Bitcoin would have given extremely good returns, therefore the skew and kurtosis of this strategy is very attractive.

[2] Theta is the time decay of an option expressed in value. A seller of options will have positive theta (earn yield) and a buyer of options will pay a premium and have negative Theta. Although that is not always strictly true depending on the shape of the volatility curve, that is for another time.

[3] Gamma is the movement in the options price based on the movement in the underlying. An option seller wants the lowest level of gamma possible i.e. the option price moves only a small amount based on the movement of the underlying.

[4] The Theta/Gamma ratio is the Amount of Theta/Gamma. A higher ratio implies more premium received relative to the potential movement in the options price relative to movements in the underlying.

Risk Management is also very important. While we cannot comment on the active strategy that lost 32% annualised, clearly their risk management needs improving. With Passive and Semi Active strategies, risk management is generally not employed so the underlying trend direction of the market is extremely important. LibertyRoad employs Extreme Value Theory (EVT) and Extreme Value at Risk (EVaR) to both monitor overall risk, but also tail risk, and EVaR is used to target a 5% level of annualised volatility in the strategy. While the Scope of EVT and EVaR is beyond this paper, we have written a paper explaining how we utilise both in the practice, and how it helped mitigate losses in November and December of 2022.[5]

Utilising EVaR allows us to much more accurately target volatility as we model the tails of the distribution directly. Clearly a rising EVaR signals increasing tail risk, especially when combined with a flat VaR and allows us to dynamically adjust the level of risk accordingly. We are firm believers in good risk management being a source of Alpha and back in 2015 I wrote a paper looking at how my old Hedge Fund Cambridge had evolved its risk management over time, resulting in a 20% increase in risk adjusted returns.[6]

[5] Extreme Value Theory and Extreme Value at Risk. D R Thompson. LibertyRoad 2022. Extreme Value Theory ('EVT') & Extreme Value at Risk ('EVaR') – LibertyRoad Capital

[6] Cambridge paper

2. Introduction

"I always say don't make plans, make options."

— Jennifer Aniston

Covered Call Strategies in Bitcoin

It is important for any investor to consider two things before they implement any covered call strategy:

- **How do they account for themselves?** In Bitcoin or USD? This seemingly innocuous distinction is very important. Consider a USD investor who has purchased Bitcoin with USD. Implementing a Covered Call strategy is effectively an opportunity cost if the call options expire in the money, as the underlying investment will have moved up significantly in value in USD terms, and it would be perfectly acceptable to look at the return profile as effectively a take profit. Most Covered Call option payoff diagrams will portray Covered Calls in these terms. On the downside, the strategy acts as a loss mitigator over time. It is not a hedge, but writing calls against an underlying Bitcoin position will offset losses. But in USD terms, a Covered Call Strategy will probably see a loss as the underlying Bitcoin USD rate moves lower, as the underlying combined position in USD terms will decline.

  A Bitcoin denominated investor however in Bitcoin terms will take a loss in Bitcoin terms if options expire in the money, as the absolute nominal amount of the Bitcoin held will go down. In contrast, writing calls will always result in profit in Bitcoin terms if options expire out of the money, as the absolute amount of Bitcoin held will increase. In these terms it is correct to think of a Bitcoin Covered Call Strategy as a yield enhancer, which is utilising elevated levels of volatility (compared to every other global market) to deliver yield. It is not however risk free, in Bitcoin terms but an actively managed strategy can deliver very low levels of risk.

- **Does an investor want an actively managed or passive strategy?** The Bitcoin market offers both. Passive strategies are available via vaults such as Ribbon. One-week low delta options are sold weekly, and the investor takes his chances. Bitcoin cannot be withdrawn until expiry, and no management takes place whatsoever.

  Actively managed strategies vary in sophistication, from one end of the spectrum where the strikes and maturities are laddered in a consistent way, to the other end of the spectrum where LibertyRoad sits, where AI and Machine Learning are utilised to aggressively manage the exposures and the calls sold are bought back and resold in the most opportunistic parts of the volatility surface. Trade signalling and active risk management are employed and theoretically (although not always as you will see) this should result in higher returns and lower risk.

  Fees are generally higher with Active strategies (LibertyRoad charges 2% management fee and 20% performance fee) but that is not always the case. As you will see Ribbon charges 2% management fee and 10% performance fee on a totally passive strategy.

3. Passive versus Active Covered Call Strategies

"Active management is little more than a gigantic con game."

— Ronald Ross

Passive

We have analysed passive Bitcoin options strategies such as that provided by Ribbon[7]. The vault earns yield by selling Bitcoin each Friday at 12pm UTC. Any Bitcoin deposited into the vault is not accessible until the following Friday at 12pm UTC. Fees are charged of 2% management fee and 10% performance fee, but only if the strategy is profitable. No fees are charged if it is unprofitable.

The strategy suffers as the market is very aware that natural sellers of volatility are coming to the market every Friday, and of course, vols tend to fall going into a weekend where the markets tend to be quieter (but not always) than during the week. The strategy is very easy to access and use. A wallet is linked to the vault, the Bitcoin is deposited, and the vault does the rest.

Semi Active

For a semi actively managed strategy we have analysed a common strategy where an equally weighted call option position is entered into where 33% 1 week 15 OTM options are sold, 33% 2 week 20% OTM options are sold and 33% 1 month 25% OTM options are sold. Sell dates are split Monday/Wednesday/Friday.

This is a live strategy offered in the market, and the returns are live and real. No delta hedging or risk management is carried out, but the laddering of the book clearly adds some value over the passive strategy.

[7] https://app.ribbon.finance/v2/theta-vault/T-WBitcoin-C

Active

For a fully active strategy we have used a very well known Active Covered Call strategy, provided by one of the largest participants in crypto space. The returns are real and the programme has been live for over a year.
Active risk management is undertaken and the strikes are laddered and trade signals are used.

We then compare these three strategies with the returns from the LibertyRoad Treasury Covered Call product. The investment process is described later in this paper.
We have taken weekly returns for all three products. Ribbon publishes weekly returns so to compare strategies directly, that is the return stream we have chosen. All four strategies are live and have investors in them. For the active strategy we have interpolated the monthly data to fit with the weekly returns.

4. Comparison of Cumulative Returns Passive versus Semi Active versus Active Covered Call Strategies

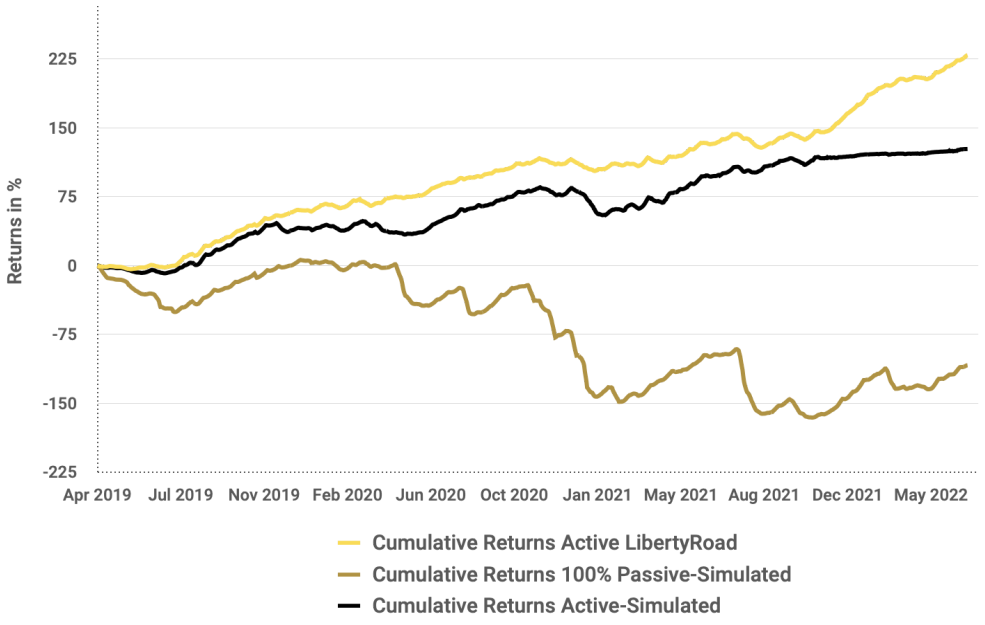
"Don't Wombat It, Meerkat It."

— Compare the Market

The chart below compares cumulative returns weekly over time between the four chosen strategies. As can be seen the Passive and Semi Active strategies performed well for over a year with some marginal outperformance from the semi active strategies. In January 2023 all strategies declined but the semi active outperformed the passive, while the real outlier was the other active strategy which was in negative territory from as early as May 2022. I have no explanation for that, except potentially very aggressive ATM strikes were sold.

Clearly the LibertyRoad Treasury product outperforms them all, Both on the upside and on the downside. Since February 2023 returns have been positive while returns in the other strategies have been negative, proving the point that it is possible to make returns in a bull market with a well run and conceived Covered Call Strategy.

Comparison of Cumulative Return of Covered Call Strategies



Statistical Comparison of Strategies

Below is the statistical analysis for each strategy. Top performing is LibertyRoad with 9.90% annualised return and a Sharpe ratio of 1.76. Next is Semi Active with a 5.07% annualised return and a Sharpe Ratio 5.08%. After that is passive with -9.79% annualised return and a Sharpe Ratio of -0.54, and last is the other Active strategy with -32% and a Shape Ratio -1.65.

Statistical Analysis of the Different Strategies

	Ribbon Passive	Semi Active	Other Active	LR Treasury
Annualised Return	-9.79%	5.07%	-32.86%	9.90%
Annualised Standard Deviation	15.41%	5.08%	20.00%	5.57%
Sharpe Ratio	-0.64	0.82	-1.65	1.76
CS Ratio	-3.12	3.67	-5.49	5.38
Skewness	-5.10	-4.6	-2.5	-0.44
Kurtosis	36.13	22.2	6.0	2.06

Clearly, as can be seen from the data, only two covered call strategies produce positive Sharpe Ratio; The LibertyRoad Strategy and a semi active strategy with a laddered, disciplined mix of strikes and maturities executed over three days each week.

5. The LibertyRoad Treasury Product Covered Call Strategy

"The best strategy is one that offers the highest compound return consistent with no risk of going broke."

— William Poundstone

The Treasury Covered Call strategy investment process can be described in the following way.

1. Trade signals are identified from about a dozen parameters. In all cases we are looking for parameters that are mispriced relative to the general market. Parameters such as the theta/gamma ratio, skew, vol curve steepness etc. etc. are analysed in real time, and our AI model identifies potentially interesting inefficiencies in the market.

2. Once a trade signal is identified, we implement a machine learning algorithm, which effectively instantaneously back tests the signal to create a "historical success ratio". This success ratio can vary depending on the trend indicators that we also utilise, so a sell signal for calls would need to have a higher success ratio in a bull market than a bear market.

3. We then utilise EVT and EVaR to determine the appropriate level of risk to target an annualised volatility of 5%. Given our historical risk adjusted returns this should target around 10% annualised return over time. EVT is extremely powerful in this regard, and is perfectly suited to non-normal distributions such as in Bitcoin. EVaR (which is a direct derivative of EVT) is much more conservative that VaR, it will anticipate potential regime changes, as it is directly modelling the left hand tail, which is completely ignored by VaR, and it can actually give you some indication of the potential level of loss beyond the confidence threshold, which VaR does not.

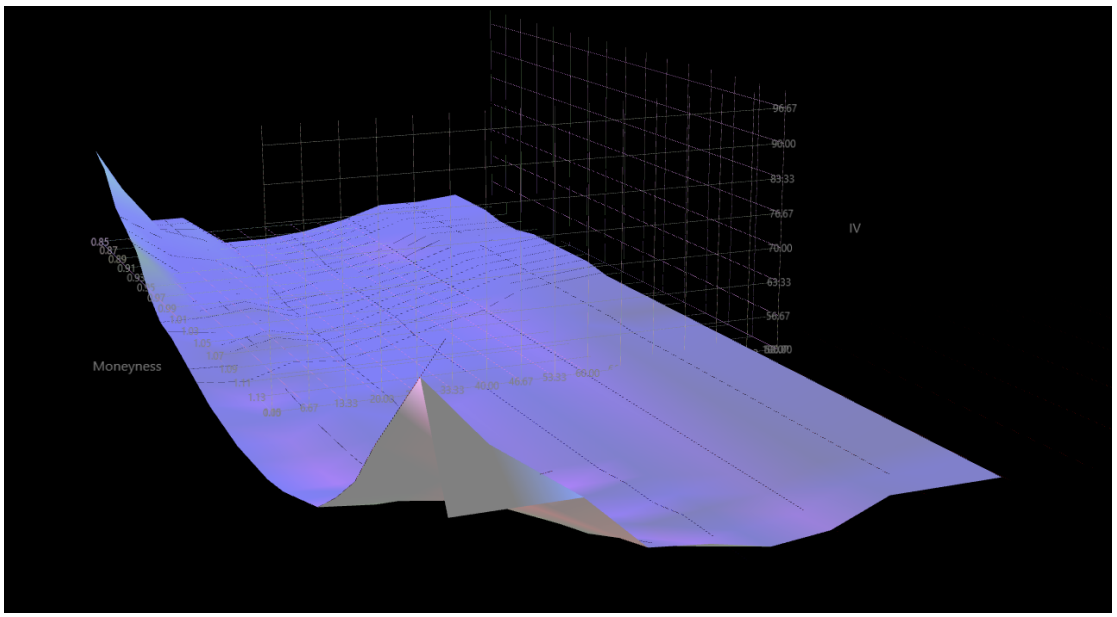
4. Trades are then executed efficiently by experienced portfolio managers, and risk of the portfolio is monitored 24/7.

5. The system then delivers trade signals to buy back options that have made the desired returns, freeing up portfolio risk for new options trades to be implemented. On average the portfolio is turned 3-5 times a month.

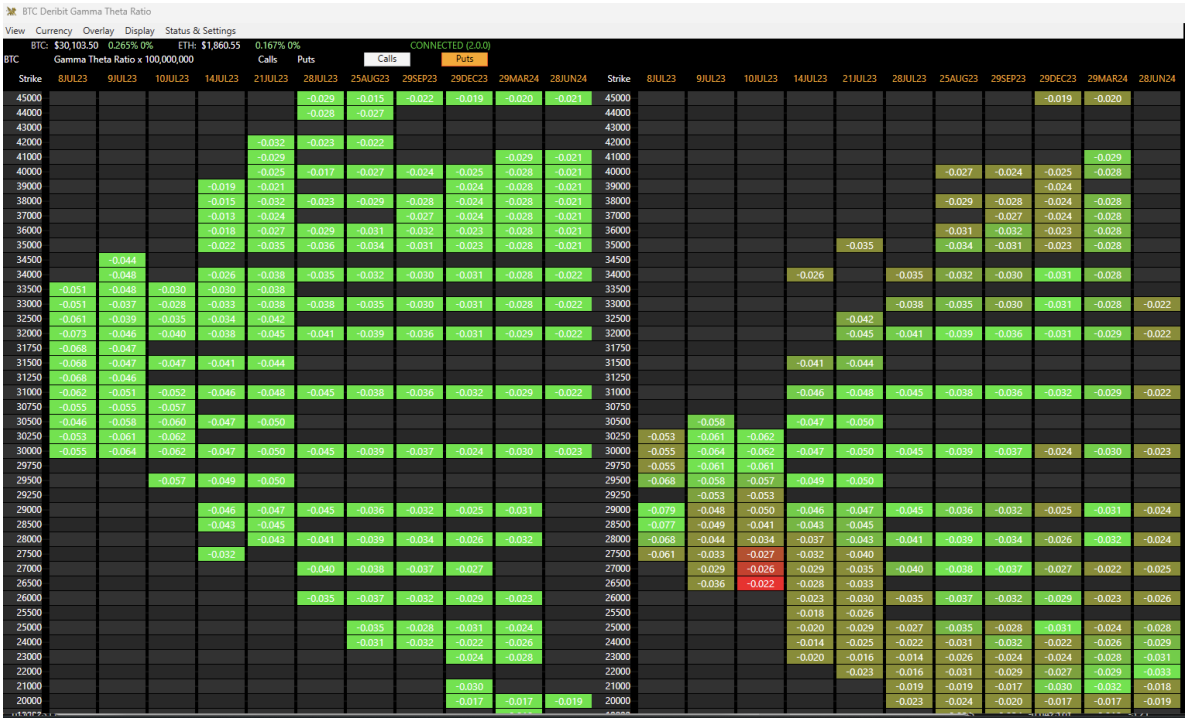
Step 1. Identifying trade opportunities on the Volatility Surface

Below is the Bitcoin Volatility surface. It is represented graphically in 3D. The three axes are Implied Volatility, Moneyness and Maturity. Abnormalities on this surface are highlighted, along with the parameter(s) that are causing the abnormality.

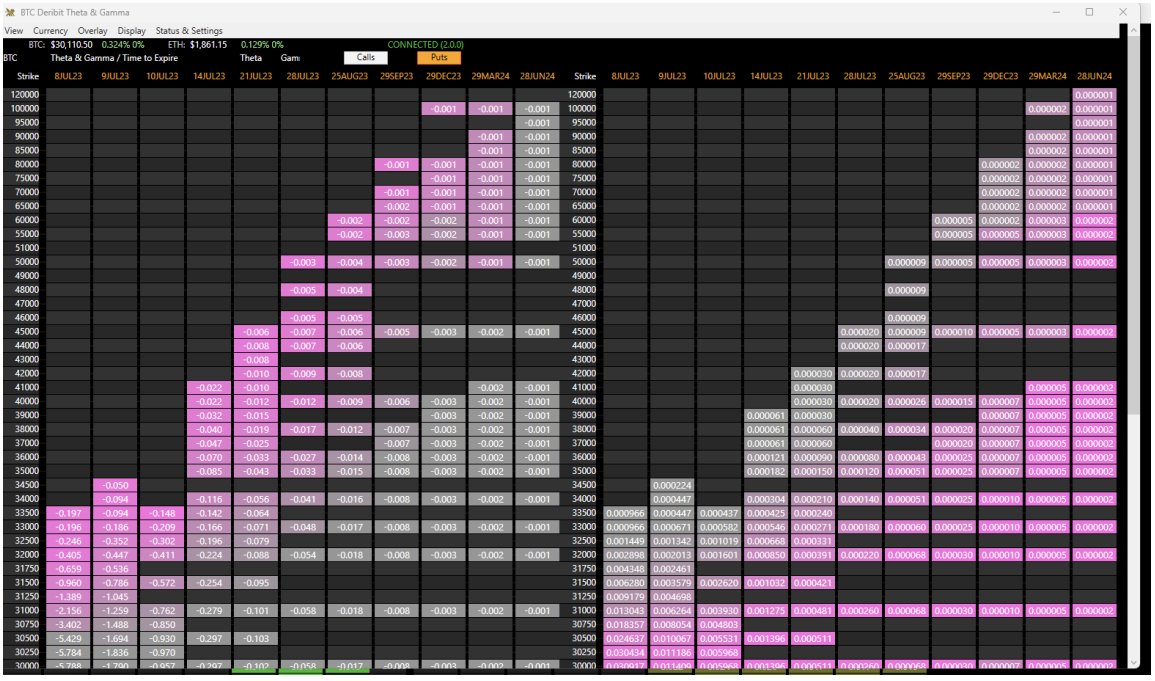
Some Example Parameters. The LibertyRoad Options Matrix



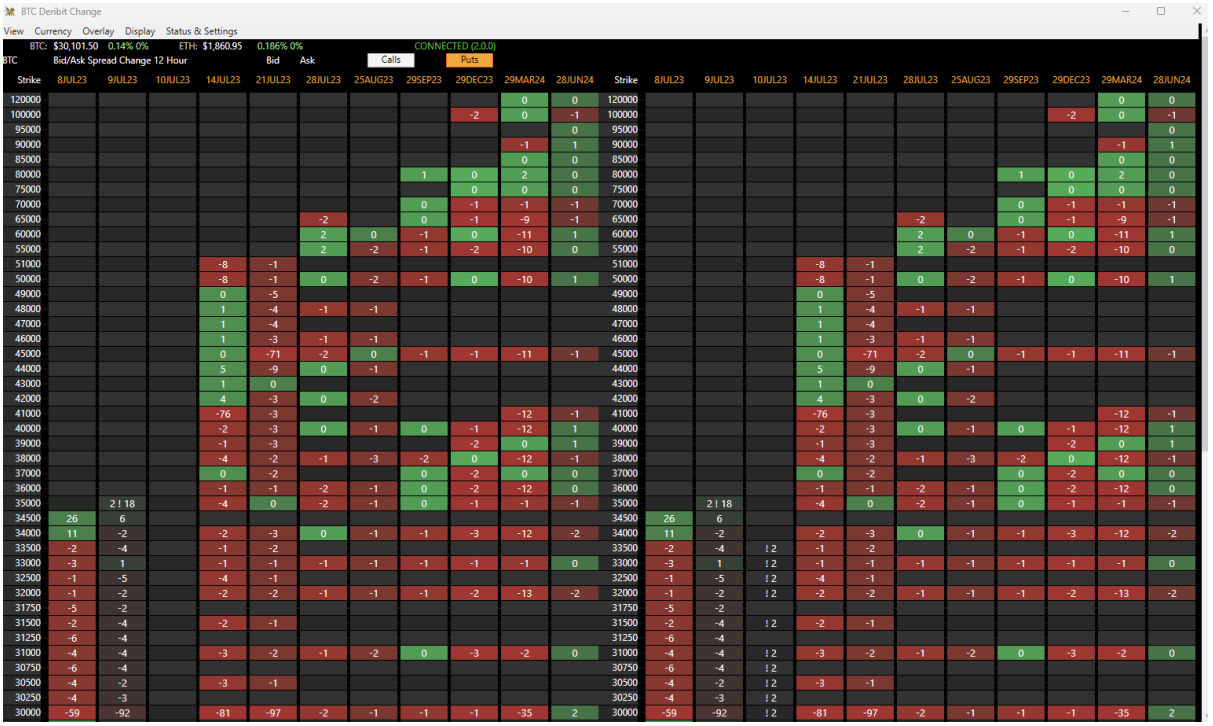
The Gamma Theta Ratio



Outright Gamma and Theta

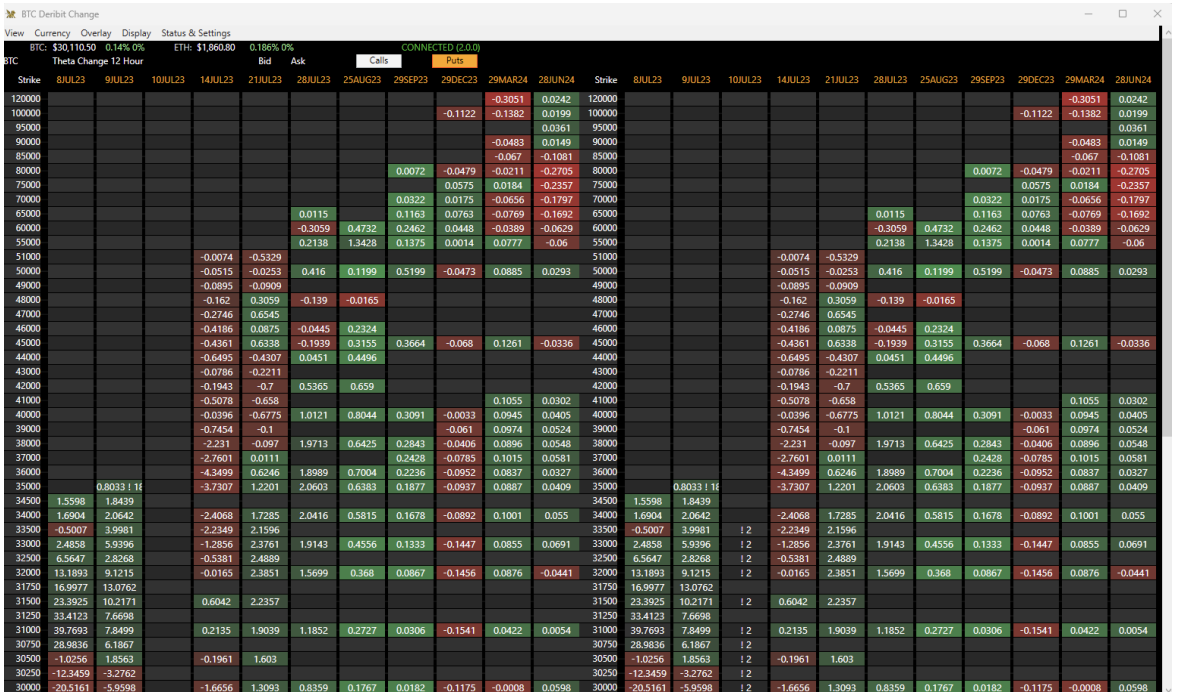


Price and Spread Movements



Strike	8JUL23	9JUL23	10JUL23	14JUL23	21JUL23	28JUL23	25AUG23	29SEP23	29DEC23	29MAR24	28JUN24	Strike	8JUL23	9JUL23	10JUL23	14JUL23	21JUL23	28JUL23	25AUG23	29SEP23	29DEC23	29MAR24	28JUN24
120000										0	0	120000										0	0
100000									-2	0	-1	100000									-2	0	-1
95000											0	95000											0
90000										-1	1	90000										-1	1
85000										0	0	85000										0	0
80000								1	0	2	0	80000								1	0	2	0
75000									0	0	0	75000									0	0	0
70000								0	-1	-1	-1	70000								0	-1	-1	-1
65000						-2		0	-1	-9	-1	65000						-2		0	-1	-9	-1
60000						2	0	-1	0	-11	1	60000						2	0	-1	0	-11	1
55000						2	-2	-1	-2	-10	0	55000						2	-2	-1	-2	-10	0
51000				-8	-1							51000				-8	-1						
50000				-8	-1	0	-2	-1	0	-10	1	50000				-8	-1	0	-2	-1	0	-10	1
49000				0	-5							49000				0	-5						
48000				1	-4	-1	-1					48000				1	-4	-1	-1				
47000				1	-4							47000				1	-4						
46000				1	-3	-1	-1					46000				1	-3	-1	-1				
45000				0	-71	-2	0	-1	-1	-11	-1	45000				0	-71	-2	0	-1	-1	-11	-1
44000				5	-9	0	-1					44000				5	-9	0	-1				
43000				1	0							43000				1	0						
42000				4	-3	0	-2					42000				4	-3	0	-2				
41000				-76	-3					-12	-1	41000				-76	-3					-12	-1
40000				-2	-3	0	-1	0	-1	-12	1	40000				-2	-3	0	-1	0	-1	-12	1
39000				-1	-3				-2	0	1	39000				-1	-3				-2	0	1
38000				-4	-2	-1	-3	-2	0	-12	-1	38000				-4	-2	-1	-3	-2	0	-12	-1
37000				0	-2			0	-2	0	0	37000				0	-2			0	-2	0	0
36000				-1	-1	-2	-1	0	-2	-12	0	36000				-1	-1	-2	-1	0	-2	-12	0
35000		2 ! 18		-4	0	-2	-1	0	-1	-1	-1	35000		2 ! 18		-4	0	-2	-1	0	-1	-1	-1
34500	26	6										34500	26	6									
34000	11	-2		-2	-3	0	-1	-1	-3	-12	-2	34000	11	-2		-2	-3	0	-1	-1	-3	-12	-2
33500	-2	-4		-1	-2							33500	-2	-4	! 2	-1	-2						
33000	-3	1		-1	-1	-1	-1	-1	-1	-1	0	33000	-3	1	! 2	-1	-1	-1	-1	-1	-1	-1	0
32500	-1	-5		-4	-1							32500	-1	-5	! 2	-4	-1						
32000	-1	-2		-2	-2	-1	-1	-1	-2	-13	-2	32000	-1	-2	! 2	-2	-2	-1	-1	-1	-2	-13	-2
31750	-5	-2										31750	-5	-2									
31500	-2	-4		-2	-1							31500	-2	-4	! 2	-2	-1						
31250	-6	-4										31250	-6	-4									
31000	-4	-4		-3	-2	-1	-2	0	-3	-2	0	31000	-4	-4	! 2	-3	-2	-1	-2	0	-3	-2	0
30750	-6	-4										30750	-6	-4	! 2								
30500	-4	-2		-3	-1							30500	-4	-2	! 2	-3	-1						
30250	-4	-3										30250	-4	-3	! 2								
30000	-59	-92		-81	-97	-2	-1	-1	-1	-35	2	30000	-59	-92	! 2	-81	-97	-2	-1	-1	-1	-35	2

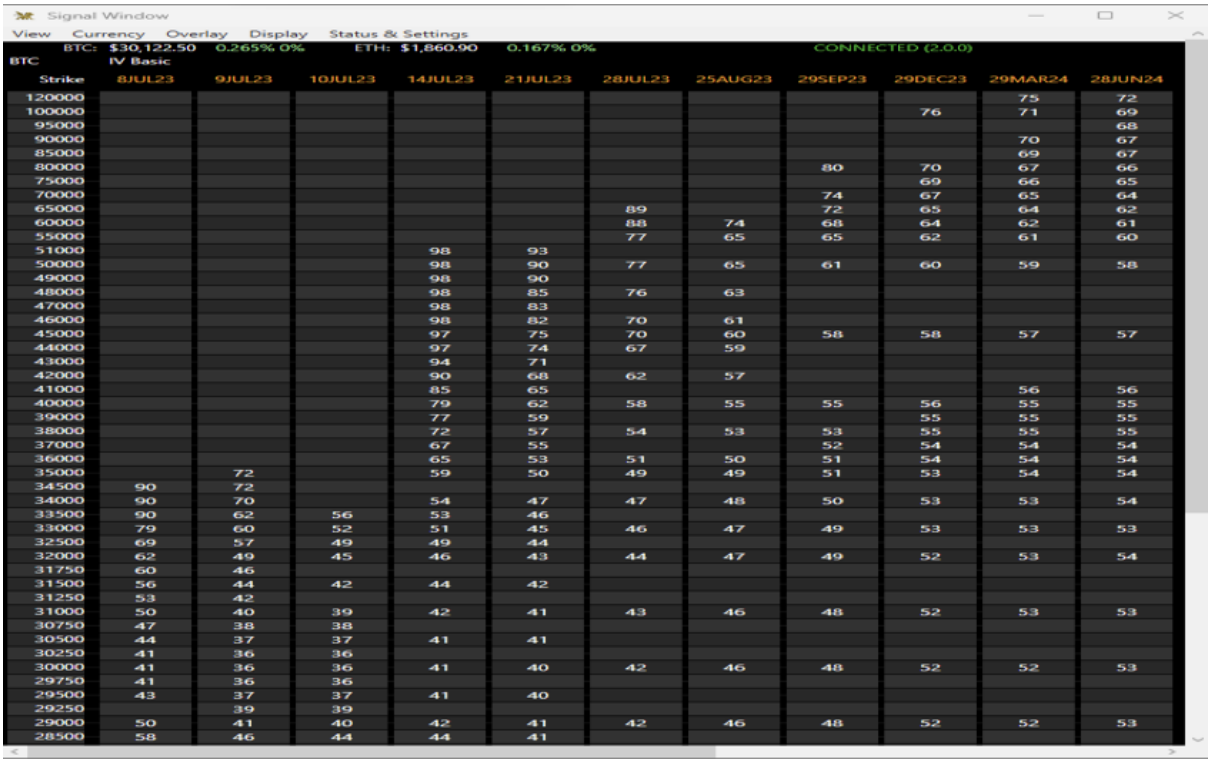
Theta Changes



Strike	8JUL23	9JUL23	10JUL23	14JUL23	21JUL23	28JUL23	25AUG23	29SEP23	29DEC23	29MAR24	28JUN24	Strike	8JUL23	9JUL23	10JUL23	14JUL23	21JUL23	28JUL23	25AUG23	29SEP23	29DEC23	29MAR24	28JUN24
120000										-0.3051	0.0242	120000										-0.3051	0.0242
100000									-0.1122	-0.1382	0.0199	100000									-0.1122	-0.1382	0.0199
95000											0.0361	95000											0.0361
90000										-0.0483	0.0149	90000										-0.0483	0.0149
85000										-0.067	-0.1081	85000										-0.067	-0.1081
80000								0.0072	-0.0479	-0.0211	-0.2705	80000								0.0072	-0.0479	-0.0211	-0.2705
75000									0.0575	0.0184	-0.2357	75000									0.0575	0.0184	-0.2357
70000								0.0322	0.0175	-0.0656	-0.1797	70000								0.0322	0.0175	-0.0656	-0.1797
65000						0.0115		0.1163	0.0763	-0.0769	-0.1692	65000						0.0115		0.1163	0.0763	-0.0769	-0.1692
60000						-0.3059	0.4732	0.2462	0.0448	-0.0389	-0.0629	60000						-0.3059	0.4732	0.2462	0.0448	-0.0389	-0.0629
55000						0.2138	1.3428	0.1375	0.0014	0.0777	-0.06	55000						0.2138	1.3428	0.1375	0.0014	0.0777	-0.06
51000				-0.0074	-0.5329							51000				-0.0074	-0.5329						
50000				-0.0515	-0.0253	0.416	0.1199	0.5199	-0.0473	0.0885	0.0293	50000				-0.0515	-0.0253	0.416	0.1199	0.5199	-0.0473	0.0885	0.0293
49000				-0.0895	-0.0909							49000				-0.0895	-0.0909						
48000				-0.162	0.3059	-0.139	-0.0165					48000				-0.162	0.3059	-0.139	-0.0165				
47000				-0.2746	0.6545							47000				-0.2746	0.6545						
46000				-0.4186	0.0875	-0.0445	0.2324					46000				-0.4186	0.0875	-0.0445	0.2324				
45000				-0.4361	0.6338	-0.1939	0.3155	0.3664	-0.068	0.1261	-0.0336	45000				-0.4361	0.6338	-0.1939	0.3155	0.3664	-0.068	0.1261	-0.0336
44000				-0.6495	-0.4307	0.0451	0.4496					44000				-0.6495	-0.4307	0.0451	0.4496				
43000				-0.0786	-0.2211							43000				-0.0786	-0.2211						
42000				-0.1943	-0.7	0.5365	0.659					42000				-0.1943	-0.7	0.5365	0.659				
41000				-0.5078	-0.658					0.1055	0.0302	41000				-0.5078	-0.658					0.1055	0.0302
40000				-0.0396	-0.6775	1.0121	0.8044	0.3091	-0.0033	0.0945	0.0405	40000				-0.0396	-0.6775	1.0121	0.8044	0.3091	-0.0033	0.0945	0.0405
39000				-0.7454	-0.1				-0.061	0.0974	0.0524	39000				-0.7454	-0.1				-0.061	0.0974	0.0524
38000				-2.231	-0.097	1.9713	0.6425	0.2843	-0.0406	0.0896	0.0548	38000				-2.231	-0.097	1.9713	0.6425	0.2843	-0.0406	0.0896	0.0548
37000				-2.7601	0.0111			0.2428	-0.0785	0.1015	0.0581	37000				-2.7601	0.0111			0.2428	-0.0785	0.1015	0.0581
36000				-4.3499	0.6246	1.8989	0.7004	0.2236	-0.0952	0.0837	0.0327	36000				-4.3499	0.6246	1.8989	0.7004	0.2236	-0.0952	0.0837	0.0327
35000		0.8033 ! 18		-3.7307	1.2201	2.0603	0.6383	0.1877	-0.0937	0.0887	0.0409	35000		0.8033 ! 18		-3.7307	1.2201	2.0603	0.6383	0.1877	-0.0937	0.0887	0.0409
34500	1.5598	1.8439										34500	1.5598	1.8439									
34000	1.6904	2.0642		-2.4068	1.7285	2.0416	0.5815	0.1678	-0.0892	0.1001	0.055	34000	1.6904	2.0642		-2.4068	1.7285	2.0416	0.5815	0.1678	-0.0892	0.1001	0.055
33500	-0.5007	3.9981		-2.2349	2.1596							33500	-0.5007	3.9981	! 2	-2.2349	2.1596						
33000	2.4858	5.9396		-1.2856	2.3761	1.9143	0.4556	0.1333	-0.1447	0.0855	0.0691	33000	2.4858	5.9396	! 2	-1.2856	2.3761	1.9143	0.4556	0.1333	-0.1447	0.0855	0.0691
32500	6.5647	2.8268		-0.5381	2.4889							32500	6.5647	2.8268	! 2	-0.5381	2.4889						
32000	13.1893	9.1215		-0.0165	2.3851	1.5699	0.368	0.0867	-0.1456	0.0876	-0.0441	32000	13.1893	9.1215	! 2	-0.0165	2.3851	1.5699	0.368	0.0867	-0.1456	0.0876	-0.0441
31750	16.9977	13.0762										31750	16.9977	13.0762									
31500	23.3925	10.2171		0.6042	2.2357							31500	23.3925	10.2171	! 2	0.6042	2.2357						
31250	33.4123	7.6698										31250	33.4123	7.6698									
31000	39.7693	7.8499		0.2135	1.9039	1.1852	0.2727	0.0306	-0.1541	0.0422	0.0054	31000	39.7693	7.8499	! 2	0.2135	1.9039	1.1852	0.2727	0.0306	-0.1541	0.0422	0.0054
30750	28.9836	6.1867										30750	28.9836	6.1867	! 2								
30500	-1.0256	1.8563		-0.1961	1.603							30500	-1.0256	1.8563	! 2	-0.1961	1.603						
30250	-12.3459	-3.2762										30250	-12.3459	-3.2762	! 2								
30000	-20.5161	-5.9598		-1.6656	1.3093	0.8359	0.1767	0.0182	-0.1175	-0.0008	0.0598	30000	-20.5161	-5.9598	! 2	-1.6656	1.3093	0.8359	0.1767	0.0182	-0.1175	-0.0008	0.0598

Step 2. Trade Back Test

Once these potential trade opportunities are identified, our proprietary machine learning algorithm back tests each potential trades and creates a signal matrix.



Signal Window

View Currency Overlay Display Status & Settings

BTC: $30,122.50 0.265% 0% ETH: $1,860.90 0.167% 0% CONNECTED (2.0.0)

BTC IV Basic

Strike	8JUL23	9JUL23	10JUL23	14JUL23	21JUL23	28JUL23	25AUG23	29SEP23	29DEC23	29MAR24	28JUN24
120000										75	72
100000									76	71	69
95000											68
90000										70	67
85000										69	67
80000								80	70	67	66
75000									69	66	65
70000								74	67	65	64
65000						89		72	65	64	62
60000						88	74	68	64	62	61
55000						77	65	65	62	61	60
51000				98	93						
50000				98	90	77	65	61	60	59	58
49000				98	90						
48000				98	85	76	63				
47000				98	83						
46000				98	82	70	61				
45000				97	75	70	60	58	58	57	57
44000				97	74	67	59				
43000				94	71						
42000				90	68	62	57				
41000				85	65					56	56
40000				79	62	58	55	55	56	55	55
39000				77	59				55	55	55
38000				72	57	54	53	53	55	55	55
37000				67	55			52	54	54	54
36000				65	53	51	50	51	54	54	54
35000		72		59	50	49	49	51	53	54	54
34500	90	72									
34000	90	70		54	47	47	48	50	53	53	54
33500	90	62	56	53	46						
33000	79	60	52	51	45	46	47	49	53	53	53
32500	69	57	49	49	44						
32000	62	49	45	46	43	44	47	49	52	53	54
31750	60	46									
31500	56	44	42	44	42						
31250	53	42									
31000	50	40	39	42	41	43	46	48	52	53	53
30750	47	38	38								
30500	44	37	37	41	41						
30250	41	36	36								
30000	41	36	36	41	40	42	46	48	52	52	53
29750	41	36	36								
29500	43	37	37	41	40						
29250		39	39								
29000	50	41	40	42	41	42	46	48	52	52	53
28500	58	46	44	44	41						

Step 3. Trade Execution

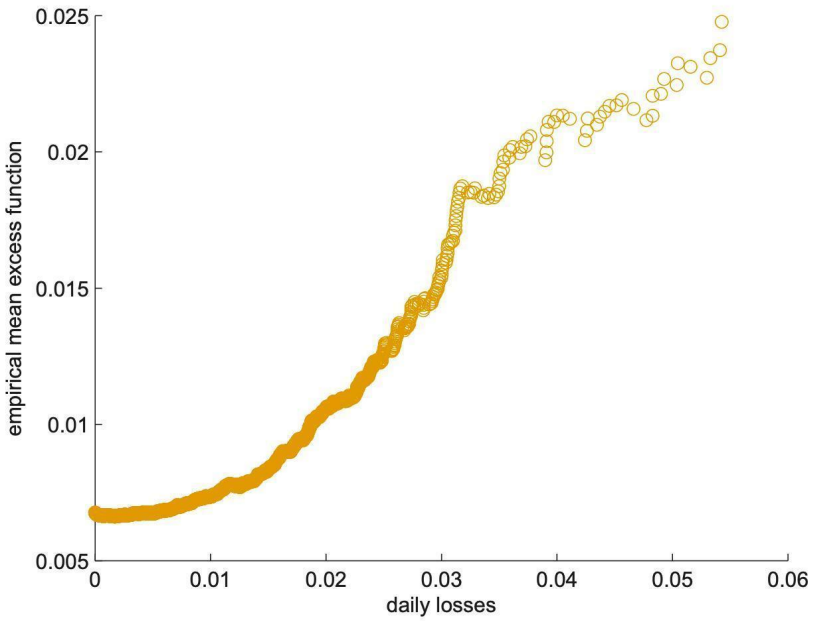
Trades are then executed by a portfolio manager, utilising API. All clients in a strategy are treated equally as the trade is batched in the LibertyRoad API, the batched amount is split on an AUM basis and the trade is then allocated automatically to each client.

The outright size of the trade is determined by our EVT based risk management system, which is constantly monitoring the portfolio and the amount of EVaR in the portfolio with a target of 5% annualised volatility to a 2 Standard Deviation level of confidence. If the portfolio gets hot, the trade size declines and if the portfolio gets cold it will increase.
In essence EVT and the creation of EVaR is done by:

A. Determining the distribution to be used.
B. Deciding on a sampling strategy (typically Block Maxima v Peak over Threshold).
C. Deciding on a sampling threshold.
D. Modelling the samples with given distribution and converting to Extreme Value at Risk (EVaR).

This is quite complicated mathematics and a paper that we wrote is available to those people who are interested, but by using a Generalised Pareto Distribution (GPD), and a Mean Excess Function (MEF) to model the left-hand tail, we get very powerful results in both more accurately understanding the portfolio risks, but also in predicting any losses above a given threshold. This is because we know that the MEF above the threshold goes linear in a GPD distribution.

Mean Excess Function plotted against Daily Losses.[8]



Importantly the EVaR in the portfolio is dynamic and forward looking. Therefore, changes in the distribution of the left hand tail above the confidence are analysed and directly affect the

[8] Extreme Value Theory and Extreme Value at Risk. D R Thompson. LibertyRoad 2022. Extreme Value Theory ('EVT') & Extreme Value at Risk ('EVaR') – LibertyRoad Capital

level of risk being implemented. This is absolutely not possible in a traditional VaR based risk management system.

LibertyRoad has many other risk limits based around a Monte Carlo risk simulation matrix, individual risk limits on Theta, Gamma liquidity etc. etc. and a document is available on request for those.

6. Conclusion

"When you say ROI, do you mean return on investment or risk of inaction."

— Paul Gilin

For any investor, be they a miner, a digital bank, a family office, institution or UHNW getting your bitcoin to work for you is important.

Many yield enhancement strategies are around, but as we saw with Terra, there is no such thing as a free lunch. An investor could wrap their bitcoin and place it into a pool, engage in collateralised lending and a myriad of other ways, but this is complicated, can have high degrees of embedded risk, and ultimately will probably not yield 10% for the investor.

A sophisticated Covered Call Strategy is simple, easy to understand and has no counterparty, exchange, credit or even settlement risk.[9] It should undoubtedly be considered as part of any investors repertoire when creating any form of yield enhancement strategy.

It clearly works better in falling markets than rising markets, but can be just as effective in markets moving higher over time, and even in parabolic markets such as May 2022, where Bitcoin rose 14% an investor in the LibertyRoad Treasury Product did not lose money. The strategy clearly produces a very asymmetric risk profile. ROI does mean Return on Investment. Inaction rarely is beneficial.

[9] LibertyRoad utilises Copper.co who hold all Bitcoin is a cold offline wallet. A document outlining this process is available on request.