

September 2021 Newsletter

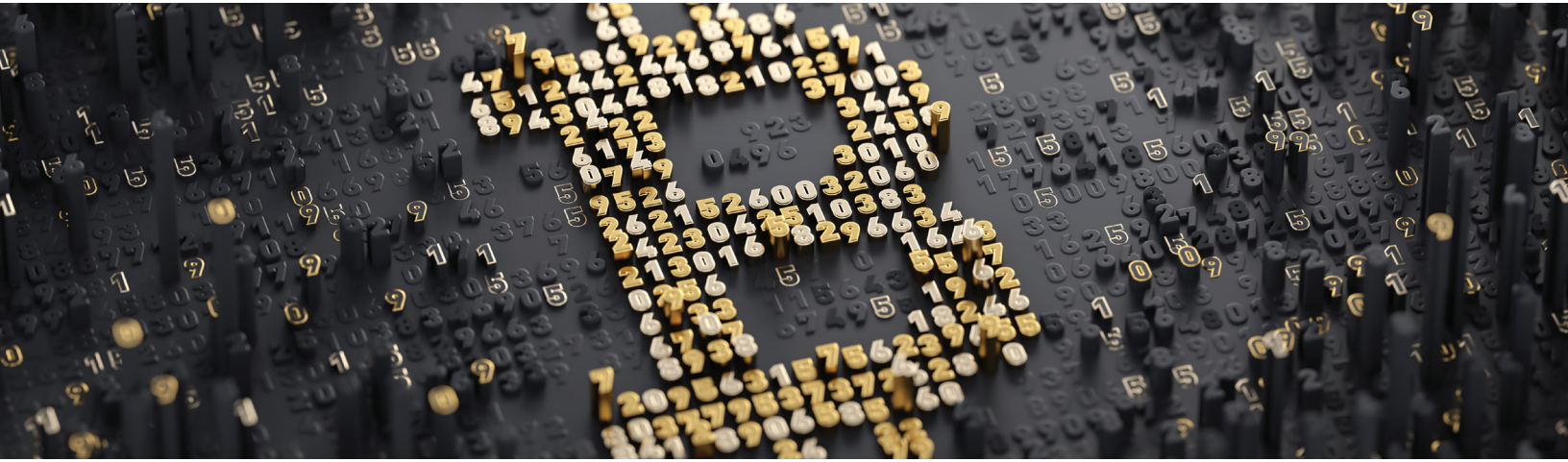
Dear Investor,

The Global Volatility Summit (“GVS”) brings together volatility and tail hedge managers, institutional investors, thought-provoking speakers, and other industry experts to discuss the volatility markets and the roles volatility strategies can play in institutional investment portfolios. The GVS aims to keep investors updated on the volatility markets throughout the year, and educated on innovations within the space.

Neuberger Berman has provided the latest piece in the GVS newsletter series.

Cheers,
Global Volatility Summit

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Tempering Bitcoin into a Rational Investment Option

Like most investors lately, we have been contemplating the numerous questions surrounding investments in Bitcoin. In our minds, the present state of cryptocurrency investing is sprinting toward institutional adoption. Yet, to date, investor focus has been concentrated on “beta/delta one” strategies dominated by high-profile, self-proclaimed Bitcoin trading experts. Our experience suggests that many crypto-traders are simply offering access to Bitcoin (a custody solution) while competing for the honor of having named the highest price target. After all, Bitcoin’s volatility indirectly provides these strategies with material “free” financial leverage. Our skeptical minds tell us that any investor claiming to know what is going to happen in cryptocurrency markets is likely just marketing their wares.

In fact, we do not believe it is possible to know what Bitcoin's price is going to do month to month and this uncertainty is exactly why we are sharing our proposal on how to gain exposure to Bitcoin in what we view as a more risk-efficient, hedged format that seeks to benefit from Bitcoin's volatility. In the name of brevity, we will skip an introduction to Bitcoin¹ and assume for the purposes of this paper that our readers are already down the road of considering Bitcoin exposure for their investment portfolios.

Why Now?

At present, most investors appear to be holding/trading Bitcoin to "get rich", to the tune of ~\$1 trillion in market capitalization. We certainly have no qualms with those pursuing great reward at the assumption of great risk. However, we prefer to pursue strategies that seek to compound capital efficiently over longer periods of time in what we call "stay rich" strategies.

Setting aside any fundamental and/or technical analysis, we believe the combination of Bitcoin's volatility and seemingly untethered existence, i.e. uncorrelated exposure (Figure 1 below), offers a potentially attractive investment opportunity for investors to generate a unique return stream and to potentially harvest volatility as part of a diversified portfolio. That said, our recommendation is to do so through a hedged format.

FIGURE 1. NOTHING COMPARES



Source: Bloomberg LP.

The explicit catalyst for our thinking was the introduction of Bitcoin futures (at 5 Bitcoins per contract or ~\$275,000) and options by CME Group in 2020; more recently, on May 3, 2021, CME Group launched Micro Bitcoin futures, which trade in units of 1/10th of a Bitcoin (roughly \$5,400 per contract). While overall volumes and open interest levels vary, Bitcoin futures have found reasonable flow, and option markets appear to be well quoted despite limited activity. We believe, with a functioning futures market supporting it, the Bitcoin option market is accessible to investors.

Bitcoin Pickaxes and Shovels (Futures and Options)

For those familiar, most daily Bitcoin transactions occur "off-blockchain" ("off-chain"), meaning they are never verified and posted to Bitcoin's public ledger ("on-chain"). Off-chain cryptocurrency transactions reduce/eliminate the latency and expense of verifying "on-chain" transactions, a process that takes about 10 minutes on average and currently costs about \$30² per verified transaction regardless of the dollar value of the transaction for Bitcoin. While off-chain transactions may diminish Bitcoin's coveted platform-independent status, they allow transaction volumes to be "off the hook".

¹ For an introduction to Bitcoin please see [The Bitcoin Experiment](#) by Hakan Kaya, PhD, Seth Yerk, CFA, & Suzanne Peck.

² Sum of daily Bitcoin Blockchain transaction fees divided by the number of transactions verified.

From an institutional perspective, persistent buying and selling, i.e. proven liquidity, of a new asset class is typically required for investor confidence and adoption to build such that futures and option markets emerge to supplement the established cash market.

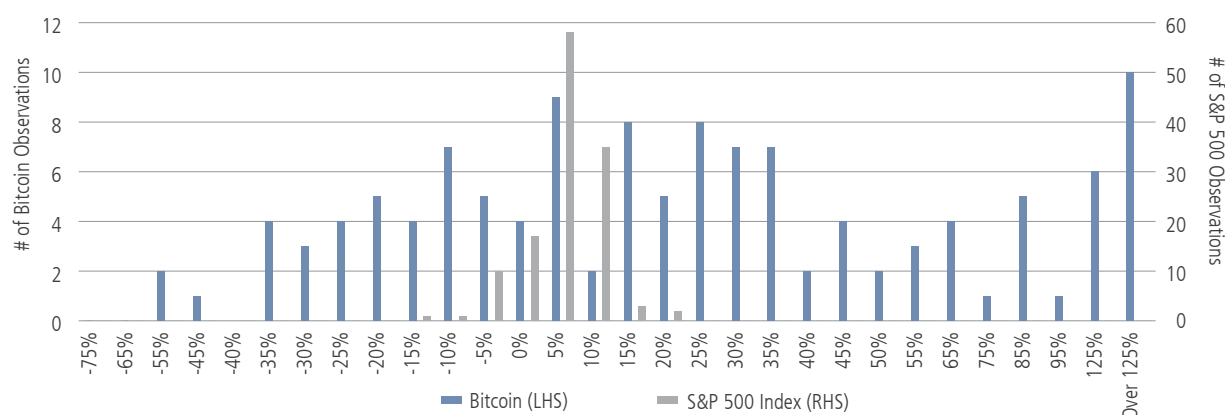
We believe cryptocurrency may have a lower hurdle to clear than most new asset classes for investor adoption of futures and options. Given the relative complexity of Bitcoin custody and trade verification on its blockchain (distributed ledger), derivatives markets may grow rapidly as efficient sources of exposures.³ We anticipate that many investors will appreciate standardized, exchange-traded, centrally cleared derivatives, e.g. CME Group products, held at secure, crypto-friendly custodians/prime brokers as their off-chain access to Bitcoin.

Surveying the Opportunity

Given our decade of experience developing systematic options strategies on a variety of volatile index exposures, we believe that there may be similar success to be found in developing such strategies with Bitcoin. With 10 years of price history, the risk of Bitcoin is well observed with both “tails” adequately “feared” by market participants. Figure 2 below highlights the monthly returns that have made Bitcoin a mythic beast of an investment. Notably, the “right-tail” of Bitcoin instills more fear in derivative desk risk managers’ minds than the “left-tail”.

FIGURE 2. BITCOIN & S&P 500: 2-MONTH RETURN DISTRIBUTIONS

November 2010 – June 2021



Source: Bloomberg LP.

Importantly, Bitcoin option markets price in an exceptionally high level of implied volatility with healthy implied volatility premiums. Further, like other commodity option markets, Bitcoin options have skew present in both the right and left tails of their implied volatility smiles. While volatility levels may decline as Bitcoin becomes more liquid and institutionalized, we expect the demand for downside protection will increase, i.e. the need to warehouse risk, which would result in Bitcoin options continuing to carry a relatively high implied volatility premium (variance risk premium) for a fairly long period of time.

³ At present, Bitcoin futures have a relatively high roll cost, but we expect the cost to fall as exposure demand grows and additional Bitcoin products proliferate.

FIGURE 3. IMPLIED VOLATILITY: 30-DAY AT-THE-MONEY

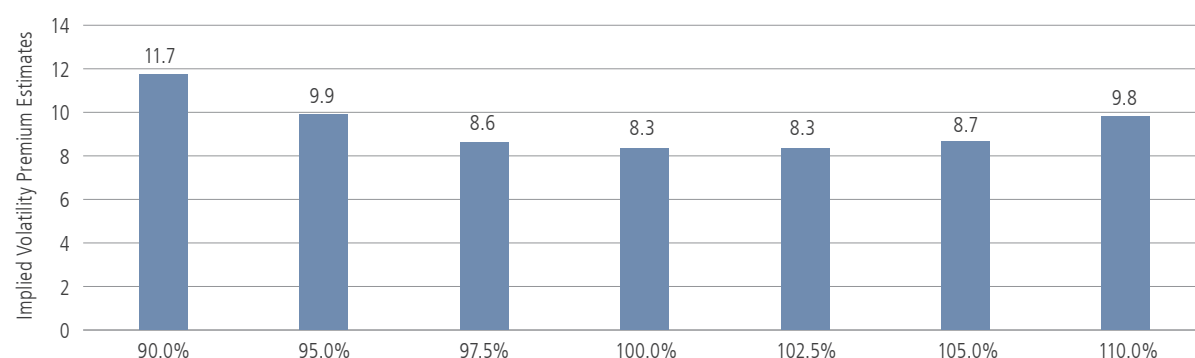
Jan. 13, 2020 – June 30, 2021



Source: Bloomberg LP.

FIGURE 4. BITCOIN IMPLIED VOLATILITY PREMIUM ESTIMATES BY OPTION MONEYNES LEVEL

Jan. 13, 2020 – June 30, 2021



Source: Bloomberg LP.

We see three higher probability scenarios for Bitcoin in the coming years. One, Bitcoin continues its meteoric rise and remains extremely volatile. Two, Bitcoin's price suffers a collapse, driving volatility to new extremes. Three, Bitcoin's growth rate slows and volatility declines (but remains attractive). In all cases, we believe utilizing option strategies may provide advantages to or complement a Buy & Hold Bitcoin strategy.

Collectively, we believe the above circumstances offer a unique opportunity to implement a strategy we have managed for over a decade across multiple indices and exchange traded fund exposures.

Taking the “Byte” out of Bitcoin Exposure

For those looking for a more stable exposure to holding Bitcoin directly, we believe a Hedged PutWrite strategy may potentially deliver a desirable balance between total return, lower volatility and less left-tail risk while preserving a relatively high return correlation to Bitcoin. The table below summarizes key attributes of the strategy.

Hedged PutWrite Positioning	Implementation Notes
1. Risk-Managed PutWrite	<ul style="list-style-type: none"> • Directionally long Bitcoin • Doesn't own Bitcoin or Bitcoin Futures exposure⁴ • Earns Bitcoin implied volatility premium • Can be fully or partially funded (overlay)
2. Buys Out-of-the-Money Put	<ul style="list-style-type: none"> • Fully hedged (defined downside) • Upside limited by premium collection • Benefits from higher volatility levels

Figure 5 below compares a Buy & Hold Bitcoin strategy to our proposed Bitcoin Hedged PutWrite model. For completeness, we present two different time periods. The first corresponds to the available data for Bitcoin options since their introduction by CME in January 2020. The second is limited to the past five years to capture a more “mature” period of Bitcoin’s history, assuming there is such a thing. While we find the full history of Bitcoin to be awe-inspiring, it includes noisy and extreme data that we do not consider representative of the present state of Bitcoin’s risk profile. The past five years of Bitcoin’s existence still provides plenty of extreme data points. Truncating the analysis period is done out of a desire to seek to be conservative. We are happy to share additional data upon request.

FIGURE 5. SUMMARY STATISTICS: BUY & HOLD BITCOIN VS. BITCOIN HEDGED PUTWRITE

Hypothetical Backtested Models

	January 2020 – June 2021 (Since Bitcoin Option Launch)		April 2016 – June 2021	
	Buy & Hold Bitcoin	NB Model: Bitcoin Hedged PutWrite	Buy & Hold Bitcoin	NB Model: Bitcoin Hedged PutWrite
Ann. Total Return (%)	170.2	50.0	131.2	52.9
Ann. Standard Deviation (%)	82.6	42.2	90.1	37.6
Risk Adjusted Return	2.06	2.76	1.46	1.41
Beta	1.00	0.45	1.00	0.33
Correlation	1.00	0.91	1.00	0.79
Correlation to S&P 500	0.64	0.74	0.19	0.33
Best Month (%)	49.6	23.6	72.6	25.8
Worst Month (%)	-24.9	-23.8	-37.6	-27.0
Max Drawdown (%)	-30.7	-24.6	-75.7	-43.6
Jan. 2018 – Dec. 2018	—	—	-63.1	-38.5
Jul. 2019 – Dec. 2019	—	—	-28.6	10.1
Jan. 2020 – Mar. 2020	—	—	-30.7	-21.5
Apr. 2021 – Jun. 2021	-30.7	-24.2	-39.1	-25.3

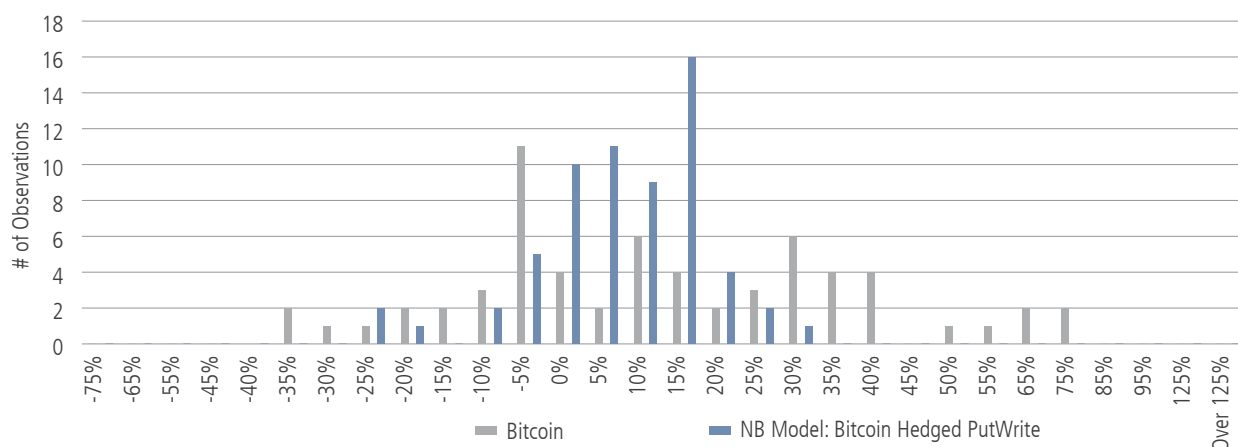
Source: Bloomberg LP, Neuberger Berman, CBOE. The Buy & Hold Bitcoin Strategy reflects the return of an investment in Bitcoin that is purchased on January 1, 2020 and April 1, 2016 and held until June 30, 2021. All returns are gross of fees. Model returns are net of estimates for transaction costs. Please see disclosures for information regarding hypothetical backtested model returns. Index data sourced from Bloomberg LP. PLEASE SEE “HYPOTHETICAL BACKTESTED PERFORMANCE DISCLOSURES” AT THE END OF THIS MATERIAL FOR IMPORTANT DISCLOSURES REGARDING THE HYPOTHETICAL BACKTESTED PERFORMANCE SHOWN IN THIS PRESENTATION. **Past performance is no guarantee of future results.**

⁴ CME Bitcoin options are European style, which prohibits early assignment of Bitcoin futures.

By design, the Hedged PutWrite strategy does not capture the full return potential nor the full volatility of a Buy & Hold strategy. However, the risk-efficiency and risk statistics in our model are attractive and, we would argue, more aligned with a rational Bitcoin investment strategy. The model also appears to demonstrate that the Hedged PutWrite strategy may offer a superior risk-efficiency for investors looking to access Bitcoin without necessarily owning Bitcoin. We would also assert that what we view as the exceptional risk efficiency of the Buy & Hold strategy is unsustainable and less stable than our model's.

FIGURE 6. 1-MONTH RETURN DISTRIBUTIONS: BUY & HOLD BITCOIN VS BITCOIN HEDGED PUTWRITE

Hypothetical Backtested Model (April 2016 – June 2021)



Source: Bloomberg LP, Neuberger Berman, CBOE. The Buy & Hold Bitcoin Strategy reflects the return of a “physical” investment in Bitcoin that is purchased on April 2016 and held until June 30, 2021. All returns are gross of fees. Model returns are net of estimates for transaction costs. Please see disclosures for information regarding hypothetical backtested model returns. Index data sourced from Bloomberg LP. PLEASE SEE “HYPOTHETICAL BACKTESTED PERFORMANCE DISCLOSURES” AT THE END OF THIS MATERIAL FOR IMPORTANT DISCLOSURES REGARDING THE HYPOTHETICAL BACKTESTED PERFORMANCE SHOWN IN THIS PRESENTATION.

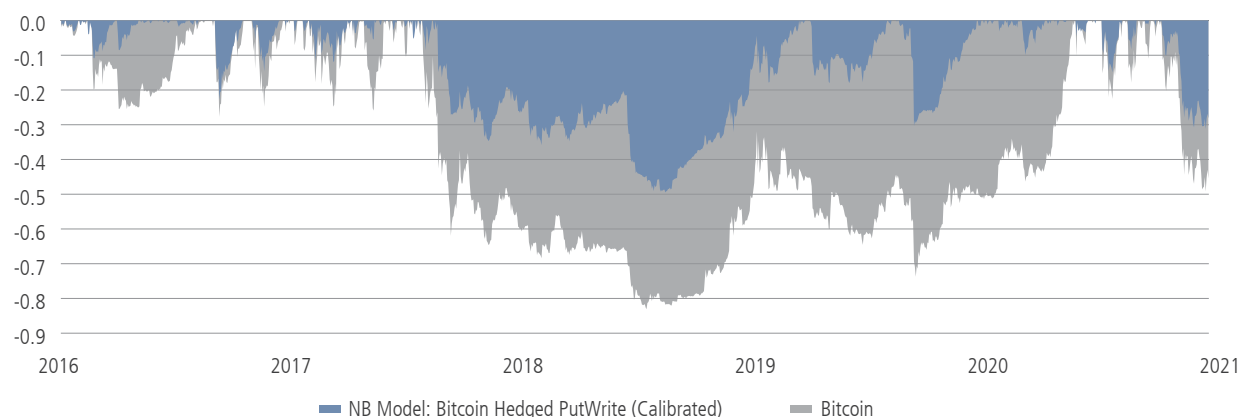
Past performance is no guarantee of future results.

Additionally, improved return stability/consistency (Figure 6 above) may be of increasing interest to investors as the growth rate of Bitcoin slows while its high levels of volatility persist. To be clear, even with a possible “stabilization” of Bitcoin’s price, we believe the return potential of a Hedged PutWrite strategy remains robust. Using the average implied volatility since Bitcoin options went live in 2020, the average monthly yield on an at-the-money Bitcoin put option has been approximately 9%, or well over 100% annualized.

In sacrificing the right-tail, the Hedged PutWrite offers notable potential downside protection. Figure 7 on the next page compares the drawdowns of the Buy & Hold strategy versus the Hedged PutWrite model over the past five years. Despite its recent stellar returns, Bitcoin has experienced severe drawdowns.

FIGURE 7. DRAWDOWNS: BUY & HOLD BITCOIN VS. BITCOIN HEDGED PUTWRITE

Hypothetical Backtested Model (April 2016 – June 2021)



Source: Bloomberg LP, Neuberger Berman, CBOE. The Buy & Hold Bitcoin Strategy reflects the return of a “physical” investment in Bitcoin that is purchased on April 2016 and held until June 30, 2021. All returns are gross of fees. Model returns are net of estimates for transaction costs. Please see disclosures for information regarding hypothetical backtested model returns. Index data sourced from Bloomberg LP. PLEASE SEE “HYPOTHETICAL BACKTESTED PERFORMANCE DISCLOSURES” AT THE END OF THIS MATERIAL FOR IMPORTANT DISCLOSURES REGARDING THE HYPOTHETICAL BACKTESTED PERFORMANCE SHOWN IN THIS PRESENTATION.

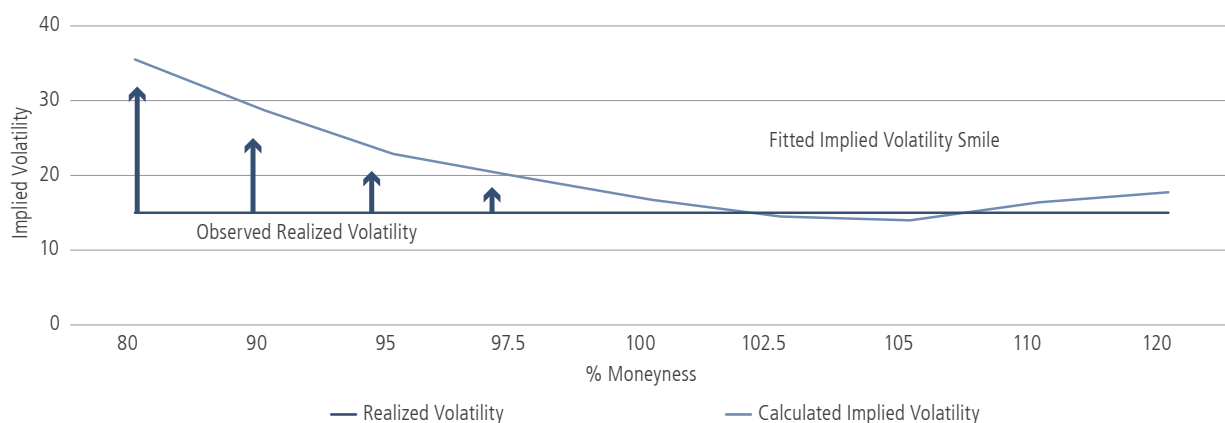
Past performance is no guarantee of future results.

Mining Bitcoin Implied Volatility

The most important inputs for our model are our approximations of the implied volatility of Bitcoin for the period prior to the existence of Bitcoin options. To do this, we build implied volatility surfaces (“IV”) that are a function of trailing realized volatilities and observed skew structures calculated for the live history of Bitcoin futures options. The illustration below assumes a 30-day realized volatility of 15% and uses an “implied volatility scalar” to create the curvature approximated by the implied volatility smile. We then build surfaces by applying this methodology across different option tenors.

FIGURE 8. HASHING AN IMPLIED VOLATILITY SMILE

Hypothetical Backtested Model (April 2016 – June 2021)



Source: Bloomberg LP.

While the curvature of implied volatility surfaces changes daily, we believe our estimation methods provide a reasonable estimate because implied volatility tends to mean revert. As a result, applying medians in models over reasonable periods of time can yield results directionally consistent with models that utilize more precise, historical implied volatility surfaces. Further, in our view this methodology tends to produce relatively conservative results versus models based on observable data. To substantiate this point, in Figure 9 we have provided model comparisons for three different putwrite strategies for distinctly different underlying index exposures, the S&P 500, the iShares MSCI EM exchange traded fund ("EEM") and the SPDRS Gold Shares exchange traded fund ("GLD"). We compare our putwrite models that utilize "Observed IV" histories versus the methodology mentioned above using "Calibrated IV". For consistency, we calculate the median implied volatility scalars for the putwrite models below based on the same abbreviated period we use for our Bitcoin surface models, January 2020 to June 2021.

FIGURE 9. SUMMARY STATISTICS

(Hypothetical Backtested Model, as of June 30, 2021)

	NB Model S&P 500 (Observed IV)	NB Model S&P 500 (Calibrated IV)	NB Model MSCI EM ¹ (Observed IV)	NB Model MSCI EM (Calibrated IV)	NB Model Gold ² (Observed IV)	NB Model Gold (Calibrated IV)
Ann. Total Return (%)	11.51	9.66	10.57	8.38	6.22	5.58
Ann. Standard Deviation (%)	11.00	9.81	17.64	16.79	9.43	9.64
Risk Adjusted Return	1.05	0.98	0.60	0.50	0.66	0.57
Tracking Error to (Observed IV)	—	2.9	—	4.4	—	2.5
Maximum Drawdown	-29.9	-26.2	-43.6	-43.1	-21.9	-21.0
Model Inception Date	January 1990		March 2006		June 2008	
Calibration Period	Jan. 2020 – Jun. 2021		Jan. 2020 – Jun. 2021		Jan. 2020 – Jun. 2021	

¹iShares MSCI Emerging Market ETF.

²SPDR Gold Shares ETF; Source: Bloomberg LP.

All returns are gross of fees. Model returns are net of estimates for transaction costs. Please see disclosures for information regarding hypothetical backtested model returns. Index data sourced from Bloomberg LP. PLEASE SEE "HYPOTHETICAL BACKTESTED PERFORMANCE DISCLOSURES" AT THE END OF THIS MATERIAL FOR IMPORTANT DISCLOSURES REGARDING THE HYPOTHETICAL BACKTESTED PERFORMANCE SHOWN IN THIS PRESENTATION. **Past performance is no guarantee of future results.**

While some may see the differences in the numbers above as "significant", their consistency across three very distinct underliers and different time periods suggest to us that our methods and assumptions regarding our Bitcoin option implied volatility surface estimates potentially yield reasonable results. Intuitively, the efficacy of our rather straightforward approximation method is partly due to the mean reversion in implied volatility and implied volatility premiums and a tendency for periods of overestimating are generally offset by periods of underestimating implied volatilities. Our live track record of EM Index putwriting has performed in line with our modeling expectations and, over time, we have found that putwriting strategies on higher volatility assets appear to offer greater relative benefits.

Let us stop here. We welcome an opportunity to discuss our modeling techniques in greater detail and to provide additional transparent analysis.

It's Worth It

For the last 10 years we have researched, recommended, and implemented options-based strategies for institutional and high net worth investors. Several times we have refrained from pursuing volatility/option strategies that we believed to be too speculative or too "trendy". In Bitcoin, we believe we have found a new and potentially worthy application of our discipline for those looking to acquire Bitcoin exposure.

Thus far, Bitcoin has proven to provide both an opportunity to diversify investment portfolios and to potentially earn substantial profits. However, those benefits are not offered on a risk-free basis. Rather, they have come with extraordinary levels of volatility and unique operational risks.⁵ Succinctly, the evolution and growth of Bitcoin (and other cryptocurrency) may offer new sources of portfolio return and volatility premium (risk premium) for investors to harvest. We expect these risks will likely persist. Hence, we believe a Hedged Putwrite strategy is a potentially unique solution for investors looking to participate in Bitcoin's future with a potentially greater degree of risk control and operational efficiency, and, down the road, we expect there will likely be additional cryptocurrencies that present similar opportunities.

⁵ We consider "lose your password and lose all your money" to be a material risk no matter how small a probability of it occurring.

APPENDIX – INDEX DESCRIPTIONS

The **S&P 500 Index** consists of 500 stocks chosen for market size, liquidity, and industry group representation. It is a market value weighted index (stock price times number of shares outstanding), with each stock's weight in the Index proportionate to its market value. The "500" is one of the most widely used benchmarks of U.S. equity performance. As of September 16, 2005, S&P switched to a float-adjusted format, which weights only those shares that are available to investors, not all of a company's outstanding shares. The value of the index now reflects the value available in the public markets.

Hypothetical Backtested Performance Disclosures

The hypothetical performance results included in this material are of various backtested model portfolios that are shown for illustrative purposes only. The hypothetical results we calculated by running the model portfolios on a backtested basis using the stated methodologies and assumptions below. The results are shown on a supplemental basis and do not represent the performance of any Neuberger Berman managed account or product, and do not reflect the fees and expenses associated with managing a portfolio. The results assume no withdrawals and reinvestment of any dividends and distributions.

This following is a summary of the backtested methodology and assumptions:

The option strategy backtesting platform is designed to estimate historical performance of portfolios that implement systematic option writing strategies. Models support a multitude of variables including option strategy, e.g., put writing or call writing, underlying exposure (index or stock), tenor, moneyness, risk management parameters and collateral investments. While models incorporate different parameter sets, they adhere to a consistent structure across all backtested model scenarios and our model architecture is such that returns are estimated independent of account size.

All models rely on a Black-Scholes pricing to estimate option prices based on historical implied volatility surfaces. We compile daily implied volatility surfaces from exchange listed option price and/or option implied volatility data available from external data providers including the Chicago Board of Options Exchange ("CBOE") and Bloomberg LP. Additional inputs for option pricing (dividends, risk-free rate, etc.) are sourced from Bloomberg LP.

Daily implied volatility surfaces allow models to price weekly expiration dates even though weekly option expirations may not have been actively traded on an exchange over the full history of a model backtest. Models methodically allocate options across weekly expirations to promote diversification across expiration dates and are assumed to settle on each Friday consistent with current option market practices.

Exposures are rebalanced on a daily basis at the close of each trading day. Daily model rebalancing adjusts portfolio exposures and rolls (covers and writes) option positions consistent with specified risk management targets. Options are rolled in a manner that seeks to preserve exposures across multiple expiration dates, and risk management targets, e.g., option delta and or moneyness, are set at the inception of a backtest and applied over its full history. All trading is assumed to be transacted at market closing prices derived from closing implied volatility levels and includes estimates for transaction costs. Option strike prices follow standard option market conventions unique to the underlying index/security. Models may round up, down or to the nearest strike price when selecting option to write.

Hypothetical option models are fully collateralized such that model portfolios are assumed to hold fixed income securities whose aggregate market values are greater than or equal to the aggregate notional exposure of the options. Collateral is assumed to be invested in a widely followed index(s) that approximates the performance of short-term U.S. Treasuries. Models may vary from actual strategy performance due to assignment risk for American style options, exchanged traded option contract availability, intra-day trading and differences in transaction costs (implicit and explicit).

Hypothetical performance results have many inherent limitations, some of which are described below. No representation is being made that any account will or is likely to achieve profits or losses similar to those shown. In fact, there are frequently sharp differences between hypothetical performance results and the actual results subsequently achieved by any particular trading program.

One of the limitations of hypothetical performance results is that they are generally prepared with the benefit of hindsight. In addition, hypothetical trading does not involve financial risk, and no hypothetical trading record can completely account for the impact of financial risk in actual trading. For example, the ability to withstand losses or adhere to a particular trading program in spite of trading losses are material points which can also adversely affect actual trading results. There are numerous other factors related to the markets in general or to the implementation of any specific trading program which cannot be fully accounted for in the preparation of hypothetical performance results and all of which can adversely affect actual trading results.

HYPOTHETICAL PERFORMANCE RESULTS HAVE MANY INHERENT LIMITATIONS, SOME OF WHICH ARE DESCRIBED BELOW. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THOSE SHOWN. IN FACT, THERE ARE FREQUENTLY SHARP DIFFERENCES BETWEEN HYPOTHETICAL PERFORMANCE RESULTS AND THE ACTUAL RESULTS SUBSEQUENTLY ACHIEVED BY ANY PARTICULAR TRADING PROGRAM.

ONE OF THE LIMITATIONS OF HYPOTHETICAL PERFORMANCE RESULTS IS THAT THEY ARE GENERALLY PREPARED WITH THE BENEFIT OF HINDSIGHT. IN ADDITION, HYPOTHETICAL TRADING DOES NOT INVOLVE FINANCIAL RISK, AND NO HYPOTHETICAL TRADING RECORD CAN COMPLETELY ACCOUNT FOR THE IMPACT OF FINANCIAL RISK IN ACTUAL TRADING. FOR EXAMPLE, THE ABILITY TO WITHSTAND LOSSES OR ADHERE TO A PARTICULAR TRADING PROGRAM IN SPITE OF TRADING LOSSES ARE MATERIAL POINTS WHICH CAN ALSO ADVERSELY AFFECT ACTUAL TRADING RESULTS. THERE ARE NUMEROUS OTHER FACTORS RELATED TO THE MARKETS IN GENERAL OR TO THE IMPLEMENTATION OF ANY SPECIFIC TRADING PROGRAM WHICH CANNOT BE FULLY ACCOUNTED FOR IN THE PREPARATION OF HYPOTHETICAL PERFORMANCE RESULTS AND ALL OF WHICH CAN ADVERSELY AFFECT ACTUAL TRADING RESULTS.

There may be material differences between the hypothetical backtested performance results and actual results achieved by actual accounts. Backtested model performance is hypothetical and does not represent the performance of actual accounts. Hypothetical performance has certain inherent limitations. Unlike actual investment performance, hypothetical results do not represent actual trading and accordingly the performance results may have under- or over-compensated for the impact, if any, that certain economic or other market factors, such as lack of liquidity or price fluctuations, might have had on the investment decision-making process or results if assets were actually being managed. Hypothetical performance may also not accurately reflect the impact, if any, of other material economic and market factors, or the impact of financial risk and the ability to withstand losses. Hypothetical performance results are also subject to the fact that they are generally designed with the benefit of hindsight. As a result, the backtested models theoretically may be changed from time to time to obtain more favorable performance results. In addition, the results are based, in part, on hypothetical assumptions. Certain of the assumptions have been made for modeling purposes and may not have been realized in the actual management of accounts. No representation

or warranty is made as to the reasonableness of the assumptions made or that all assumptions used in achieving the hypothetical results have been stated or fully considered. Changes in the model assumptions may have a material impact on the hypothetical returns presented. There are frequently material differences between hypothetical performance results and actual results achieved by any investment strategy. Neuberger Berman does not manage accounts in this manner reflected in the models.

Unless otherwise indicated, results shown reflect reinvestment of any dividends and distributions. The hypothetical performance figures are shown gross of fees, which do not reflect the deduction of investment advisory fees and other expense. If such fees and expense were reflected, returns referenced would be lower. Advisory fees are described in Part 2 of Neuberger Berman's Form ADV. A client's return will be reduced by the advisory fees and any other expenses it may incur in the management of its account. The deduction of fees has a compounding effect on performance results. For example, assume Neuberger Berman achieves a 10% annual return prior to the deduction of fees each year for a period of ten years. If a fee of 1% of assets under management were charged and deducted from the returns, the resulting compounded annual return would be reduced to 8.91%. Please note that there is no comparable reduction from the indices for the fees.

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Options involve investment strategies and risks different from those associated with ordinary portfolio securities transactions. By writing put options, an investor assumes the risk of declines in the value of the underlying instrument and the risk that it must purchase the underlying instrument at an exercise price that may be higher than the market price of the instrument, including the possibility of a loss up to the entire strike price of each option it sells but without the corresponding opportunity to benefit from potential increases in the value of the underlying instrument. If there is a broad market decline and the investor is not able to close out its written put options, it may result in substantial losses to the investor. The investor will receive a premium from writing options, but the premium received may not be sufficient to offset any losses sustained from exercised put options. Put writing makes an explicit trade-off between up-market participation and down-market participation, while still seeking reasonable returns in flat markets. As such, in up markets, an investor typically will not participate in the full gain of the underlying index above the premium collected.

This material may include estimates, outlooks, projections and other "forward-looking statements." Due to a variety of factors, actual events or market behavior may differ significantly from any views expressed.

Leverage. Option overlay strategies employ the use of derivatives and leverage, which involves the risk of loss greater than the actual cost of the investment, and also involves margin and collateral requirements. Leverage magnifies both the favorable and unfavorable effects of price movements in the investments made by an account, which may subject it to substantial risk of loss. In the event of a sudden, precipitous drop in value of an account's assets occasioned by a sudden market decline, it might not be able to liquidate assets quickly enough to meet its margin or borrowing obligations. Also, because acquiring and maintaining positions on margin allows an account to control positions worth significantly more than its investment in those positions, the amount that it stands to lose in the event of adverse price movements is higher in relation to the amount of its investment. In addition, since margin interest will be one of the account's expenses and margin interest rates tend to fluctuate with interest rates generally, it is at risk that interest rates generally, and hence margin interest rates, will increase, thereby increasing its expenses.

Representative portfolio information (characteristics, holdings, weightings, etc.) is based upon the composite or a representative/model account. Representative accounts are selected based on such factors as size, length of time under management and amount of restrictions. Any segment-level performance shown (equity only or fixed income only) is presented gross of fees and focuses exclusively on the investments in that particular segment of the portfolio being measured (equity or fixed income holdings) and excludes cash. Client accounts are individually managed and may vary significantly from composite performance and representative portfolio information. Specific securities identified and described do not represent all of the securities purchased, sold or recommended for advisory clients. It should not be assumed that any investments in securities, companies, sectors or markets identified and described were or will be profitable.

Gross of fee returns do not reflect the deduction of investment advisory fees and other expense. If such fees and expense were reflected, returns referenced would be lower. Advisory fees are described in Part 2 of Neuberger Berman's Form ADV. A client's return will be reduced by the advisory fees and any other expenses it may incur in the management of its account. The deduction of fees has a compounding effect on performance results. For example, assume Neuberger Berman achieves a 10% annual return prior to the deduction of fees each year for a period of ten years. If a fee of 1% of assets under management were charged and deducted from the returns, the resulting compounded annual return would be reduced to 8.91%. Please note that there is no comparable reduction from the indices for the fees.

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