

Protected Bitcoin: Improving Portfolios Utilizing a Stable Risk Framework

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Executive summary

As Bitcoin has matured into a \$1.43 trillion asset and emerging global store of value, investors face a key challenge: gaining exposure while managing its elevated volatility. Conventional portfolio sizing approaches are fundamentally limited, typically suggesting a modest allocation (1-2%) to avoid material increases in overall portfolio risk.

Our approach combines options with treasuries to optimize bitcoin exposure while matching the downside risk profiles of traditional asset classes - what we call a Stable Risk Framework. Our framework aims to provide:

- **Calibrated risk profiles**
- **Enhanced risk-adjusted returns**
- **Effective portfolio integration**
- **Low correlations**

Sizing alone does not address bitcoin's elevated volatility and penchant for sharp drawdowns, which can obscure the asset's return and diversification benefits. Using these Protected Bitcoin strategies as complements to traditional assets enables more meaningful allocations and provides an answer to the question, "How does bitcoin fit in a portfolio?" We backtested replacing traditional assets (fixed income, global equities, and gold) with our corresponding strategy – in each case, doing so improved a portfolio's return while maintaining similar or lower risk levels.

Problem: A sizing approach has limited benefits

Bitcoin as an asset has unique characteristics: high returns and low correlations to traditional equities, but also elevated volatility and a history of sharp drawdowns. When incorporating even a small bitcoin allocation into a traditional portfolio, these characteristics fundamentally transform the portfolio's risk-return profile, making it more susceptible to extreme outcomes and larger price swings than are traditionally acceptable. The table below (Portfolio Risk Statistics) compares 10-year trailing risk-return statistics of a traditional 60/40 Stock—Bond portfolio with a 55/40/5 Stock—Bond—Bitcoin portfolio. A 5% allocation to bitcoin funded from equities would have increased volatility by about 1.1% on an annualized basis and materially increased average drawdown.

PORTFOLIO RISK STATISTICS

	Standard deviation	Sortino ratio	Average drawdown	Average loss
60/40 Stock—Bond	9.93%	0.92	-7.04%	-2.86%
55/40/5 Stock—Bond—Bitcoin	10.98%	1.32	-7.25%	-2.44%

Source: Calamos Investments, MSCI and Bloomberg - 7/1/2016 to 6/30/2026

These challenges help explain why many investors remain underexposed to bitcoin despite its growth potential. We believe they need an approach that bridges the gap between bitcoin's unique characteristics and their fiduciary risk requirements. As well, many allocators are sensitive to "fat-tailed" risks - the risk their committees and investors will focus unduly on a single investment if it has an unusually large drawdown, making it difficult to stay invested.

Solution: Using options to create Protected Bitcoin exposure

Advancements in both bitcoin as an asset and options markets have enabled Calamos to apply stable risk techniques, creating risk-calibrated exposures to bitcoin.

Using a combination of zero-coupon US Treasury Bonds and options on the Bitcoin Index, we've established three Protected Bitcoin Strategies with specific maximum loss potentials ("floors") and upside participation (to a cap rate), over the 1-year life of the options portfolio. Intuitively, as the potential for loss increases (i.e., lower floor) the opportunity to capture upside also increases.

These strategies accomplish their outcome through three layers:

- 1. Protection layer**
Zero-coupon bonds that return par at maturity, establishing a floor for potential losses.
- 2. Upside participation layer**
Long ATM or ITM call options that provide exposure to bitcoin's price appreciation. At-the-money options establish 100% protection, while in-the-money options can be used to establish 80% or 90% protection.
- 3. Cap layer**
Short OTM call options that fund the protection but limit maximum gains.



By setting maximum loss floors, we stabilize risk at levels that approximate traditional asset classes.

Strategy	Over 1-yr outcome period		Risk equivalents
	Maximum loss (Floor)	~Upside potential	
100% Protected Bitcoin	0%	~10–15%	Fixed income & cash equivalents
90% Protected Bitcoin	10%	~25–35%	Gold, multi-alternatives, real estate, managed futures, hedge funds
80% Protected Bitcoin	20%	~40–60%	Public & private equities

Incorporating Protected Bitcoin using a Stable Risk Framework

A Stable Risk Framework cuts off the downside tail of an asset at a level matching a corresponding traditional investment asset. In essence, this harnesses the volatility to draw out the return and diversification benefits, enabling investors to select where to put the strategy in a traditional portfolio, based on desired risk tolerance and funding location.

The result of a Stable Risk Framework is a portfolio component that offers exposure to bitcoin returns within a risk framework that professional investors can incorporate into their overall allocation strategy while focusing on outcome rather than worrying about excess volatility. We propose three funding strategies below.

Funding strategies—analysis & back-testing

We back-tested the 100%, 90% and 80% Protected Bitcoin Strategies from April 2019 through June 2026. The results demonstrated how these strategies effectively transformed bitcoin's risk profile to match different asset classes—including fixed income, gold and global equities.

Strategy	Annualized return	Standard deviation	Sharpe ratio	Sortino ratio	Average drawdown	Average loss
Bitcoin	44.36%	68.00%	0.82	1.63	-35.10%	-12.01%
80% Protected Bitcoin	21.30%	22.32%	0.85	1.57	-13.92%	-4.16%
Equities	13.35%	16.13%	0.69	1.05	-10.74%	-4.02%
90% Protected Bitcoin	13.17%	12.28%	0.85	1.48	-7.67%	-2.58%
Gold	15.76%	15.89%	0.83	1.42	-10.80%	-2.90%
100% Protected Bitcoin	5.39%	3.09%	0.84	1.53	-1.14%	-0.42%
Fixed Income*	4.28%	4.07%	0.47	0.70	-2.37%	-0.82%

Source: Calamos Investments, MSCI and Bloomberg 4/1/2019 to 6/30/2026

*Fixed Income: Utilized a long term, 30 year time frame as the common inception period listed resulted in an abnormally negative return period for fixed income. We believe this to be a more conservative and fair representation of the risk/return profile.

Several key observations emerged regarding the merits of Protected Bitcoin:

- **Matched risk profiles**
- **Enhanced returns**
- **Superior risk-adjustment**
- **A higher Sharpe ratio**

Additionally, Protected Bitcoin Strategies maintained bitcoin's consistently low correlation with traditional asset classes while cutting off tail risk.

CORRELATION SINCE COMMON INCEPTION

	Equities	Gold	Bonds
80% Protected Bitcoin	0.36	0.10	0.17
90% Protected Bitcoin	0.34	0.10	0.16
100% Protected Bitcoin	0.21	0.12	0.15

Source: Calamos Investments 4/1/2019 to 6/30/2026

Bitcoin correlation to traditional asset classes is inherently low given the return distribution pattern and drivers of growth. Even though Protected Bitcoin Strategies cut off the tails, they maintain a consistently low correlation with equities, fixed income, and gold respectively. This phenomenon is particularly valuable for portfolio construction, as it means the Protected Bitcoin Strategies provide true diversification benefits despite their managed downside.

Applying the Stable Risk Framework— portfolio application scenarios

With matching risk profiles, we can now test specific examples of replacing traditional assets with a portion of Protected Bitcoin.

SCENARIO 1: EQUITY REPLACEMENT WITH 80% PROTECTED BITCOIN STRATEGY

Investors can apply Bitcoin as an enhancement of their growth allocation. The table below illustrates the impact of replacing equity allocations with an 80% Protected Bitcoin strategy. **Notably, replacing 5% of equities with 80% Protected Bitcoin increased returns by 47 basis points annually, with a 35 basis point decrease in annual standard deviation and improved drawdown characteristics.** These benefits widened with a 10% allocation.

ASSET ALLOCATION—EQUITY REPLACEMENT

Allocation			Portfolio Characteristics					
Equity	80% Prot. Bitcoin	Fixed income	Anlzd return	Standard deviation	Sharpe ratio	Sortino ratio	Average drawdown	Average loss
60%	0%	40%	8.77%	11.00%	0.56	0.84	-7.46%	-3.06%
57%	3%	40%	9.05%	10.78%	0.60	0.90	-7.24%	-2.83%
55%	5%	40%	9.24%	10.65%	0.62	0.94	-7.09%	-2.66%
50%	10%	40%	9.70%	10.41%	0.67	1.05	-6.72%	-2.35%

Source: Calamos Investments, MSCI and Bloomberg - 4/1/2019 to 6/30/2026

SCENARIO 2: GOLD OR EQUITY REPLACEMENT WITH 90% PROTECTED BITCOIN STRATEGY

Bitcoin is often compared to gold as an emerging store of value, with characteristics of a digital commodity. While gold's exceptional recent performance has narrowed the return differential, **replacing a 3% gold allocation with 90% Protected Bitcoin delivered nearly identical returns while maintaining similar standard deviation and drawdown metrics** — offering a compelling forward-looking alternative with meaningful upside optionality. 90% Protected Bitcoin and gold maintain a low correlation of 0.10.

ASSET ALLOCATION—GOLD REPLACEMENT

Allocation				Portfolio Characteristics					
Gold	90% Prot. Bitcoin	Equity	Fixed income	Anlzd return	Standard deviation	Sharpe ratio	Sortino ratio	Average drawdown	Average loss
10%	0%	50%	40%	9.11%	9.98%	0.64	0.97	-6.88%	-2.61%
7%	3%	50%	40%	9.02%	9.92%	0.64	0.97	-6.78%	-2.67%
5%	5%	50%	40%	8.96%	9.89%	0.64	0.96	-6.71%	-2.65%
0%	10%	50%	40%	8.81%	9.89%	0.62	0.95	-6.53%	-2.44%

Source: Calamos Investments, MSCI, Standard & Poor's, and Bloomberg - 4/1/2019 to 6/30/2026

ASSET ALLOCATION - EQUITY REPLACEMENT

90% Protected Bitcoin can also be used as an equity replacement. Replacing a 10% equity allocation produced returns 4 basis points higher and a standard deviation 111 basis points lower.

Allocation			Portfolio Characteristics					
Equity	90% Prot. Bitcoin	Fixed income	Anlzd return	Standard deviation	Sharpe ratio	Sortino ratio	Average drawdown	Average loss
60%	0%	40%	8.77%	11.00%	0.56	0.84	-7.46%	-3.06%
50%	10%	40%	8.81%	9.89%	0.62	0.95	-6.53%	-2.44%

Source: Calamos Investments, MSCI, Standard & Poor's, and Bloomberg - 4/1/2019 to 6/30/2026

SCENARIO 3: FIXED INCOME REPLACEMENT OR TREASURY MANAGEMENT WITH 100% PROTECTED BITCOIN STRATEGY

As capital discipline around required rate of returns normalizes, option-based strategies that can produce returns higher than treasuries with similar downside will become more desirable. **Even a conservative implementation replacing just 3% of fixed income with 100% Protected Bitcoin increased portfolio returns by 12 basis points annually, lowered the standard deviation and improved risk metrics.** Note that similar or improved metrics may be achieved replacing cash as well as fixed income. The table below illustrates the impact of replacing fixed income allocations with a 100% Protected Bitcoin strategy.

ASSET ALLOCATION—FIXED INCOME REPLACEMENT

Allocation			Portfolio Characteristics					
Fixed income	100% Prot. Bitcoin	Equity	Anlzd return	Standard deviation	Sharpe ratio	Sortino ratio	Average drawdown	Average loss
40%	0%	60%	8.77%	11.00%	0.56	0.84	-7.46%	-3.06%
37%	3%	60%	8.89%	10.91%	0.58	0.87	-7.37%	-3.02%
35%	5%	60%	8.98%	10.85%	0.59	0.88	-7.30%	-2.99%
30%	10%	60%	9.19%	10.71%	0.61	0.93	-7.14%	-2.81%

Source: Calamos Investments, MSCI and Bloomberg - 4/1/2019 to 6/30/2026

Conclusion: The pathway to bitcoin integration

We believe that the Bitcoin network has hit an adoption inflection point with an estimated 50 million investors in the US and more than 300 million globally.¹ While these numbers are strong, they only translate to 4% of the global population, implying adoption can continue for many years. But, given the assets' unique characteristics, we expect price volatility to continue for the foreseeable future.

Bitcoin's unique characteristics require rethinking portfolio construction. Protected Bitcoin strategies offer a pathway to meaningful exposure. A 5% allocation using the strategies outlined in this paper can help investors solve the central challenge of incorporating bitcoin's diversification benefits while curtailing tail risk.

For fiduciaries, these strategies provided key advantages:

Risk clarity	Predefined maximum loss parameters align with governance requirements
Efficient exposure	Higher allocations provide meaningful portfolio impact
Framework compatibility	Protected strategies fit within existing asset class categories
Adaptive implementation	Protection levels can evolve as the asset class matures

By transforming bitcoin's risk profile to match traditional parameters, these strategies enable investors to participate in the digital asset revolution while maintaining their fiduciary responsibilities.

The performance shown in this paper is hypothetical in nature and does not represent the performance and/or investment risk characteristics of any specific client. While the performance listed for each respective strategy is based on actual performance, the aggregate portfolio performance, allocations listed and account comparisons shown are hypothetical in nature, as no actual clients are invested in these strategies. Hypothetical performance results have many inherent limitations, including those described below:

Hypothetical performance results are generally prepared with the benefit of hindsight.

There are limitations inherent in model results, such results do not represent actual trading and that they may not reflect the impact that material economic and market factors might have had on the advisor's decision making if the advisor were actually managing clients' money.

The hypothetical performance shown does not involve financial risk, and no hypothetical performance calculation can completely account for the impact of financial risk on an actual investment strategy.

The ability to withstand actual losses or to adhere to a particular investment strategy in spite of losses are material points which can adversely affect actual performance results.

There are distinct differences between hypothetical performance results and the actual results subsequently achieved by a particular investment portfolio. No representation is being made that an account will or is likely to achieve profits or losses similar to those shown, and any investment may result in loss of principal.

As with any hypothetical illustration there can be additional unforeseen factors that cannot be accounted for within the illustrations included herein.

Hypothetical performance and index returns presented assume reinvestment of any and all earnings/distributions.

Return. Expressed in percentage terms, Morningstar's calculation of total return is determined each month by taking the change in monthly net asset value, reinvesting all income and capital-gains distributions during that month, and dividing by the starting NAV. Average annual total return measures net investment income and capital gain or loss from portfolio investments as an annualized average.

Standard deviation. A statistical measurement of dispersion about an average, which, for a mutual fund, depicts how widely the returns varied over a certain period of time. Used to measure performance volatility or overall risk of a fund.

Sharpe ratio. Measures risk-adjusted performance by subtracting the fund's return by the risk-free rate and dividing by the fund's standard deviation. Determines reward per unit of risk. The Sharpe ratio can be used to compare two funds directly on how much risk a fund had to bear to earn excess return over the risk-free rate.

Sortino ratio. Similar to Sharpe ratio except it uses downside risk (Downside Deviation) in the denominator.

Average loss. A geometric average of the periods with a loss. It is calculated by compounding the returns for loss periods where rates of return are less than 0 and then the monthly average is calculated.

Average drawdown (Average DD). An average of yearly maximum drawdown measures.

The **Target Outcome** may not be achieved, and investors may lose some or all of their strategy. The strategy is designed to achieve the Target Outcome only if an investor buys on the first day of the Outcome Period and holds a strategy until the end of the Outcome Period. While the strategy seek to provide 100%, 90% or 80% protection against losses experienced by the price of Spot bitcoin for investors who hold the strategy for an entire Outcome Period, there is no guarantee a strategy will successfully do so. If a strategy has increased significantly, an investor that purchases the strategy after the first day of an Outcome Period could lose their entire investment. An investment in the strategy is only appropriate for investors willing to bear those losses. There is no guarantee the Capital Protection and Cap will be successful, and an investor investing at the beginning of an Outcome Period could also lose their entire investment.

Digital Assets Risk. The Bitcoin network was first launched in 2009 and bitcoins were the first cryptographic digital assets created to gain global adoption and critical mass. Although the Bitcoin network is the most established digital asset network, the Bitcoin network and other cryptographic and algorithmic protocols governing the issuance of digital assets represent a new and rapidly evolving industry that is subject to a variety of factors that are difficult to evaluate. Moreover, because digital assets, including bitcoin, have been in existence for a short period of time and are continuing to develop, there may be additional risks in the future that are impossible to predict as of the date of this prospectus. Digital assets represent a new and rapidly evolving industry, and the value of the Underlying ETPs' shares depends on the acceptance of bitcoin. The realization of one or more of the following risks could materially adversely affect the value of the Underlying ETPs' shares.

Investing involves risks. Loss of principal is possible. The strategy faces numerous market trading risks, including authorized participation concentration risk, underlying ETP risk, cap change risk, capital protection risk, capped upside risk, cash holdings risk, concentration risk, clearing member default risk, correlation risk, costs of buying and selling fund shares, counterparty risk, derivatives risk, equity securities risk, FLEX options risk, interest rate risk, investment in a subsidiary, investment timing risk, liquidity risk, management risk, market maker risk, market risk, new fund risk, non-diversification risk, options risk, OTC options risk, position limits risk, premium-discount risk, secondary market trading risk, sector risk, tax risk, trading issues risk, U.S. Government security risk, U.S. Treasury risk, and valuation risk.

100%, 90% or 80% capital protection is over a one-year period before fees and expenses. All caps are predetermined.

Cap Rate. Maximum percentage return an investor can achieve from an investment in a strategy if held over the Outcome Period.

Protection Level. Amount of protection a strategy is designed to achieve over the Days Remaining.

Outcome Period. Number of days in the Outcome Period.

1. Nakamoto Survey as of 9/30/24, River Financial as of February 2025

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Calamos Financial Services LLC, Distributor
2020 Calamos Court | Naperville, IL 60563-2787
866.363.9219 | www.calamos.com | caminfo@calamos.com

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