Portfolio Insight

The Role of Bitcoin in a Portfolio

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Introduction

Since its inception in 2008, bitcoin has weathered intense scrutiny and frequent claims it wasn't a viable asset. Fifteen+ years on, it remains not only alive but thriving. Its network is growing, use cases are expanding and its relevance in the financial system is rising.

At WisdomTree, we have argued since 2022 that digital assets are no longer a niche experiment. They are an emerging asset class. For asset allocators, the debate is no longer if crypto should be included in portfolios, but how much exposure makes sense.

This edition of Portfolio Insights digs into that very question. Using robust quantitative techniques, we explore the risk-reward dynamics of introducing bitcoin into traditional multi-asset portfolios. While the optimal allocation will depend on each investor's objectives and constraints, our findings are clear and compelling:

- Bitcoin's standalone volatility is high, but in a diversified portfolio, the added risk is marginal and the historical reward exceptional.
- Even conservative investors with a low risk tolerance can benefit from a small ~1% allocation, with minimal impact on overall portfolio volatility and drawdowns.
- Looking ahead, even under cautious assumptions, the data consistently points to bitcoin improving portfolio efficiency. For balanced portfolios, the optimal allocation gravitates towards 6%.

In a market defined by high correlations and stretched valuations, ignoring bitcoin is not prudence — it's a missed opportunity.

Part 1 — Bitcoin optimal allocation: a relative risk approach

In our previous research, Bitcoin in multi-asset portfolios, we identified four critical takeaways for institutional investors evaluating crypto's role within a 60/40 framework. The conclusions are hard to ignore:

1. **Crypto is already in the global market portfolio:** typically representing 1-2% of total market capitalisation, depending on timing. Investors with zero allocation are not being cautious. They are actively underweight.
2. **Bitcoin offers a unique return profile:** its combination of strong historical performance, low correlation with traditional assets, and asymmetric upside makes it a high-conviction addition to a diversified portfolio.
3. **The data speaks clearly:** even small allocations to bitcoin can meaningfully boost returns with only marginal increases in risk, resulting in superior risk-adjusted performance.

4. **Volatility is real, but manageable:** with thoughtful sizing and active rebalancing, bitcoin's impact on drawdowns remains limited, while its potential for outsized gains can materially enhance portfolio returns.

In summary, the risk-adjusted case for bitcoin is not theoretical. It's grounded in hard data and increasingly in real-world allocations by sophisticated institutional investors.

Estimating the impact of a small allocation to bitcoin in a portfolio using the bootstrapping technique

What is bootstrapping? It is a simulation technique that leverages historical data to estimate future outcomes without relying on theoretical distributions. Instead of generating synthetic data, as in traditional Monte Carlo simulations, bootstrapping works by randomly sampling from actual historical return series with replacement.
The key distinction lies in how return paths are created:

+ **Monte Carlo** simulations use statistical assumptions to generate return series based on specified parameters, such as average return, volatility, and correlation — typically assuming a normal or log-normal distribution.
+ **Bootstrapping** constructs simulated return paths by resampling real historical data. This means each bootstrapped scenario is made up of real returns, simply reordered or repeated in different sequences.

By doing so, bootstrapped samples preserve the empirical characteristics of the original dataset — including fat tails, skewness and volatility clustering — offering a more realistic, data-driven view of possible future outcomes. It allows investors to estimate the distribution of performance metrics (for example, returns, volatility, drawdowns) under a wide range of plausible scenarios.

To deepen our analysis of bitcoin's role in a traditional 60/40 portfolio, we applied the bootstrapping technique to estimate how a small allocation to bitcoin might perform over typical investment horizons. This method allows us to simulate thousands of realistic three-year investment periods using actual historical data, offering a more comprehensive, probabilistic perspective on risk and return.

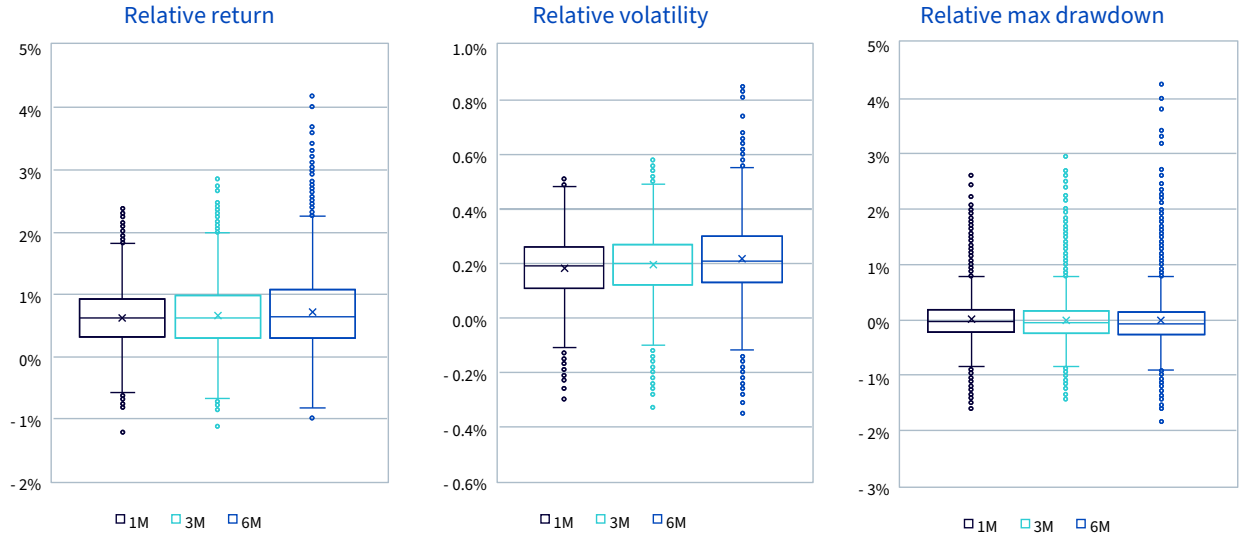
Methodology

We constructed our analysis by resampling 36-month blocks (with replacement) from monthly return series spanning equities, bonds and bitcoin. Each simulation created three parallel return streams: one for each asset class. We then built the following portfolios:

+ A classic 60/40 equity-bond portfolio rebalanced semi-annually.
+ Portfolios with 1% allocated to bitcoin and 99% to the 60/40 portfolio, rebalanced to maintain that 1% weighting every one, three, or six months.

This approach generated thousands of hypothetical portfolio paths, which we evaluated across three key dimensions: return, volatility and maximum drawdown. The results are summarised in Figure 1.

Figure 1: Distribution of results using bootstrapping technique



Source: WisdomTree, Bloomberg, S&P. From January 2014 to May 2025. Calculations are based on monthly returns in USD. Historical performance is not an indication of future performance, and any investments may go down in value.

Looking at the charts, we can draw the following conclusions:

+ **Return:** adding just 1% bitcoin consistently enhanced portfolio performance. The median return uplift remained stable across rebalancing frequencies. However, less frequent rebalancing led to more upside in the 'lucky' scenarios, effectively letting winners run a bit longer.
+ **Volatility:** as expected, introducing bitcoin slightly increases volatility. But the average rise was marginal regardless of rebalancing frequency. That said, portfolios with longer rebalancing intervals showed greater dispersion in volatility outcomes, reflecting a wider range of potential paths.
+ **Maximum drawdown:** perhaps most surprisingly, the addition of bitcoin did not materially worsen drawdowns. The distribution was also positively skewed, meaning many outcomes saw improved drawdown figures. This reinforces bitcoin's role as a diversifier.

The data is clear: a modest allocation to bitcoin can enhance long-term risk-adjusted performance without meaningfully compromising portfolio stability. Even under conservative assumptions and across a wide range of scenarios, bitcoin continues to show its value as a complementary asset in institutional portfolios.

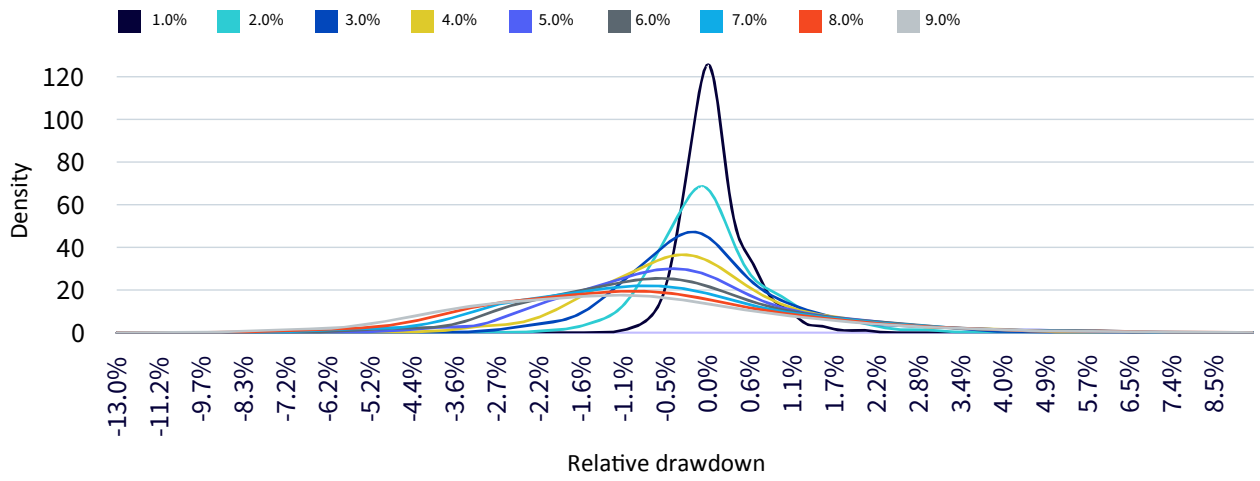
Determining bitcoin allocation using relative risk

Let's now turn our attention to maximum drawdown — a critical metric for any risk-sensitive investor. Moving beyond a fixed 1% allocation, we expand our analysis to assess a range of bitcoin allocations, from 1% to 9%, using quarterly rebalancing.

For each allocation level, we calculate the relative maximum drawdown versus a standard 60/40 equity-bond portfolio. As shown in Figure 2, the drawdown distribution shifts leftward as the bitcoin allocation increases. This means:

+ Higher bitcoin exposure increases the probability and magnitude of underperformance in worst-case scenarios.
+ The left tail of the distribution thickens, indicating a growing risk of materially worse outcomes versus a traditional balanced portfolio.

Figure 2: Relative drawdown distribution of multi-asset portfolios with varying levels of investment in bitcoin



Source: WisdomTree, Bloomberg, S&P. From January 2014 to May 2025. Calculations are based on monthly returns in USD. Historical performance is not an indication of future performance, and any investments may go down in value.

This clear link between crypto allocation and downside risk offers a practical framework for determining an investor's optimal exposure. Risk-aware allocators can use this relative risk lens to calibrate their bitcoin allocation based on their drawdown tolerance.

In Figure 3, we plot the relative Value at Risk (VaR) for various allocation levels, providing a probabilistic view of downside outcomes:

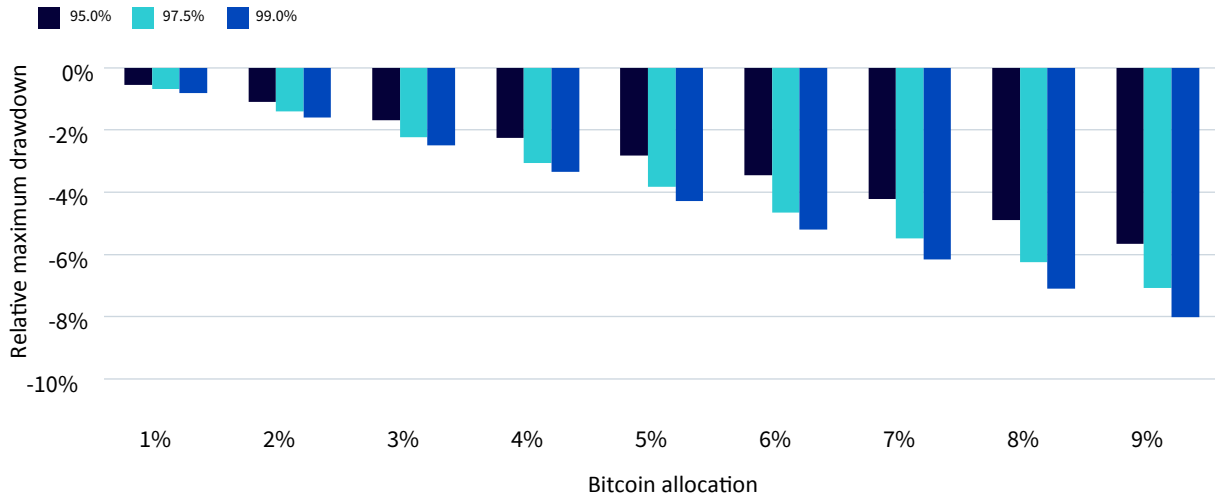
+ The x-axis represents the portfolio's bitcoin allocation.
+ Each histogram bar shows the relative VaR at different levels of confidence for the investment compared to a standard 60/40 portfolio.

Take the example of a 5% bitcoin allocation:

- At the 99% confidence level, the worst-case relative drawdown would have been no worse than -4.3% in 99% of historical scenarios (light blue bar).
- At the 95% confidence level, the relative drawdown threshold drops to -2.8% (dark blue bar).

This analysis allows investors to balance upside participation with downside resilience — anchoring allocation decisions in data, not guesswork.

Figure 3: Using relative drawdown to calibrate the allocation to bitcoin



Source: WisdomTree, Bloomberg, S&P. From January 2014 to May 2025. Calculations are based on monthly returns in USD. Historical performance is not an indication of future performance, and any investments may go down in value.

Using this approach, investors can align their crypto allocation with their individual risk appetite. For example, a conservative investor who is only willing to tolerate a maximum 1% relative drawdown — compared to a traditional 60/40 portfolio — with 99% confidence, can use the chart to identify an appropriate allocation range. In this case, the data suggests that a 1% bitcoin allocation would fall comfortably within that risk threshold.

Part 2 — Bitcoin optimal allocation: a Markowitz mean-variance framework

A historical perspective

The mean-variance optimisation framework, introduced by Harry Markowitz, remains a cornerstone of modern portfolio construction. In this section, we use it to evaluate the optimal allocation to bitcoin, starting with a backward-looking, empirical analysis.

We construct an efficient frontier using the following asset set[1], all denominated in USD:

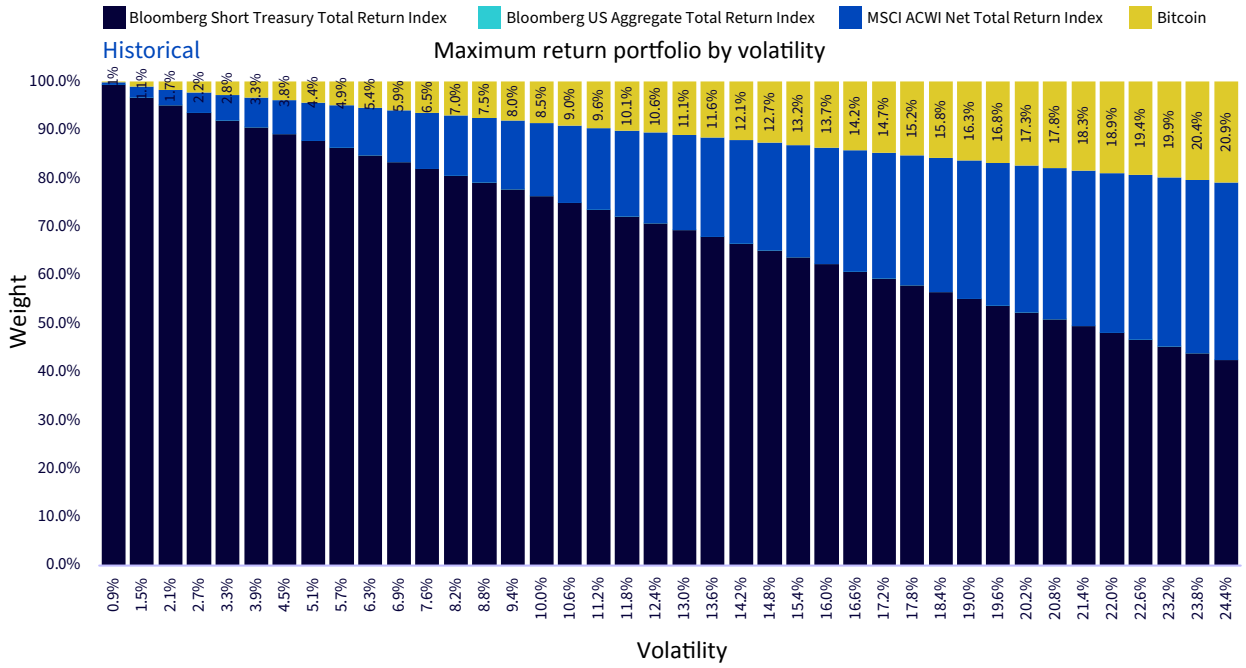
+ Bloomberg Short Treasury Total Return Index
+ Bloomberg US Aggregate Total Return Index
+ MSCI ACWI Net Total Return Index
+ CME CF Bitcoin Reference Rate

The dataset spans January 2014 to May 2025, and the optimisation includes standard constraints: no shorting, no leverage. As shown in Figure 4, the results are striking:

+ Even at low levels of target volatility, a small allocation to bitcoin consistently appears in the optimal portfolio.
+ As risk tolerance increases, bitcoin's weight rises, peaking at ~21% in the most aggressive portfolios.

Despite its historically high annualised volatility, bitcoin's extraordinary returns and low correlation with traditional asset classes more than compensated for its risk. Its inclusion materially boosted portfolio efficiency over the past decade.

Figure 4: Historical asset allocation of efficient portfolios by portfolio volatility



Source: WisdomTree, Bloomberg, S&P. From January 2014 to May 2025. Calculations are based on monthly returns in USD. Historical performance is not an indication of future performance, and any investments may go down in value.

That said, a 21% allocation is clearly aggressive by institutional standards. While it may have been optimal in hindsight, it would be unrealistic to assume such performance will persist unchanged into the future. One limitation of the mean-variance framework is its extreme sensitivity to return

1 Tickers: LT12TRUU Index, LBUSTRUU Index, NDUEACWF Index and BRR Index.

assumptions, which can lead to concentrated or unstable allocations, especially when one asset (such as bitcoin) has exhibited outsized historical returns[2].

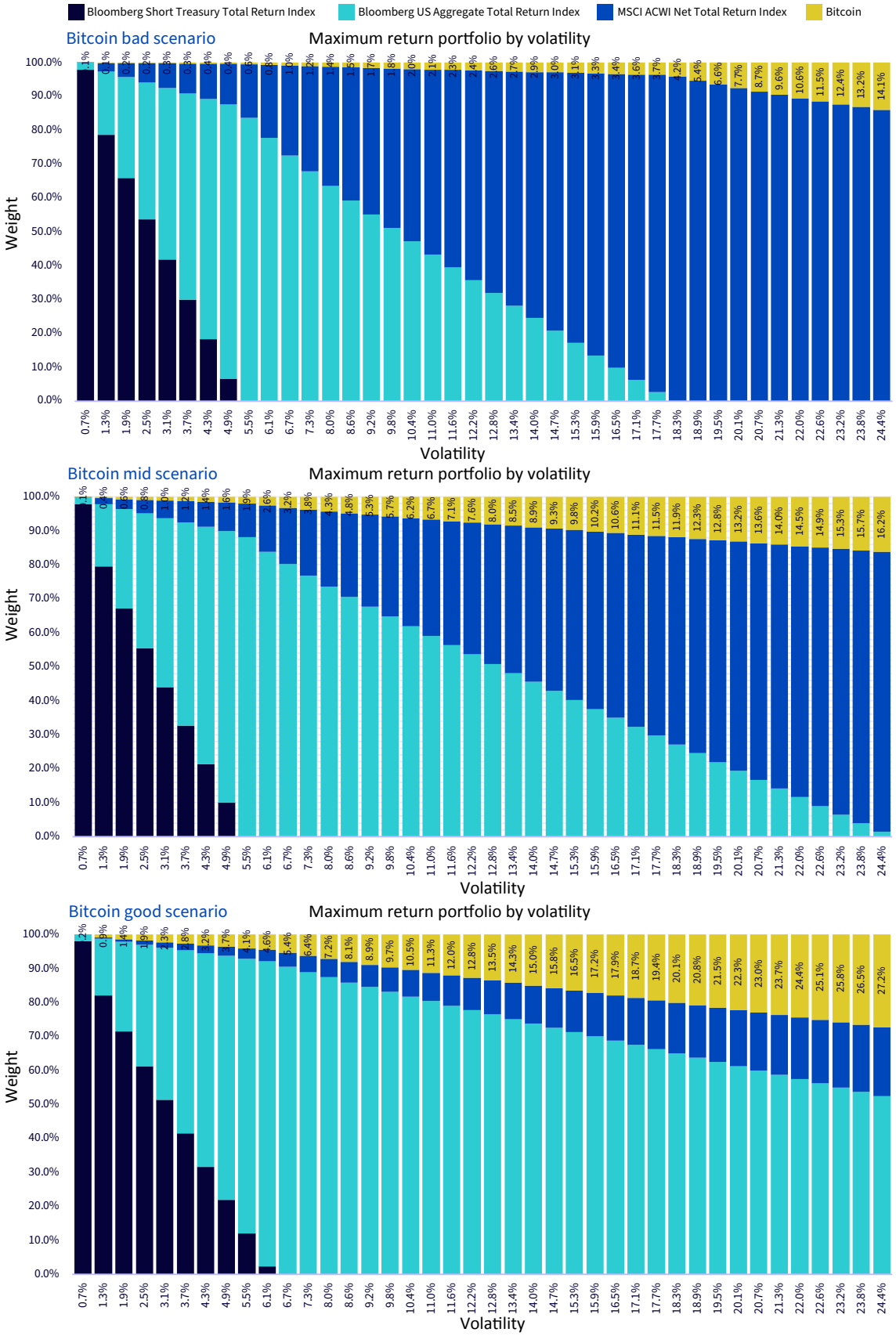
A forward-looking view

To address this, we re-ran the optimisation using forward-looking assumptions, replacing historical inputs with more conservative, scenario-based projections. Return estimates for traditional assets were sourced from J.P. Morgan's 29th annual Long-term Capital Market Assumptions (2025). For bitcoin we modelled three plausible return scenarios:

+ **Good scenario**
  - Return: US Large Cap Equity return + 20% per year
  - Volatility: 20% lower than historical
  - Correlations: unchanged
+ **Mid scenario**
  - Return: US Large Cap Equity return + 12.5% per year
  - Volatility: 10% lower than historical
  - Correlations: 10% higher than historical
+ **Bad scenario**
  - Return: US Large Cap Equity return + 7.5% per year
  - Volatility: unchanged (historical level)
  - Correlations: 20% higher than historical

2 See as a reference: Putting Markowitz theory to work (1981, Jobson and Korkie) or Portfolio Optimization in Practice (1992, Jorion).

Figures 5, 6 and 7: Asset allocation of efficient portfolios by portfolio volatility in three forward-looking scenarios



Source: WisdomTree, JP Morgan. Calculations are based on monthly returns in USD. **Historical performance is not an indication of future performance, and any investments may go down in value.**

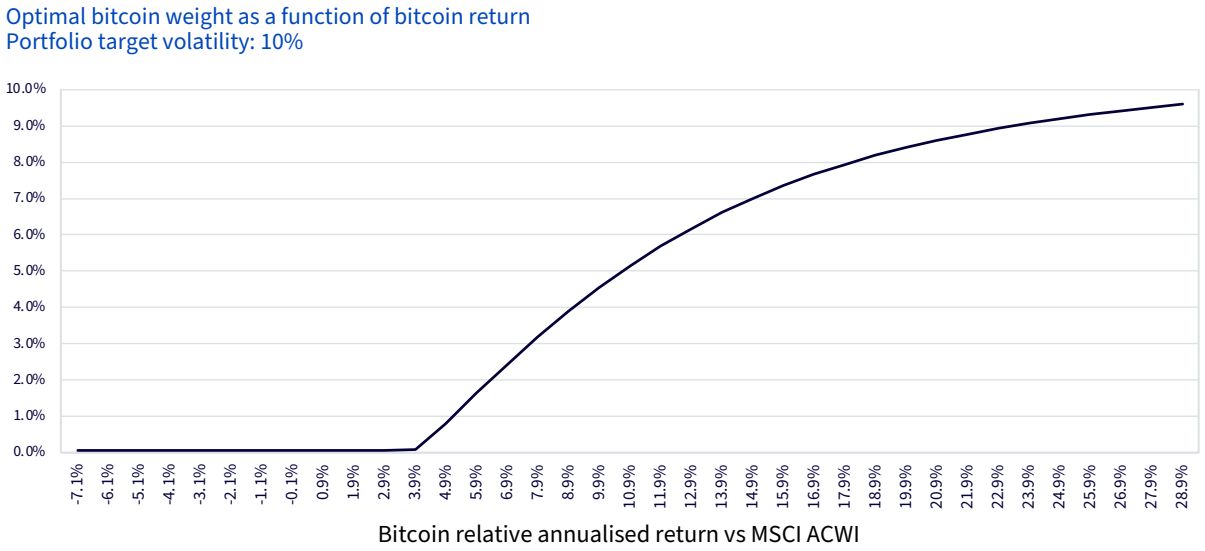
Key insights

- In both the good and mid scenarios, bitcoin earns a non-trivial allocation, even in low-volatility portfolios. For example, in the mid scenario, a portfolio with a 5.5% target volatility includes 1.9% bitcoin.
- In the bad scenario, despite reduced return expectations and higher correlation, bitcoin still features in all portfolios.
- For balanced portfolios (~10% volatility), optimal bitcoin allocations range from ~2% to ~10%, depending on the return scenario.

Sensitivity to expected returns

To further refine the framework, we examine how bitcoin's optimal portfolio weight evolves as its expected return varies — holding volatility and correlation assumptions constant (from the mid scenario). This provides a simple, intuitive tool for investors to translate their own return expectations into an actionable allocation.

Figure 8: Optimal weight as a function of bitcoin expected annualised relative returns over the next 10 years



Source: WisdomTree, JP Morgan. Calculations are based on monthly returns in USD. Historical performance is not an indication of future performance, and any investments may go down in value.

- If an investor expects bitcoin to outperform MSCI ACWI by 15% per year (still well below historical averages), the optimal allocation is 7.0%.
- If the expected excess return drops to 7.5%, the optimal allocation adjusts to 2.8% — still justifiable within a diversified portfolio.

Part 3 - Bitcoin optimal allocation: a risk contribution approach

Target risk allocation without relying on return forecasts

Unlike the return-dependent frameworks discussed earlier, this third approach shifts focus entirely to risk-based allocation, offering a return-agnostic lens for incorporating bitcoin. This method is rooted in diversification principles and seeks to allocate portfolio risk more evenly across assets, rather than allowing one component — typically equities — to dominate.

An asset's risk contribution is calculated by combining its standalone volatility with its covariance with other portfolio components. In a two-asset portfolio, the risk contribution of Asset 1 is:

$$\textit{Asset 1 Risk Contribution} = (w_1^2\sigma_1^2 + w_1 w_2 Cov_{12}) / \sigma^2(p)$$

Where:

- w_1 = weight of the asset
- σ_1 = volatility
- Cov_{12} = covariance with Asset 2
- $\sigma(p)$ = total portfolio volatility

The starting point: traditional risk budgeting

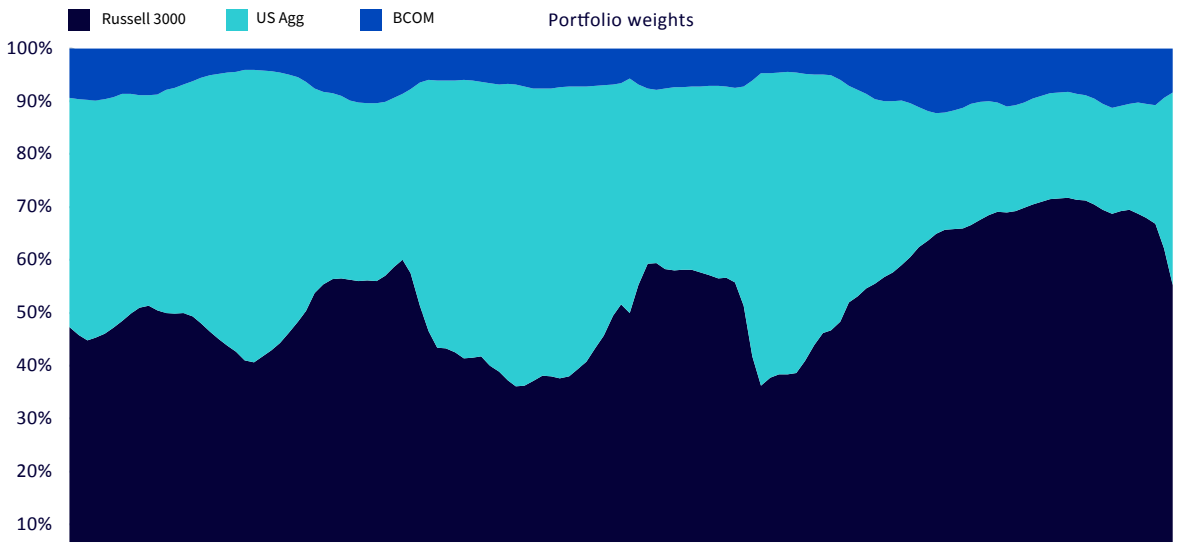
A typical 60/40 equity-bond portfolio allocates 60% of capital to equities, but due to the higher volatility of equities, they often contribute over 90% of total portfolio risk. Diversifying away from such concentration is a common objective for multi-asset managers, with commodities often added as a first line of diversification.

As a starting benchmark, we use a Target Risk Contribution (TRC) portfolio structured with:

- 90% risk from equities
- 5% from bonds
- 5% from commodities

This results in approximate capital weights of 55% equities, 37% fixed income, and 8% commodities: more balanced in terms of risk than the classic 60/40.

Figure 9: Portfolio construction via risk budgeting — 90% equities, 5% fixed income, 5% commodities



Source: WisdomTree, Bloomberg. From December 2014 through May 2025. The portfolio represents the benchmark 'TRC 90/5/5/0' portfolio where 'TRC' denotes 'Target Risk Contribution', and the portfolio consists of 90% risk allocated to equities, 5% to bonds, 5% to commodities, and 0% to bitcoin. US Agg represents Bloomberg US Aggregate Bond Index and BCOM represents Bloomberg Broad Commodities Index. Historical performance is not an indication of future performance, and any investments may go down in value.

Table 1: Key performance metrics of starting benchmark

	1-year	3-year	5-year	Since inception
Annualised return	18.1%	5.4%	9.2%	7.6%
Volatility	9.1%	12.9%	12.3%	9.5%
Sharpe ratio	1.41	0.12	0.55	0.62
Max drawdown	-6.2%	-18.8%	-19.4%	-19.4%
Risk free	5.3%	3.9%	2.5%	1.7%

Source: WisdomTree, Bloomberg. From December 2014 through May 2025. Historical performance is not an indication of future performance, and any investments may go down in value.

Introducing bitcoin into the risk budget

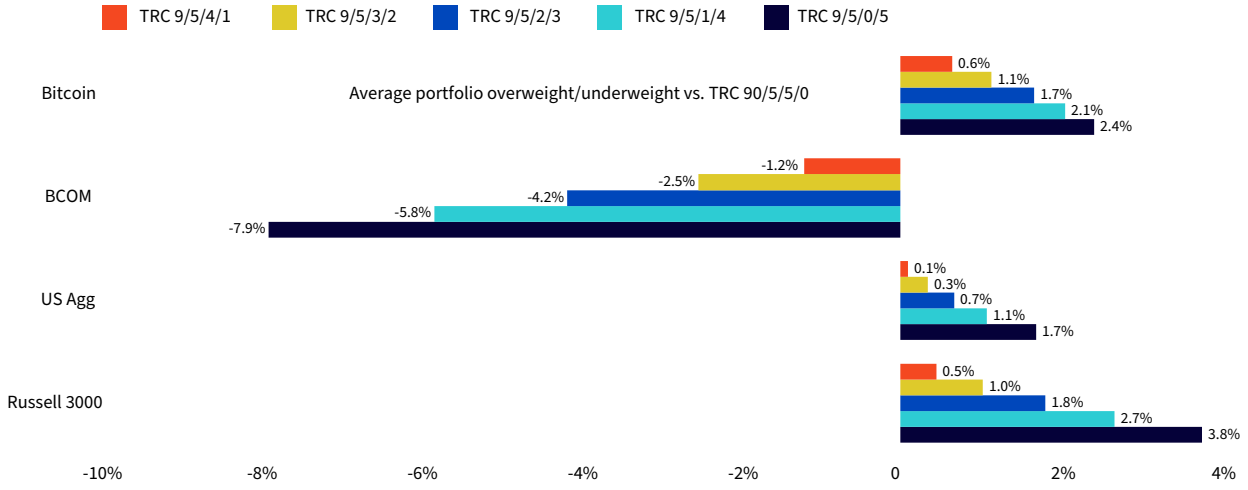
Given bitcoin's strong diversification characteristics — arguably even more powerful than commodities — we explore reallocating the 5% commodity risk budget progressively to bitcoin. We construct four TRC portfolios (equities/bonds/commodities/bitcoin):

+ TRC 90/5/4/1
+ TRC 90/5/3/2
+ TRC 90/5/2/3
+ TRC 90/5/1/4

Each 1% of bitcoin risk replaces 1% of the commodity risk sleeve.

Due to its high volatility, even a modest risk allocation to bitcoin leads to smaller capital allocations (for example, a 1% risk contribution translates to 0.7% capital weight). As more risk is allocated to bitcoin, both bitcoin and commodities take up less capital overall — freeing up space for increased exposure to lower-volatility, cash-flow generating assets such as equities and bonds.

Figure 10: Average overweight/underweight vs. the benchmark portfolio



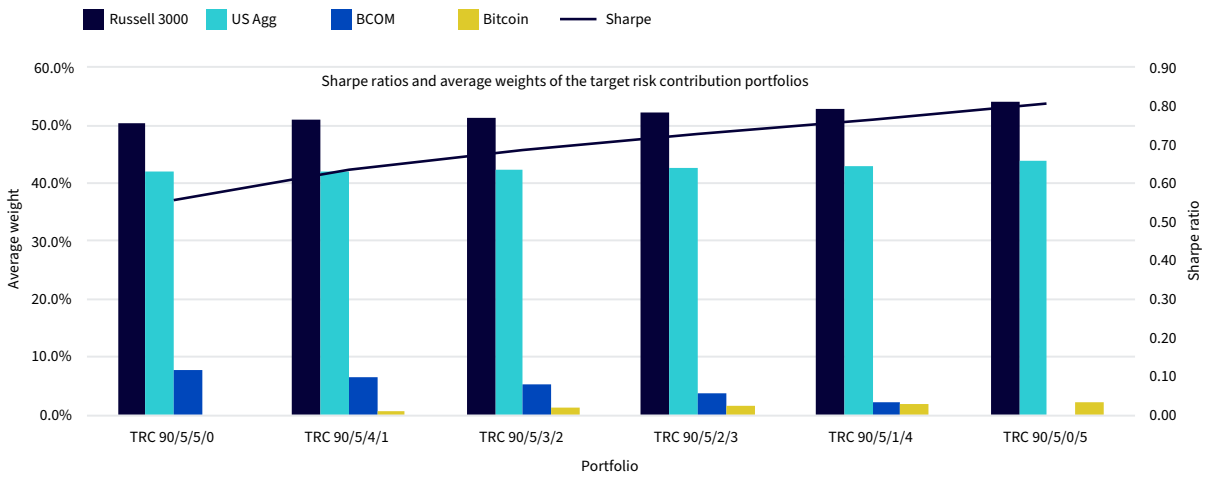
Source: WisdomTree, Bloomberg. From December 2014 through May 2025. 'TRC' denotes 'Target Risk Contribution', and '90/5/5/0' representing the benchmark portfolio of 90% risk allocated to equities, 5% to bonds, 5% to commodities, and 0% to bitcoin. Historical performance is not an indication of future performance, and any investments may go down in value.

Performance and volatility outcomes

This reallocation delivers two key benefits:

1. Improved Sharpe ratios: even a small 1% bitcoin risk allocation leads to notable enhancements in risk-adjusted returns, echoing results from our earlier bootstrapping analysis.
2. Minimal volatility impact: adding bitcoin increases total portfolio volatility by just 20 basis points at each incremental level. Given bitcoin's upside potential, this is a relatively low cost for meaningful diversification.

Figure 11: The Sharpe ratios of the target risk contribution portfolios



Source: WisdomTree, Bloomberg. From December 2014 through May 2025. 'TRC' denotes 'Target Risk Contribution', and '90/5/5/0' representing the benchmark portfolio of 90% risk allocated to equities, 5% to bonds, 5% to commodities, and 0% to bitcoin. Historical performance is not an indication of future performance, and any investments may go down in value.

Table 2: The annualised volatility for the target risk contribution portfolios

Portfolio volatility	1Y	3Y	5Y	10Y	SI	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
TRC 90/5/5/0	9.1%	12.9%	12.3%	9.6%	**9.5%**	6.8%	4.6%	2.2%	6.8%	4.3%	16.5%	5.4%	16.3%	12.2%	9.1%
TRC 90/5/4/1	9.4%	13.2%	12.6%	9.8%	**9.7%**	7.2%	4.5%	2.5%	6.8%	4.2%	16.9%	5.5%	16.5%	12.3%	9.4%
TRC 90/5/3/2	10.3%	13.5%	12.9%	10.1%	**9.9%**	7.4%	4.5%	2.8%	6.9%	4.3%	17.3%	5.6%	16.6%	12.5%	10.3%
TRC 90/5/2/3	10.8%	13.8%	13.2%	10.3%	**10.2%**	7.6%	4.5%	3.0%	6.9%	4.3%	17.6%	5.8%	16.7%	12.7%	10.8%
TRC 90/5/1/4	11.4%	14.2%	13.5%	10.5%	**10.4%**	7.8%	4.5%	3.3%	7.0%	4.4%	17.9%	6.1%	16.8%	12.9%	11.4%
TRC 90/5/0/5	11.8%	14.5%	13.8%	10.7%	**10.6%**	8.1%	4.5%	3.6%	7.1%	4.5%	18.2%	6.3%	17.0%	13.2%	11.8%

Source: WisdomTree, Bloomberg. From December 2014 through May 2025. 'TRC' denotes 'Target Risk Contribution', and '90/5/5/0' representing the benchmark portfolio of 90% risk allocated to equities, 5% to bonds, 5% to commodities, and 0% to bitcoin. Historical performance is not an indication of future performance, and any investments may go down in value.

Conclusion

As crypto continues to embed itself in institutional portfolios, the question around 'if' has become one of 'how much'. This paper explored three distinct frameworks for determining optimal bitcoin allocation across varying investor risk profiles:

	Conservative portfolio	Balanced portfolio	Aggressive portfolio
Bootstrapping method	**~1%** Allocation resulting in 1% relative max drawdown with 99% confidence	**~3%** Allocation resulting in 2.5% relative max drawdown with 99% confidence	**~6%** Allocation resulting in 5% relative max drawdown with 99% confidence
Markowitz Mean-Variance method	**~2%** Optimal weight in mid scenario for 5% Target Vol portfolio	**~6%** Optimal weight in mid scenario for 10% Target Vol portfolio	**~10%** Optimal weight in mid scenario for 15% Target Vol portfolio
Risk contribution method	**~0.6%** 1% risk contribution allocation to crypto	**~1.7%** 3% risk contribution allocation to crypto	**~2.4%** 5% risk contribution allocation to crypto

Across all frameworks, the answer converges:

+ A conservative portfolio would justifiably allocate ~1% to bitcoin, a slight underweight to the market portfolio — aligned with its broader aversion to risk assets.
+ A balanced portfolio could move towards a ~3% allocation, marginally overweighting bitcoin relative to market cap.
+ An aggressive portfolio targeting high growth should consider ~6%, consistent with its higher tolerance for volatility and its typical risk asset overweight.

Bottom line: not allocating to bitcoin is no longer the default. Every asset allocator now needs a view — and a plan — for this maturing asset class.

Part 4 — Implementing bitcoin exposure with WisdomTree

In 2019, WisdomTree became the first established exchange-traded product (ETP) provider to launch physically backed crypto ETPs, starting with WisdomTree Physical Bitcoin. Since then, we have built an institutional-grade suite of crypto ETPs, combining 20+ years of expertise in physically backed products with the unique demands of crypto investing.

Built and structured for institutional investors:

+ **100% physically backed:** physical exposure without the need for crypto infrastructure.
+ **Cold storage:** private keys are held offline.
+ **Security:** high grade security protocols applied to all activities involving private keys — secured in segregated wallets offline.
+ **Coin entitlement:** each share represents a certain amount of the relevant cryptocurrency.
+ **Custodian:** dual-custody model with regulated custodians (Coinbase and Swissquote).

+ **Fees:** one of the lowest-fee ranges of crypto ETPs in Europe. Our flagship Bitcoin ETP is priced at just 0.15%[3].

To learn more, visit the WisdomTree Crypto ETP centre and discover our comprehensive suite of institutional grade solutions designed to support professional investors entering the crypto space.

3 A portion of the management fee (MER) has been waived, effective from and including 26 March 2025 until 31 December 2026. During this period, the MER will be 0.15% per annum. From 1 January 2027, the MER will revert to 0.25% per annum.

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