Hashdex

Bitcoin’s Impact to 60/40 Portfolios: Sizing, Rebalancing, and Holding Period

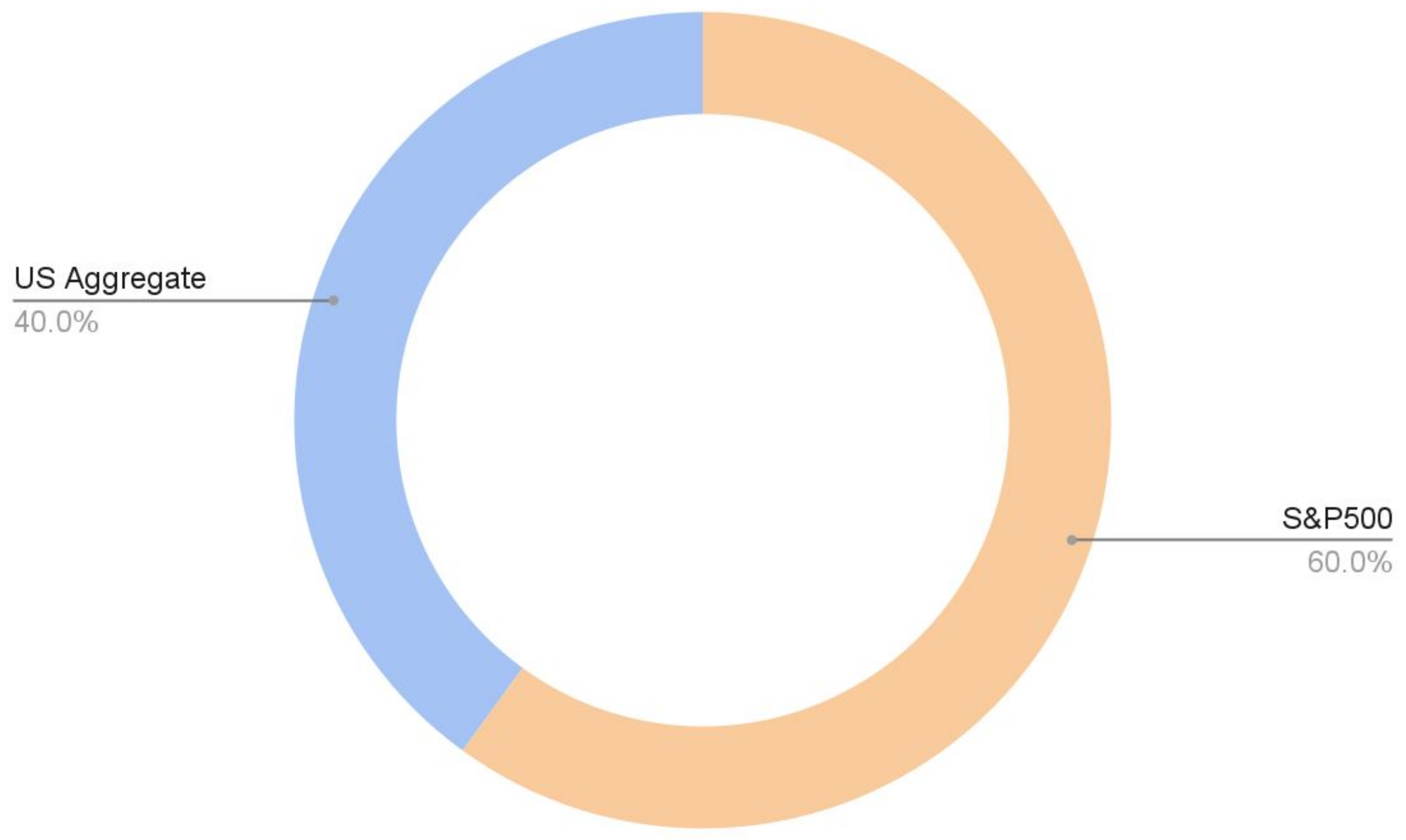
Context

Our simulation spans the period from January 2014 to March 2024.

We assume a baseline 60/40 portfolio for the US (60% S&P 500 and 40% US Aggregate), and that the bitcoin (BTC) allocation replaces part of the S&P 500 allocation. We use 3 month US Treasury Bills as the risk-free asset.

Our simulation aims to address three questions:

1. What is the ideal size of a BTC allocation in a portfolio?
2. What is the ideal rebalancing frequency?
3. What is the ideal investment horizon?



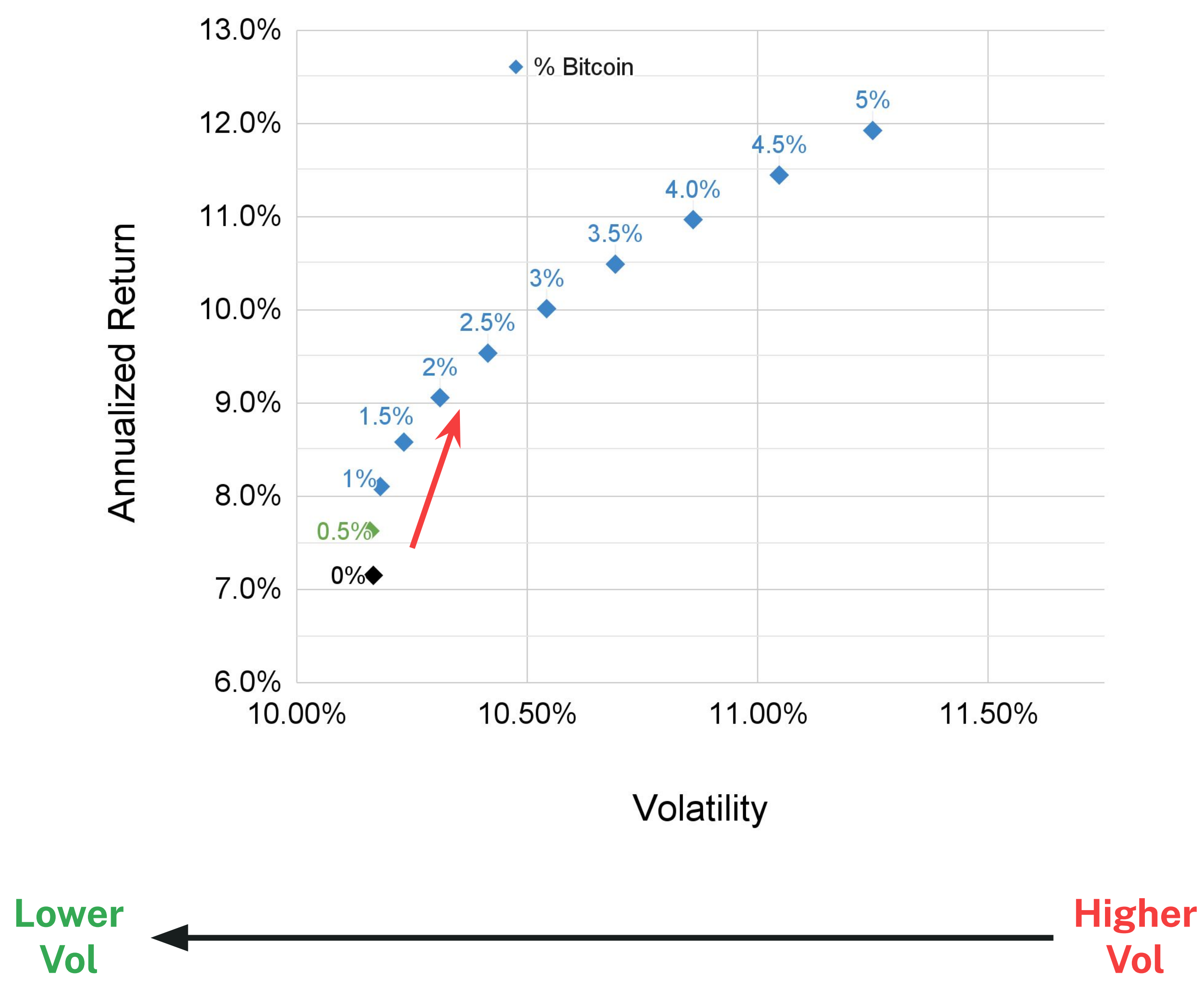
What is the ideal size of a bitcoin allocation?

Increasing an allocation to BTC **consistently led to higher average returns and higher average Sharpe ratios**, even up to a 10% BTC allocation.

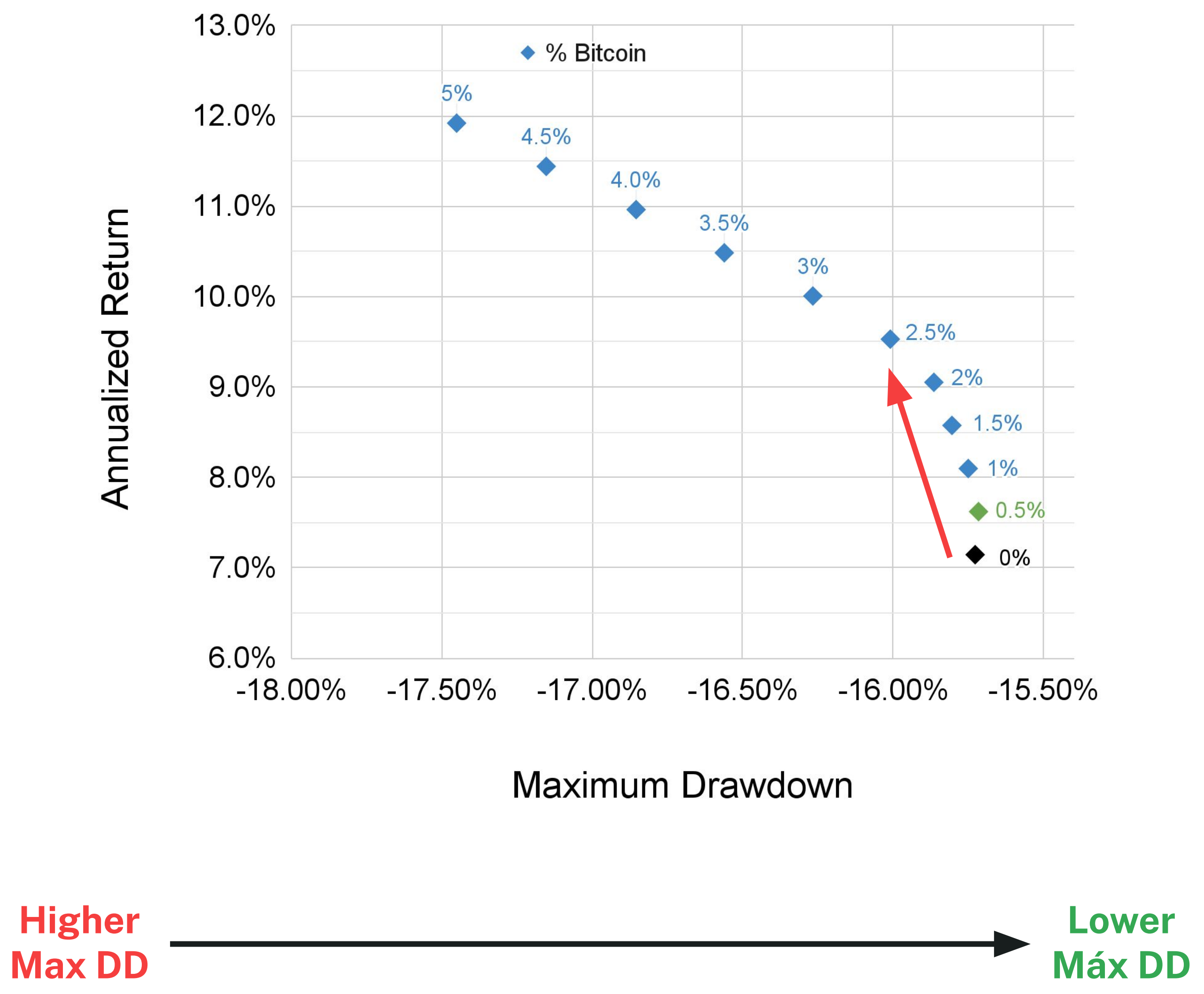
A 2% BTC allocation increased average portfolio returns by 1.9% per year and only 0.14% in additional volatility, **improving the Sharpe ratio by 0.71**.

For risk-sensitive investors, **the sweet spot for a BTC allocation was 2% to 2.5%**, as the impact on volatility and maximum drawdown remains marginal in this range.

Risk x Return



Max Drawdown x Return



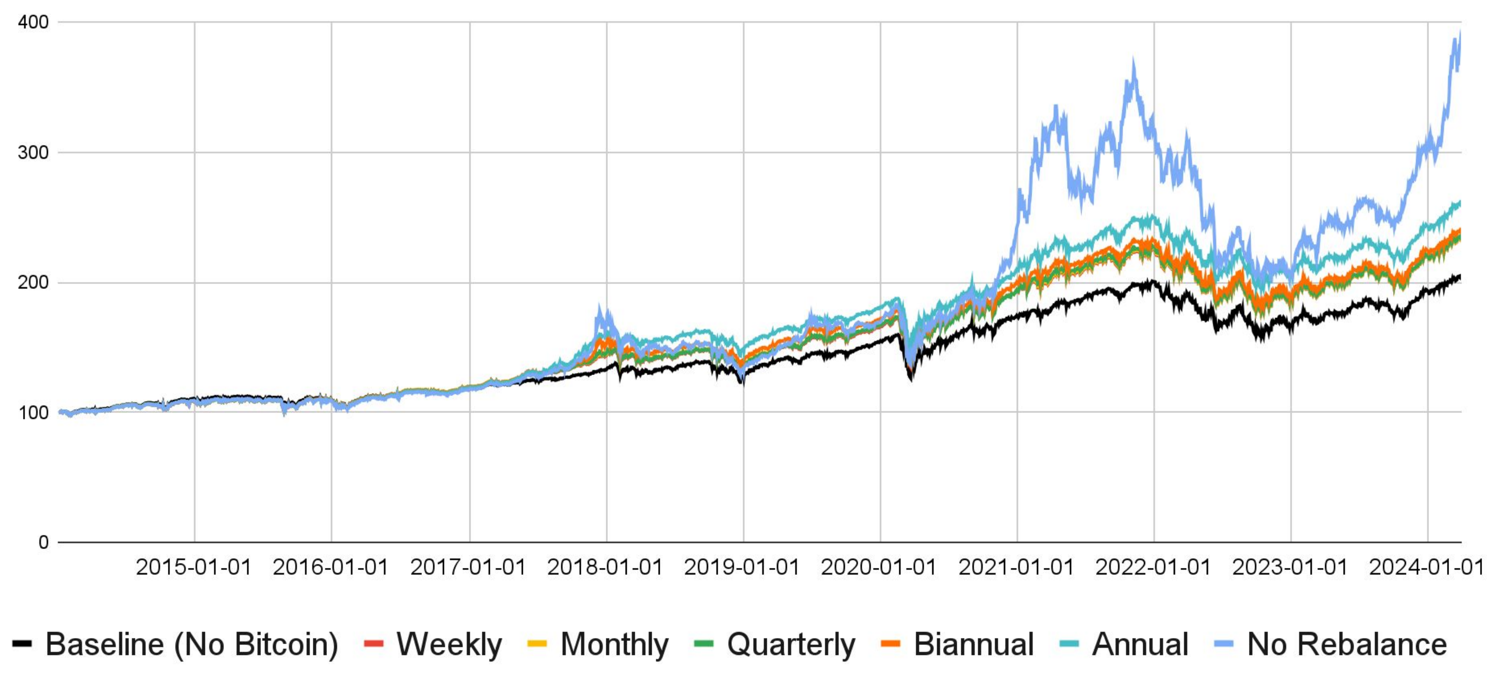
Assuming **quarterly** rebalancing and **3-year holding period**

What is the ideal rebalancing frequency for a BTC allocation?

The portfolio that does no rebalancing generates the best returns, but will significantly increase volatility and maximum drawdown. It has a lower Sharpe ratio than all the rebalanced portfolios.

Quarterly rebalancing does the best in minimizing the impact on volatility for a 2% bitcoin allocation, improving annual returns by 1.5% and the Sharpe ratio by 0.17, with only 0.1% increase in volatility.

Return



Summary

Portfolio	Cumulative Return	Annual Return	Annual Volatility	Sharpe	Sortino	Maximum Drawdown
Baseline (No bitcoin)	**105.2%**	**7.0%**	**10.2%**	**0.56**	**0.66**	**-21.4%**
No Rebalancing	283.2%	13.6%	18.3%	0.67	0.78	-45.0%
Weekly	134.7%	8.4%	10.5%	0.68	0.79	-22.0%
Monthly	135.1%	8.4%	10.4%	0.69	0.81	-22.3%
Quarterly	135.9%	8.5%	10.3%	0.69	0.83	-22.3%
Biannual	140.7%	8.7%	10.6%	0.69	0.83	-22.6%
Annual	161.8%	9.5%	10.6%	0.77	0.93	-22.3%

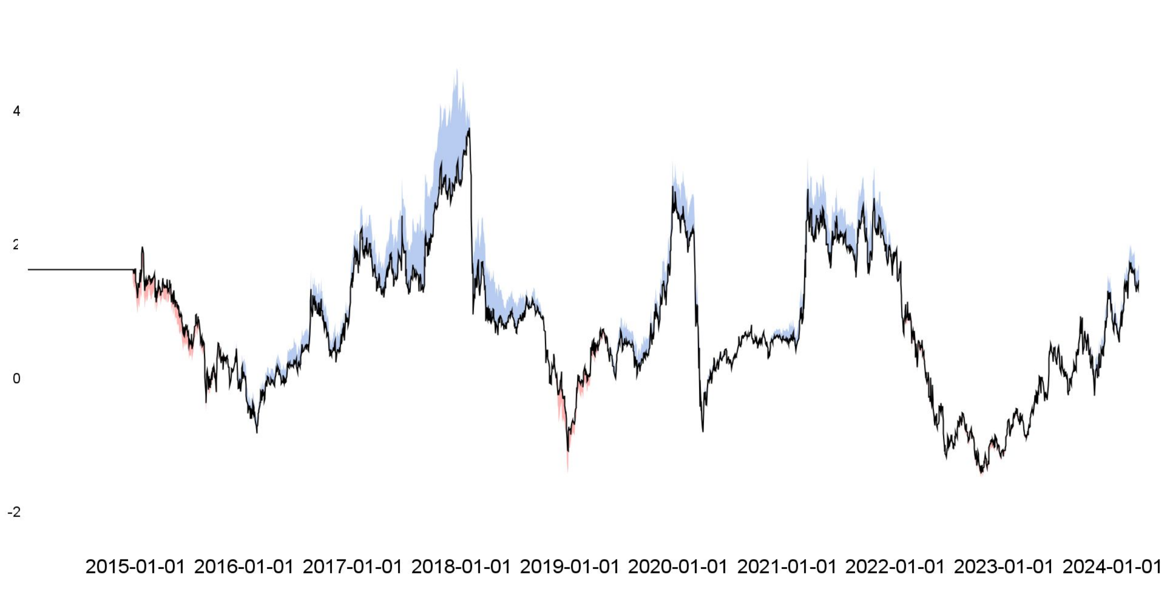
Assuming **2%** bitcoin allocation and **3-year holding period**

What is the ideal investment horizon?

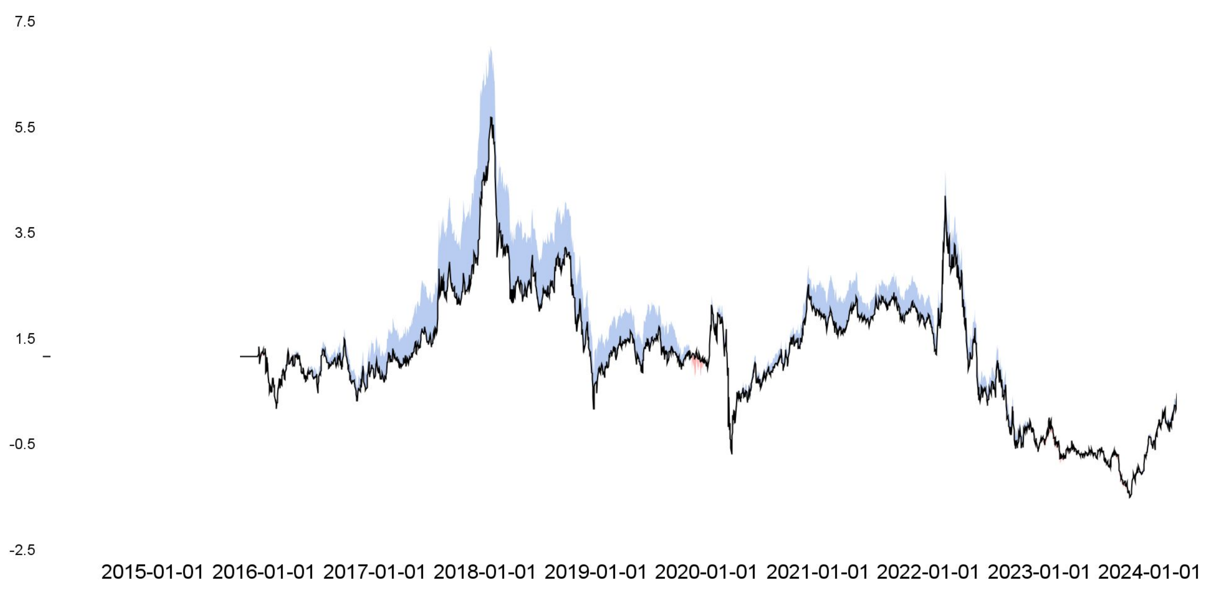
An allocation to bitcoin, if held for 3 years, increases portfolio returns in 98% of cases (vs. 87% for 2-year holding period and 70% for 1-year).

A 3-year holding period has, on average, a better impact on returns and Sharpe ratio than a 2-year or 1-year holding period.

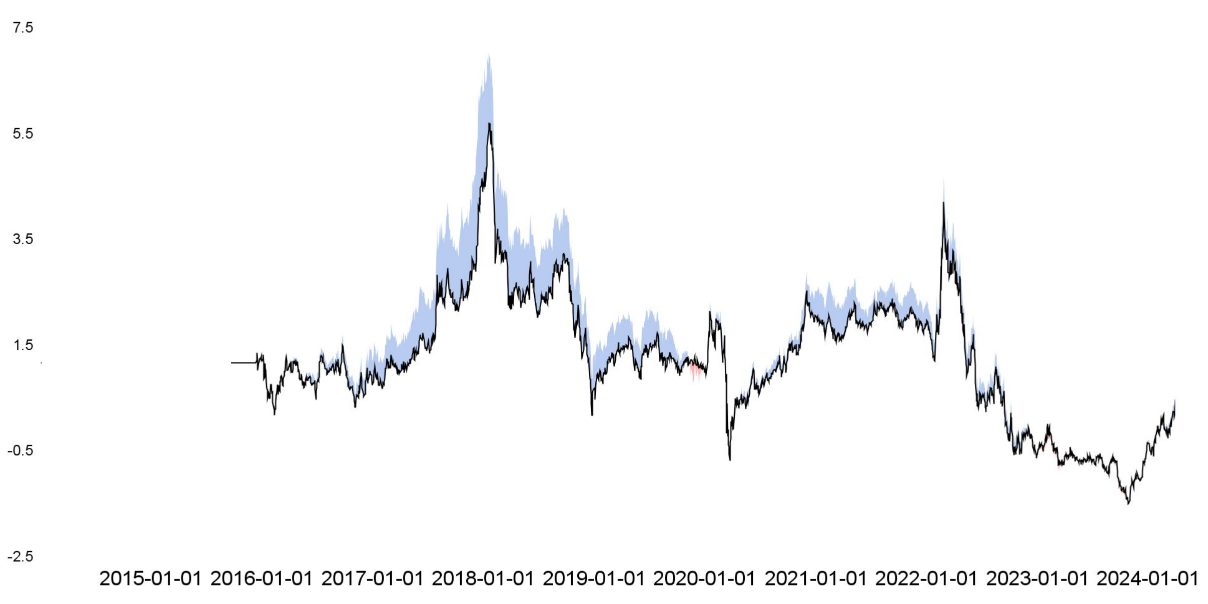
Sharpe Ratio (1Y)



Sharpe Ratio (2Y)



Sharpe Ratio (3Y)



		Rolling Cumulative Return					Rolling Sharpe Ratio				
Holding Period (years)	Number of Simulations	Max	Avg	Min	Win Rate	Loss Rate	Max	Avg	Min	Win Rate	Loss Rate
1	2411	46.6%	8.2%	-20.7%	70%	30%	4.64	0.95	-1.49	70%	30%
2	2159	54.6%	16.9%	-13.2%	87%	13%	7.04	1.62	-1.49	89%	11%
3	**1907**	**72.8%**	**29.7%**	**3.6%**	**98%**	**2%**	**5.73**	**2.79**	**-0.20**	**98%**	**2%**

Assuming **2%** bitcoin allocation, **quarterly** rebalancing, and **3-year holding period**

Portfolio Comparisons: No Bitcoin vs. 2% Allocation

We compared a baseline portfolio (no BTC) to a portfolio with 2% that was rebalanced quarterly. The portfolio with a 2% BTC allocation generated higher returns in 7 of the last 10 calendar years.

Interestingly, even if the BTC allocation led to higher volatility and maximum drawdowns for most years, the increase in the portfolio return is several times higher, more than compensating for the increase in risk parameters.

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Cumulative
Return												
Baseline Portfolio (No BTC)	**9.5%**	-0.1%	6.7%	12.5%	**-3.3%**	19.8%	12.8%	14.4%	**-16.3%**	16.0%	24.6%	105.2%
2% BTC Quarterly Rebal Portfolio	7.9%	**1.0%**	**8.5%**	**20.7%**	-5.7%	**21.9%**	**16.0%**	**16.4%**	-17.5%	**17.9%**	**29.7%**	**135.9%**
Volatility												
Base Portfolio (No BTC)	6.37%	**8.80%**	7.46%	**3.75%**	**9.69%**	6.80%	18.59%	**7.83%**	**15.29%**	8.55%	7.24%	**10.17%**
2% BTC Quarterly Rebal Portfolio	**6.15%**	**8.79%**	**7.20%**	5.04%	9.86%	**6.59%**	**18.55%**	8.33%	15.52%	**8.54%**	**7.19%**	10.26%
Maximum Drawdown												
Base Portfolio (No BTC)	**-3.90%**	-7.51%	**-4.84%**	**-1.30%**	**-11.55%**	**-8.17%**	**-20.86%**	**-3.46%**	**-21.26%**	**-16.87%**	-1.23%	**-21.26%**
2% BTC Quarterly Rebal Portfolio	-4.09%	**-7.20%**	-4.97%	-1.99%	-12.09%	-8.83%	-20.83%	-3.63%	-22.04%	-18.00%	**-1.18%**	-22.04%

Assuming **2%** bitcoin allocation, **quarterly** rebalancing, and **3-year holding period**

Key takeaways

1. Increasing an allocation to bitcoin within our simulated portfolios consistently led to **higher average returns and higher average Sharpe ratios**.

2. **A 2% to 2.5% bitcoin allocation kept the risk budget** (volatility and maximum drawdown) roughly unchanged.

3. For a 2% bitcoin allocation, **quarterly rebalancing performed the best in minimizing the impact on volatility**, while improving annual returns and Sharpe ratio.

4. If a BTC allocation was held for 3 years, **portfolio returns increased 98% of the time** and with a better Sharpe ratio than a 2-year or 1-year holding period.

Disclaimer

This material expresses Hashdex Asset Management Ltd. and its subsidiaries and affiliates ("Hashdex")'s opinion for informational purposes only and does not consider the investment objectives, financial situation or individual needs of one or a particular group of investors. We recommend consulting specialized professionals for investment decisions. Investors are advised to carefully read the prospectus or regulations before investing their funds. The information and conclusions contained in this material may be changed at any time, without prior notice. Nothing contained herein constitutes an offer, solicitation or recommendation regarding any investment management product or service. This information is not directed at or intended for distribution to or use by any person or entity located in any jurisdiction where such distribution, publication, availability or use would be contrary to applicable law or regulation or which would subject Hashdex to any registration or licensing requirements within such jurisdiction. No part of this material may be (i) copied, photocopied or duplicated in any form by any means or (ii) redistributed without the prior written consent of Hashdex. By receiving or reviewing this material, you agree that this material is confidential intellectual property of Hashdex and that you will not directly or indirectly copy, modify, recast, publish or redistribute this material and the information therein, in whole or in part, or otherwise make any commercial use of this material without Hashdex's prior written consent.

Investment in any investment vehicle and cryptoassets is highly speculative and is not intended as a complete investment program. It is designed only for sophisticated persons who can bear the economic risk of the loss of their entire investment and who have limited need for liquidity in their investment. There can be no assurance that the investment vehicles will achieve its investment objective or return any capital. No guarantee or representation is made that Hashdex's investment strategy, including, without limitation, its business and investment objectives, diversification strategies or risk monitoring goals, will be successful, and investment results may vary substantially over time. Nothing herein is intended to imply that the Hashdex s investment methodology or that investing any of the protocols or tokens listed in the Information may be considered "conservative," "safe," "risk free," or "risk averse."

Investors should consider the investment objectives, risks, charges and expenses carefully before investing. For a prospectus or summary prospectus with this and other information about the Fund, please visit https://www.hashdex-etfs.com/. Read the prospectus carefully before investing.

Bitcoin Risks

Bitcoin and bitcoin futures are a relatively new asset class and the market for bitcoin is subject to rapid changes and uncertainty. Bitcoin and bitcoin futures are subject to unique and substantial risks, including significant price volatility and lack of liquidity. The value of an investment in the ETF could decline significantly and without warning, including to zero. You should be prepared to lose your entire investment. The ETF does not invest directly in or hold bitcoin. The price and performance of bitcoin futures should be expected to differ from the current "spot" price of bitcoin. These differences could be significant. Bitcoin futures are subject to margin requirements, collateral requirements and other limits that may prevent the ETF from achieving its objective. Margin requirements for futures and costs associated with rolling (buying and selling) futures may have a negative impact on the fund's performance and its ability to achieve its investment objective. Bitcoin is largely unregulated and bitcoin investments may be more susceptible to fraud and manipulation than more regulated investments. Bitcoin and bitcoin futures are subject to rapid price swings, including as a result of actions and statements by influencers and the media.

Futures Risk

Commodities and futures investing is generally volatile and risky which may not be suitable for all investors. Futures may be affected by Backwardation: a market condition in which a futures price is lower in the distant delivery months than in the near delivery months. As a result, the fund may benefit because it would be selling more expensive contracts and buying less expensive ones on an ongoing basis; and Contango: A condition in which distant delivery prices for futures exceeds spot prices, often due to costs of storing and inuring the underlying commodity. Opposite of backwardation. As a result, the Fund's total return may be lower than might otherwise be the case because it would be selling less expensive contracts and buying more expensive one.

- Commodities and futures generally are volatile, and instruments whose underlying investments include commodities and futures are not suitable for all investors.

- This material must be preceded or accompanied by a prospectus. Please read the prospectus carefully before investing.

- The Fund is a commodity pool regulated by the Commodity Futures Trading Commission.

- The Fund, which is an exchange-traded product (ETP), is not a mutual fund or any other type of investment company within the meaning of the Investment Company Act of 1940, as amended, and is not subject to regulation thereunder. An ETP refers to a financial product that is publicly trade like a bond in the stock market. ETPs offer a cost-effective and safe way to diversify an investment portfolio by acquiring exposure to an index or asset class.

- Because the Fund will invest primarily in BITCOIN futures contracts and other derivative instruments based on the price of BITCOIN, an investment in the Fund will subject the investor to the risks of the BITCOIN market, and this could result in substantial fluctuations in the price of the Fund's shares.

- Shares of the Fund are not insured by the Federal Deposit Insurance Corporation ("FDIC"), may lose value and have no bank guarantee.

- Unlike mutual funds, the Fund generally will not distribute dividends to its shareholders.

Investors may choose to use the Fund as a means of investing indirectly in bitcoin, and there are risks involved in such investments.

This material is not an offer or solicitation of any kind to buy or sell any securities outside of the United States of America.

Hashdex Asset Management Ltd. and its affiliates ('Hashdex') is providing this website for information purposes online to sophisticated prospective investors with respect to a potential interest in subscribing shares ('Shares') of the Hashdex Bitcoin Futures ETF (the "Fund"). The Fund is a commodity pool that issues Shares that may be purchased and sold on NYSE Arca. The Fund's investment objective is for changes in the Shares' NAV to reflect the daily changes of the price of the Benchmark, less expenses from the Fund's operations. Under normal market conditions, the Fund invests in Benchmark Component Futures Contracts and cash and cash equivalents. Because the Fund's investment objective is to track the price of the Benchmark by investing in Benchmark Futures Contracts rather than bitcoin, changes in the price of the Shares will vary from changes in the spot price of bitcoin. The Fund will invest in BTC Contracts and MBT Contracts to the extent necessary to achieve maximum exposure to the bitcoin futures market. Because the Fund's investment objective is to track the price of the Benchmark by investing in Benchmark Futures Contracts rather than bitcoin, changes in the price of the Shares will vary from changes in the spot price of bitcoin.

The Fund employs Foreside Fund Services, LLC as the Distributor for the Fund. The Distribution Services Agreement among the Distributor, the Sponsor, and the Trust calls for the Distributor to work with the Custodian in connection with the receipt and processing of orders for Creation Baskets and Redemption Baskets and the review and approval of all Fund sales literature and advertising material. The Distributor's principal business address is Three Canal Plaza, Suite 100, Portland, Maine 04101. The Distributor is a broker-dealer registered with the U.S. Securities and Exchange Commission ("SEC") and a member of FINRA.

The Fund is a series of the Teucrium Commodity Trust (the "Trust"). The sponsor to the Fund is Teucrium Trading, LLC (the "Sponsor"), which receives a management fee. The Sponsor is registered as a commodity pool operator ("CPO") and a commodity trading adviser ("CTA") with the Commodity Futures Trading Commission ("CFTC") and is a member of the National Futures Association ("NFA"). Hashdex Asset Management Ltd. ("Hashdex") will serve as the Fund's Digital Asset Adviser and will assist the Sponsor and Marketing Agents with research and investment analysis regarding bitcoin and bitcoin markets for use in the marketing of the Fund. Hashdex will also provide the Fund with marketing services including, but not limited to, branding, the issuance of press releases, preparation of website data content, holding promotional webinars and engaging in promotional activities through social media outlets.

Hashdex has no responsibility for the investment or management of the Fund investment portfolio or for the overall performance or operation of the Fund.

For more information pertaining to the relationship of companies involved in the Fund please read the prospectus.