- For 1% Bitcoin target weight: if BTC's portfolio weight goes below 0.50% or above 1.50%.
    - For 5% Bitcoin target weight: if BTC's portfolio weight goes below 2.50% or above 7.50%.
- The target study period ranges from **December 31st 2015 to June 30th 2019** which represents 3.5 years, in line with the previous subsection.

Table 7 - Aggregated results for dynamic boundary rebalanced portfolios

Portfolio	Total Return (%)	Annualized Return (%)	Annualized Volatility (%)	Max Drawdown (%)
BlackRock Multi-Asset Income	27.86%	7.29%	5.63%	-6.98%
With Bitcoin 0.5% - 1.5 %	33.99% **(+6.13%)**	8.74% **(+1.45%)**	5.63% **(+0.00%)**	-7.52%
With Bitcoin 2.5% - 7.5 %	62.05% **(+34.19%)**	14.82% **(+7.53%)**	6.57% **(+0.94%)**	-10.28%
Vanguard Managed Payout Fund	26.03%	6.85%	7.00%	-11.61%
With Bitcoin 0.5% - 1.5%	32.10% **(+6.07%)**	8.30% **(+1.45%)**	6.97% **(-0.03%)**	-12.05%
With Bitcoin 2.5% - 7.5 %	59.45% **(+33.42%)**	14.29% **(+7.44%)**	7.68% **(+0.68%)**	-13.82%

Similarly to the previous subsection, dynamically rebalanced portfolios exhibited better risk-return profiles when Bitcoin was included into the two respective ETFs than without its inclusion.

Once again, the inclusion of Bitcoin in these multi-asset portfolios led to larger maximum drawdowns with increasing absolute values based on how large was the target allocation of Bitcoin. On the other hand, Bitcoin inclusion brought larger total returns, increasing in line with how large was the dedicated Bitcoin allocation in the portfolio.

Chart 9 - Dynamic allocation results with BlackRock Multi-Asset Income (Base = 1000)

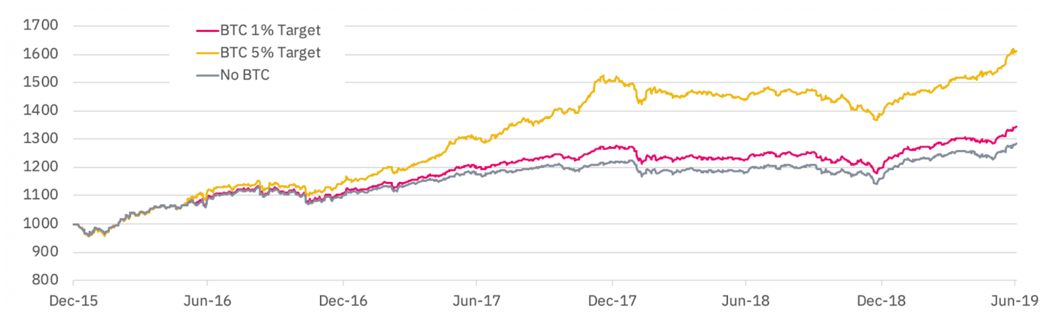

Chart 10 - Dynamic allocation results with Vanguard Managed Payout Fund (Base = 1000)

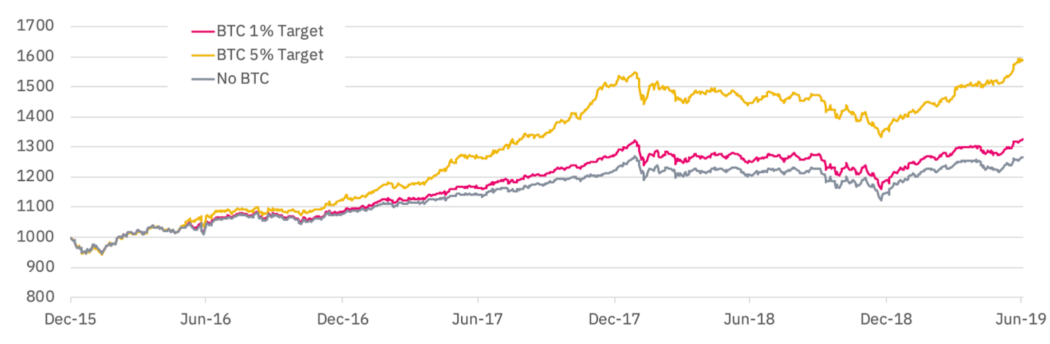

Table 8 - Calendar returns for dynamically rebalanced portfolios

Portfolio	2016	2017	2018	Q2 2019
BlackRock Multi-Asset Income	9.83%	10.95%	-4.78%	10.19%
with 1% BTC	10.78% **(+0.95%)**	14.68% **(+3.73%)**	-5.63% **(-0.85%)**	11.77% **(+1.58%)**
with 5% BTC	14.61% **(+4.78%)**	31.35% **(+20.40%)**	-7.92% **(-3.14%)**	16.91% **(+6.72%)**
Vanguard Managed Payout Fund	7.55%	13.28%	-5.65%	9.63%
with 1% BTC	8.49% **(+0.94%)**	17.12% **(+3.84%)**	-6.45% **(-0.80%)**	11.13% **(+1.50%)**
with 5% BTC	12.28% **(+4.73%)**	33.81% **(+20.53%)**	-9.58% **(-3.93%)**	17.37% **(+7.74%)**

Once again, **all portfolios with Bitcoin exhibited better returns** than without, in all sub-periods with the exception of the year 2018.

Regarding rebalancings, all of these dynamic portfolios triggered rebalancing just 11 or 12 times over this 3.5-year section. In comparison, monthly rebalanced portfolios changed their allocations every month, resulting in 42 rebalancing events over the same period.

As each rebalancing incurs transaction fees, it may be judicious to prevent too frequent rebalancing events. Yet, a quarterly rebalancing approach could also serve as a potential solution to reduce transaction fees. An alternative approach could be to quarterly rebalance the Bitcoin allocation while also set up caps and floors on the effective weight to trigger rebalancings. Despite having larger maximum drawdowns, portfolios rebalanced based on dynamic weight boundaries **had similar (or even lower) volatility profiles with higher average returns**.

The next subsection will discuss some of the key findings from this analysis along with some of the key limits that need to be considered.

3.3 Key findings and limitations

As Bitcoin is uncorrelated to all other traditional asset classes, its inclusion in multi-asset portfolios leads to improved risk/return profiles for these simulated portfolios. While it also leads to greater maximum drawdowns, this increase is quite marginal compared to the added positive returns over the study period.

However, some of the important limitations of this analysis must be considered, such as:

- **Slippage and taxation costs**. While transaction fees were included in this analysis, neither taxation nor slippage costs were considered for this analysis. For large investors, slippage should be considered for a more accurate representation of the expected past performance. Furthermore, taxation may potentially impact realized returns at rebalancing events and could vary greatly depending on the taxation jurisdiction applying to every single investor (or investment management company). However, Bitcoin is a very liquid asset (see section 1.3) and slippage is almost nonexistent for most of the retail and small-medium institutional investors.
- **Calendar days and price sources.** This analysis relied on calendar days, using an aggregated price source among Bitcoin spot exchanges. Furthermore, there may be small discrepancies in the reported performance from ETF providers themselves versus actual performance owing to the use of different calculation methods and other small changes such as different calendar days or the use of market data (versus NAV returns + income distribution versus including the reinvestments).
- **Study period.** Owing to its relatively short history, Bitcoin has a short price history. Specifically, some of the high growth periods may not be replicated in the future and past performance should not be considered as a proxy for expected future returns. However, if Bitcoin (and other cryptocurrencies) remains uncorrelated to other asset classes, the diversification benefits should remain in the future.

Other reports in the Portfolio Management Series will include different allocation periods & more complex methodologies including the addition of other cryptoassets (e.g., Ethereum and XRP) in these simulations.

4. Conclusion

In this first report about portfolio management series, Bitcoin represents its own asset class as it exhibited a null correlation with all other traditional asset classes like equities, fixed-income and commodities.

As part of a multi-asset portfolio, Bitcoin provides **diversification benefits** for investors, irrespective of their preferred asset classes. In spite of its high (yet decreasing) volatility, a simple allocation to Bitcoin in a diversified portfolio consistently leads to improved risk/return profile for both retail and institutional investors, in line with modern portfolio and diversification theories.

While Bitcoin slippage and taxation rates were not discussed in this report, the popularity of OTC desks[16] and futures contracts have increased as alternative methods to trade Bitcoin in large volumes, making it **possible for institutions to quickly build significant positions of cryptoassets**. Large volumes across large exchanges, along with efficient prices and low spreads also provide relief to potential investors.

Furthermore, **new product offerings for Bitcoin** are being introduced to all investors:

- Physically delivered futures contracts (e.g., LedgerX, Bakkt)
- ETF providers trying to approve their products by the SEC in the US (e.g., Bitwise)
- Dedicated custodian solutions (e.g., Fidelity Digital Assets)

These new products will help in answering most of the existing concerns from traditional investors, such as technology and custodian risks. As a result, these launches could elevate Bitcoin's status from being an intriguing risky asset class to an investable asset for most traditional asset managers with an appetite for Bitcoin's unique diversification properties.

Despite the simplicity of the strategies described in this report, they all provided overall positive results from a risk/return perspective; hence, there is a reason to believe that more complex strategies should provide even more room for additional positive contribution owing to the inclusion of Bitcoin into portfolios.

While Bitcoin can be considered as the flagship in the new asset class of **cryptocurrencies and digital assets**, other large market cap assets (e.g., Ethereum, XRP) will be included in future reports with more **complex portfolio allocation strategies**, such as mean-variance strategies, both within the cryptoasset industry and across other asset classes.

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11. Bitwise: Page 79, figure 35.↩
12. e.g., Fidelity Digital Assets. https://www.fidelitydigitalassets.com/overview↩
13. See our report about Q2 2019 correlations of large cryptoassets. https://research.binance.com/analysis/correlations-q2-2019↩
14. i.e., diversified strategy across different asset classes like equities, commodities and fixed-income instruments.↩
15. For instance, someone can purchase USDC/PAX with their bank account. Then he/she can head over to the Binance OTC trading desk to purchase BTC in block trades. Telegram: @BinanceOTC. Mail: tradedesk1@binance.com↩