Supplementary Material of *Cryptocurrencies in equity portfolios: trend or opportunity?*

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Abstract

This study develops a large-scale framework to evaluate whether—and under what conditions—adding cryptocurrencies to equity investment universes improves portfolio performance. We apply four long-only portfolio strategies—Global Minimum Variance, Risk Parity, Most Diversified Portfolio, and Equally Weighted—to 10,000 randomly generated investment universes. These universes consist of baskets containing either only equities or varying combinations of equities and cryptocurrencies. We conduct an out-of-sample analysis on real-world data from 2018 to 2023 to assess the influence of cryptocurrencies on portfolio outcomes. The empirical findings reveal that portfolios constructed from mixed equity and cryptocurrency universes provide a better risk-return profile compared to purely equity-based portfolios, particularly for Risk Parity, Most Diversified, and Equally Weighted.

Keywords: Portfolio Optimization, Cryptocurrencies, Performance Evaluation, Diversification, Equity Risk Premium.

For completeness, we present here the graphs of the datasets not included in the main text. Specifically, Supplementary Material S1 reports figures illustrating the portfolio weights of the cryptocurrencies selected by the different strategies for the Crypto-S&P, Crypto-EuroStoxx, and Crypto-NASDAQ datasets, as well as those selected by the RP strategy for the Crypto-FTSE dataset. Supplementary Material S2 presents the one-year ROI plots for the Crypto-FTSE, Crypto-S&P, Crypto-EuroStoxx, and Crypto-NASDAQ datasets. Finally, the corresponding three-year ROI plots for the same datasets are provided in Supplementary Material S3, with the exception of the Crypto-FTSE dataset under the MDP strategy, which is discussed in the main text.

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S1 Cryptocurrency weights selected over time from the portfolio selection approaches

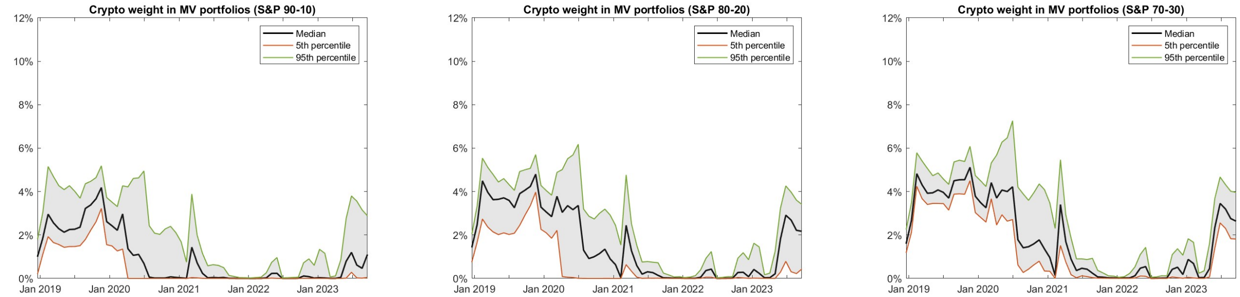


Figure S1: Cryptocurrency weights selected over time from the MV approach on Crypto-S&P

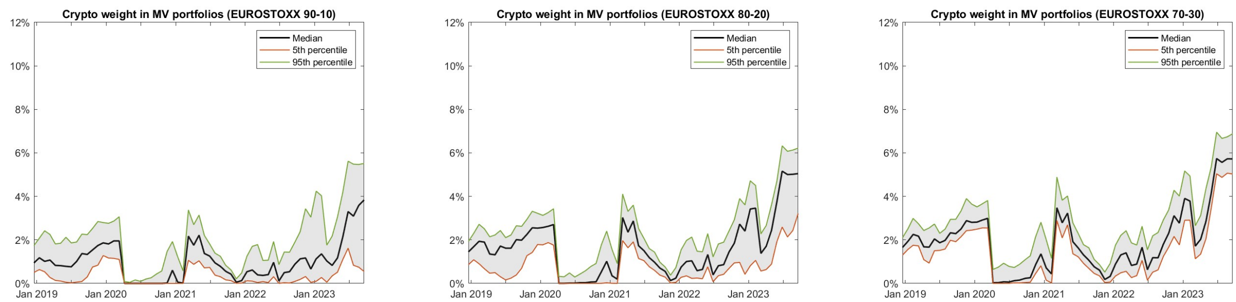


Figure S2: Cryptocurrency weights selected over time from the MV approach on Crypto-EuroStoxx

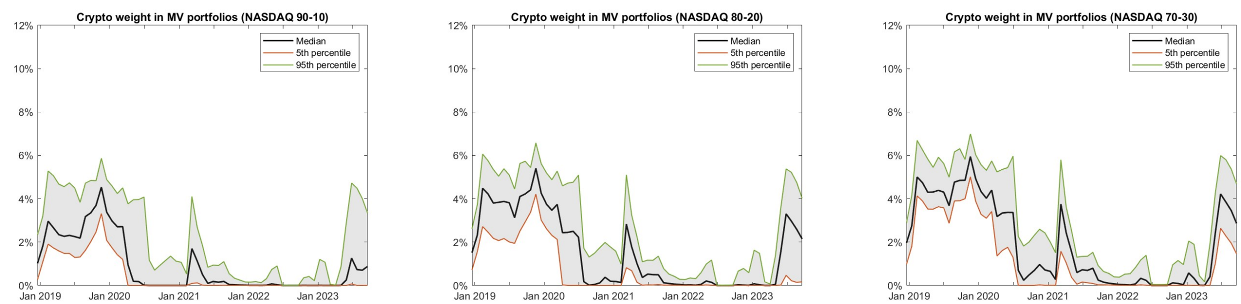


Figure S3: Cryptocurrency weights selected over time from the MV approach on Crypto-NASDAQ

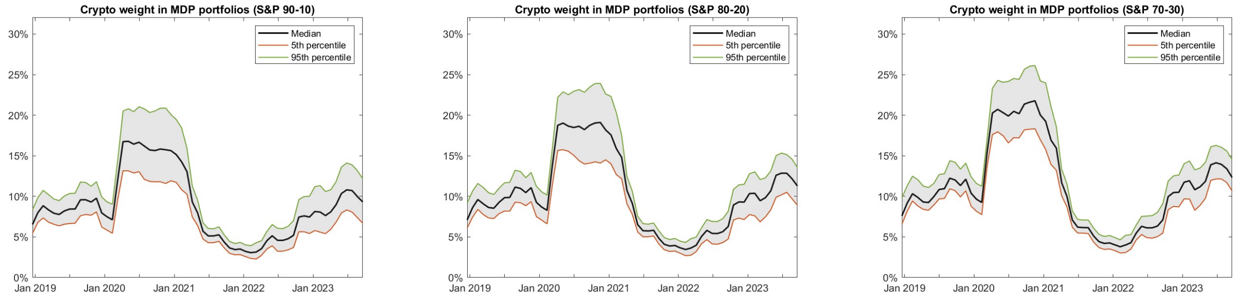


Figure S4: Cryptocurrency weights selected over time from MDP on Crypto-S&P.

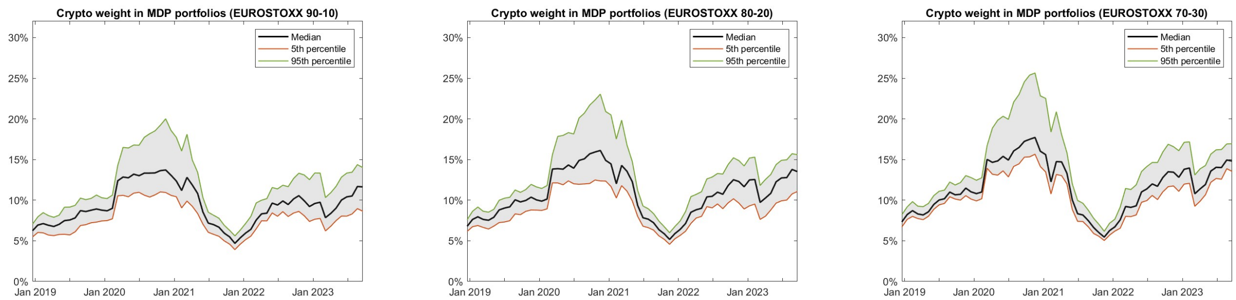


Figure S5: Cryptocurrency weights selected over time from MDP on Crypto-EuroStoxx

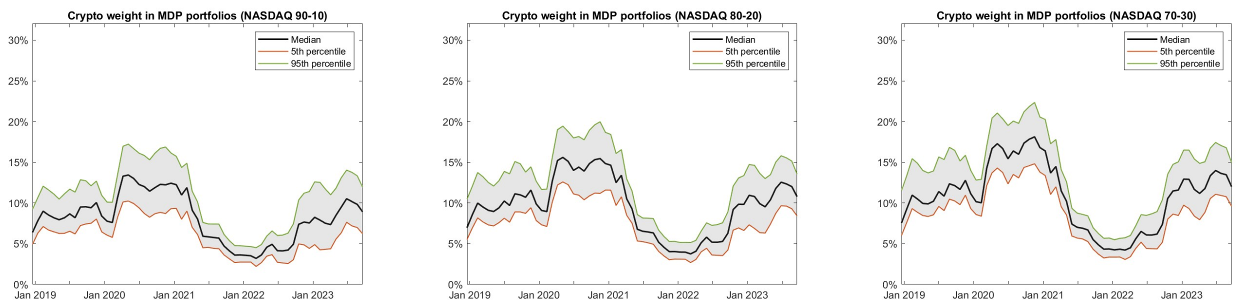


Figure S6: Cryptocurrency weights selected over time from MDP on Crypto-NASDAQ

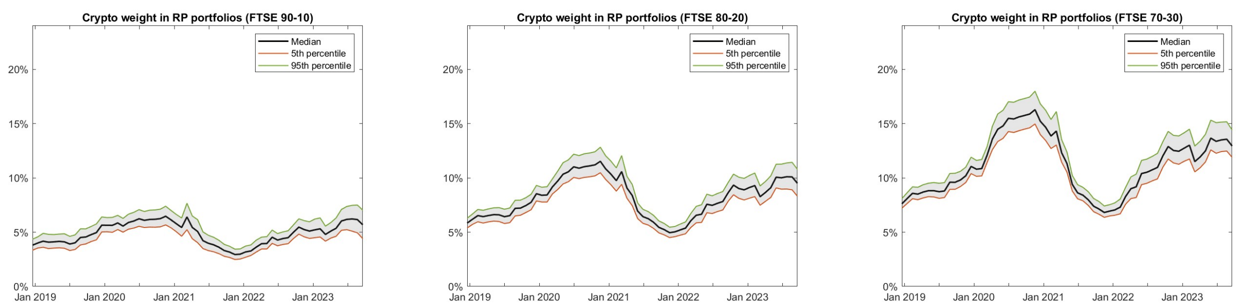


Figure S7: Cryptocurrency weights selected over time from the RP approach on Crypto-FTSE.

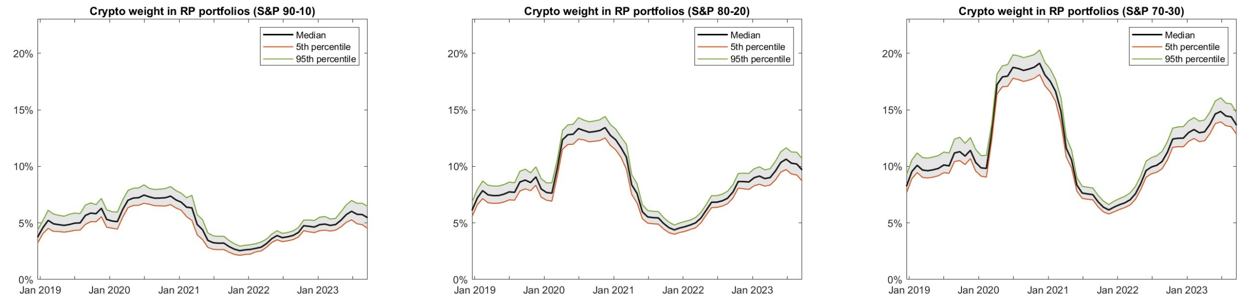


Figure S8: Cryptocurrency weights selected over time from the RP approach on Crypto-S&P

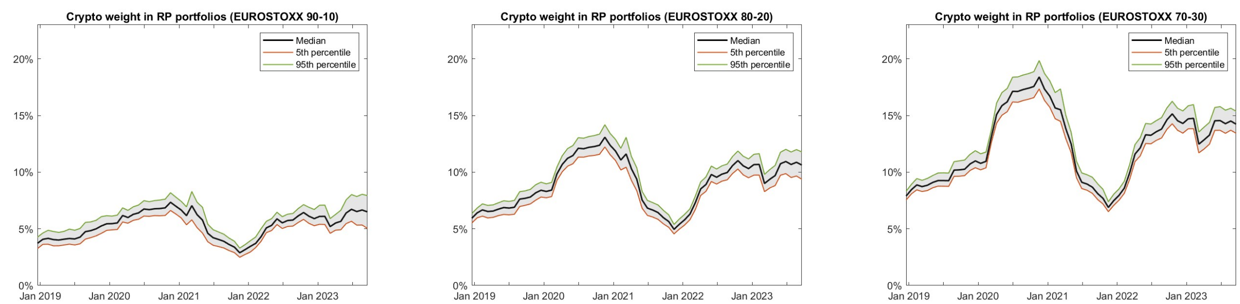


Figure S9: Cryptocurrency weights selected over time from the RP approach on Crypto-EuroStoxx

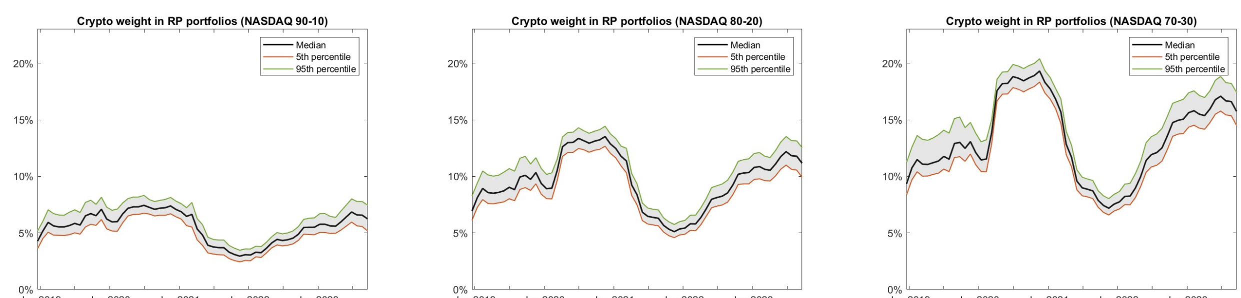


Figure S10: Cryptocurrency weights selected over time from the RP approach on Crypto-NASDAQ

S2 ROI based on one-year time horizon

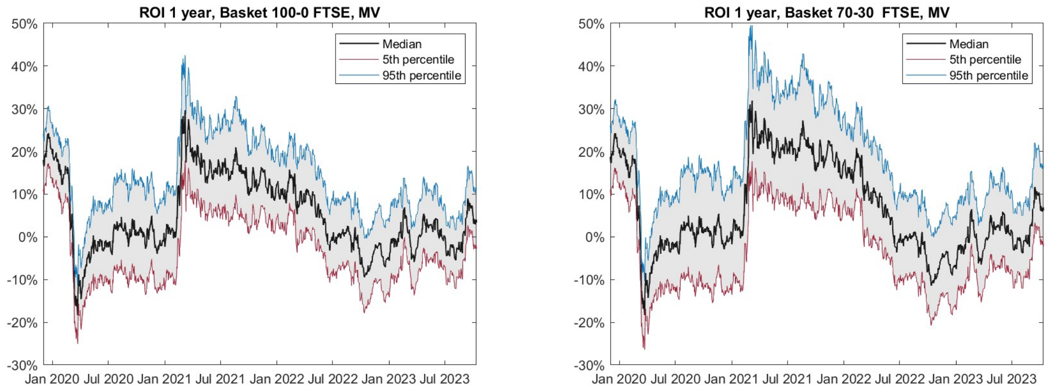


Figure S11: One-year ROI for the MV portfolios on equity-only FTSE (left) and Crypto-FTSE (right).

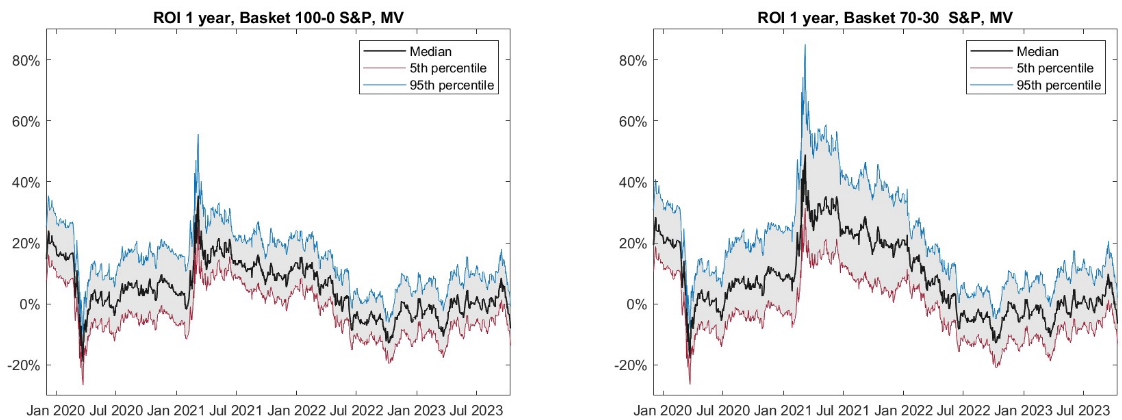


Figure S12: One-year ROI for the MV portfolios on equity-only S&P (left) and Crypto-S&P (right).

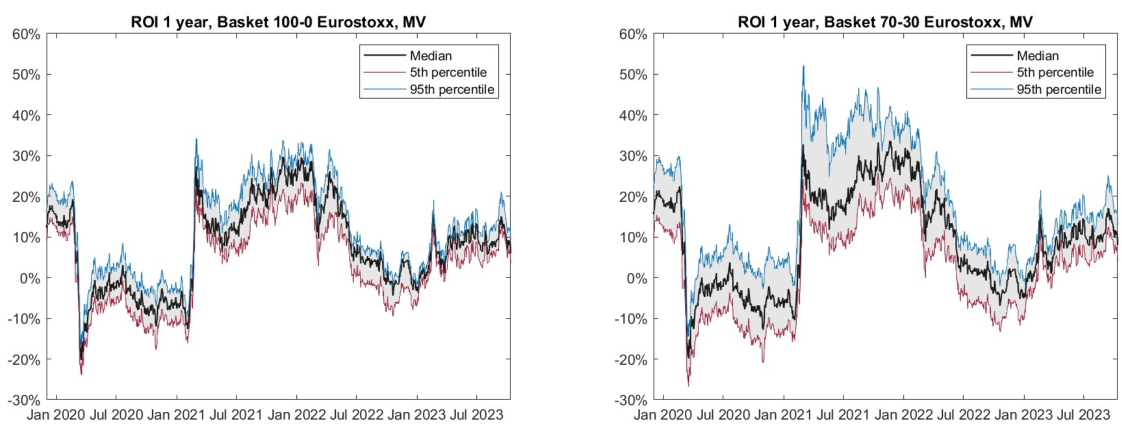


Figure S13: One-year ROI for the MV portfolios on equity-only EuroStoxx (left) and Crypto-EuroStoxx (right).

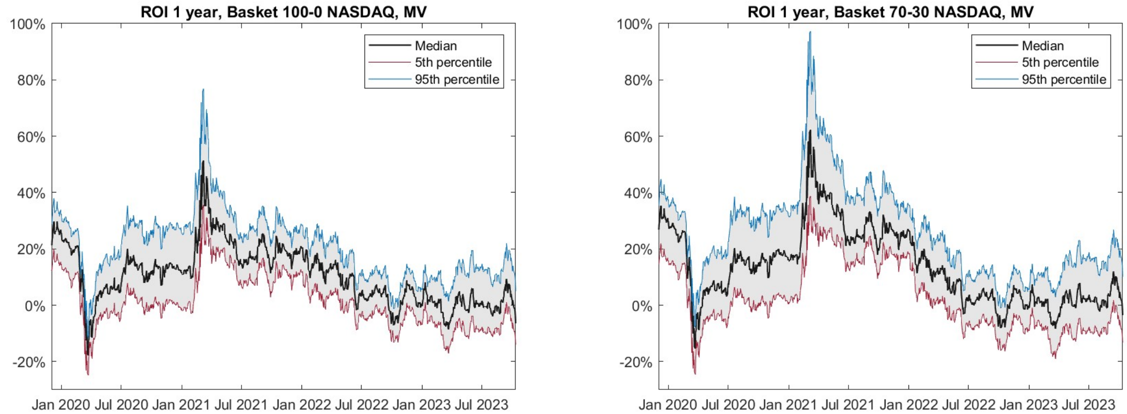


Figure S14: One-year ROI for the MV portfolios on equity-only NASDAQ (left) and Crypto-NASDAQ (right).

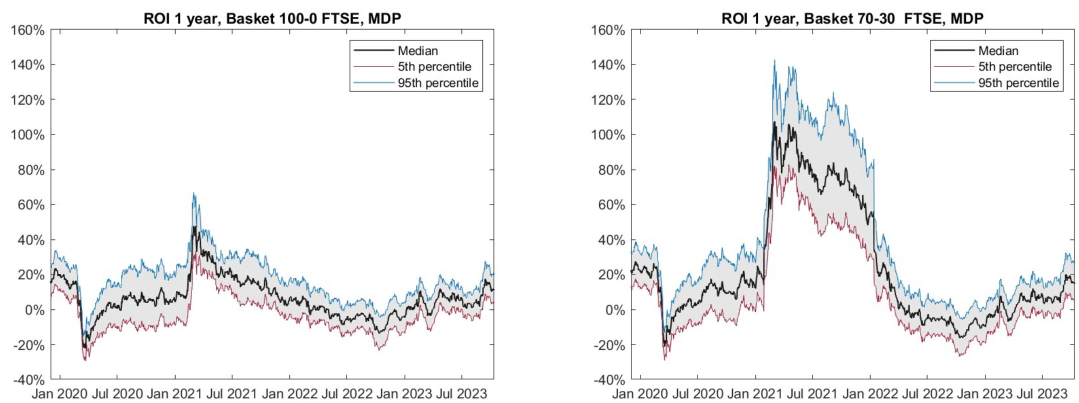


Figure S15: One-year ROI for MDP on equity-only FTSE (left) and Crypto-FTSE (right).

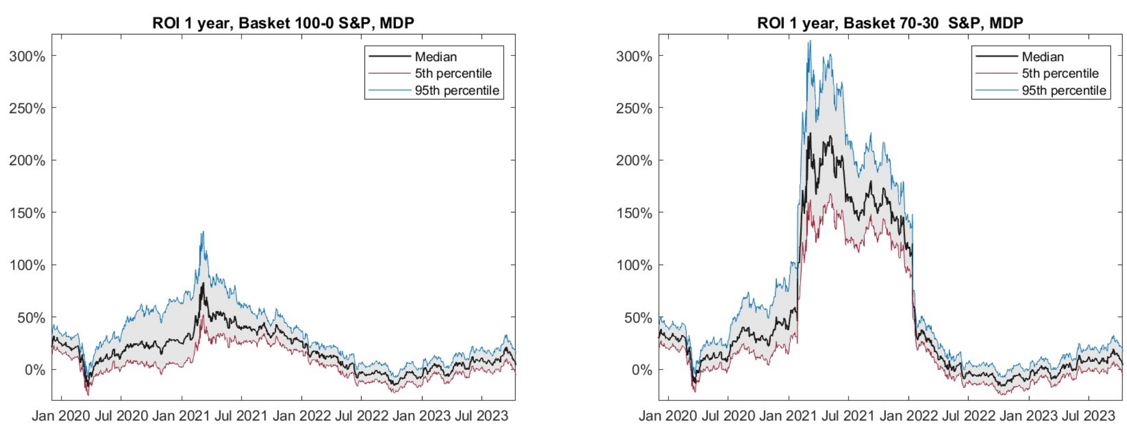


Figure S16: One-year ROI for the MDP portfolios on equity-only S&P (left) and Crypto-S&P (right).

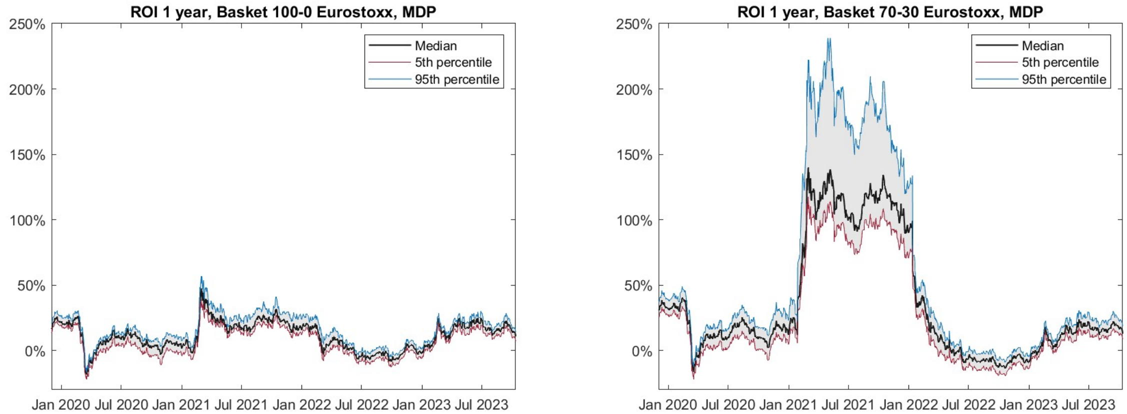


Figure S17: One-year ROI for the MDP portfolios on equity-only EuroStoxx (left) and Crypto-EuroStoxx (right).

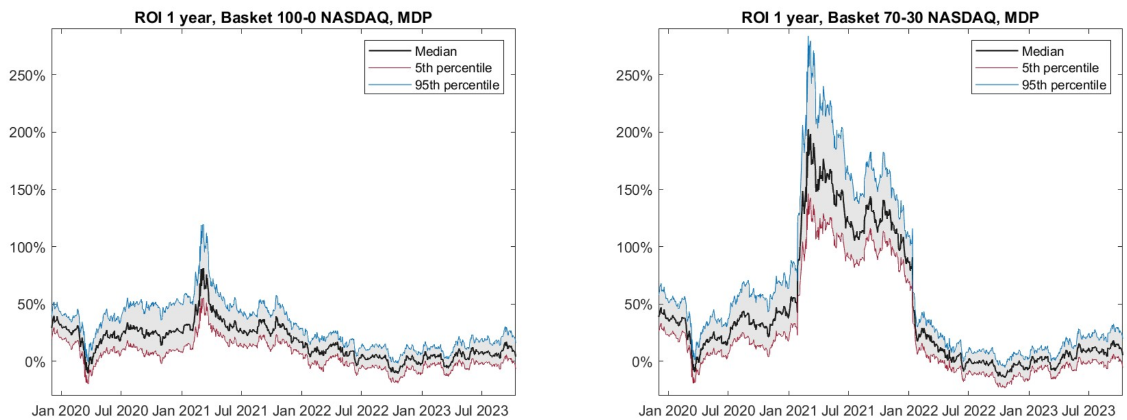


Figure S18: One-year ROI for the MDP portfolios on equity-only NASDAQ (left) and Crypto-NASDAQ (right).

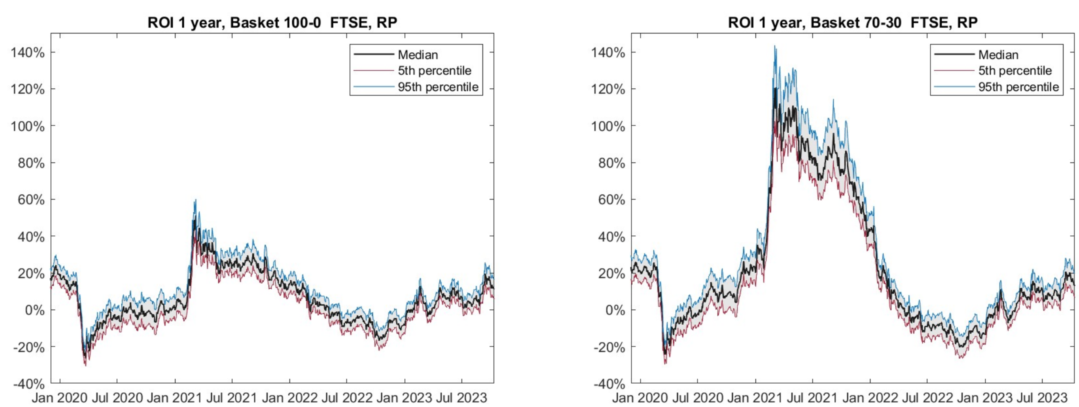


Figure S19: One-year ROI for the RP portfolios on equity-only FTSE (left) and Crypto-FTSE (right).

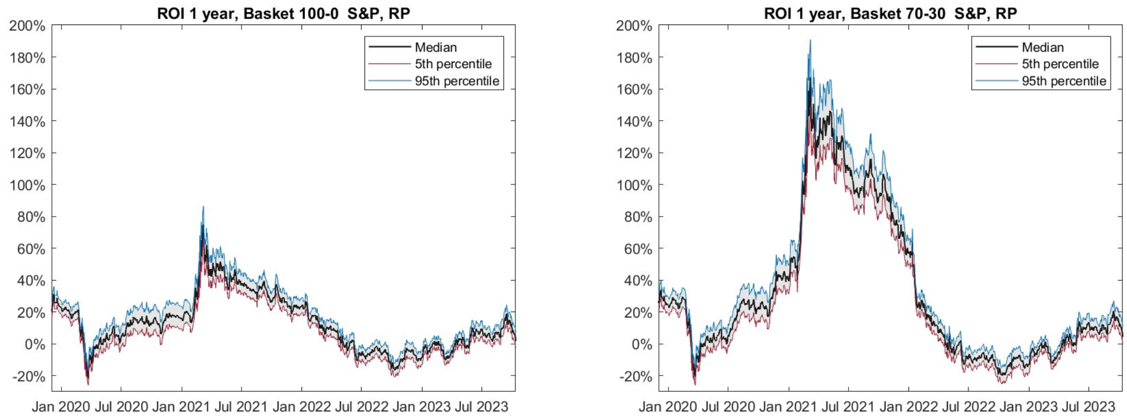


Figure S20: One-year ROI for the RP portfolios on equity-only S&P (left) and Crypto-S&P (right).

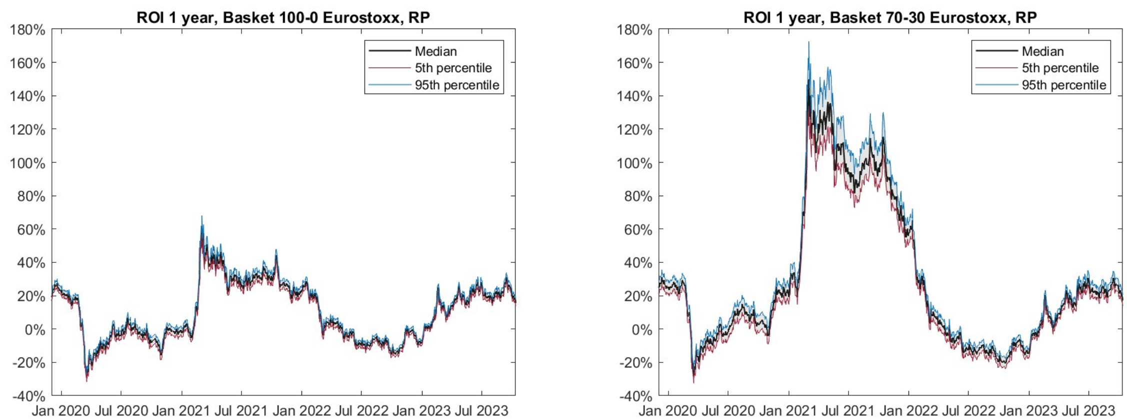


Figure S21: One-year ROI for the RP portfolios on equity-only EuroStoxx (left) and Crypto-EuroStoxx (right).

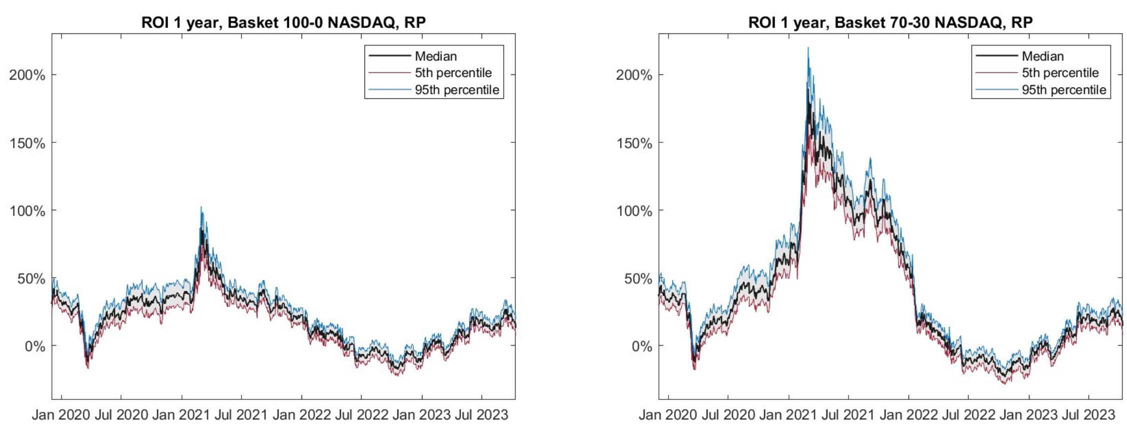


Figure S22: One-year ROI for the RP portfolios on equity-only NASDAQ (left) and Crypto-NASDAQ (right).

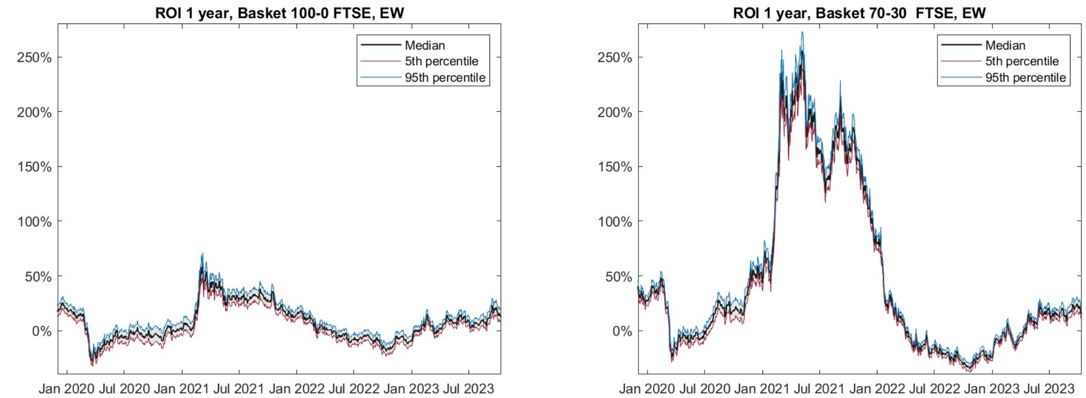


Figure S23: One-year ROI for the EW portfolios on equity-only FTSE (left) and Crypto-FTSE (right).

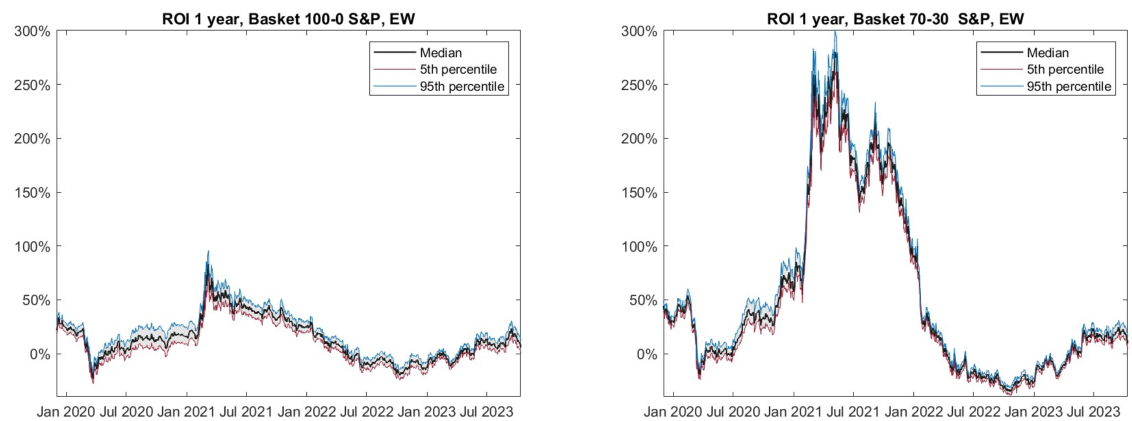


Figure S24: One-year ROI for the EW portfolios on equity-only S&P (left) and Crypto-S&P (right).

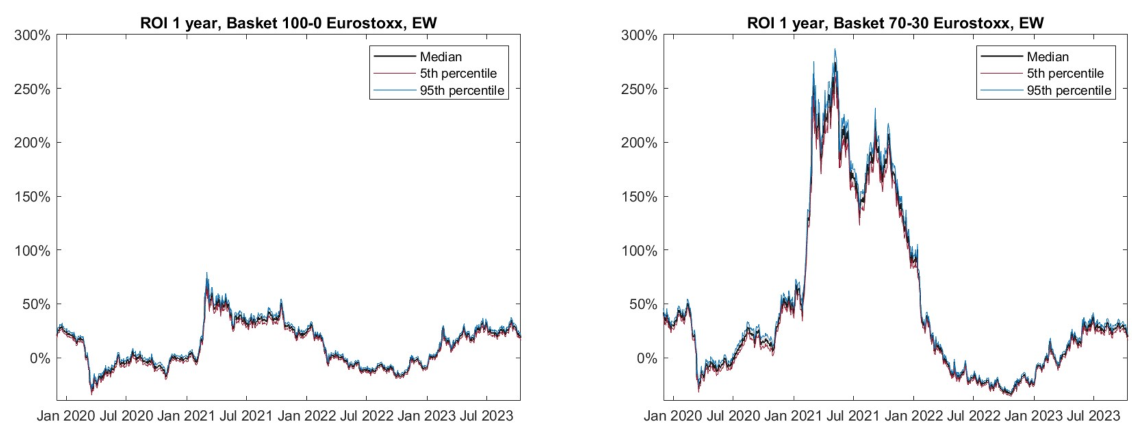


Figure S25: One-year ROI for the EW portfolios on equity-only EuroStoxx (left) and Crypto-EuroStoxx (right).

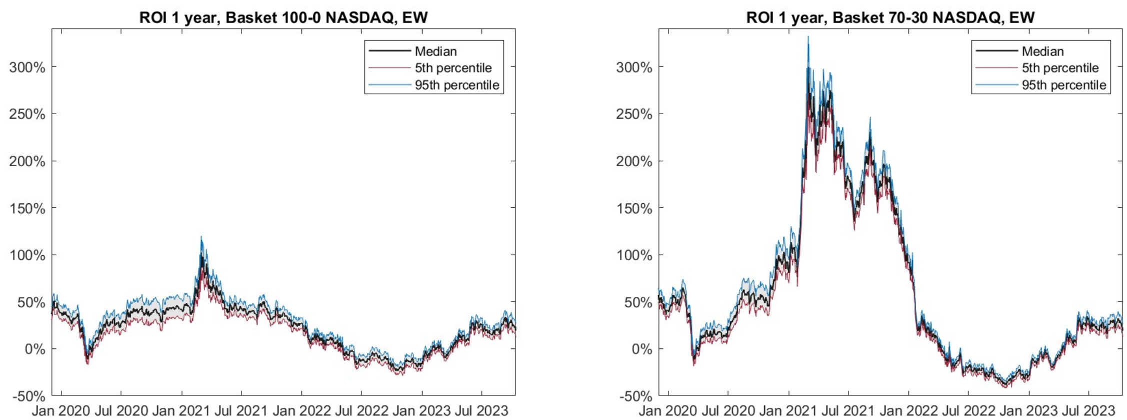


Figure S26: One-year ROI for the EW portfolios on equity-only NASDAQ (left) and Crypto-NASDAQ (right).

S3 ROI based on a three-year time horizon

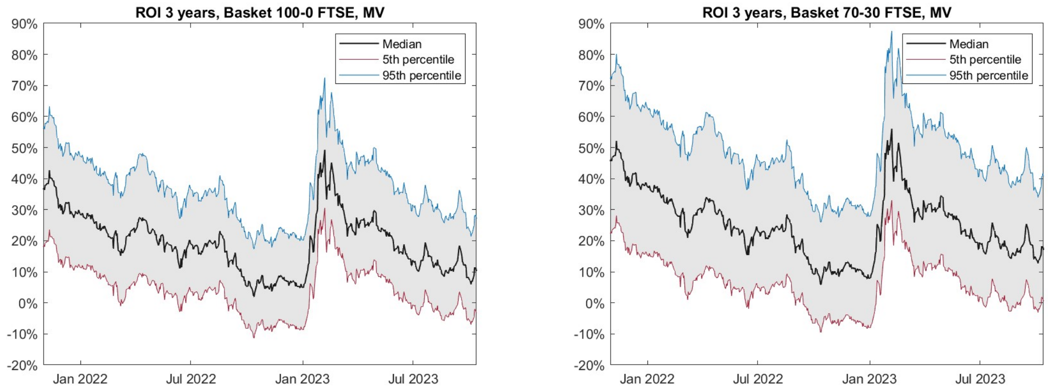


Figure S27: Three-year ROI for the MV portfolios on equity-only FTSE (left) and Crypto-FTSE (right).

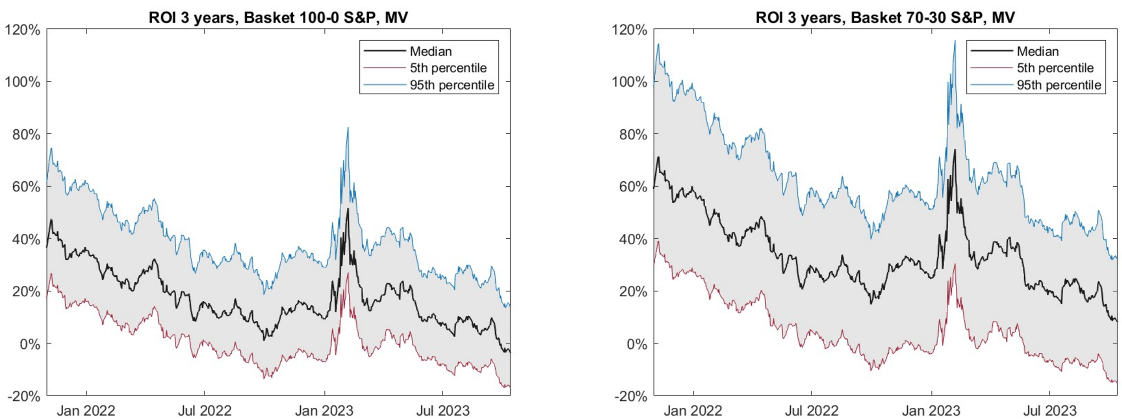


Figure S28: Three-year ROI for the MV portfolios on equity-only S&P (left) and Crypto-S&P (right).

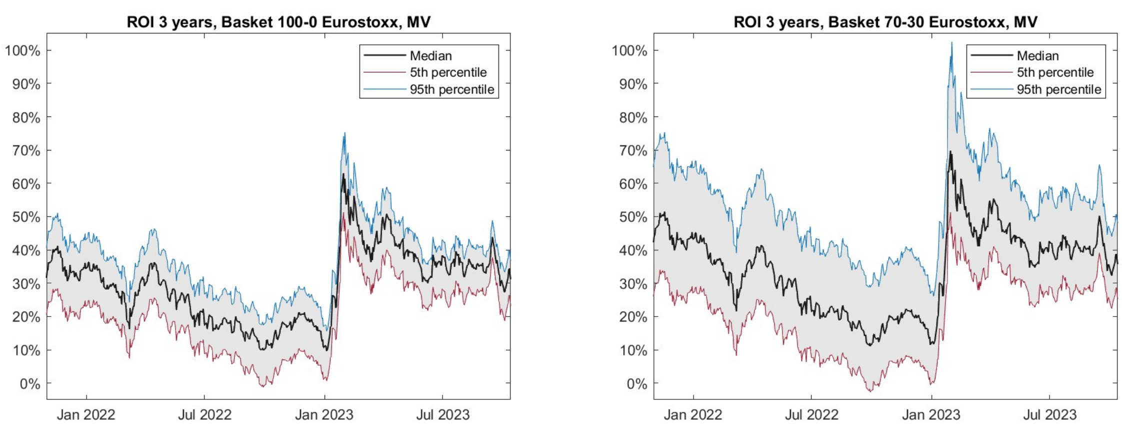


Figure S29: Three-year ROI for the MV portfolios on equity-only EuroStoxx (left) and Crypto-EuroStoxx (right).

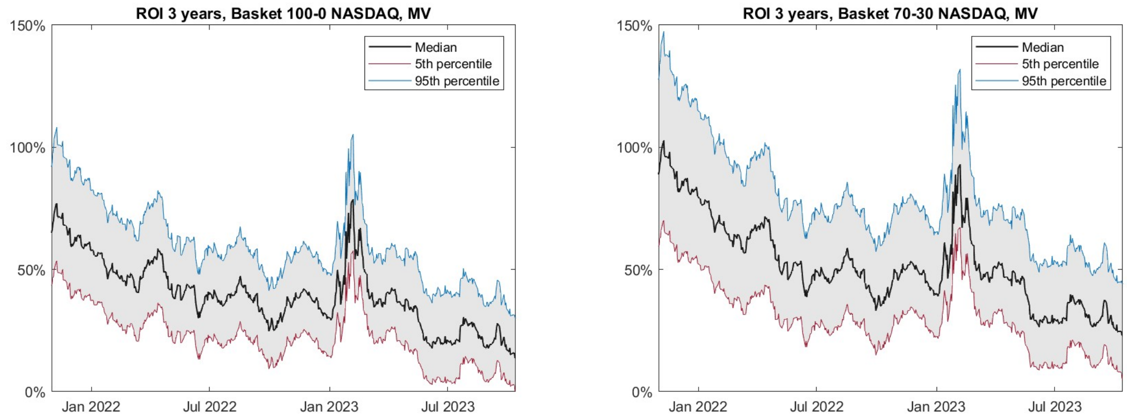


Figure S30: Three-year ROI for the MV portfolios on equity-only NASDAQ (left) and Crypto-NASDAQ (right).

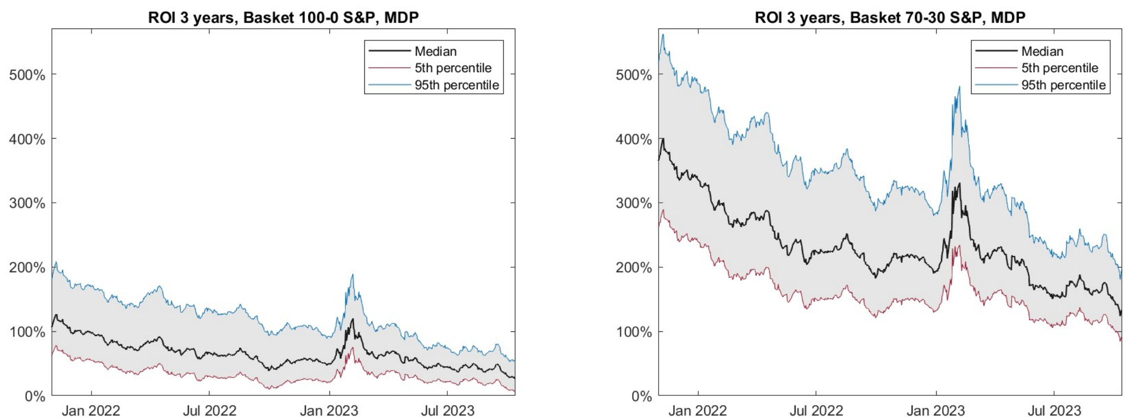


Figure S31: Three-year ROI for MDP on equity-only S&P (left) and Crypto-S&P (right).

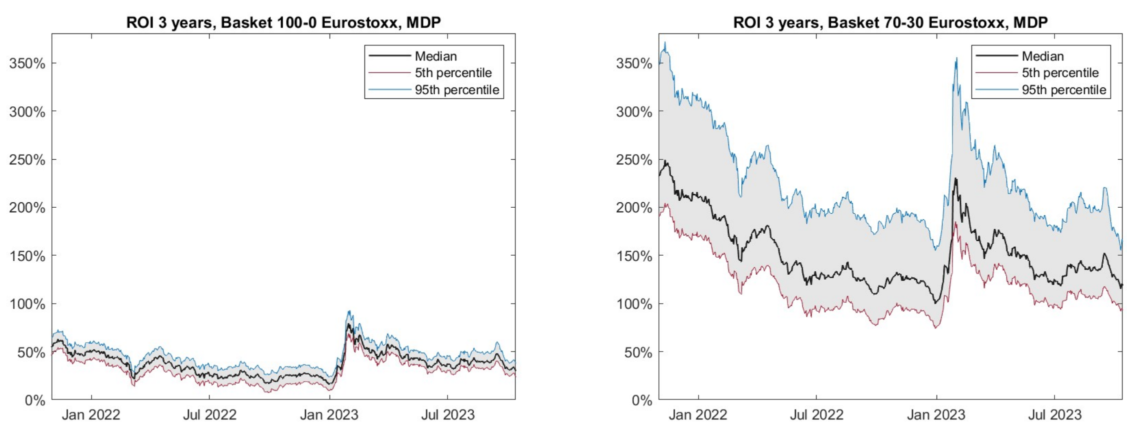
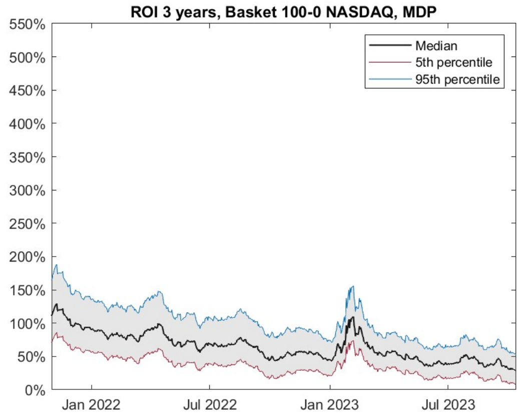


Figure S32: Three-year ROI for MDP on equity-only EuroStoxx (left) and Crypto-EuroStoxx (right).



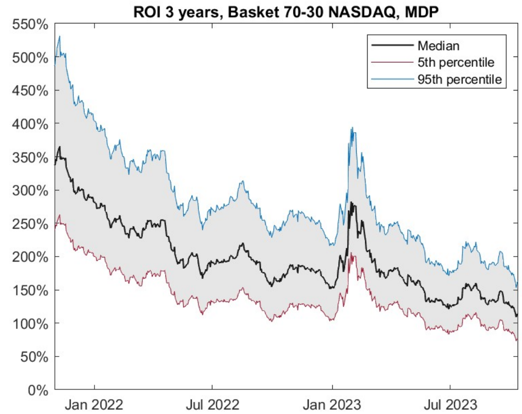
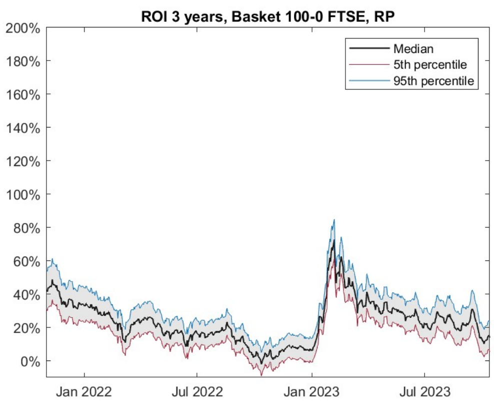


Figure S33: Three-year ROI for MDP on equity-only NASDAQ (left) and Crypto-NASDAQ (right).



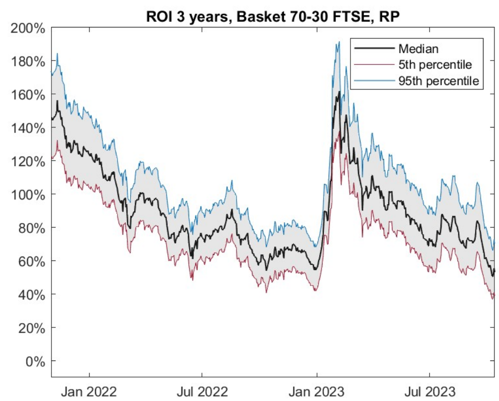
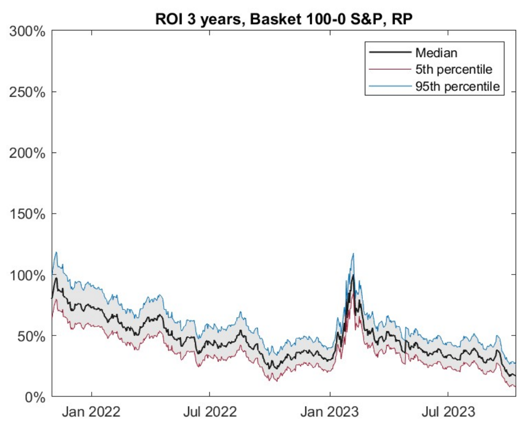


Figure S34: Three-year ROI for the RP portfolios on equity-only FTSE (left) and Crypto-FTSE (right).



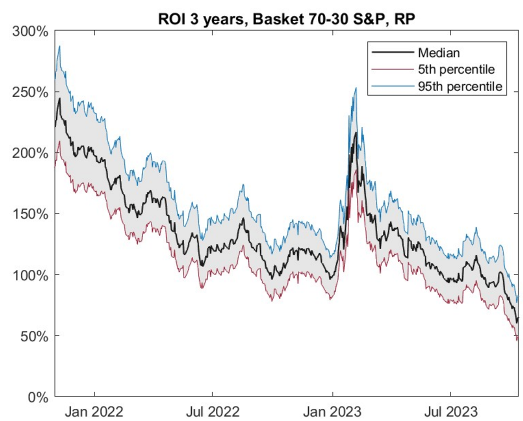


Figure S35: Three-year ROI for the RP portfolios on equity-only S&P (left) and Crypto-S&P (right).

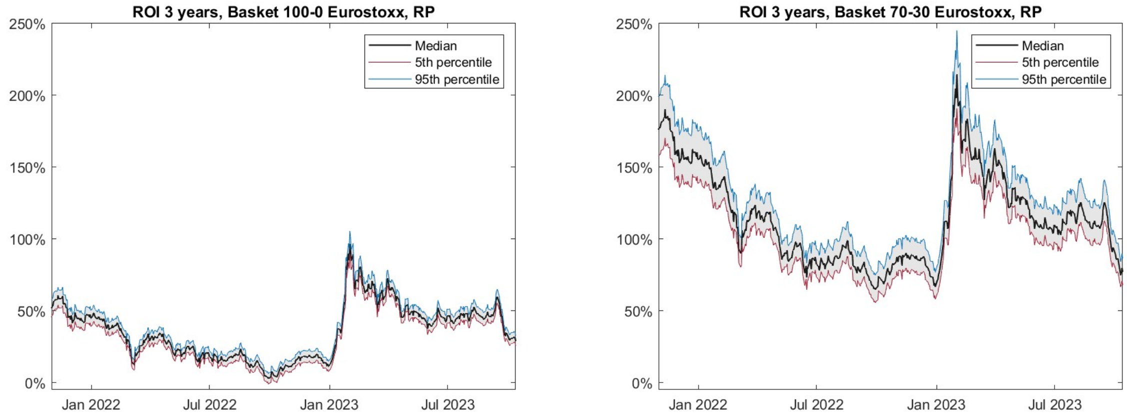


Figure S36: Three-year ROI for the RP portfolios on equity-only EuroStoxx (left) and Crypto-EuroStoxx (right).

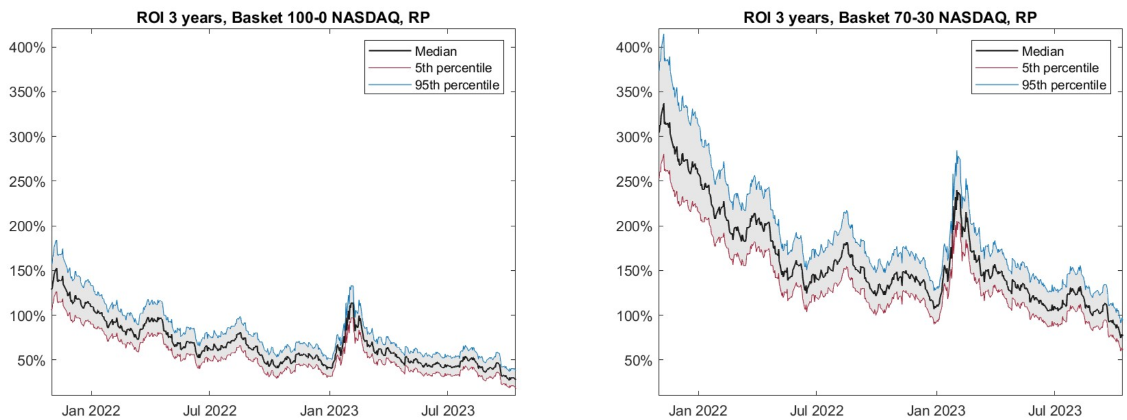


Figure S37: Three-year ROI for the RP portfolios on equity-only NASDAQ (left) and Crypto-NASDAQ (right).

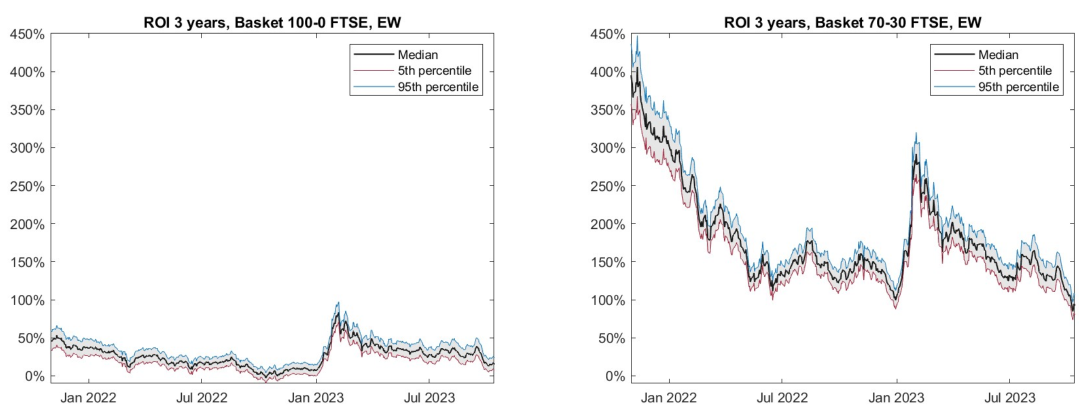


Figure S38: Three-year ROI for the EW portfolios on equity-only FTSE (left) and Crypto-FTSE (right).

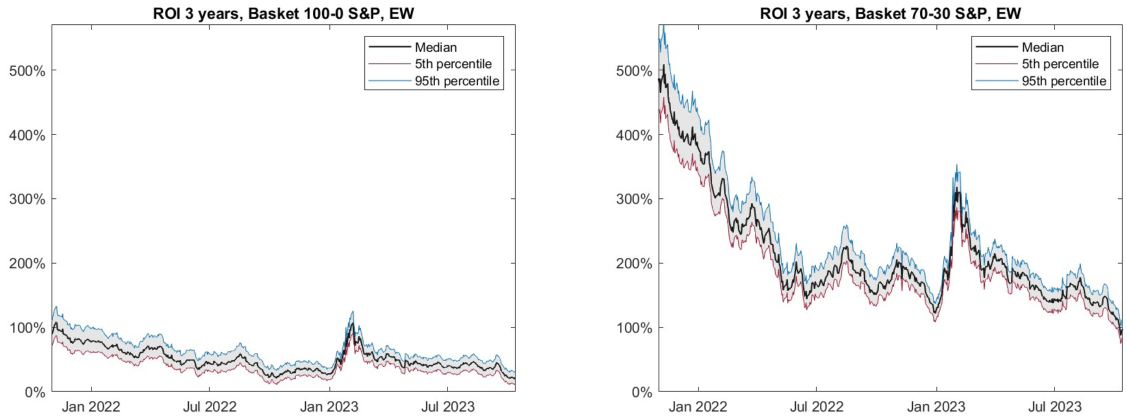


Figure S39: Three-year ROI for the EW portfolios on equity-only S&P (left) and Crypto-S&P (right).

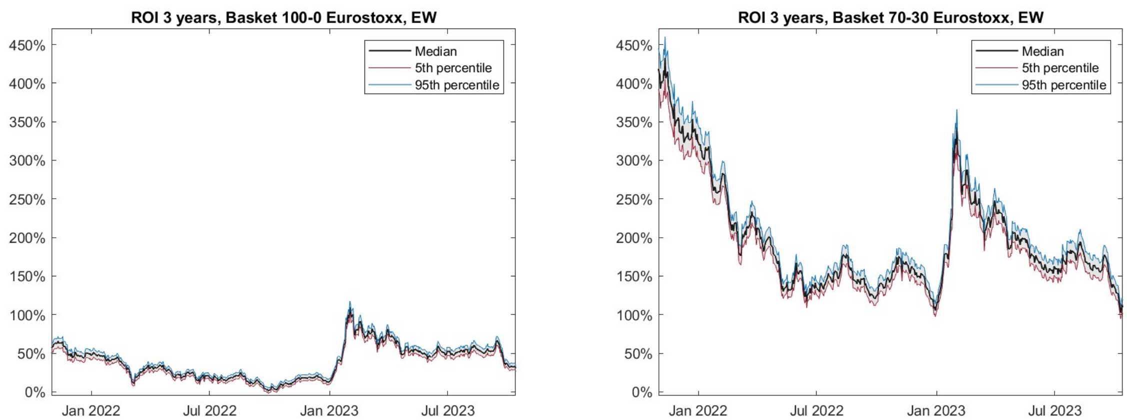


Figure S40: Three-year ROI for the EW portfolios on equity-only EuroStoxx (left) and Crypto-EuroStoxx (right).

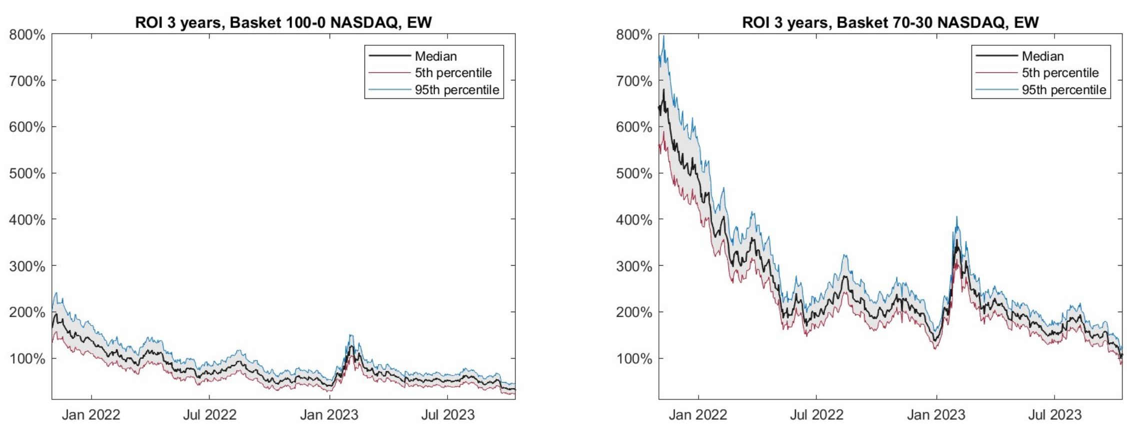


Figure S41: Three-year ROI for the EW portfolios on equity-only NASDAQ (left) and Crypto-NASDAQ (right).