Optimized Kalman Filter

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Reward on Raw Portfolio Returns

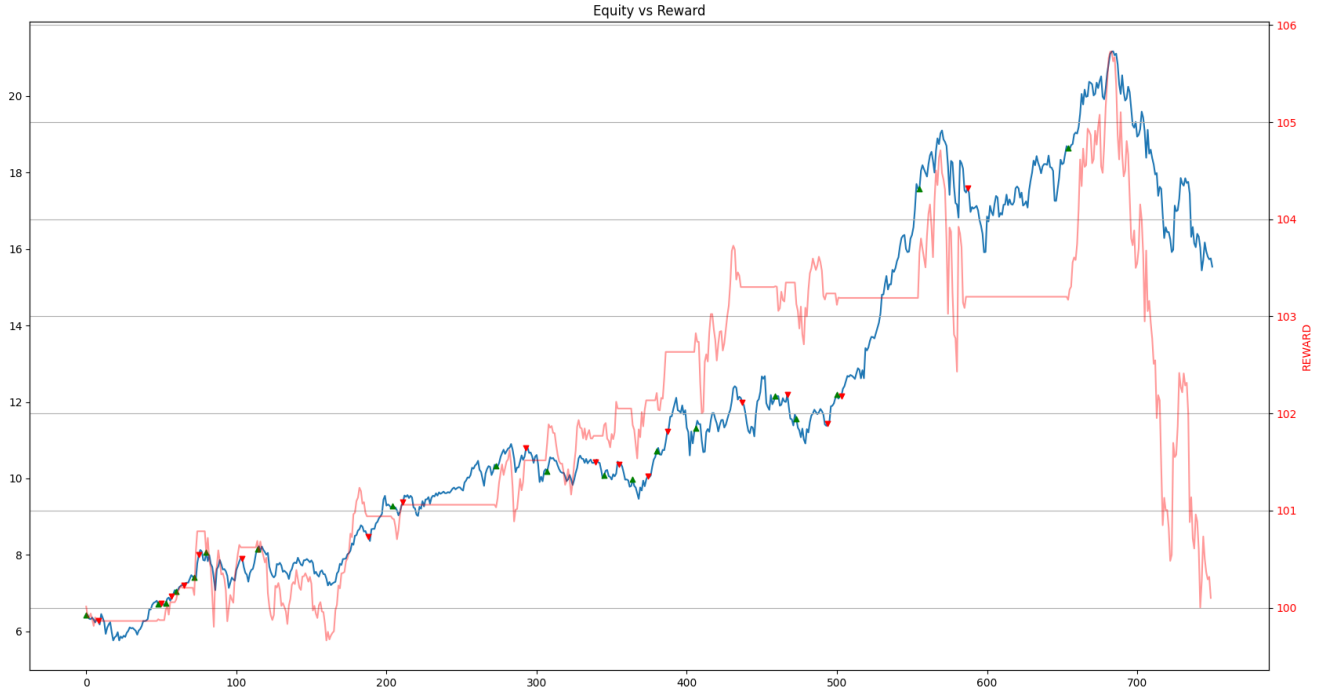
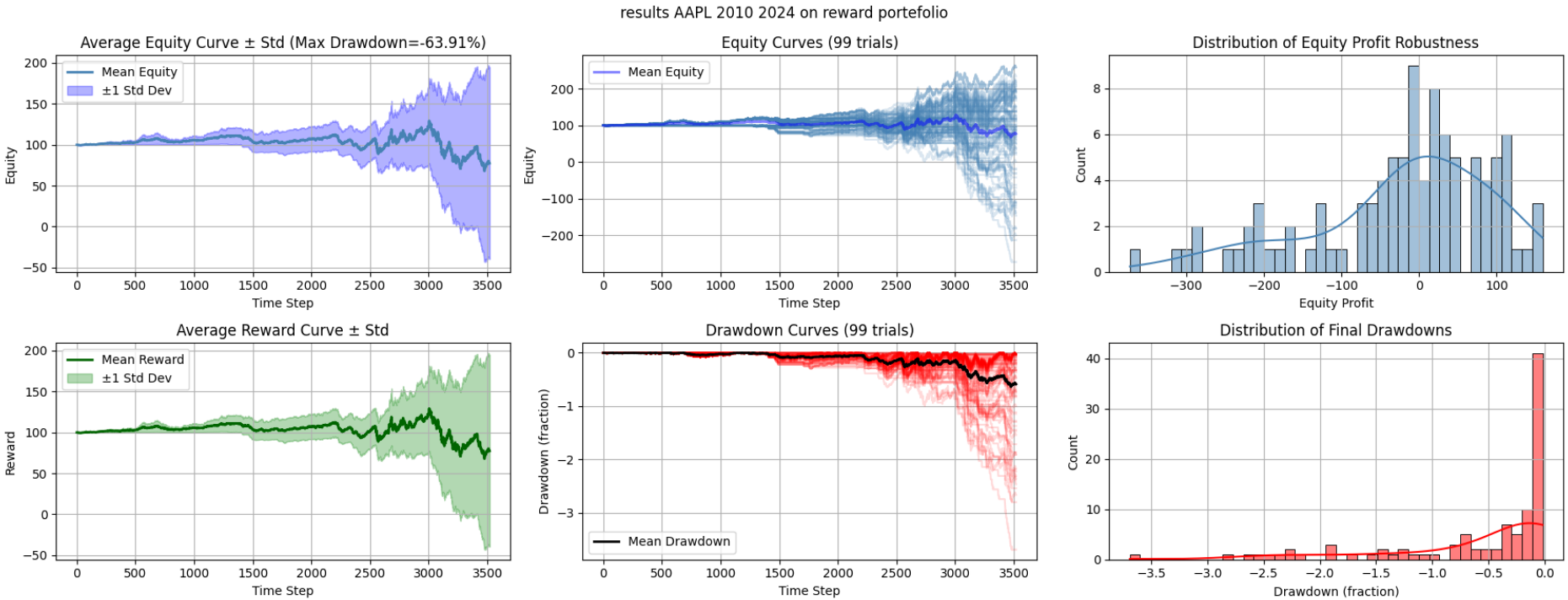


Figure 1: Reward based on the portfolio value.

$$\mathcal{R} = x_{portfolio}$$

Reward on Raw Portfolio Returns (Analysis)



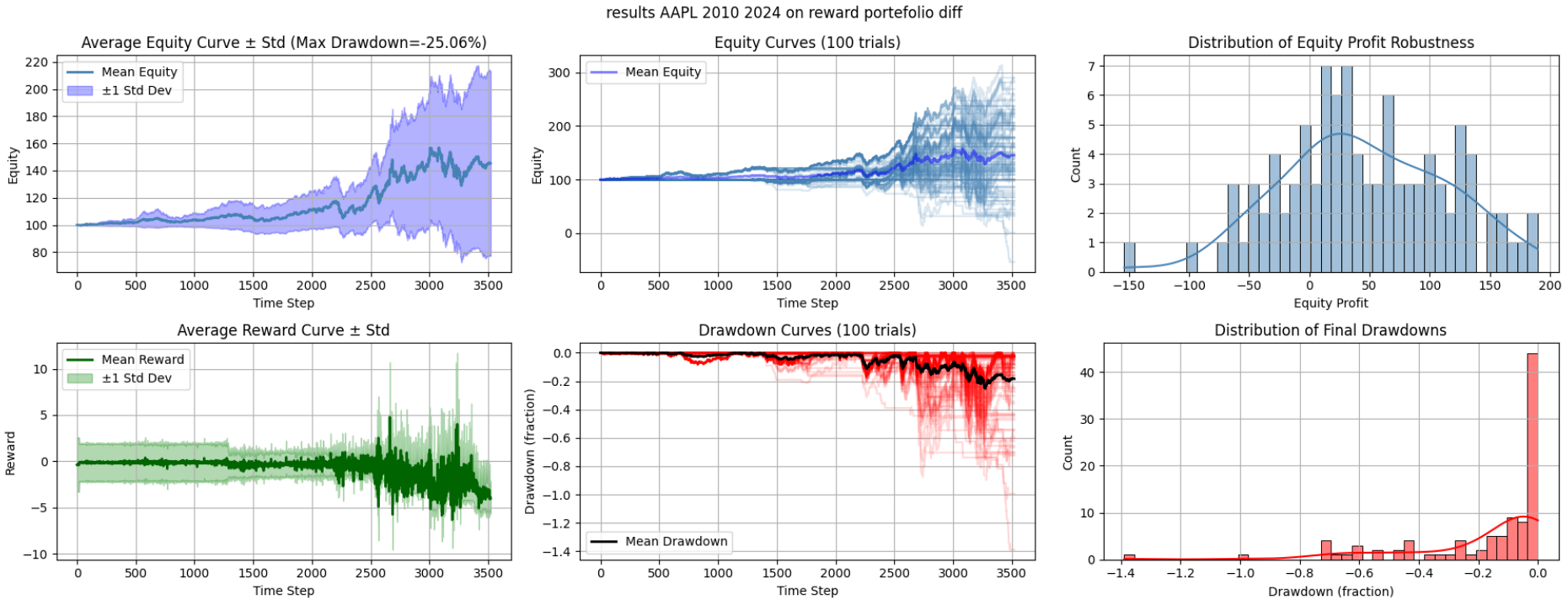
$$
\begin{aligned}
\textit{Maximum Drawdown} &: -64\ \% \\
\textit{Profit} &: 10\ \$ \\
\textit{Average Drawdown} &: -10\ \%
\end{aligned}
$$

Reward on Raw Portfolio Differences

Figure 2: Reward based on the portfolio differences

$$\mathcal{R} = x_{portfolio}[t] - x_{portfolio}[t-1]$$

Reward on Raw Portfolio Differences (Analysis)



$$
\begin{aligned}
\textit{Maximum Drawdown} &: -25\ \% \\
\textit{Profit} &: 30\ \$ \\
\textit{Average Drawdown} &: -3\ \%
\end{aligned}
$$

Reward on Raw Portfolio Slope sign

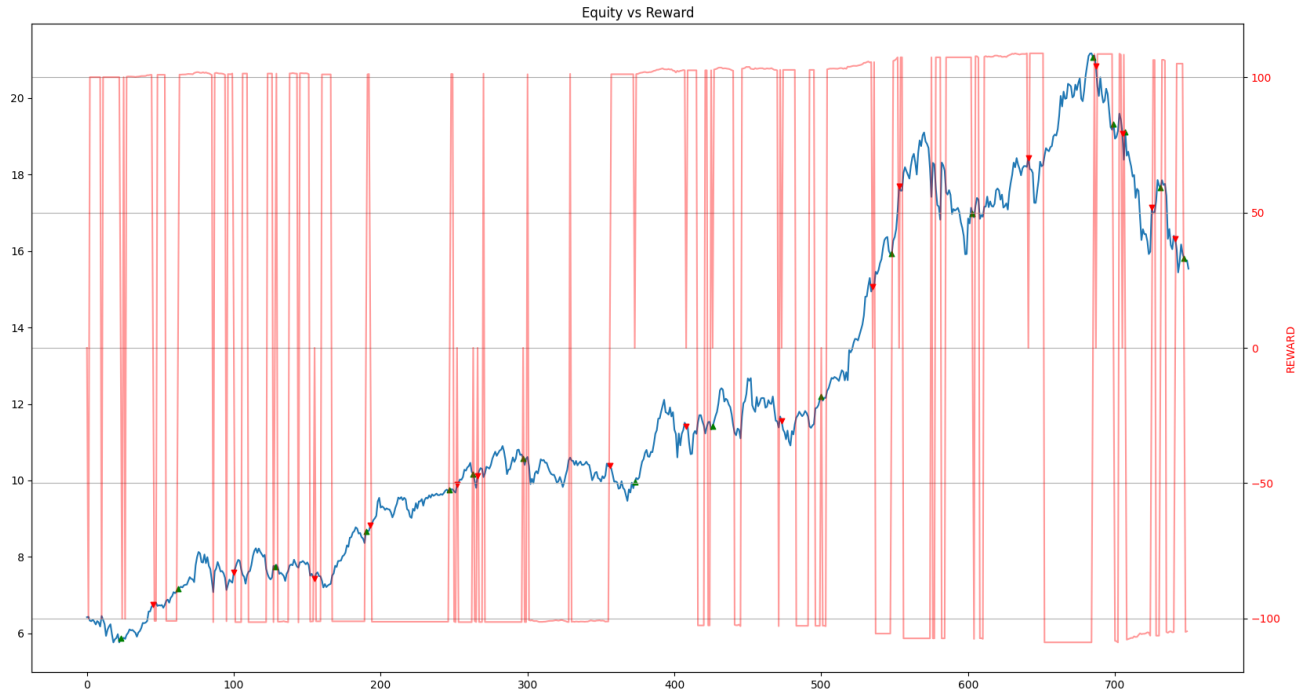
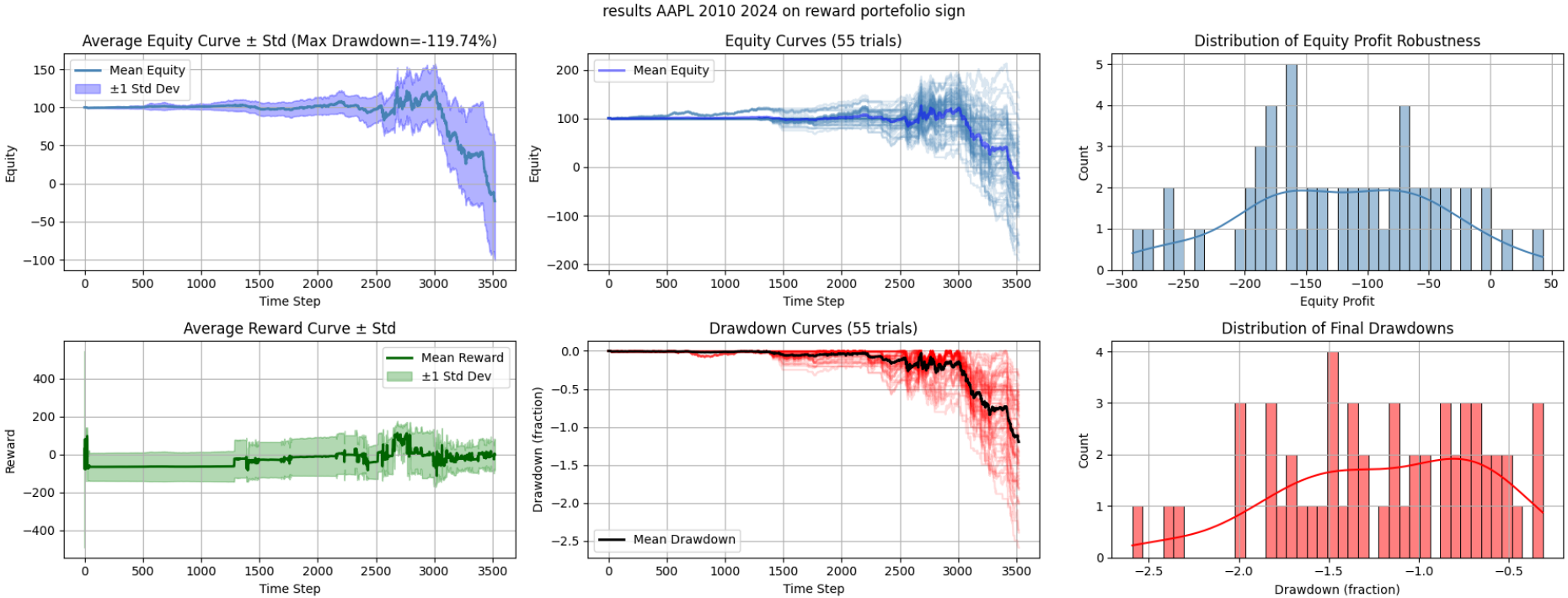


Figure 3: Reward based on the portfolio slope sign

$$\mathcal{R} = \text{sign}\left(\frac{\delta}{\delta t}\left(x_{portfolio}[t_{\text{last action}}] - x_{portefolio}[t]\right)\right) * x_{portfolio}[t]$$

Reward on Raw Portfolio Slope sign (Analysis)



$$
\begin{aligned}
\textit{Maximum Drawdown} &: -120\ \% \\
\textit{Profit} &: -110\ \$ \\
\textit{Average Drawdown} &: -60\ \%
\end{aligned}
$$

Reward on Raw Portfolio Slope

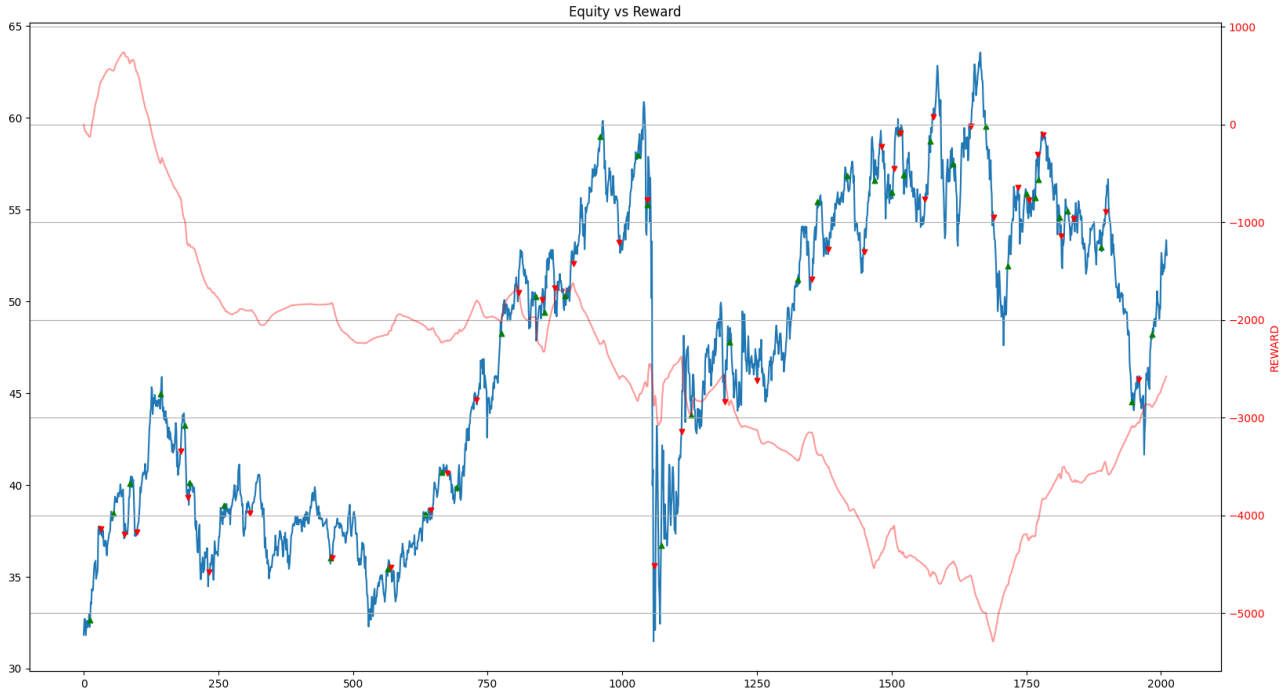
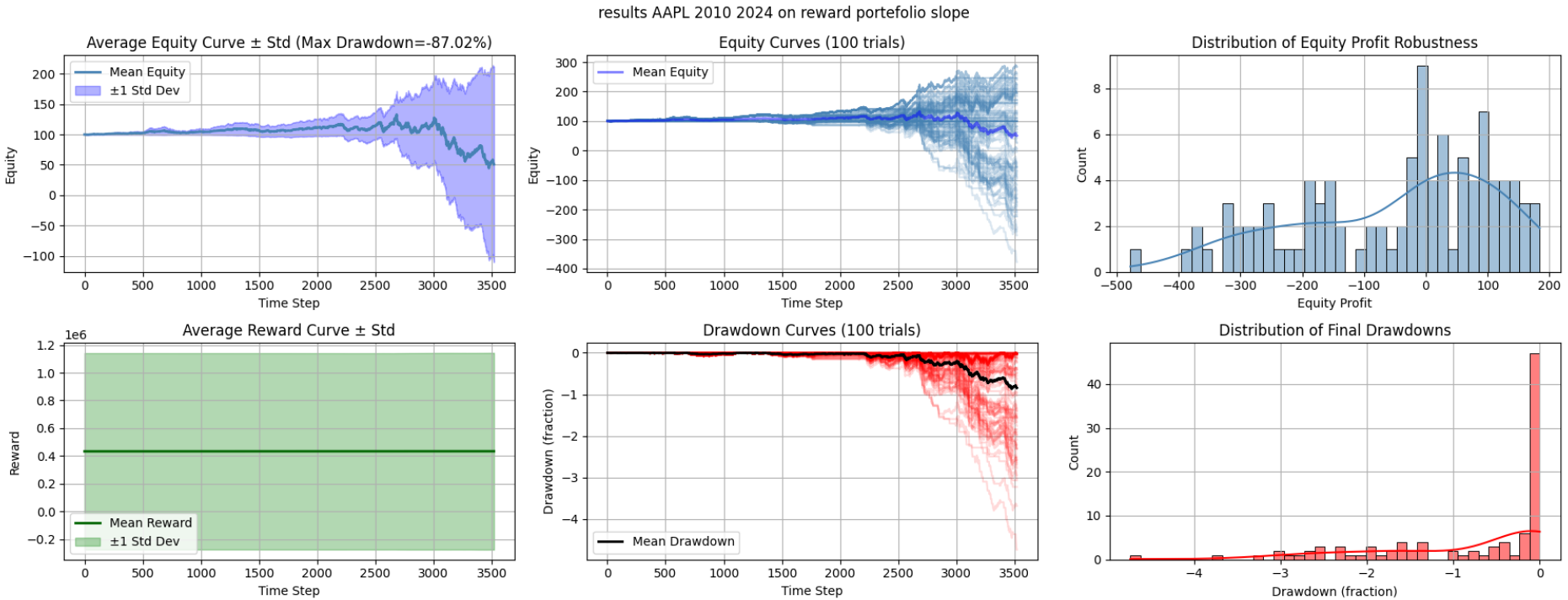


Figure 4: Reward based on the portfolio slope sign

$$\mathcal{R} = \frac{\delta}{\delta t}\left(x_{portfolio}[t_{\text{last action}}] - x_{portefolio}[t]\right) * x_{portfolio}[t]$$

Reward on Raw Portfolio Slope (Analysis)



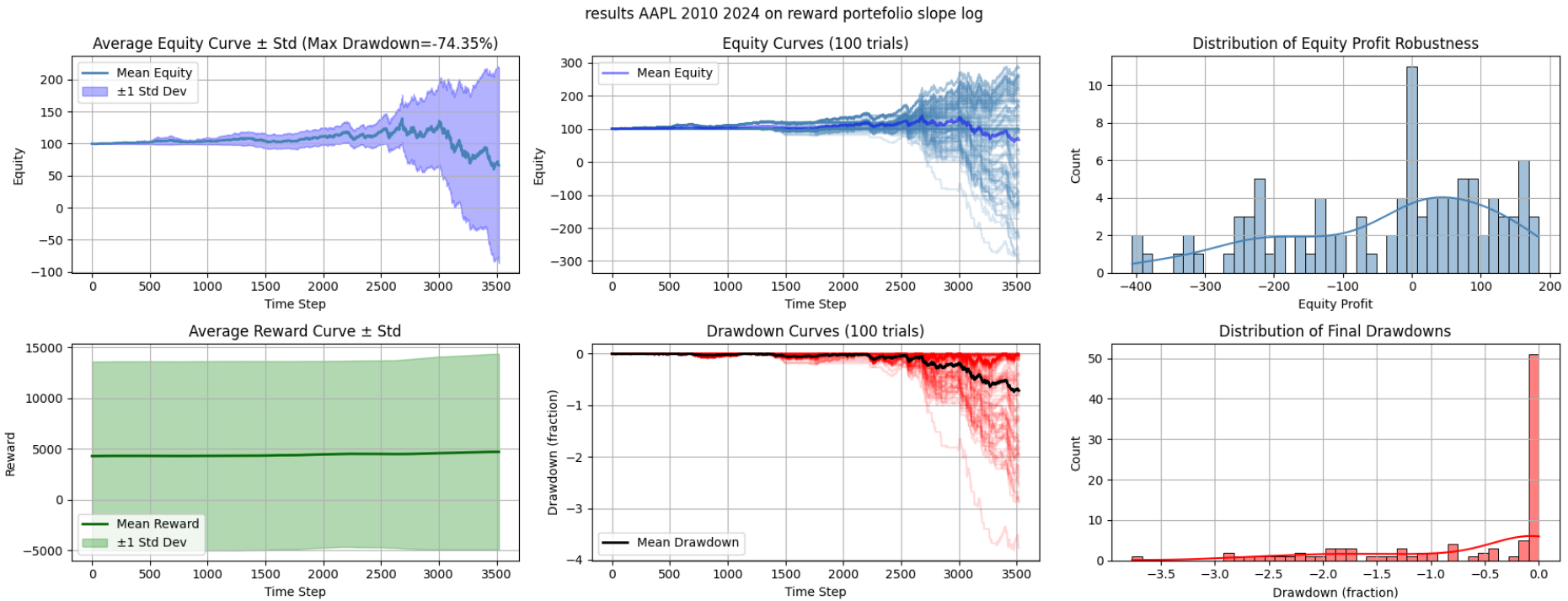
$$
\begin{aligned}
\textit{Maximum Drawdown} &: -87\ \% \\
\textit{Profit} &: 50\ \$ \\
\textit{Average Drawdown} &: -10\ \%
\end{aligned}
$$

Reward on Raw Portfolio Slope log

Figure 5: Reward based on the portfolio slope (log)

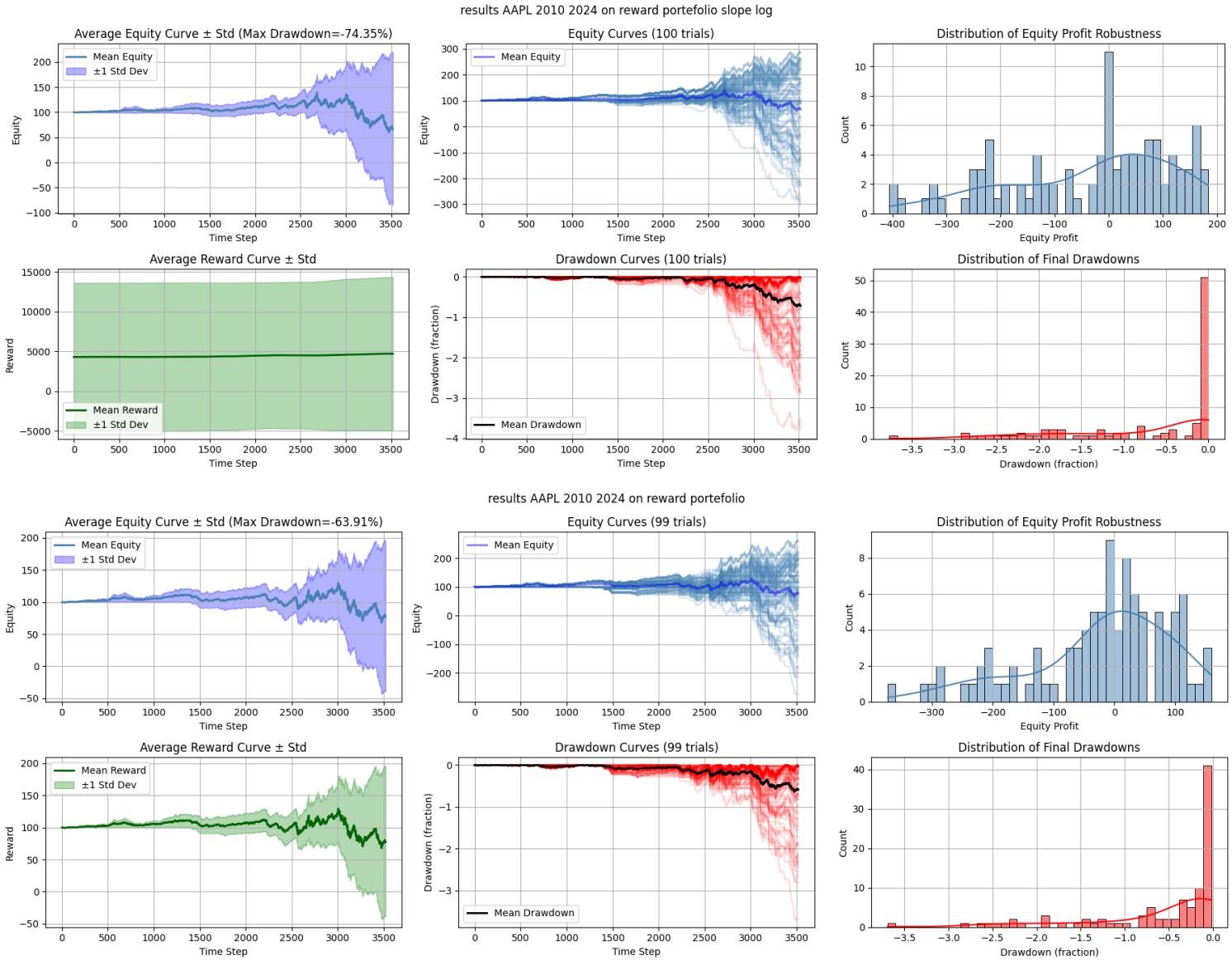
$$\mathcal{R} = \log\left(\frac{\delta}{\delta t}\left(x_{portfolio}[t_{\text{last action}}] - x_{portefolio}[t]\right) * x_{portfolio}[t]\right)$$

Reward on Raw Portfolio Slope log (Analysis)



$$
\begin{aligned}
\textit{Maximum Drawdown} &: -74\ \% \\
\textit{Profit} &: 75\ \$ \\
\textit{Average Drawdown} &: -10\ \%
\end{aligned}
$$

Conclusion


results AAPL 2010 2024 on reward portefolio slope log
Average Equity Curve ± Std (Max Drawdown=-74.35%)
Mean Equity
±1 Std Dev
Equity
Time Step
Equity Curves (100 trials)
Distribution of Equity Profit Robustness
Count
Equity Profit
Average Reward Curve ± Std
Mean Reward
Reward
Drawdown Curves (100 trials)
Mean Drawdown
Drawdown (fraction)
Distribution of Final Drawdowns
results AAPL 2010 2024 on reward portefolio
Average Equity Curve ± Std (Max Drawdown=-63.91%)
Equity Curves (99 trials)
Distribution of Equity Profit Robustness
Average Reward Curve ± Std
Drawdown Curves (99 trials)
Distribution of Final Drawdowns

Thank You