Optimized Kalman Filter

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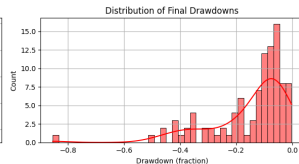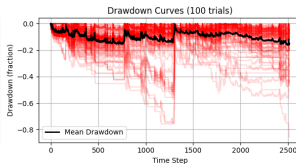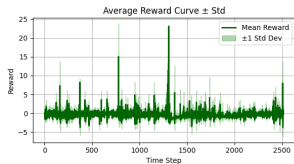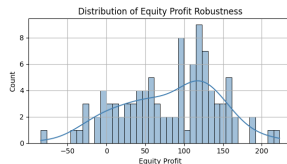
Portfolio Difference Reward

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

Figure 1: Analysis of the portfolio value

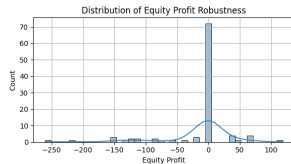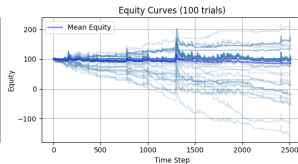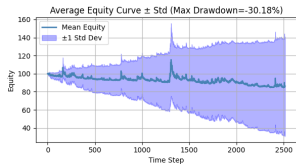**Portfolio Value and Direct Slope Reward**

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

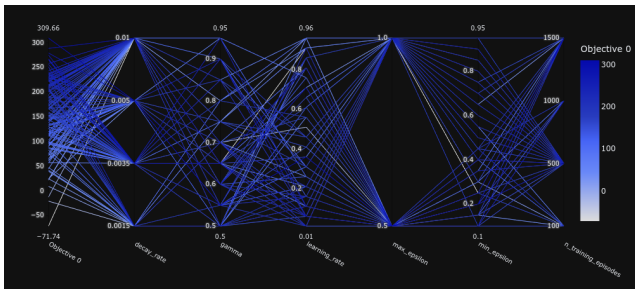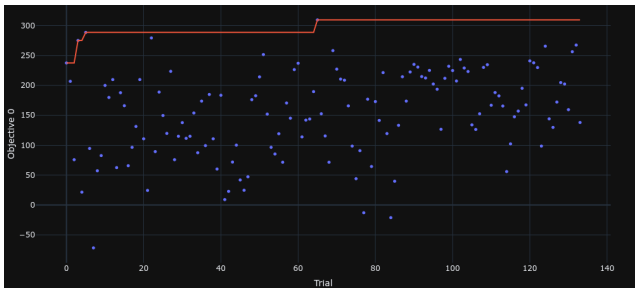databases/VIX/results ^VIX 2015 2025 on reward slope additive
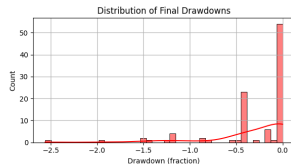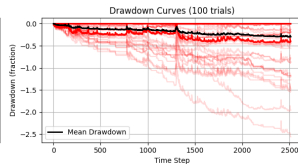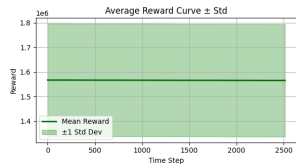
Finding the best reward for VIX

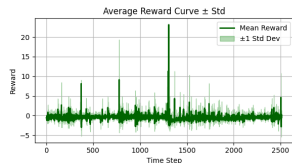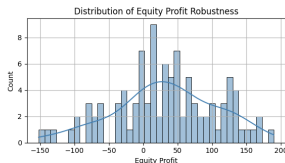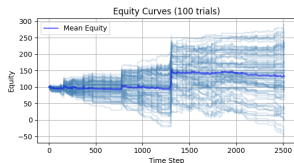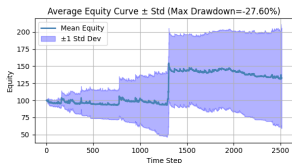|	**Diff Reward**	**Slope Reward**
Mean MMD	-36.25%	-30.18%
MMD Distribution	$\sim -9\%$	$\sim -3\%$
Best agent Profit	284%	218%
Profit Distribution	$\sim 120\%$	$\sim 10\%$

Optuna Hyperparameterization

Optuna Hyperparameterization

results ^VIX 2015 2025 on reward portfolio diff value optimized parameters
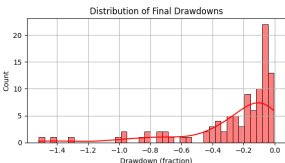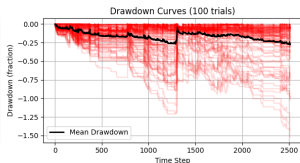
Mean MMD	-27.60%
MMD Distribution	$\sim -5\%$
Best agent Profit	290%
Profit Distribution	$\sim 40\%$
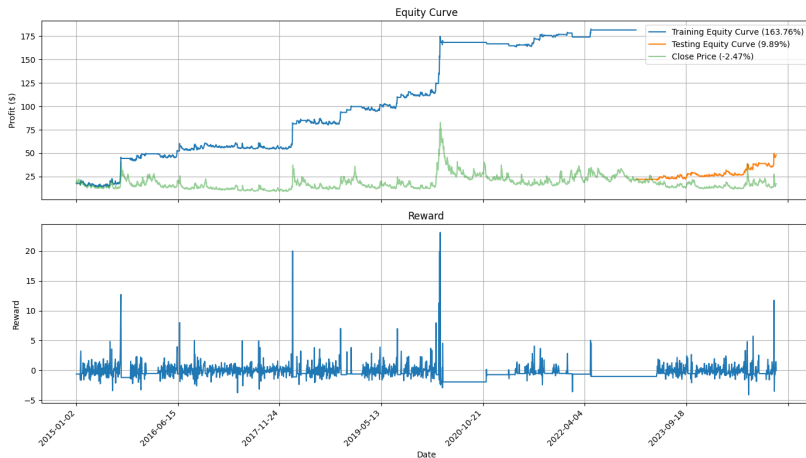
Figure 3: Best performing agent from the 100 training trials
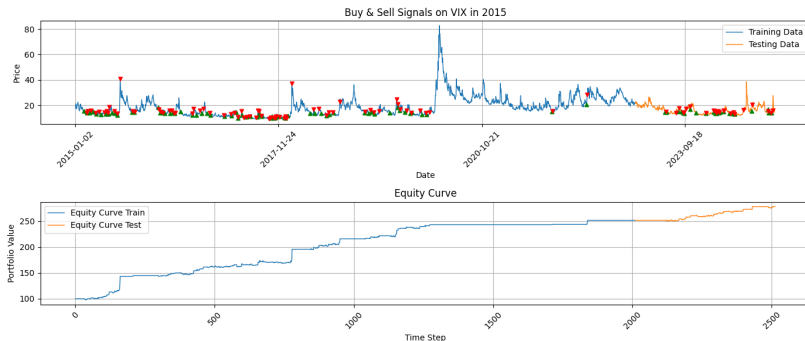
Figure 4: Deep Q-Learning Agent

Agent comparison for VIX

	Q-Learning	**Deep Q-Learning (not optimized)**
Agent Training Profit	163%	151%
Agent Testing Profit	10%	24%
Global Profit	173%	175%

Thank You