Day 10: Alpha Benchmark Report v1

Does alpha exist?

Yes, provisionally.
The RL agent exhibits positive risk-adjusted performance, with a mean Sharpe ratio of ~0.11, while both baselines show negative Sharpe ratios:

- RL Agent: Sharpe = +0.108
- Buy & Hold: Sharpe = -0.052
- Random Agent: Sharpe = -0.100

This indicates that the RL agent delivers returns that are superior on a risk-adjusted basis, rather than merely benefitting from market drift or randomness.

Against which baseline?

Against both baselines, but with different interpretations:

1. Against the Random Agent:
   The RL agent clearly outperforms randomness.
   Random trading produces negative Sharpe and modest drawdowns.
   This confirms that learning is occurring and the reward signal is meaningful.
2. Against Buy & Hold (conditional evidence):
   Buy & Hold produces near-zero returns with very low drawdown.
   The RL agent achieves substantially higher returns but at significantly higher risk.
   Alpha exists only when risk tolerance is allowed.

Thus, the RL agent demonstrates behavioral alpha, not passive exposure.

At what risk cost?

At a high drawdown cost.

- RL Agent**:** Max drawdown = 19.6%
- Buy & Hold: Max drawdown = 0.36%
- Random Agent: Max drawdown = 1.5%

The drawdown curve shows:

- A pronounced early drawdown (~5%) before recovery
- Several later drawdown spikes in the 2–3% range
- Higher volatility than both baselines

This means that the RL agent's alpha is not free and that it comes with significantly higher tail risk. The strategy would be unacceptable for risk-constrained capital without further controls.