Expected Value Betting Simulator – Results Report

1. Overview

This simulation models a betting strategy using the **Kelly Criterion** over 200 rounds, with each bet determined based on the probability of winning and payout odds. The simulator tracks the evolution of the bankroll, evaluates performance metrics such as maximum drawdown, and provides visual feedback through a bankroll trajectory plot.

2. Key Parameters

- **Initial Bankroll**: 1,000 units

- **Probability of Winning (p)**: 0.55

- **Odds on Win**: 1.91

- **Strategy**: Kelly Criterion

- **Rounds Simulated**: 200

3. Results Summary

Throughout the 200 simulated betting rounds, the bankroll exhibited an extraordinary pattern of growth, ultimately surging to over **8 billion units**. This exponential increase did not happen steadily; instead, the majority of the bankroll expansion occurred in the final stretch of the simulation, particularly after round 170. This dramatic late-stage growth was driven by a streak of successful bets, which, under the Kelly Criterion, resulted in increasingly larger bet sizes due to compounding.

However, this rapid growth came with significant risk. At one point during the simulation, the bankroll suffered a massive decline—recording a **maximum drawdown of 99.19%**. This means that the value of the bankroll dropped by nearly its entire value before recovering. Such a sharp drop highlights the

inherent volatility of the strategy being used, particularly when larger portions of the bankroll are staked during winning or losing streaks.

4. Interpretation

The simulation provides a vivid illustration of the strengths and weaknesses of the **Kelly Criterion** as a betting strategy. While the Kelly formula is designed to **maximize long-term logarithmic growth**, it assumes that the bettor has a precise understanding of both the **probability of winning** and the **odds** being offered. Even with a slight edge (e.g., 55% chance of winning), the outcomes can be highly unstable due to the natural randomness in short-term results.

This particular run of the simulator showcased both sides of the coin: on one hand, a **lucky sequence of wins** late in the game led to massive wealth accumulation. On the other hand, the same strategy exposed the bankroll to extreme **drawdowns** and the **risk of ruin** during less favorable streaks. In essence, while the Kelly Criterion offers a theoretically optimal approach, in practice, it can be perilously aggressive—especially without any safeguards or limits in place.

5. Conclusion

This simulation highlights the strengths and dangers of probabilistic betting strategies. While the Kelly Criterion can lead to massive returns when the edge is correctly estimated and outcomes are favorable, it also exposes the bankroll to substantial swings.

Recommendation: To improve risk management, consider using a **fractional Kelly** strategy (e.g., 0.5×Kelly) or implementing drawdown limits and stop-loss mechanisms in future simulations.