

Modeling Skewed losses in Forex Trading

A Game-Theoretic and Stochastic Approach Integrating Trader Behavior and Market Adaptivity

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Background

1. Introduction (or educational background)

This research is part of a PhD in Computer Science with focus on computational modeling of complex financial systems. The study integrates insights from:

- A game-theoretic model of forex trading under stochastic strategies and information asymmetry arXiv:2411.18448, and
- An intelligent market simulation that captures individual trader behavior via agent-based modeling, published in *Computing Open* DOI: 10.1142/S2972370125500059.

Together, these models offer a robust framework for understanding skewed loss distributions in real-world forex dynamics.

2. Problem statement

Real-world forex trading features:

- Stochastic trader behavior with varying risk profiles and limited information
- Information asymmetry between market participants
- A market that observes trader behavior and reacts strategically, not predictively

Conventional models often overlook:

- The emergence of loss asymmetry
- The adaptive response of the market to observable trader patterns
- The impact of strategic feedback loops between traders and market mechanisms

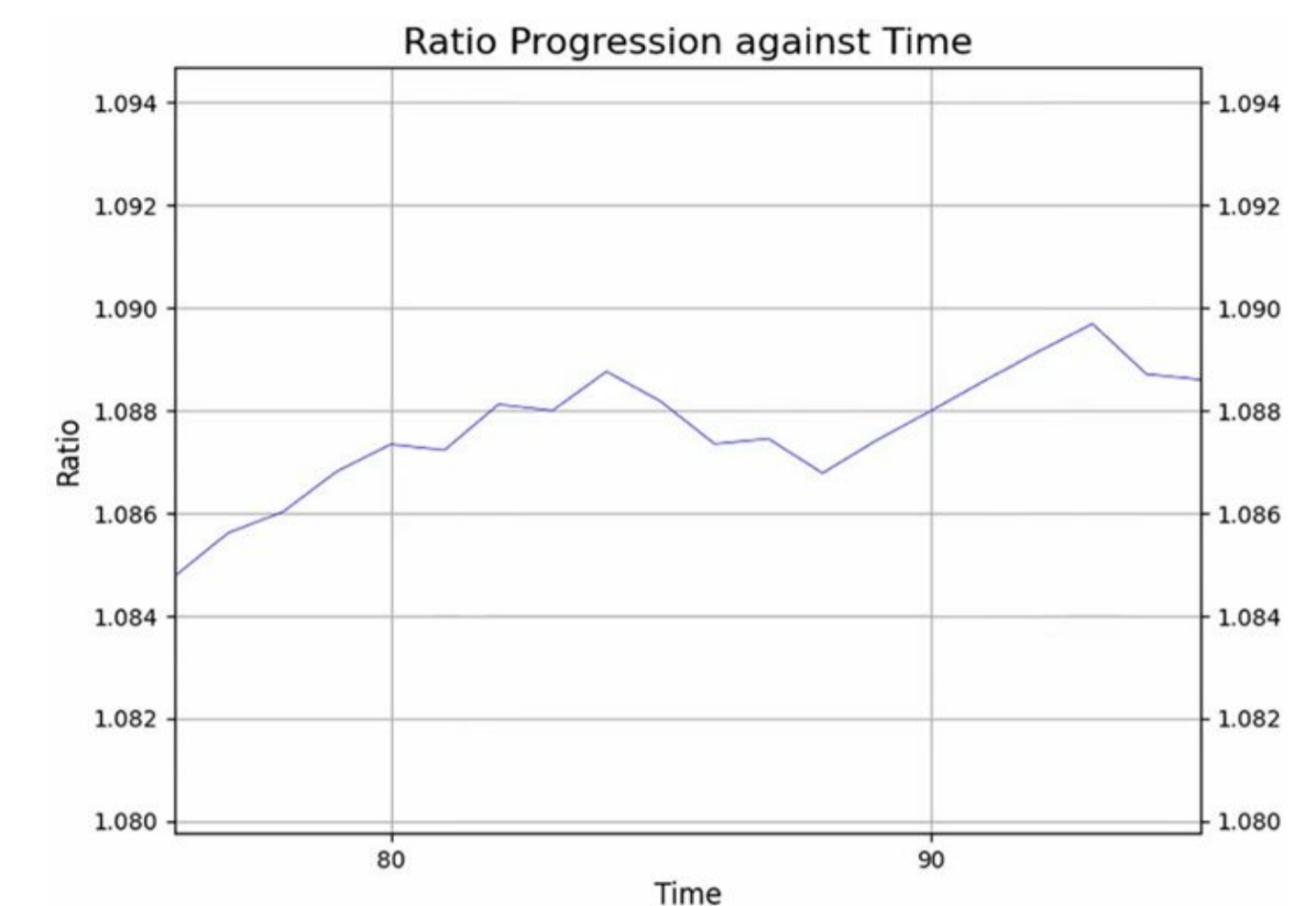


Fig. 1 Ratio(Price) again Time

Current Work

1. Objectives

- Model the emergence of skewed losses from market–trader interactions
- Integrate stochastic strategies, information asymmetry, and adaptive market feedback
- Quantify the impact of market reaction to predictable trader choices
- Explore risk mitigation through strategy diversification and learning

2. Methodology

- The system is modeled as a repeated stochastic game
- Traders act based on probabilistic rules driven by risk appetite and information fidelity
- The market agent does not predict, but observes past trader choices and reacts strategically, adjusting price accordingly
- Under information asymmetry, the market's visibility into trader behavior allows it to adaptively respond, producing non-neutral outcomes
- A skewed loss function penalizes incorrect trades more in adverse/reactive market conditions
- Simulations use synthetic agents to test outcomes across multiple market settings

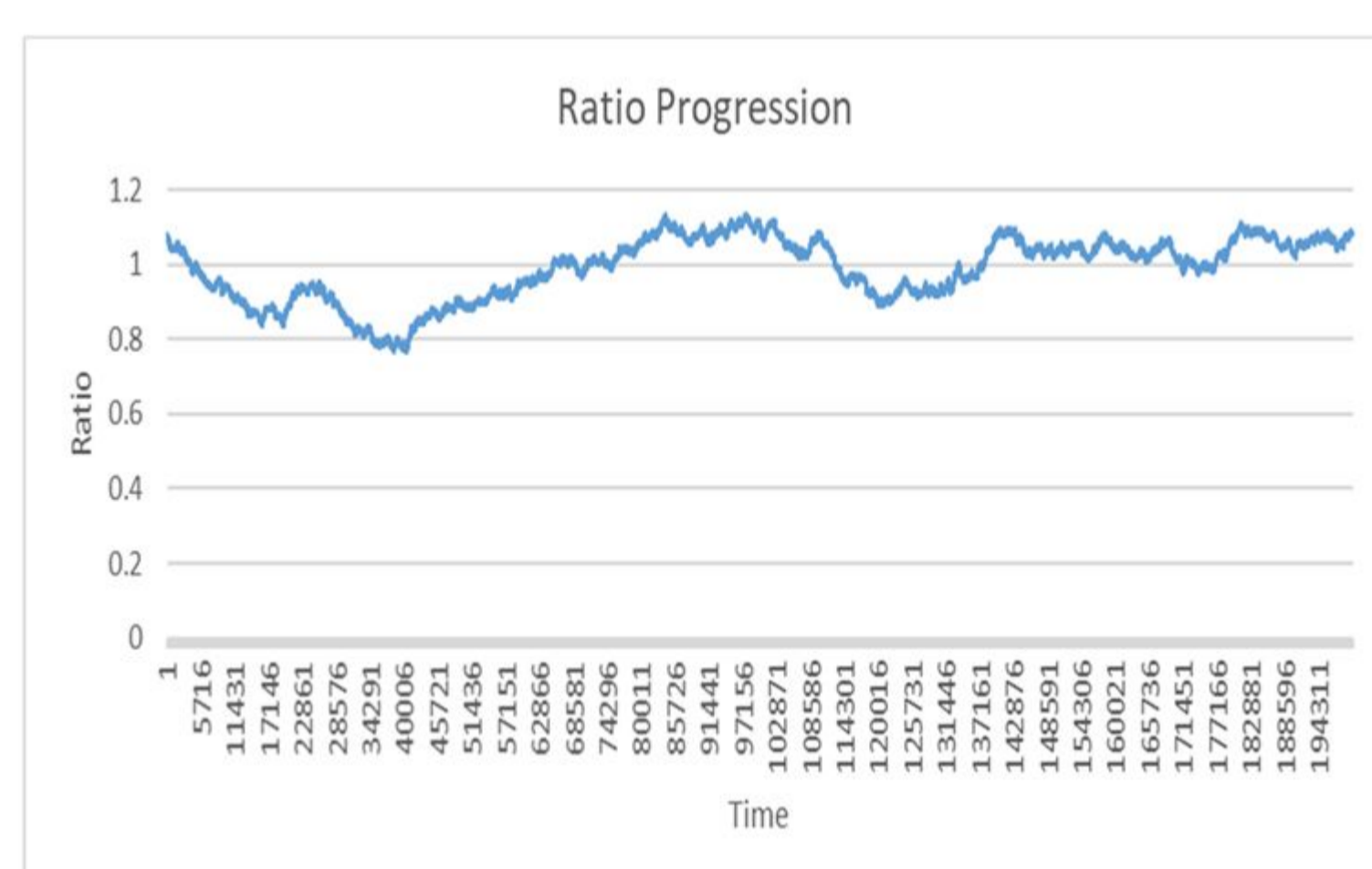
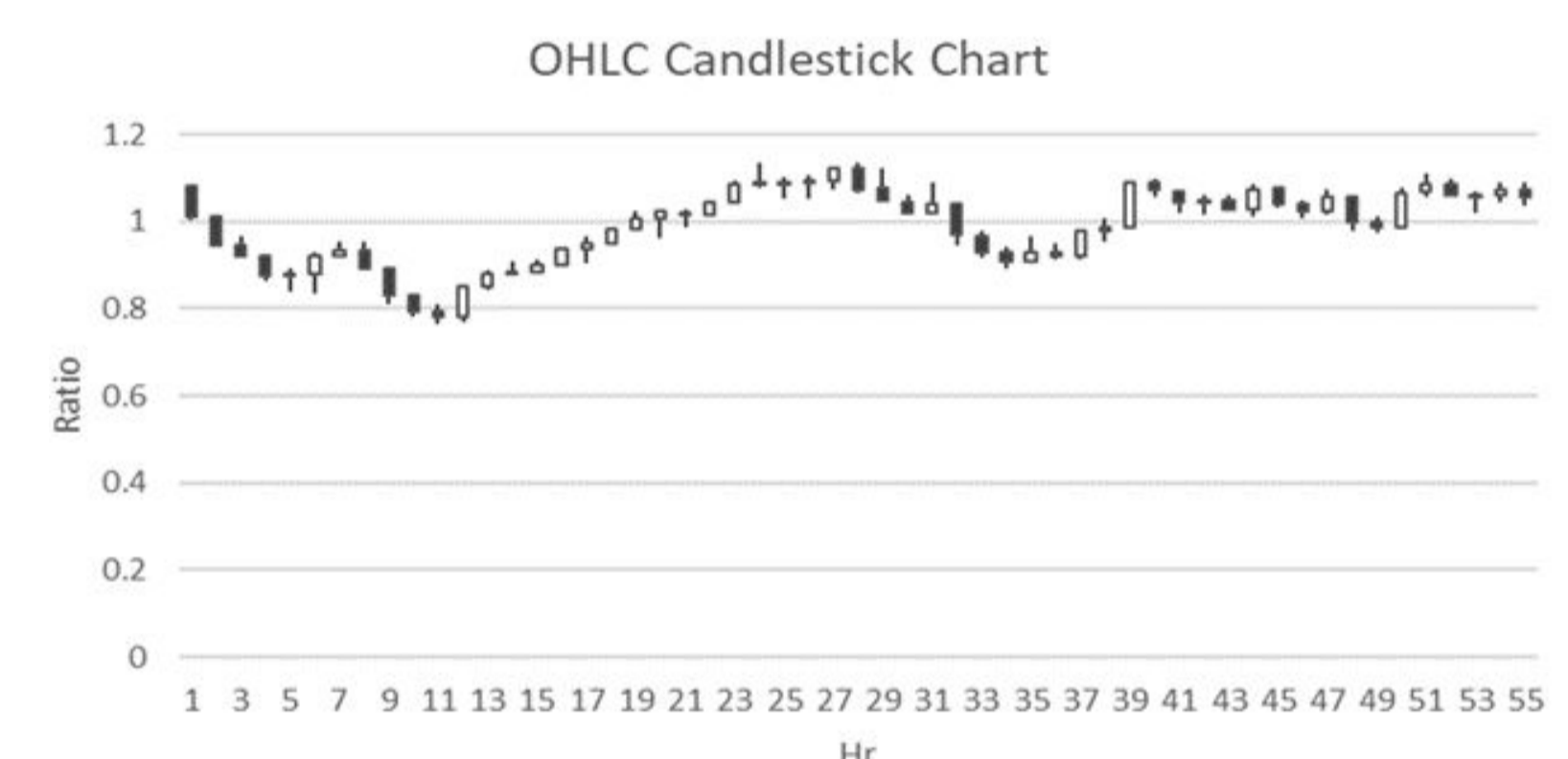


Fig. 2 Ratio/Price Progression against time

3. Results

- On aggregate, traders incur net losses, especially under information asymmetry.
- Stylized facts from real forex markets such as volatility clustering and fat-tailed returns emerge in the simulation.
- Access to more granular data reveals market microstructure effects that are lost in aggregated formats.
- Outcome distributions vary with trader heterogeneity, with more uniform trader populations experiencing sharper loss concentration.

Fig. 3 OHLC Candlestick chart.



Conclusion & Expectations

This study contributes a unified model explaining how skewed losses emerge in forex trading due to the interplay between:

- Stochastic trader behavior
- Information asymmetry
- Adaptive market reaction

It advances both theoretical and applied research from prior studies, providing a computational tool for studying risk asymmetry and strategic adaptation in complex markets.

Next steps:

- Integrating reinforcement learning agents to simulate strategy evolution
- Calibrating the model using real forex tick data
- Developing robust, asymmetry-aware trading frameworks for decision support

References & Acknowledgment (if needed)



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