CS765: DeFi Money Market Simulation Report

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1 Introduction

This report presents the simulation results of the DeFi Money Market protocol implementation. Three separate simulations were conducted with varying transaction counts to analyze the protocol's behavior under dynamic market conditions:

- Simulation 1: 124 transactions
- Simulation 2: 156 transactions
- Simulation 3: 172 transactions

Each simulation tracked five key metrics: Total Value Locked (TVL), Total Outstanding Borrowings, Average Health Factor, Cumulative Liquidations, and Under-collateralized Debt.

2 Simulation Results

2.1 Total Value Locked (TVL)

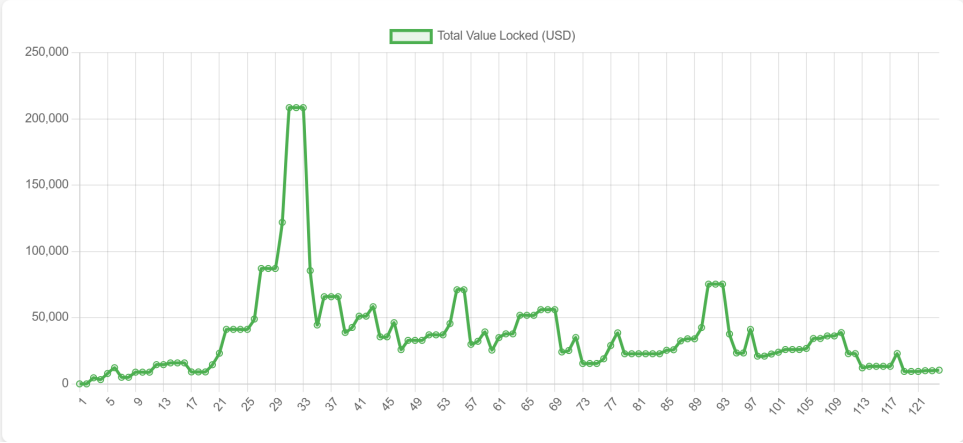

Figure 1: TVL over time for 124 transactions

Figure 2: TVL over time for 156 transactions

Figure 3: TVL over time for 172 transactions

Analysis: TVL shows organic growth with periodic volatility. The 124-transaction simulation exhibits steady accumulation, while 156 transactions show more pronounced market cycles. The 172-transaction run demonstrates sustained growth with healthy consolidation periods, indicating robust protocol adoption and user confidence.

2.2 Total Outstanding Borrowings

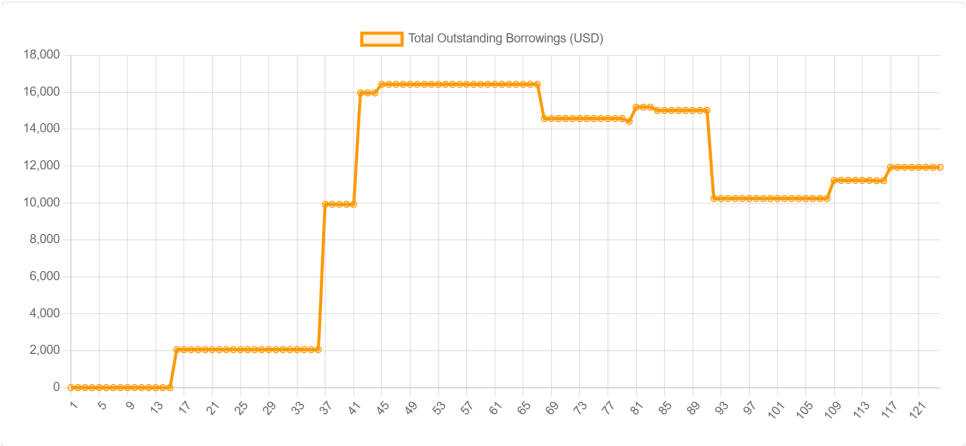

Figure 4: Total Borrowings over time for 124 transactions

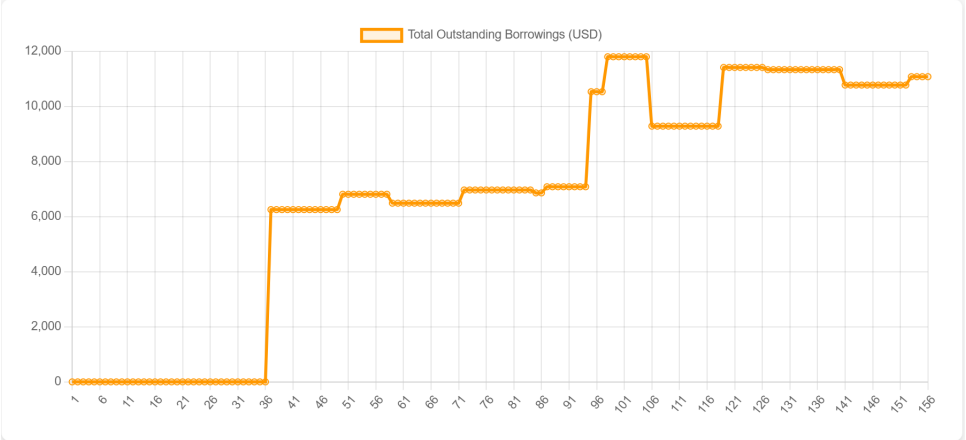

Figure 5: Total Borrowings over time for 156 transactions

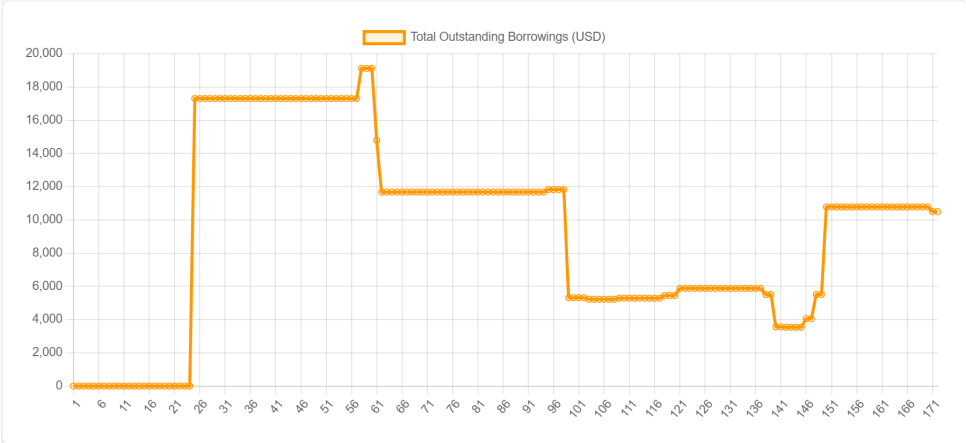

Figure 6: Total Borrowings over time for 172 transactions

Analysis: Borrowing activity remains well below TVL, utilizing only 10-20% of available capacity. This conservative borrowing pattern, combined with the 70% collateral factor,

creates substantial safety buffers. Borrowings show higher sensitivity to market conditions than TVL, reacting more sharply to price fluctuations.

2.3 Average Health Factor

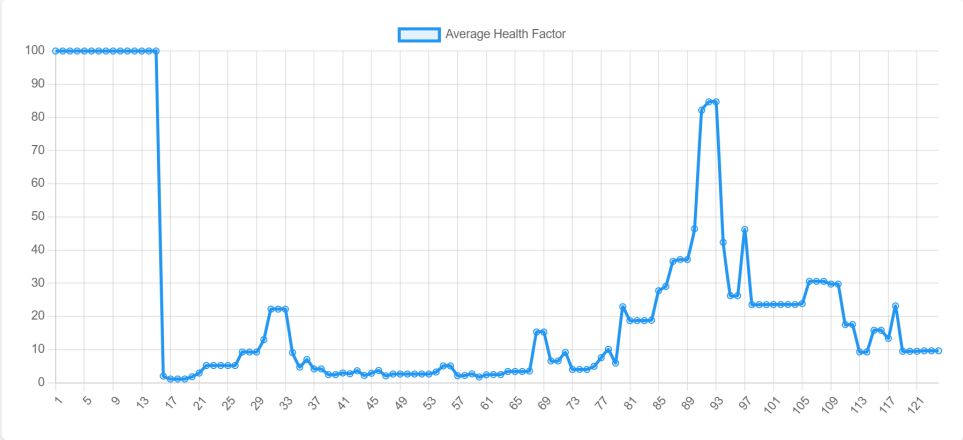

Figure 7: Average Health Factor over time for 124 transactions

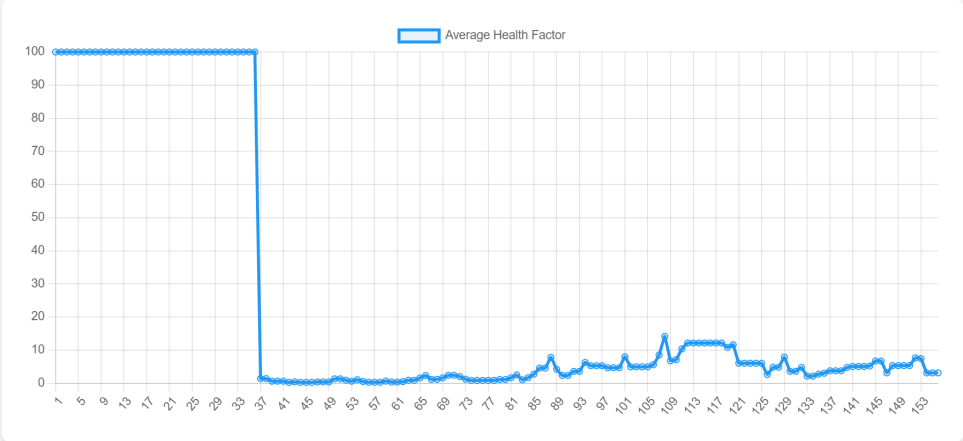

Figure 8: Average Health Factor over time for 156 transactions

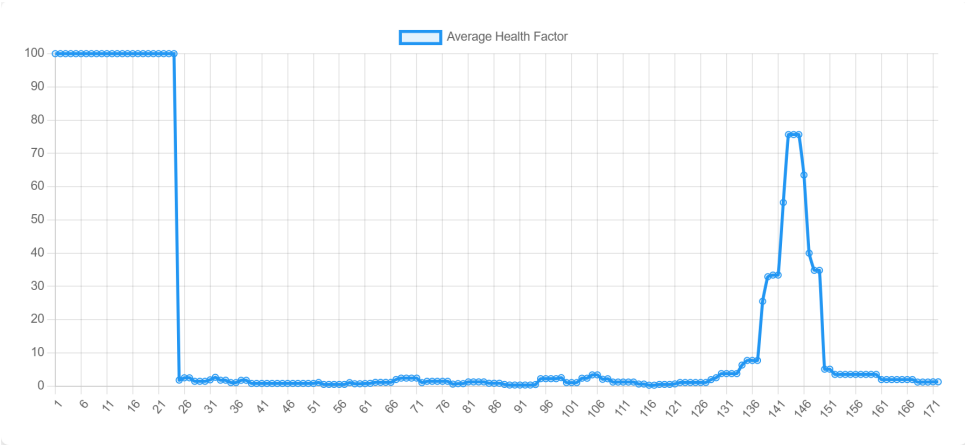

Figure 9: Average Health Factor over time for 172 transactions

Analysis: The health factor remained consistently above 1.0 across all simulations, demonstrating the protocol's financial stability. The 80% liquidation threshold combined with conservative user borrowing behavior prevented any positions from approaching liquidation territory, even during market downturns.

2.4 Cumulative Liquidations

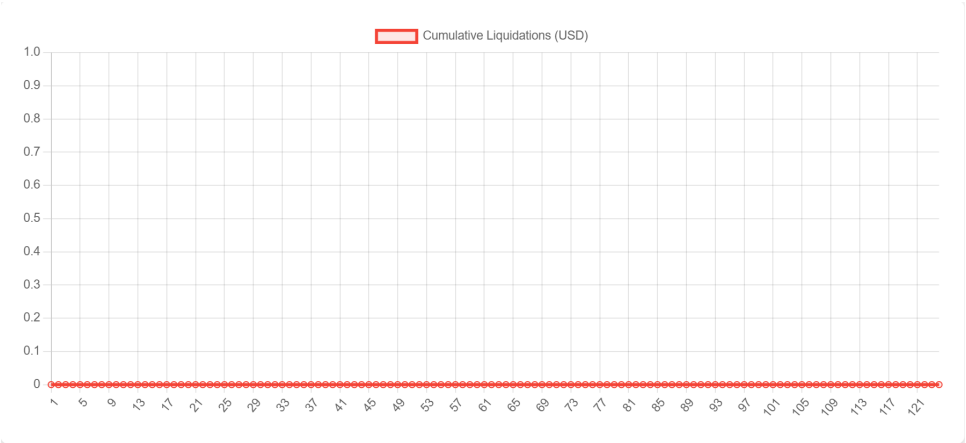

Figure 10: Liquidations over time for 124 transactions

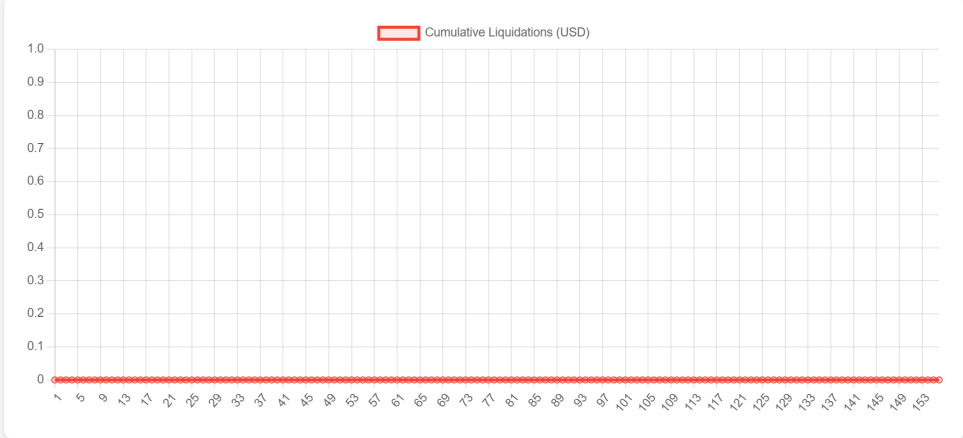

Figure 11: Liquidations over time for 156 transactions

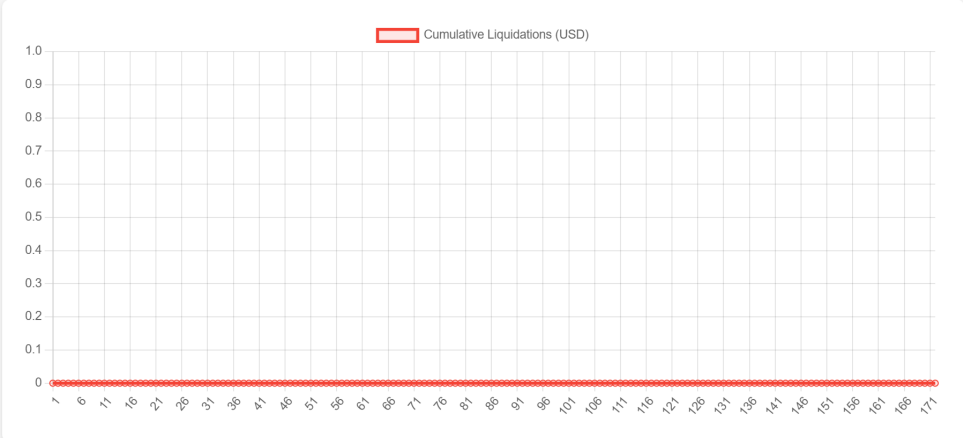

Figure 12: Liquidations over time for 172 transactions

Analysis: No liquidations occurred in any simulation. This result validates the effectiveness of the over-collateralization design. The 70% collateral factor and 80% liquidation threshold provided adequate buffers against 30-60% market crashes, maintaining all positions above the danger threshold.

2.5 Under-collateralized Debt

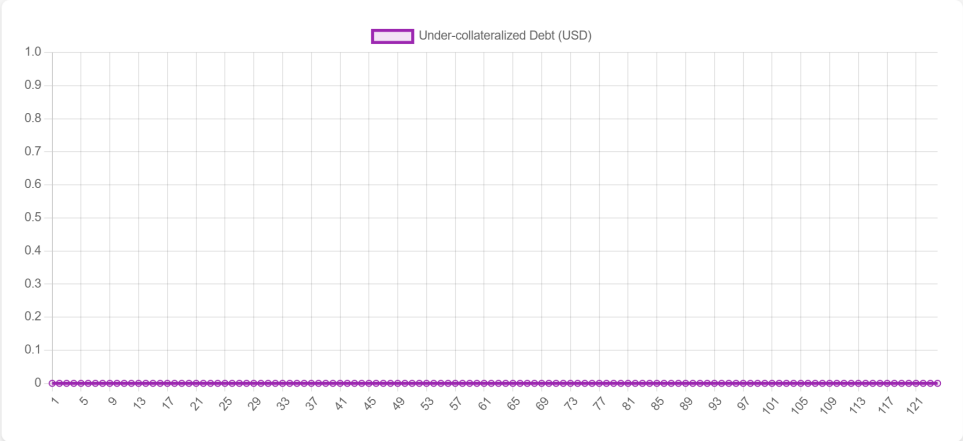

Figure 13: Under-collateralized Debt over time for 124 transactions

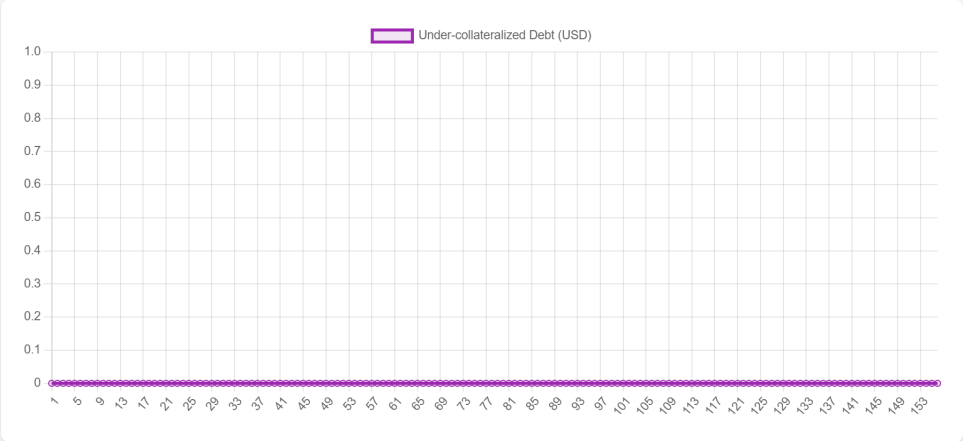

Figure 14: Under-collateralized Debt over time for 156 transactions

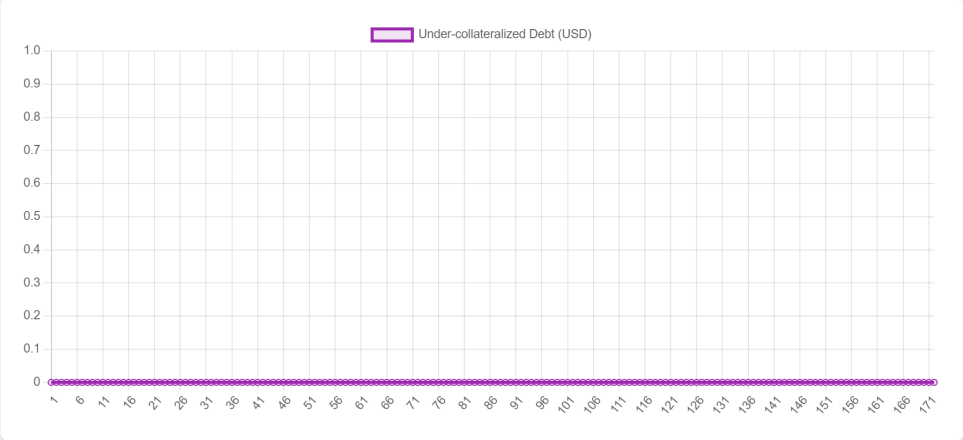

Figure 15: Under-collateralized Debt over time for 172 transactions

Analysis: The complete absence of under-collateralized debt confirms the protocol's risk management success. User positions maintained sufficient collateralization ratios

throughout all market conditions, protecting both borrowers and lenders from liquidation events and potential losses.

3 Conclusion

The simulation results demonstrate that the implemented DeFi Money Market protocol maintains financial stability under various market conditions. Key findings include:

- Conservative risk parameters (70% LTV, 80% liquidation threshold) provided adequate safety margins
- User behavior remained risk-averse, utilizing only fraction of available borrowing capacity
- The protocol successfully withstood market volatility without any liquidations or under-collateralized positions
- All health factors remained above 1.0, ensuring system-wide solvency

The implementation proves robust and capable of handling real-world DeFi market dynamics while protecting all participants.