UltraSuperMiracleSoraFinalAgentZ: An agent submitted to the ANAC 2025 SCM league

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Abstract

This paper presents the design and evaluation of UltraSuperMiracle-SoraFinalAgentZ, an autonomous agent developed for the ANAC 2025 Supply Chain Management League (SCML). The agent is designed to maximize profit by dynamically adjusting its negotiation strategy based on its role (BUYER or SELLER), inventory state, delivery timing, and historical partner reliability. When acting as a BUYER, the agent front-loads purchases in early simulation steps to reduce inventory costs and avoids late contracts with distant delivery times. As a SELLER, it avoids over-contracting to minimize shortfall penalties and gradually increases its willingness to concede price over time. Extensive experiments demonstrate that the agent consistently outperforms baseline agents in all tested configurations, achieving stable and high scores across multiple runs.

1 Introduction

To generate profits in a factory, it is important to reduce the cost of manufacturing products, improve productivity, and avoid holding excess inventory.

In the SCML world, the size of the factory and the products to be manufactured are fixed. The main cost factors are inventory maintenance costs for raw materials and penalties for shortages in product delivery. Therefore, avoiding excessive purchases and overselling, while trading only the necessary quantities at appropriate prices, leads to profitability.

For this reason, my agent, UltraSuperMiracleSoraFinalAgentZ, aims to avoid excessive purchasing and focuses on selling appropriate quantities.

2 The Design of UltraSuperMiracleSoraFinalAgentZ

UltraSuperMiracleSoraFinalAgentZ employs a complex and multifaceted strategy for decision-making in negotiations.
Specifically, it records the success and failure of past contracts with each negotiation partner and calculates a reliability score based on that history. In addition, it takes into account various factors such as current inventory levels, the appropriateness of delivery deadlines, its own production capacity, and a concession strategy that evolves over time.

From a risk management perspective, the agent places greater emphasis on avoiding shortfall penalties than on minimizing storage costs.

Furthermore, one of the most effective aspects of this agent ' s strategy is the clear differentiation in behavior depending on whether it is acting as a buyer or a seller. The agent adopts distinct and appropriate strategies for each role, which significantly contributes to its performance.

2.1 When Acting as a BUYER

UltraSuperMiracleSoraFinalAgentZ adopts a strategic approach that balances planning and flexibility when acting as a BUYER. Specifically, it actively procures raw materials during the early stages of negotiation (approximately the first 15% of the total steps), while it restricts purchasing in the later stages to avoid unnecessary inventory costs.

The main objective of this strategy is to secure enough materials early on and reduce storage cost risks by avoiding over-purchasing in the mid-to-late phases. This is implemented in both the respond() and propose() methods, where the agent checks the current step and inventory level, and rejects offers when thresholds are exceeded.

However, if the inventory is insufficient, the agent is designed to flexibly accept purchase contracts even in the later steps. This behavior is controlled in respond() through a conditional rejection logic based on both step number and current input inventory.

Additionally, strict constraints are placed on delivery timing: contracts with a delivery time more than 7 steps ahead of the current step are generally rejected. This prevents the risk of accumulating unnecessary long-term inventory. The concession strategy is also dynamic—within the is_good_price() function, the acceptability of an offer is evaluated based on progress and the relative time of the negotiator, enabling adaptive decision-making.

When selecting negotiation partners, the agent uses a trust score (calculated as success rate * price evaluation) based on past negotiation history. This score is used in the distribute_history_based() method to prioritize offers from more reliable partners.

In this way, UltraSuperMiracleSoraFinalAgentZ achieves a well-balanced BUYER strategy that dynamically optimizes quantity, timing, price, and partner selec-

tion—successfully avoiding shortfall penalties while minimizing inventory costs.

2.2 When Acting as a SELLER

When the UltraSuperMiracleSoraFinalAgentZ functions as a seller, it prioritizes avoiding shortfall penalties and making contracts that match realistic production capabilities. The agent carefully calculates the maximum number of products it can safely sell on the current day using max_safe_sales_today(), which considers inventory, expected incoming supplies, and the number of production lines.

The agent adopts a cautious sales strategy, only entering into contracts that it can realistically fulfill. This is aimed at preventing penalties for failing to deliver and avoiding excess inventory that leads to additional storage costs.

Moreover, as the simulation progresses, the agent gradually becomes more willing to make concessions on price. In the early steps, it attempts to sell at favorable prices, but in the later steps, it shifts toward a sell-out strategy—even accepting lower prices to clear remaining inventory before the end of the simulation. This dynamic concession logic is implemented in the good_offer() method, which increases the concession rate based on the step progress.

During contract evaluation (in respond()), the agent also considers multiple factors such as delivery time, offered quantity, current inventory, production capabilities, and trust scores of negotiation partners. In particular, if the step number is near the end of the simulation, the agent is designed to be more flexible in order to secure as many contracts as possible and avoid surplus inventory.

This SELLER strategy ensures a balance between profit maximization and risk management, especially in avoiding costly penalties and wasted resources.

3 Evaluation

I conducted several experiments to evaluate the agent using the following settings. The results are presented below.

- `n_step = 30`
- `n_processes = 3`
- `n_configs = 4`
- `n_repetitions = 3`

In all cases, MyAgent achieved a score of 1.0 or higher, consistently generating profit. Moreover, its score was higher than those of the other two agents in every experiment.

Table 1: Experiment Results

Experiments	MyAgent	SyncRandomStdAgent	RandomOneShotAgent
1	1.004	0.792	-0.071
2	1.003	0.937	0.438
3	1.139	0.937	0.097
4	1.008	0.783	0.221
5	1.232	0.843	-0.189
Average	1.077	0.859	0.099

Conclusions

In this study, we described the design and implementation of the agent "UltraSuperMiracleSoraFinalAgentZ," which aims to maximize profit under the standard SCML environment. The agent adopts a strategy that dynamically considers multiple factors such as partner reliability, inventory status, delivery time, and price, and flexibly changes its negotiation approach depending on whether it is acting as a BUYER or SELLER.

As a result of the experiments, the proposed agent consistently achieved higher scores than other agents in all configurations and was confirmed to stably secure profits.