

SupmerkosV3: Ledger-Based Portfolio Selection for the SCML 2026 Standard Track

Kosuke Nakata
Tokyo University of Agriculture and Technology

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Abstract

This paper presents SupmerkosV3, a negotiation agent developed for the Standard Track of the ANAC 2026 Supply Chain Management League (SCML). Unlike OneShot agents, a Standard-track agent must reason about multiple production steps, inventory, signed contracts, and future delivery risk. SupmerkosV3 uses a compact ledger of signed and expected future contracts and evaluates simultaneous offers as a portfolio rather than as independent bilateral deals. The agent searches over subsets of current-step offers using the official utility function when available, adds a quantity-fit term to reduce shortage and surplus risk, and generates counteroffers through conservative price schedules. Future contracts are handled cautiously: they are accepted only when close in time, profitable, and compatible with the agent’s current ledger. A local evaluation against standard baselines and ANAC finalist and winner agents suggests that SupmerkosV3 is competitive with strong heuristic agents, ranking second behind the ANAC 2025 Standard winner AS0 in the small preliminary experiment reported here.

1 Introduction

SCML models a supply chain in which autonomous factory agents negotiate procurement and sales contracts while managing production capacity and inventory. In the Standard Track, contracts may refer to multiple future production steps. This makes the problem different from a purely myopic price negotiation task: an apparently profitable purchase can create excess inventory, while an attractive sales contract can become dangerous if the agent cannot secure enough inputs before delivery.

SupmerkosV3 was designed as a conservative ledger-based agent. Its objective is not to maximize the value of a single negotiation in isolation, but to keep the accepted set of contracts feasible under production-line and inventory constraints. The design has three main goals:

1. avoid large losses caused by shortage, disposal, or infeasible future commitments;
2. accept combinations of simultaneous offers that fit the current supply and sales needs;
3. remain simple and robust enough to run reliably in the online tournament environment.

2 Design of SupmerkosV3

2.1 Ledger Representation

SupmerkosV3 keeps a lightweight internal ledger. For each production step it tracks signed buys, signed sells, tentative future buys, and tentative future sells. The ledger is updated after successful negotiations and cleaned at the beginning of each step. This enables the agent to compute the remaining room for additional purchases or sales:

$$\text{room}_{d,t} = \max(0, \text{target}_{d,t} - \text{planned}_{d,t}),$$

where d is the trading direction and t is the delivery time. The planned quantity includes already known contracts in the same direction and time. This rule is deliberately conservative: it prevents the agent from accepting many individually profitable offers that jointly exceed production or inventory capacity.

2.2 Round-Level Decision Procedure

SupmerkosV3 treats simultaneous offers as a portfolio. Current-step offers are collected and all small subsets are enumerated. Each subset is evaluated using the official utility function when possible. A quantity-fit bonus is then added to reward bundles that cover the current need and penalize excess.

Algorithm 1 Round-level response procedure of SupmerkosV3

Require: Current offers O , current step s , ledger L

Ensure: A response for every active negotiation partner

- 1: Split O into current-step offers and future offers
 - 2: Enumerate small subsets of current-step offers
 - 3: **for** each subset S **do**
 - 4: Evaluate official utility of S
 - 5: Add quantity-fit bonus for supply and sales needs
 - 6: **end for**
 - 7: Accept the best current-step subset if it improves the baseline
 - 8: **for** each future offer in score order **do**
 - 9: **if** it is profitable, close in time, and ledger-compatible **then**
 - 10: Accept the offer
 - 11: **else**
 - 12: Send a conservative counteroffer or end negotiation
 - 13: **end if**
 - 14: **end for**
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2.3 Offer Scoring

For an offer with quantity q , time t , and unit price p , SupmerkosV3 estimates a direction-dependent unit margin. For purchases, the margin compares the expected value of an input against the proposed price. For sales, it compares the proposed price against the estimated output cost. The offer score combines margin, quantity, timing, reliability, and risk:

$$\text{score}(o) = q \cdot \text{unitMargin}(o) + \text{trustBonus} + \text{timingBonus} - \text{overflowRisk} - \text{futureRisk}.$$

The score is not intended to be a complete model of the SCML world. It is a small heuristic that filters obviously dangerous offers and ranks acceptable ones. Offers that exceed the remaining room at a delivery time are penalized heavily. Future offers receive additional risk penalties unless they are near-term and balanced with expected production and sales.

2.4 Current-Step Portfolio Selection

The most important component is current-step subset selection. A purely independent acceptance policy can accept too many small offers or reject a combination that would be valuable jointly. SupmerkosV3 therefore enumerates subsets after truncating the candidate list to keep computation bounded. The selected subset maximizes utility plus a need-fit term:

$$J(S) = U(S) + \lambda B(S),$$

where $U(S)$ is the official utility of the selected bundle and $B(S)$ is a hand-designed bonus for covering current supply and sales needs without large surplus. This portfolio view is central to reducing low-score worlds: the agent prefers coherent bundles over isolated bargains.

2.5 Future Contracts and Safety

SupmerkosV3 is intentionally cautious with future contracts. It proposes mostly current-step contracts and accepts future contracts only if they pass a strict feasibility test. A future purchase must be useful for covering expected sales or production, and a future sale must be compatible with available inventory, incoming supplies, and production capacity. This cautious design may sacrifice upside in some worlds, but it reduces exposure to unfulfilled contracts and inventory accidents.

3 Evaluation

3.1 Experimental Setup

We evaluated SupmerkosV3 using the SCML tournament framework. The comparison lineup consisted of SupmerkosV3, SCML standard baselines, the ANAC 2025 Standard winner AS0, and the ANAC 2024 Standard finalist agents AX, CautiousStdAgent, and DogAgent. The official SCML 2024 page lists AX, CautiousStdAgent, DogAgent, PenguinAgent, and QuickDecisionAgent as Standard-track finalists. The SCML agents package lists AS0 as the 2025 Standard-track winner.

Table 1: Experimental setup

Item	Value
Production steps	10
Base configurations	1
Maximum worlds per configuration	3
Compared agent types	8
Score records	8

The compared agents were SupmerkosV3, AS0, AX, CautiousStdAgent, DogAgent, GreedyStdAgent, SingleAgreementAspirationAgent, and SyncRandomStdAgent. The experiment is a local preliminary evaluation and does not represent an official ANAC ranking.

3.2 Results

Table 2: Local evaluation results

Rank	Agent	Mean score
1	AS0	1.02708
2	SupmerkosV3	1.01012
3	GreedyStdAgent	0.97462
4	AX	0.96551
5	DogAgent	0.91489
6	CautiousStdAgent	0.90668
7	SyncRandomStdAgent	0.85255
8	SingleAgreementAspirationAgent	0.79440

SupmerkosV3 ranked second in this local experiment with a mean score of 1.01012. It outperformed the included standard baselines and the three ANAC 2024 finalist agents included in the lineup, but it did not outperform AS0 in this run. The result supports the usefulness of ledger-based portfolio selection, while also indicating that stronger future-contract planning and signing-time selection remain promising directions.

4 Discussion

The experiment suggests that robust quantity management is at least as important as price aggressiveness. Greedy or aspiration-based policies can perform well in simple cases, but they may accept contracts that are poor in combination. SupmerkosV3 addresses this by evaluating bundles of simultaneous offers and by using a room calculation based on its ledger.

The main limitation of SupmerkosV3 is its conservative treatment of future contracts. This is safe, but Standard-track tournaments often reward agents that use near-term future contracts to smooth production and sales. Another limitation is the lack of a full signing-time portfolio optimizer. These limitations point to natural directions for future improvements.

5 Conclusion

SupmerkosV3 is a compact Standard-track agent based on ledger-aware offer evaluation and current-step portfolio selection. It avoids unconditional acceptance, penalizes overcommitment, and uses conservative future-contract filters. In the local preliminary evaluation reported here, it ranked second behind AS0 and ahead of the included standard baselines and ANAC 2024 Standard finalist agents. Future work should improve signing-time selection and short-horizon future planning without losing the low-risk behavior that makes the current design robust.

References

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