Adaptive Multi-Strategy Market-Making Agent For Volatile Markets

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Publications

Architecture of Automated Crypto-Finance Agent
https://ieeexplore.ieee.org/document/9686345
https://arxiv.org/abs/2107.07769

Adaptive Multi-strategy Market Making Agent
https://link.springer.com/chapter/10.1007/978-3-030-93758-4_21

Adaptive Multi-Strategy Market-Making Agent For Volatile Markets
https://arxiv.org/abs/2204.13265

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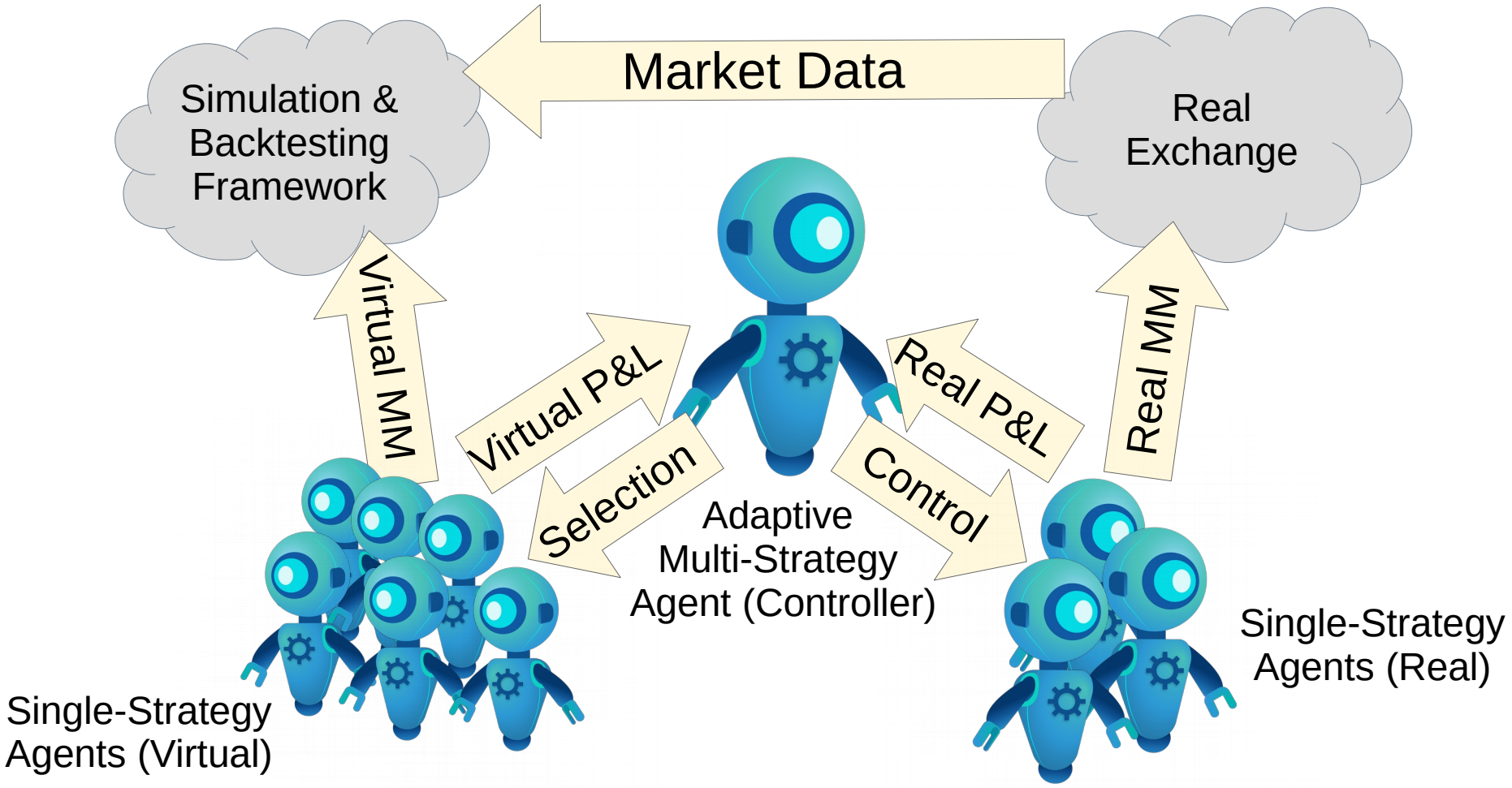
Market-Making Architecture



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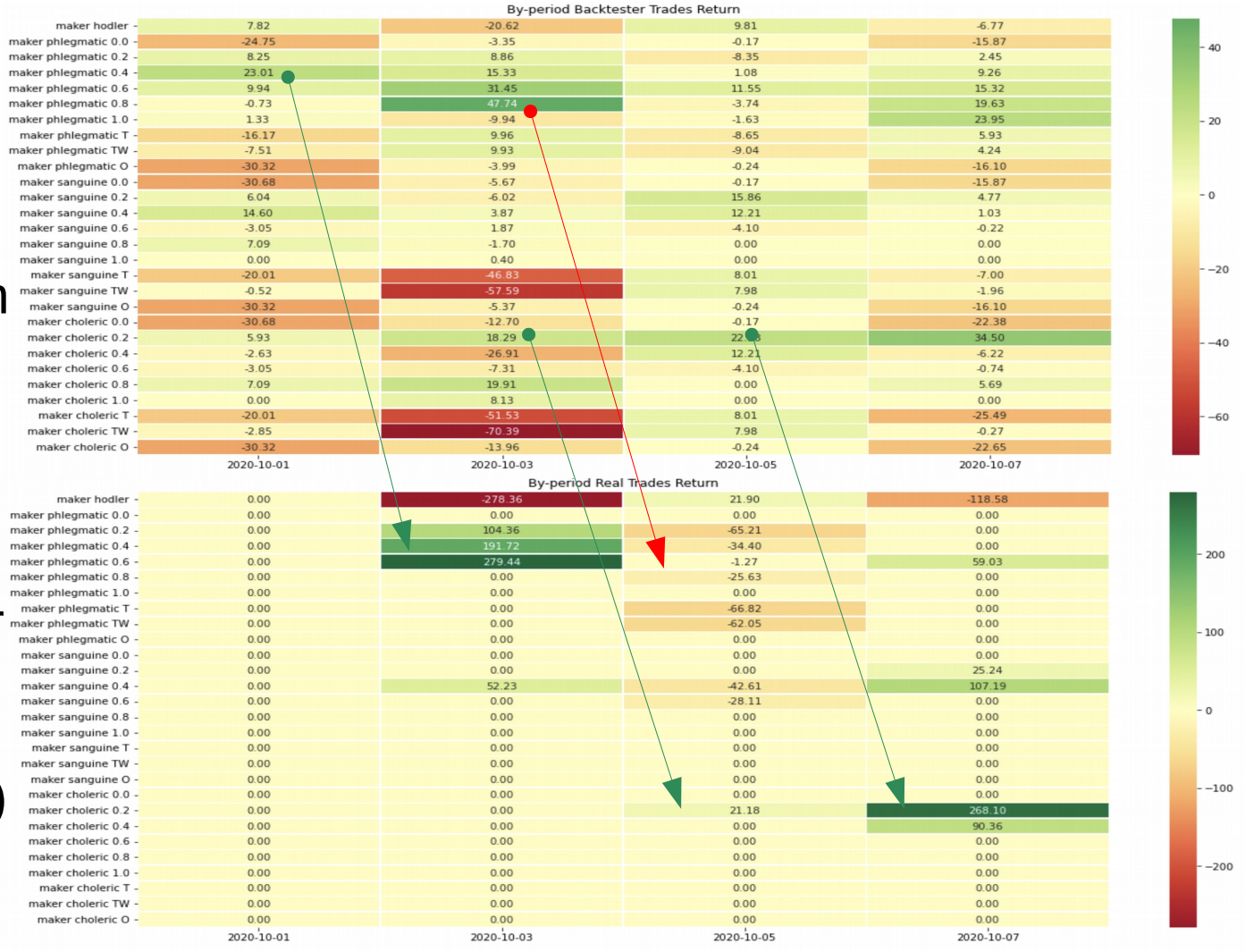
Real-time model-based policy selection

Profit and Loss for Backtesting on historical data / Forward testing on live market data

Profit and Loss for Trading on live market data (still, “backtested”)

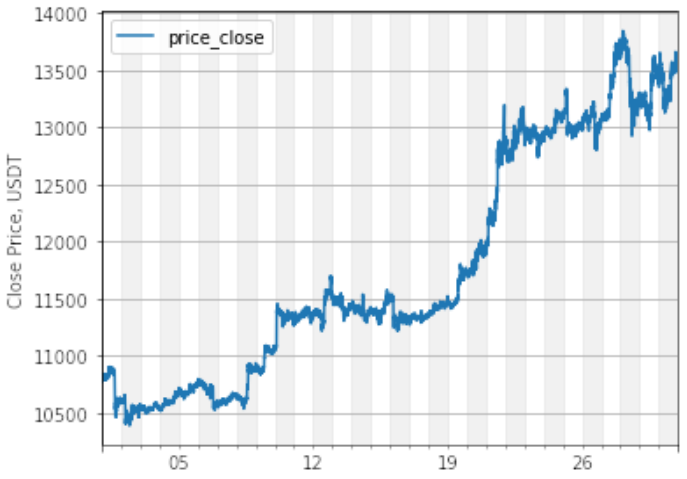


Experiment:
4 Types of Agent Strategies

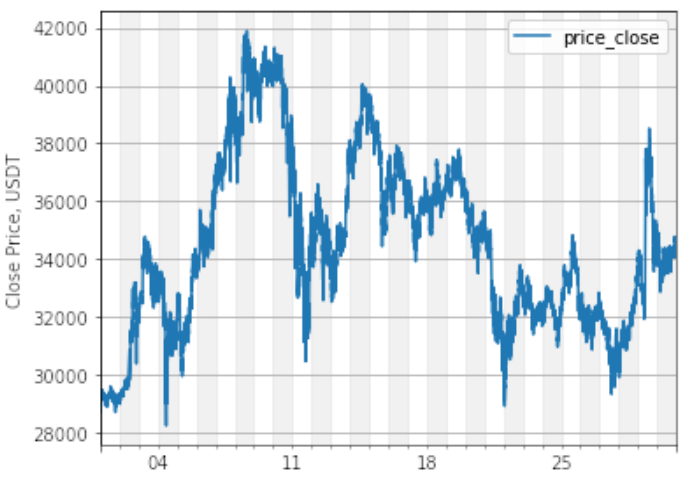
- “Base”
  - “buy low, sell high”, spread and cancellation policy vary
- NIOX
  - https://www.autonio.foundation/posts/niox-maker-user-guide
- Hummingbot
  - https://hummingbot.io/en/academy-level-2-c-beginner-strategy-1-pure-market-making-pmm-strategy
- Hodler
  - “buy and hold all the time” (for reference)

Experiment:
3 Types of Market

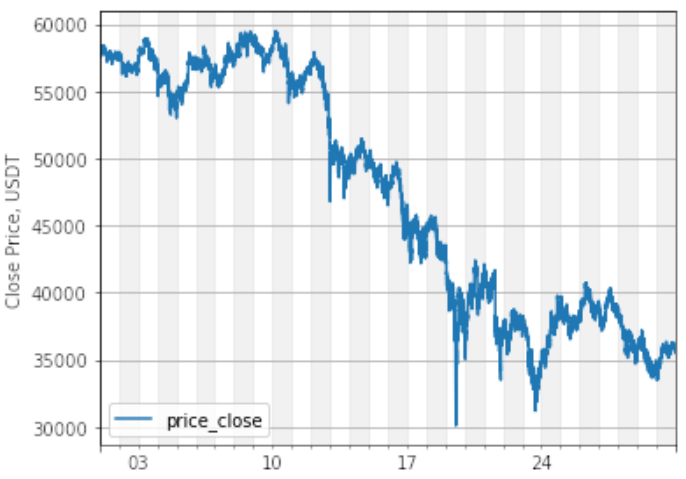
Bull, Low Volatility



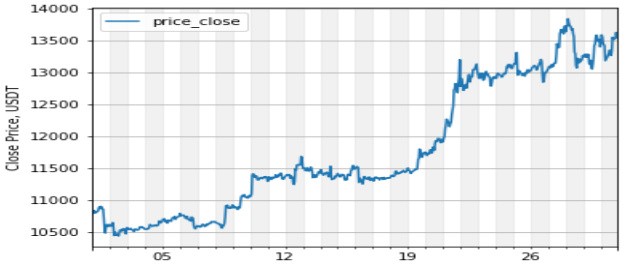
Bull, High Volatility

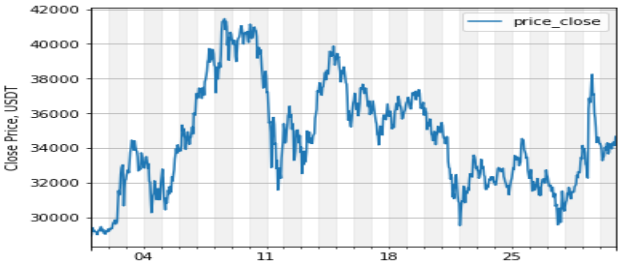


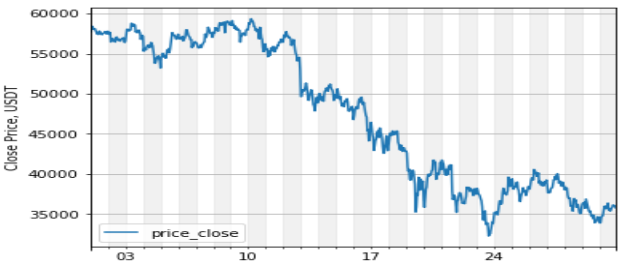
Bear, Medium Volatility



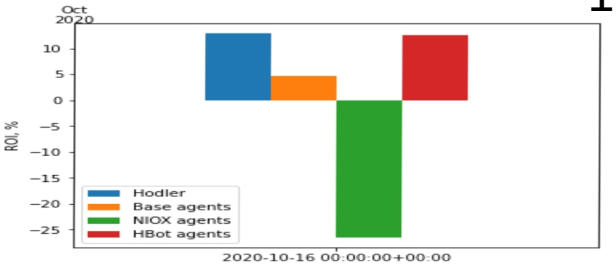
1-Hour Step Data Experiment Result

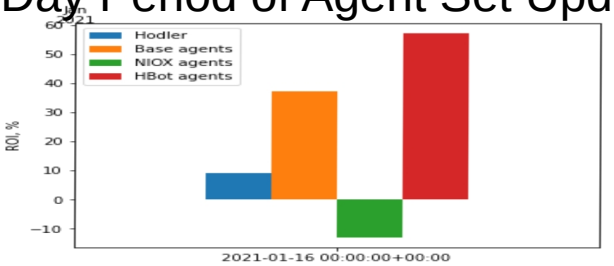


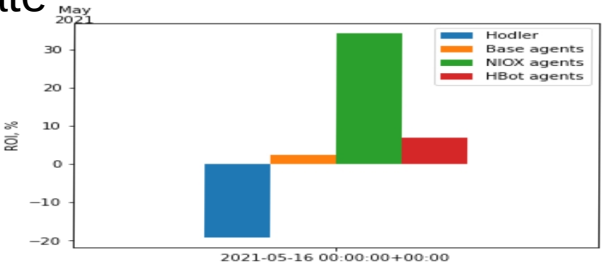




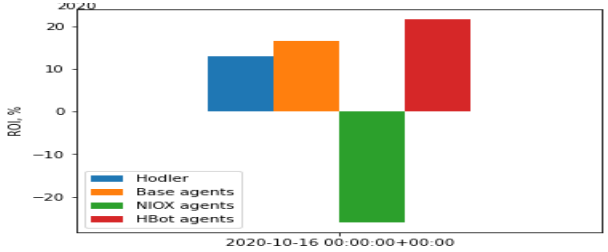
1-Day Period of Agent Set Update

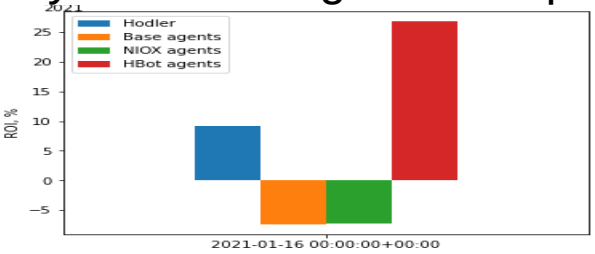


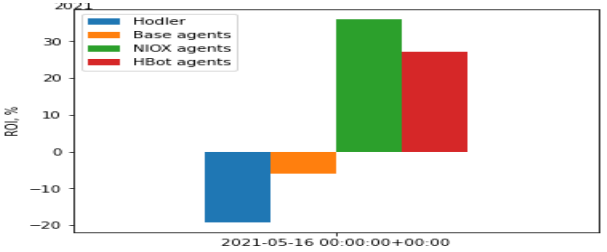




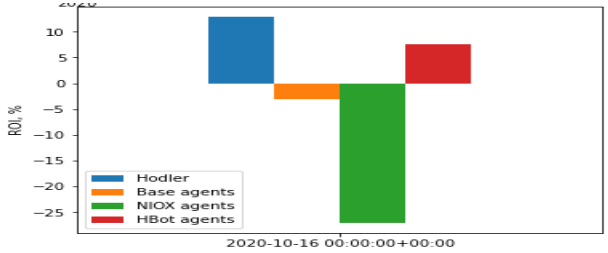
2-Day Period of Agent Set Update

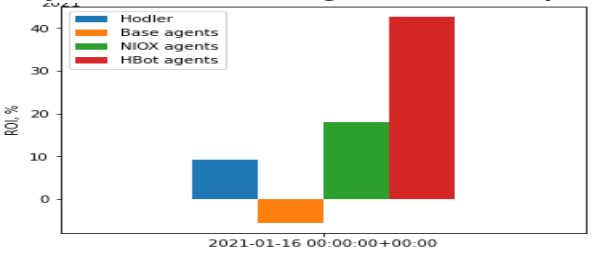


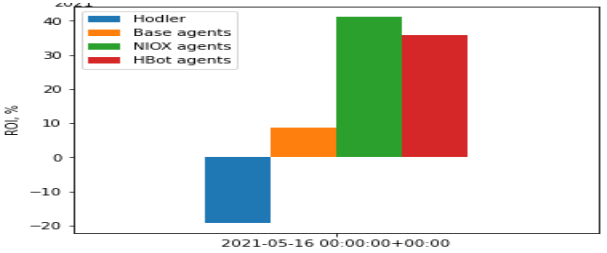




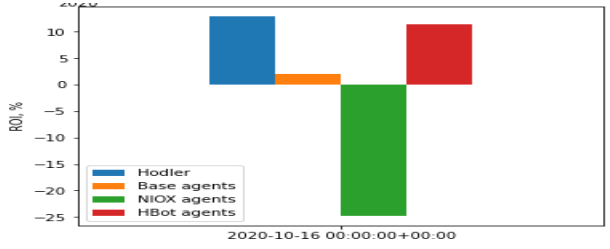
3-Day Period of Agent Set Update

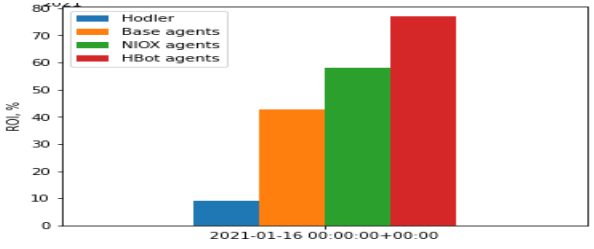


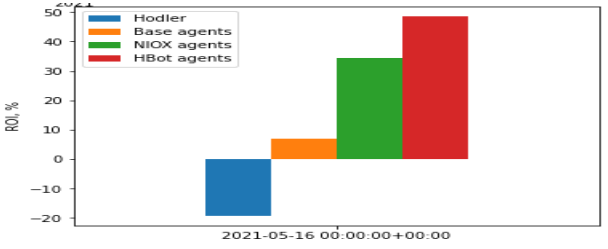




5-Day Period of Agent Set Update



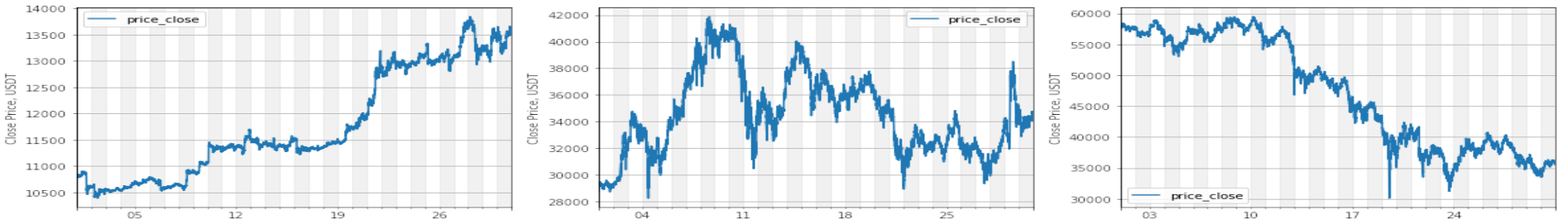




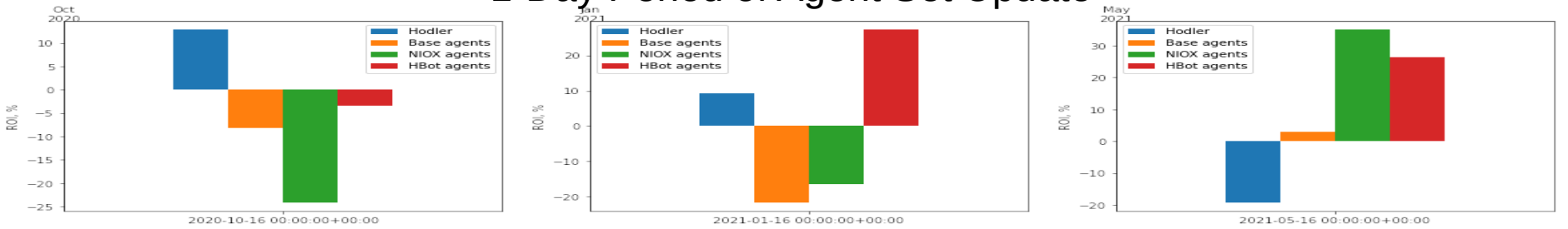
Hourly Results Analysis

- Base agent configuration shows positive alpha only in 7 out of 12 experiments and highly dependent on period duration regardless of type of market.
- NIOX configuration always shows positive alpha for “bear, medium volatility” market with slight period dependency while constantly negative for “bull, low volatility” market. The alpha for “bull, high volatility” is negative for shorter periods and positive for longer periods.
- Hummingbot shows positive alpha for most periods in all markets, while most successful for “bull, high volatility” market

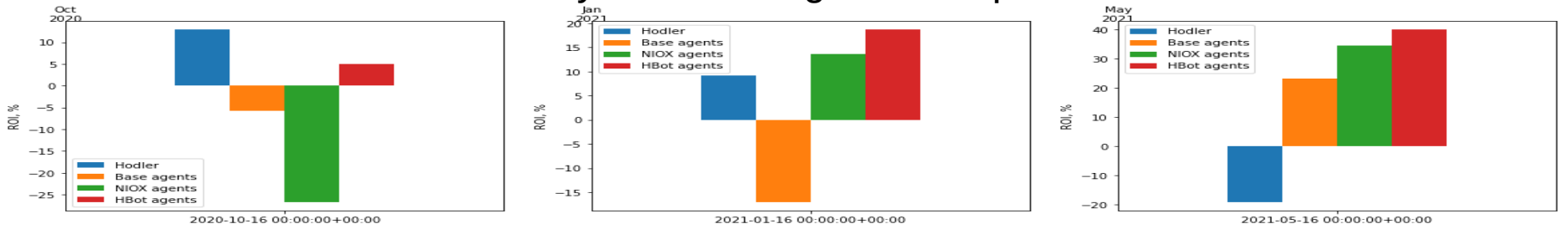
1-Minute Step Data Experiment Result



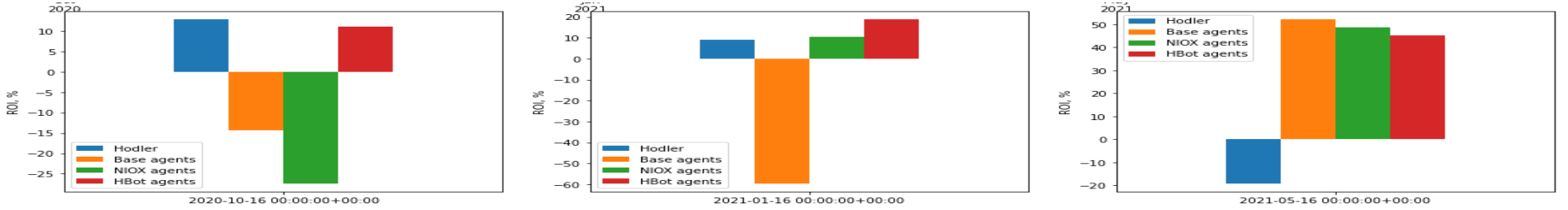
1-Day Period of Agent Set Update



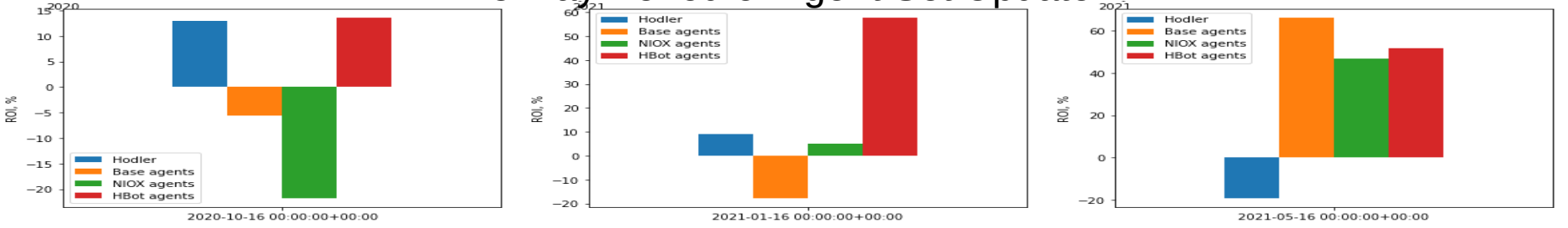
2-Day Period of Agent Set Update



3-Day Period of Agent Set Update



5-Day Period of Agent Set Update



Minutely Results Analysis

- Regardless of period all three types of agent strategies have shown positive alpha for “bear, medium volatility” market
- “Bull, high volatility” market brings negative return and alpha for Base agents, inconsistently positive or negative one for NIOX agents while Hummingbot stays positive regardless of period
- “Bull, low volatility” market alpha is mostly negative and highly dependent on period (growing with the period durability) for Hummingbot while constantly negative for Base and NIOX

“Bull”, Low Volatility Market: Agent Performance Comparison

Period	Hodler ROI, %		Base Makers ROI, %		NIOX Makers ROI, %		Hummingbot Makers ROI, %	
	Hours	Minutes	Hours	Minutes	Hours	Minutes	Hours	Minutes
1	12.90	12.90	4.67	-8.14	-26.45	-24.07	12.55	-3.46
2	12.90	12.90	16.49	-5.70	-25.90	-25.65	21.61	4.99
3	12.90	12.90	-3.08	-14.29	-27.02	-27.36	7.55	11.19
5	12.90	12.90	2.06	-5.53	-24.71	-21.73	11.33	13.61

“Bull”, High Volatility Market: Agent Performance Comparison

Period	Hodler ROI, %		Base Makers ROI, %		NIOX Makers ROI, %		Hummingbot Makers ROI, %	
	Hours	Minutes	Hours	Minutes	Hours	Minutes	Hours	Minutes
1	9.20	9.20	37.14	-21.60	-12.88	-16.47	57.09	27.36
2	9.20	9.20	-7.35	-16.99	-7.31	13.67	26.83	18.75
3	9.20	9.20	-5.51	-59.47	17.89	10.51	42.62	18.86
5	9.20	9.20	42.82	-17.65	58.16	5.09	76.80	57.80

“Bear”, Medium Volatility Market: Agent Performance Comparison

Period	Hodler ROI, %		Base Makers ROI, %		NIOX Makers ROI, %		Hummingbot Makers ROI, %	
	Hours	Minutes	Hours	Minutes	Hours	Minutes	Hours	Minutes
1	-19.10	-19.10	2.45	3.03	34.23	35.06	6.79	26.46
2	-19.10	-19.10	-5.95	23.20	35.99	34.60	27.07	40.11
3	-19.10	-19.10	8.71	52.19	41.20	48.69	35.88	45.11
5	-19.10	-19.10	6.99	66.16	34.48	46.63	48.59	51.52

Hourly And Minutely Results Analysis

- Base makers are mostly effective (always positive alpha) on “bear, medium volatility” market showing much better result on minutely data. For “bull, low volatility” market, they perform rather worse - only 2-day period on minutely experiment has positive alpha. “Bull, high volatility” market is a complete loss on minutes while depends on period with hourly periods.
- NIOX constantly looses on “bull, low volatility” market, unstable on “bull, high volatility” one and always has a good performance on “bear, medium volatility” market for both hours and minutes.
- Hummingbot has constantly positive alpha for bull and bear market with high/medium volatility, and unstable, yet negative alpha in 5 out of 8 cases on “bull, low volatility” market.

Possible Experiments Problems

- The smaller the chosen period the larger the market trend discrepancy.
- Hummingbot in its current implementation has poor control over base asset spent which may effect in competitive advantages over other agent strategies on bear market.
- NIOX agent was used with irregular grid skewed spreads which may be the cause of a better performance specifically for bear market.

Possible Agent Configuration Improvement

- More dense regular bid/ask spread grid
- Base/quote order amount grid
- Hanging orders option (NIOX) within the period
- Hanging orders throughout the periods
- Using Hummingbot strategies other than “Pure Market Making”

AMSA Possible Improvements

- Agent selection policy tuning
- Uneven (prioritized) funds distribution among the agents
- More dense period grid for further analysis
- Hanging orders throughout the periods
- Long term market trend prediction (several periods)
- Short term market trend prediction (next period)
- Nested AMSA configurations (can be a huge number of options)

Major Takeaway

- Market volatility is your friend!!!
- You just need to cook it properly :-)

Thank you for Attention!

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