

ALA 2021
3 & 4 May 2021, London (Virtual)

Adaptive learning for financial markets mixing model-based and model-free RL

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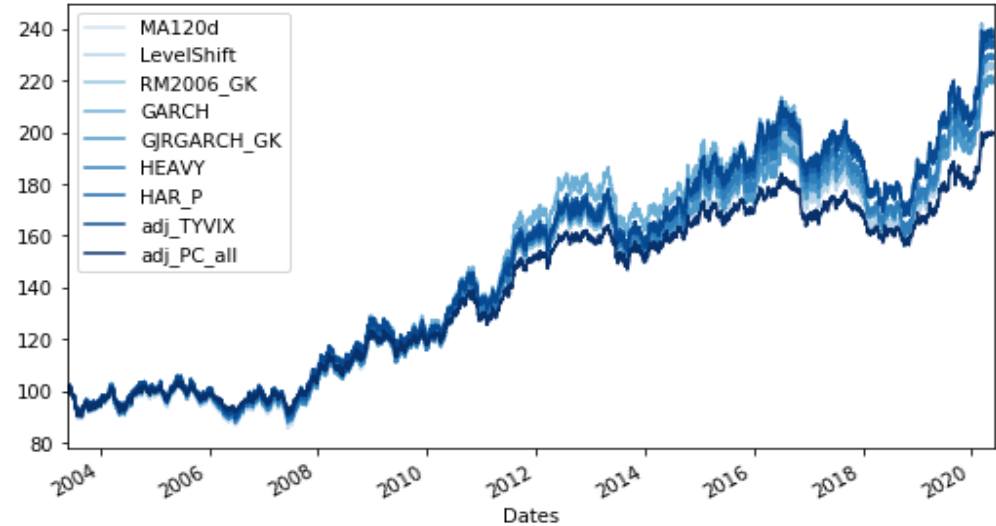


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Problematic: chose the right model?

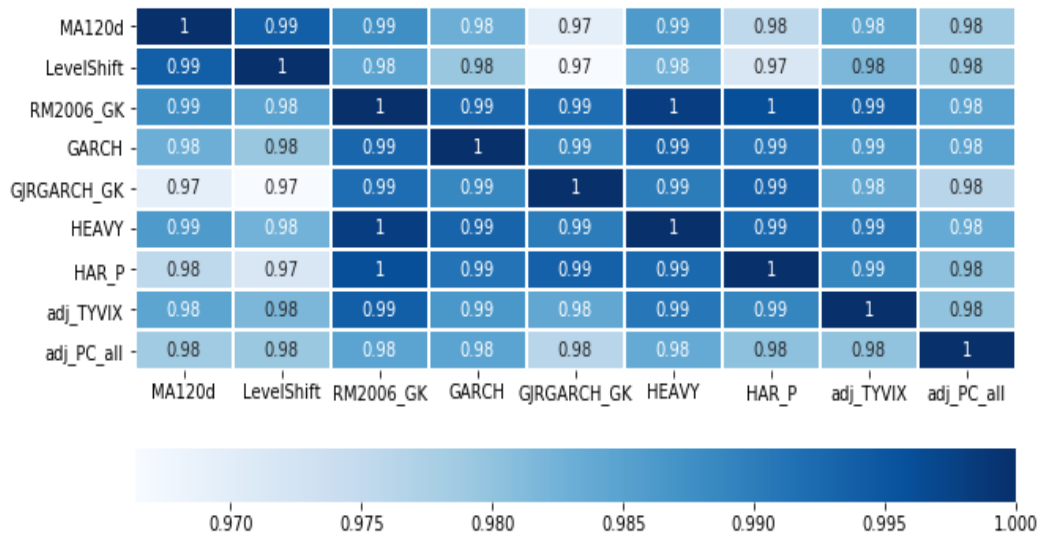
LOIM has an expertise in volatility targeting, with a wide range of models to forecast volatility



TBond future volatility targeting models (source LOIM)

However, not obvious to choose which model as they are:

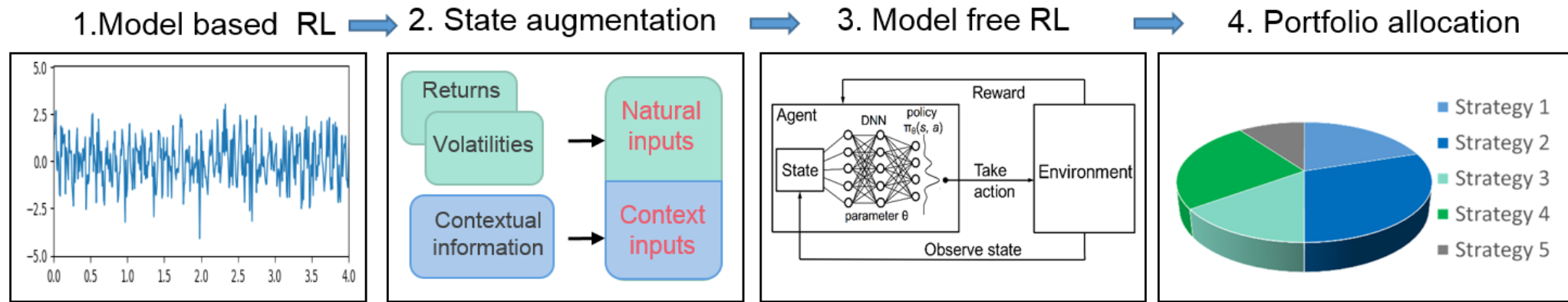
- very similar
- Very correlated



Experiments

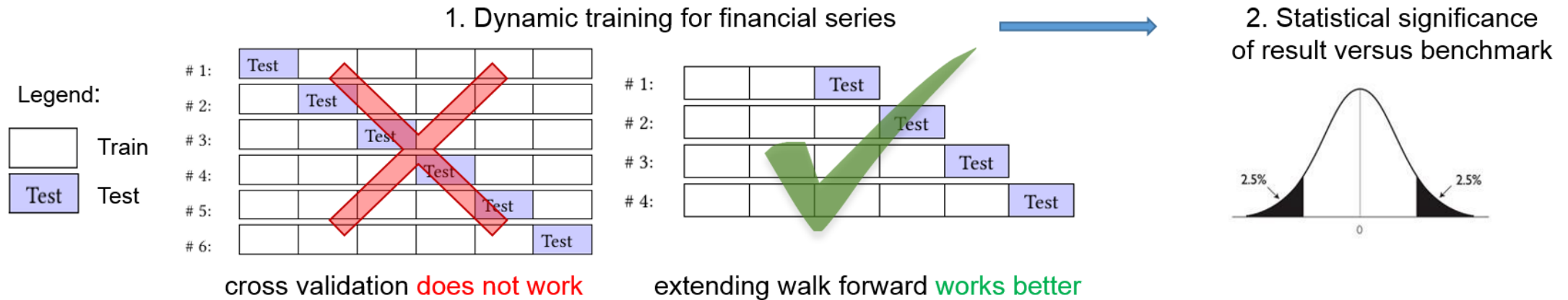
- 9 volatility targeting models
 - Moving average
 - Level shift
 - GARCH:
 - GJR-GARCH
 - HEAVY
 - HAR
 - Adjusted TYVIX
 - Adjusted Principal Component
 - RM2006
- Data from 2003 to 2020 consisting
 - Model daily performances
 - LOIM Risk appetite over 60 and 260 days
 - LOIM Macro signal and 2W MA Macro signal
- Goal:
 - Beat equally weighted allocation
 - Check that the method is robust over time

Solution: use model free deep RL



We combine past returns, volatilities with contextual information to find optimal allocations using deep RL methods

Training process



We use extending walk forward to test out of sample results and do a statistical significance test

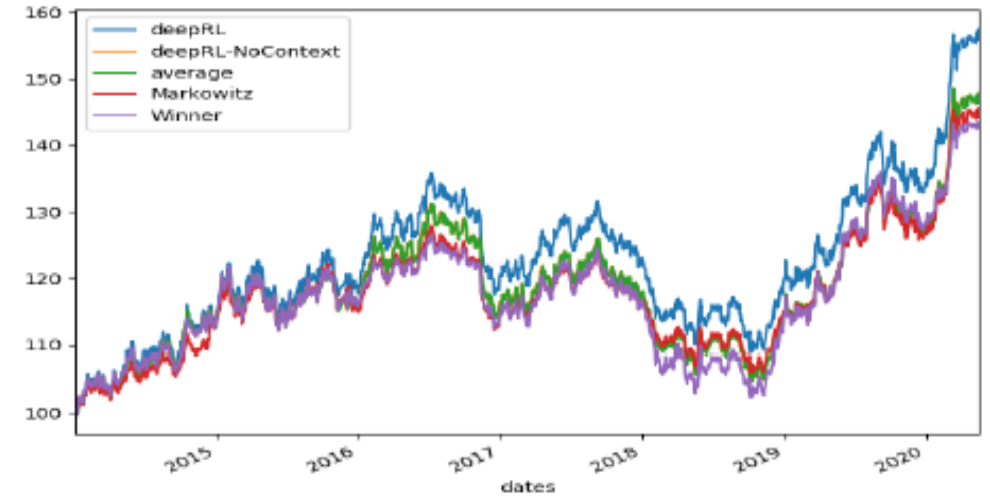
Results

DRL with context is able to identify volatility regime and outperform traditional methods

Context in DRL is important

Table 1: Models comparison over 1, 3, 5 years

	return	sharpe	sortino	mdd	mdd/vol
3 Years					
DRL1	8.056	0.835	0.899	-17.247	-1.787
DRL2	7.308	0.783	0.834	-16.912	-1.812
Average	7.667	0.822	0.876	-16.882	-1.810
Markowitz	7.228	0.828	0.891	-16.961	-1.869
Winner	6.776	0.712	0.754	-17.770	-1.867
5 Years					
DRL1	6.302	0.651	0.684	-19.794	-2.044
DRL2	5.220	0.565	0.584	-20.211	-2.187
Average	5.339	0.579	0.599	-20.168	-2.187
Markowitz	4.947	0.569	0.587	-19.837	-2.074
Winner	4.633	0.508	0.526	-19.818	-2.095



Conclusion and future works

- Initial results are very encouraging as they suggest that deep RL can identify volatility regime and choose volatility targeting accordingly
- Further work is to test on more volatility targeting models and assets