IMPROVING TRADING BY MEANS OF SMART ALGORITHMS

by Dr. Martin Luckow

IN SHORT

- **Current heuristics used in trading often contradict each other or are not comprehensible.**

- **To overcome these difficulties, Trivadis – Part of Accenture developed a bot that independently buys and sells bonds along certain guidelines.**

- **With the help of AI, it leads to better performance in trading, higher profit and lower risk.**

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For hedging stock exchange transactions as well as for direct trading, a variety of leveraged financial instruments exists. These can be geared towards individual stocks, commodities such as gold, or even stock indices. The principles to be applied are partly reminiscent of the investigation of questions of faith – augury and self-fulfilling prophecies are the order of the day.

In the active trade with these instruments, automation plays an important role since reactions must occur very fast and levers offer great opportunities, but entail equally great risks. Current solutions, including the bot developed by Trivadis – Part of Accenture, act in the millisecond range.

OVERCOMING TRADING CHALLENGES WITH A BOT

Our solution is a bot which independently takes over the buying and selling of bonds along certain guidelines. In addition to classical methods, it also employs artificial intelligence (AI). Overall, the performance of the solution using AI is measurably better than the performance of a system using heuristics and statistical methods alone. The bot addresses the three problems prevalent in stock market trading:

- Heuristics and algorithms often contradict each other in their effect.
- They are so numerous that the mechanics of large trading systems are hardly comprehensible.
- The market-changing behavior of many trading bots is problematic because it is deterministic.

CONVERTING FUNDAMENTAL SPECIFICATIONS INTO TRADING DECISIONS

In consideration of the aforementioned challenges, our solution deviates from the classical course of action and does not try to predict e.g. the price trend. Instead, it pursues the approach of converting fundamental specifications into trading decisions as optimally as possible – it thus views trading as an optimization problem. Only very rudimentary assumptions are made about the future price development – by the human, not the system. The objective function is either the maximum profit or the best profit/risk ratio.

« **Instead of trying to make predictions, e.g. regarding the price trend, our solution views trading as an optimization problem and converts fundamental specifications into trading decisions.»**

Another aspect is the solution architecture. Here, a fully event-driven approach has been adopted, allowing the solution to scale using independently operating agents. These agents form «teams of specialists» that take care of a single financial instrument and communicate exclusively via events. Each agent has clearly defined tasks, from identifying trading opportunities to optimally skimming profits and managing risk. In addition, there are agents that coordinate entire agent groups across security types to automate the trading of market segments, e.g. crypto currencies. The agent concept allows individual procedures to be supported by AI methods, or new paths to be taken without the overall system being affected. The methods currently being used belong to the areas of classification and regression and concern the following:

- the identification of trading situations in the millisecond range (multi-dimensional pattern recognition),
- the estimation of so-called trailing distances both when opening and closing positions (estimation).

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Moreover, there is a system-wide autoregressive concept that enables all agents to remember the results of their historical decisions when making future decisions (system memory), hence optimizing decisions over time. Thus, in addition to the statically trained neural networks, the overall system has feedback mechanisms which make it adaptive.

FROM A CAPITAL OF 4000 UNITS TO 7080 UNITS WITH THE HELP OF AI

The effect of using AI methods can be easily demonstrated: The following graph (Figure 1) shows the performance of the DAX 30 in the first three months of 2021. In red one can see the result of the reference solution which generates about 7080 units from a capital of 4000 units. Two red lines are visible: the «smooth» line represents the balance, i.e. the nominal account balance. The more volatile line, usually running below it, shows the equity, i.e. the currently existing value of the investment, which can of course plummet if the trend is unfavorable.

Figure 1: Development of the DAX 30 as well as the balance and equity generated by the reference solution and the system using AI, January to March 2021

The purple charts show the performance of the system when enriched by AI features. What is particularly interesting here is that not only the profit is higher by about 500 units, but also the decline in equity, i.e. the risk, is significantly lower.

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DEVELOPMENT, OPERATION AND OUTLOOK

In terms of the development and operation of the bot, the most important points are the following:

- The overall system connects to the servers of any broker by means of two widely used trading platforms (Meta Trader5 and CTrader).

- The bridge between bot and trading platform was implemented accordingly in C# and MQL5.

- The core system was implemented in Python.

- System-wide learning is a system feature and was implemented in Python.

- All neural networks to be applied are based on Keras and the Azure Machine Learning SDK in their formulation.

Furthermore, the bot can reside as a REST service on-premises as well as cloud-based. Test versions have already been implemented as Azure App Services. In the next version, the event-oriented agents will be partially formulated as Azure Functions.

ABOUT THE AUTHOR

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Martin Luckow (*1960) holds a doctorate in mathematics and computer science and is a transformation architect at Trivadis – Part of Accenture. The German is considered a connoisseur, enthusiast and at the same time sceptic in the field of Artificial Intelligence. The former two attributes and his love of squash led him to develop the app «Go To The T», with which squash players can make their training more efficient thanks to artificial intelligence.

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