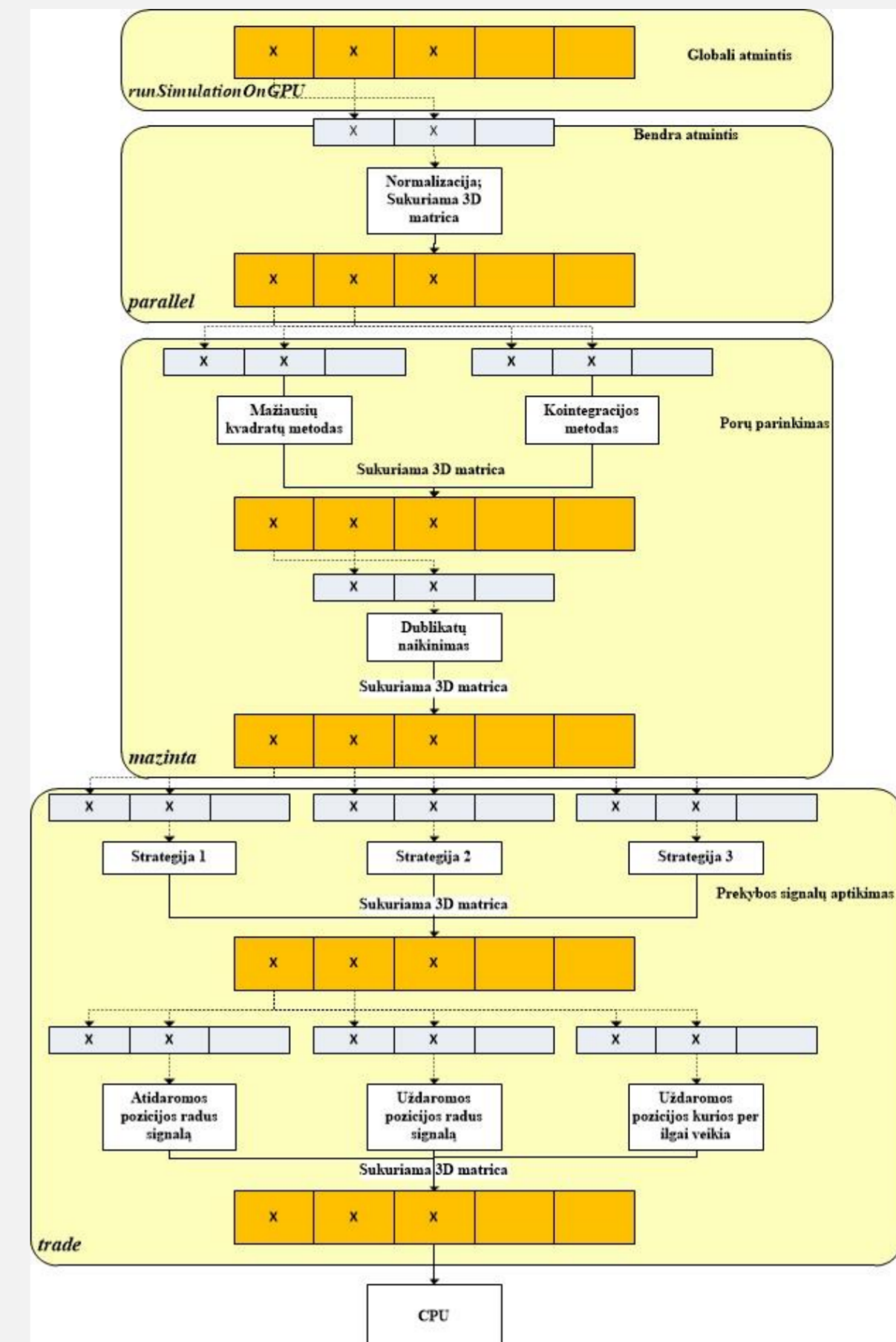


INTRODUCTION

The number of financial institutions that do include cryptocurrencies in their portfolios has increased in recent years. These are the first purely digital assets that are included in hedge funds and asset managers portfolio. Cryptocurrencies price prediction is attracting a growing attention from researchers and investors. Although they have some similarities with most traditional assets, they do have their own behavior as an asset is still in the process of being understood. It is therefore important test this highly noisy and risky financial instrument especially during critical financial periods. Market fear is a critical macroeconomic construct which demands in-depth and thorough monitoring due to its strong nexus with critical financial assets even in normal circumstances. A lot of works has been done from the beginning of pandemic which focused on the impact of COVID – 19 pandemics to financial instruments. However, there is little information of the effect to cryptocurrencies, especially in high frequency environment. In this research authors implement their created testing method for the automated high frequency trading strategy, which was previously not tested using cryptocurrency data and was not implemented during critical finance environment. HFT algorithm testing method allows to parallelize data normalization, trading pair selection, position opening/closing, deletion of unnecessary trade pairs, and closing of long-held transactions that are performed simultaneously at the same time.

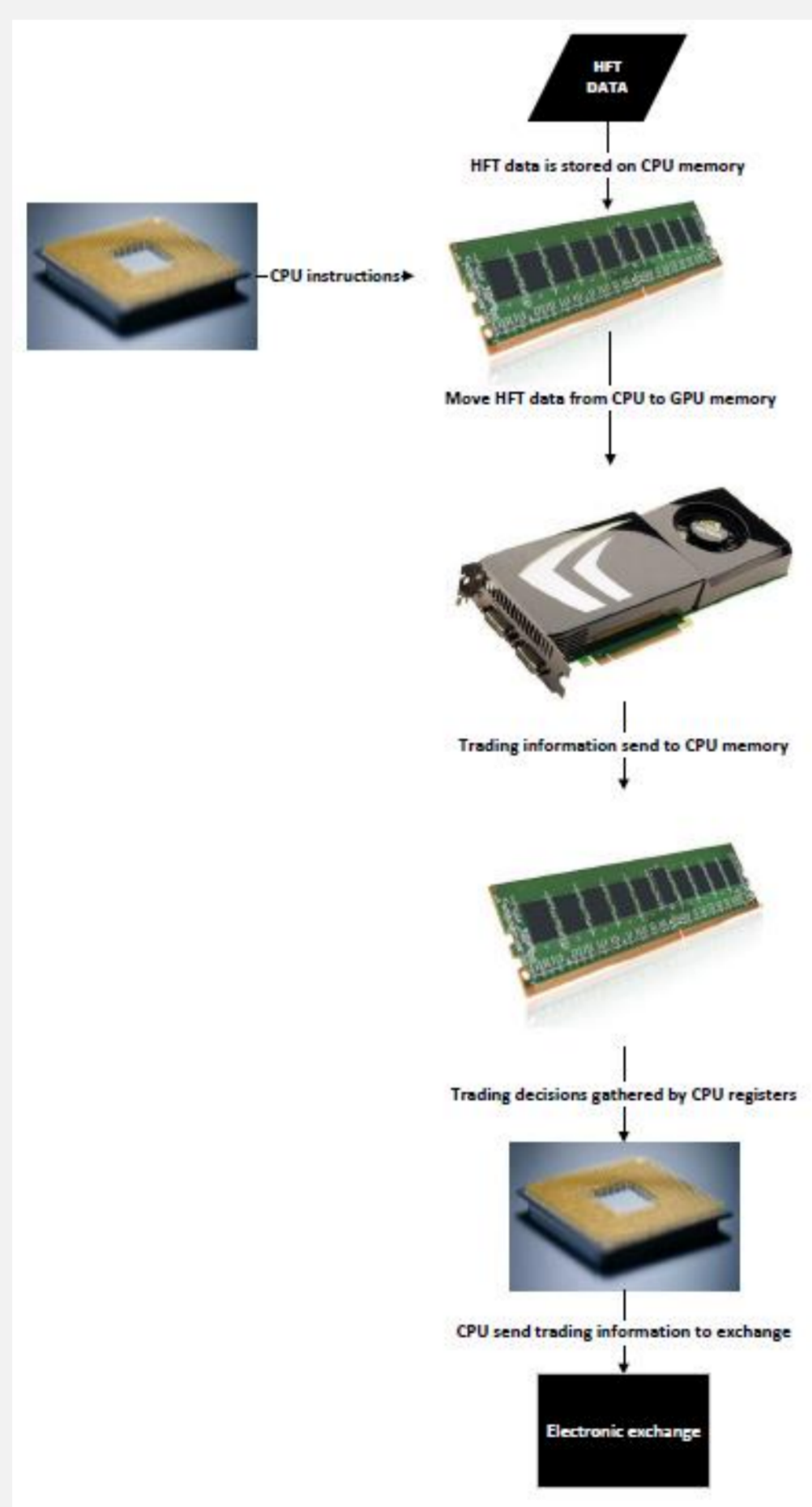
HFT TESTING METHODOLOGY

The main aim of the HFT testing method is to receive high-frequency data from an electronic market, send it from the CPU memory to the GPU global memory, where calculations are parallelized and processed, the buy/sell decisions are made and the information is sent back to an electronic exchange. The data obtained from an electronic market that it is stored in the CPU memory is immediately sent to the GPU global memory and trading algorithm or algorithms are evoked.



DATA USED IN THE RESEARCH

As the research is based on high frequency information from electronic exchanges, thus tick-by-tick data is used. This type of data sets are the most granular and comprehensive order book data in the industry. It collects every incremental update or "delta" to the order book as they happen in real-time. This includes every added, changed or removed bid and ask, the price level, amount, and the corresponding timestamp or sequence ID. The needed data was provide by the KAIKO. It did provided with three different cryptocurrency. The first two were from Bitstamp (BTC/USD and ETH/USD) and the third one was from BitMEX (XBT/USD). In order to examine how COVID-19 effected cryptocurrency trading in high frequency environment the data sets consist of information from 01-12-2020 till 31-01-2021.



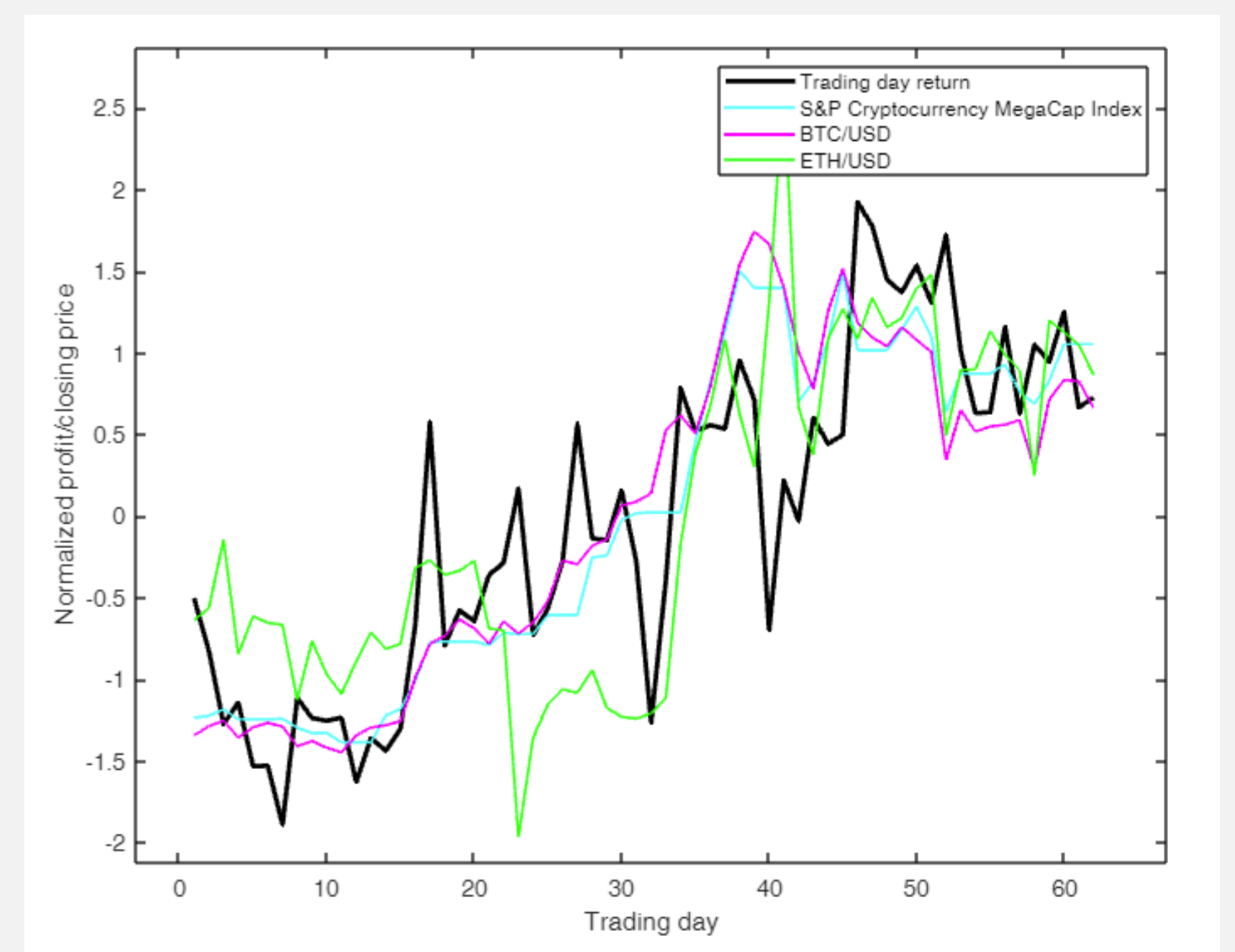
The aim of trading algorithm on the GPU is to parallelize all possible calculations across the CUDA cores at the expense of the GPU global memory. The parts that are in the GPU can be parallelized by implementing a multidimensional matrix. Due to the way the algorithm works, the following are parallelized:

- Data normalization;
- Pair selection for the trading period;
- Looking for trading signals;
- Evoking trading and closing positions based on the received data.

EXPERIMENTAL SETUP OF CASE STUDY

The main aim of high-frequency statistical arbitrage trading is to find two financial instruments that work together. Once such a pair is found, it has to be decided when to take long and short positions based on the trading rules. With respect to the research on algorithm formulation, following steps of statistical arbitrage trading strategy have been identified:

- the selection of the size for data normalization and trading window;
- data normalization;
- the selection of the correlated pair;
- the definition of the trading rules;
- the act of trading;
- the assessment of the statistical arbitrage strategy



CONCLUSION

Experimental research of HFT during COVID-19 with cryptocurrencies data has shown that the implemented testing method has that this type of data give positive trading results. The trading trend did follow the S&P Cryptocurrency MegaCap Index by balancing highs and lows of BTC and EHT. Moreover the gathered results proves the proposed concept of HFT testing method and brings one step by providing an algorithmic trading testing framework as needed in MiFID II directive.

Future research on high frequency trading testing method might extend to implemented different type of trading algorithms. In this study only statistical arbitrage was carried out. However, there is a number of different trading strategies (market making, low latency, news based, liquidity detection, etc.) that could use the same methods in order to implement testing on them. Moreover, the given study could be expended by applying different financial instruments.