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**Research Paper:** “Trading via Selective Classification” by N. Chalkidis  
and R. Savani

## Assignment Part I

### “Trading through Selective Classification”

#### Introduction:

Researchers are constantly looking for new ways to increase trading profitability and performance using machine learning algorithms, which is a fast-expanding field in the world of finance. The paper chosen for this assessment, titled "Trading via Selective Classification," was co-written by N. Chalkidis and R. Savani,(2021). In the paper, the authors present a novel strategy for trading in financial markets that is predicated on the application of selective classification.

#### About the Topic Objective:

The primary objective of the paper is to improve trading performance by choosing only the most profitable trade opportunities and averting potentially risky trades. This is accomplished by employing machine learning techniques to determine the most profitable transactions and basing trading decisions on this data. The authors compare the suggested strategy with other cutting-edge approaches in the field and show how selective classification can be utilised to find profitable trades. They conduct research on the application of selective binary and ternary classification in the development of trading strategies. In order to provide the classifier with another way to avoid making a directional prediction, we introduce a third class for ternary classification that corresponds to relatively small price fluctuations in either direction.

#### Approach Used:

To pinpoint the trades that have the best chance of being profitable, the authors' method uses selective classification. Selective classification is a machine learning method that employs binary/ternary classifiers to foretell the likelihood that a certain trade will succeed or fail. Selective classification enables the trained classifier to refrain from making a prediction of financial price time series whenever it lacks sufficient confidence, thereby reducing false predictions and trading risks. The researchers train and evaluate binary and ternary selective classifiers utilising four distinct ML classification approaches and compare their accuracy to that of non-selective classifiers. It presents the accuracy coverage trade-off of selective classifiers, demonstrating that they have higher accuracy than non-selective classifiers. The authors approach the problem by first building a model that can predict the outcome of a trade using

various features such as price movements, trading volumes, and other market indicators. They then use a selective classification algorithm to filter out trades that are likely to be unprofitable and only select those that have a high probability of success. This approach is based on the idea that not all trades are created equal, and some trades are more likely to be profitable than others.

Technically, they train, examine and analyze binary and ternary, selective and non-selective classifiers using a walk-forward train-validate-test methodology across a variety of feature sets based on LR(logistic regression), RF(random forests), NN(feed-forward networks), and LSTM(long-short term memory networks).

After that, conversion of these classifiers into trading plans was made for which we run back tests on futures markets for commodities. The generated trading strategies are subjected to cross-validated backtests using a walk-forward method, and the outcomes are analysed. The results demonstrate the potential of selective categorization for trading strategy construction. Using MCC(Matthews Correlation Coefficient), the authors of this article assess how well their suggested method performs in comparison to other classification techniques.

## Obtained Results:

The study utilized machine learning classifiers to forecast the direction of commodity futures prices across five markets using intraday data collected at 30-minute intervals.

In terms of accuracy and risk-adjusted performance, selective classifiers outperformed non-selective classifiers in intraday futures trading. In particular, the model with the best performance was a selective ternary classifier using logistic regression, which obtained a hit rate of 22.34 % of coverage, an accuracy of 63.00 %, and a Sharpe ratio of approx. 0.4.

The selective classifiers also demonstrated the ability to avoid trading under ambiguous market situations, resulting in fewer losses and reduced risk. The researchers also carried out an in-depth evaluation of the method's performance in various market conditions. The researchers discovered that the method functioned well under all market situation, but particularly in volatile markets.

The authors demonstrate that their method can generate higher returns while simultaneously reducing risk and enhancing stability. The authors examine the distribution of abstentions over time and discover that the differences between predictions are typically small and follow a power law distribution. Comparing the performance of binary and ternary classification, they discover significant differences in terms of coverage and accuracy. The selective ternary classifier tends to pick relatively high multiplier values, resulting in a larger number of flat labels, and lower coverage thresholds, leading to better selective accuracy.

However, determining whether binary or ternary classification is better for the intended trading application is not easily determined by accuracy alone. The ternary classifiers behaved in a distinct manner from the binary classifiers and seemed to show potential when considering only accuracy. However, their backtesting outcomes were ultimately inferior. It could be worthwhile to investigate hyperparameter optimization by considering other metrics such as profit and loss, to further comprehend the reasons for these results.

## Strengths:

In my point of view some of the key strengths are mentioned below:

- **Novel Approach:** The paper's innovative use of selective classification to enhance trading performance is one of its greatest strengths.
- **Effective Results:** The authors have demonstrated that this method can effectively identify profitable transactions while avoiding potentially risky ones, which represents a substantial improvement over conventional trading strategies.
- **Robustness:** the comprehensive evaluation of the proposed method demonstrates its robustness and effectiveness under various market conditions and relative to various benchmarks.
- **Explanation:** The paper provides a detailed explanation of the technique employed, making it straightforward to reiterate and verify the findings.
- **Real-world Data Usage:** The incorporation of real-world raw data from five metal commodities futures markets enhances the applicability of the study's findings to actual trading scenarios.

## Weaknesses:

I believe there are also some weaknesses in the paper that need to be addressed too.

- **Lack of Transparency:** The proposed method's lack of transparency is one of its major flaws. While the authors have provided an exhaustive assessment of the approach, they haven't yet given an in-depth explanation of how the algorithm for selective classification operates and how it is used to exclude trades. This lack of transparency makes it challenging for others to replicate the outcomes or comprehend the approach's underlying principles.
- **Limited Scope:** Another flaw of the paper is its limited scope of analysis. While the authors have tested their method on a variety of markets and against a variety of benchmarks, the sample size is small, and it is unclear whether the results would stand up in other market dynamics or with larger datasets.

## Conclusion:

In conclusion, the use of machine learning in finance is a rapidly growing field that has the potential to revolutionize the way trading is done in financial markets. The "Trading via Selective Classification" paper is a significant contribution to this field, and its innovative use of selective classification and comprehensive evaluation make it a promising avenue for future research. This paper is an excellent example of how machine learning algorithms can be used to improve trading performance in financial markets.

## References

Chalkidis, Nestoras & Savani, Rahul. (2021). Trading via Selective Classification.