

A Semi-supervised Classification Approach for Trend Following Investment Strategy

Authors : Rodrigo Arnaldo Scarpel

Abstract : Trend following is a widely accepted investment strategy that adopts a rule-based trading mechanism that rather than striving to predict market direction or on information gathering to decide when to buy and when to sell a stock. Thus, in trend following one must respond to market's movements that has recently happen and what is currently happening, rather than on what will happen. Optimally, in trend following strategy, is to catch a bull market at its early stage, ride the trend, and liquidate the position at the first evidence of the subsequent bear market. For applying the trend following strategy one needs to find the trend and identify trade signals. In order to avoid false signals, i.e., identify fluctuations of short, mid and long terms and to separate noise from real changes in the trend, most academic works rely on moving averages and other technical analysis indicators, such as the moving average convergence divergence (MACD) and the relative strength index (RSI) to uncover intelligible stock trading rules following trend following strategy philosophy. Recently, some works has applied machine learning techniques for trade rules discovery. In those works, the process of rule construction is based on evolutionary learning which aims to adapt the rules to the current environment and searches for the global optimum rules in the search space. In this work, instead of focusing on the usage of machine learning techniques for creating trading rules, a time series trend classification employing a semi-supervised approach was used to early identify both the beginning and the end of upward and downward trends. Such classification model can be employed to identify trade signals and the decision-making procedure is that if an up-trend (down-trend) is identified, a buy (sell) signal is generated. Semi-supervised learning is used for model training when only part of the data is labeled and Semi-supervised classification aims to train a classifier from both the labeled and unlabeled data, such that it is better than the supervised classifier trained only on the labeled data. For illustrating the proposed approach, it was employed daily trade information, including the open, high, low and closing values and volume from January 1, 2000 to December 31, 2022, of the São Paulo Exchange Composite index (IBOVESPA). Through this time period it was visually identified consistent changes in price, upwards or downwards, for assigning labels and leaving the rest of the days (when there is not a consistent change in price) unlabeled. For training the classification model, a pseudo-label semi-supervised learning strategy was used employing different technical analysis indicators. In this learning strategy, the core is to use unlabeled data to generate a pseudo-label for supervised training. For evaluating the achieved results, it was considered the annualized return and excess return, the Sortino and the Sharpe indicators. Through the evaluated time period, the obtained results were very consistent and can be considered promising for generating the intended trading signals.

Keywords : evolutionary learning, semi-supervised classification, time series data, trading signals generation

Conference Title : ICQFM 2023 : International Conference on Quantitative Finance and Models

Conference Location : Rome, Italy

Conference Dates : October 09-10, 2023