Development and Implementation of a Fully Integrated Expert Advisor for Asset Selection

Masterarbeit

Zur Erlangung des akademischen Grades „Master of Science (M.Sc.)“ im Studiengang Wirtschaftswissenschaft der Wirtschaftswissenschaftlichen Fakultät der Leibniz Universität Hannover

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1. Introduction

The following paper deals with the development and implementation of a fully integrated expert advisor for asset selection.

One of the main objectives is the creation of a fully automated trade system based on R and Java, which is able to make decisions based on real time economic data. Besides the decision making process, a link to the broker will be established to execute all necessary trades (see figure 1). Therefore, the "Trader Workstation" application programming interface (TWS API) was chosen to allow the system to operate on a completely autonomous level. Other automated trading systems or sophisticated trading rules are published by Dempster and Leemans (2006), by Subramanian et al. (2006) and by Tucnik (2010) or Kearns and Ortiz (2003).

For the main process an asset selection interface was written, that allows the user to implement any set of assets available on yahoo finance, which are selected and traded due to their liquidity, their cointegrative behavior and in terms of their ratios among each other. While this paper is concerned with US-assets, asset selection has been conducted in the literature for Greek equity by Xidonas et al. (2009) and for Iranian assets by Fasanghari and Montazer (2010). The selection relies on a semi-automated subroutine whereby the user can intervene at almost every step to change a variety of parameters before the automated main-routine takes over.

Automated trading may be subject to certain risks, for which Donefer (2010) offers insights even though his focus is on high frequency trading.

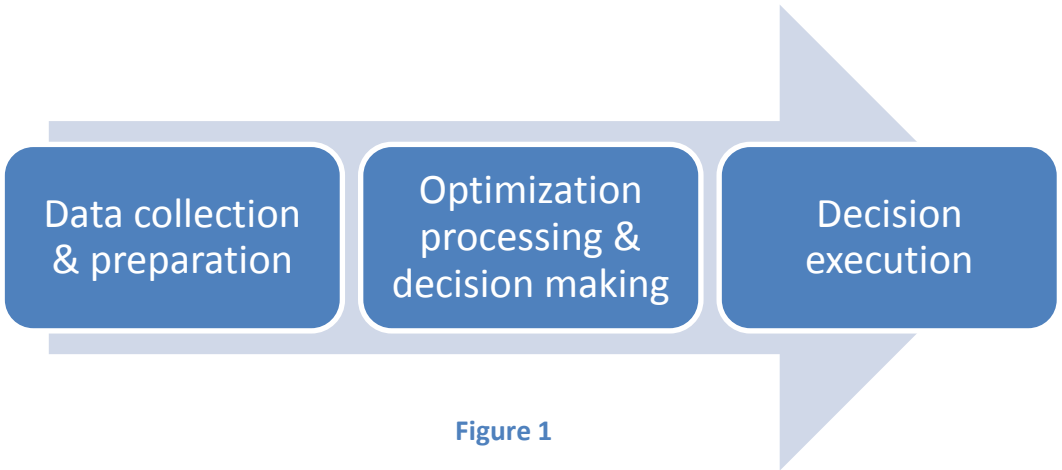

Figure 1

The first part of this paper contains the theoretical foundation, followed by the development of the computational system, where almost every implemented step is accompanied by an empirical foundation.

Afterwards, the trading system is tested on real time economic data, including over 6700 US stocks.

Also different other approaches like portfolio replication or carry trade are studied to give further information about possible and promising trading strategies.

The conclusion summarizes the final results and insights and the appendix contains the R-Codes directly involved with the main routine. For more insights concerning the underlying code Ruey and Tsay (2012) may prove useful.

6. Conclusion

The main goal for this thesis was to develop an autonomous and complete trading cycle, beginning with data collection and preparation, continuing with optimization processing and decision making and finishing with the execution of those decisions. This objective was achieved and a working trading system has been implemented, which generates almost 12% in annualized return and selects pairs from 6700 assets. However, the high annualized volatility of 28.37% relativizes this outcome. Anyhow, it remains questionable if volatility is the best measure of risk for this case. The best-choice selection for this particular strategy was made ex post but the alternative strategies still exceed 10% in annualized return. Therefore, the system delivers stable and reliable results.

Another achievement is the modular structure of the involved scripts because it allows for internal changes. Thus, it would be easy to use different data sets, as long as a link to a regularly updated data platform, like Yahoo Finance, can be established. A change regarding the webbroker for example would only require adjustments within the WK function and not within the much more complex BK function.

Secondary objectives were the implementation of a carry trade model and a study regarding a portfolio replication approach. The carry trade implementation has also been successful as it generates positive returns of 3.77%. Also it employs alternative methods for risk modelling and an iterative fitting process for variable output values, which are restricted to an (variable) interval. However, it may be flawed because the use of linear fitting mechanics does not allow for sufficient adjustments, even if an iterative process is applied. This exploration may fuel future endeavors because of its unique approach and modular structure.

The later introduced portfolio replication study shows a weak superiority of the long-anticyclical trading strategy with a 75:25 ratio between the simulation and testing period of a two year cycle. Although, the order of the optimization steps may influence the achieved results, some general information are obtained for further studies.