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Deep Learning to enhance momentum Trading Strategies using RNNs and LSTM on the US Stock Market

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ABSTRACT

# Structured Abstract

i. Background

ii. Aim

iii. Methodology

iv. Results

v. Conclusions

# Introduction

The profession of investment management has been undergoing a radical shift over the last 2 decades with the introduction of index tracking funds and a major challenge in the form of fee compression. As such, the methods and job of professional investment managers is under pressure to evolve. Predicting stock prices and generating alpha (returns above market return) are at the heart of what professional investment managers do. The evolution of professional investment management saw the adoption of quantitative methods that use linear models on factors or characteristics derived from stock prices. These models have tended to have their short comings and don’t always perform well.

The use of non-linear methods and other predictive techniques such as machine learning including deep learning has seen an explosion in the last decade with the emergence of cloud computing as well as improved hardware. What’s old is new again, and many researchers, funds and investment banks are actively exploring and implementing the use of machine learning in their investment and trading processes.

There are two major challenges with applying machine learning beyond simple linear techniques such as regressions which are already quite actively used. The first is the volume and reliability of data, and the second is the if results, especially for the applications of deep neural networks, which is critical for the . Machine learning techniques.

The momentum effect is well known phenomena in stock price movements. This effect occurs when a stock’s price moves up or down, and it generally tends to persist in that path for a period of time relative to it’s peers. Can this momentum effect be harnessed as a variable within a non-linear machine learning based approach to essentially provide better stock price prediction and assist in portfolio construction? In this paper, we demonstrate the use and results of using a LSTM (Long-Short Term Memory) reinforcement learning approach in relation to a momentum strategy. The aim is to determine if there are any improvements to the overall return of individual stock selection (this section will be updated as the results of the analysis are discussed).

# Background and Literature Review

Takeuchi and Lee did some of the seminal work in this regard, where they use an autoencoder composed of stacked restricted Boltzmann machines to extract features from the history of individual stock prices and discover an enhanced version of the momentum effect in stocks without extensive hand-engineering of input features and deliver an annualized return of 45.93% over the 1990-2009 test period versus 10.53% for basic momentum.

Fischer and Krauss followed on this work, using the same definition of returns from the above paper, but they explicitly aimed to use an LSTM within a short term approach. They particularly focus on the S&P 500.

# Methodology

## Data, Software, Hardware

The daily prices of the S&P TSX constituents over the last 20 years ( 1999-2019) are extracted from Compustat via WRDS.

# Results and Discussions

# Conclusions and Future Work

# Appendix

# References