28-10-2025

003 Advanced Trading Strategies: Deep Learning

MARKET MICROSTRUCTURE AND TRADING SYSTEMS

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ITESO

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# Introduction

This project focuses on the development of a systematic trading strategy using deep learning models trained on engineered time series features. The objective is to design, implement, and evaluate a quantitative trading framework capable of predicting market signals — long, short, or short, or hold through the integration of multiple neural network architectures. The analysis will be conducted using a dataset containing 15 years of daily price data for the selected financial asset, allowing for the identification of long-term market behaviors and regime shifts.

The strategy will incorporate three deep learning architectures: MLP, CNN, and LSTM, each designed to capture distinct aspects of temporal and nonlinear dependencies in financial data. A comprehensive feature engineering process will be conducted, combining momentum, volatility, and volume indicators across multiple periods. All features will be normalized, and class imbalance will be addressed through weighting techniques to enhance model fairness and generalization.

MLFlow will be used for experiment tracking, ensuring systematic management of model versions, hyperparameters, and performance metrics. Additionally, data drift analysis will be performed to detect significant changes in the distribution of input variables over time, providing insight into market regime changes or evolving dynamics.

The developed models will be evaluated through a Backtesting framework that integrates realistic trading conditions, including transaction costs, position sizing, and dynamic trade management. The final evaluation will consider both predictive and financial performance metrics such as Accuracy, F1-Score, Sharpe Ratio, Sortino Ratio, Calmar Ratio, Maximum Drawdown, and Win Rate. Overall, this project aims to establish a robust and data-driven methodology for applying deep learning techniques to systematic trading in financial markets.

# Asset Selection

# Asset

AutoZone **(AZO)**

# Economic Sector

Discretional Consume

# Industry

Retail Automotive Parts

# Company Overview

AutoZone (AZO) is a retail and distribution company of automotive replacement parts and accessories in the Americas, benefiting from the inelastic demand for auto parts. The company has consistently demonstrated the ability to generate high returns on invested capital, reflecting efficient management and ongoing opportunities for reinvestment. AutoZone (AZO) represents an ideal asset for systematic trading strategies based on deep learning, due to its predictable financial behavior, liquidity, and the abundance of historical data available.

# Strategy Overview

Aquí va otra cosa

# Feature Engineering

## Momentum

8 Indicadores de Momentum

### RSI

….dddidj

### RSI

….dddidj

### RSI

….dddidj

### RSI

….dddidj

### RSI

….dddidj

### RSI

….dddidj

### RSI

….dddidj

### RSI

….dddidj

## Volatility

8 Indicadores de Volatility

### RSI

….dddidj

### RSI

….dddidj

### RSI

….dddidj

### RSI

….dddidj

### RSI

….dddidj

### RSI

….dddidj

### RSI

….dddidj

### RSI

….dddidj

## Volume

4 Indicadores de Volumen

### RSI

….dddidj

### RSI

….dddidj

### RSI

….dddidj

### RSI

….dddidj

Esto porque queremos ganar en periodos de volatilidad, pero a su vez no queremos perder tanto dinero. Con la acción de **AZO** -

## ----Extra---

# Target Variable Definition

## Sub

Model Architecture and Design

## Sub

# MLFlow Experiment Tracking

## Sub

# Data Drift Monitoring

## Sub

# Backtesting Methodology

## Sub

# Results and Performance Analysis

## Sub

# Conclusions

# Bibliography