Stock Price Predictability and The Business Cycle

With Machine Learning

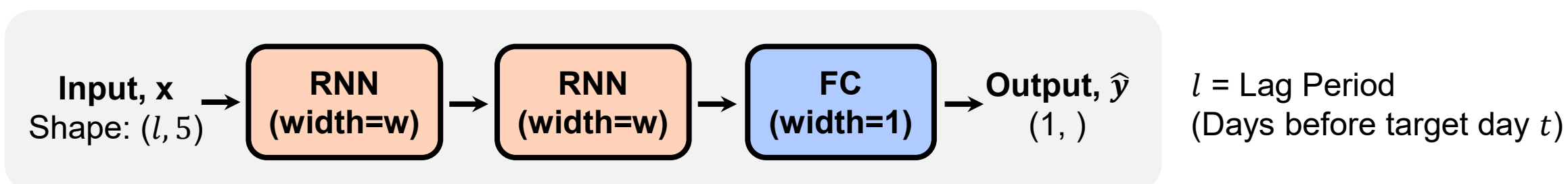Student: Wang Li Rong   Supervisor: Dr Fan Xiu Yi

Project Objectives:

This project studies the impacts of business cycles on machine learning (ML) predictions. Specifically, we focus on answering the following 4 research questions:
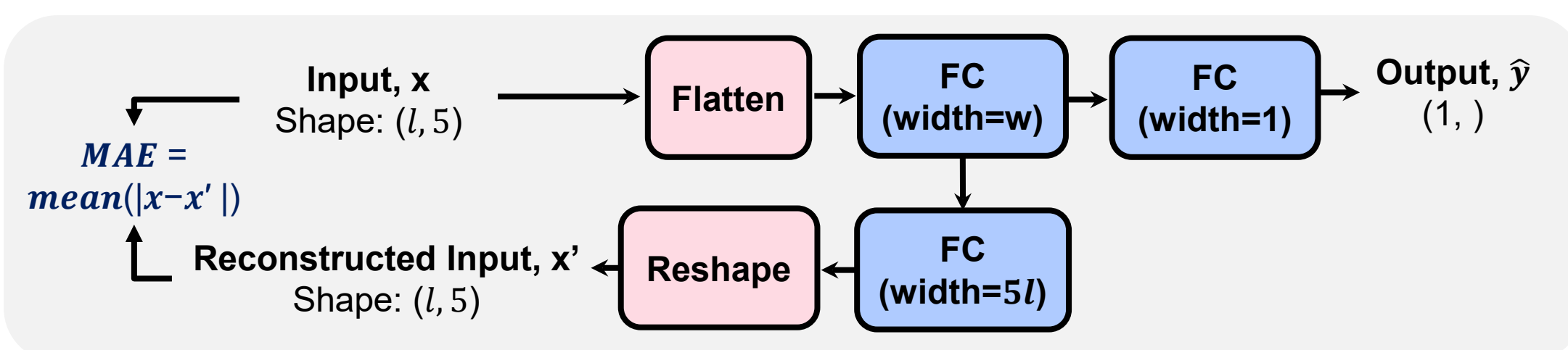
1. Do ML models perform differently during the recession compared to expansion?

2. Does including recession data in the in-sample (training) period improve ML performance?

3. Does the risk-free rate predictor improve ML performance during recessions?

4. Does confidence-based decision-making mitigate deteriorating ML performances during recessions?
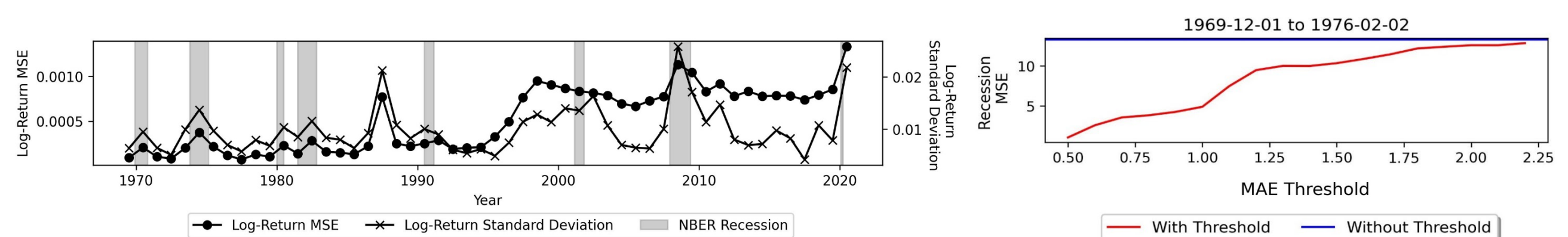
Neural Network Architectures:

Stock Price Prediction Model

Input, x
Shape: $(l, 5)$ → RNN (width=w) → RNN (width=w) → FC (width=1) → Output, $\hat{y}$ (1,)

l = Lag Period
(Days before target day t)

Stock Price Prediction + Confidence Score Model

$MAE = mean(|x-x'|)$

Input, x
Shape: $(l, 5)$ → Flatten → FC (width=w) → FC (width=1) → Output, $\hat{y}$ (1,)

FC (width=5l)

Reshape

Reconstructed Input, x'
Shape: $(l, 5)$

Main Findings:

1969-12-01 to 1976-02-02

With Threshold   Without Threshold

Log-Return MSE   Log-Return Standard Deviation   NBER Recession

1. Forecasting performance deteriorates during recession due to increased market volatility

2. Inclusion of recession data, risk-free rate or VIX index did not improve recession predictions

3. Confidence-based decision-making enhances recession prediction performance