

Stock Prediction

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A dark blue diagonal gradient bar that starts from the bottom left corner and extends towards the top right corner, covering the lower half of the slide.

Methods Used

Activations:

Tanh

ReLU

Sigmoid

Preprocessing:

MinMaxScaler

Optimizer:

Adam

Stocks Tracked and Features Used

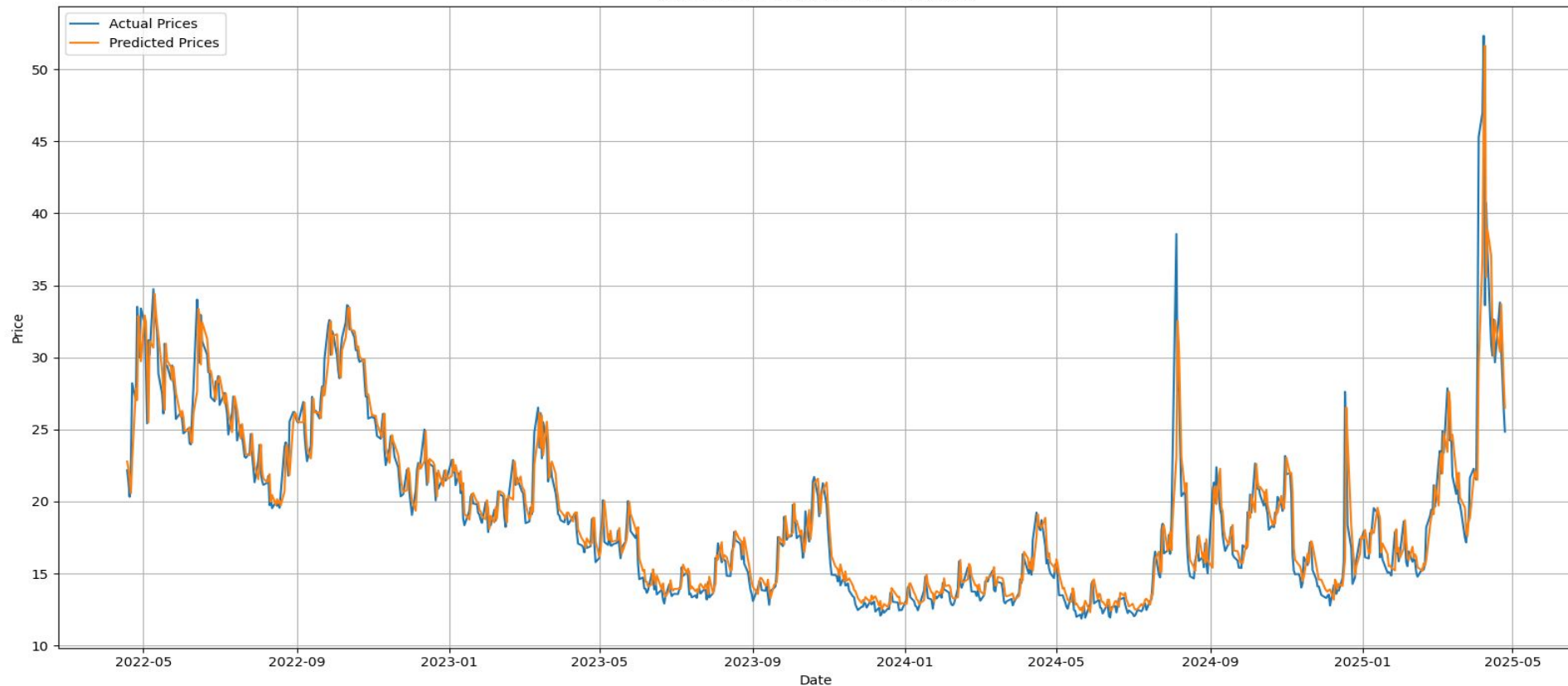
- AAPL
- TSLA
- NVDA
- SPY
- VTI
- VIX

- Close
- Volume
- Volume_change - day over day % change

Dates: Jan 1st, 2010 - April 1st, 2025

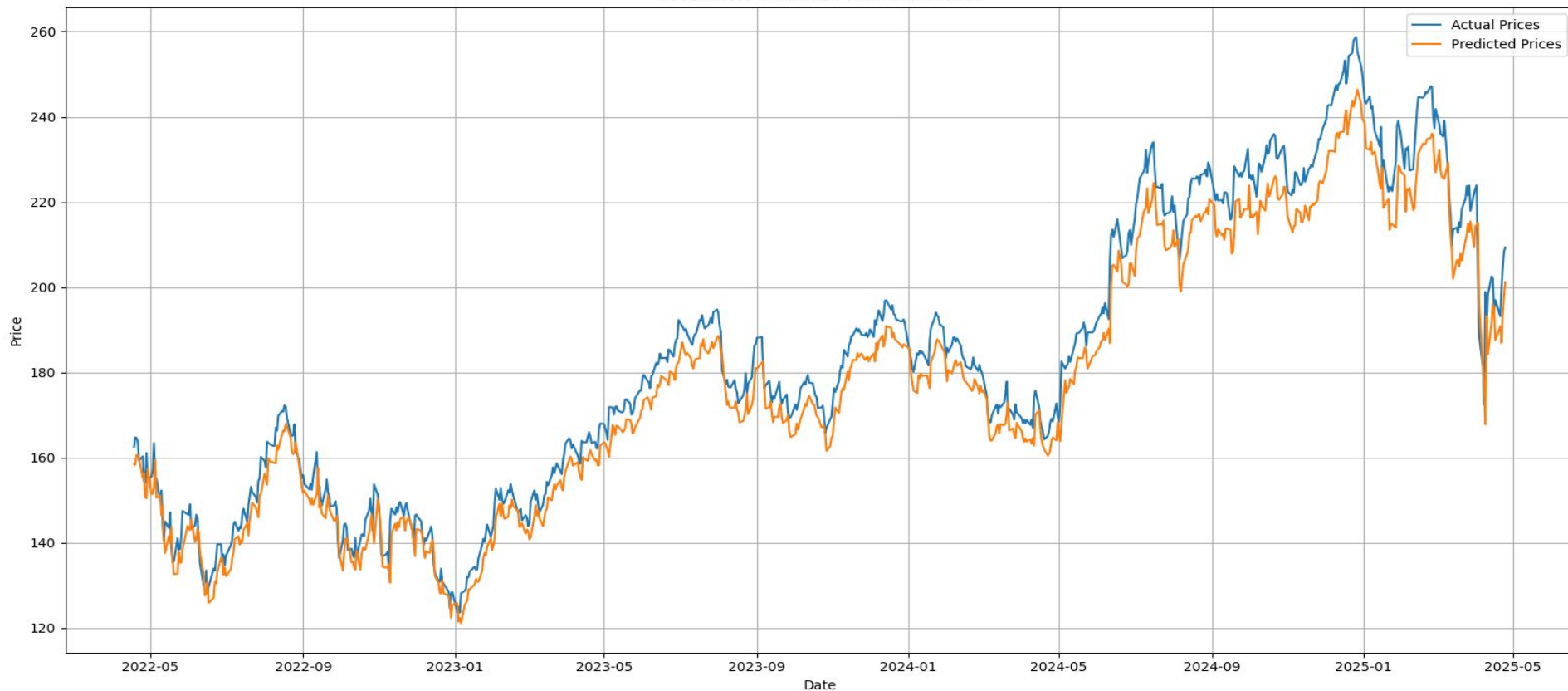
VIX – Volatility Index

Stock Price Prediction with GRU Model



Stock Predictions – 100 epochs AAPL

Stock Price Prediction with GRU Model



Stock Predictions – 30 and 50 epochs AAPL

Results Summary:

Activation: tanh, RMSE: 4.143929179026501

Activation: relu, RMSE: 3.9855973170975076

Activation: sigmoid, RMSE: 17.4850228300876

Best activation function: relu with RMSE:

3.9855973170975076

Results Summary:

Activation: tanh, RMSE: 3.475564179448518

Activation: relu, RMSE: 3.9982834856155276

Activation: sigmoid, RMSE: 5.025647304636605

Best activation function: tanh with RMSE:

3.475564179448518

Stock Predictions – 100 epochs TSLA

Stock Price Prediction with GRU Model



Stock Predictions – 30 and 50 epochs TSLA

Results Summary:

Activation: tanh, RMSE: 61.33525235426007

Activation: relu, RMSE: 45.40882022527097

Activation: sigmoid, RMSE: 63.66610991622708

Best activation function: relu with RMSE:

45.40882022527097

Results Summary:

Activation: tanh, RMSE: 10.25130747864757

Activation: relu, RMSE: 9.597866478473033

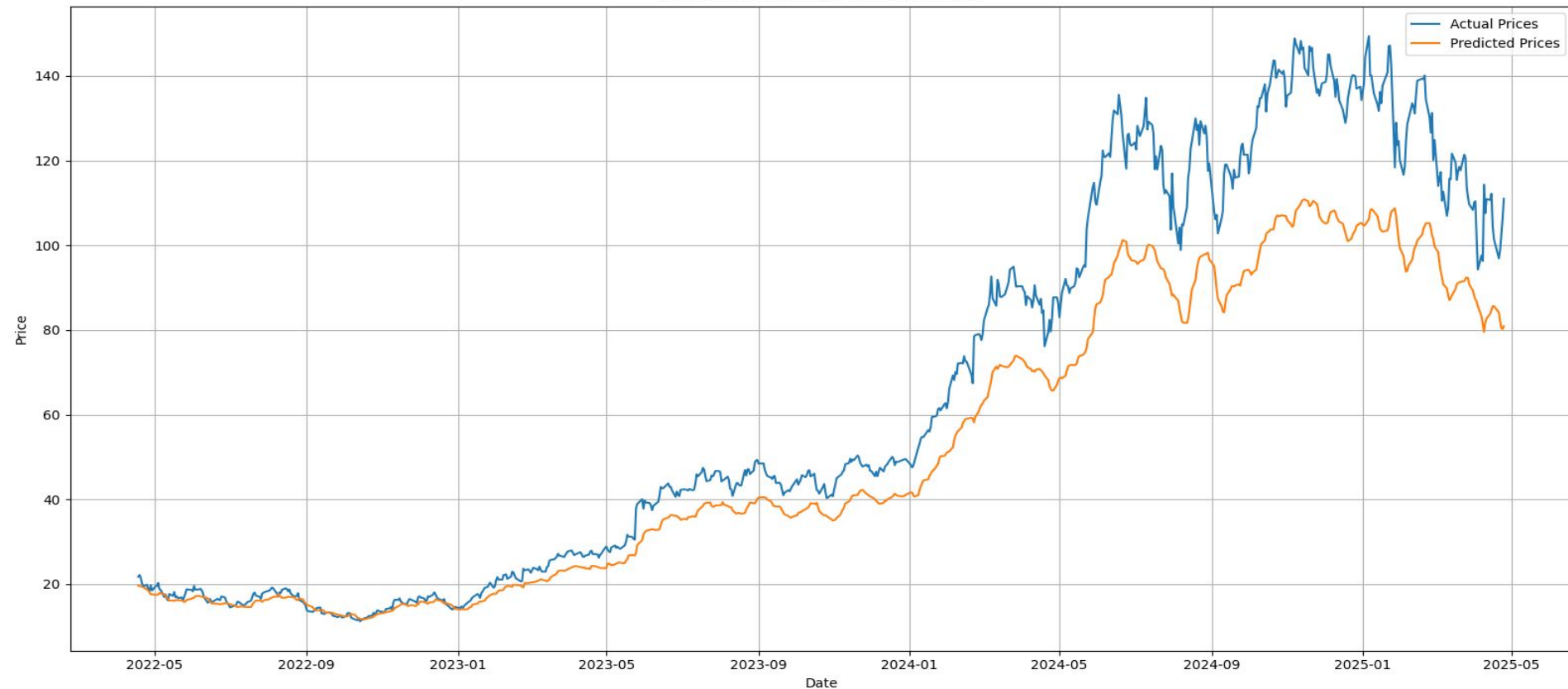
Activation: sigmoid, RMSE: 10.437655648348478

Best activation function: relu with RMSE:

9.597866478473033

Stock predictions – 100 epochs NVDA

Stock Price Prediction with GRU Model



Stock predictions – 30 and 50 epochs NVDA

Results Summary:

Activation: tanh, RMSE: 17.57138730793528

Activation: relu, RMSE: 15.718807963269258

Activation: sigmoid, RMSE: 45.73912585136967

Best activation function: relu with RMSE:

15.718807963269258

Results Summary:

Activation: tanh, RMSE: 12.836588525217046

Activation: relu, RMSE: 6.592015186322449

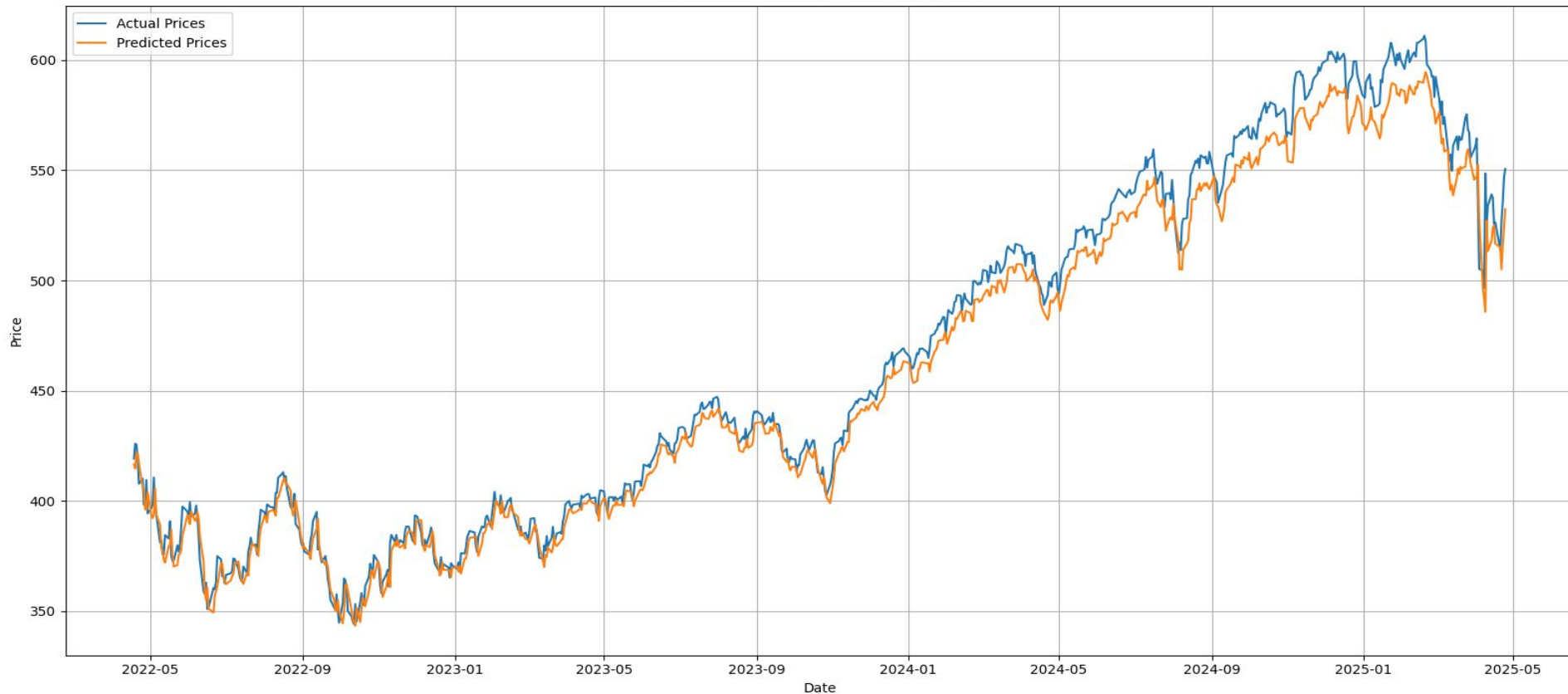
Activation: sigmoid, RMSE: 25.892895829009436

Best activation function: relu with RMSE:

6.592015186322449

Stock Predictions – 100 epochs SPY

Stock Price Prediction with GRU Model



Stock Predictions – 30 and 50 epochs SPY

Results Summary:

Activation: tanh, RMSE: 14.315275109122002

Activation: relu, RMSE: 9.721237527135708

Activation: sigmoid, RMSE: 11.574261377624536

Best activation function: relu with RMSE:

9.721237527135708

Results Summary:

Activation: tanh, RMSE: 8.953409828038506

Activation: relu, RMSE: 16.55606366819974

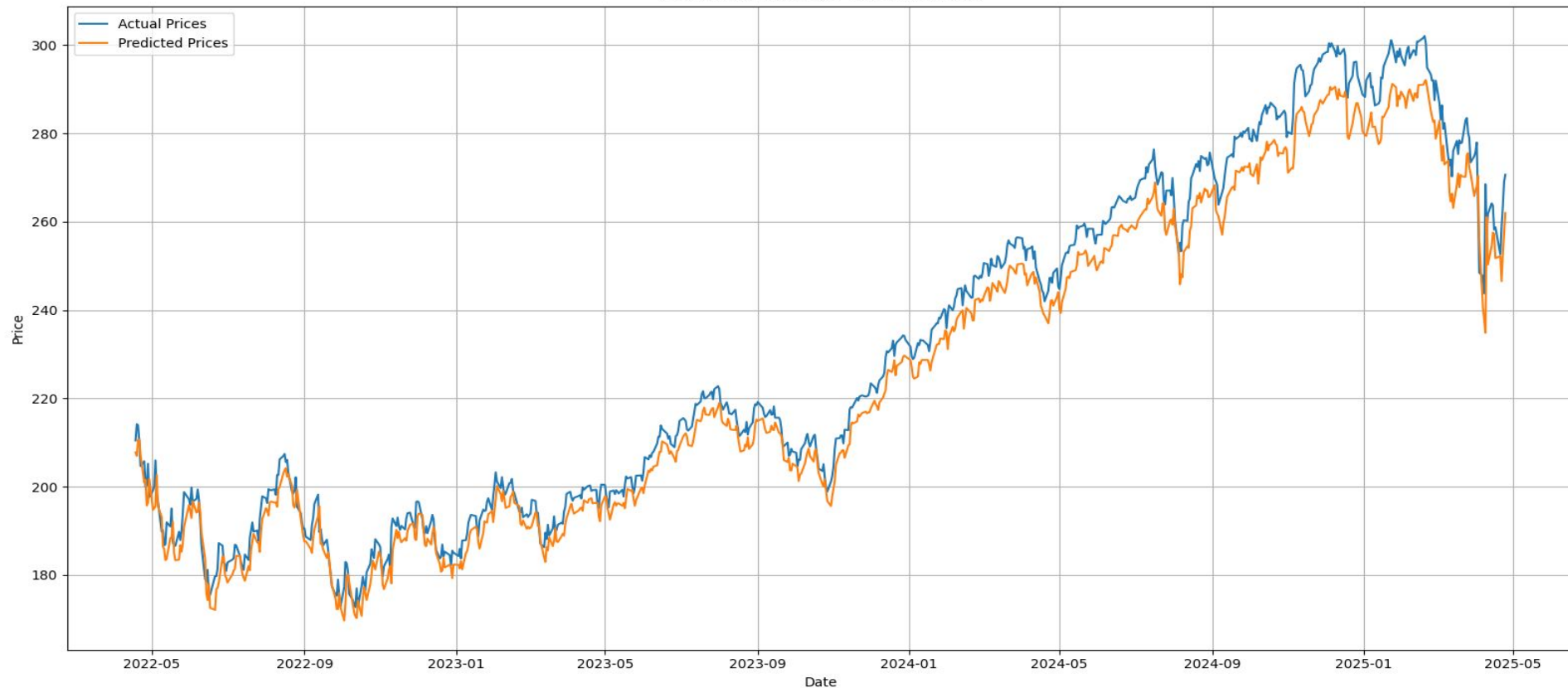
Activation: sigmoid, RMSE: 5.547445027410045

Best activation function: sigmoid with RMSE:

5.547445027410045

Stock Predictions – 100 epochs VTI

Stock Price Prediction with GRU Model



Stock Predictions – 30 and 50 epochs VTI

Results Summary:

Activation: tanh, RMSE: 3.5128398789668283

Activation: relu, RMSE: 4.793477318248

Activation: sigmoid, RMSE: 3.3934158013916904

Best activation function: sigmoid with RMSE:
3.3934158013916904

Results Summary:

Activation: tanh, RMSE: 2.929236435650841

Activation: relu, RMSE: 3.008663541934939

Activation: sigmoid, RMSE: 2.86526184224681

Best activation function: sigmoid with RMSE:
2.86526184224681

Activations Ranked

30 epochs

Tanh: 0

ReLU: 3

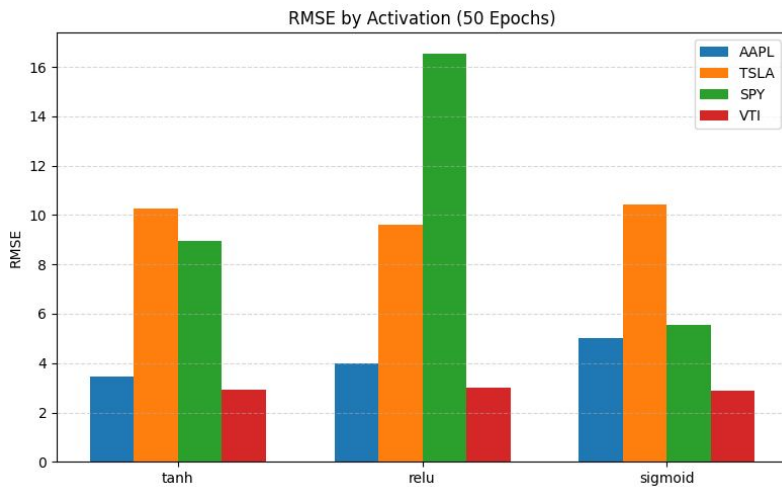
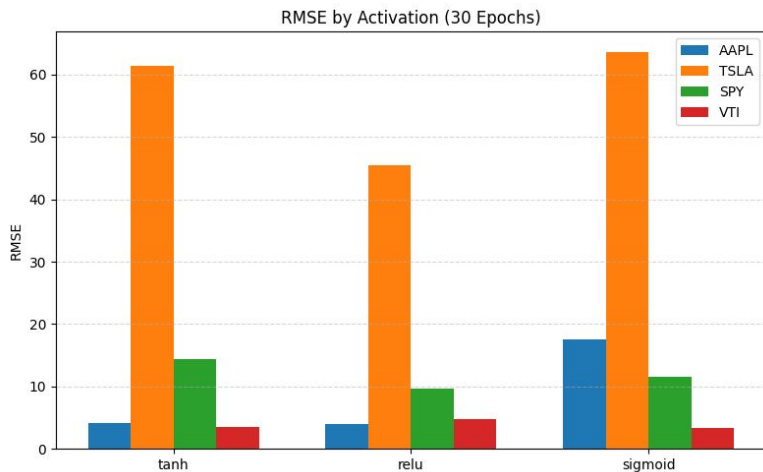
Sigmoid: 1

50 epochs

Tanh: 1

ReLU: 1

Sigmoid: 2



Conclusions

RMSE lowered as epochs increased, a negative correlation

RMSE was higher on stocks that are more volatile, naturally harder to predict

When testing from 2010-2023, RMSE was lower than from 2010-2025

Real World Applications

The current political administration has caused the markets to become increasingly volatile. Tariffs are considered 'bad business' and has caused extreme fluctuations in volatility over recent months. We have seen several historic market moves, with stocks moving +/-8% some days. This volatility scares investors and then markets must account for consumer sentiments, and not only stock data. This results in predictions being very challenging, and we have already seen companies not report forecasts during their earnings reports.