Agricultural Futures

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Loaded In and Cleaned the Data

- CME DataMine
- HE - lean hogs
- ZC - corn
- ZM - soybean meal
- LE - live cattle
- GF - feeder cattle
- Built the project in Jupyter Lab
- Joined the data into a single Data Frame

Project Goals

- Predict hog prices
    - Feed is 95% of the cost
    - Farmers need to determine quantity of corn to purchase
    - What are farmers margins?
    - What is GFM?
    - How does all this correlate?
- Predict and create a profitable algo for trading the hog crush
    - Assess and visualize results

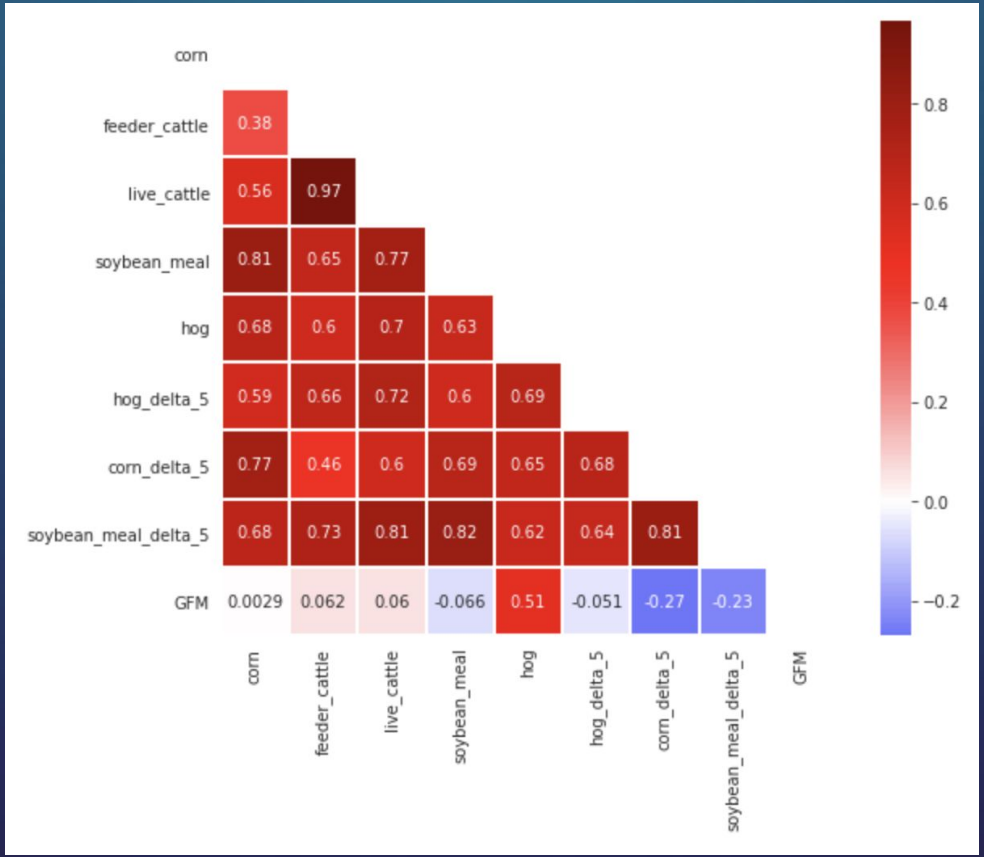
Understanding Gross Feeding Margin (GFM)

- The difference between the purchased inputs value and the sold finished hog value is known as the gross feeding margin (GFM).
- GFM t= 2.05 * LH t - WP t-5-(10 * C t-5)-(0.a * SM t-5)
- **LH t**: Lean Hog at placement, **WP t-5**: Weaned Hog 5 months from placement, **C t-5**: Corn 5 months from placement, **SM t-5**: Soybean meal 5 months from placement.
- Corn and soybean meal correlate positively with the price of actual hog.

Data Preparation

- Created a correlation matrix
- Used the window_data function to generate the X and y values for the model
- Experimented with window sizes to see how the model performance changed
- Split the data into 70% training and 30% testing
- Applied the MinMaxScaler to the X and y values to scale the data between 0 and 1
- Reshaped the X_train and X_test data for the model

Correlation Matrix



Assess the Value of the Hog Crush

- Traders subtract the combined values of the corn and soymeal inputs from the value of the lean hogs.
- Hogs are priced per hundred pounds in eight futures contracts (40,000 lbs per contract)
- Corn is priced per bushel in three contracts (5,000 bushels per contract)
- Soymeal is priced for short ton in a single contract (100 short tons per contract)
- Creating a 8-3-1 Hog Crush
- Expressed as a positive value of price per cwt. (hundredweight) of lean hogs

Trading Algo on Hog Crush

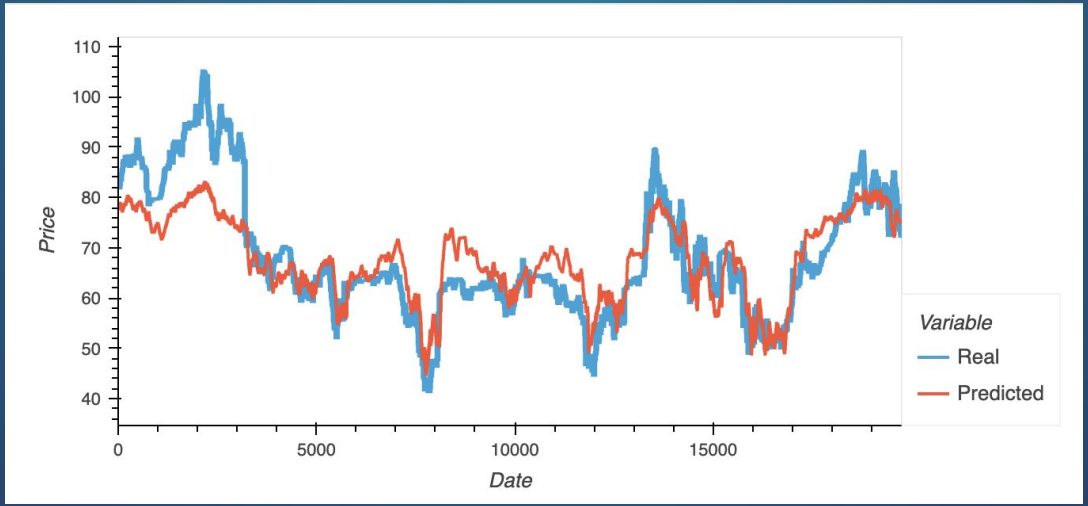
- Visualized correlations
- Confirmed the hog crush ratio through historical OLS
- Due to mean-reverting nature of spread, created z-score based algo
- Used feature engineering to enhance model using a z-score over MACD (Chose 5 and 60)
- Plot the equity curve and analyze the performance on a risk adjusted basis

	coef	std err
const	1.144e+05	1462.935
corn	3.1219	0.106
soybean_meal	1.2026	0.087

Built and Trained the LSTM RNN Model

- Defined the model architecture
- Compiled the model
- Fit the model
- Ran two different models to exemplify our process

Date	corn	feeder_cattle	live_cattle	soybean_meal	hog	hog_delta_5	corn_delta_5	soybean_meal_delta_5	GFM
2001-06-04	2.1500	91.450	76.200	151.9	52.075	47.500	2.6175	176.3	43.60625
2001-06-05	2.1425	91.500	76.275	152.2	51.575	47.800	2.5825	176.4	42.77375
2001-06-06	2.1725	91.350	75.975	154.1	51.425	47.150	2.6100	175.2	42.60625
2001-06-07	2.1700	91.150	75.750	153.8	51.600	48.000	2.6100	173.8	42.64500
2001-06-08	2.1550	91.475	75.950	155.7	52.675	48.000	2.5800	171.7	45.30625
2001-06-11	2.1725	91.475	75.925	156.8	53.375	48.300	2.5800	172.3	46.54625
2001-06-12	2.1575	91.250	75.550	158.6	53.525	48.275	2.5925	174.2	46.59875
2001-06-13	2.1525	91.125	75.575	157.7	53.600	47.800	2.6150	172.9	46.86250
2001-06-14	2.1350	90.850	75.175	156.9	52.925	47.875	2.5625	170.0	46.18375
2001-06-15	2.0925	91.100	75.075	154.1	53.450	47.850	2.5425	169.9	47.48000


110
100
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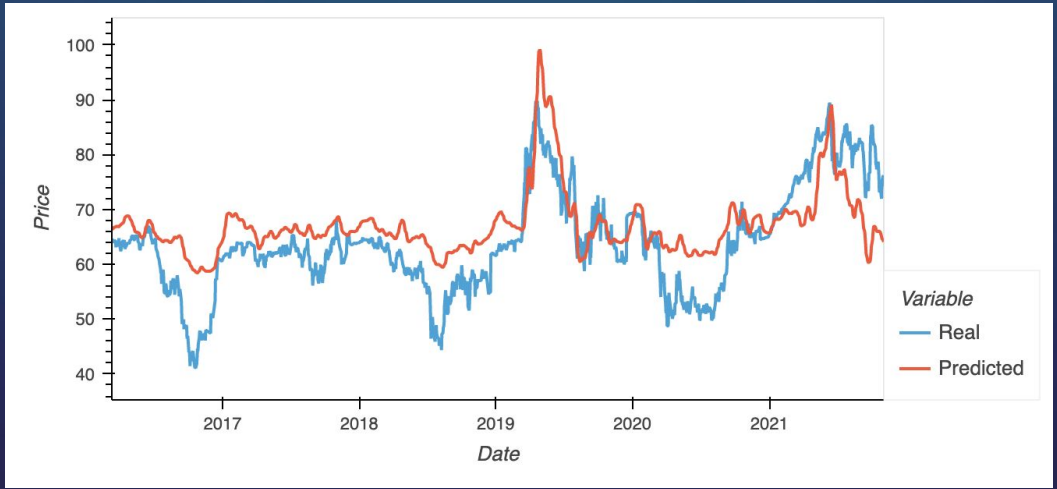
80
70
60
50
40
Price
0
5000
10000
15000
Date
Variable
Real
Predicted


100
90
80
70
60
50
40
Price
2017
2018
2019
2020
2021
Date
Variable
Real
Predicted

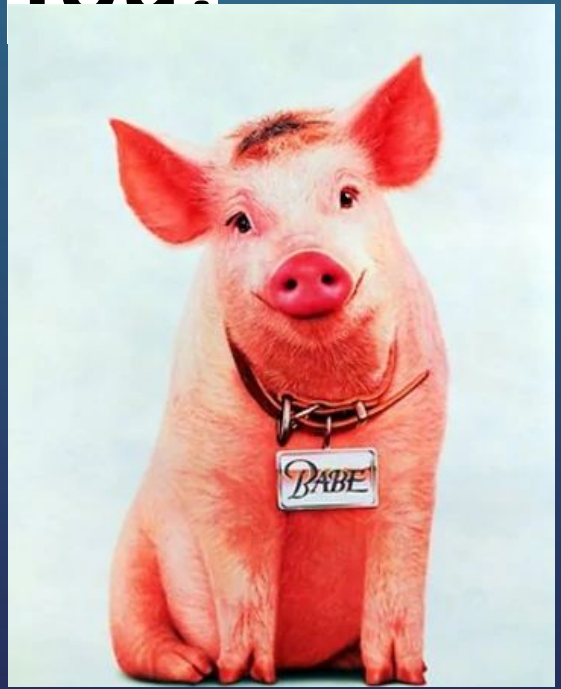
Conclusions and Predictions

- We need to add more data to the model to train.
- We would need more time or an extremely powerful machine for us to play around with an LSTM model and move inputs and variables around.
- Consider risk-adjusted metrics to better ascertain algo robustness
- Optimize MA variables and z-score entry levels
- Calculate and implement cost of trading (commissions, slippage, etc.)
- Assess seasonality and remove outlier data like (PED in 2014, COVID, etc.)

Future Considerations

- - Add Weather Data Api
- - Add Oil Prices Api
- - Perform Livestock Disease Analysis
- - Factor In Land, Storage and Fertilizer Costs
- - Take more time to analyze more models and understand more the capabilities and inputs of Deep Learning Models

Thank You!



Resources

- https://jakevdp.github.io/PythonDataScienceHandbook/04.01-simple-line-plots.html
- https://machinelearningmastery.com/machine-learning-in-python-step-by-step/
- https://towardsdatascience.com/how-to-build-your-first-machine-learning-model-in-python-e70fd1907cdd
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