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# Gold and cryptocurrencies exchange rates correlation

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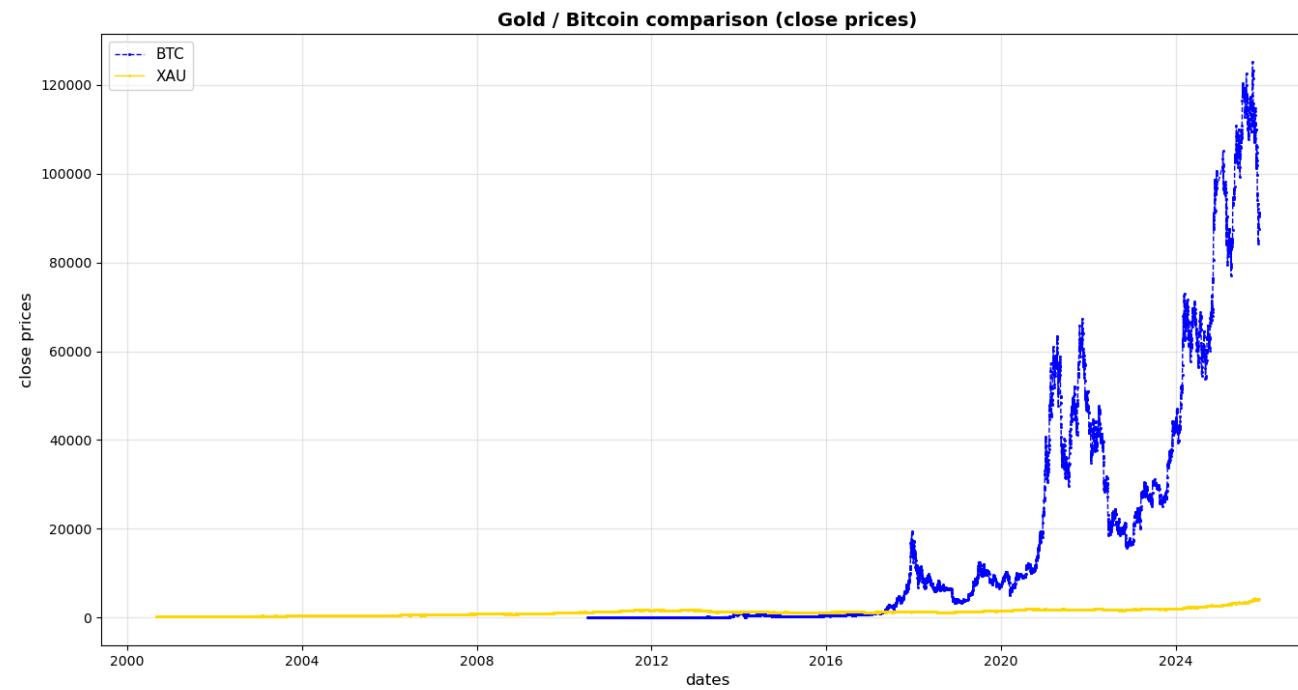
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# I Method

# Data shape



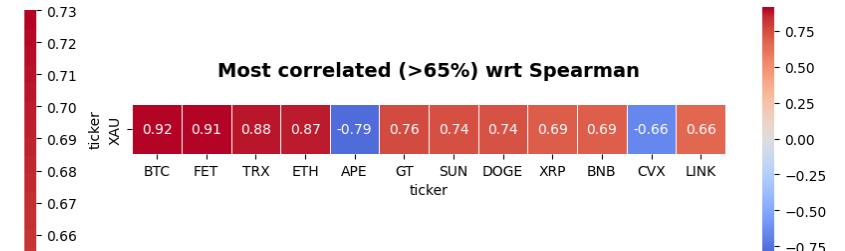
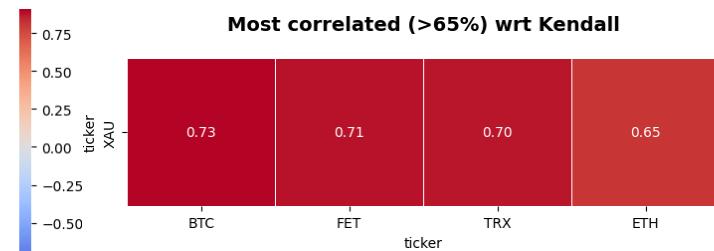
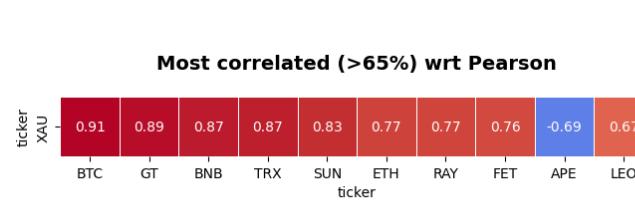
Cryptos do not seem to be correlated to gold exchange rate:



# Method

- Tickers with >65% of correlation with gold (from Kaggle and Yahoo! Finance)
- Date ranges from 16/05/2022 to 09/12/2024 (hole in dataset from 10/12/2024)
- Tickers are exogenous data for gold time series

Correlation matrices:



## Models

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Models applied to time series:

- Naive model: tomorrow = today
- ARIMA/SARIMA model: captures linear trend of gold price changes
- LSTM (deep learning): Long Short Term Memory (CNN) keeps important data over long time

Final model: ARIMA/SARIMA + LSTM together

# Time series

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ds	exogenous tickers	y	unique_id
date	normalized price at closing time (one column for each ticker)	gold price at closing time (in \$)	XAU

day	week	month
day of the month	week of the year	month of the year

months_since_start	is_holiday	days_to_holiday
number of month since the first date	holiday with respect of US federal calendar	amount of days remaining before next holidays

# Result

# Result

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metric	Naive	HistoricAverage	WindowAverage	SeasonalNaive
MAE	57.471655	598.324263	83.421234	86.408374
MSE	4161.423763	359019.774221	7986.952859	9092.011023

Table 4: Baseline Model comparison (1/2)

metric	ARIMA	SARIMA
MAE	71.508333	71.508333
MSE	5916.408276	5916.408276

Table 5: Baseline Model comparison (2/2)

## Result (ii)

Model	MAE	RMSE
ARIMA_TimeOnly	74.022	79.428
SARIMA_TimeOnly	74.022	79.428
ARIMA_Crypto+Time	92.358	101.845
SARIMA_Crypto+Time	117.592	132.474

Table 6: ARIMA/SARIMA comparison between different features

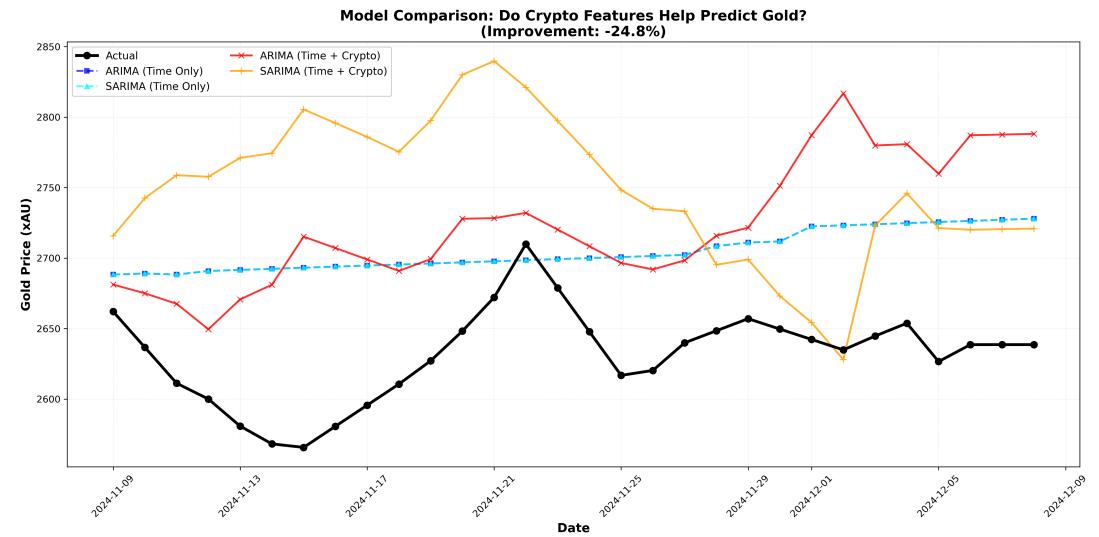
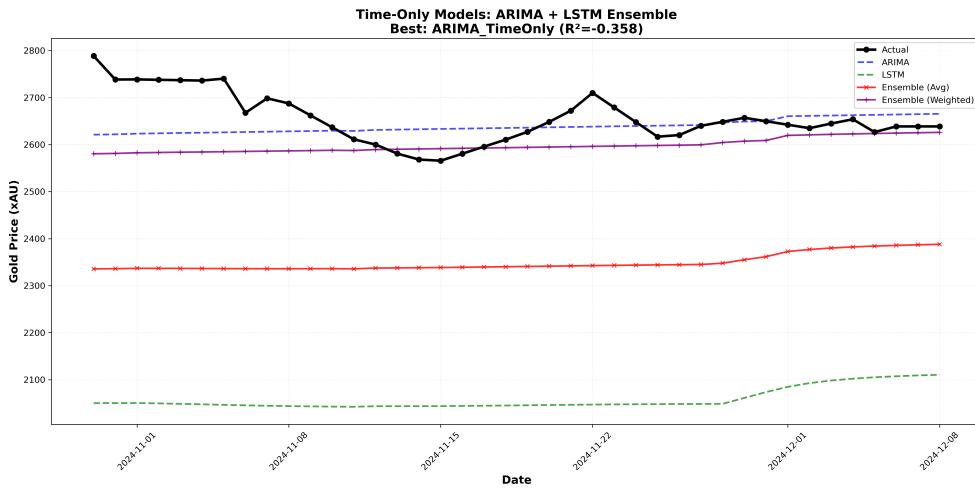


Figure 1: Visualization ARIMA/SARIMA

# Result (iii)

Model	MAE	RMSE	R <sup>2</sup>
ARIMA_TimeOnly	45.66	61.00	-0.358
LSTM_TimeOnly	540.974	543.786	-106.889
Ensemble_Avg_TimeOnly	278.607	284.345	-28.499
Ensemble_Weighted_TimeOnly	60.585	81.713	-1.436

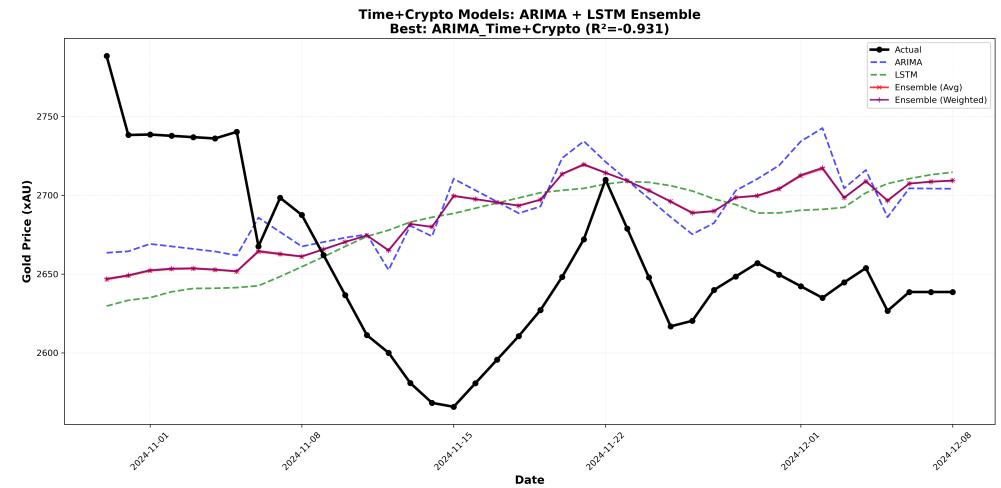
**Table 7:** “Time-Only Dataset Result”



**Figure 2:** “Time-only models visualization”

Model	MAE	RMSE	R <sup>2</sup>
ARIMA_Time+Crypto	47.485	58.477	-0.248
LSTM_Time+Crypto	59.376	70.860	0.0239
Ensemble_Avg_Time+Crypto	43.320	57.908	-0.223
Ensemble_Weighted_Time+Crypto	42.270	57.227	-0.195

**Table 8:** “Time + Crypto Dataset Result”



**Figure 3:** “Time+crypto models visualization”

## Conclusion

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High correlation found but hard to predict  
gold exchange rate.

Question time!