

Correlation Analysis on Cryptocurrency and Traditional Financial Assets

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IT Skills for Research

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1 General View

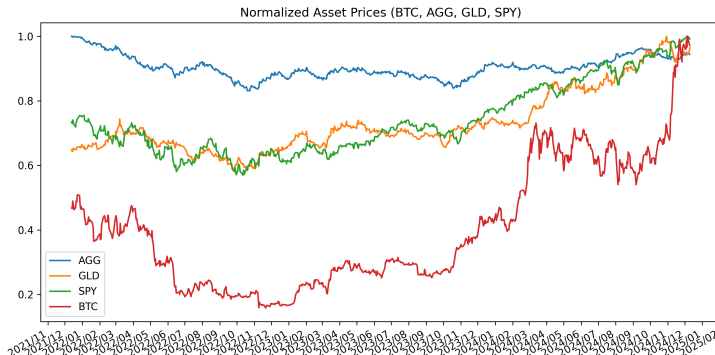
2 Data Description

3 Results and Findings

- In this project, we investigate the dynamic relationship between cryptocurrency and traditional financial asset markets from November 2021 to January 2025.

Overview

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- In general, Bitcoin shows a moderate positive correlation with the S&P 500 Index, while its relationships with COMEX Gold Futures and Aggregate Oil Futures are weaker and more variable.



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- In general, Bitcoin shows a moderate positive correlation with the S&P 500 Index, while its relationships with COMEX Gold Futures and Aggregate Oil Futures are weaker and more variable.
- Further, the LSTM-based correlation heatmap reveals stronger correlations across all assets

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In this research project, we used Yahoo Finance data on the following items:

- Cryptocurrency market
- Traditional financial asset market

Classes of consumption goods and commodities

Traditional financial asset Groups:

- The S&P 500 Index
- West Texas Intermediate (WTI) futures
- COMEX gold futures

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Cryptocurrency Groups:

- Bitcoin index

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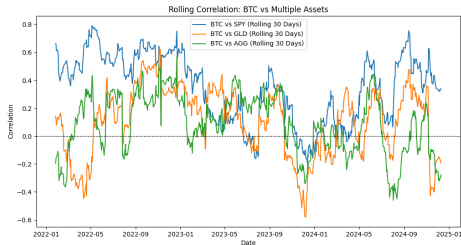
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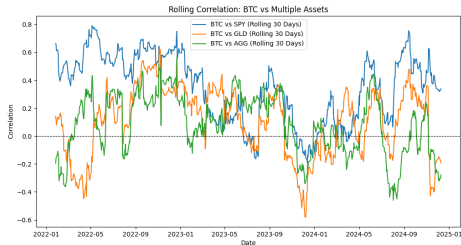
Correlation Analysis

- The figure illustrates the rolling 30-day correlation between different asset classes.



Correlation Analysis

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- Bitcoin shows a moderate positive correlation with the S&P 500 Index, while its relationships with COMEX Gold Futures and Aggregate Oil Futures are weaker and more variable, reflecting differing macroeconomic influences and market-specific dynamics.



Vector Autoregression Model

- Indicate no significant causal relationship between BTC and the selected traditional assets at the 5% significance level. For AGG, GLD, and SPY, the p-values (0.977, 0.423, and 0.091, respectively) are above the critical threshold of 0.05

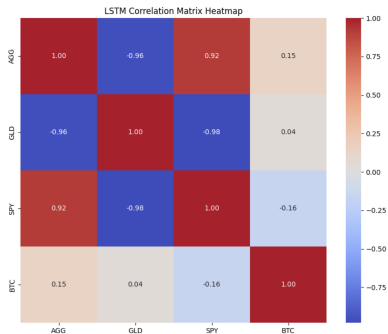
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Causality of BTC on AGG:
Granger causality F-test. H_0: AGG does not Granger-cause BTC. Conclusion: fail to reject H_0 at 5% significance level.
=====
Test statistic Critical value p-value df
-----
0.0000512 3.845 0.977 (1, 2992)

Causality of BTC on GLD:
Granger causality F-test. H_0: GLD does not Granger-cause BTC. Conclusion: fail to reject H_0 at 5% significance level.
=====
Test statistic Critical value p-value df
-----
0.6426 3.845 0.423 (1, 2992)

Causality of BTC on SPY:
Granger causality F-test. H_0: SPY does not Granger-cause BTC. Conclusion: fail to reject H_0 at 5% significance level.
=====
Test statistic Critical value p-value df
-----
2.859 3.845 0.091 (1, 2992)
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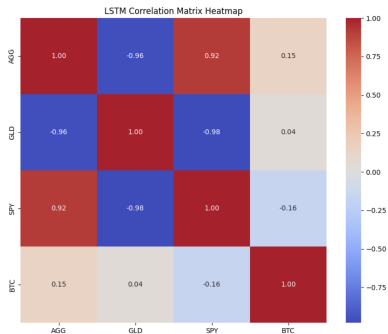
Long Short-Term Memory Model

- The figure represents the heatmap of LSTM correlation matrix, revealing the relationships between the four financial assets.



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Long Short-Term Memory Model

- The figure represents the heatmap of LSTM correlation matrix, revealing the relationships between the four financial assets.
- The matrix demonstrates an exceptionally high degree of correlation across all traditional assets
- But! Not bitcoin. In contrast to the earlier Pearson correlation analysis, which may have shown higher correlations in certain short-term market conditions, the LSTM heatmap reflects Bitcoin's longer-term

