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ARKANSAS®

TSLA vs F During COVID-19: Volatility, Sharpe Ratios & Event Study

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Introduction

Topic

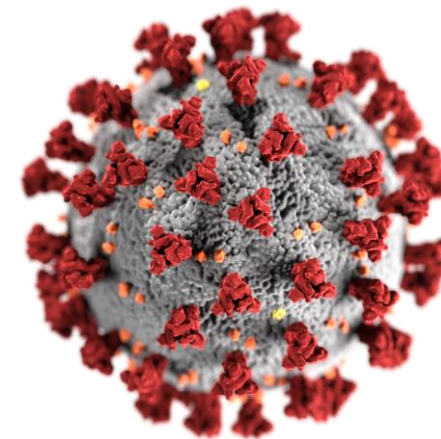
Comparison of **Tesla (TSLA)** vs **Ford (F)** throughout the COVID-19 pandemic.

Goals

- Volatility analysis
- Risk-adjusted return analysis
- Event-driven short-term reaction

Data

Benchmark data (S&P 500) & macro data (FRED)



Research Questions

RQ1: Volatility & Risk-Adjusted Returns

- How did TSLA & F differ in volatility?
- Which had higher *risk-adjusted* returns (Sharpe)?

RQ2: Event-Driven Analysis

- How did major COVID events impact short-run movements?
- Did TSLA & F respond differently tow WHO/CARES Act/Pfizer?

Data Sources



TSLA, F, S&P 500
daily price data



CPI: Inflation indicator
3-Month T-Bill: risk-free rate used in Sharpe Ratio

Event Dates: WHO announcement, CARES Act, Pfizer vaccine

Methodology

Methodology

Data Cleaning

- Align trading days
- Forward-fill macro data (monthly → daily)

Returns & Volatility

- Daily % returns
- 30-day rolling volatility

Sharpe Ratio

- Uses **3-month T-Bill from FRED** as the risk-free rate
- Annualized Sharpe = $\sqrt{252} \times \text{mean excess return} / \text{std deviation}$

Event Studies

- ± 10 trading day windows
- Cumulative returns & pre/post volatility

Analysis

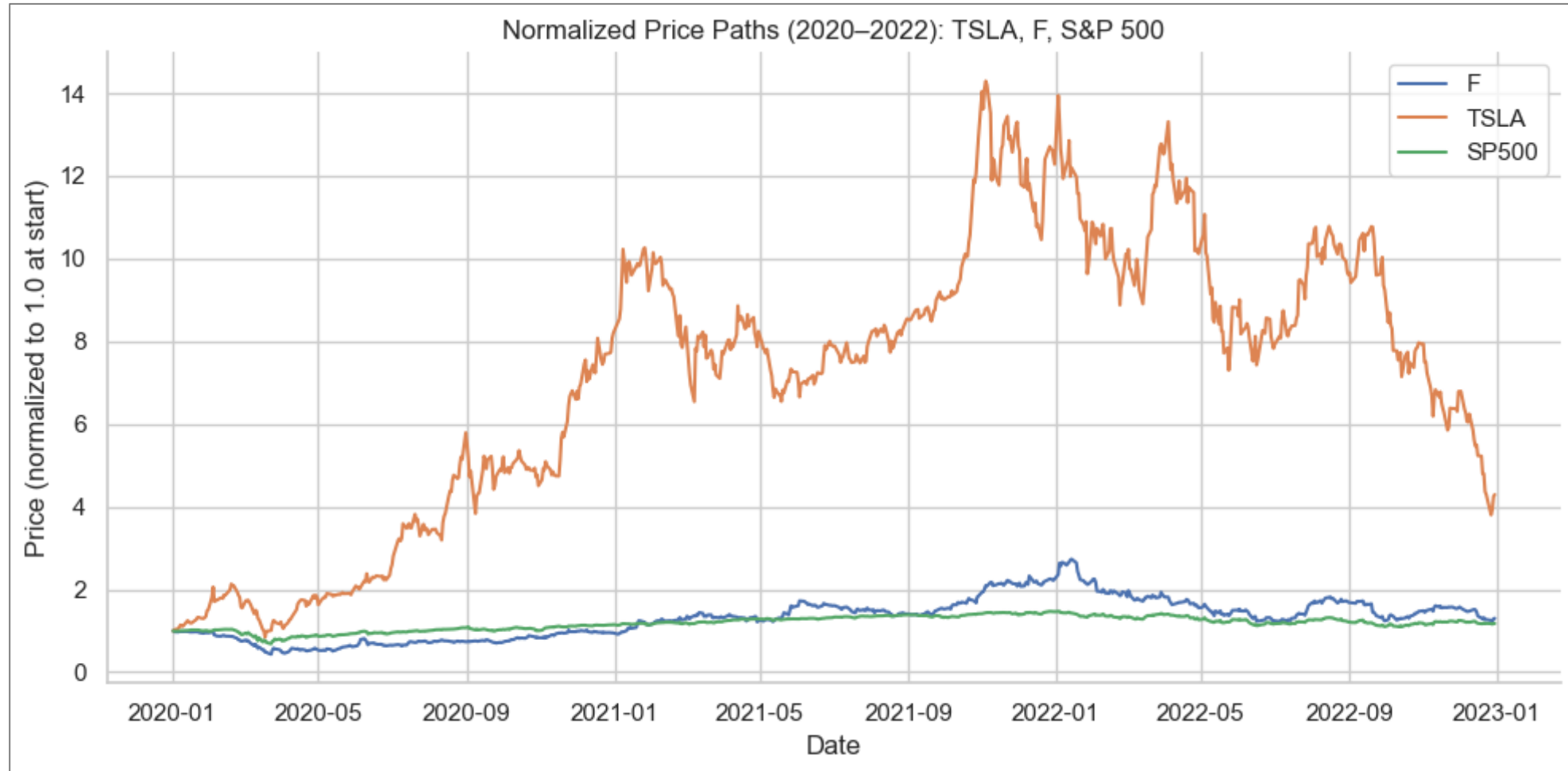
Descriptive Statistics (2020 – 2022)

Asset	Mean Daily Return	Std Dev Daily Returns	Sharpe Ratio
TSLA	0.0030	0.0455	1.0236
F	0.0008	0.0312	0.4074
S&P 500	0.0003	0.0160	0.3115

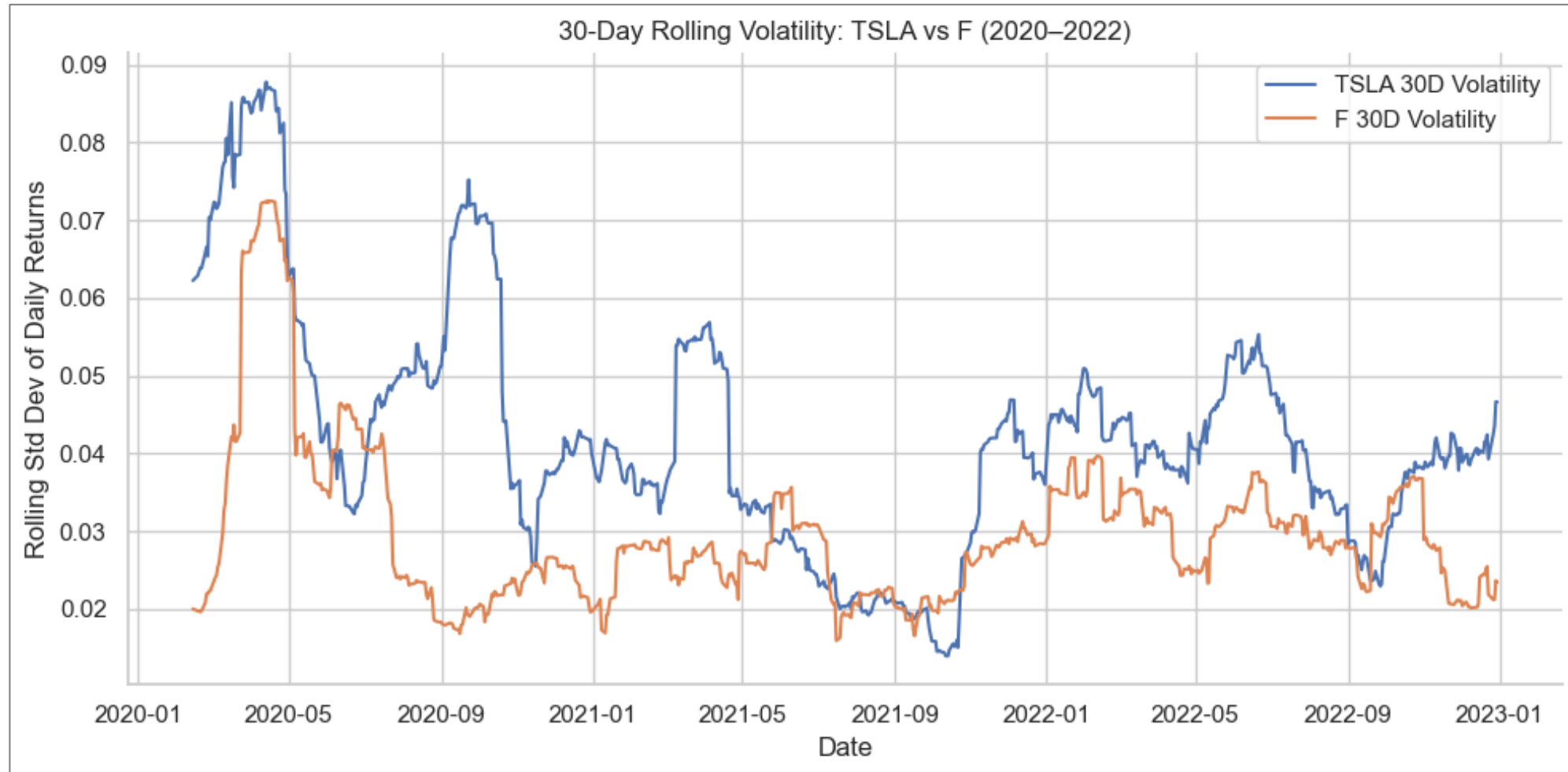
- Tesla generated **nearly 4×** Ford's average daily return.
- Tesla was **more volatile** but still had a **higher risk-adjusted** return (Sharpe).
- Ford's returns were **more correlated with the S&P 500** (0.62 vs 0.51).
- Tesla's lower correlation reflects **growth-stock behavior**, while Ford tracks **cyclical market trends**.

Visualization

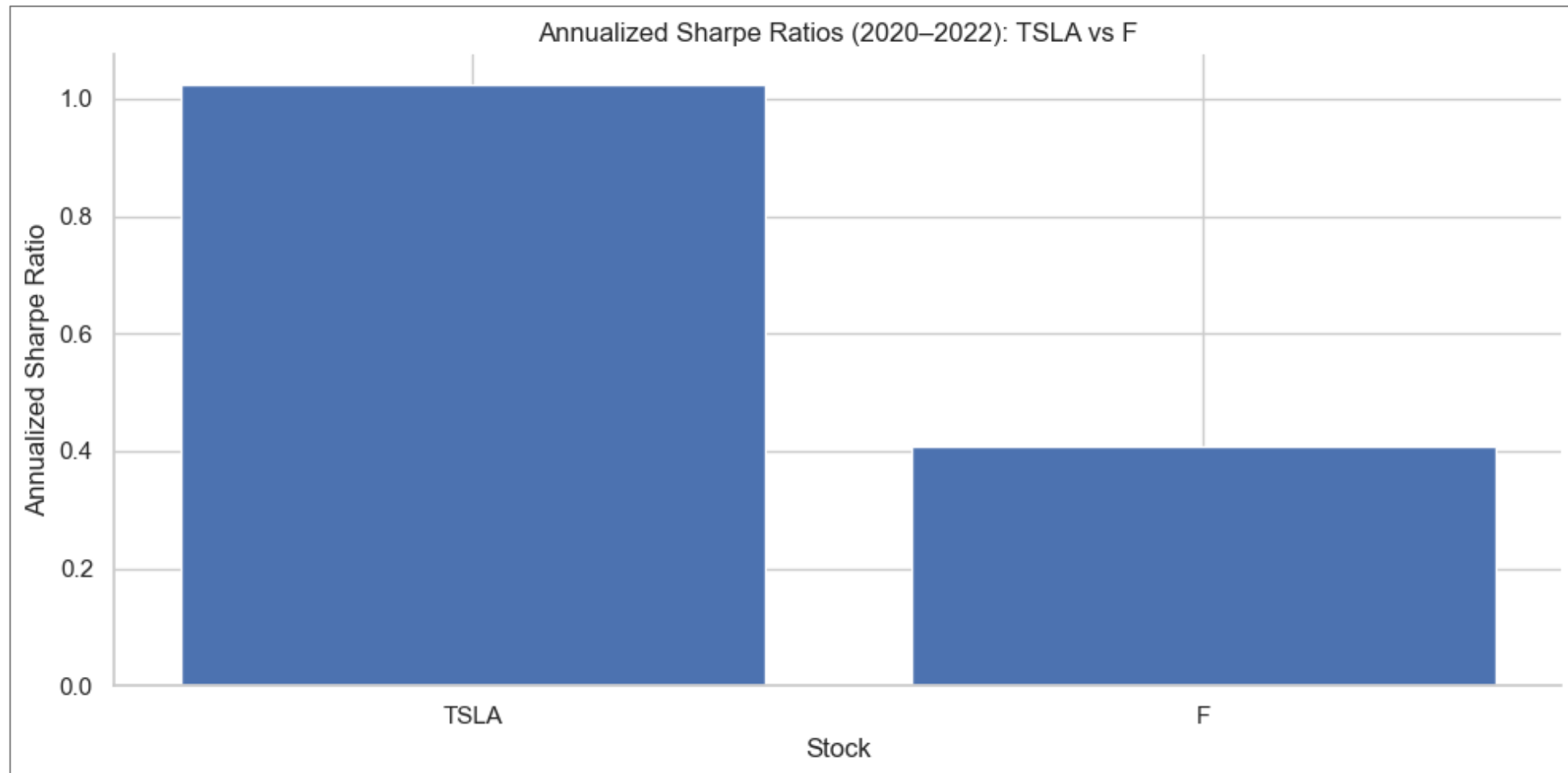
Normalized Price Paths



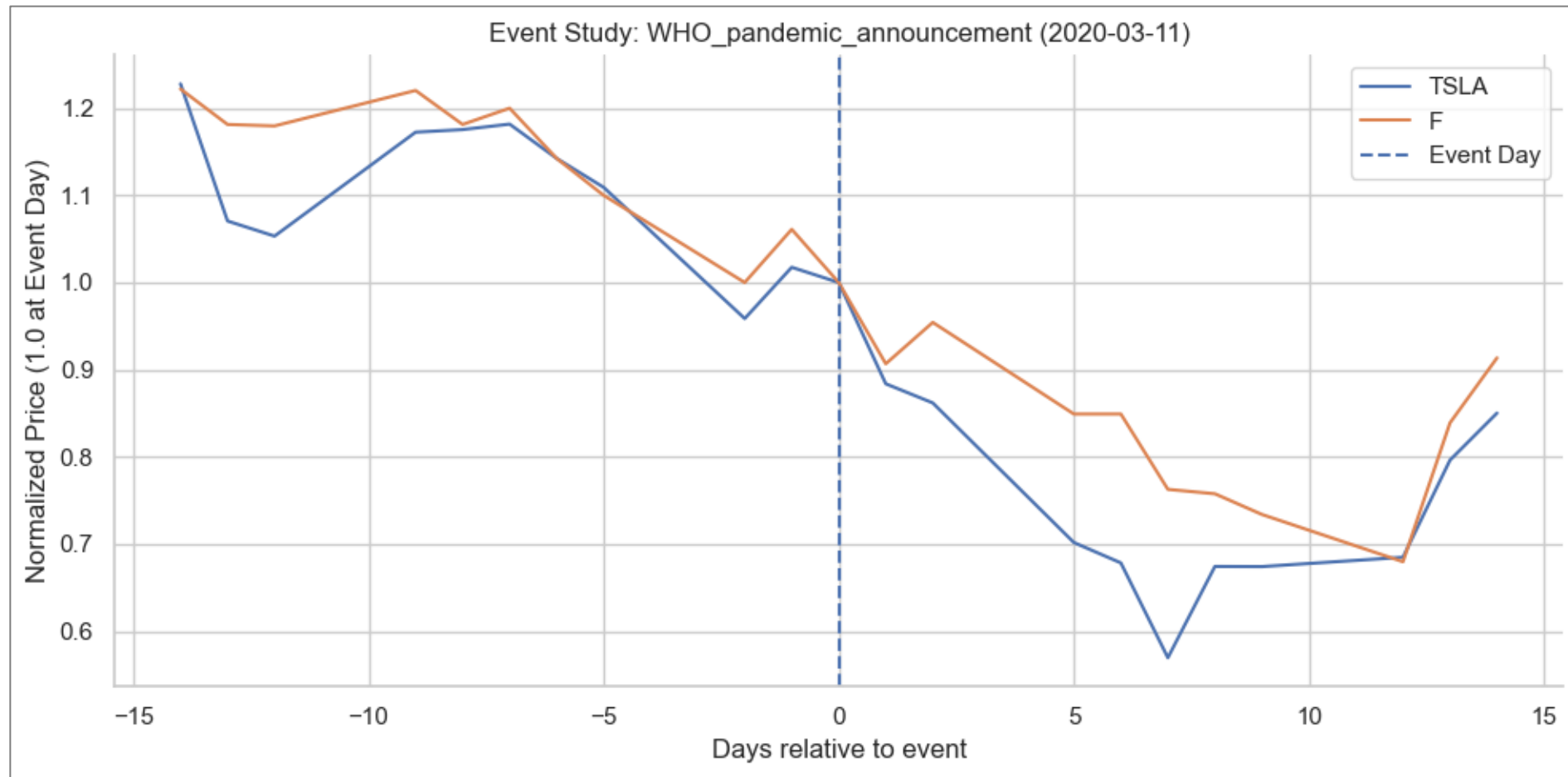
30-Day Rolling Volatility



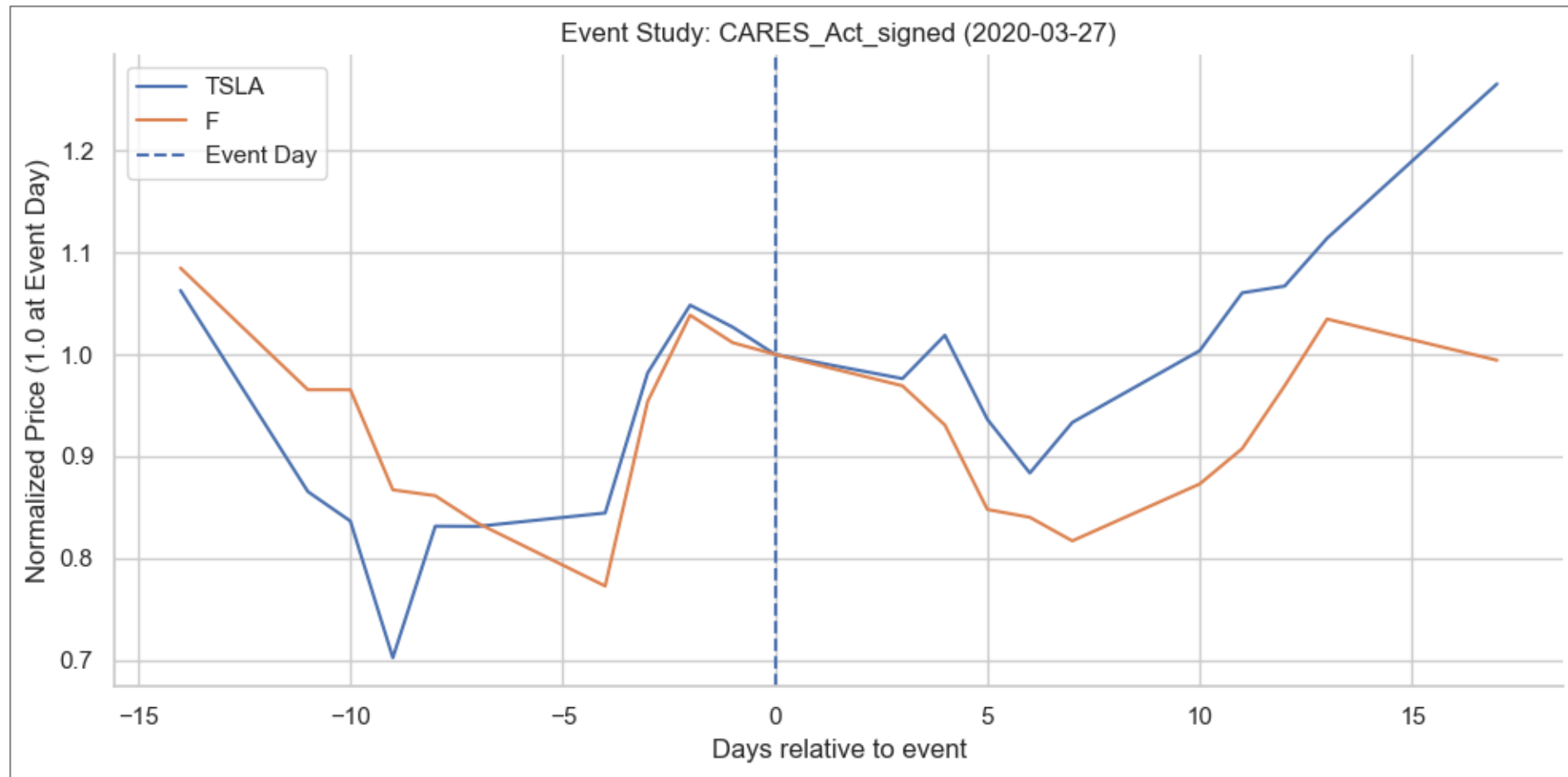
Sharpe Ratios (Using FRED Risk-Free Rate)



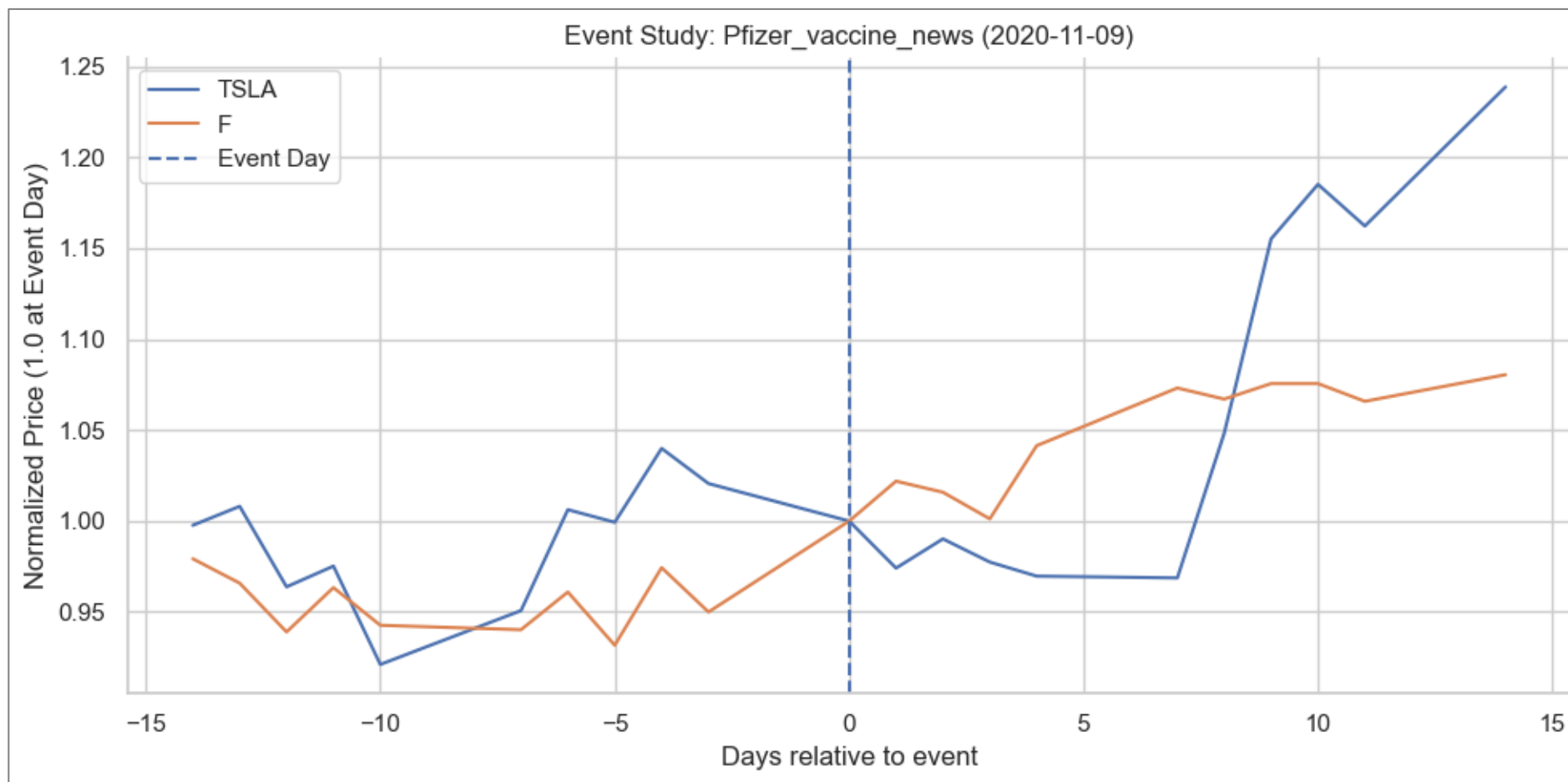
Event Study Overview



Event Study Overview



Event Study Overview



Results

Answering Research Questions

RQ1:

How did TSLA & F differ in volatility?
Which had higher *risk-adjusted* returns (Sharpe)?

Volatility

- TSLA consistently more volatile
- Higher spikes around major events

Risk-Adjusted Returns

- TSLA Sharpe = **1.02**
- F Sharpe = **0.41**
- TSLA outperforms even after adjusting for risk (via FRED T-Bill rate)

RQ2:

How did major COVID events impact short-run movements?
Did TSLA & F respond differently to WHO/CARES Act/Pfizer?

WHO Announcement

Both fall – TSLA drops harder

CARES Act

TSLA rallies sharply – Ford flat

Pfizer Vaccine

Both rise – TSLA much stronger

Overall

TSLA reacts more aggressively – up and down – while Ford reacts moderately & more in line with market fundamentals.

Insights

Tesla

- Higher volatility
- Higher absolute returns
- Higher risk-adjusted returns
- Bigger responses to macro news

Ford

- Lower volatility
- More stable, cyclical behavior
- Movement closer to S&P 500

COVID events magnified the difference between a high-growth tech stock and a traditional automaker

Challenges & Future Work

Challenges & Future Work

Challenges

- Align daily stock data with monthly FRED macro data
- Converting T-Bill annual yields to daily risk-free rate
- Selecting clean event windows
- Avoiding noise from long pandemic timelines

Future Work

- Add more automakers (GM, Toyota, Rivian)
- Include more FRED macro series (VIX, unemployment, PMI)
- Expand event-study to additional policy announcements

Thank you