

GLOBAL STOCK INDEX PERFORMANCE ANALYSIS USING TIME SERIES MODELING

ABSTRACT

We analyze the performance and volatility of six major global stock indices using GARCH (1,1) models.

Findings show strong volatility persistence across markets, with notable regional differences in short-term volatility behavior.

INTRODUCTION:

- Global markets fluctuate due to macroeconomic shocks and systemic risks.
- Volatility modeling, like GARCH, helps understand and predict market behavior.
- Objectives:
- Model return and volatility of indices
- Evaluate volatility persistence
- Compare developed vs. emerging markets



METHODOLOGY:

Indices analyzed (2000–2024):

- S&P 500 (USA)
- FTSE 100 (UK)
- DAX (Germany)
- Hang Seng (Hong Kong)
- Nikkei 225 (Japan)
- Bovespa (Brazil)

Data Source: Yahoo Finance

Return Calculations:

$$r_t = \ln \left(\frac{P_t}{P_{t-1}} \right)$$



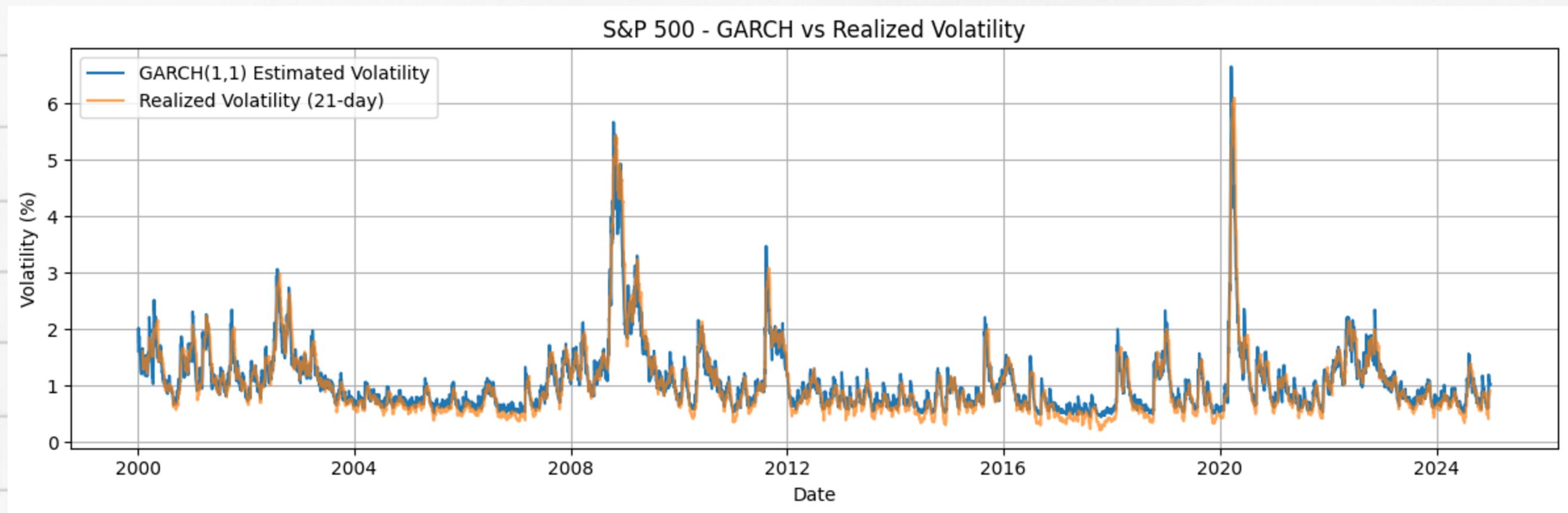
METHODOLOGY: GARCH (1,1) MODEL

GARCH(1,1) Specification:

$$\sigma_t^2 = \omega + \alpha \epsilon_{t-1}^2 + \beta \sigma_{t-1}^2$$

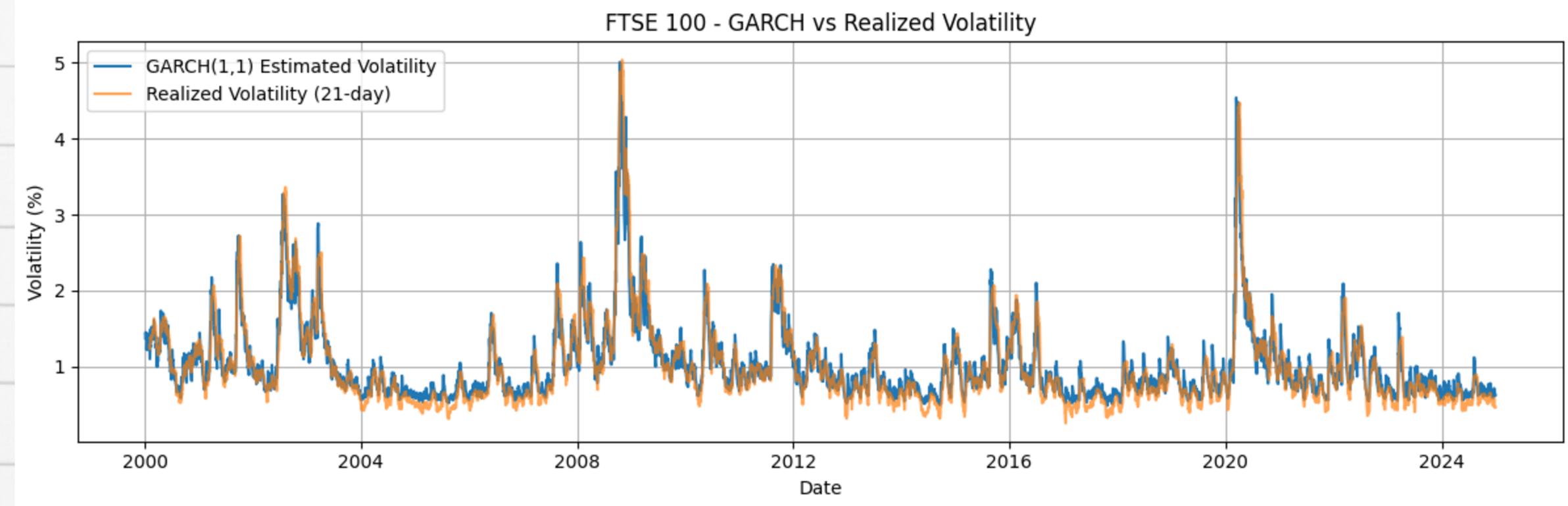
- ω : constant
- α : past shock impact (ARCH effect)
- β : volatility persistence (GARCH effect)

RESULTS: S&P 500 (USA)



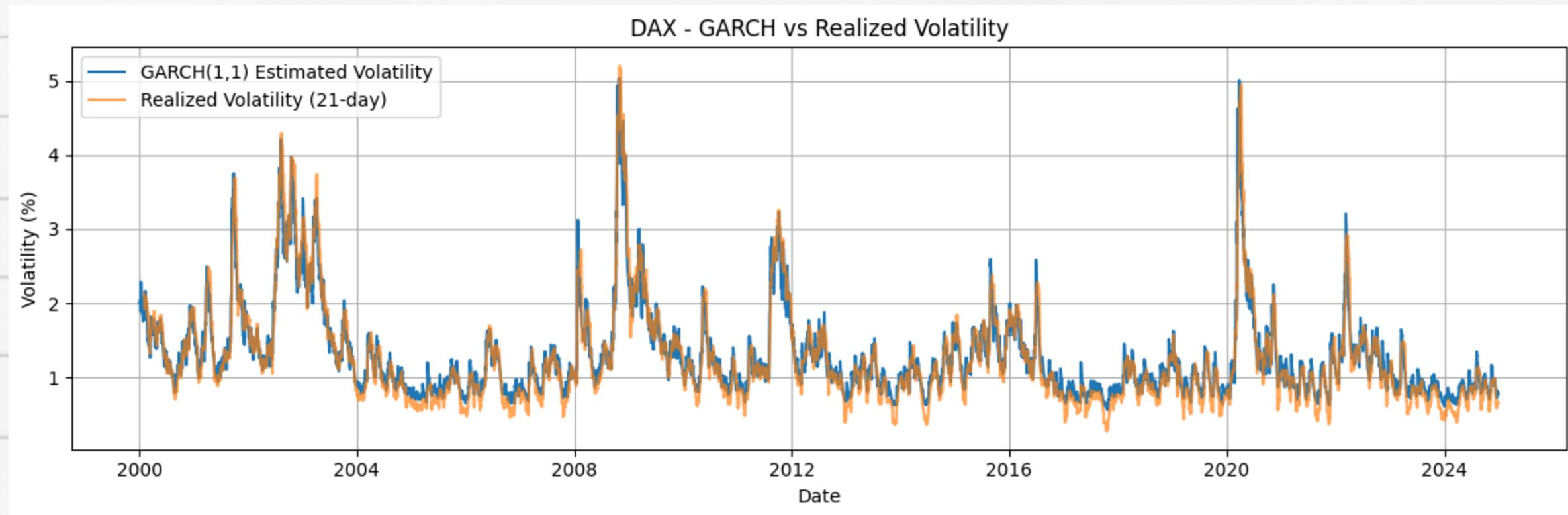
- Mean Return: 0.0655% per day
- Volatility Persistence: $\alpha + \beta = 0.9828$
- Interpretation: Strong volatility clustering and responsiveness to shocks.

RESULTS: FTSE (UK)



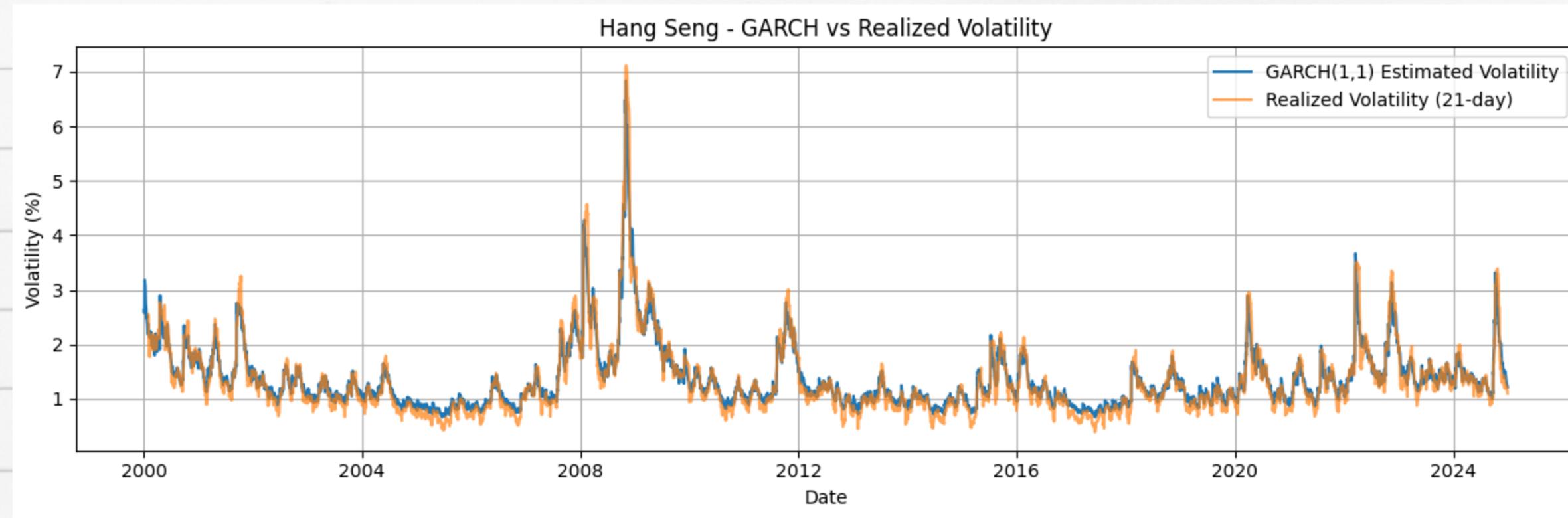
- Mean Return: 0.0352% per day
- Volatility Persistence: $\alpha + \beta = 0.9801$
- Interpretation: Strong persistence with moderate average return.

RESULTS: DAX (GERMANY)



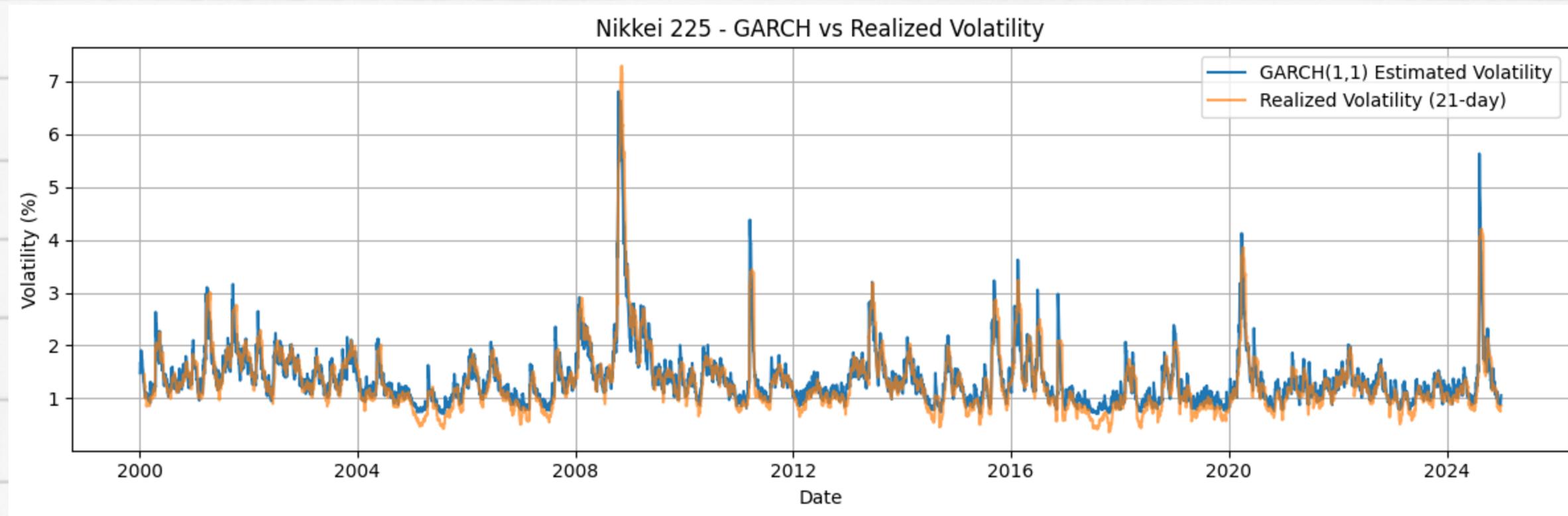
- Mean Return: 0.0715% per day
- Volatility Persistence: $\alpha + \beta = 0.9855$
- Interpretation: Highest persistence; long-lasting reactions to volatility shocks.

RESULTS: HANG SENG (HONG KONG)



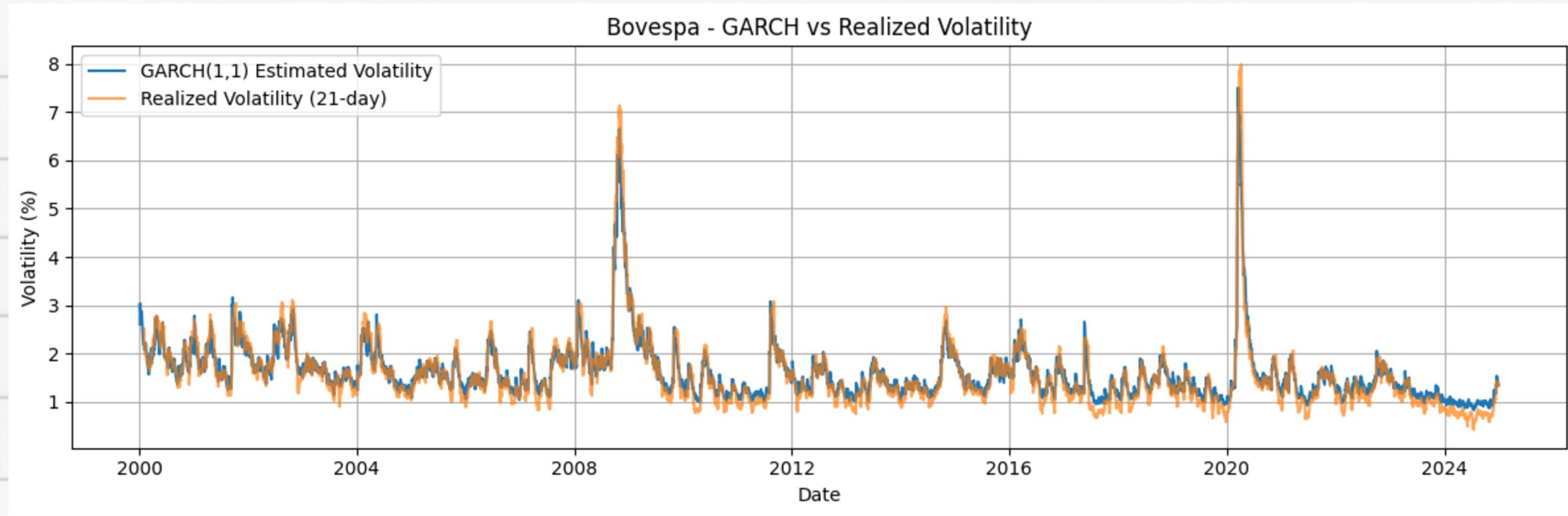
- Mean Return: 0.0443% per day
- Volatility Persistence: $\alpha + \beta = 0.9903$
- Interpretation: Extremely persistent volatility; reflects systemic risks.

RESULTS: NIKKEI (JAPAN)



- Mean Return: 0.0637% per day
- Volatility Persistence: $\alpha + \beta = 0.9775$
- Interpretation: High persistence, quicker recovery than Hang Seng.

RESULTS: BVSP (BRAZIL)



- Mean Return: 0.0649% per day
- Volatility Persistence: $\alpha + \beta = 0.9855$
- Interpretation: Highest persistence among emerging markets.

COMPARATIVE ANALYSIS

- Highest persistence: Hang Seng (0.9903)
- Bovespa and DAX closely follow (0.9855).
- Developed markets (S&P500, FTSE, Nikkei) show slightly faster recovery.



DISCUSSION

- Extended data confirms strong volatility clustering.
- Emerging markets show prolonged volatility cycles.
- Developed markets recover more quickly after shocks.
- GARCH (1,1) effectively captures market dynamics across regions.



RESULTS

- All indices exhibit high volatility persistence.
- Regional differences highlight risk characteristics.
- Findings help global investors manage diversified portfolios.
- Useful for policymakers to monitor systemic risks.



**THANK
YOU VERY
MUCH!**