MODELING VOLATILITY CLUSTERING IN EUROPEAN STOCK MARKETS USING GARCH IN EVIEWS

1. Overview

Client:

A European asset management firm focused on quantitative strategies and regulatory risk disclosures

Objective:

To assess the presence and structure of volatility clustering in key European stock indices using GARCH modeling in EViews. The goal was to enhance volatility forecasting and support portfolio risk metrics under EU regulation (e.g., MiFID II, SFDR).

2. Background

Traditional risk models underestimate short-term shocks in turbulent markets. With rising market uncertainty, the client sought a robust framework to detect and quantify time-varying volatility in equity returns. GARCH models in EViews offer an ideal solution for modeling conditional heteroskedasticity in financial time series.

3. Data Summary

Timeframe:

Daily data from January 2015 to December 2022

Indices Modeled:

Index Name	Country	Description
DAX 30	Germany	Benchmark for large-cap German equities
CAC 40	France	Represents the 40 largest listed French firms
FTSE 100	United Kingdom	UK blue-chip companies
EURO STOXX 50	Eurozone	Aggregated top 50 Eurozone stocks

Variable of Interest:

Log returns:

$$r_t = \ln\left(\frac{Pt}{Pt-1}\right)$$

4. Methodology

Software Used:

EViews 13

Model Type:

Univariate GARCH(1,1) for each index

Steps in EViews:

1. **Data Import and Return Generation:**
    - Daily closing prices imported from .csv
    - Log returns calculated using genr command
2. **Preliminary Analysis:**
    - Checked return distributions for skewness, kurtosis
    - ADF test confirmed stationarity of return series
    - Plotted squared returns for volatility clustering
3. **GARCH Model Estimation:**
    - *Quick > Estimate Equation > ARCH*
    - Conditional variance equation:

$$\sigma^2{}_t = \omega + \alpha\varepsilon^2{}_{t-1} + \beta\sigma^2_{t-1}$$

4. **Diagnostics:**
    - ARCH LM test on residuals
    - Ljung-Box test on squared standardized residuals
    - Plots of conditional variance forecasts

5. Key Results (Example: FTSE 100)

Parameter	Coefficient	p-value	Interpretation

ω (constant)	0.0000021	0.000	Baseline volatility level
α (ARCH term)	0.081	0.004	Immediate impact of recent shocks
β (GARCH term)	0.912	0.000	Strong persistence in volatility (β > α)

- Sum α + β = 0.993 → High volatility persistence
- Similar structures observed in DAX and CAC40

Model Diagnostics:

- No ARCH effect in residuals post-estimation
- Conditional variance forecast closely tracked observed spikes during Brexit and COVID-19

6. Visual Outputs (Generated in EViews)

- Conditional volatility plots (daily volatility over time)
- Residual diagnostics histograms
- Standardized residuals and squared residuals plots
- Forecast variance bands with major market events annotated

7. Deliverables

- EViews .wf1 with all series, equations, and diagnostics
- Technical report (16 pages), including:
    - Financial theory behind GARCH
    - EViews implementation workflow
    - Interpretation of volatility behavior per index
    - Implications for portfolio allocation and VaR calculations
- Summary slide deck (6 slides) for internal portfolio risk meetings

8. Outcome & Application

- Adopted as part of the client's VaR model enhancement process
- Used in quarterly risk reviews to report conditional volatility to regulators

- Incorporated into stress testing modules for European equity exposure portfolios

9. Strategic Value Delivered

- Quantified **short-term volatility risks with statistical rigor**
- Enabled **scenario-based forecasting of market turbulence**
- Supported compliance and portfolio design under **modern risk frameworks**