

Federal Reserve Sentiment and European Volatility

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- Central bank communications (eg. FOMC Minutes) influence international financial markets
- During crises (2008, COVID), Fed announcements watched by European investors
- Does FOMC sentiment affect prices and volatility in European markets?
 - ▶ Does FOMC sentiment predict VSTOXX and DAX changes?
 - ▶ If yes, how persistently?

Related Literature and Contribution

- Fed sentiment and markets

- ▶ *Bomfim (03)*: Fed policy surprises increase US stock-market volatility
- ▶ *Tetlock (07)*: Newspaper sentiment moves financial markets
- ▶ *Diebold & Yilmaz (09)*: Volatility spills over across markets and countries
- ▶ *Hilscher, Nabors & Raviv (26)*: Central bank sentiment predicts rates in US and in EU

- Open question

Does FOMC FinBERT sentiment explain changes in European volatility

- Contribution

First to apply FinBERT to FOMC Minutes and use to forecast European volatility (VSTOXX)

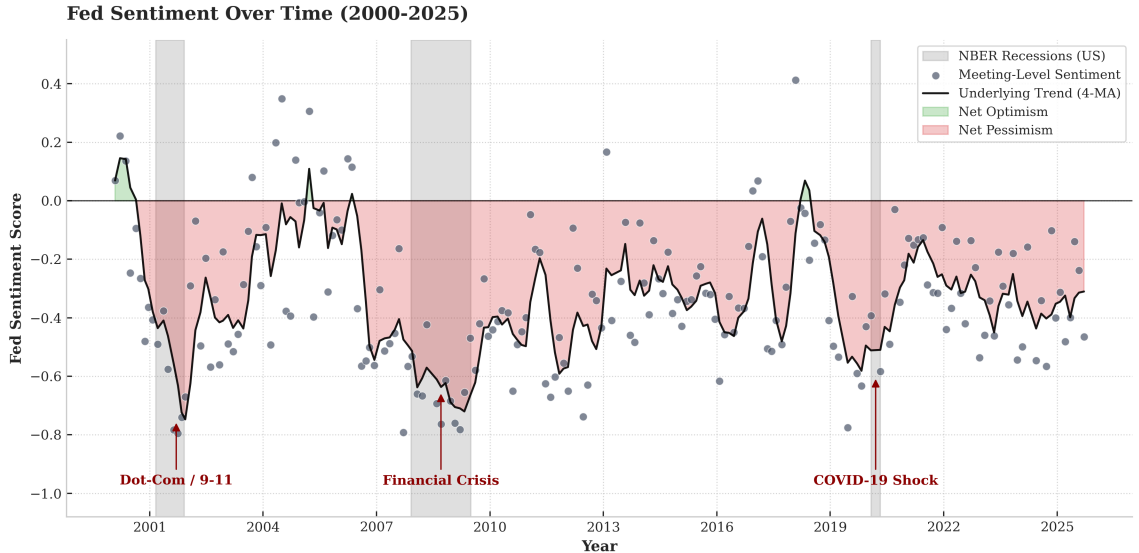
Main Findings

- VSTOXX Effects: Significant Volatility Impact (ARX-GARCH)
 - ▶ A more positive Fed tone increases VSTOXX: markets anticipate tighter monetary policy
 - ▶ Effects are highly persistent, taking multiple weeks to decay
 - ▶ Forecasting Accuracy: Adding sentiment reduces Mean Absolute Errors (MAEs) in GARCH models
- DAX Effects: Impact on Equity Prices
 - ▶ Contemporaneous: Significant negative impact, more positive sentiment leads to lower prices
 - ▶ Lagged: Fed sentiment does not affect daily percent changes in the DAX
 - ▶ Markets anticipate higher interest rates for longer

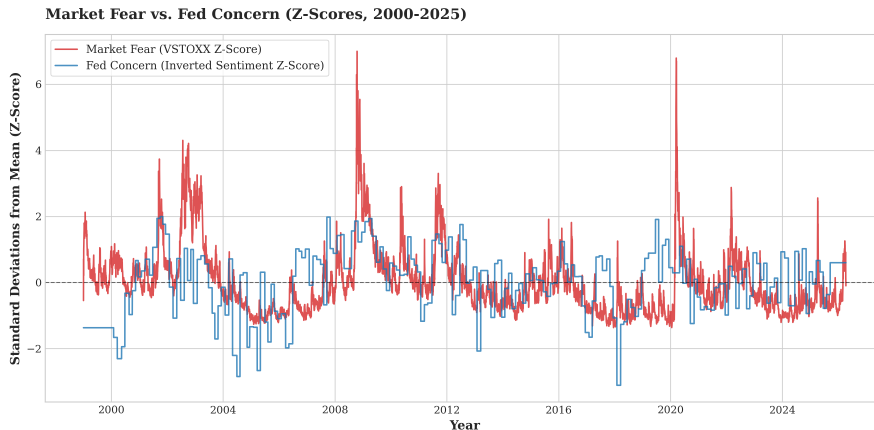
Data Description

- FOMC Minutes (2000–25) transcripts (205 docs)
- Extraction of Fed sentiment via FinBERT
 - ▶ Also standardized (Z-score) in "Fed Concern" index
- Market Data: VSTOXX (30-day implied volatility), S&P 500 index, DAX 40, VIX
- Macroeconomic Variables: US 3-month Treasury Bill rate, German 10-year yield
- One-day time lag to sentiment for US-EU trading asynchrony
- VSTOXX standardized (Z-score): interpret as "Market Uncertainty"

Fed FinBERT Sentiment Over Time



Market Uncertainty vs. Fed Concern



- Positive correlation (Pearson's $r = 0.26$, $p < 0.01$) and synchronization during stress times

Fed Sentiment and European Volatility

- ARX-GARCH (1,1) model
- Non-announcement days imputed with zero Sentiment value
- Main variables in $\Delta \log$ for stationarity
- Reflects empirical evidence for volatility clustering
- Equation (1) is the mean model, (2) is the volatility model

$$\Delta \log VSTOXX_t = \beta_0 + \phi \cdot \Delta \log VSTOXX_{t-1} + \gamma \cdot \text{Sentiment}_t + \epsilon_t \quad (1)$$

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

Results

Mean Model	Coefficient	t-Statistic	Prob.
$\Delta \log VSTOXX_{t-1} (\phi)$	-0.04	-3.31	0.001***
Sentiment _t (γ)	1.91	2.52	0.01*
Volatility Model	Coefficient	t-Statistic	Prob.
ARCH term (α)	0.09	5.83	< 0.001***
GARCH term (β)	0.87	33.06	< 0.001***

- $\gamma = 1.91$: More positive Fed sentiment increases VSTOXX (signals tighter policy)
- $\alpha + \beta \approx 0.96$: > 96% of a volatility shock carries over to next day (volatility clustering)

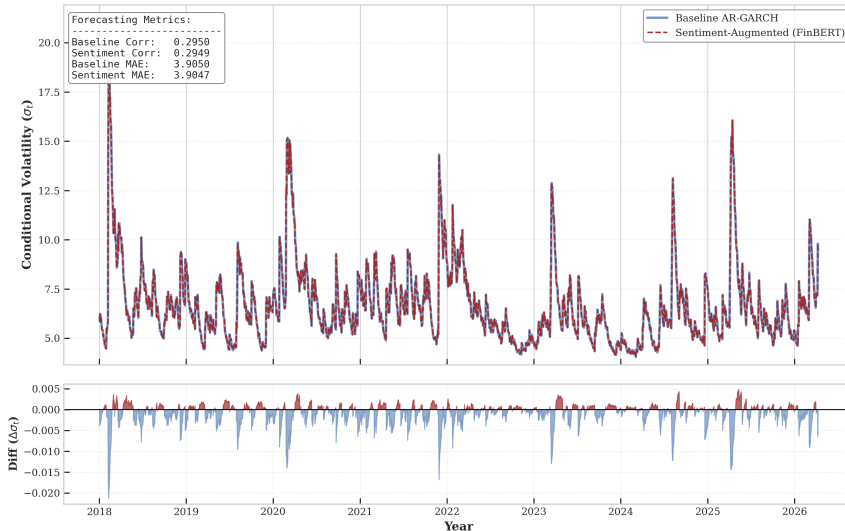
Role of Lagged Sentiment

Mean Model	Coefficient	t-Statistic	Prob.
$\Delta \log VSTOXX_{t-1} (\phi)$	-0.04	-3.39	0.001***
$Sentiment_{t-1} (\gamma)$	1.74	1.61	0.11
Volatility Model	Coefficient	t-Statistic	Prob.
ARCH term (α)	0.09	5.78	< 0.001***
GARCH term (β)	0.86	32.36	< 0.001***

- Fed sentiment does not predict next-day VSTOXX percent changes
- Lagged sentiment has no significant effect
- Conditional variance remains highly persistent over time

Sentiment Reduces GARCH MAEs

Out-of-Sample Volatility Forecasting Performance (2018-2026)



Fed Sentiment and European Equity Prices: Contemporaneous Effects

- Does Fed sentiment affect German equity prices contemporaneously?
- Model

$$\Delta \log DAX_t = \beta_0 + \phi \Delta \log DAX_{t-1} + \gamma \text{Sentiment}_t + \epsilon_t$$
$$\sigma_t^2 = \omega + \alpha \epsilon_{t-1}^2 + \beta \sigma_{t-1}^2$$

- Mean Equation Results
 - ▶ Statistically significant: $\gamma = -0.43, p = 0.003$
 - ▶ More positive Fed sentiment $\rightarrow \downarrow$ DAX
 - ▶ Markets anticipate higher interest rates for longer
- Volatility Model Results
 - ▶ Extreme variance persistence: $\alpha = 0.09$ and $\beta = 0.89$ are highly significant ($p < 0.001$)
 - ▶ Summing to $\alpha + \beta = 0.99$

Fed Sentiment and European Equity Prices: Lagged Effects

- Does Fed sentiment affect German equity prices via lags?
- Model

$$\begin{aligned}\Delta \log DAX_t &= \beta_0 + \phi \Delta \log DAX_{t-1} + \gamma \text{Sentiment}_{t-1} + \epsilon_t \\ \sigma_t^2 &= \omega + \alpha \epsilon_{t-1}^2 + \beta \sigma_{t-1}^2\end{aligned}$$

- Mean Equation Results
 - ▶ Fed sentiment does not affect daily percent changes in the DAX
 - ▶ Statistically not significant: $\gamma = 0.11, p = 0.65$
- Volatility Model Results
 - ▶ Extreme variance persistence: $\alpha = 0.09$ and $\beta = 0.89$ are highly significant ($p < 0.001$)
 - ▶ Summing to $\alpha + \beta = 0.99$

- VSTOXX Effects

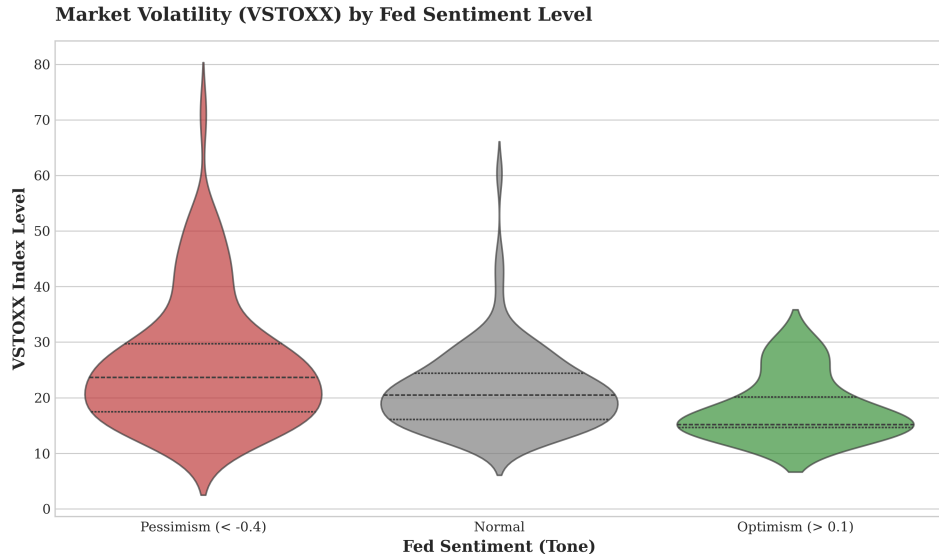
- ▶ Improvements in Fed sentiment increase VSTOXX significantly
- ▶ Effect persistent over time
- ▶ Fed sentiment inclusion reduces GARCH prediction errors, esp. during crises

- DAX Effects

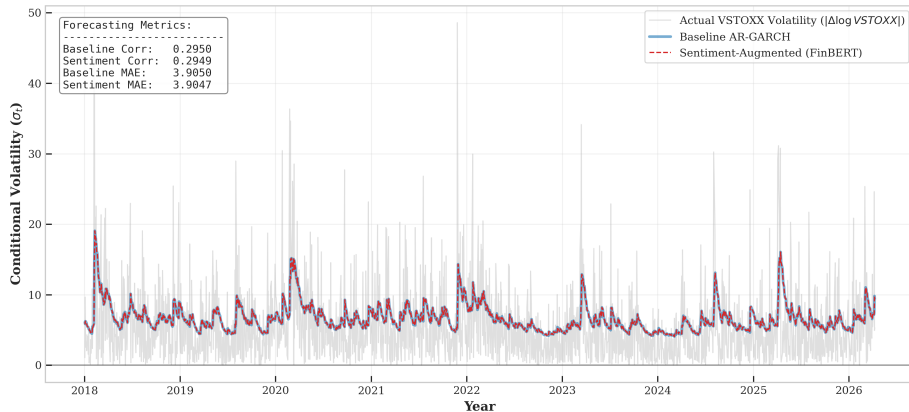
- ▶ Fed sentiment does effect contemporaneous changes in DAX
- ▶ Lagged sentiment does not predict DAX changes
- ▶ Variance remains highly persistent

Thank You

Market Volatility (VSTOXX) by Fed Sentiment Level



Out-of-Sample Volatility Forecasting Performance (2018-2026)



- Comparison of GARCH with and without Sentiment
- Both models track VSTOXX
- Introduction of sentiment reduces forecast errors ($\Delta \text{MAE} \approx -0.002$)

Fed Sentiment and European Equity Prices: Lagged Effects

Mean Equation	Coefficient	t-Statistic	Prob.
$\Delta \log DAX_{t-1} (\phi)$	-0.02	-2.00	0.045*
$Sentiment_{t-1} (\gamma)$	0.11	0.45	0.65
Variance Equation	Coefficient	t-Statistic	Prob.
ARCH term (α)	0.09	8.46	< 0.001***
GARCH term (β)	0.89	76.30	< 0.001***

- Mean Equation Results

- ▶ Fed sentiment does not affect daily percent changes in the DAX, statistically not significant

- Volatility Model Results

- ▶ Extreme variance persistence: highly significant ($p < 0.001$)