

**Federal Reserve Rhetoric and GCC Equity Market
Returns:
Insights from NLP, Sentiment Analysis and Event Studies**

**Ali Bendob
Mokhtar Benlamine**

Arab Monetary Fund © 2026

**Federal Reserve Rhetoric and GCC Equity Market Returns: Insights from NLP,
Sentiment Analysis and Event Studies**

Prepared by Ali Bendob and Mokhtar Benlamine

June 2026

The views expressed in this publication are those of the authors and do not necessarily reflect the views of the Arab Monetary Fund, its Executive Board, or the member countries.

The Arab Monetary Fund (AMF) is committed to fostering constructive communication with researchers, policymakers, and stakeholders by welcoming requests for additional information and inquiries related to its publications. For any correspondence, please contact us at Library@amfad.org.ae

Contents

ABSTRACT 4

I. INTRODUCTION 5

II. LITERATURE REVIEW 6

III. DATA & METHODOLOGY 8

 1. Data Sources and Collection 8

 2. Variable Definitions and Construction..... 8

 3. Empirical Analysis Steps..... 9

 4. Validation and Robustness Checks 11

IV. EMPIRICAL RESULTS AND DISCUSSION 11

 1. Market Reaction to Fed Speeches (Event Study Results) 11

 2. The Influence of Speaker Identity on Market Dynamics 13

 3. The Role of Sentiment in Market Movements 15

 4. Fed’s Speaker Rhetoric Profiles and Communication Styles 16

V. POLICY IMPLICATIONS AND RECOMMENDATIONS..... 20

VI. LIMITATIONS AND AVENUES FOR FUTURE RESEARCH 21

REFERENCES 23

APPENDICES..... 24

Abstract

Central bank communication has an important role in shaping financial market expectations, yet its spillover effects on financial markets outside the issuing economy remain insufficiently underexplored. This study examines the effects of the tone, sentiment, and thematic content of US Federal Reserve communications by the Federal Reserve Chair and senior officials on abnormal stock returns in Gulf Cooperation Council (GCC) countries.

In this study we use machine learning techniques, specifically natural language processing (NLP), for extracting sentiment scores and thematic signals from publicly available speeches delivered by Chair Jerome Powell and six other Federal Reserve officials. By using an event study methodology and panel regression models, the study analyses the communication shocks' transmission to GCC stock market returns and distinguishes between the effects of speaker identity, communication tone, and references to salient macroeconomic themes.

Our findings reveal a dual-channel spillover effect from the Fed's communication to GCC equity markets. First, sentiment has a significant role: positive tones associate positively and significantly with abnormal returns, while negative tones associate negatively and significantly with abnormal returns. Second, the identity of the speaker matters: the speeches of the Chair and other high-ranking or voting Federal Open Market Committee (FOMC) members have more important market reactions than those by non-voting officials. Additionally, themes related to inflation and interest rates had negative market responses, underscoring the sensitivity of the GCC equity market to tightening signals—especially in the context of dollar-pegged exchange rate regimes.

These results underscore the importance of monitoring Fed's communications as a key input for financial decision-making in the GCC. Policymakers, investors, and regulators could benefit from understanding how shifts in sentiment, thematic content, and speaker authority affect the GCC equity markets. This research is developed at a time of increased uncertainty regarding central bank independence as political pressures are mounting, especially in the US to cut rates, which makes Central Bank's communication an even more important tool of policy making

This research provides novel empirical evidence for the case of international monetary policy spillovers, reinforcing the importance of communication and the notoriety of key speakers beyond inflation expectations to market sentiment and stock equity markets in the GCC countries. It extends the literature by including NLP-based textual analysis with event study and panel data analysis to examine real-time market reactions. This paper contributes profound insights into how rhetoric dynamics—beyond traditional policy rate announcements—shape equity markets and financial conditions in economies closely linked to the US dollar.

Keywords: Federal Reserve Communication, Monetary Policy Spillovers, GCC Equity Markets, Sentiment Analysis, Event Study, Natural Language Processing (NLP), Financial Stability, Cross-Border Transmissions.

JEL Codes: E52, G14, G15, F42, C55.

I. INTRODUCTION

The United States Federal Reserve (the Fed) is a powerful force in today's global economy. In an interconnected global economy, the Fed's decisions affect interest rates and liquidity conditions, thereby influencing global capital flows, exchange rates, and risk premiums (Ahmed et al., 2024; IMF, 2025a). In the past few years, there has been an increasing trend of the Fed emphasizing forward guidance and transparency by using a variety of venues for communicating its decision-making process (including speeches, press releases, and meeting minutes). To help manage market expectations, the Fed now provides contributors with more ways to communicate. Recent findings have shown that changing the tone and framing of Fed communication can move asset prices and increase volatility, even when policy does not change (Gopinath, 2025; Powell, 2025).

Communication signalling is particularly powerful in emerging markets (EMs) where the transmission mechanism of monetary policy is limited, creating an environment in which domestic financial conditions are vulnerable to global monetary signalling. In fact, researchers have found that EM central banks are attempting to make domestic policy looser, and the effort might be completely counteracted by simultaneous tightening in global monetary conditions that are triggered by hawkish Fed rhetoric (De Leo et al., 2024; Gopinath, 2025). Therefore, it is equally important to take into consideration not only Fed actions, but the underlying narratives that are communicated through their rhetoric.

Speeches of senior Fed officials can significantly impact emerging-market equity indices, currencies, and credit default swap spreads (Aizenman et al., 2014). However, the impact of the Fed communications on equity markets in the Gulf Cooperation Council (GCC) region has received little attention so far. Despite the GCC's well-documented sensitivity to US monetary policy, there is a lack of empirical research linking explicitly the Fed's communication to the financial market responses in the region.

There are several interesting features to be explored. First, GCC economies peg their currencies to the U.S. dollar¹, meaning they are highly sensitive not just to Fed policy actuals, but also to expectations established through its communications (Gopinath, 2025). Second, GCC equity markets have complicated dynamics as they depend on hydrocarbons; a hawkish Fed signal may generally shift risk appetite down but would also signal that the U.S. economy is preheating, boosting oil prices and, at least partially, offsetting bad sentiment. Third, the GCC region is integrated into global finance as highlighted by the increase of foreign investment in the GCC markets. Research has shown that capital flows can lead to increased volatility, particularly when they are directed toward assets perceived to carry higher risks. Such vulnerabilities are amplified by increased policy uncertainty and the resurgence of tariffs as protectionism instruments and economic coercion tools, amplifying uncertainty across international trade, investment channels, and traditional economic and financial partners. An abrupt tightening of global financing conditions, generally responding to Fed communications, may provoke immediate capital flight from the EMs, including the GCC (IMF, 2025b).

¹ While Kuwait pegs its currency to an undisclosed basket of currencies, it is strongly believed that the dollar's weight in the basket is high.

In this paper, we apply new tools with relevance to both financial econometrics and data science. We create a unique data set of 72 Fed communications from 2025 and utilize natural language processing (NLP), specifically VADER (Valence Aware Dictionary and sEntiment Reasoner) sentiment analysis and topic modelling, to quantify the tone and thematic content of those communications. We convert qualitative narratives into measurable sentiment and topic variables (inflation, Interest rate, etc.) using an event-study approach and regression analysis to measure the effect of the Fed forward guidance on GCC equity returns.

This research provides the following contributions: First, it includes the speeches made by Chair Powell and other Federal Open Market Committee (FOMC) participants, thus enabling a more comprehensive narrative analysis. Second, it uses a bi-dimensional approach to the communication strategy performance, separating sentiment polarity effects from substantive topic content effects, as tone and substance likely impact markets and market behavior in different ways. Third, it explores regional heterogeneity by observing the impact on individual GCC member countries, as varying degrees of economic diversification and market depth could lead to different structural impacts. Finally, it provides timely contextual policy analysis, providing insights for GCC central banks, regulators, and investors in successfully future proofing against capital flow volatility, as it relates to the Fed's evolving communication strategy by 2025.

The paper is organized as follows: Section 2 reviews existing literature related to global monetary spillovers and central bank communication; Section 3 describes the dataset and methodology; Section 4 presents the empirical evidence; and Section 5 discusses some policy implications and concludes.

II. LITERATURE REVIEW

Research on central bank communication has developed an awareness among policy makers that what they say, and how they say it, has the ability to move markets in ways that policy rates alone may not fully capture. The studies using text analysis, looking broadly at monetary policy statements and decisions by the ECB and Swiss National Bank (SNB), have shown that there are signals present in press releases, press conferences, and introductory statements that translate the raw data of monetary policy, and helps shape yields, equities and uncertainty (Möller, 2020; Möller & Reichmann, 2020; Hüning, 2020; Baranowski et al., 2020). The literature has introduced a larger project looking at communication as an information set with its own shocks that could be differentiated from monetary policy or term-premium shocks.

A central issue is tone and signaling channel. Hubert and Labondance (2021) use tonal features from text to proxy stance or confidence of the central bank, saying a more hawkish (or confident) tone has a unique signaling effect on expectations and asset prices, beyond the mechanical effect of changing policy rate. Parle (2022) extends this to ECB press conferences, providing a fully text-based approach, and shows high frequency moves in financial markets around policy communication that cannot be explained by rate surprises. Finally, Hayo and Zahner (2022) contribute to the literature by demonstrating that the variation in sentiment in communication is economically meaningful and persistent. Their findings support the emerging consensus on the importance of verbal communication and the tone as priced characteristics of policy narratives.

A second connected strand is identifying communication shocks and independently identifying them from policy-rate shocks. [Lunsford \(2020\)](#) traces the early forward-guidance era with the Fed, noting that the policy language itself had information effects. [Nunes et al. \(2022\)](#) sharpen the identification with their decomposition of "interest rate surprises" to demonstrate that markets react differently to the path-of-rates information and the term-premium components. This notion is mirrored in text-based identification by [Adrian and Ochs \(2021\)](#) in their Cambridge working paper that proposes a "new monetary policy shock" via text analysis. These studies together prompt research designs that disentangle information shocks from policy shocks if the aim is solely to identify communication effects.

The literature also relates communication to uncertainty, risk aversion, and systemic risk. [Chau et al. \(2024\)](#) provide direct evidence that Fed communication reflects uncertainty and risk-aversion states. [Möller \(2020\)](#) and [Leitner et al. \(2021\)](#) connect systemic-risk dynamics in the euro area to public ECB announcements. There are also relevant implications for corporate finance. According to the [Adra and Menassa \(2023\)](#) study, companies' investment decisions reacted to both the Fed's actual policy changes and its public communication. This indicates that the real economy mechanism is responding not only to rates but also to the narrative.

Alongside the US and Europe, a growing body of literature has begun to focus on emerging-market and non-advanced economy central banks, highlighting the diversity in monetary policy transmission mechanisms. The research in Brazil uses hierarchical topic models (hLDA) to identify thematic structures and their expansion in communication ([Fasolo et al., 2021a, 2021b](#)) and linkages to yield-curve movements ([Alves & Laurini, 2025](#)), showing that narratives around subjects (such as inflation, growth, or foreign exchange) may differentially impact the level, slope, and curvature of the curve. This stresses the importance of including topic controls and sentiment in regression analysis of returns and/or yields.

Comparing central banks further supports the universality of communication effects. [Chortareas et al. \(2025\)](#) show that communication from the Bank of England, European Central Bank, and Federal Reserve do have some predictive capacity, showing that communication involves anticipatory signals that both the markets and models might utilize. [Baranowski et al. \(2020\)](#) show that the ECB employs introductory statements to articulate policy, finding that communication not only echoes but predicts policy, while [Fendel et al. \(2020\)](#) evidence yield-curve emergent behaviour asymmetries in the core-periphery to the ECB's communication, because agreement on a guiding role could also potentially and differentially, influence spillovers based on institutional structure and financial depth-considerations even in a currency union.

[Lin et al. \(2023\)](#) conduct research on the People's Bank of China and acknowledge gaps between rhetoric and action that include measurement issues of credibility and narrative consistency. [Hu and Sun \(2021\)](#) ask the question "news or noise" related to press conference talks, and note the caution that "not all textual variation is informative." These two paths matter methodologically for two reasons: they motivate checks and robustness for the quality of the narrative and motivate instrumental strategies. The latter represents characteristics that are exogenous to the speaker's communication and identity, to minimize endogenous measures or estimates captured by one's selective communication. Methodologically, the literature has a broadening definition beyond simply 'news': sentiments derived from dictionaries, supervised classification-

based systems and topic models (hLDA etc.) but most frequently in an event-study or high-frequency context around announcements and press events. Communication creates priced signals that manifest in measurable effects on returns, term structures, uncertainty and systemic risk. Among others, the tone, topic, time, and market structure are essential in setting the magnitude, direction, and duration.

In summary, the literature review highlights three key methodological considerations: (1) isolate pure communication shock: using the two-shock paradigm (information vs policy) and employing sentiment (with some topic controls) (Nunes et al., 2022; Adrian & Ochs, 2021; Parle, 2022); (2) allow for heterogeneity across GCC's markets (Fendel et al., 2020 ; Alves & Laurini, 2025); and (3) construct analysis framework using return data displacement and risk aversion measures, following the bivariate-case in the Fed-communication – uncertainty literature (e.g., Chau et al., 2024), as well as the literature on systemic-risk responses to cumulative abnormal return (CAR) communication (Möller, 2020; Leitner et al., 2021).

III. DATA & METHODOLOGY

The used methodology encompasses a multi-stage process: data collection, sophisticated text processing, an event study analysis, and robust regression modeling, all implemented using Python.

1. Data Sources and Collection

The analysis utilizes two primary datasets. Federal Reserve speeches and daily stock market indicators for seven GCC markets.

Federal Reserve Speeches

1. **Collection:** All public speeches from Federal Reserve officials between **January and July 2025** were collected from the official [Federal Reserve website](#).
2. **Format:** PDF files are renamed using a consistent schema:

YYYY-MM-DD_Speaker.pdf(e.g., 2025-05-25_Powell.pdf)
3. **Coverage:** Includes speeches from the Chair (e.g., Jerome Powell), FOMC voting members, and non-voting members. All files are verified for naming integrity and parsed uniformly for metadata.

GCC Equity Market Data

4. **Source:** Daily stock market indicators for **seven GCC markets**—UAE (Dubai (UAED), Abu Dhabi(UAEA)), Saudi Arabia, Kuwait, Qatar, Bahrain, and Oman—were obtained from **Refinitiv Datastream**.
5. **Variables:** Closing prices, daily returns, trading volumes, volatility, and turnover.
6. **Aggregation:** A **regional composite index** was constructed using normalized and equally weighted country-level returns to reflect GCC-wide movements.

2. Variable Definitions and Construction

Key variables derived for the analysis include:

Variable	Description
$r_{i,t}$	Log return for country i on day t
$R_{m,t}$	Return of benchmark index (GCC or global) on day t
$\hat{r}_{i,t}$	Expected return based on market model
$AR_{i,t}$	Abnormal return: $r_{i,t} - \hat{r}_{i,t}$
CAR_i	Cumulative abnormal return over the event window $[T_0, T_1]$
S_t	VADER sentiment score of speech on day t , scaled $[-1, +1]$
$K_{k,t}$	Count of keyword k in speech on day t
$CHAIR_t$	Dummy: 1 if speech delivered by Fed Chair; 0 otherwise
$VOTER_t$	Dummy: 1 if speaker is FOMC voting member; 0 otherwise

3. Empirical Analysis Steps

This study employs a detailed Text Processing Pipeline to extract quantitative insights from speech transcripts, an Event Study Framework to measure market reactions around speech dates, and comprehensive Regression Analysis to identify the key drivers of these reactions.

3.1 Text Processing Pipeline & Sentiment analysis

The text processing pipeline systematically converts raw speech documents into structured data suitable for quantitative analysis.

1. **Extraction:** PDF speeches parsed using PyMuPDF, removing non-substantive text (headers, footers).
2. **Sentiment Analysis:** VADER algorithm used to compute compound sentiment score S_t .

The VADER is an algorithm and operational framework divided into the following four - step process:

- **Tokenization:** The text is segmented into tokens (words, symbols, emoticons).
- **Contextual Adjustment:** The emotion score of each token sentiment score is subsequently altered with heuristic rules to address intensifiers, negations, capitalization, punctuation, and contrastive conjunctions.
- **Score Aggregation:** The previously adjusted valences are summed to achieve a raw sentiment score.
- **Normalization:** The previous raw sum is transformed into a standardized Compound Sentiment Score (S_t), where the raw sum is bounded between -1 and $+1$ using the normalization function:

$$S_t = \frac{X}{\sqrt{X^2 + \alpha}}$$

where the (X) refers to the sum of adjusted valences and ($\alpha = 15$) is a normalization constant set empirically (Hutto & Gilbert, 2014).

This normalization will achieve comparability across speeches and concerns speeches of differing length and rhetorical density.

Metrics Extracted: For each document, VADER provides three sentiment indicators:

1. **Compound Sentiment (S_t):** Overall normalized sentiment score (-1 to +1).
Positive and Negative Proportions: Fractional representation of positive and negative valence expressions or signals.
2. **Keyword Detection:** Counts of thematic terms (e.g., inflation, rates, risk, growth) extracted using regex.
3. **Speaker Roles:** Roles (Chair, voting member) inferred from filenames and metadata tagging.

3.2 Event Study Framework

Building on MacKinlay’s (1997) approach, this study employs an event study design to estimate abnormal returns around the dates of Federal Reserve speeches, allowing to separately identify their impact on the market. Event studies and other econometric models are routinely used to explore how central banks communicate with their constituents, often framing announcements, speeches, or press conferences as shocks and comparing observed outcomes to a counterfactual situation in which the communication does not occur (Born et al. 2011; ECB Working Paper No. 1332).

Event studies as an approach are useful but also reveal important nuances, as results can be influenced by other news and/or events concurrent to the announcement, including regional variations in knowledge of the speech, or technics used in coding the tone of the speech itself.

Step 1: Estimation of Normal Returns

Estimated via a market model over a 250-day pre-event window:

$$r_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \dots \dots \dots (1)$$

Step 2: Abnormal Return Calculation

During event window $t \in [-3, +3]$:

$$AR_{i,t} = r_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i R_{m,t}) \dots \dots (2)$$

Step 3: Cumulative Abnormal Return

Total return attributable to the speech:

$$CAR_i = \sum_{t=T_0}^{T_1} AR_{i,t} \dots \dots \dots (3)$$

where typically $T_0 = -3, T_1 = +3$.

3.3 Multivariate Regression Analysis

Panel regressions estimate the influence of speech content and speaker identity on event-day returns:

$$AR_{i,0} = \gamma_0 + \gamma_1 S_0 + \sum_k \gamma_{k+1} K_{k,0} + \gamma_c CHAIR_0 + \gamma_v VOTER_0 + \delta_i + \varepsilon_{i,0} \dots \dots \dots (4)$$

Where:

4. S_0 : Sentiment score on speech day
5. $K_{k,0}$: Keyword frequency for theme k
6. $CHAIR_0, VOTER_0$: Speaker role dummies
7. δ_i : Country fixed effects
8. $\varepsilon_{i,0}$: Error term

4. Validation and Robustness Checks

Results are displayed with multiple visualizations: CAR curves with 95% confidence intervals across the event window that covers each country, boxplots that compare speech effects across officials (e.g., Fed Chair and non-Chair), and sentiment-return heatmaps that depict average abnormal returns segregated by sentiment (positive, neutral, negative) bins. To ensure the results are robust, a number of checks were conducted, including changing estimation windows and performing country-by-country regressions.

The analysis was conducted in Python. The text extraction from the PDF documents was accomplished using the *PyMuPDF* library. The Pandas and NumPy libraries allowed for flexible data management and manipulation. Econometric modelling (primarily the regression), was conducted using the *Statsmodels* library. Data visualizations were completed using Matplotlib and Seaborn, which facilitated the production of several plots that illustrated the study's findings.

IV. EMPIRICAL RESULTS AND DISCUSSION

This analysis collates empirical evidence regarding how U.S. Federal Reserve monetary policy communication affects GCC financial markets. Our findings provide valuable insights that can be useful to policymakers in improving market predictability, stability and strategic reactions.

1. Market Reaction to Fed Speeches (Event Study Results)

The line graph (figure.1) shows the average cumulative abnormal returns (CARs) for the various GCC countries and a regional aggregate, the GCC_Regional, over the time period of 3 days prior to the Federal Reserve speech and 3 days after.

Figure 1: Cumulative Abnormal Returns Around Fed Speeches

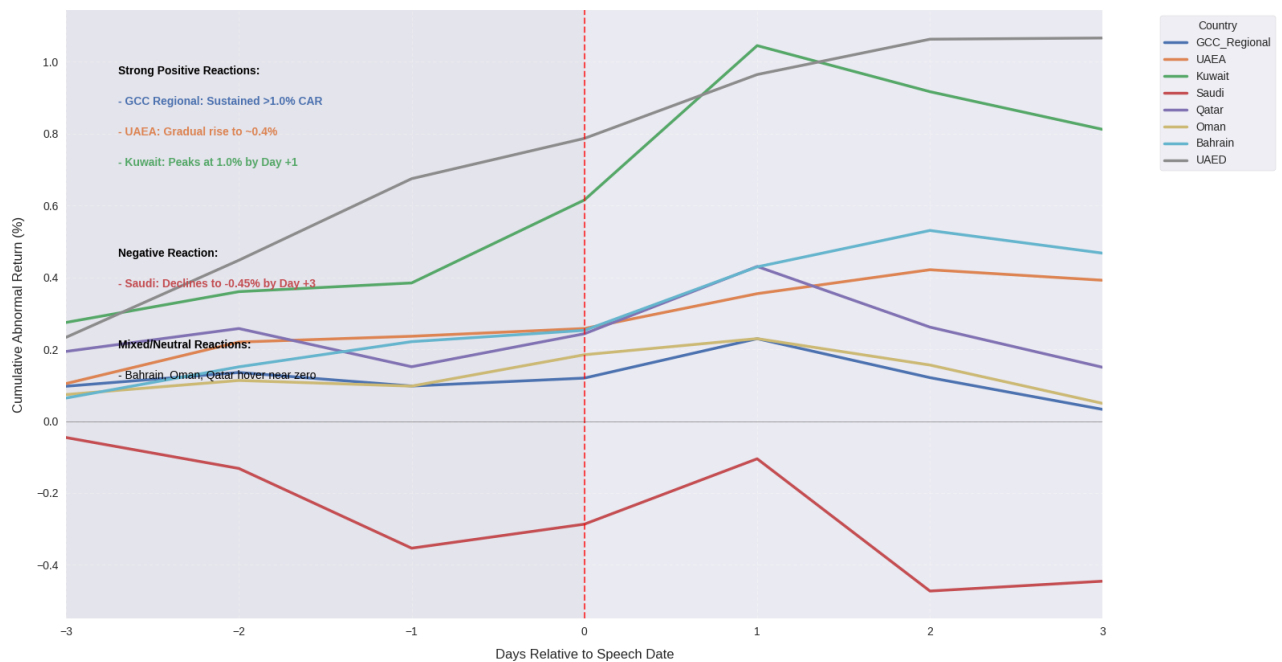


Figure 1 offers three main insights:

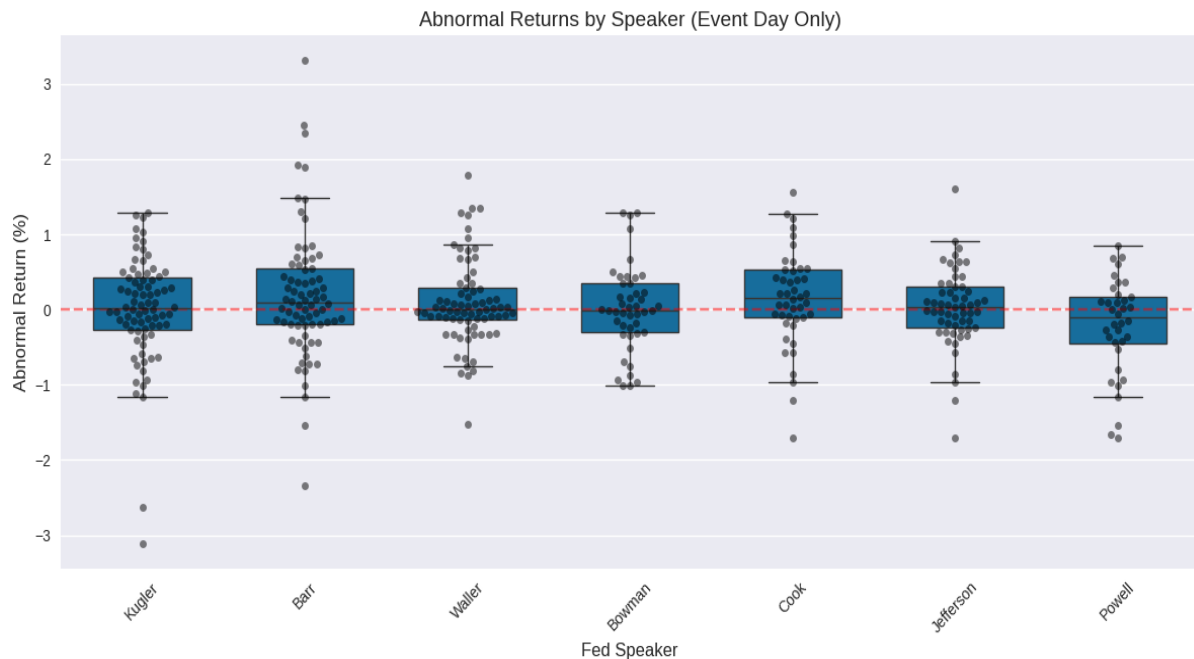
- Regional index & Positive Spillover:** The GCC Regional index and the UAE markets realize abnormally positive statistically significant abnormal returns following Fed speeches. Specifically, the CAR's of the GCC_Regional moves above 1.0% by Day +1 and the CAR's of the UAE increases above the no return line. Additionally, the confidence intervals of the GCC_Regional and UAE both follow the trend and increase above zero. Therefore, the markets are typically taking the Fed communication and deriving positive interpretations that lead to upward momentum and there are elements of positive spillovers.
- Saudi Arabia's Unique Sensitivity:** Alternatively, however, Saudi Arabia, contrarily experiences a proportional reaction, consistent with negative and statistically significant abnormal returns before, during, and after Fed speeches. This line consistently indicates negative CARs, that start off negative before the speech, and decline further after Day 0, settling around -0.8% by Day +3. The confidence interval for Saudi Arabia looks to be entirely below the zero line, indicating a statistically significant negative market reaction and representing persistent market underperformance in response to U.S. monetary policy communication . A potential rationalization for this trend is the concentration of hydrocarbon-based firms in the Saudi market, namely Aramco and SABIC, which are valued based on global hydrocarbon prices. As U.S. monetary policy is tightened, this generally boosts the dollar value and puts downward pressure on oil prices. Therefore, the impact of the SFED on the market may be exacerbated by the weighted energy sector firms in Saudi Arabia.
- Varied Responses Elsewhere:** Bahrain, Kuwait, Oman, and Qatar generally yield CARs that can fluctuate around the zero line, with their confidence intervals frequently crossing zero. This indicates that their market reactions to Fed speeches are not as consistently positive

or negative, and are often not statistically significant indicating an insignificant direct and immediate market impact in these countries.

2. The Influence of Speaker Identity on Market Dynamics

Figure.2 depicts the distribution of abnormal returns for the seven Federal Reserve speakers (Kugler, Barr, Waller, Bowman, Cook, Jefferson, and Powell) for the day of their speeches and allows a better understanding of the effect that each speaker has on market abnormal returns.

Figure.2: Abnormal Returns by Speaker (Event Day Only)



The figure 2 outlines the immediate market response in GCC Equity Markets to speeches by alternative Federal Reserve officials, which will specifically highlight the degree to which the speakers' official position - and mandate - shaped their market impact in the following ways:

1. Neutral Median Impact No Matter Where the Speaker Sits: The median abnormal return for all speakers is close to zero on the day of the speech. This is an important discovery: it suggests that GCC equity markets do not offer either systematic advantage to hawks or doves on speech days. The baseline assumption in the market is that all officials (regardless of position) offer their remarks within the broader envelope of the Committee's consensus and, therefore, there is no consistent directional shift.

2. Volatility is a Function of Uniqueness & Mandate: The variance noted in volatility (and thus the spreads of returns) can best be explained through the function of the information each speaker typically conveys - it is a direct function of their job description.

A - High-Volatility Speakers: "News-Breakers".

- **Lisa Cook (Governor):** Her area of focus often deals with international economics and financial stability. Speeches made on issues pertaining to international economics can directly discuss global spillovers, emerging market appetite volatility or trade issues.

These are very relevant topics to GCC markets and can help explain her high variation in effect.

- **Adriana Kugler (Governor):** As a labor economist, her speeches provide substantive information about the maximum employment aspect of the Fed's dual mandate. Even unexpected or unanticipated interpretations of data or views on wage growth can cause meaningful shifts in market expectations of inflation which could shift interest rate expectations and could cause large market moves.
- **Michael Barr (Vice Chair for Supervision):** With a classic "volatility" role as head of banking regulation and oversight, his comments about capital requirements, stress tests or systemic issues within the financial system directly affect the cost of capital and the risk appetites of global banks, including banks and global entities highly exposed to GCC financing and investment needs. This can help explain the extreme variation in outliers.

B- Low-Volatility Speakers: The "Anchors"

- **Jerome Powell (Chair):** His speeches show the tightest cluster of returns, as an illustration of the "Powell Put" in action. As Chair, he is both communicating and anchoring the consensus view of the FOMC. The market simply expects his comments to be slow-moving, balanced, and reflective of already established policy. Surprises are few and far between, thus low volatility.
- **Michelle Bowman (Governor):** Considered a consistent hawk, the market has a tightly defined expectation for her position. While her speeches could also be considered aggressive, they usually cement existing views rather than articulate new views. Much like a predictable performance, the response is limited.
- **Loretta Mester (Cleveland Fed President - 2024 data):** Just like the other veteran policymakers, the market made assumptions about her views. To be clear, regional Fed Presidents (with independence) share their views which, while independent, do not stray far from the consensus bunker. We assumed her emphasis would be building the argument, leading to lower volatility.

3. Outliers: When Mandate Meets Surprise: These outliers were instances when a speaker delivered unexpected news in the area of competency.

- **Kugler's** significant negative outlier could be linked to speeches where he presented labor market statistics that gave off an unexpectedly hawkish tone, surprising therefore the market.
- **Barr's** outliers surely matched up with speeches that delivered unexpected news on the regulatory side, which is said to almost instantly have ramifications for global financial liquidity.
- **Cook's** positive outliers were probably driven by speeches that alleviated fears of international financial contagion or were unexpectedly dovish on the global outlook.

This analysis demonstrates the GCC equity market's incisive parsing of Fed rhetoric, where a speaker's particular mandate is the most important lens for predicting volatility. The market distinguishes between officials who often produce new information in their specialization and those who fail to offer anything new to the consensus. Speeches by specialists such as Vice Chair for Supervision Michael Barr (whose direct charge over banking regulation has a palpable effect

on the global supply of financial liquidity) or labor expert Adriana Kugler (whose analysis of the labor market may indicate future paths for inflation) include an inherent degree of market-moving risk. Communications from Chair Jerome Powell could be seen as the anchor for the official FOMC consensus. Therefore, the strategic implications for investors are clear: while the substantive material of the speech is king in establishing direction, as the speaker identity, expertise, and function play a key role in estimating the probability of market moving event. This ultimately enhances risk management, as policymakers and portfolio managers can give greater consideration and assign defensive positioning around higher probability of volatility, directly influencing global flows of capital and appetite driven by emerging market risk.

3. The Role of Sentiment in Market Movements

The study of abnormal returns on the first day of trading following Federal Reserve speeches (see Figure 3) clearly demonstrates a strong and consistent relationship between the sentiment expressed in Federal Reserve speeches and the corresponding stock market reaction across GCC countries.

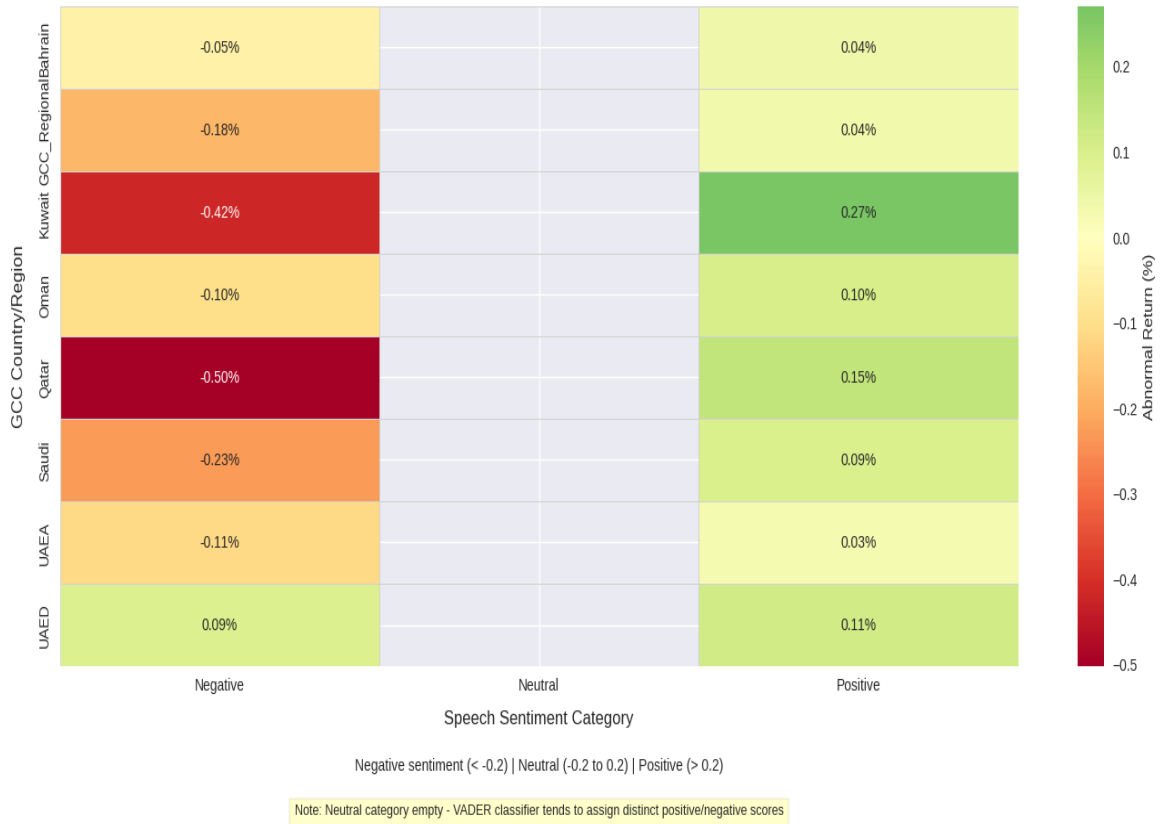
The analysis suggests that there is a bifurcated market response depending on whether the speech is considered positive or negative:

Negative sentiment, Negative returns: Speeches with a hawkish or restrictive tone consistently displayed a significant association with negative abnormal returns in GCC equity markets. In particular, negative abnormal returns were observed in the GCC equity markets of Qatar, Kuwait, and Saudi Arabia - potentially signalling their relative sensitivity to monetary tightening or signals of economic caution. This appears to support the perspective that investors in these markets interpret tighter monetary policy signal rhetoric as a precursor to reduced levels of liquidity and rising borrowing costs, thus prompting a de-risking behaviour. Further, the response may encapsulate the spillover effects of U.S. monetary policy on the oil and gas prices. Tighter monetary policy negatively impacts growth, damping global energy demand and its implications for prices, which may have an influence on market sentiment in hydrocarbon-dependent economies, such as those of the GCC.

- **Positive sentiment and market expansion:** In contrast, communications characterized by a dovish or pro-growth tone were associated with positive abnormal returns, with particularly strong positive abnormal returns observed in the GCC equity markets of Kuwait, Qatar, and Saudi Arabia—indicating that investors expected monetary conditions to remain accommodative and would drive greater investment by investors and general sentiment. This response might also be correlated to rising expectations of increased oil and gas demand and prices, and hydrocarbon revenues, which generally accompany global growth optimism and dovish policy signals, and thereby support positive market sentiment in these energy-reliant economies.
- Importantly, and reinforcing the above analysis, the methodological lessons from the sentiment analysis using VADER and its uncoded classification of speeches as almost entirely positive or negative (very few 'neutral' speeches were coded) suggests that financial markets, practically, do not tend to view Fed communication as actually neutral. According to VADER, market participants filter through the language of monetary policy and respond to

an almost exclusively directional bias, even when the language of policy is not openly directional.

Figure.3: First-Day Abnormal Returns by Sentiment and Country



The results indicate that the tone of Federal Reserve communications acts as a crucial transmission channel for the impact of U.S. monetary policy on GCC financial markets. In the context of Federal Reserve communications, it is important for investors, policymakers, and market participants to monitor sentiment contained in Fed rhetoric. This sentiment acts as a strong and immediate cue that can alter market expectations and impact trading behavior across GCC markets.

4. Fed’s Speaker Rhetoric Profiles and Communication Styles

The rhetorical profiles of Federal Reserve officials provide useful information describing their individual communication preferences and what they may be communicating on to the market by the tone of their comments (see Figure 4).

Figure.4: Speaker Rhetoric Profiles (Normalized)

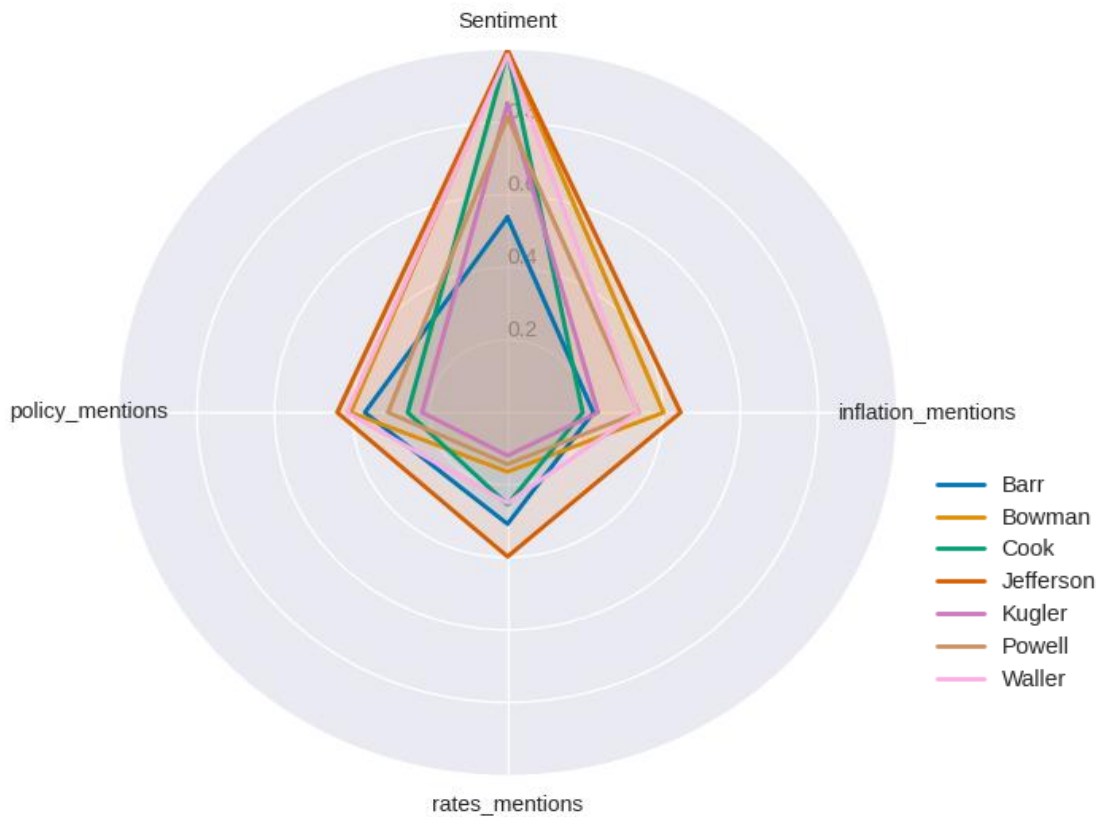


Figure 4 offers three main insights:

- Sentiment Leaders:** Governors **Powell and Waller** exhibit the most positive and balanced sentiment across speeches. In particular, their mode of speech is generally supportive and build confidence, positively affecting markets' stability and reducing uncertainty for investors and financial actors.
- Topic Emphasis:** The figure 4 highlights differences in emphatic themes of focus among Federal Reserve officials. Specifically, Governors **Waller and Jefferson** put relatively more emphasis on inflation themes than Governors **Barr and Bowman**, who reference interest rate topics more frequently. The respective voice of each speaker reflects not only their views, but also their policy preferences and their contextual interest in overall communication about policy.
- Policy Implications:** Understanding the communication of each individual may enhance the overall interpretation of Federal Reserve communication. Understanding which speaker (Fed official) emphasizes either those themes or tones offers additional useful signals to analysts, investors, and policymakers, especially in markets that are sensitive to U.S. monetary policy. To regulators and financial institutions in the GCC, the presence of a speaker-level distinction can also enhance the role of sentiment measurement as a monitoring system that improves predicting market reactions and hence provide a chance to improve risk management.

Overall, the radar chart (Figure 4) visualization captures these trends, plotting Federal Reserve officials in addition to the fact that they differ in communication tone and speech inclined focus themes. The speaker-level difference is critical in evaluating the international transmission of monetary policy signals, and figure 4 provides interesting elements of these differences.

5. The effects of speech content and speaker identity (regression analysis)

To better understand the impact of Federal Reserve speeches on GCC equity markets, panel regression analysis was used to quantify the association between speech artifacts (e.g., sentiment, emphasizing topics) and market returns, while incorporating the influence of different Fed speakers and country-specific elements.

5.1 Panel Regression Results (All Countries)

The panel regression analysis provides a robust quantitative avenue through which one can assess how Federal Reserve communications impact GCC equity markets. Considering all seven markets at once, the model is statistically significant ($p = 0.0043$) and explains approximately 8.1% of the variability of the abnormal returns. While this is small in absolute terms, it remains considerable in comparison with financial event studies' explanatory power, suggesting that Fed rhetoric is a real (though not primary) factor in movements in the GCC equity markets (see table 1).

A few observations arise:

Tone as the primary channel: The positive and statistically significant coefficient for sentiment (A significant positive coefficient: $+0.2098$, $p = 0.001$) suggests that markets are reacting more to the emotional valence of remarks than the content. Specifically, dovish remarks are associated with positive returns while hawkish tones dampen sentiment. This point aligns with some of the speaker-based work. Speakers such as Kugler or Barr are more likely to cause bigger moves, not only because of who they are, but also because of the unexpected aspects of their tone and rhetoric.

Content focus as a policy signal: Mentions of high inflation and interest rates have a statistically significant negative effect (inflation (-0.0028) , $p = 0.015$) and interest rates (-0.0343) , $p = 0.003$). GCC investors view these usages as communicating a potential monetary tightening.

Institutional authority as a moderating factor: Speeches of FOMC voting members are associated with negative abnormal returns in part, because the market is more sensitive to those with immediate influence on the policy decision. And even though there is less attribution to the Fed Chair after controlling for sentiments and topics, it still emphasizes that Powell's influence is conveyed both through substance and tone. This is consistent with the event study which showed that Powell's speeches often anchor instead of surprise markets, which could also be interpreted as well-established market expectations for policy decisions, and therefore communication.

Regional uniformity: the lack of significant country-level fixed effects suggests GCC markets responded overall consistently to Fed rhetoric over the studied period. This could be further investigated by extending further the studied period.

Table 1: Panel Regression Results for Abnormal Returns

```

=====
Dep. Variable:      Abnormal_Return      R-squared:          0.081
Model:              OLS                  Adj. R-squared:     0.044
Method:             Least Squares        F-statistic:        0.471
Date:               Thu, 24 Jul 2025      Prob (F-statistic): 0.00430
Time:              05:21:50             Log-Likelihood:     -318.13
No. Observations:  314                  AIC:                862.2
Df Residuals:      301                  BIC:                325.0
Df Model:          12
Covariance Type:   HC3
=====
Code Summary      coef      std err      z      P>|z|      [0.025      0.975]
-----
const            0.0958     0.013     0.026     0.347     0.006     -0.228
Sentiment        0.2998     0.243     0.310     0.001     0.601     0.915
inflation_mentions -0.0028     0.001     2.423     0.903     0.064     -0.039
rates_mentions  -0.0343     0.012     2.936     0.370     0.020     -0.912
Is_Chair        -0.2298     0.034     0.249     1.277     0.025     -0.108
Is_Voii_Bahrain  0.2167     0.066     0.550     0.105     0.868     -0.042
country_Kuwait   0.2151     0.265     1.514     0.002     0.059     -0.215
country_Oman     0.0171     0.027     0.014     0.005     0.860     -0.171
country_Qatar    0.0515     0.158     0.139     0.021     0.046     -0.151
country_UAEA     -0.0288     0.225     0.020     0.635     0.664     -0.303
country_UAED     0.0824     0.131     0.088     0.050     0.650     -0.935
=====
Omnibus          39.148      Durbin-Watson      1.705
Omnibus:         0.00        Durbin-Watson:
Prob(Omnibus):   0.80        Jarque-Bera (JB):   0.002
Skew:            -6.61        Prob(JB):           1.26555
Kurtosis:        7.69        Cond. No.           279.
=====
Notes:
[1] Standard Errors are heteroscedasticity robust (HC3)

```

Overall, sentiment and policy-based language represent the primary transmission mechanisms, while the role of the speaker - as a voter or Chair - matters.

5.2 Country-Specific Regression Results

Table 2 displays by-country OLS regressions for GCC countries to give one more perspective on particular market sensitivities.

Country regressions demonstrate variety in market sensitivities:

- **Market Sensitivity:** Qatar displayed a marginally significant positive impact of speech sentiment on returns (coefficient 0.3508, $p = 0.089$), uniquely marking it as more sensitive to Fed tone than the other GCC countries.
- **Chair Speech Effects:** Saudi Arabia displays a large negative effect, but also statistically insignificant for Chair speeches (-0.8344 , $p = 0.323$), but in line with the observed underperformance on chair speeches days. Negative coefficients for Chair speeches were also apparent for UAE, Kuwait and the GCC regional aggregate.
- **Keyword Effect(s):** Mentions of inflation and rates generally featured small, insignificant coefficients across the countries.

- **Model Fit:** Explanatory power remains low to moderate (R^2 values between 0.05 and 0.19) with Oman and Saudi Arabia exhibiting relatively better fits, which suggests that other factors likely influence returns.

Table 2: Country-Specific Regression Results (Event Day Abnormal Returns)

Country	Sentiment (Coef, p-value)	Inflation Mentions	Rates Mentions	Chair Speech	R ² %
Bahrain	0.0831 (0.638)	-0.0019	0.0253	0.1446	5
Kuwait	0.2766 (0.509)	-0.0030	-0.0703	-0.4282	8
Oman	0.1967 (0.153)	-0.0020	-0.0429	0.2616	19
Qatar	0.3508 (0.089)	0.0010	-0.0089	-0.3006	13
Saudi	0.2857 (0.323)	-0.0069	-0.1082	-0.8344	19
UAEA	0.0922 (0.702)	-0.0058	-0.0324	-0.7448	12
UAED	0.0088 (0.980)	-0.0025	-0.021	-0.7463	4
GCC_Region	0.1451 (0.404)	-0.0027	-0.0357	-0.5071	12

*Note: * $p < 0.10$ (marginally significant)

These regression results provide strong evidence that the tone and thematic content of Fed speeches have a material impact on the GCC equity markets, as does the identity of the speaker. Understanding these effects is essential for investors and policymakers.

V. POLICY IMPLICATIONS AND RECOMMENDATIONS

The research findings show the impact of Federal Reserve communications—and their sentiment and thematic content—on GCC equity markets, in addition to traditional economic factors such as oil prices. The regression estimates and the responses of GCC regional indices provide impact estimates; therefore, for the following actions could be envisaged by the financial stability authorities of the GCC:

- **First**, GCC financial stability authorities could institutionalize a system for monitoring sentiment in real-time that gives weight to the speeches of multiple Fed officials, not only the Chair. Non-Chair speeches significantly influence market prices for Qatar and the UAE. The suggested framework will improve the financial stability authorities' capability to monitor and react to changes in U.S. monetary policy sentiment as information about the anticipated impacts on regional financial conditions emerges. As a proactive regulator, alterations in liquidity management, macroprudential policy, and communication methods would evolve in time. This interactive, data-driven monitoring is feasible and scalable thanks to automated NLP pipelines.

- **Second**, GCC central banks could incorporate Fed rhetoric on inflation and interest rates into existing macro-financial risk assessments. We quantified the Fed rhetoric on inflation and interest rates with topic modelling and VADER sentiment scores. This permits stress tests to take into account shifts in monetary policy, resulting in a more informed and accurate assessment of vulnerability, whether moving into a tightening or easing cycle. It could also help better predict local market financial conditions, which are influenced not only by policy decisions but also by Fed rhetoric.
- **Third**, authorities in the GCC region could reinforce their communication plans to mitigate market volatility from either hawkish or ambiguous signals from the Federal Reserve. The disproportionate market reactions to Chair Powell's comments illustrate a clear example of this. By laying the groundwork for a proactive and organized communication taxonomy for domestic use, GCC policymakers would be better positioned to provide guidance during periods of Fed-induced uncertainty. This would allow policymakers to help provide context of external shocks to local markets, which could mitigate overreactions and maintain stability to avoid dislocation. If executed efficiently, this communication could further stabilize local markets from external elements, especially Fed policy announcements.
- **Fourth**, the spillover sensitivities indicated for each country require differentiated responses to Fed signals. For example, Qatar responds more to the speeches that were not attributed directly to Chair Powell, while Saudi Arabia responds to Chair Powell's tone. In turn, the central banks can create differentiated policies based on distinctions, influences, and the local market structure.
- **Sixth**, artificial intelligence and machine learning could be used to leverage potentially scalable analysis of Fed communications. In particular, automated analyses of sentiment and topics could be utilized to develop early warning systems to proactively forecast imminent risks as the Fed's communication challenges increase in complexity.

VI. Limitations and Avenues for Future Research

This research paper suggests that the impact of Federal Reserve communications on GCC financial markets is growing and proposes measures to mitigate the associated risks. While the methodology used provides effective tools to assess this impact, it is important to outline a few limitations:

- **Data availability:** The functionality of NLP and AI tools relies on having timely and consistent data for Fed communications. Distortions in the date or scheduled periods of communication could impact any monitoring, real-time, or timely objectives.
- **Uncertain Market Response:** Financial markets are dynamic, and past responses to Fed communications do not always predict future responses or market reactions. This means the market message, approach, or timing continues to change, and models or analyses may require continual re-evaluation.

Future Enhancements

To address these limitations and offer opportunities for extensions in the future, it is suggested that GCC policymakers and researchers build on existing research by:

- **Expanding regional comparisons and international comparisons:** Future studies should investigate the impact of Fed communications further afield from the GCC, including other Arab countries with peg exchange rate regimes.
- **Using broader data:** Research could use Fed communications from additional years and larger or expanded datasets to better assess sentiments over the long-term and to improve the reliable use of sentiment models.
- **Utilise market analysis on commodities:** Given the GCC's comparative reliance on commodity exports, studies should investigate how Fed communication affects more specifically the markets of oil and gas.
- **Expanding research domains:** This includes, other financial, oil prices and macroeconomic variables in our model, non-traditional data (e.g., social media, investor sentiment data) or alternative standardized visual or pictorial symbols (e.g., emoji) to improve accuracy and credibly implore predictive changes in policymaking or investor confidence.

References

- Adra, S., & Menassa, E. (2023). Uncertainty and corporate investments in response to the fed's dual shocks. *Journal of Corporate Finance*, 78, 102345. <https://doi.org/10.1111/fire.12342>
- Adrian, C. R., & Ochs, A. (2021). *A new monetary policy shock with text analysis* (Cambridge Working Papers in Economics No. 2145). University of Cambridge.
- Ahmed, S., Akinci, O., & Queralto, A. (2024). *U.S. monetary policy spillovers to emerging markets: Both shocks and vulnerabilities matter* (Staff Report No. 972). Federal Reserve Bank of New York. Retrieved from https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr972.pdf
- Aizenman, J., Binici, M., & Hutchison, M. (2014, October 20). *The transmission of Federal Reserve tapering news to emerging financial markets*. VoxEU.org. Retrieved from <https://cepr.org/voxeu/columns/transmission-federal-reserve-tapering-news-emerging-financial-markets>
- Alves, C. R. A., & Laurini, M. (2025). The effects of Brazilian Central Bank communication on the yield curve. *Journal of International Money and Finance*, 140, 102987. <https://doi.org/10.1017/S1365100524000725>
- Baranowski, P., Bennani, H., & Doryń, W. (2020). Do the ECB's introductory statements help predict monetary policy? Evidence from a tone analysis. *International Journal of Central Banking*, 16(4), 1–35. <https://www.sciencedirect.com/science/article/pii/S0176268020301129>
- Chau, F., Deesomsak, R., & Shaikh, R. (2024). Does Fed communication affect uncertainty and risk aversion? *Journal of Financial Stability*, 72, 101265. <https://doi.org/10.1007/s11156-024-01318-9>
- Chortareas, G., Papailias, F., & Shuku, L. (2025). Does Central Bank Talk Matter for Forecasting? Evidence From Speeches of the BoE, ECB, and Fed. *Journal of Economic Dynamics and Control*, 158, 104823. <https://doi.org/10.1002/ijfe.3136>
- De Leo, P., Gopinath, G., & Kalemli-Özcan, Ş. (2024). *Monetary policy transmission in emerging markets: The role of global financial conditions* [Unpublished manuscript].
- Fasolo, A. M., Graminho, F., & Bastos, S. B. (2021a). Seeing the Forest for the Trees: Using hLDA Models to Evaluate Communication in Banco Central do Brasil. *Journal of Econometric Methods*, 10(1), 20200025.
- Fasolo, A. M., Graminho, F., Bastos, S. D., & Londoño, J. M. (2021b). Seeing the Forest for the Tree: Using hLDA Models to Evaluate Communication in Banco Central do Brasil. *Central Bank of Brazil Working Paper Series*, (589).
- Fendel, R., Neugebauer, F., & Kılınç, M. (2020). ECB's communication and the yield curve: core versus periphery effects. *Finance Research Letters*, 37, 101387. <https://doi.org/10.1080/13504851.2020.1770184>
- Gopinath, G. (2025, May 7). *Steering through the fog: The art and science of monetary policy in emerging markets* [Speech]. International Monetary Fund. <https://www.imf.org/en/News/Articles/2025/05/07/sp050725-science-of-monetary-policy-in-emerging-markets-gita-gopinath>
- Hayo, B., & Zahner, J. (2022). What's that noise? Analysing sentiment-based variation in central bank communication. *European Journal of Political Economy*, 75, 102205. <https://doi.org/10.1016/j.econlet.2022.110962>
- Hu, N., & Sun, Z. (2021). Uncertain Talking at Central Bank's Press Conference: News or Noise? *Pacific-Basin Finance Journal*, 68, 101592 <http://dx.doi.org/10.2139/ssrn.3796816>
- Hubert, P., & Labondance, F. (2021). The signaling effects of central bank tone. *Journal of Money, Credit and Banking*, 53(5), 1223–1254. <https://doi.org/10.1016/j.euroecorev.2021.103684>

Hüning, H. (2020). Swiss National Bank communication and investors' uncertainty. *Journal of International Financial Markets, Institutions and Money*, 69, 101256. <https://doi.org/10.1016/j.najef.2019.101024>

International Monetary Fund. (2025a, April). *World Economic Outlook: A critical juncture amid policy shifts*.

International Monetary Fund. (2025b, April). *Emerging markets face a perfect storm*. In *IMF PFM Blog*.

Leitner, G. J., Hübel, T., Wolfmayr, A., & Zerobin, M. (2021). Effect of Monetary Policy on Systemic Risk in the Euro Area. *Journal of Financial Stability*, 57, 100939. <https://doi.org/10.57938/261deb9d-b8bb-4370-95cb-6547214ac0c0>

Lin, J.-H., Mei, Z., Chen, L., & Zhu, C. (2023). Is the People's Bank of China consistent in words and deeds? *China Economic Review*, 77, 101897. <https://doi.org/10.1016/j.chieco.2023.101919>

Lunsford, K. G. (2020). Policy Language and Information Effects in the Early Days of Federal Reserve Forward Guidance. *American Economic Review*, 110(9), 2892–2932. <https://www.jstor.org/stable/26966319>

MacKinlay, A. C. (1997). Event studies in economics and finance. *Journal of Economic Literature*, 35(1), 13–39. <https://www.jstor.org/stable/2729691>

Möller, R. (2020). Systemic Importance of Central Bank Communication: ECB Policy Announcements and Systemic Risk in the Eurozone. *Journal of Banking & Finance*, 121, 105968. <http://dx.doi.org/10.2139/ssrn.3644439>

Möller, R., & Reichmann, D. (2020). ECB Language and Stock Returns – A Textual Analysis of ECB Press Conferences. *Journal of Behavioral and Experimental Finance*, 28, 100402. <https://doi.org/10.1016/j.qref.2021.04.003>

Nunes, R., Ozdagli, A. K., & Tang, J. (2022). Interest Rate Surprises: A Tale of Two Shocks. *Journal of Monetary Economics*, 125, 62–79. Nunes, Ricardo and Ozdagli, Ali K. and Tang, Jenny, Interest Rate Surprises: A Tale of Two Shocks (July 28, 2023). Available at SSRN: <https://ssrn.com/abstract=4524624> or <http://dx.doi.org/10.2139/ssrn.4524624>

Ostapenko, N. (2020). Central bank communication: Information and policy shocks. https://mpira.ub.uni-muenchen.de/104604/1/MPRA_paper_104604.pdf

Parle, C. (2022). The financial market impact of ECB monetary policy press conferences — A text-based approach. *Journal of Macroeconomics*, 73, 103430. <https://doi.org/10.1016/j.ejpoleco.2022.102230>

Powell, J. H. (2025, August 22). *Monetary policy and the Fed's framework review* [Speech]. Federal Reserve Bank of Kansas City. <https://www.federalreserve.gov/newsevents/speech/powell20250822a.htm>

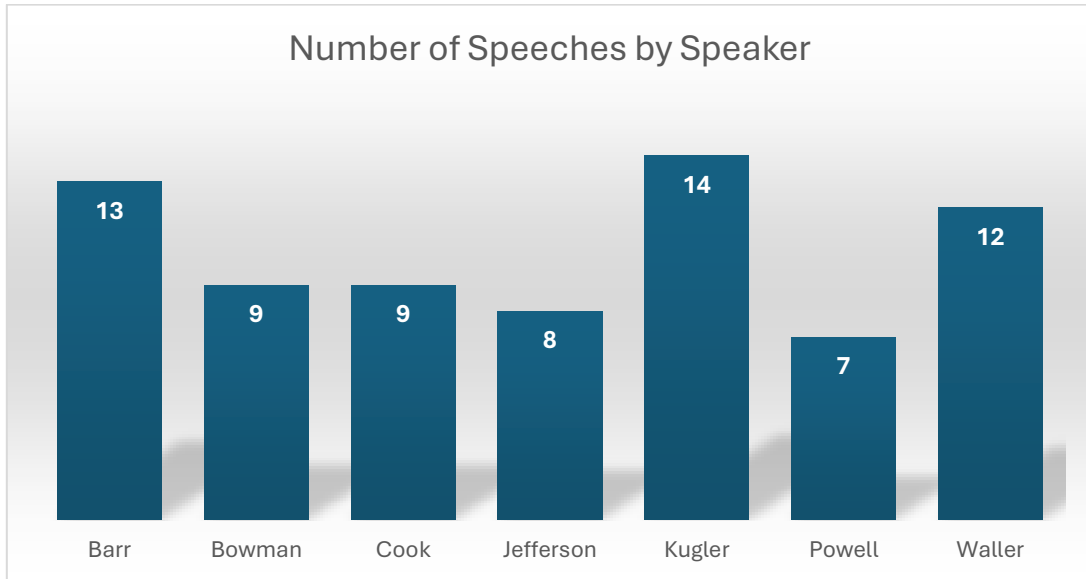
APPENDICES

Appendix A: Summary of Federal Reserve Officials' Speeches (Most Recent First)

index	Filename	Size (Bytes)	Speakers Last Name	index	Filename	Size (Bytes)	Speakers Last Name
0	2025-05-25_Powell.pdf	83375	Powell	36	2025-06-04_Cook.pdf	92630	Cook
1	2025-05-23_Cook.pdf	231370	Cook	37	2025-06-05_Kugler.pdf	135709	Kugler
2	2025-05-09_Cook.pdf	110619	Cook	38	2025-06-01_Waller.pdf	166695	Waller
3	2025-05-15_Powell.pdf	462924	Powell	39	2025-05-29_Kugler.pdf	99610	Kugler
4	2025-05-15_Barr.pdf	121286	Barr	40	2025-04-14_Waller.pdf	119021	Waller
5	2025-05-14_Jefferson.pdf	461077	Jefferson	41	2025-04-07_Kugler.pdf	1452603	Kugler

Federal Reserve Rhetoric and GCC Equity Market Returns

6	2025-05-19_Jefferson.pdf	686336	Jefferson	42	2025-04-04_Barr.pdf	154143	Barr
7	2025-05-14_Waller.pdf	125826	Waller	43	2025-04-04_Powell.pdf	103082	Powell
8	2025-05-09_Waller.pdf	127465	Waller	44	2025-04-03_Cook.pdf	1449010	Cook
9	2025-05-12_Kugler.pdf	169061	Kugler	45	2025-04-02_Kugler.pdf	1100485	Kugler
10	2025-05-20_Kugler.pdf	133634	Kugler	46	2025-04-03_Jefferson.pdf	981618	Jefferson
11	2025-05-09_Barr.pdf	213632	Barr	47	2025-03-25_Kugler.pdf	146159	Kugler
12	2025-05-03_Cook.pdf	144009	Cook	48	2025-03-24_Barr.pdf	197592	Barr
13	2025-05-09_Kugler.pdf	244790	Kugler	49	2025-03-21_Waller.pdf	71177	Waller
14	2025-04-16_Powell.pdf	138034	Powell	50	2025-03-07_Powell.pdf	129166	Powell
15	2025-04-17_Barr.pdf	176440	Barr	51	2025-03-07_Kugler.pdf	224049	Kugler
16	2025-04-22_Jefferson.pdf	662904	Jefferson	52	2025-03-07_Bowman.pdf	218826	Bowman
17	2025-04-22_Kugler.pdf	213439	Kugler	53	2025-02-27_Bowman.pdf	200954	Bowman
18	2025-04-23_Waller.pdf	99413	Waller	54	2025-02-25_Barr.pdf	218057	Barr
19	2025-04-15_Cook.pdf	93658	Cook	55	2025-02-27_Barr.pdf	144035	Barr
20	2025-07-22_Powell.pdf	88519	Powell	56	2025-02-21_Jefferson.pdf	817057	Jefferson
21	2025-07-16_Barr.pdf	195478	Barr	57	2025-02-20_Kugler.pdf	162121	Kugler
22	2025-07-17_Kugler.pdf	181137	Kugler	58	2025-02-20_Barr.pdf	279872	Barr
23	2025-07-17_Cook.pdf	177453	Cook	59	2025-02-19_Jefferson.pdf	1146182	Jefferson
24	2025-07-17_Waller.pdf	112556	Waller	60	2025-02-18_Barr.pdf	303424	Barr
25	2025-07-15_Barr.pdf	186359	Barr	61	2025-02-17_Waller.pdf	110708	Waller
26	2025-07-15_Bowman.pdf	135280	Bowman	62	2025-02-17_Bowman.pdf	221988	Bowman
27	2025-06-26_Barr.pdf	155983	Barr	63	2025-02-07_Kugler.pdf	179104	Kugler
28	2025-06-24_Barr.pdf	98838	Barr	64	2025-02-05_Bowman.pdf	225646	Bowman
29	2025-06-23_Kugler.pdf	93728	Kugler	65	2025-02-05_Jefferson.pdf	1622171	Jefferson
30	2025-07-10_Waller.pdf	175157	Waller	66	2025-02-04_Jefferson.pdf	1260412	Jefferson
31	2025-06-23_Bowman.pdf	268083	Bowman	67	2025-02-12_Waller.pdf	160128	Waller
32	2025-06-23_Waller.pdf	131494	Waller	68	2025-01-31_Bowman.pdf	277290	Bowman
33	2025-06-06_Bowman.pdf	159612	Bowman	69	2025-01-09_Bowman.pdf	207155	Bowman
34	2025-06-03_Cook.pdf	120270	Cook	70	2025-01-08_Waller.pdf	192453	Waller
35	2025-06-02_Powell.pdf	134379	Powell	71	2025-01-06_Cook.pdf	176274	Cook



Appendix B: Federal Reserve Speech Text Processing and Sentiment Quantification Methodology

The text processing pipeline transforms raw Federal Reserve speech documents into structured data for quantitative analysis through several key steps.

Extraction involves parsing speech PDFs using the PyMuPDF library to extract the textual content while removing non-substantive elements such as headers and footers, ensuring the focus remains on meaningful policy discourse (Lee et al., 2021). Formally, a document D_i is converted into a clean text corpus T_i by removing extraneous tokens:[1]

$$T_i = \text{clean}(\text{parse}(D_i))$$

where $\text{parse}(\cdot)$ extracts raw text from PDF and $\text{clean}(\cdot)$ removes noise such as headers, line breaks, and footers.

Sentiment Analysis applies the VADER (Valence Aware Dictionary and sentiment Reasoner) algorithm, a lexicon- and rule-based model designed for social media and policy text, to calculate a compound sentiment score $S_i \in [-1, 1]$ for each processed speech text T_i , reflecting overall positive or negative sentiment (Hutto and Gilbert, 2014):

$$S_i = \text{VADER}(T_i)$$

The compound score synthesizes various polarity scores weighted by intensity and linguistic rules.

Keyword Detection entails extracting counts of predefined thematic terms pertinent to monetary policy (e.g., "inflation," "rates," "risk," "growth") using regular expressions (regex). For each keyword k_j , the count C_{ij} within document i is:

$$C_{ij} = \sum_{w \in T_i} \mathbb{1}_{w=k_j}$$

where $\mathbb{1}_{condition}$ is the indicator function that equals 1 if the word w matches the keyword k_j , and 0 otherwise.

Speaker Roles are inferred by associating document metadata and filename conventions with speakers' positions (e.g., Chair, voting member). This enables tagging speech contributions to contextualize sentiment and term usage by official role:

$$R_i = \text{inferRole}(\text{metadata}_i, \text{filename}_i)$$

This pipeline converts unstructured Federal Reserve communications into structured sentiment, thematic intensity, and speaker-tagged datasets, enabling rigorous empirical analysis of how rhetorical tone and topics influence financial markets.

[1] Lee et al. (2021), "FedNLP: An interpretable NLP System to Decode Federal Reserve Communications" <https://arxiv.org/pdf/2106.06247.pdf>

[2] Smith (2019), python-based pipeline for Federal Reserve speech processing. <https://github.com/davidjsmith44/NLP-Fed-Speeches>

[3] Hutto and Gilbert (2014), "VADER: A Parsimonious Rule-based Model for Sentiment Analysis of Social Media Text." <https://arxiv.org/pdf/1805.07851.pdf>

[4] <https://fednlp.net>

[5] <https://papers.ssrn.com/sol3/Delivery.cfm/4135736.pdf?abstractid=4135736&mirid=1>

[6] <https://www.sciencedirect.com/science/article/pii/S2405918823000302>

Appendix C: Literature Review Summary Table (2025–2020)

Author(s), Year	Main Results	Methodology	Data Used	Limitations
Alves & Laurini, 2025	Brazilian CB communication significantly shifts the yield curve; credibility of guidance.	Text analysis, econometrics	Brazilian CB statements, yield curve data	Brazil-specific; new study, few citations.
Chortareas, Papailias & Shuku, 2025	CB speeches (BoE, ECB, Fed) improve forecasting accuracy, especially in uncertainty.	NLP, forecasting models	BoE, ECB, Fed speeches; macro indicators	Focus on speeches; major CBs only
Chau, Deesomsak & Shaikh, 2024	Fed talk influences volatility/risk aversion, strong effects in crises/recession.	Sentiment analysis, VAR models	Fed statements, volatility indices	Context-dependent; advanced economies only.
Adra & Menassa, 2023	Fed shocks raise or lower firm uncertainty, influencing investment via uncertainty shift.	Panel & local projection regression	US firm investment, Fed announcements	US-centric; causality attribution.
Lin, Mei, Chen & Zhu, 2023	Mixed alignment between PBoC communication and actual policy; credibility issues.	Sentiment & index analysis	PBoC releases, monetary decisions	China-specific; transparency limits ⁵
Hayo & Zahner, 2022	Market may overreact to "noise" in CB communication; 80% of sentiment variation is noise.	Sentiment analysis, ANOVA	ECB/Fed texts, speeches (>10,000)	Hard to separate noise from signal.
Parle, 2022	ECB press conferences move markets; tone drives response.	Text sentiment, event study	ECB transcripts, market data	ECB focus; tone/policy separation issues
Nunes, Ozdagli & Tang, 2022	Policy-rate vs. information-rate shocks have distinct market impacts.	High-frequency ID, VAR	FOMC data, US markets	Shock separation complex; US-only
Hubert & Labondance, 2021	Tone signals policy direction; clear impact on market yields.	Sentiment indicators, econometrics	ECB/Fed communication, yield data	Tone coding subjective
Hu & Sun, 2021	Some CB pressers raise uncertainty, not clarity.	Sentiment analysis, uncertainty	CB press conference transcripts	Uncertainty definitions, limited scope

Author(s), Year	Main Results	Methodology	Data Used	Limitations
Fasolo et al., 2021 (a)	hLDA topic model uncovers themes linked to Brazilian yield curve.	Topic modeling (hLDA)	Brazilian CB statements	Brazil-only; novelty limits comparability
Fasolo et al., 2021 (b)	Confirms usefulness of hLDA for theme identification (robustness check).	hLDA, econometrics	Brazilian CB statements	Overlaps v1; novelty reduction
Leitner et al., 2021	ECB shocks affect systemic risk with heterogeneity in euro area.	Systemic risk econometrics	Eurozone systemic risk metrics	Regional scope; noise in shock ID
Ochs, 2021	Text-based policy shocks add information beyond rate changes.	Text analysis, VAR	ECB/Fed communications	Experimental, robustness unclear
Boehm & Kroner, 2021	FOMC talk directly affects US stocks, not just bonds.	Event study, regressions	US stocks, FOMC announcements	US focus; comm/policy overlap
Hüning, 2020	Swiss NB communication alters investor uncertainty, tone matters.	Text, volatility models	SNB statements, Swiss market data	Switzerland-specific; small sample
Möller, 2020	ECB communication shifts systemic risk in eurozone.	Event, systemic risk metrics	ECB news, eurozone risk measures	ECB-only; comparability limits
Möller & Reichmann, 2020	ECB conference language affects stock returns.	Sentiment, regressions	ECB transcripts, stock markets	ECB-only; no spillover analysis
Baranowski, Bennani & Doryń, 2020	ECB tone predicts policy moves.	Tone, forecasting analysis	ECB statements, policy actions	Tone focus; ECB only
Fendel, Neugebauer & Kilinc, 2020	Core/periphery yield effects of ECB communication differ.	Event study, yield curve modeling	ECB comms, euro area yield data	Euro area only
Ostapenko, 2020	CB communication as info vs. policy shock has distinct effects.	VAR, event study	ECB/Fed communication	Broad theoretical framing, empirical depth
Lunsford, 2020	Early Fed guidance had strong effects even without rate moves.	Text, high-frequency ID	US Fed guidance (2000s), market data	Historical sample; may not match modern

Appendix D: Federal Reserve speakers

Last Name	Full Name	Role
Powell	Jerome H. Powell	Chair of the Federal Reserve Board
Cook	Dr. Lisa D. Cook	Member (Governor) of the Federal Reserve Board
Waller	Christopher J. Waller	Member (Governor) of the Federal Reserve Board
Bowman	Michelle W. Bowman	Member (Governor) of the Federal Reserve Board
Barr	Michael S. Barr	Vice Chair for Supervision of the Federal Reserve Board
Jefferson	Dr. Philip N. Jefferson	Vice Chair of the Federal Reserve Board
Kugler	Dr. Adriana D. Kugler	Member (Governor) of the Federal Reserve Board