The Effects of Central Bank Digital Currency Communication and Associated Social Media Sentiment on Cryptocurrency Markets

Iulia Cioroianu, Shaen Corbet, Charles Larkin & Les Oxley

Comments

Alvaro Ortiz (BBVA Research)

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Relevance: Important Topic

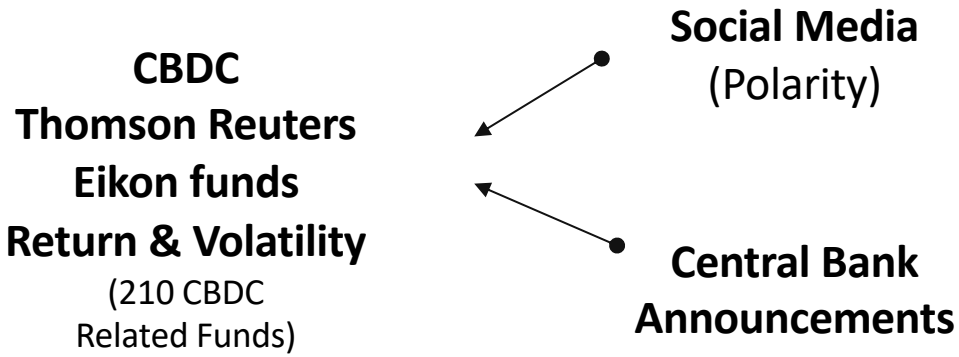
- The development of Cryptocurrency Markets
  - Potential development and use of CBDCs
  - Financial Stability
- Central Bank Communication effects: How and When
- Propagation of Information in Social Media
- Big Data : “NPL Sentiment Analysis techniques”

The Paper: Key Question and Methodology

- **Key Question:** Does Social Media & Central Bank Messages influence returns & volatility of CBDC funds

- **Big Data Methodology II:** Social Media (Supervised Dictionaries LM & Harvard HI) and Central Bank CBDC Analysis

- **Methodology II:** Garch Regression testing significance of Social Media and Regulation on Eikon Funds



Results: Sentiment effects on returns & volatility. Higher eff by CBDC

$$R_t = a_0 + \sum_{j=1}^{5} b_j R_{t-j} + b_2 DJ_t + b_3 S_t + D_{reg} + \varepsilon_t$$

$$\varepsilon_t | \Omega_t \sim i.i.d. \quad N(0, h_t)$$

$$h_t = \omega + \alpha_1 h_{t-1} + \beta_1 u_{t-1}^2$$

Figure 5: Return and volatility differentials based on sentiment and regulatory effects

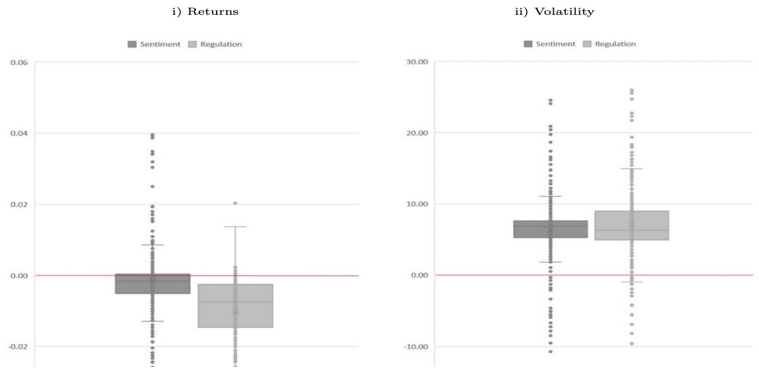


Table 3: Proportion of significant coefficients in returns and volatility models

	Returns						*Volatility*					
Fund Type	LM Pol.	HI Pol.	Reg.	LM Subj.	HI Subj.	Reg.	LM Pol.	HI Pol.	Reg.	LM Subj.	HI Subj.	Reg.
Equity ETF	40.4%	41.2%	46.7%	48.1%	44.6%	56.9%	49.0%	53.1%	54.2%	55.2%	57.3%	52.1%
Exchange-Traded Fund	16.7%	33.3%	33.3%	66.7%	16.7%	66.7%	33.3%	16.7%	50.0%	50.0%	50.0%	83.3%
Exchange-Traded Note	34.3%	41.1%	46.0%	34.9%	47.6%	60.3%	34.9%	47.6%	60.3%	31.7%	68.3%	54.0%
Other Exch-Traded Products	61.9%	76.2%	61.9%	78.6%	59.5%	85.7%	78.6%	59.5%	85.7%	59.5%	73.8%	66.7%
Geographic Region	LM Pol.	HI Pol.	Reg.	LM Subj.	HI Subj.	Reg.	LM Pol.	HI Pol.	Reg.	LM Subj.	HI Subj.	Reg.
Germany	42.6%	50.0%	63.2%	51.5%	58.8%	77.9%	51.5%	58.8%	77.9%	70.6%	83.8%	72.1%
Switzerland	81.0%	71.4%	95.2%	95.2%	71.4%	71.4%	95.2%	71.4%	71.4%	61.9%	81.0%	76.2%
United States	5.6%	7.2%	7.8%	7.8%	7.2%	13.9%	7.8%	7.2%	13.9%	15.6%	14.4%	17.8%
Other	56.5%	53.2%	65.8%	66.5%	64.5%	77.4%	65.0%	64.5%	59.0%	54.8%	58.2%	87.1%

Note: The above results present the proportion of coefficients for sentiment (polarity and subjectivity) and central bank announcements that were significant at the 1% level in each GARCH(1,1) model. For brevity, individual methodological results, and those results focusing on variants of the presented dummy variables as a robustness testing mechanism have been omitted, but are available from the authors upon request.

Sentiment: Data on Tweets (I) Growing but What about the rest ?

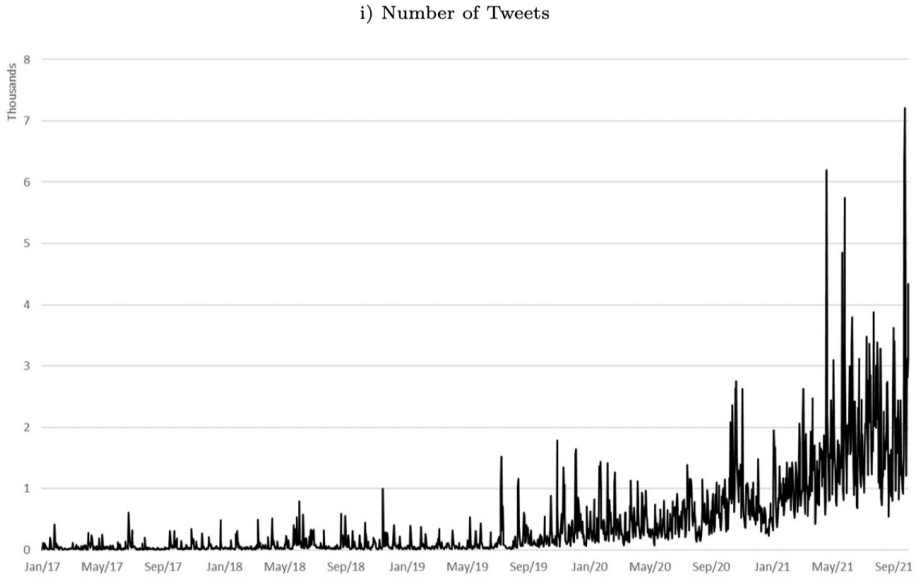
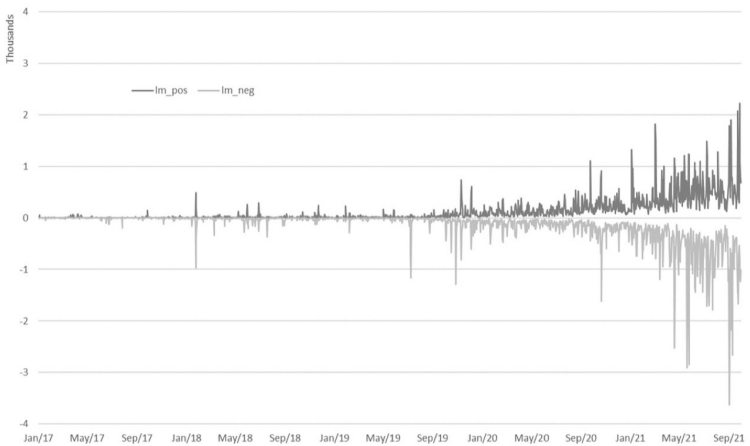


Table 2: Summary statistics relating to collected social media data

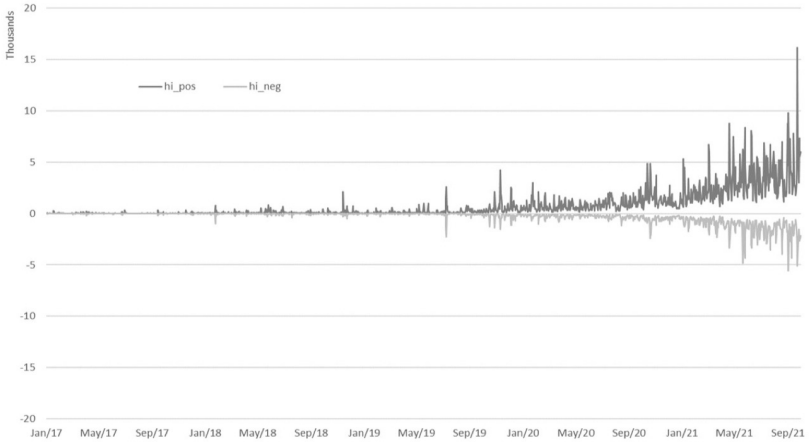
Time Period	Tweets	Likes	Retweets
2017 Q1	3,320	29,673	1,498
2017 Q2	5,482	293,231	3,871
2017 Q3	3,370	104,234	2,818
2017 Q4	4,695	25,472	2,199
2017 Total	16,867	452,610	10,386
2018 Q1	4,535	275,587	5,209
2018 Q2	11,013	315,686	8,722
2018 Q3	6,838	230,185	5,343
2018 Q4	7,810	622,312	10,525
2018 Total	30,196	1,443,770	29,799
2019 Q1	5,486	67,361	6,682
2019 Q2	6,567	206,414	9,780
2019 Q3	17,142	4,133,913	29,133
2019 Q4	32,317	4,375,106	62,365
2019 Total	61,512	8,782,794	107,960
2020 Q1	37,220	1,563,719	70,784
2020 Q2	38,317	927,914	63,948
2020 Q3	54,713	1,959,856	104,673
2020 Q4	76,679	1,838,124	160,964
2020 Total	206,929	6,289,613	400,369
2021 Q1	95,912	6,464,895	259,307
2021 Q2	162,536	31,404,284	451,578
2021 Q3	187,752	40,402,754	503,500
2021 Total	446,200	78,271,933	1,214,385
Total Period	761,704	95,240,720	1,762,899

Sentiment Measures: Dictionaries and Measures

i) Loughran and McDonald financial sentiment as separated by positivity and negativity

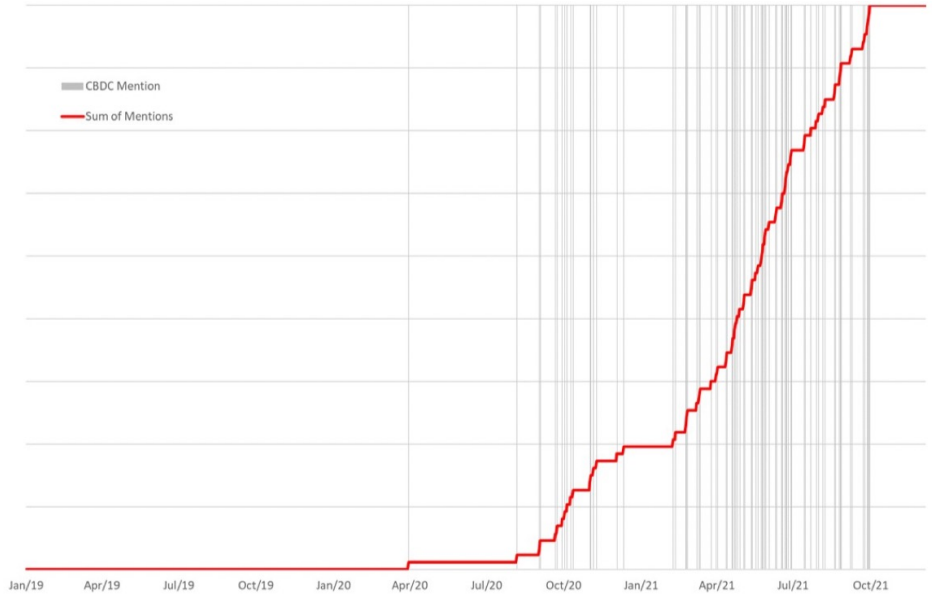


ii) Harvard General Inquirer IV-4 as separated by positivity and negativity



Central Bank Announcements: Increasing & assumed negatives

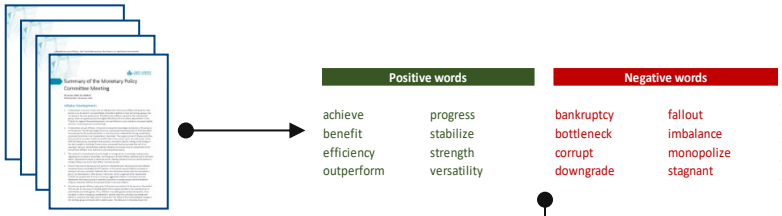
Figure 4: Major central bank mentions with regards to CBDC (2019-2021)



Note: In the above figure, we present the time series of all announcements made on the websites of the U.S. Federal Reserve, the European Central Bank, the Bank of England, the Bank of Japan, the Swiss National Bank, and the Bank of Canada and which were related explicitly to either CBDC or central bank-denoted cryptocurrencies.

Sentiment Measures I: Different Approaches

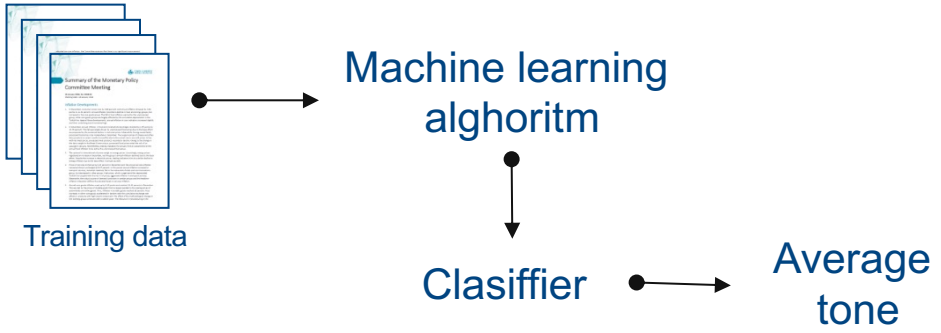
The Lexicon approach
(Unsupervised)



$$\textbf{Average tone} = \frac{\sum Positive\ words\ - \sum Negative\ words}{\sum Total\ words}$$

From the bag of words, dictionaries are applied to get the matched words and assign a polarity score. Finally average tone is computed

The Machine Learning approach
(Supervised)



The algorithm analyses data that were previously labelled as positive, negative or neutral; extracts features that model the differences between different classes, and infers a function, that can be used for classifying new examples unseen before.

Sentiment Measures II: The Twitter Challenge

- **Why is Twitter a Challenge:**

- Small size of the tweet (280 characters max)
- Use of abbreviations and slangs
- Use of hashtags, emoticons, symbols, urls,…
- High emotional language to express opinions
- Use of different languages

ML Algorithms could be more suitable since they could learn from this type of language and increase the accuracy to analyze sentiment from new tweets

To get a more accurate measure of sentiment using the lexicon approach, dictionaries should be based on this particular way of writting

Check (adjust) for the existence of "Confounders": Tightening

Same Asset Class As NasDaq?

$$R_t = a_0 + \sum_{j=1}^{5} b_j R_{t-j} + b_2 DJ_t + b_3 S_t + D_{reg} + \varepsilon_t$$

$$\varepsilon_t | \Omega_t \sim i.i.d. \quad N(0, h_t)$$

$$h_t = \omega + \alpha_1 h_{t-1} + \beta_1 u_{t-1}^2$$

Interest Rates (Tightening)

CBDC
Thomson Reuters Eikon funds
Return & Volatility
(210 CBDC Related Funds)

Social Media (Polarity)

Central Bank Announcements

Summing Up:

- Relevant Paper
- Sample: Ultraloose + New Tightening
- Variable Robustness: Test Supervised & Unsupervised Sentiment
- Model Robustness: Existance of Confounder

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