Prediction of Exchange Rate Changes with Monetary Policy Indexation of FOMC Meeting Minutes

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Abstract

We derive four monetary policy indices from FOMC (Federal Open Market Committee) minutes to analyze exchange rate changes in several foreign currencies. These monetary policy indices are found to have significant impacts on foreign currency changes in emerging markets while exchange rate changes in some developed or industrial countries could depend on monetary policy indices from meeting records of their own central banks or central banks of their competitors. Additionally, a monetary policy uncertainty indicator based on entropy is introduced to further improve the prediction of exchange rate changes in certain currencies. We find that the uncertainty of meeting minutes could reduce the market belief in monetary policy stance, and then reduce the impact of monetary policy sentiments on exchange rate variations.

Keywords: Carry Trade; Interest Rate Policy; FOMC; Meeting Minutes; Monetary Policy Index

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I. Introduction

Carry trade strategies often involve selling one low-interest-rate currency and buying the other high-interest-rate currency to earn the interest rate spread. According to the uncovered interest parity (UIP) theory, the forward exchange rate can be determined by interest rate differentials between two currencies. Meanwhile, low-interest-rate currencies would tend to appreciate, and high-interest-rate currencies would tend to depreciate. Nevertheless, the outcomes of carry trades could deviate from the UIP theory. This paper aims to provide insights into future exchange rate changes by studying some monetary policy factors constructed from FOMC minutes and other central banks' meeting records.

In 2020, the COVID-19 pandemic raged globally, and lots of countries tried to adopt expansionary fiscal and monetary policies to propel the global economic recovery in 2021. However, the excess liquidity in the currency supply could incur high inflation rates. In 2022, many central banks began to tighten their monetary policies to curb high inflation. For example, the FOMC raised the policy interest rate from zero to 425 basis points within a year. The higher policy interest rates in the United States made market participants prefer holding high-yield U.S. dollars to other currencies, and the influx of international funds into the United States further boosted the U.S. dollar exchange rate. The U.S. Dollar Index (the DXY Index) even hit its 20-year high value. Compared to U.S. dollars, there is a nearly 10% depreciation of new Taiwan dollars (NTD) in 2022. This phenomenon aligns with the forward premium puzzle proposed by Fama (1984). Chinn & Meredith (2005) point out that interest rate differentials between two currencies are not necessarily offset by exchange rate movements and may even make high-interest-rate currencies further appreciate.

Reviewing the performance of various currencies in 2022, we observed significant market volatility every time the FOMC meeting concluded. This volatility not only reflects changes in monetary policy but also indicates that investors adjust their expectations for the future

performance of financial assets by analyzing the content of the post-FOMC meeting press conference by the Federal Reserve chairman, policy statements, and the meeting minutes released 20 days after the meeting. Although the minutes are not published until 20 days after the meeting, they contain substantial amounts of information regarding financial market conditions and economic prospects. Therefore, when the minutes are released, the market could react quite intensely, aligning with Rosa's (2013) observation that the minutes receive significant market attention. However, the extensive information contained in the minutes, combined with their length, makes interpreting their content challenging and time-consuming. Huang & Kuan (2019, 2021) point out that, without analytical tools to examine the text content of these minutes, analysts' interpretations of FOMC's attitude by reading between the lines based on their experience and surmise could be very subjective. Thus, we try to derive the information of FOMC minutes about the future monetary policy (dovish or hawkish etc.) by document indexation and further investigate these monetary policy indices whether to aid in the prediction of future exchange rate changes. Constructed monetary policy indices may effectively explain the performance of currency exchange rate changes in percentage terms following the release of meeting minutes of monetary policy meetings. For example, when the monetary policy indices lean toward the hawkish monetary policy, the trend of the US dollar against specific currencies may tend toward appreciation. However, the impossible trinity of Mundell (1960, 1963) and Fleming (1962) may provide explanation why there may be differences existing in the responses of various currencies. Mundel-Fleming's impossible trinity shows that, in a triangle of the fixed exchange rate, free capital mobility, and independence monetary policy, we can choose only one corner with two policy choices and impossible to have all three policy choices. Aizenman et al. (2013) further provide an example of empirical measurement and testing of this hypothesis.

This paper employs the methodology proposed by Tadle (2022) to construct indices based on categorizing the implied direction of monetary policy decisions in meeting minutes with

used vocabulary including hawkish and dovish terms. We also distinguish between positive and negative terms to differentiate the hawkish and dovish monetary policies in the semantics. First, we read the meeting minutes, segment them into sentences, remove punctuation, and label the monetary policy attitude for each sentence. Ultimately, based on the monetary policy attitude distribution of each set of meeting minutes, we construct four monetary policy indices. The synthesis index (SI) references the indicator proposed by Tadle (2022), while this paper further constructs three advanced monetary policy indices: dovish index (DI), hawkish index (HI), and Christofferson index (CI) based on Christofferson's (1998) bunching concept. Furthermore, we measure the uncertainty of monetary policy attitudes using the concept of entropy based on the monetary policy attitude distribution in the meeting records. We then conduct regression analysis that combines monetary policy indices, the monetary policy attitude uncertainty index, and other macroeconomic variables with the percentage change in exchange rates by adopting the methods proposed by Berge et al. (2011) and Jordà & Taylor (2012) for various currencies after the release of FOMC monetary policy meeting minutes.

The remaining content of this paper is described as follows: Section II outlines the research methodology. Section III describes the data and discusses the results, and Section IV provides the conclusion.

II. Methodology

Related carry-trade literature includes Lustig & Verdelhan (2007), Brunnermeier (2009), Jordà & Taylor (2012), and others. Clarida et al. (2009) find that carry-trade strategies across countries could generate long-term excess returns. Meanwhile, returns of carry-trade could quickly reverse. Jordà & Taylor (2012) find that trading based on interest rate differentials could generate positive returns until the global financial crisis in 2008. Returns could be increased with the aid of fundamental information such as inflation rates, previous exchange rate returns,

and the fundamental equilibrium exchange rate (FEER). Considering the dependence of exchange rate movements on related central banks, Chen (2016) used a structural VAR model to identify structural exchange rate fluctuations and investigate whether the central bank of Taiwan exhibits asymmetric intervention behavior in the foreign exchange market, i.e., whether it intervenes to prevent depreciation but not appreciation. Lan et al. (2018) introduced the foreign exchange reserves hold by the central bank of Taiwan as a proxy variable for the exchange rate intervention of the central bank of Taiwan to increase the return of the carry trade strategy.

Recently, many researchers have focused on the reaction of asset prices to the documents released by FOMC. For example, Balduzzi et al. (2001) investigate the impact of related macroeconomic announcements on government bond prices, trading volume, and bid-ask spreads. Bernanke & Kuttner (2005) analyze the impact of monetary policy on stock prices and find that an unexpected 25-basis-point decrease in the federal fund rate target could lead to approximately a 1% increase in the index of the stock market. Fischer & Ranaldo (2011) find that FOMC announcements could lead to an approximately 5% increase in foreign exchange trading volumes in the spot and overnight markets. Rosa (2013) finds that the impact of the FOMC minutes on asset prices is still statistically and economically significant, although the magnitude may be slightly smaller compared to the release of FOMC statements. Jegadeesh & Wu (2017) further quantify the economic and policy content by segmenting FOMC minutes into different economic themes and extracting the tone and uncertainty levels associated with each theme. They find that, even though the FOMC minutes is released on the day of 20 days after the FOMC meeting, the thematic content still holds significant informational value. Tadle (2022) introduces an automated and systematic method called the latent Dirichlet allocation (LDA) for evaluating information within FOMC documents to analyze inflations. A custom dictionary is developed to quantify the information of the policy guidance implicit in the press releases.

We employ and extend the method of Tadle (2022) to compile monetary policy indicators from FOMC minutes for the prediction of the subsequent currency exchange rate movements across countries. Four emotion dictionaries were defined: positive dictionary, negative dictionary, dovish dictionary, and hawkish dictionary (see Table 1).[1] In the dovish dictionary, words are marked to represent a dovish stance, emphasizing a deteriorating economic outlook and implying that the Fed may tend to adopt the expansionary monetary policy. Examples of dovish terms include "unemployment" and "recession." On the other hand, the hawkish dictionary marks words to represent a hawkish stance, emphasizing an overheating economy and implying that the Fed may tend to adopt the contractionary monetary policy. Examples of hawkish terms include "inflation" and "income." The positive and negative dictionaries contained terms describing positive or negative sentiments, such as "increase," "decrease," "rise," and "fall," to assess the implied monetary policy attitudes in sentences, whether leaning toward a hawkish or dovish stance. We first split the FOMC minutes into sentences based on periods, and n_d denotes the total number of sentences. Then, all words in each sentence are converted into lowercase and we remove punctuation and irrelevant stop words, such as "a", "an", and "the". To obtain the implied monetary policy attitudes in each sentence, we conduct a comparison to determine how many hawkish (*hawk*), dovish (*dov*), positive (*p*), and negative (*n*) words appearing in each sentence. Based on this comparison, we assign a monetary policy attitude score to each sentence. If a sentence leans hawkish, its score is labeled as +1. If it leans dovish, the score is labeled as -1. If there is no specific tendency, the score is labeled as 0. The

[1] Table 1 displays four different dictionaries: the hawkish dictionary, the dovish dictionary, the positive dictionary, and the negative dictionary. Each dictionary comprises terms that are analyzed by Tadle (2022) through LDA to be the most emotional in the minutes of the FOMC meetings over the past few years. In this paper, we completely adopt Tadle's approach to employing these four distinct dictionaries for analysis without modification. We also compile indicators from central bank meeting minutes of other countries by employing their English meeting minutes to avoid linguistic variations.

determination method for the sentence k in the minutes d is as follows:

$$score\left(sent_{d,k}\right) = \begin{cases} 1, & hawk > \text{dov and } p > n \\ -1, & hawk > \text{dov and } p < n \\ -1, & dov > hawk \text{ and } p > n \\ 1, & dov > hawk \text{ and } p < n \\ 0, & \text{otherwise} \end{cases} \quad (1)$$

The following two sentences are excerpted from the FOMC minutes as examples for monetary policy attitude analysis:

Ex 1：This sentence indicates that the labor market conditions remain strong, implying a vibrant economic situation. In this sentence, “labor” is a term from the hawkish dictionary, and “strong” is a term from the positive dictionary. Taking together, this sentence implies hawkish sentiment, with a score of +1: *hawk*=1>*dov*=0 & *p*=1>*n*=0

Participants agreed that labor market conditions had remained strong.

(From Fed Minutes 2018/12/19)

Ex 2：This sentence indicates that the decline in inflation is due to the fall in oil prices. In this sentence, “prices/inflation” are hawkish terms, while “decline/drop” are negative terms. Taking together, this sentence implies a dovish sentiment, with a score of -1: *hawk*=2>*dov*=0 & *n*=2>*p*=0.

A sizable decline in oil prices was cited as an important factor contributing to the drop in measures of inflation compensation.

(From Fed Minutes 2018/12/19)

With the monetary policy attitude labeling to assess the implied monetary policy score for each sentence in the meeting minutes, we can obtain the monetary policy attitude distribution $sent\_dist_d$ for this FOMC minutes. $sent\_dist_d$ is a sequence consisting of -1, 0, and 1, representing the monetary policy scores for each sentence in the minutes, d. By summing the monetary policy scores of all sentences and dividing by the total number of sentences n_d, we can calculate the monetary policy score $SI(d)$ for this FOMC minutes as follows：

$$SI(d) = 100 \times \frac{1}{n_d} \times \sum_{k=1}^{n_d} score\left(sent_{d,k}\right). \quad (2)$$

If the monetary policy score $SI(d)$ of the FOMC minutes, d tends to approach 1, it indicates that the overall monetary policy attitude in the minutes leans hawkish, suggesting that FOMC may adopt the contractionary monetary policy. Conversely, if the $SI(d)$ tends to approach -1, it generally leans dovish, suggesting that FOMC may adopt the expansionary monetary policy. Figure 1. presents the line chart of the sentiment index compiled from the FOMC minutes. After the outbreak of the subprime mortgage crisis in 2008, the negative values of the sentiment index show that the FOMC promptly adopted a relatively expansionary monetary policy. Similar phenomena occurred during the 2011 U.S. debt ceiling crisis and the 2020 global COVID-19 pandemic crisis.

Different from Tadle (2022), we further subdivide the monetary policy indicator $SI(d)$ into dovish indicator $DI(d)$ and hawkish indicator $HI(d)$ for assessing the implied different attitude tendencies more flexibly. The dovish indicator represents sentences in the FOMC minutes leaning toward maintaining or adopting an expansionary monetary policy, while the hawkish indicator represents sentences leaning toward maintaining or adopting a contractionary monetary policy. The dovish and hawkish indicators could be quantified with the following equations:

$$DI(d) = 100 \times \frac{1}{n_d} \times \sum_{k=1}^{n_d} I_{d,k}^{dovish}, \quad (3)$$

where

$$I_{d,k}^{dovish} = \begin{cases} 1, & score(sent_{d,k}) = -1 \\ 0, & score(sent_{d,k}) = 0 \text{ or } 1 \end{cases} \quad (4)$$

and

$$HI(d) = 100 \times \frac{1}{n_d} \times \sum_{k=1}^{n_d} I_{d,k}^{hawkish}, \quad (5)$$

where

$$I_{d,k}^{hawkish} = \begin{cases} 1, & score(sent_{d,k}) = 1 \\ 0, & score(sent_{d,k}) = 0 \text{ or } -1 \end{cases}. \quad (6)$$

If the $DI(d)$ indicator of the FOMC minutes, d, is higher, it indicates that the overall monetary policy attitude in the FOMC minutes leans toward dovish. Conversely, if the $HI(d)$ indicator for the FOMC minutes, d, is higher, it implies a higher overall hawkish monetary policy attitude.

Because previous literature has mostly used methods such as "summation" or "averaging" to measure the implied monetary policy score of FOMC minutes, the impact of monetary policy attitude transition frequency has been rarely explored. Inspired by the concept of independence tests for bunching (Christofferson, 1998), we apply it to gauge the monetary policy tendency in the FOMC minutes. With the previous description of employing dictionaries to extract the monetary policy score implicated in the sentence,k , in the FOMC minutes, d, denoted as $score(sent_{d,k})$, we can obtain a monetary policy attitude distribution, $sent\_dist_d$, for the FOMC minutes, d. This attitude distribution is a sequence composed of 1, 0, and -1, where 1 indicates a hawkish monetary policy attitude, 0 represents a relatively neutral attitude, and -1 signifies a dovish monetary policy attitude implied in the corresponding sentence. For example, $sent\_dist_d$=[0, 1, 1, 1, 0, -1, -1, -1,…, 0, 0, 1, 0, 1, 0, 1, 0, 0]. Given $sent\_dist_d$, the attitude transition between each pair of sentences in the FOMC minutes could be calculated. For example, if the $score(sent_{d,k})$ for the sentence, k, is 0, indicating a neutral attitude implied in that sentence, and the $score(sent_{d,k+1})$ for the sentence $(k+1)$ is 1, indicating a hawkish monetary policy attitude, the attitude transition between these two sentences could lead to adding 1 to $\pi_{d,0,1}$. Based on the similar classifications, we could calculate the frequencies of various attitude transition patterns such as $\pi_{d,0,0}$, $\pi_{d,0,-1}$, $\pi_{d,-1,1}$, $\pi_{d,-1,0}$, $\pi_{d,-1,-1}$, $\pi_{d,1,1}$,

$\pi_{d,1,0}$, and $\pi_{d,1,-1}$. After obtaining the frequency of attitude transition patterns, we can calculate the CI hawkish transition indicator using the following method:

$$CI(d) = \frac{\pi_{d,0,1}+\pi_{d,1,1}+\pi_{d,-1,1}}{\sum_{i=-1}^{1}\sum_{j=-1}^{1}\pi_{d,i,j}}. \quad (7)$$

If $CI(d)$ for the FOMC minutes, d, is higher, it indicates that, in the FOMC minutes, the transitioning frequency of hawkish remarks or maintaining hawkish remarks is higher. Conversely, if $CI(d)$ is lower, it indicates that the FOMC minutes leans toward dovish transition. Now, we have four monetary policy indicators: $SI(d)$, $DI(d)$, $HI(d)$, and $CI(d)$ corresponding to the overall sentiment, dovish, hawkish, and hawkish transition tendencies in the FOMC minutes.

However, we seek to further understand whether the density of the sentence monetary policy score in the FOMC minutes affects the percentage changes in exchange rates. Entropy is a metric used to measure the uncertainty and disorder of information. We further introduce the concept of entropy to analyze the impact of the disorder of monetary policy scores in the FOMC minutes on exchange rates. Higher monetary policy score density indicates a relatively concentrated distribution of monetary policy discourse in the FOMC minutes, which may reflect strong monetary policy tendencies and could therefore have a significant impact on currency exchange rates. In contrast, lower and dispersed monetary policy score density suggests relatively high uncertainty of the monetary policy discourse. Therefore, the calculation of entropy is defined as follows:

$$EN(d) = -\left(P_{d,H}\log_3 P_{d,H} + P_{d,N}\log_3 P_{d,N} + P_{d,D}\log_3 P_{d,D}\right) \quad (8)$$

where $P_{d,H}$ denotes the proportion of hawkish sentences, $P_{d,N}$ denotes the proportion of neutral sentences, and $P_{d,D}$ denotes the proportion of dovish sentences in minutes d. If the $EN(d)$ indicator score for the FOMC minutes, d, is higher, it indicates that the monetary policy distribution in the FOMC minutes is more dispersed, and the monetary policy uncertainty is

higher. Conversely, if the score is lower, it suggests that the monetary policy distribution in the FOMC minutes is more concentrated and the monetary policy uncertainty is lower.

Next, these monetary policy indicators are employed for regression analysis to investigate whether they can explain the percentage change in exchange rates following the release of FOMC minutes. In addition to these monetary policy indices, factors proposed by Berge et al. (2011) and Jordà & Taylor (2012) are also included in the regression model as follows:

$$\Delta e_{t+1} = \beta_0 + \beta_1 \Delta e_t + \beta_2 e_t + \beta_3 (i_t^* - i_t) + \beta_4 (\pi_t^* - \pi_t) + \beta_5 Index_{t,j} + \varepsilon_{t+1} \quad (9)$$

where e_t denotes the exchange rate of one base-country currency (USD) for the home-country currency on day t, Δe_{t+1} denotes the percentage change in the exchange rate on the day after the release of the FOMC meeting records, i_t denotes the annual base-country interest rate (USD), i_t^* denotes the corresponding home-country currency annual interest rate, π_t denotes the base-country annual inflation rate, π_t^* denotes the annual inflation rate of the home-country country, $Index_t$ denotes one of our constructed monetary policy indices from the FOMC meeting minutes, and ε_{t+1} denotes the prediction error. The policy interest rate differential between two countries, used in carry-trade strategies, has its economic implications rooted in the UIP theory: when a country's interest rates are higher, its currency tends to depreciate. While this theory may have limited practical applicability, evidence supporting the impact of interest rate differentials on exchange rate movements has been put forth by Bilson (1981), Lyons (2001), and Sarno et al. (2006). The difference in inflation rates between the two countries involved in the interest rate differential trade is in line with the purchasing power parity (PPP) theory. According to PPP, countries with higher inflation tend to depreciate their currencies.

In further analysis, we hypothesize that the monetary policies of various central banks may also have an impact on the percentage change in exchange rates following the release of FOMC minutes. Based on this hypothesis, we expand the scope of constructing monetary policy indicators by using meeting records from other central banks. These central banks include the European Central Bank (Monetary Policy Accounts), the Bank of England (Monetary Policy

Summary and Minutes), the Bank of Canada (Monetary Policy Report), the Bank of Japan (Minutes of the Monetary Policy Meeting), the Bank of Korea (Minutes of the Monetary Policy Board Meeting), and the Central Bank of Taiwan (Minutes of Monetary Policy Meeting). We constructed monetary policy indicators for each meeting record of central banks following the methodology consistent with the monetary policy indicators for FOMC meeting minutes with the same dictionaries of words and word tagging methods to label hawkish and dovish monetary policy attitudes, as well as identifying positive and negative terms.

Ⅲ. Data and Results

We collect meeting record data from the official website of the U.S. Federal Reserve System, spanning from 2008 to 2022, totaling 121 meeting records. Furthermore, we also employ relevant data from other central banks for analysis, including the European Central Bank's (ECB) Monetary Policy Reports, the Bank of England's (BOE) Monetary Policy Summary and Minutes, the Bank of Canada's Monetary Policy Report, the Bank of Japan's Minutes of the Monetary Policy Meeting, the Bank of Korea's Minutes of the Monetary Policy Board Meeting, and the Central Bank of China's Minutes of Monetary Policy Meeting. These data are obtained from the official websites of central banks. It is worth noting that due to the absence of meeting records for the early periods from the European Central Bank, the Bank of Korea, and the Central Bank of China, the time frames consist of 64 meeting records from 2015 to 2022, 132 meeting records from 2010 to 2022, and 20 meeting records from 2018 to 2022, respectively.

We analyze the explanatory power of the monetary policy index for the exchange rate movements of various countries' currencies after the release of the meetings. Currencies are included from countries such as the United States (US Dollar), Canada (Canadian Dollar), European Union (Euro), United Kingdom (British Pound), Japan (Japanese Yen), South Korea

(South Korean Won), Taiwan (New Taiwan Dollar), Mexico (Mexican Peso), Brazil (Brazilian Real), Turkey (Turkish Lira), India (Indian Rupee), Thailand (Thai Baht), and the Philippines (Philippine Peso). Selected countries encompass both developed and emerging market countries. The timeframe ranges from January 2, 2008, to December 20, 2022 with a total of 3905 daily closing exchange rate data points against the U.S. dollar. The date is from Bloomberg terminal and the Investing.com database.

In the analysis process, variables such as interest rates, inflation rates, and foreign exchange reserves may be included in the regression. For interest rates, we use the policy rate data from various countries. Inflation rates are calculated with each country's consumer price index (CPI) year-on-year growth rate data, spanning from 2008 to 2022 with a total of 180 monthly data points. Data sources include the FRED database and Bloomberg terminal. As for foreign exchange reserve data from the Central Bank of Taiwan, it is obtained from the official website of the Central Bank of Taiwan. Table 2 gives the summary statistic for each monetary policy index and the monetary policy uncertainty index.

This paper aims to compile four indicators measuring monetary policy tendency and one indicator measuring monetary policy uncertainty for meeting records of Fed, European Central Bank, Bank of England, Bank of Canada, Bank of Japan, the Central Bank of Taiwan, and Bank of Korea. These indicators are $SI(d)$, $DI(d)$, $HI(d)$, $CI(d)$, and $EN(d)$. These indicators were standardized to ensure comparability across countries. We conduct an analysis of the percentage changes in exchange rates for various currencies following the release of FOMC minutes using previously mentioned regression models. We select several important currency pairs, including the U.S. Dollar against the Mexican Peso (MXN), Brazilian Real (BRL), Turkish Lira (TRY), Indian Rupee (INR), Thai Baht (THB), Philippine Peso (PHP), New Taiwan Dollar (NTD), and South Korean Won (KRW), as well as the Euro (EUR), British Pound (GBP), Canadian Dollar (CAD), and Japanese Yen (JPY).

Table 3 gives the regression result with Eq. (9) for THB/USD. In addition to the inflation spread ($\pi_t^* - \pi_t$) and the exchange rate change on the previous day (Δe_t), the response of THB/USD exchange rate changes (Δe_{t+1}) on the day after releasing the FOMC minutes to the monetary policy indicator ($Index_{t,j}$) constructed from the FOMC minutes appears to be significant except for the hawkish indicator (HI). The response of THB/USD to the FOMC minutes seems to arise from the dovish monetary policy attitude. One possible reason is that the dovish monetary policy of FOMC may aid to the travelling industry of Thailand. The dovish monetary policy of FOMC could make THB appreciate against USD. It is presumed that Thailand's economy is primarily driven by tourism (over 50% of GDP). In fact, we find similar phenomena among other countries such as Mexico and Brazil in central and south America, Turkey in western Asia, India in south Asia, and Philippines in southeast Asia. Due to the similarity, we only present the analysis result of Thailand for illustration. According to the empirical work of Aizenman et al. (2013), emerging market countries in Latin America and Asia have moved toward the middle-range levels of exchange rate stability and financial integration while not losing much monetary independence. Currencies in these countries may depend on the monetary policy of FOMC. One possible reason is that these countries may adopt these policies to ensure their heavily trades with the U.S. and these choices make their currencies more susceptible to fluctuations in the Fed policy.

However, currencies of developed countries like the United Kingdom and Japan, as well as some industrial countries like South Korea and Taiwan, are not significantly predicted by these monetary policy indicators constructed from FOMC minutes alone. Tables 4 and 5 respectively show the responses of NTD/USD and KRW/USD exchange rate changes to these monetary policy indices as examples for illustration. According to the popular Mundell-Fleming model of Mundell (1960, 1963) and Fleming (1962), some countries may maintain their monetary independence with exchange rate flexibility and capital account openness. Currencies in these countries may depend on the monetary policy of their own central banks.

These countries may have relatively independent monetary policies and mature economic systems. Therefore, currencies in these countries are more likely to be influenced by their own central banks. Therefore, we further investigate the response of exchange rate changes for countries with high development levels to monetary policy indices constructed from meeting records of their own central banks. These countries include Taiwan (NTD), South Korea (KRW), Euro (EUR), United Kingdom (GBP), Canada (CAD), and Japan (JPY). The regression analysis model is presented in Eq. (10) and Table 6 shows the result of the response of NTD/USD exchange rate changes to these monetary policy indices including $Index_{t,j}^{*}$ constructed from meeting records of the central bank of Taiwan (CBC) as an example for illustration.

However, due to the variance in announcement dates between the FOMC meeting minutes and other central banks, we adopted the publication time of the FOMC minutes as the reference point and proceeded backward to find out the nearest meeting minutes of other central banks for compiling indicators. For instance, we will employ indicators derived from the FOMC meeting minutes on 2019/02/20 and the nearest backward meeting minutes of the Taiwan Monetary Policy Board (released on 2019/01/31) as illustrated in Figure 2 to analyze the NTD/USD movement following the release of the FOMC minutes on 2019/02/20. These central banks' monetary policy indicators would be included in the regression model:

$$\Delta e_{t+1} = \beta_0 + \beta_1 \Delta e_t + \beta_2 e_t + \beta_3 (i_t^* - i_t) + \beta_4 (\pi_t^* - \pi_t) + \beta_5 Index_t + \beta_6 Index_{t,j}^{*} + \varepsilon_{t+1}, \quad (10)$$

where $Index_t^{*}$ denotes one of our constructed monetary policy indices from the meeting minutes of the central bank in the home country. After including the CBC monetary policy indicators into the regression, the responses to CBC SI, CBC DI, CBC HI, and CBC CI are all significant. Obviously, the NTD/USD exchange rate is influenced by the monetary policy of the central bank of Taiwan. One possible reason is the GDP composition of Taiwan heavily relies on exports with United States. Therefore, the central bank of Taiwan may have incentives to influence the NTD/USD exchange rate with its monetary policy. Table 7 shows the response

of the GBP/USD exchange rate changes to these monetary policy indices including $Index^*_{t,j}$ constructed from meeting records of the central bank of U.K. The GBP/USD exchange rate seems to be influenced by the hawkish monetary policy of the central bank of U.K. because both of BOE HI and BOE CI are significant at the 10% level. It is interesting that the NTD and the GBP both tend to depreciate with hawkish monetary policies of their own central banks. One possible reason is that contractionary monetary policies of CBC or BOE seem to reshape a future negative public's macroeconomic outlook.[2]

Table 8 shows the response of the JPY/USD exchange rate changes to these monetary policy indices including $Index^*_{t,j}$ constructed from meeting records of the central bank of Japan. Four monetary policy indices constructed from meeting records of the central bank of Japan are all significant at 5% level or better. The JPY tends to appreciate with a hawkish monetary policy of BOJ.

However, the exchange rate of South Korean (KRW) still does not exhibit a significant response even after including the monetary policy indices of the central bank of South Korea in the regression. We infer that the KRW/USD exchange rate is still influenced by other economic factors such as exchange rates of its competitors of trades. To test the hypothesis, we further include the NTD/USD exchange rate (NTD_t) and monetary policy indices ($Index'_{t,j}$) constructed from meeting records of the central bank of Taiwan in the regression model as Eq. (11).

$$\begin{aligned}&\Delta e_{t+1}\\&= \beta_0 + \beta_1 \Delta e_t + \beta_2 e_t + \beta_3 (i_t^* - i_t) + \beta_4 (\pi_t^* - \pi_t)\\&+\beta_5 Index_{t,j} + \beta_6 NTD_t + \beta_7 Index^*_{t,j} + \beta_8 Index'_{t,j} + \varepsilon_{t+1},\end{aligned} \tag{11}$$

where variables $Index^*_{t,j}$ and $Index'_{t,j}$ respectively represent monetary policy indicators

[2] Tadle (2022) argues that a hawkish-leaning sentiment can affect the rest of the financial market in two opposing ways. The first is that hawkish minutes increase the likelihood of future contractionary policy, and they could have adverse effects on the prices of other financial assets. The other is that the same information set has a strong association with expected police rates and may also reshape the public's macroeconomic outlook.

constructed from meeting records of central banks of South Korea and Taiwan, including SI, DI, HI, and CI. Table 9 shows that the NTD/USD exchange rate and both of CBC SI and CI exhibit a significant 10% level. This indicates that the KRW/USD exchange rate is sensitive to changes in the NTD/USD exchange rate and the monetary policy indices of Taiwan. South Korea has an export-oriented economic structure like its trading competitor such as Taiwan. Both countries treat United States as a major target market. Therefore, when the central bank of South Korea tries to determine the KRW/USD exchange rate, BOK may need to further consider the current level of the NTD/USD exchange rate and the impact of CBC's monetary policy decisions on the future NTD/USD exchange rate. According to the popular Mundell-Fleming model of Mundell (1960, 1963) and Fleming (1962), South Korea may have some difficulties in maintaining its monetary independence with capital mobility and its exchange rate stability against the USD.

In addition to four monetary policy indicators, we also construct a monetary policy uncertainty index to observe the differences in the concentration and dispersion of monetary policy attitude words within the meeting records. Lan et al. (2018) point out that carry-trade strategies with the New Taiwan Dollar (NTD) are significantly influenced by the foreign exchange reserves of the central bank of Taiwan. Therefore, in the subsequent analysis of TWD/USD, the foreign exchange reserves of the central bank of Taiwan (FXR_t) will be included into the regression model. Therefore, we employ the following regression model to investigate these effects on the prediction of exchange rate changes:

$$\Delta e_{t+1} = \beta_0 + \beta_1 \Delta e_t + \beta_2 e_t + \beta_3 (i_t^* - i_t) + \beta_4 (\pi_t^* - \pi_t) + \beta_5 FXR_t + \beta_6 Index_{t,j} + \beta_7 EN_t \times Index_{t,j} + \beta_8 Index_{t,j}^* + \beta_9 EN_t^* \times Index_{t,j}^* + \varepsilon_{t+1}. \quad (12)$$

where EN_t and EN_t^* represent the indicators measuring the concentration and dispersion of monetary policy attitudes constructed through the base-country FOMC minutes and the corresponding home-country central bank's meeting records, respectively. Table 10 shows that

there is an improvement in the significance levels for the response of the NTD/USD exchange rate changes to the monetary policy indicators constructed from meeting records of the central bank of Taiwan after including the monetary policy uncertainty index (CBC EN) in the regression model as Eq. (12). The significance of the coefficient of $EN_t^* \times Index_{t,j}^*$ with the opposite sign of the coefficient of $Index_{t,j}^*$ suggests that the uncertainty of meeting minutes of the central bank of Taiwan would reduce the market belief in monetary policy stance, then reducing the impact of monetary policy sentiments on exchange rate variations.

IV. **Conclusion**

We compile monetary policy indicators from the central bank's meeting records and employe them in the regression analysis to investigate their ability in the prediction of exchange rate changes. Additionally, we differentiate monetary policy indicators into the dovish monetary policy indicator and the hawkish monetary indicator aiding to differentiate in how countries respond to these two monetary policies. We find that the response of the THB/USD exchange rate changes to the FOMC minutes primarily arise from the dovish monetary policy attitude. We also use the concept of Christofferson's bunching test to construct an index called Christofferson index based on the monetary policy attitude transition frequency and find that it could be a good indicator in the prediction of exchange rate changes. We also utilize the concept of entropy to establish a monetary policy uncertainty index reflecting the distribution of attitudes within minutes and find that the uncertainty of meeting minutes could reduce the market belief in monetary policy stance, then reducing the impact of monetary policy sentiments on exchange rate variations.

We find that the currency in Thailand may depend on the monetary policy of FOMC. One possible reason is that developing countries including Mexico and Brazil in central and south America, Turkey in western Asia, India in south Asia, and Philippines in southeast Asia may

adopt policies to ensure their heavily trades with the U.S. and these choices make their currencies more susceptible to fluctuations in the Fed policy. However, we also find that the currency exchange rates of the United Kingdom, Japan, and Taiwan are heavily influenced by the monetary policy indices from their respective central banks' meeting records, while the currency exchange rate of South Korean is also affected by the monetary policy indices of Taiwan. Because some developed countries or industrial countries tend to maintain their monetary independence with exchange rate flexibility and capital account openness, these findings may be explained by the impossible trinity of Mundell (1960, 1963) and Fleming (1962).

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Table 1: Four defined dictionaries

Positive Term				
abating	eased	heightened	rebounded	stable
accelerated	elevated	high	recovering	strength
add	elevating	higher	rise	strengthen
advance	expand	improved	risen	strengthened
advanced	expanding	improvement	rising	strengthens
augmented	expansionary	improving	robust	strong
balanced	extend	increase	rose	stronger
better	extended	increased	significant	supportive
bolsters	fast	increases	solid	up
boom	faster	increasing	sooner	upside
booming	firmer	more	spike	upswing
boost	gains	raise	spikes	uptick
boosted	growing	rapid	spiking	

Negative Term				
adverse	decreasing	fall	removed	softened
back	deepening	fallen	restrain	softening
below	depressed	falling	restrained	stimulate
constrained	deteriorated	fell	restraining	strained
contract	deterioration	insufficient	restraint	strains
contracting	diminished	jading	resumption	stress
contraction	disappointing	less	reversed	subdued
cooling	dislocation	limit	slack	tragic
correction	disruptions	low	slow	turmoil
dampen	down	lower	slowed	underutilization
damping	downbeat	moderated	slower	volatile
decelerated	downside	moderating	slowing	vulnerable
decline	drop	moderation	slowly	wary
declined	dropping	reduce	sluggish	weak
declines	ebbed	reduced	sluggishness	weakened
declining	erosion	reduction	slumped	weaker
decrease	fade	reluctant	soft	weakness
decreases	faded			

Table 1 Four defined dictionaries (continue)

Dovish Term	
accommodation	devastation
downturn	recession
unemployment	

Hawkish Term			
business	expansion	investments	resource
businesses	financial	labor	securities
demand	growth	manufacturing	slack
economic	housing	outlook	spending
economy	income	output	target
employment	indicators	price	toll
energy	inflation	prices	wage
equities	inflationary	production	wages
equity	investment	recovery	

Table 2: Summary statistic for each monetary policy index

Parameter	*N*	Mean	SD	Mid	Min	Max	Skewness	Kurtosis
Fed SI	119	7.4742	14.6924	7.7465	-46.0733	32.2581	-0.6518	1.0137
Fed DI	119	24.8107	8.5244	24.375	10.3586	54.9738	0.7034	0.9461
Fed HI	119	32.2849	7.2206	31.7308	8.9005	47.8495	-0.332	0.5606
Fed CI	119	0.3224	0.0718	0.3188	0.0895	0.4757	-0.3364	0.5574
Fed EN	119	1.2316	0.0539	1.2451	1.0377	1.2932	-1.1311	0.9629
ECB SI	61	9.2916	13.6474	9.2105	-14.966	33.3333	0.1703	-1.0848
ECB DI	61	18.7957	9.659	19.6203	0.0	35.3741	-0.339	-0.3511
ECB HI	61	28.0874	12.6816	29.6875	0.0	46.875	-0.9041	0.5382
ECB CI	61	0.2809	0.1271	0.2992	0.1963	0.4712	-0.8948	0.5155
ECB EN	61	1.1863	0.0763	1.2007	0.8168	1.2767	-2.3998	9.2706
BOE SI	118	-1.8731	12.9377	-1.7812	-36.6972	26.7148	-0.3141	-0.0152
BOE DI	118	23.4996	9.2454	21.8954	7.9422	49.5413	0.6313	3.6836
BOE HI	118	21.6265	7.5437	20.0671	5.6391	41.2281	0.6477	0.5186
BOE CI	118	0.2164	0.0749	0.202	0.0566	0.4071	0.6197	(0.158)
BOE EN	118	1.1316	0.1079	1.1169	0.8802	1.2941	-0.1722	-1.0557
BOC SI	108	4.8409	13.6895	2.691	-19.5055	29.9296	0.0982	-1.1787
BOC DI	108	22.497	6.4258	21.9154	10.3774	33.0097	-0.0267	-0.8078
BOC HI	108	27.3379	7.8006	25.9259	13.2404	43.4555	0.1269	4.2736
BOC CI	108	0.2731	0.0777	0.2571	0.1329	0.4331	0.1316	-0.9738
BOC EN	108	1.1932	0.046	1.2026	0.9989	1.2594	-1.6826	4.5433
BOJ SI	118	7.0126	11.5411	8.3408	-36.0902	31.1111	-1.1622-	1.8116
BOJ DI	118	16.1323	9.471	12.4344	4.1096	48.1203	1.0473	10.1445
BOJ HI	118	23.1449	7.1175	22.9286	8.4249	42.7778	0.3075	3.4679
BOJ CI	118	0.2313	0.0709	0.2287	0.0846	0.4246	0.3019	-0.3019
BOJ EN	118	1.0325	0.1616	0.9689	0.7864	1.2916	0.3153	-1.5484
CBC SI	38	11.7708	13.6524	14.0998	-22.3214	32.5	-0.7938	0.2316
CBC DI	38	16.3557	6.9615	13.7179	6.25	35.7143	1.2145	1.2241
CBC HI	38	28.1265	7.6418	30.1282	13.3929	38.75	-0.4933	0.5091
CBC CI	38	0.281	0.0761	0.2968	0.1351	0.3797	-0.5116	-0.9619
CBC EN	38	1.1123	0.0674	1.1207	0.9937	1.2459	0.0045	-0.6096
BOK SI	99	9.5734	22.4483	12.9412	-38.4615	50.6849	-0.2652	-0.7954
BOK DI	99	24.9541	11.8534	22.8571	2.8571	53.2468	0.4732	5.8753
BOK HI	99	34.5276	12.4568	35.6322	7.6923	63.8554	0.1095	3.2113
BOK CI	99	0.3468	0.1247	0.3611	0.08	0.6463	0.1058	-0.5568
BOK EN	99	1.1972	0.0839	1.2201	0.8869	1.294	-1.2175	1.3174

Table 3: Prediction results of monetary policy indices from FOMC meeting minutes for THB/USD exchange rate changes

	Δe_{t+1}			
Parameters	*j*=1 (SI)	*j*=2 (DI)	*j*=3 (HI)	*j*=4 (CI)
$Constant$	0.0	0.0	0.0	0.0
	(0.0842)	(0.0843)	(0.0844)	(0.0844)
e_t	-0.0195	-0.0076	-0.0359	-0.0351
	(0.1048)	(0.106)	(0.1044)	(0.1044)
Δe_t	0.3814***	0.3857***	0.3759***	0.3758***
	(0.086)	(0.0862)	(0.0861)	(0.086)
$(i_t^* - i_t)$	0.0054	0.0243	-0.0217	-0.0215
	(0.1055)	(0.1086)	(0.1037)	(0.1037)
$(\pi_t^* - \pi_t)$	0.174*	0.1872*	0.1539*	0.1549*
	(0.0923)	(0.0943)	(0.091)	(0.0909)
$Index_{t,j}$	0.1617*	-0.1687*	0.1415	0.1445*
	(0.0900)	(0.0969)	(0.0854)	(0.0854)
$Adj\ R^2$	0.177	0.176	0.174	0.174
F-Stat.	5.949	5.900	5.829	5.858
N	116	116	116	116

Numbers in parentheses are the standard errors. ***, **, and * represent significance at the 1%, 5%, and 10%, respectively.

Table 4: Prediction results of monetary policy indices from FOMC meeting minutes for NTD/USD exchange rate changes

	Δe_{t+1}			
Parameters	*j*=1 (SI)	*j*=2 (DI)	*j*=3 (HI)	*j*=4 (CI)
$Constant$	0.0	0.0	0.0	0.0
	(0.0757)	(0.0757)	(0.0757)	(0.0757)
e_t	0.0323	0.035	0.0327	0.0327
	(0.0856)	(0.0876)	(0.0847)	(0.0847)
Δe_t	0.5722***	0.5736***	0.5706***	0.5707***
	(0.0835)	(0.0832)	(0.0834)	(0.0834)
$(i_t^* - i_t)$	0.1113	0.1128	0.1101	0.1101
	(0.0957)	(0.0957)	(0.0956)	(0.0956)
$(\pi_t^* - \pi_t)$	0.0144	0.0204	0.0119	0.0121
	(0.101)	(0.1048)	(0.0964)	(0.0964)
$Index_{t,j}$	-0.0034	-0.0095	-0.0138	-0.0132
	(0.0921)	(0.0988)	(0.0835)	(0.0836)
$Adj\ R^2$	0.323	0.323	0.324	0.323
F-Stat.	12.18	12.18	12.19	12.19
N	118	118	118	118

Numbers in parentheses are the standard errors. ***, **, and * represent significance at the 1%, 5%, and 10%, respectively.

Table 5: Prediction results of monetary policy indices from FOMC meeting minutes for KRW/USD exchange rate changes

	Δe_{t+1}			
Parameters	*j*=1 (SI)	*j*=2 (DI)	*j*=3 (HI)	*j*=4 (CI)
$Constant$	0.0	0.0	0.0	0.0
	(0.0282)	(0.0281)	(0.0283)	(0.0283)
e_t	-0.0324	-0.0254	-0.0375	-0.0375
	(0.0372)	(0.0375)	(0.0374)	(0.0374)
Δe_t	0.9922***	0.9948***	0.9889***	0.9891***
	(0.0309)	(0.031)	(0.0309)	(0.0309)
$(i_t^* - i_t)$	-0.0105	-0.0058	-0.0202	-0.0204
	(0.039)	(0.0393)	(0.038)	(0.038)
$(\pi_t^* - \pi_t)$	-0.0884**	-0.0894**	-0.0906**	-0.0909**
	(0.0331)	(0.0328)	(0.0334)	(0.0334)
$Index_{t,j}$	0.0479	-0.058	0.0309	0.0301
	(0.0345)	(0.0363)	(0.0322)	(0.0323)
$Adj\ R^2$	0.906	0.907	0.905	0.905
F-Stat.	227.1	228.4	224.9	224.8
N	118	118	118	118

Numbers in parentheses are the standard errors. ***, **, and * represent significance at the 1%, 5%, and 10%, respectively.

Table 6: Prediction results of monetary policy indices from FOMC and CBC meeting minutes for NTD/USD exchange rate changes

	Δe_{t+1}			
Parameters	*j*=1 (SI)	*j*=2 (DI)	*j*=3 (HI)	*j*=4 (CI)
$Constant$	0.0	-0.0	-0.0	0.0
	(0.1614)	(0.1645)	(0.1693)	(0.1693)
e_t	0.2397	0.2371	0.2212	0.2386
	(0.4677)	(0.4295)	(0.5055)	(0.5088)
Δe_t	-0.4338**	-0.4766**	-0.3889*	-0.3939*
	(0.2004)	(0.2037)	(0.21)	(0.2102)
$(i_t^* - i_t)$	-0.2126	-0.1932	-0.2211	-0.2244
	(0.2233)	(0.2253)	(0.2367)	(0.2368)
$(\pi_t^* - \pi_t)$	0.4905	0.5233	0.4376	0.4764
	(0.5313)	(0.509)	(0.5387)	(0.5416)
$Index_{t,j}$	-0.0835	-0.0386	-0.0699	-0.0554
	(0.2834)	(0.2662)	(0.2749)	(0.2759)
$Index_{t,j}^*$	0.6207**	-0.5386**	0.5368**	0.537**
	(0.2274)	(0.2112)	(0.2296)	(0.2314)
$Adj\ R^2$	0.218	0.188	0.140	0.140
F-Stat.	2.351	2.118	1.786	1.788
N	30	30	30	30

Numbers in parentheses are the standard errors. ***, **, and * represent significance at the 1%, 5%, and 10%, respectively.

Table 7: Prediction results of monetary policy indices from FOMC and BOE meeting minutes for GBP/USD exchange rate changes

	Δe_{t+1}			
Parameters	*j*=1 (SI)	*j*=2 (DI)	*j*=3 (HI)	*j*=4 (CI)
$Constant$	0.0	0.0	0.0	0.0
	(0.0871)	(0.0868)	(0.0878)	(0.0882)
e_t	0.0637	0.1082	0.016	0.0221
	(0.1568)	(0.1556)	(0.1562)	(0.1568)
Δe_t	0.1013	0.1018	0.116	0.1165
	(0.0955)	(0.0966)	(0.0952)	(0.0954)
$(i_t^* - i_t)$	-0.0714	-0.0594	-0.1149	-0.1109
	(0.0971)	(0.1018)	(0.0959)	(0.0961)
$(\pi_t^* - \pi_t)$	-0.2005	-0.19	-0.1946	-0.1915
	(0.1492)	(0.149)	(0.1509)	(0.1511)
$Index_{t,j}$	-0.0695	-0.0554	-0.0896	-0.0755
	(0.1327)	(0.131)	(0.1106)	(0.1111)
$Index_{t,j}^*$	0.1536	-0.023	0.1872*	0.1786*
	(0.1203)	(0.1271)	(0.1053)	(0.1057)
$Adj\ R^2$	0.037	0.025	0.049	0.047
F-Stat.	1.727	1.486	1.984	1.931
N	115	115	115	115

Numbers in parentheses are the standard errors. ***, **, and * represent significance at the 1%, 5%, and 10%, respectively.

Table 8: Prediction results of monetary policy indices from FOMC and BOJ meeting minutes for JPY/USD exchange rate changes

	Δe_{t+1}			
Parameters	*j*=1 (SI)	*j*=2 (DI)	*j*=3 (HI)	*j*=4 (CI)
$Constant$	-0.0	-0.0	-0.0	-0.0
	(0.0878)	(0.0896)	(0.0914)	(0.0913)
e_t	-0.0875	-0.0431	-0.0312	-0.0337
	(0.1095)	(0.1096)	(0.1126)	(0.1124)
Δe_t	-0.096	-0.0711	-0.0577	-0.0573
	(0.0946)	(0.0958)	(0.0966)	(0.0965)
$(i_t^* - i_t)$	0.0803	0.142	0.0306	0.0314
	(0.0956)	(0.1038)	(0.0961)	(0.0961)
$(\pi_t^* - \pi_t)$	-0.0156	0.1491	-0.1736	-0.1769
	(0.106)	(0.1221)	(0.122)	(0.1216)
$Index_{t,j}$	0.1492	-0.1711	0.0211	0.0259
	(0.1149)	(0.127)	(0.1053)	(0.1052)
$Index_{t,j}^*$	-0.4457***	0.4595***	-0.2688**	-0.2758***
	(0.1112)	(0.1388)	(0.1087)	(0.1083)
$Adj\ R^2$	0.091	0.052	0.014	0.017
F-Stat.	2.953	2.074	1.276	1.333
N	118	118	118	118

Numbers in parentheses are the standard errors. ***, **, and * represent significance at the 1%, 5%, and 10%, respectively.

Table 9: Prediction results of monetary policy ndices from FOMC, BOK, and CBC Meeting Minutes for KRW/USD Exchange Rate Changes

	Δe_{t+1}			
Parameters	*j*=1 (SI)	*j*=2 (DI)	*j*=3 (HI)	*j*=4 (CI)
$Constant$	0.0	-0.0	-0.0	0.0
	(0.1561)	(0.1575)	(0.1601)	(0.1592)
e_t	0.2224	0.1814	0.2554	0.2492
	(0.2393)	(0.2362)	(0.2451)	(0.2429)
Δe_t	-0.0812	-0.0832	-0.0477	-0.0488
	(0.171)	(0.1753)	(0.1753)	(0.1743)
$(i_t^* - i_t)$	0.867*	0.8055*	1.0209**	1.028**
	(0.4172)	(0.4114)	(0.4376)	(0.4374)
$(\pi_t^* - \pi_t)$	0.1561	0.0367	0.2594	0.2481
	(0.2514)	(0.2397)	(0.2727)	(0.2688)
NTD_t	0.779	0.7828	0.5969	0.9676**
	(0.4681)	(0.4784)	(0.5113)	(0.4793)
$Index_{t,j}$	-0.3728	0.3765	-0.1755	-0.1926
	(0.2708)	(0.2351)	(0.2859)	(0.2854)
$Index_{t,j}^*$	0.3585	-0.2519	0.3445	0.3473
	(0.2403)	(0.2264)	(0.2641)	(0.2588)
$Index_{t,j}'$	0.4578*	-0.3717	0.4095	0.4361*
	(0.2348)	(0.2299)	(0.2394)	(0.2416)
$Adj\ R^2$	0.196	0.181	0.154	0.164
F-Stat.	1.976	1.884	1.729	1.783
N	33	33	33	33

Numbers in parentheses are the standard errors. ***, **, and * represent significance at the 1%, 5%, and 10%, respectively.

Table 10: Prediction Results of Monetary Policy and Uncertainty Indices from FOMC and CBC Meeting Minutes for NTD/USD Exchange Rate Changes

	Δe_{t+1}			
Parameters	*j*=1 (SI)	*j*=2 (DI)	*j*=3 (HI)	*j*=4 (CI)
$Constant$	-1.0126	0.1474	0.675	0.6575
	(0.7441)	(1.3917)	(0.4762)	(0.4542)
e_t	-0.0764	0.4418	-0.0382	-0.0175
	(0.4963)	(0.4803)	(0.5201)	(0.5226)
Δe_t	-0.2744	-0.3897*	-0.2116	-0.2115
	(0.182)	(0.1971)	(0.2037)	(0.2036)
$(i_t^* - i_t)$	0.0016	0.3155	-0.0783	-0.0718
	(0.4216)	(0.4051)	(0.486)	(0.4879)
$(\pi_t^* - \pi_t)$	-0.277	-0.2792	-0.1179	-0.1138
	(0.1942)	(0.2215)	(0.2215)	(0.221)
FXR_t	0.0562	0.0908	-0.0716	-0.075
	(0.1538)	(0.1839)	(0.1636)	(0.1631)
$Index_{t,j}$	-5.5125	-0.2047	-7.4099	-7.6688
	(3.6941)	(2.8209)	(4.7572)	(4.8051)
$Index_{t,j} \times EN_{t,j}$	4.5632	0.3028	5.6629	5.8412
	(3.2949)	(2.8426)	(3.7812)	(3.7988)
$Index_{t,j}^*$	10.5014***	-8.2156**	8.5823**	8.9888**
	(3.0008)	(3.0142)	(3.1967)	(3.3007)
$Index_{t,j}^* \times EN_{t,j}^*$	-9.7912***	7.6577**	-7.9497**	-8.3541**
	(2.9596)	(2.9912)	(3.1564)	(3.2611)
$Adj\ R^2$	0.427	0.300	0.290	0.295

F-Stat.	3.403	2.381	2.315	2.346
N	30	30	30	30

Numbers in parentheses are the standard errors. ***, **, and * represent significance at the 1%, 5%, and 10%, respectively.

Figure 1. Sentiment scores of the FOMC minutes

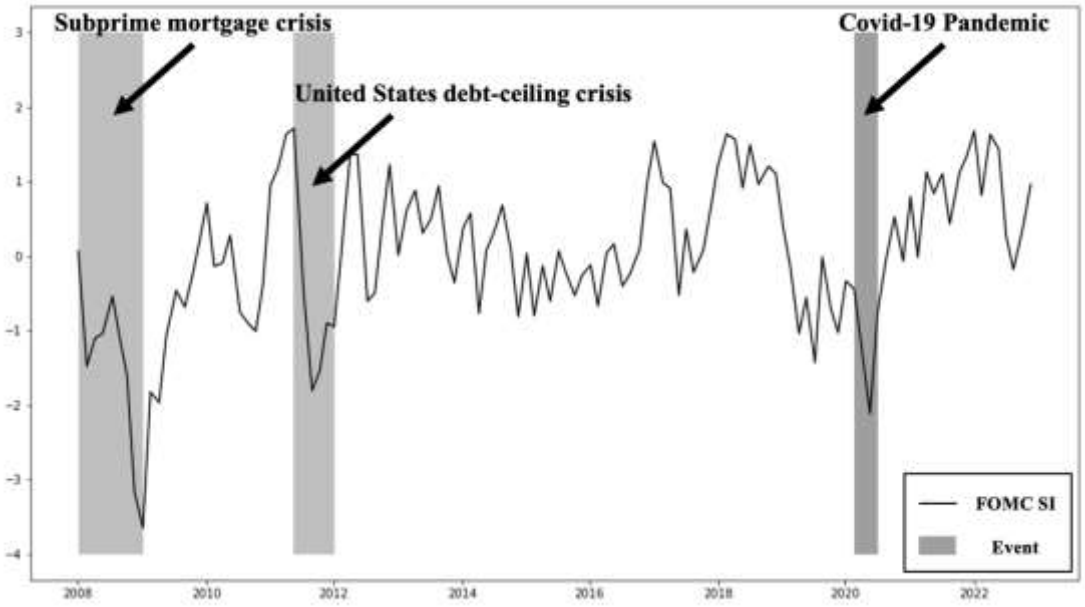

Figure 2. A timeline example of the alignment of the informational releases