



The Spillover Effects of US Unconventional Monetary Policy on the Taiwanese Economy

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ABSTRACT

Due to the severity of the 2007-2009 financial crisis, the United States Federal Reserve aggressively lowered the policy rate to zero and adopted several “unconventional” monetary policies, including “Quantitative Easing (QE).” The literature has long suggested that US monetary policies had strong spillover effects on foreign countries. Accordingly, the governor of Taiwan’s central bank, Dr. Fai-Nan Perng, expressed strong concerns about such ripple effects of US policy on the Taiwanese economy. This paper follows Ammer et al. (2016) to use the Federal Reserve’s unconventional monetary policy announcements to support the claim that US monetary policy has significant impacts on the Taiwanese economy and financial markets. Also, the spillover effects of pre-crisis “traditional” monetary policies are compared with the spillover effects from implementing “unconventional” policies during and post-crisis. The results show that US monetary policies exert significant impacts on the Taiwanese economy. Finally, we discuss the response of Taiwan’s central bank to these spillover effects.

Keywords: Quantitative Easing Policy, Central Bank Intervention, VAR Model, Exchange Rate, Unconventional Monetary Policy Announcement

JEL Classifications: E44, E52, E58

1. INTRODUCTION

After the 2008 financial crisis, the Federal Reserve implemented unconventional monetary policies to stabilize the global financial markets, such as purchasing a considerable amount of treasury bonds and mortgage-based securities (Wang et al., 2015). This period of unconventional US monetary policy was followed by large capital inflows into emerging countries, which affected the profitability of emerging countries’ export industry and growth performance through rapid appreciation of currencies. Bhattarai et al. (2021) found that the US quantitative easing policy has a significant impact on emerging markets. It leads to exchange rate appreciation, stock market rises, long-term bond yields fall, and large amounts of capital flow into these countries (Fratzscher et al., 2018). Moreover, US unconventional monetary policies are also discussed in the context of fluctuation in exchange rates, domestic demand, and the effect on foreign financial conditions

(Ammer et al., 2016). Ahmed and Zlate (2014) suggest that large capital inflows could also positively affect emerging countries. Contrarily, Maćkowiak (2007) estimates quick and robust effects, which may cause the phenomenon of overheating. However, the impact of policies on emerging markets depends on their flexibility and vulnerability. Thus, when a country has stable economic and financial policies, it can overcome negative spillover effects (Lavigne et al., 2014). Furthermore, Chen et al. (2016) recognize that cross-border monetary policy spillovers can be an important source of macroeconomic and financial instability. According to Lima et al. (2016)’s research, the quantitative easing policies implemented by the US, Japan and the UK have a positive effect on the stock market, and promoted domestic demand in small economies (Kolasa and Wesolowski, 2020). Matousek et al. (2019) highlighted the significant positive impact of quantitative easing on GDP and inflation. However, Kiendrebego (2016) found adverse effects for most countries, notably in economies with

weaker economic outlooks. Therefore, in line with the evidence in Ammer et al. (2016), there are different spillover effects, depending on various country-specific features, including how monetary policy is implemented, the exchange rate regime, and the degree of vulnerability to external shocks.

Prior studies, including Bowman et al. (2015), observed how emerging countries economic and financial markets responded to changes in US unconventional monetary policy announcements and determined that there were large fluctuations in asset prices - especially relating to sovereign yields in local currency - in emerging market economies, which correlated with the timing of announcements. Meinus and Tillmann (2016) illustrate that countries suffered shocks immediately after announcement dates. In other words, after FOMC meetings and certain speeches, the market would produce monetary policy shocks (Wright, 2012). Furthermore, Ammer et al. (2016) show that after the announcement by the Federal Reserve of a downward movement in bond yields, both the US exchange rate and German yields trended downwards. Contrary to other studies, Ahmed and Zlate (2014) conclude that the policy announcements yield a positive and economically significant effect on net capital inflows.

This paper observes the cross-border spillover effects of US monetary policies in Taiwan. The discussion is undertaken in two distinct areas: conventional and unconventional monetary policy. In addition, a vector autoregressive (VAR) model analyzes the shock from US monetary policy. Also, the paper analyzes the reaction of the Central Bank of Taiwan after the announcement by the Federal Reserve. The rest of this paper is organized as follows. First, Section 2 describes the data. Then Section 3 reports the methodology, and Section 4 presents and discusses the empirical results. Finally, Section 5, the conclusion, gives a brief overview.

2. DATA AND MONETARY POLICY SHOCK

As previously highlighted, the policy statements issued by the Federal Open Market Committee (FOMC) after its meetings influence investment decisions and the emotion of investors and produce spillover effects across the global economy.

Based on prior studies relating to announcements by the Federal Reserve, data were collected daily during the period 2003 to 2015 and divided into two categories: conventional policy (2003-01:2008-10) and unconventional policy (2008-11:2015-03). Furthermore, to determine the spillover effect and observe fluctuations of economic activity in Taiwan - after the US policy announcements - the yields for 10-year sovereign bonds for set periods of 1, 5, and 30 days intervals and the movements of interest rates are observed and analyzed (Bowman et al., 2015).

In addition, also observed were the reactions of the Central Bank of Taiwan, namely, whether there was intervention in the local exchange rate market. To evaluate this assumption, we analyzed the stock of foreign reserve, overnight rate, and exchange rate via announcements issued by the Central Bank of Taiwan. In addition, to observe the dynamic relationship between U.S. monetary policy

and the Taiwan exchange rate, the estimation method used was the vector autoregressive (VAR) model.

3. METHODOLOGY

3.1. Arithmetic Average

Taiwan central bank's intervention in the local market, foreign reserves, and open market operations are assessed for conventional and unconventional categories. Then, the average of the variables was calculated, and the changes in the different periods were observed. The following equation was used to find the average:

$$\bar{x} = \frac{x_1 + x_2 + \dots + x_n}{n} \quad (1)$$

3.2. Regression

In the research design, the interest rate adjustment declared by the United States is used as a dummy variable, and the regression analysis is done with the other variables. Then the dummy variables are added to the regression equation and the quantitative variables based on the conclusion of Gujarati and Porter (2003). Hence, the regression model is defined as:

$$Y_i = \beta_1 + \beta_2 D_1 + \beta_3 D_2 + \varepsilon_{yi} \quad (2)$$

Where Y_i = variables of the foreign reserve, overnight rate, and exchange rate.

D_1 = The United States announced raising interest rates.

D_2 = The United States announced decreasing interest rates.

3.3. VAR Model

To analyze the effects of the variables between conventional and unconventional policies employed by the Federal Reserve, Gujarati and Porter's (2003) vector autoregression model (VAR) is employed and structured as follows:

$$y_t = \alpha + \sum_{i=1}^k \beta_i y_{t-i} + \varepsilon_t \quad (3)$$

Where matrix y_t is interpreting the contemporaneous relationships of variables, k is the maximum lag length, and ε_t is reduced-form errors, which can be structured shocks arising from the monetary policies announced by the Federal Reserve.

4. EMPIRICAL RESULTS

4.1. Scatter Plot

Figure 1 reports the correlation between the Taiwanese exchange rate and the U.S. 10-year bond yield. The results show that the Federal Reserve announcement of QE policy that led to lower bond yield by ten basis points and an appreciation of the Taiwanese exchange rate, especially in the 1-day and 5-day period after the announcement.

Moreover, after the Federal Reserve implemented unconventional policies, Taiwan's exchange rate was positively correlated with the bond yield, which reflects a positive relationship between the implementation of unconventional policies by the United States and Taiwan's exchange rate. Conversely, conventional policies are

Figure 1: The changes of one, 5 and 30-day periods between the exchange rate and the U.S. 10-year bond yield after the U.S. monetary policy announcement

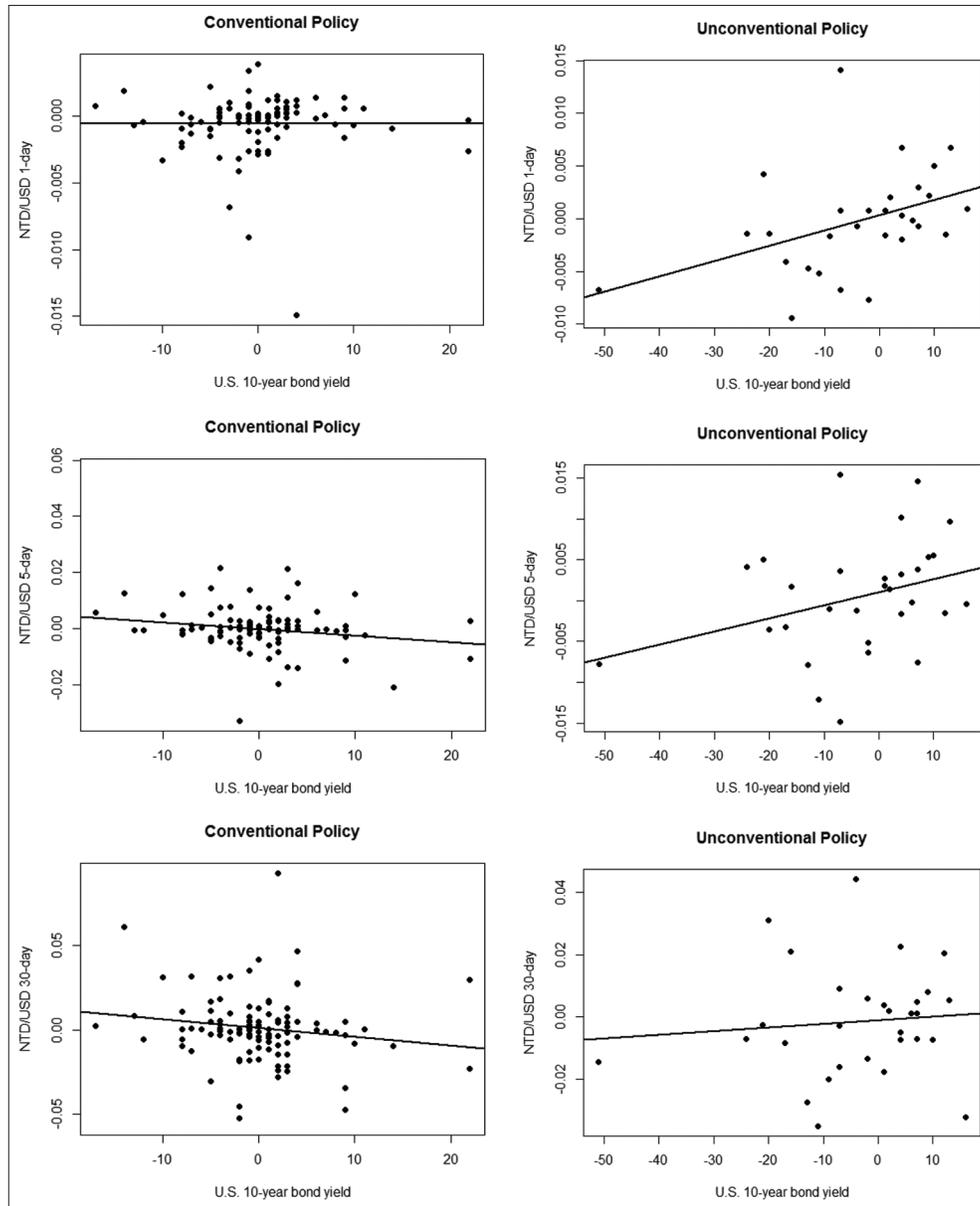


Table 1: Correlation coefficient between exchange rate and U.S. 10-year bond yield

| | Conventional policy | Unconventional policy |
|-------------------------|---------------------|-----------------------|
| NTD/USD | | |
| U.S. 10-year bond yield | | |
| volatility | | |
| 1 day | 0.0525 | 2.4419** |
| 5 days | -1.9783* | 1.7878* |
| 30 days | -1.5588 | 0.48359 |

*, ** and *** denote significance at the 10%, 5% and 1% level, respectively

negatively correlated with announcements on monetary policies by the US government. This negative correlation means that the U.S. government’s implementation of conventional policies has little impact on Taiwan’s exchange rate.

Further, Table 1 shows that the impact of unconventional policy is more significant than the impact of conventional policy on Taiwan’s

exchange rate. As a result, the Federal Reserve’s announcement of QE policy that it is significantly affected Taiwan’s exchange rate, which is consistent with other studies.

4.2. Taiwan Central Bank

In the face of U.S. monetary policy, the exchange rate regime played an important role (Bowman et al., 2015). Therefore, using different perspectives, an investigation is undertaken to observe if Taiwan’s central bank, under the influence of U.S. monetary policy announcements, adjusted Taiwan’s exchange rate to stabilize the Taiwanese economy.

To understand the changes in the foreign reserves, overnight rate, and the Central Bank’s intervention in the market, the number of times the news is published and the average of the number of times the news is published during the week are calculated. Table 2 shows that the news releases of Taiwan’s central bank’s

intervention in the market during the unconventional policy period (Average = 2.214 days/1 week) are more than the news releases during the conventional period. Moreover, a significant increase in the foreign reserves of Taiwan is observed during the period of the implementation of unconventional policy (Average = 2.829 billion USD/1 week). Finally, Taiwan’s central bank increased the money supply by purchasing government bonds in open market operations during the unconventional policy period (Average = -4.413 billion USD/1 week). Therefore, according to the above, it appears that Taiwan’s central bank may have more interventions in the market during the unconventional policy period.

4.3. Estimating the Effects of the Federal Reserve Announcements

The results from the regression analysis Equation (3.2) are presented in Table 3. There is evidence that the United States announcement of decreasing interest rates had a significant effect on the overnight rate in Taiwan during the periods of implementation of conventional and unconventional policy. This effect means that the announcement by the Federal Reserve to decrease interest rates caused varied effects, including foreign capital inflows to Taiwan and an increase in equity prices (MacDonald, 2017). Thus, Taiwan’s central bank adjusted the overnight rate (short-term interest rates) to stabilize the domestic market.

In addition, when the United States Federal Reserve announced increasing and decreasing interest rates, these announcements had

a significant effect on Taiwan’s exchange rate during periods of unconventional policy. However, it was observed that the effects on Taiwan’s exchange rate would lag for three periods, rather than immediately and during periods of unconventional policy. Furthermore, we infer that to maintain the order and stability of the foreign exchange market, Taiwan’s central bank would moderately intervene, which is in line with the data presented above in Table 2. However, for Taiwan, the impact of the announcement of unconventional monetary policy by the Federal Reserve is more significant than the impact from the Federal Reserve’s announcement of conventional monetary policy.

4.4. Impulse Response Function

In this section, different perspectives were used to investigate the impact of each variable on Taiwan’s exchange rate. Therefore,

Table 2: Policy analysis of Taiwan’s central bank after the Federal Reserve announcement

| | Conventional policy | | Unconventional policy | |
|-----------------------|------------------------|------------------------|------------------------|------------------------|
| | Increase interest rate | Decrease interest rate | Increase interest rate | Decrease interest rate |
| News release | 2.138 | 1.973 | 1.333 | 2.214 |
| Foreign reserve | 0.9131 | 1.244 | 1.133 | 2.8289 |
| Open market operation | -7.797 | -7.337 | -2.303 | -4.413 |

The average of the weeks of each variable after the announcement

Figure 2: Impulse response function of conventional policy

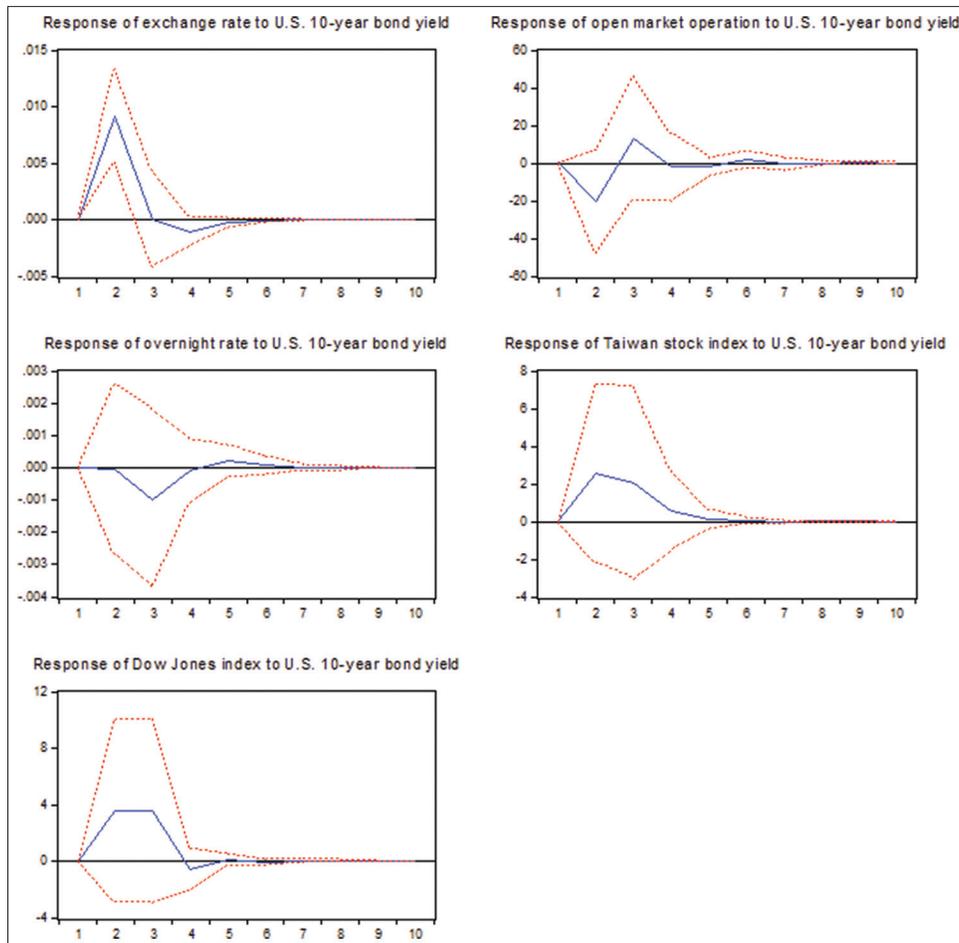
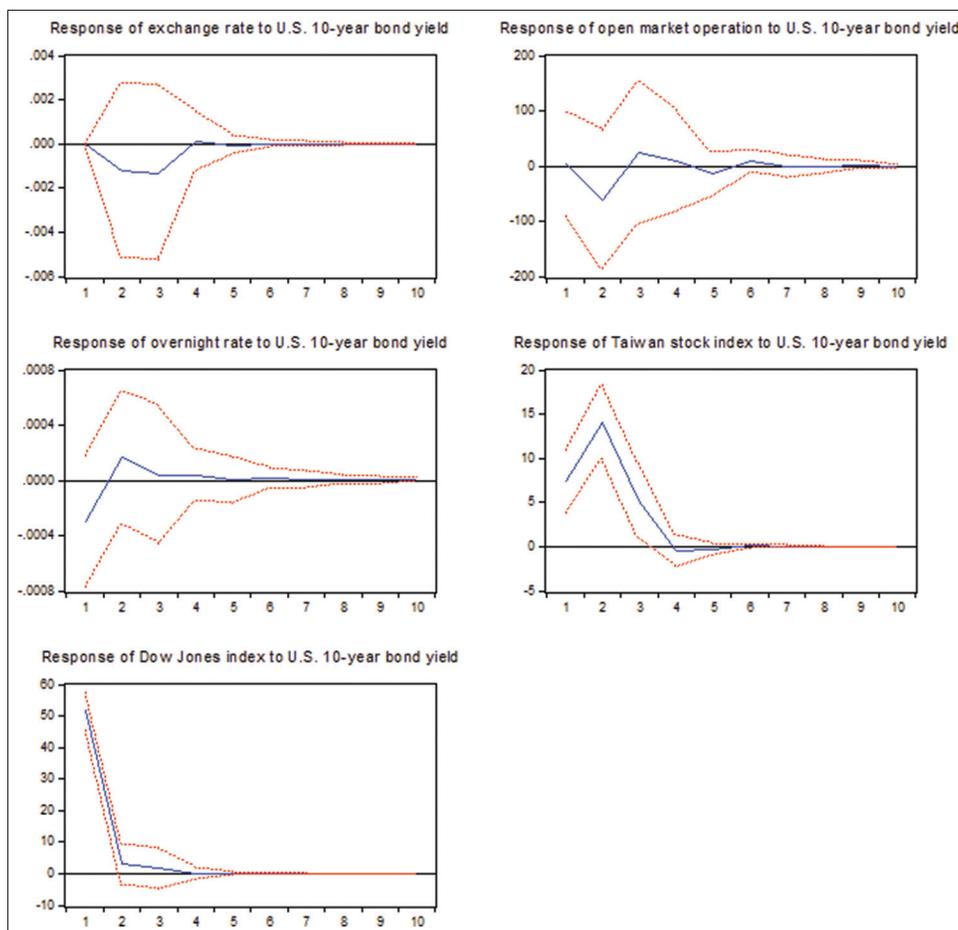


Table 3: The effect of the Taiwan financial market after Fed announcement

| | Conventional policy | | | Unconventional policy | | |
|---------------------------------------|---------------------|-------------------|------------------|-----------------------|-------------------|--------------------|
| | Foreign reserve | overnight rate | Exchange rate | Foreign reserve | overnight rate | Exchange rate |
| Increase interest rate | | -0.0015 (0.0061) | -0.0052 (0.0241) | -0.7211 (0.999) | 0.0063 (0.0045) | 0.1614*** (0.0455) |
| Increase interest rate ^{t-2} | 1.2195** (0.483) | | | | | |
| Decrease interest rate | | -0.0090* (0.0053) | -0.0016 (0.0239) | | 0.0096** (0.0045) | |
| Decrease interest rate ^{t-1} | | | | 2.0798* (1.090) | | |
| Decrease interest rate ^{t-2} | 0.2630 (0.467) | | | | | |
| Decrease interest rate ^{t-3} | | | | | | -0.1029 (0.0455)** |

Standard errors are provided in parentheses; *, ** and *** denote significance at the 10%, 5% and 1% level, respectively

Figure 3: Impulse response function of unconventional policy



the goal of this section is to use impulse response to observe the relationship between the exchange rate and each variable or between each variable.

Figure 2 shows that the U.S. 10-year bond yield has a significant impact on all variables. Under the exchange rate transmission mechanism, the weak capital flows into Taiwan cause a significant appreciation in the second period. However, to avoid excessive capital inflows, Taiwan’s central bank used open market operations to release funds and adjust the overnight rate. Furthermore, the Central Bank is quick to react to the stock market after the U.S. announcement, in line with Maćkowiak (2007). Figure 3 shows that the variables reacted immediately after and during

unconventional monetary policy. A large number of funds flowed into Taiwan, which caused an appreciation of Taiwan’s currency. Compared with the conventional monetary policy period, the release of funds was relatively large, and the overnight rate was also rapidly reduced. In particular, the stock market rose rapidly and then immediately declined, which is a short effect.

5. CONCLUSION

This paper collected data according to the Federal Reserve’s periods of announcement and implementation of conventional and unconventional monetary policy. To summarize, the results showed that the impact of unconventional monetary policy is relatively

substantial after the announcement by the Federal Reserve. Therefore, our results are in line with Curcuru et al. (2018), quantitative easing has greater international spillover effects than traditional monetary policy, and then explained that U.S. unconventional monetary policy will produce volatility spillovers and global systemic risks (Yang and Zhou, 2017). However, through rigorous analysis, it was verified that Taiwan's central bank did intervene in the foreign exchange market after the Federal Reserve announcements, and the impact of these announcements affected and still affects Taiwan's financial markets.

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