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Transmission Mechanism of U.S. Monetary Policy to Economies

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Abstract: Due to the special status of the United States and the U.S. dollar in the world economy, the U.S. monetary policy has a significant spillover effect on the world. Especially since the subprime mortgage crisis in 2007, the U.S. monetary policy has attracted more attention from the world. Combined with the previous literature, this paper finds that the transmission channels of the US monetary policy uncertainty spillover effect include exchange rate expectation channel, financial asset allocation channel, contagion of monetary policy uncertainty, and real option effect. Among them, the channel of exchange rate expectations, the channel of financial asset allocation and the channel of contagion of monetary policy uncertainty are responsive and rapid, while the real option effect has a slow and long-term impact on the real economy. At the same time, there are differences in the spillover effects of U.S. monetary policy uncertainty on different countries. The results of this study have certain guiding significance for monetary policy formulation in other countries, such as strengthening the supervision of cross-border bonds and cross-border investment. Especially under the impact of the new crown pneumonia epidemic, major developed economies have implemented a new round of quantitative easing monetary policies, and policymakers in emerging economies need to pay great attention to this.

Keywords: U.S. monetary policy uncertainty, spillovers, emerging economies

1. Introduction

As the degree of economic globalization deepens, international capital flow and trade between countries have increased, and the spillover effects of the macroeconomic policies of the world's major economies have never been so evident. As a country with a special status in the world economy, the monetary policy of the United States has attracted worldwide attention. Since the 2007 subprime mortgage crisis, the impact of US monetary policy on the world economy has once again become the focus of attention of scholars.

In the process of the Fed's quantitative easing and withdrawal, every major policy decision has become the source of the Fed's policy decisions. Both before and after the implementation of quantitative easing, they have triggered strong reactions in the global market. Even a speech by a senior Fed official in an interview or a public forum may trigger speculation about the future direction of the Fed's policy and trigger some market turbulence.

This paper studies the transmission channel of the US monetary policy uncertainty spillover effect. In the follow-up, we can further study the degree of reaction of countries with different trade ties with

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the US and countries with different capital controls to such spillover effects.

2. Literature Review

The classical theoretical model of the international spillover effects of monetary policy is mainly the Mundell-Fleming-Dornbusch model. The Dornbusch model and the New Open Economy Macroeconomics model. The Mundell-Fleming-Dornbusch model is based on a combination of studies by Mundell, Fleming, and Dornbusch [1-3]. Fleming. In the Dornbusch model, under a floating exchange rate regime, when a country conducts an expansionary monetary policy, an increase in domestic output is accompanied by a decrease in domestic interest rates, which causes a large outflow of capital, a depreciation of the domestic currency and an appreciation of the foreign currency, which affects foreign exports through the price mechanism and leads to a decrease in foreign output. The new open macroeconomic model proposed by Obstfeld and Rogoff, on the other hand, links micro variables and macroeconomic indicators in its analysis, and is similar to the findings of Mundell-Fleming [4]. The Dornbusch model is broadly similar.

In recent years, there have been more empirical studies on the transmission channels of monetary policy spillovers in the U.S.

Kim argues that the effect of US monetary policy on output in other countries is mainly through the real interest rate, and that when US monetary policy is eased, the decrease in US interest rates causes a decrease in worldwide real interest rates, which in turn raises world aggregate demand and eventually caused a rise in global aggregate trade and real GDP [5]. The IMF used a VAR model to study the impact of quantitative easing policies in developed countries and regions such as the US, Europe and Japan on other countries and discovered that the impact on other countries was more significant through the channel of the financial market than through the channel of trade [6].

Kim and Yang study the impact of US monetary policy on interest rates and exchange rates in East Asian countries and argue that the impact of US monetary policy on East Asian countries does not result from the traditional exchange rate channel, instead is the response of these countries to changes in US interest rates [5].

Due to the enormous influence of the US economy and the current US dollar-centric international trade settlement system, US monetary policy has a significant impact on the settlement prices and international competitiveness of goods from other countries. Emerging economies are usually in a phase of rapid economic development and are highly dependent on economic globalization [7]. External trade and foreign direct investment have a significant impact on economic development. On the other hand, emerging economies are most vulnerable to the unilateral spillover effects of US monetary policy as their economies are limited in size and changes in individual countries are unlikely to have a significant impact on the rest of the world [8]. Previous theoretical and empirical studies have confirmed that the international transmission and spillover effects of US monetary policy are real. It is the real existence of this spillover mechanism and its monetary policy uncertainty can be of high concern to the market, making uncertainty spillovers possible.

At present, the existing literature has not developed a mature theoretical system on the cross-country impact mechanism of monetary policy uncertainty in the US. On the basis of the previous literature, this paper argues that the spillover effects of US monetary policy uncertainty may have the following transmission mechanisms.

3. Methodology

This paper uses a theoretical approach to summarize the global transmission of US monetary policy on the basis of the existing literature. At the same time, empirical analysis is used to study the impact of exchange rate changes on the export of related countries.

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In order to explore the role of global value chain factors in the impact mechanism of exchange rate fluctuations on exports, we selected data on exports and exchange rates from China, the United States, Japan, and Russia from 2000 to 2015, and constructed a panel model for regression analysis.

4. Result

The study basically concludes that an increase in uncertainty about a country's economic policies will be detrimental to the prosperity of its economy. Increased uncertainty in economic policy inevitably causes a shrinking in real GDP, capital purchase, and consumption, and also has an impact on international trade, primarily export, and inflation stability. Alternatively, to a certain degree, economic policy uncertainty also influences the effectiveness of policy implementation.

4.1. Exchange Rate Expectation Channel

The exchange rate is more sensitively influenced by changes in monetary policy. At the same time, the exchange rate is also an important variable that affects a country's foreign economic exchanges [9]. When the Fed released the signal that its monetary policy might be adjusted, the original expectations of relative balance were broken. The market began to speculate on when the Fed would actually implement the new monetary policy, and the market also created a new equilibrium for the future equilibrium exchange rate. It is expected that this will directly affect the current exchange rate changes of emerging economies against the US dollar. When market expectations are relatively consistent, the dollar exchange rates of these countries may change significantly in the short term. When market expectations are divergent, the exchange rate may fluctuate sharply in the short term.

Changes in exchange rates can affect the import and export prices of a country's products, have an impact on the balance of payments, and lead to changes in domestic investment and residents' income. At the same time, when there is a divergence in the foreign exchange market on whether and when the policy changes, the trading volume between emerging market countries' currencies and the U.S. dollar will increase rapidly in the short term.

Increased exchange rate volatility has led to an increase in cross-border capital flows, and at the same time increasing the transaction costs of import and export trade.

4.2. Empirical Analysis on the Influence of Exchange Rate on Exports

In order to explore the role of global value chain factors in the impact mechanism of exchange rate fluctuations on exports, we selected data on exports and exchange rates from China, the United States, Japan, and Russia from 2000 to 2015, and constructed a panel model for regression analysis.

The explained variable of the model is the export value of a country, and the main explanatory variable is the fluctuation of a country's real exchange rate, which is the level of change rate. Thus, the basic settings of the model are as follows:

$$\mathrm{lnex}_{it} = \beta_1 \mathrm{lnex}_{it-1} + \beta_2 \mathrm{lnreervola}_{it} \quad (1)$$

Among them, "lnex" represents the logarithmic value of a country's exports, and "reervola" represents the fluctuation of a country's real effective exchange rate.

The data on the export value of each country in each year is calculated based on the WIOD [10].

Data on real effective exchange rates by country comes from the Economist Intelligence Unit (EIU) database. We selected the monthly real exchange rate of the country data in this database, and based on the empirical analysis results of previous studies, we expect that the fluctuation of a country's real effective exchange rate will have an inhibitory effect on the growth of exports.

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Table 1: Regression results.

	GLS			GMM		
	2000-2015	2000-2007	2008-2015	2000-2015	2000-2007	2008-2015
exp_t-1	-	-	-	0.197 6***	0.0237 2***	0.313 4***
	-	-	-	(0.005 8)	(0.006 0)	(0.003 2)
reervola	-0.073 6***	-0.177 4***	-0.066 9***	-0.040 9***	-0.193 3***	-0.009 1*
	(0.032 9)	(0.048 5)	(0.028 5)	(0.002 8)	(0.022 2)	(0.005 2)

As we predicted before, exchange rate fluctuations have a significant negative impact on a country's exports, ceteris paribus, an increase in exchange rate fluctuations of 1% reduces the export value by nearly 0.04%. Both the country's per capita GDP and the per capita GDP of major trading partners have a significant positive impact on the export value, which is also in line with our previous forecast.

4.3. The Influence of Policy Uncertainty

Due to the widespread fear of large exchange rate fluctuations and large capital outflows in emerging economies, some countries will take follow-up measures in accordance with changes in US monetary policy [11]. When the uncertainty of US monetary policy rises, governments and central banks will pay close attention to it. If central banks take actions to adjust monetary policies, then the changes in policies will have an impact on indicators such as interest rates and inflation rates, which will lead to exchange rate changes, stock market fluctuations, and fluctuations in the real economy. Even if central banks do not immediately adjust their monetary policies, due to some targeted adjustments that have existed in the past, the market will believe that the possibility of adjustments in their own monetary policies will increase, and the uncertainty of the US monetary policy will infect the uncertainty of the other country's monetary policy.

Now introduce an index - the United States Monetary Policy Uncertainty Index (USMPU). We use the U.S. Monetary Policy Uncertainty Index (MPU Index) established by Baker et al. in 2017 as a proxy variable for U.S. monetary policy uncertainty. The index is compiled using the frequency of certain keywords appearing in a certain range of media and magazines as basic data. The higher the value, the higher the uncertainty of US monetary policy. Depending on the range of media selected, the index is divided into two sets of indices based on 10 mainstream US media and one based on globally available media. Judging from the actual data, the trends of the indices obtained by these two compilation methods are almost the same. This article uses the MPU index based on 10 mainstream media in the United States, including "USA Today", "Miami Herald", "Chicago Tribune", "Washington Post", "Los Angeles Times", "Boston Globe" (the Boston Globe, San Francisco Chronicle, Dallas Morning News, Houston Chronicle, Wall Street Journal. The raw data for the index is directly available on Professor Baker's website.)

"To capture uncertainty related to central bank policies Husted, Rogers, and Sun apply the text-based methodology [of the economic policy uncertainty index]…by tracking the frequency of newspaper articles related to monetary policy uncertainty [MPU]. For the United States, the MPU index measures the perceived uncertainty surrounding the Federal Reserve Board's policy decisions and their consequences [12]."

The figure below is a detailed change chart of the MPU index in the United States from 1985 to 2020.

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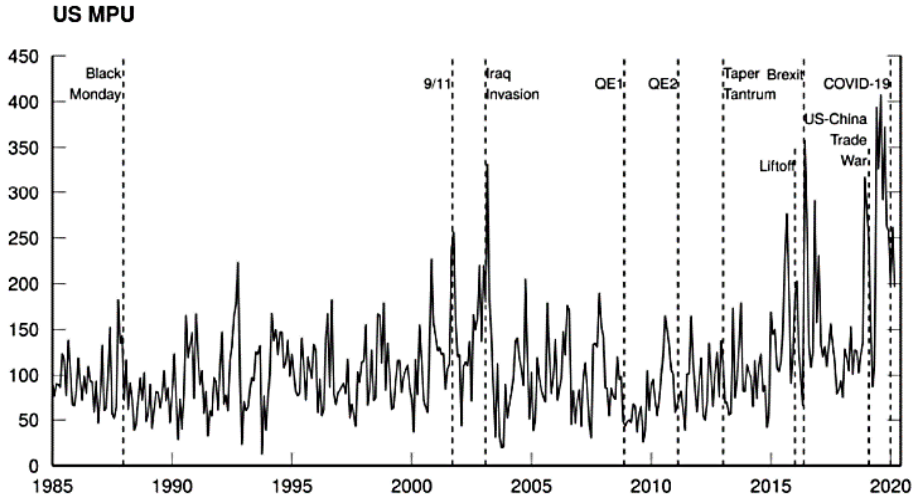

Figure 1: Changes in the US MPU index. (Data source: systemic risk and systematic value.)

The MPU index measures the uncertainty of U.S. monetary policy. In order to explore the impact of U.S. monetary policy uncertainty on the economies of other countries, we do not directly compare the MPU indexes of other countries with the U.S. MPU index, but compare the economic policies of other countries with the U.S. MPU index. U.S. monetary policy is compared to that of the European Union. Therefore, we introduce another index - the EPU index.

From an economic point of view, the development of any country and region is inseparable from a stable political environment and policy state. However, due to the games in various departments, regions and fields, policy uncertainty cannot be avoided. The inherent amplification mechanism of the market will This uncertainty is transmitted to all corners. Policymakers hope to improve the effectiveness of policy implementation, while market participants hope to form reasonable expectations for policy uncertainty in the most accurate and timely manner.

The academic community is also committed to this goal and is moving forward in exploration. Past research is often based on event analysis, which cannot quantify and continuously measure policy uncertainty. This issue was published by Baker et al. in the article Measuring Economic Policy Uncertainty in the Quarterly Journal of Economics provides new ideas [13]. So far, the research on policy uncertainty has formed two mainstream branches: one is the refined modeling represented by the DSGE model to evaluate the effect of the policy; the other is combined with the EPU (Economic Policy Uncertainty) index constructed by Baker in the above article for time series analysis.

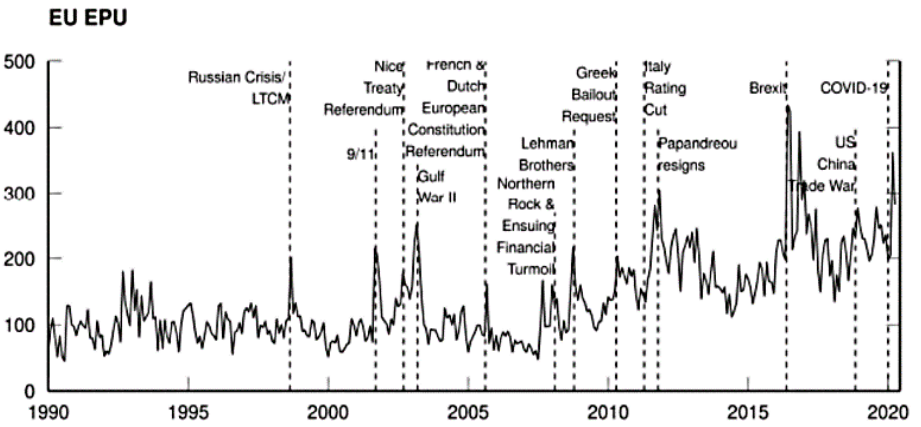

Figure 2: Changes in the EU EPU index. (Data source: systemic risk and systematic value.)

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If we superimpose the EPU index of Europe and the MPU index of the United States, we can find that the European EPU index is largely consistent with that of the United States, and there is a certain time lag, which can intuitively see that the monetary policy of the United States affects other countries. or spillover effects of regional economic policies.

From the quantitative analysis point of view, we can refer to the research evidence of other scholars. The study by Lucas Husted, for example, shows the contribution of US shocks to foreign MPU variability through variance decomposition of bivariate VAR [14]. In terms of impact, US shocks accounted for 9% of the change in monetary policy uncertainty in the UK and 26% of the change in monetary policy uncertainty in the euro area. On a one-year scale, the U.S. shock explained a whopping 41% to the euro area. Clearly, these simple norms do not account for the exact channels through which monetary policy uncertainty spillovers take place, but still strongly imply that the spillovers are not trivial [15].

4.4. Asset Allocation Channel

The uncertainty of monetary policy is a risk to the financial market. When there is the possibility of changes in monetary policy, the yields of treasury bonds and other financial assets may change, which changes the balance of investors' previous asset portfolio allocation. Therefore, investors may be based on the yield and risk of holding assets. Re-determine the asset portfolio ratio. When risks increase, investors may increase their cash holdings and reduce their holdings in stocks and bonds, which in turn will cause the stock market and related capital markets to fall.

For the U.S. market, the uncertainty of U.S. monetary policy directly affects its own capital market risks, which in turn affects the attractiveness of its stock market to funds. For the financial markets of emerging economies, because the economic and financial systems of emerging market countries are not fully mature, their market risks may be more obviously affected by the monetary policy of the United States. And because of the existence of capital controls, foreign holdings of currencies or assets of emerging economies require additional risk premiums.

When the uncertainty of the U.S. monetary policy increases, there will be changes in the allocation of domestic financial assets in the U.S. and emerging markets due to increased risk, and the inconsistency of market risks in various emerging economies will lead to imbalances in the flow of transnational capital in the short term. Therefore, the uncertainty of U.S. monetary policy may lead to fluctuations in the prices of financial assets in various countries, intensified cross-border capital flows, and instability in the exchange rates of various countries.

4.5. Real Option Effect

Investment opportunities owned by enterprises can be regarded as a kind of call option, called real option. As policy uncertainty increases the risk of investment.

Therefore, the value of call options is increased, and companies are more inclined to delay investment and increase cash holdings (that is, holding options without exercising), and the impact is more obvious in regions with lower financial development and marketization.

For emerging market economies, most of the flow of transnational capital is the inflow and outflow of capital from foreign countries. The inflow of capital into emerging economies is the increase of foreign capital's willingness to invest in the country, and the outflow of capital from emerging economies is the decrease in the country's willingness to invest in the country and concerns about the future economic prospects [16]. When the uncertainty of the U.S. monetary policy increases, foreign companies tend to hold more U.S. dollars or the country's currency due to the effect of real options and reduce investment in the real economy of emerging economies [17]. This leads to exchange rate fluctuations in these countries and cross-border capital. Flow, the stock market has fallen, and output

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has fallen.

5. Conclusion

Uncertainty about US monetary policy will have a negative impact on 27 emerging economy countries, including China The impact channels include exchange rate expectations, the contagion of policy uncertainty, financial market asset allocation channels, and real option effects. The impact will be felt through the channels of exchange rate expectations, policy uncertainty contagion, asset allocation in financial markets, and real options effects.

The exchange rate expectation channel has caused an increase in foreign trade costs and a slowdown in economic growth in emerging economies, and the response has been rapid and short-lived.

The contagion of policy uncertainty has caused fluctuations in interest rates, etc., with rapid response and a relatively long duration of action.

Financial asset allocation channels lead to the stock market and exchange rate shocks, and cross-border capital flows. The channel responded quickly.

The real option effect leads to a decline in the willingness of enterprises to invest and affects economic growth. The impact on the capital market is relatively rapid, and the response to the real economy is relatively slow, but the impact is long-term.

These studies can provide some action guidance for other countries when dealing with US monetary policy shocks. For example, policy-makers should pay attention to the use of macroprudential policy spillovers within the banking sector and the non-banking sector, strengthening the impact on foreign banks. In the supervision of domestic branches, strengthen the supervision of cross-border bond issuance and cross-border stock investment. Current cross-border bond issuance and cross-border bond capital flows

Primarily denominated in U.S. dollars, when the currencies of emerging economies face depreciation pressure, there will be the risk of bond defaults and the risk of violent cross-border bond capital outflows. Cross-border capital flow management tools need to be used when necessary.

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