

# Whether the Implementation of the New Monetary Policy can Reduce the Volatility of Stock Market Yield-Based on Experimental and Mathematical Statistics Analysis

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**Abstract**—The role of the new monetary policy tools in regulating the economy are obvious to all. The stock market, as a barometer of the economy, reflects the situation of economic operation. In this paper, the EGARCH model is used to explore the impact of different types and maturities of new monetary policy instruments on the volatility of the stock market returns. The results show that short-term loan instruments can not reduce the volatility of stock market returns, but will increase the volatility of the stock market returns. Short-term liquidity adjustment is ineffective in reducing volatility of the stock market return. Medium-term loan instruments can effectively reduce the volatility of the stock market returns, and the longer the term, the better the policy effect.

**Keywords**-New monetary policy tools, stock market, EGARCH

## 1 INTRODUCTION

In the wake of the global financial crisis, central banks have resorted to various remedies. In addition to the fact that most central banks began to adjust the size of their balance sheets, countries were also actively innovative and came up with different monetary policy tools than in the past. China's liquidity environment has undergone great changes as the economic development has entered the new normal. First of all, China's overall liquidity structural imbalance, excessive liquidity into the financial market, the real economy is still lack of liquidity. Secondly, since 2014, China's basic money supply has been greatly affected by the decline of outstanding foreign exchange funds, resulting in insufficient basic money supply. Third, the economic and financial reform requires that the innovative monetary policy tools in China should be transformed from direct liquidity injection to indirect liquidity injection and from quantitative to price<sup>[1]</sup>. In order to solve the above three problems and enhance the central bank's ability to provide base money, the central bank summarizes and compares the unconventional monetary policy tools of foreign countries and puts forward innovative monetary policy tools. In China, there are few studies on the relationship between the financial market and new monetary policy tools. Wenli Zou et al<sup>[2]</sup>. found that the implementation of new monetary policy tools had a significant impact on the securities market in the bull market. Zhang Kefei et al<sup>[3]</sup>. proved that the impact of new monetary policies on stock prices changes over time. Zhu Ning et al<sup>[5]</sup>. found that medium-term lending facilities can effectively stabilize

the capital markets. The above a few per capital studied the new monetary policy for the part of financial markets, this paper summarizes the basis of forefathers' research to join the new monetary policy tools for the impact of the stock market, this article will help us deep interpretation of the new monetary policy can really work to promote China's economic development.

The use of the new domestic monetary policy is shown in Figure 1:

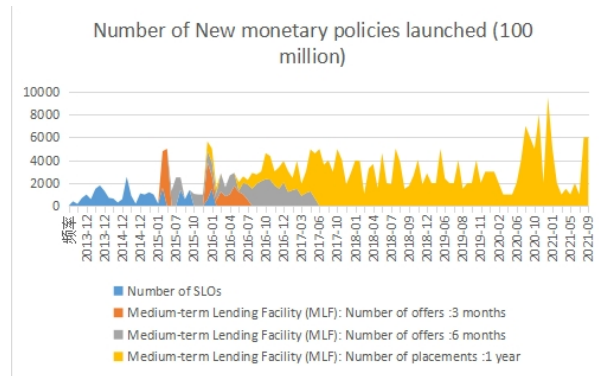


Figure 1 New monetary policy quantity chart

## 2 RESEARCH METHODS

### 2.1 Transmission path of the new monetary policy to the real economy

How is monetary policy transmitted to and used in the real economy? There are three main transmission channels, namely, through the expected effect, balance sheet effect and liquidity effect to the real economy. The balance sheet channel is that the central bank changes the collateral terms, optimizes its own balance sheet structure, improves the balance sheet condition of the financing department, and enhances the financing availability of the financing department. Liquidity effect is the implementation of the new monetary policy to provide targeted liquidity to specific sectors and enterprises to support their economic activities. The expected effect means that the implementation of the new monetary policy will give market participants a good expectation of the economy and make people more actively participate in the future economic and financial activities, thus promoting economic development. The above conduction path are summarized as shown in Figure 2:

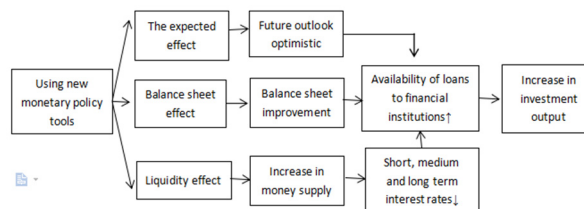


Figure 2 New monetary policy transmission path chart

## 2.2 Variable selection

In order to study the relationship between the stock market and the new monetary policy, we choose the volatility of the return rate of the stock market as the explained variable, the new monetary policy tools as the explanatory variable, and the traditional monetary policy tools as the control variable. Variable names and value methods are shown in Table 1:

**Table 1** Variable description

The variable name	Variable meaning	Write in English	Assignment case and calculation method
Index yield	The Shanghai composite index	SSEC	Take the logarithmic rate of return (representing the overall stock market)
	Csi 100	CSI100	Take logarithmic rate of return (representing large market capitalization stock market)
	Csi 500	CSI500	Take the logarithmic return rate (representing the small-cap stock market)
New monetary policy tools	Medium-term lending facility	MLF	Release quantity; Unit: 100 million yuan (MLF <sub>t</sub> =MLF3M <sub>t</sub> +MLF6M <sub>t</sub> +MLF1Y)
	Standing lending facility	SLF	Take 0 before implementing interest rate corridor (May 21, 2015) and 1 after
	Short-term liquidity adjustment	SLO	Release quantity; Unit: 100 million yuan
Control variables	Adjustment of statutory deposit reserve funds	MP	When the statutory deposit reserve ratio is adjusted, take 1; otherwise, take 0.
	Open market business operations	OMO	Net money supply = Central bank bill maturity + positive repurchase maturity + reverse repurchase - Central bank bill issuance - positive repurchase - reverse repurchase maturity; Unit: 100 million yuan.

## 2.3 Data sources and descriptive analysis

This paper selects January 4, 2013 to May 21, 2021 as the sample interval. All data are from Wind database. The descriptive analysis of the obtained data are shown in Table 2:

**Table 2** Descriptive analysis

Variable name	Observed	Mean	Standard deviation	Minimum	Maximum
ssec	2029	0.000116	0.014842	-0.14225	0.056709
csi100	2029	0.000358	0.014821	-0.09367	0.066987
csi500	2029	0.000341	0.016966	-0.09081	0.063926
mlf	2029	96.03549	636.3884	-1300	9500
Mlf3m	2029	10.23263	167.019	0	5000
Mlf6m	2029	20.49039	176.8328	0	2500
Mlf1y	2029	100.7999	611.1762	0	9500
slo	2029	12.31148	125.2482	0	2550

slf	2029	0.748645	0.433899	0	1
mp	2029	0.005914	0.076695	0	1
omo	2029	19.4485	2696.913	-11185	11600

## 2.4 ADF and ARCH effect test

In order to make the results more accurate, we conducted ADF and ARCH effect tests on the explained variables and obtained the results as shown in Table 3 below:

**Table 3** ADF and ARCH effect test

	ADF value (p value in parentheses)	P value of ARCH-LM test	Conclusion
csi100	-3.433377 (0.0001)	0.0000	ARCH effect exists
ssec	-3.433377 (0.0000)	0.0000	ARCH effect exists
csi500	-3.433377 (0.0000)	0.0000	ARCH effect exists

## 2.5 Model setting

Combined with ADF test and ARCH effect test results, it is found that all the time series of explained variables in this paper have ARCH effect. Then we choose the GARCH (1, 1) model by comparison. Meanwhile, in order to avoid the non-negative limitation of the GARCH model and other problems, we choose the EGARCH (1, 1) model, as shown below:

Where C stands for constant and disturbance term.

$$y = c + \varepsilon_t. \quad (1)$$

Among them:

$$E_t = v_t \sqrt{\sigma_t^2}. \quad (2)$$

$$\ln(\sigma_t^2) = \alpha_0 + \alpha_1 T_t + \alpha_2 mp_t + \alpha_3 omo_t + \alpha_4 \frac{\varepsilon_{t-1}}{\sigma_{t-1}^2} + \alpha_5 \left| \frac{\varepsilon_{t-1}}{\sigma_{t-1}^2} \right| + \alpha_6 \ln(\sigma_{t-1}^2). \quad (3)$$

$v_t$  is independently identically distributed, with a mean of 0 and a variance of 1.  $\sigma_t^2$  is the variance of  $t$ ,  $\sigma_{t-1}^2$  is the variance of  $t-1$ .  $T_t$  is the new monetary policy tool variable.  $mp_t$  is the statutory deposit reserve adjustment variable, and  $omo_t$  is the open market operation variable.

### 3 EMPIRICAL PROCESS

The empirical process of this paper is divided into two categories, and the impact of different types and maturities of monetary policy tools on the volatility of the stock market returns are investigated separately. The results are shown below.

#### 3.1 The influence of different kinds of new monetary policy tools on stock market yield

Based on the EGARCH model established above, the short-term liquidity adjustment, standing lending facility and medium-term lending facility are brought into the EGARCH(1, 1) model, and the results are shown in table 4 (Note: Standard deviation in brackets; \*\*\*, \*\* and \* represent the significance level of 1%, 5% and 10% respectively, as shown in the following table. ):

**Table 4** The impact of different types of new monetary policy tools on stock market returns

		ssec	csi100	csi500
The mean equation	cons	0.00093 (0.00051)	0.00031 (0.00049)	0.00076 (0.00059)
Conditional variance equation	slf	0.04970** (0.00058)	0.01261* (0.00563)	0.04841** (0.00682)
	slo	0.00404* (0.00269)	0.00001 (0.00003)	0.00000 (0.00005)
	mlf	-0.00053** (0.00033)	-0.00004** (0.00003)	-0.00004* (0.00001)
	mp	-0.09552* (0.00243)	-0.12901** (0.06389)	-0.00019 (0.00008)
	omo	0.00007 (0.00001)	0.00000 (0.00000)	0.00000 (0.00001)

In the conditional variance equation, MLF can significantly reduce the volatility of stock returns in the financial market and stabilize the financial market, which is in line with the policy expectations of the central bank. The use of SLF has significantly increased the volatility of stock returns. The use of SLO significantly increases the volatility of the overall stock return rate, but has no obvious effect on the volatility of the stock return rate of large market capitalization and small and medium market capitalization companies.

#### 3.2 The impact of the operation of new monetary policy tools with different maturities on stock market returns

Considering that new monetary policy tools of different maturities will also have different degrees of impact on the stock market, we put monetary policy tools of different maturities into the EGARCH (1, 1) model and get the results as shown in table 5 (note: standard deviation in parentheses; \*\*\*, \*\* and \* represent the significance level of 1% , 5% and 10% respectively, as in the following table):

**Table 5** Influence of the operation of new monetary policy tools with different maturities on stock market returns

		ssec	Csi100	Csi500
The mean equation	cons	0.00095 (0.00049)	0.00031 (0.00049)	0.00070 (0.00060)
Conditional variance equation	slf	0.00625* (0.00256)	0.02571** (0.00563)	0.04031** (0.00686)
	slo	0.00004* (0.00000)	0.00001 (0.00029)	0.00002 (0.00013)
	Mlf3m	-0.00003 (0.00004)	-0.00014* (0.00009)	-0.00002 (0.00062)
	Mlf6m	-0.00009 (0.00016)	-0.00007 (0.00024)	-0.00008** (0.00004)
	Mlf1y	-0.00087* (0.00014)	-0.00037** (0.00011)	-0.00026* (0.00001)
	mp	-0.08843* (0.02418)	-0.12746** (0.07681)	-0.01112* (0.00559)
	omo	0.00000 (0.00001)	0.00000 (0.00000)	0.00000 (0.00002)

As shown in the table, SLF and SLO have the same impact on stock returns in the three markets as before. For MLF, the three-month medium-term borrowing facility has a significant impact on reducing volatility of stock returns in the overall market, but has no significant impact on stock returns in the large-market and small-market markets. The 6-month medium-term borrowing facility has a significant effect on the reduction of stock returns in the overall market and the small-market market, but has no significant effect on stock returns in the large-market market. The one-year medium-term facility had a significant impact on the reduction in volatility of stock returns in all three markets. Moreover, from the coefficient in front of the index, the longer the term of medium-term lending facility, the more effective it is to stabilize the fluctuation of the stock market yield.

### 3.3 Robustness test

In order to avoid the interference caused by index components on the results, the return rate of CSI 300 index, SSE 180 index and small and medium-sized board index are selected as proxy variables of stock market return rate. After passing ADF test and ARCH effect test, Robustness tests are conducted on the impact of different types of new monetary policy instruments on the return rate of the stock market and the impact of new monetary policy instruments with different maturities on the return rate of the stock market respectively. The results are shown in Table 6 and Table 7 below (Note: the brackets are standard deviations; \*\*\*, \*\* and \* represent the significance level of 1%, 5% and 10% respectively, as shown in the following table.):

**Table 6** Robustness test

		CSI 300	SSE180	MSB
The mean equation	cons	0.00050 (0.00048)	0.00054 (0.00047)	0.00059 (0.00058)

Conditional variance equation	slf	0.01441** (0.00552)	0.01553* (0.00536)	0.02375* (0.00681)
	slo	0.00000 (0.00000)	0.00001 (0.0000)	0.00001 (0.00000)
	mlf	-0.00009* (0.00000)	-0.00018* (0.00007)	-0.00012* (0.00004)
	mp	-0.11270* (0.04502)	-0.10550** (0.04112)	-0.1957** (0.05771)
	omo	0.00000 (0.00000)	0.00001 (0.00000)	0.00000 (0.00000)

As can be seen from Table 6, the use of MLF in the new monetary policy tool significantly reduces the volatility of stock return rate, but the use of SLF increases the volatility of stock market return rate, and the effect of SLO is not obvious.

**Table 7** Robustness test

		CSI300	SSE180	MSB
The mean equation	cons	0.00050 (0.00048)	0.00054 (0.00047)	0.00058 (0.00059)
Conditional variance equation	slf	0.03890** (0.0055)	0.01570* (0.00538)	0.02420* (0.00685)
	slo	0.00009 (0.00016)	0.00001 (0.00000)	0.00001 (0.00000)
	Mlf3m	-0.00002 (0.00026)	-0.00004** (0.00000)	-0.00002 (0.00000)
	Mlf6m	-0.00022* (0.00005)	-0.00009* (0.0000)	-0.00009* (0.00000)
	Mlf1y	-0.00027* (0.00007)	-0.00019* (0.00004)	-0.00002 (0.00000)
	mp	-0.10321* (0.04498)	-0.10630** (0.0411)	-0.14723** (0.05869)
	omo	0.00000 (0.00000)	0.00000 (0.00000)	0.00000 (0.00000)

Number equations consecutively. Equation numbers, within parentheses, are to position flush right, as in (1), using a right tools that can be seen from Table 7 that SLO is ineffective in stabilizing the fluctuation of return rate in the three stock markets. The use of SLF significantly increased the volatility of the three stock market returns. Three-month lending effectively reduces the Shanghai stock market return. Mid six-month lending facilities effectively reduces the shares of the three market yields, mid one-year lending facilities effectively reduces the csi 300 and 180 the Shanghai stock market return volatility, which reduce daily fluctuations in the stock yield of small and medium-sized panels is invalid. The results of robustness test are basically consistent with the above core results.

## 4 EMPIRICAL CONCLUSIONS AND POLICY RECOMMENDATIONS

Through the narration of the above chapter, in this section, we summarize the empirical conclusions of the previous chapter and put forward certain policy suggestions to the Central Bank for the problems reached.

### 4.1 The empirical summary

Through the above empirical analysis, we can draw the following conclusions:

- 1)SLF cannot significantly reduce the return rate of the stock market, but increases the volatility of the return rate of the stock market, which indicates that SLF as the upper limit of the interest rate corridor is occasionally ineffective.
- 2)SLO does not reduce the volatility of the overall stock market return rate, but increases it.
- 3)MLF has a significant effect on reducing volatility of stock market return rate. Among them, the 3-month medium-term lending facility can significantly reduce the volatility of return on large-market stock markets, the 6-month medium-term lending facility can only reduce the volatility of return on small-market stock markets, and the 1-year medium-term lending facility can help reduce the volatility of return on all stock markets. And the longer the term of the medium-term lending facility, the better the adjustment effect.

### 4.2 Policy recommendations.

- 1)Short-term liquidity facility did not have expected effect, may be because of the disclosure of the short-term liquidity adjustment tools not in time, causing investors to get information delay, so pay attention to the short-term liquidity facility operation in the future the disclosure of information, pay attention to play its expected role, strengthen the new monetary policy transmission channels of expected to financial markets.
- 2)SLF occasionally fails to speed up the construction of interest rate corridor, so that SLF can better serve the financial market as the upper limit of interest rate corridor.
- 3)Standardize the use of medium-term lending facilities, pay attention to guide the flow of capital to small and micro enterprises, "agriculture, rural" enterprises and key state-supported related fields, pay attention to the combination of medium-term lending facilities with different maturities, and jointly promote the development of macro economy.

**Acknowledgment.** I have been busy for a period of time, the content of my article is about to be completed, and the empirical results have reached the basic expected effect. When I think of the scenes in the writing process, I will feel a sense of achievement, but I feel more relieved. When I think of the end of the article that I prepared for so long, I feel a little reluctant to give up and miss the fighting time. However, due to my ability, I always feel that there are many unsatisfactory places in my articles. However, I secretly comfort myself that the results of doing something are important, but the harvest in the process should not be ignored. It is enough to learn and grow up. I hope to comfort myself with these words, so that I will not be too depressed. Also I want to borrow this opportunity to thank all the teachers and classmates who give me help, your help is the wealth of my life, and it is an indispensable part of my statement, especially I want to thank my mentor, in the process of the completion of my article, he in a manner of elders to give me much guidance, in this say thank you to him.



I would like to thank all the scholars for their references in this paper writing. Without the inspiration and help from your literature, my paper writing would have been difficult. Due to my limited academic level, there are inevitably many inadequacies in the article I wrote. I sincerely request criticism and correction.

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