The Effect of Interest Rate of Monetary Policy Transmission Mechanism in China

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Abstract: The paper tries to make a study of effect of interest rate transmission mechanism of Chinese Monetary policy. VAR model is established to conduct an analysis of impulse response function and variance decomposition. Empirical studies demonstrate that it is hard for interest rate transmission channel of Chinese monetary policy to play a role in the short term while it will play a part in the long run, and long-term effect of Chinese monetary policy is relatively better, which further indicates that effectiveness of monetary policy of central bank largely depends on whether interest rate transmission channel of monetary policy is smooth or not.

Keywords: Monetary policy, interest rate effect, VAR model

I.   INTRODUCTION

Chinese monetary policy tool and operational target have been taking into increasing consideration the role of interest role since the reform and opening-up policy, and transmission mechanism of monetary policy has been diversified, changing from former single transmission mechanism of bank credit to coexistence of bank credit, interest rate, exchange rate and asset price. Monetary transmission mechanism plays an important role in implementation system of monetary policy and possesses a decisive status in promoting macroeconomic operation. Due to measurability, controllability and relevance of interest rate, many central banks in Western countries take interest rate as one of operational targets of monetary policy. Central banks make use of interest rate to conduct direct or indirect control and give play to the role of interest rate effect in adjustment of monetary policy, to effectively realize the goal of monetary policy.

As China accelerates reform process of interest rate marketization, making full use of the role of interest rate transmission mechanism will not only greatly influence promotion of transmission efficiency of Chinese monetary policy and realization of expected effect of monetary policy, but also exert a profound influence on whether China can timely deal with the impact of global financial crisis. The paper tries to establish VAR model to study interest rate effect of monetary transmission mechanism.

II.   METHODS

A.   Variable Selection and Data Processing

Central banks usually take the monetary policy of making use of leverage of interest rate, carry out monetary policy to influence money supply, and change money supply to alter interest rate, further affecting consumption and investment and ultimately acting on total demand, so that output level will change. Variables should include money supply, interest rate, consumption, investment and output when interest rate transmission mechanism is analyzed. M2 is selected to stand for change of money supply. From the perspective of marketization, inter-bank lending interest rate of commercial banks can relatively accurately represent change of interest rate, whose overnight inter-bank lending is the kind with the biggest turnover, so overnight inter-bank lending interest rate r is selected as the measure index of market interest rate. Moreover, fixed investment in cities and towns tz is taken as the index to measure investment, and total retail sales of consumer goods xf serves as the index to measure consumption.as for output, industrial added value q is selected as output measurement index to replace GDP, which is used by most scholars.

Data of Money supply m2 and overnight inter-bank lending interest rate r come from the

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website of People's Bank of China, while date of fixed investments in cities and towns tz, total retail sales of consumer goods xf and industrial added value q come from the website of State Statistics Bureau. All monthly data span from January of 2003 to November of 2011. To eliminate seasonal volatility, a seasonal adjustment is made to money supply, overnight inter-bank lending interest rate, fixed investments, total retail sales of consumer goods and industrial added value, and five variables take the logarithm to remove heteroscedasticity,

namely lnv, lnw, lnx, lny and lnz respectively. VAR model requires co-integration relationship or stationary time series among variables, so unit root test and co-integration test are required to be made for variables.

B. Unit Root Test

ADF unit root test is made for horizontal value and first-order variance of all variables, whose test result is shown as Table 1.

Table 1.   ADF unit root test.

Variable	Test type	ADF Statistic	Critical value (1%)	Critical value （10%）	Result
lnv	(C, T, 0)	-1.9789	-3.4937	-2.5816	Non- stationary
D(lnv)	(C, T, 0)	-11.2481	-3.4944	-2.5817	stationary
lnw	(C, 0, 1)	-3.0696	-3.4944	-2.5817	Non- stationary
D(lnw)	(C, 0, 0)	-12.7393	-3.4944	-2.5817	stationary
lnx	(C, T, 2)	-2.0449	-3.4937	-2.5816	Non- stationary
D(lnx)	(C, T, 3)	-11.4680	-3.4944	-2.5817	stationary
lny	(C, T, 1)	-2.3446	-3.4937	-2.5816	Non- stationary
D(lny)	(C, T, 0)	-11.2905	-3.4943	-2.5817	stationary
lnz	(C, T, 2)	0.0358	-3.4937	-2.5816	Non- stationary
D(lnz)	(C, T, 1)	-7.3241	-3.4937	-2.5816	stationary

Test result indicates that ADF test values of variable lnv, lnw, lnx, lny and lnz in absolute value are less than critical value in 10% significance level, so time series of these five variables is not stationary. ADF test values of these five variables in absolute value are all greater than critical value in 1% significance level after first difference is made. It can thus be seen that lnv, lnw, lnx, lny and lnz are all first-order integrated series.

C. Johansen Co-integration Test

Johansen Co-integration Test is used to test multivariable, whose test result is shown as Table 2.

It can be known from test result that co-integration relationship exists among variable lnv, lnw, lnx, lny and lnz, for which VAR model can be established.

Table 2.   Johansen Cointegration Test.

Hypothesized No. of CE(s)	Eigenvalues	Trace Statistic test			Max-Eigen Statistic test		
		Trace Statistic	Critical Value (5%)	Critical Value (10%)	Max-Eigen Statistic	Critical Value (5%)	Critical Value (10%)
None	0.2184	65.6679	69.8189	65.8197	25.1278	33.8769	31.2392
At most 1	0.1945	40.5400	47.8561	44.4936	22.0619	27.5843	25.1240
At most 2	0.0902	18.4782	29.7971	27.0670	9.6419	21.1316	18.8928
At most 3	0.0667	8.8362	15.4947	13.4288	7.0357	14.2646	12.2965
At most 4	0.0175	1.8005	3.8415	2.7055	1.8005	3.8415	2.7055

III.   ANALYSIS OF EMPIRICAL RESULTS

A.   *VAR Model*

The key to establishment of VAR model lies in selection of lag phase, which should not be too small or too big. Too small lag phase may seriously affect autocorrelation of error term, leading to oversize error of model parameter estimation; too big lag phase will reduce degree of freedom of model, directly influencing effectiveness of parameter estimator. According to former research experience, it is reasonable to select lag phase 2. Result of model shows bigger goodness of fit of various sub-equations will lead to smaller AIC value and SC value; meanwhile, holistic determining residual of VAR system is 1.32E-11, adjusted maximum likelihood value is 570.3662, AIC value is -9.816499, SC value is -8.426329, and estimated results of model are relatively ideal from sub-equation to entirety. Based on above-mentioned VAR model, a further analysis of impulse response function and variance decomposition will be made for effect of interest rate transmission mechanism of monetary policy.

B.   *Impulse Response Function*

Impulse response function describes how a standard deviation impact from random disturbance term exerts an influence on current value and future value of endogenous variables. Therefore, to more specifically demonstrate transmission process of interest rate channel of monetary policy as well as more vividly illustrate dynamic relation among money supply, interest rate, investment, consumption and output, an impulse response function is used to analyze short-term dynamic feature. Process of impulse response is shown as Table 3.

Table 3.   Process of impulse response.

Response of LNW:

Period	LNV	LNW	LNX	LNY	LNZ
1	-0.024062	0.317812	0.000000	0.000000	0.000000
	(0.03106)	(0.02193)	(0.00000)	(0.00000)	(0.00000)
2	0.007991	0.045607	0.018702	-0.045700	0.025033
	(0.03178)	(0.03184)	(0.03166)	(0.03249)	(0.03114)
3	0.024319	0.101297	0.037134	-0.038973	0.007714
	(0.03248)	(0.03142)	(0.03148)	(0.03067)	(0.01684)
4	0.016554	0.040007	0.009995	-0.031729	0.001183
	(0.02159)	(0.02168)	(0.02108)	(0.01844)	(0.01842)
5	0.017877	0.042568	0.015617	-0.030530	0.000827
	(0.02126)	(0.02185)	(0.02127)	(0.01787)	(0.01274)
6	0.013257	0.024206	0.004917	-0.021544	0.000149
	(0.01539)	(0.01628)	(0.01536)	(0.01352)	(0.01153)
7	0.011421	0.020816	0.004854	-0.018699	0.001029
	(0.01426)	(0.01519)	(0.01407)	(0.01257)	(0.00874)
8	0.009114	0.013907	0.001471	-0.013628	0.001436
	(0.01128)	(0.01201)	(0.01078)	(0.01049)	(0.00750)
9	0.007551	0.011157	0.000895	-0.011105	0.001909
	(0.00999)	(0.01051)	(0.00919)	(0.00936)	(0.00625)
10	0.006222	0.008108	-0.000125	-0.008470	0.002190
	(0.00826)	(0.00856)	(0.00726)	(0.00800)	(0.00560)

According to impulse response function table, impulse response value of overnight inter-bank lending interest rate impacting one standard deviation reaches -0.024 at phase 1, tends to be 0 in phase 2, and basically remains stable after that, which indicates that change of money supply in China has a relatively weak influence on market interest rate in the short term. A standard deviation

impact of overnight inter-bank lending interest rate almost exerts no influence on investment and consumption in a continuous period, which demonstrates that lowering of market interest rate has a relatively small influence on investment and consumption on the whole in a short period. With regard to a standard deviation impact of overnight inter-bank lending interest rate, impulse response value of industrial added value is 0 in phase 1, basically tends to be 0 after that, and reaches 0.002 in phase 12, which shows that fluctuation of market interest rate will cause certain alternation of output level in the short term but within a small range.

C. Analysis of Variance Decomposition

Impulse response function describes how an impact of endogenous variable will affect other endogenous variable in VAR model while variance decomposition further evaluates importance of different structural impacts by analyzing contribution degree of every structural impact on change of endogenous variables. Therefore, variance decomposition can offer information with relative significance of various random disturbance terms that influence variables of VAR model. Table 4 is the result of variance decomposition based on VAR model of interest rate transmission channel.

Table 4.   Result of variance decomposition.

Variance Decomposition of LNW:

Period	S.E.	LNV	LNW	LNX	LNY	LNZ
1	0.318721	0.569962	99.43004	0.000000	0.000000	0.000000
2	0.326790	0.601960	96.52812	0.327515	1.955630	0.586777
3	0.347278	1.023426	93.98312	1.433393	2.991137	0.568923
4	0.351546	1.220466	93.00999	1.479634	3.733583	0.556324
5	0.356220	1.440510	92.01307	1.633262	4.370803	0.542359
6	0.357970	1.563598	91.57273	1.636200	4.690387	0.537085
7	0.359278	1.653292	91.24294	1.642565	4.927195	0.534003
8	0.359927	1.711461	91.06372	1.638322	5.052827	0.533673
9	0.360356	1.751290	90.94271	1.635038	5.135758	0.535208
10	0.360607	1.778625	90.86667	1.632774	5.183777	0.538152

In accordance with the result of variance decomposition, forecast error fluctuation of overnight inter-bank lending interest rate comes from slowly diminishing influence of its own while influence from money supply, social consumer goods and investment is becoming increasingly larger, and influence on output basically remains between 50% and 60% except in phase one, which indicates that Chinese monetary policy has very low effectiveness on transmission of market interest rate in the short term but with an outstanding role in the long run. From the perspective of conductivity, fluctuation of Chinese market interest rate has an increasing influence on fixed investments in a long period. Overnight inter-bank lending interest rate has a slowly increasing influence on forecast error, which shows that market interest rate has no big influence on total retail sales of consumer goods but with certain transmission effect in a long period. Like other factors, forecast error of industrial added value is being influenced less by its own information factor but more by other factors. However, interest rate effect has poor influence on consumption, investment and output on the whole.

IV.   CONCLUSION

Central Bank of China makes use of adjustments of monetary policies to alter money supply, which is difficulty to facilitate effective fluctuation of market interest rate and undoubtedly lowers transmission effect of monetary policy on market interest rate. Alternation of fixed investments and total retail sales of consumer goods is largely influenced by fluctuation of market interest rate in the long run while investment and consumption is less influenced by market interest rate in the short term. Moreover, in view of time-delay factors of interest rate effect, empirical results indicate that it is hard for Chinese monetary policy to play a part in interest rate transmission in the short term but in the long run, so Chinese monetary policy effect is effective in the long run, which largely depends on whether interest rate transmission channel of monetary policy is smooth.

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