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An Empirical Study on the Factors Affecting Savings Bank Loan Interest Rates

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Abstract

The study analyzed reciprocal effects of base rate of the central bank, CD, CP, interest rates for bank deposits, bank loan interest, interest rate for savings bank deposits and savings bank loan interest. In particular, the study attempted to find an interest rate which affects interest rates of savings banks. If these variables affected interest rate decisions by savings banks, it would be possible to predict that movements of these variables in the future may affect changes of interest rates as well. In the impulse reaction function, CD rate and CP rate took the highest impact to the savings bank's deposit interest and loan rate. In forecast error variance decomposition analysis, it was fond that the deposit interest and loan rate of the savings bank reciprocally affected each other. Then, CD rate and CP rate had the highest explanation power. Consequently, factors that affect the savings' bank's decision on interest rates were a bank's deposit interest, CP and RP interest rate and RP rate which is the benchmark interest rate. The important point is that RP rate as the benchmark interest rate takes an important role because it becomes the base for influenced variables.

Keywords: RP(KTB), CD, CP, bank deposit rate, bank loan rate, savings bank, interest rate

1. Introduction

In engaging in economic activities, funds act like blood. The flow is important. Whenever necessary, it must be able to be supplied properly. When funds are supplied by the monetary institutions or the bank financial institutions, it is possible to make a loan at a comparatively low interest; however, those with bad credit rating have to depend on money lenders because they have difficulty in borrowing money from the monetary institutions. In that case, relatively high interest rates are applied so it may cause considerable damage to them inevitably. Most lenders apply maximum legal loan rate; moreover, barely does the regulatory system supervise them. So, many types of illegal or expedient operations extreme illegal activities are adopted in collecting loans, which causes social problems. In case of money lenders, a loan applicant's credit score are usually exclusively used to decide whether or not to give a loan.

In this aspect, the interest rates offered by savings banks have symbolic meanings in stabilizing the daily financial lives of ordinary people (Note 1). Recently, many people feel sympathetic for the arguments suggesting that those who feel that they would have been rejected if they had applied for a loan, in consideration of their credit scores, income levels and holding assets, should be classified as credit constraint as well as those whose credit applications have been rejected by a financial institution (Jappelli, 1990, 1998). The financial situation of the ordinary people is getting more attention globally as it is seen in the Grameen Bank which won a Nobel Peace Prize pioneering the concepts of microcredit.

It is necessary to supply sufficient funds to the financial institutions that ordinary people prefer to use; supervising institutions must guide decisions on the interest rate to the most favorable way to ordinary people and they need to fully understand how savings banks make interest rate decisions. In this regard, savings banks' structure of interest rate decisions may have significant meanings socially. Likewise, analyzing elements affecting interest rate decisions by savings banks may have important significances as well.

2. Benchmark Interest Rate and Lending Rate

The benchmark interest rate set by Bank of Korea mainly aims to stabilize inflation by control the money supply; it also considers the liquidity aspect of the financial institutions which take a role of supplying and demanding money. From an aspect of real economy, a nation's benchmark interest rate is decided on the ground of marginal productivity of money, profitability of money, industrial productivity indices, and expected inflation reflecting return on investment and inflation rate, such as real economic growth rate.

The benchmark interest rate set by the central bank is a policy measure implemented by imposing a certain cash reserve ratio on financial institutions. So, it may cause a problem intertwining which decision should be prioritized between a money supply decision and an interest rate decision. When a money supply decision is made in advance, possibilities of a wide range of interest rate's fluctuation become high as the demand for money arises. Conversely, prioritizing an interest rate decision would allow the central bank to manipulate the money supply flexibly at appropriate levels. For that reason, the central bank in Korea controlling the base rate tends to prioritize a benchmark interest rate decision.

However, in case of ultra-short-term interest rates, they may easily cause market distortions unless the money supply and demand are precisely comprehended. It is difficult to predict the instability of short-term money market; however, a cautious approach is important, since its ripple effect on money market is quite huge. In this vein, Korea's benchmark interest rate is now decided on the basis of repurchase paper (RP), switching it from the overnight call rate which was sued from May 1995 to March 2008.

Levels of savings and loan rates move, being interlocked with market rate. In case of loan rates, they are decided on the ground of an applicant's credit score, lending period, additional interest and other non-price factors as well as the money supply cost imposed on a financial institution which is also a lending institution. The following is equation for loan rate determination.

$$D_t = R_f + c + t + p \tag{1}$$

Where, D_t: loan rate for the term of t,

R_f: risk free rate for unit term,

c: credit risk premium,

t: term premium,

p: fee, contribution costs, etc, non-price factors.

Interest rates can be usually defined as a yield-to-maturity of bonds. Thus, it can be said that discount rates or the concept of required interest rates necessary to switch a present value to a future one or a future value to a present one decide deposit interest. A future value can become larger than a present value in terms of an opportunity given by time. That is a general principle of finance which can be applied to all cases except for a zero interest rate which has recently emerged.

3. Literature Review

A vast literature review on interest rates is available and more research is being processed. Among them, this part focused on short-term interest rates and interest rates of non-banking financial institutions.

Estrella and Mishikinr (1998) analyzed reactive of interest rates differentials for base rate variations through analyses on fund interest of European Central Bank and term premium.

Afanasieff, Lhacer, and Nakane (2002) investigate the main determinants of the bank interest spreads in Brazil. The behavior of bank interest spreads in Brazil reveal two stylized facts. They are, first, a remarkable fall in the average rates since early 1999, second, a strong and persistent dispersion of rates across banks. The results suggest that macroeconomic variables are the most relevant factors to explain the behavior of bank interest spread in Brazil.

Claeys and Vennet (2008) investigate the determinants of bank interest margins in the Central and Eastern European countries. The authors assess to what extent the relatively high bank margins in those countries can be attributed to low efficiency or non-competitive market conditions. The results show that banking is on a virtuous path, increased efficiency benefits customers, while capital adequacy supports systemic stability.

Naceur and Goaied (2008) investigate the impact of banks' characteristics, financial structure and macroeconomic indicators on banks' net interest margins and profitability in the Tunisian banking industry for the 1980-2000 periods. Individual bank characteristics explain a substantial part of the within-country variation in bank interest margins and net profitability. On the other hand, we found that macroeconomic variables have no

impact on Tunisian bank's profitability. They find that stock market development has a positive effect on bank profitability. This reflects the complementarities between bank and stock market growth.

Maddaloni and Peydre find that low (monetary policy) short-term interest rates soften standards for household and corporate loans. This softening—especially for mortgages—is amplified by securitization activity, weak supervision for bank capital, and low monetary policy rates for an extended period. Conversely, low long-term interest rates do not soften lending standards. Finally, countries with softer lending standards before the crisis related to negative Taylor rule residuals experienced a worse economic performance afterward. These results help shed light on the origins of the crisis and have important policy implications.

In Korea, Park et al. (2009) in the comparison and analysis of base rate and the interest rate of the credit co-operative association carried out regression analyses to explore whether or not RP interest which is a newly applied base rate affects the interest rate of the credit co-operative association and confirmed RP interest's influence on the interest rate of the credit co-operative association.

Oh (1998) explored the presence of an interest rate path through VAR and analyses of structural models and illustrated in the year of 1997 that the differences of Korea's short-and long-term interest rates enhanced future activities of real economy and predictability on inflation. Moreover, his study also suggested that monetary policy partially affects interest rates differentials. Kang (2001) analyzed variation factors Korea's short-and long-term interest rates differentials in 1990s based on the preferred habitat theory which is a theory of term structure determinants. It concludes that big differences between short-and long-term interest rates based on expected inflation values can be an appropriate policy suppressing inflation of the future and cases based economic uncertainty requires a policy which can reduce systematic risks so as to resolve such uncertainty.

4. Research Model

4.1 Introduction

The study explored whether or not the RP interest rate affects the loan rates of a savings bank based on monthly data from April 2008 to July 2016 when RP was practically applied as the benchmark interest rate by expanding the results of Park et al. (2009)'s study confirming the newly applied RP interest affects the interest rate of the credit cooperative association as base rate. It aims to explain by using the model of casual relationship analyses in which RP rates, CD, CP, interest rates for bank deposits, bank loan interest, and interest rate for savings bank deposits were used for independent variables and loan rates for savings banks were used for a variable through the VAR model. Korean central bank's benchmark interest rate is RP rate and CD, CP, interest rates for bank deposits and bank loan interest and interest rate for savings bank deposits inevitable correlated with the RP rate were used for samples. The data used for the study was from April 2004 to July 2016 and the decision for the maximum number of lags was made based on AIC and BIC criteria and the impulse response period was made 12.

4.2 Unit Root Test

In case of time serial variables, the unit root test is required to judge their stability. There are several unit root testing methods among which ADF test is a method assuming a general situation where autocorrelation exists. ADF test (Augmented Dickey-Fuller t-test) is a method determining whether or not a unit root is significantly different from the least squares estimate for disparity parameter after regressing the time series determining the presence of a unit root to the disparity parameter and a certain number of disparity parameters. Although the ADF test is the most widely used due to its operational convenience, its rather weak testing sensitivity is under criticism.

$$\Delta Y_t = \alpha + \beta \times T + rY_{t-1} + \sum_{t=1}^{p} \delta_t \Delta Y_{t-1} + \varepsilon_t \quad (2)$$

Where t = 1, 2, --- , p.

4.3 Cointegration Test

Although time series variables have a unit root, such time series variables can be more stabilized if common factors exist among the time series variables. When such relations exist, cointegration among time series variables can be confirmed. Cointegration means that the linear combination among the variables is stable despite a presence of unstable series between each variable. In other words, even though a unit root exists in each time series, their linear combination is stable, so regression analysis results can have significance.

$$Y_t = \alpha + \beta X_{t-1} + \varepsilon_t \quad (3)$$

Where, Y_t: endogenous variable, X_t: exogenous variable, ε_t: error.

4.4 Empirical Analysis

In this model, a time series process is estimated through linear regression equation system of n samples composed of past observations on other variables as explanatory variables after designating present variables which have casual relationships different to each other as dependent variables. It is a combination of regression analysis and time series analysis, having characteristics of an expanded autoregressive-moving-average (ARMA) multivariate model.

In other words, it is not to estimate the ARMA model with one variable. Even though an estimate is made for two variables or more; only autoregressive-moving-average (ARMA) is considered by omitting the moving average part which might inevitably entail a nonlinear function estimate. All the present variables in the model are regarded endogenous variables while all disparity parameters are regarded exogenous variables. However, meticulous caution is required in interpreting analysis results, since the VAR model can induce different results in accordance with the selection of disparity and structural limitations (variables, sorting orders).

The VAR model can be generally summarized as below.

$$X_t = A(L)X_{t-1} + \varepsilon_t = \sum_{j=1}^{k} A_j X_{t-1} + \varepsilon_t \quad (4)$$

The VAR model enables analyzing the speed of information transfer among all the variables in the model so it is appropriate when a high level of autocorrelation phenomena. However, the VAR model has a disadvantage. That is, an error in establishing a model may occur as it loses information on long-term relations of variables while variables are processed.

In case of using the VECM model, the disadvantage that the VAR model has can be solved. In other words, when a cointegration relation exists between variables, it can verify both long-term equilibrium relations and short-term adjustment relations by including level variables and differencing variables in the regression function simultaneously. That is one of the VECM model's advantages.

Below is the general function of the VECM.

$$\Delta Y_t = c + \delta\varepsilon_{t-1} + \sum_{t=1}^{n} \theta_t \Delta X_{t-1} + \sum_{t=1}^{n} \gamma_t \Delta Y_{t-1} + \mu_t \quad (5)$$

If a vector exists in the results verified by cointegration, the VECM is used; unless a cointegrated vector exists, it is appropriate to use the VAR model left out error calibration items from the VECM.

The impulse response function analysis is to figure out effects generated by a change of a particular variable on other variables in the system.

Forecast error decomposition goes through a separating process by changes of other endogenous variables including self-variables, through which it is possible to look into levels how much prediction error variance can be explained by variations of self-variables and other variables. If a variable is not endogenous, forecast error decompositions nearly reach 100%, which means that self-disturbance can explain variance without or nearly without being affected by other variables in the model.

5. Results of Analysis

5.1 Descriptive Statistics Quantity

The following tables illustrate basic statistics and correlations between variables. As it can be known in the table 2, each variable has positive correlations with RP interest rate. It implies that other interests move along with RP interest rate whether it moves up or down.

Table 1. Basic statistic

Variable	Obs.	Mean	Std. Dev.	Min	Max
RP(KTB)	100	3.15235	1.068137	1.216	5.9
CD	100	2.86373	1.015256	1.36	5.98
CP	100	3.98988	1.616897	1.642	8.91
BKDepositRate	100	2.7756	0.9503294	1.23	5.18
BKLoanRate	100	6.5841	1.363437	4.24	9.2
SBDeposite	100	4.0523	1.471277	2	8.05
SBLoanRate	100	12.9647	1.890669	9.92	17.5

Table 2. Correlation between variables

	RP(KTB)	CD	CP	BKDep.	BKLoan	SBDep.	SBLoan
RP(KTB)	1						
CD	0.8194	1					
CP	0.9164	0.7789	1				
BKDep.	0.8465	0.9762	0.8367	1			
BKLoan	0.8719	0.8457	0.8353	0.9032	1		
SBDep	0.8876	0.8217	0.9593	0.8944	0.8994	1	
SBLoan	0.1911	0.3581	0.1478	0.4165	0.5682	0.3489	1

5.2 Results of Unit Root Test and Cointegration Test

The following table shows the results of Unit root test.

Table 3. Results of unit root test (ADF)

	Level		Differenced	
Variable	Z(t)	p-value	z(t)	p-value
KTB	-1.332	0.6144	-6.997	0.0000
CD	-2.549	0.1041	-5.040	0.0000
CP	-1.236	0.6580	-5.855	0.0000
BKDeposit	-2.325	0.1639	-5.005	0.0000
BKLoan	-0.901	0.7877	-6.699	0.0000
S&LDeposit	-1.798	0.3816	-7.164	0.0000
S&LLoan	-1.277	0.6398	-8.616	0.0000

ADF unit root test was carried out to verify whether or not economic time series data used for analysis was stable. According to the analysis results, null hypothesis of a unit is present in every level variable failed to be rejected so it was found as non-stationary time series having unstable time series. Thus, primary differencing diagnosis was implemented to make unstable time series to stable time series. According to primary differencing, all level variables rejected the null hypothesis at the significance level of 1%, so its normality was recovered and it was confirmed as I(1) variable and the null hypothesis could be rejected with stable time series.

According to cointegration test results, the lag test results on the basis of AIC and SIC criteria employing RP interest rate as a dependent variable was decided as 2. Thus the lag of Johansen cointegration was decided as 2 in this study. And, below results were obtained after testing the cointegration relation for the variable vector concerned with RP interest rate using Trace statistics and Maximum Eigen Value statistics.

It was found that cointegration vector did not exist before differencing (put differently, cointegration relation existed). Thus, it is safe to say that the time series data used for analyses have a long-term stable relation.

5.3 Results of VAR Model Analysis

Below are results of forecast decomposition of impulse response function test and forecast error variance decomposition analysis. In the analysis, the determinations of the maximum number of lags were made 2 and impulse response period was made 12.

5.3.1 Impulse Response Function Test

Below are the results of the impulse response function tests. Above all, an initial exploration was made for RP (KTB) interest rate. When RP interest rate increased by the impulse per unit, the impulse reactions of the savings bank's deposit interest increased by 0.022% in 5 months; it decreased by 0.0086% in 6 months and gradually disappeared. The savings bank's loan rate increased by 0.01% in 6 months; it creased by -0.0043% in 7 months and approached nearly 0 level in a long run.

When CD rate increased by the impulse per unit, the impulse reactions of the savings bank's deposit interest increased 0.0151 in one month; it appeared at -0.0173% in 2 months and appeared 0.0061% at 9 months and gradually disappeared. The savings bank's loan rate increased by 0.092% in one month; it decreased by -0.058% in 2 months and showed negative for 4 months and appeared 0.0007% at 8 months and gradually approached nearly 0 level in a long run.

The impulse reactions of the savings bank's deposit rate as much as CP's impulse per unit increased by 0.092% in two months; it appeared at -0.011% in 7 months and disappeared. The loan rate of the mutual savings bank increased by 0.0243% in 3 months; it decreased by -0.0005% in ten months and approached nearly 0 in a long run.

As seen in the impulse response function tests, it was found that each variable's movement similarly affects other variables in some way.

Table 4. Impulse response of variables to the RP (KTB)

Step	RP(KTB)	CD	CP	BKDeposit	BKLoan	SBDeposit	SBLoan
0	0.184	0.0411	0.1089	0.022	0.0717	-0.0075	0
1	-0.0586	0.036	-0.043	0.0422	0.06	0.04	0.0115
2	0.5277	0.0779	0.0575	0.018	0.0011	0.02	0.00268
3	-0.014	0.017	0.0167	0.048	0.00387	0.031	0.012
4	-0.009	0.02	0.033	0.02	0.012	0.043	0.0386
5	0.0028	-0.0026	0.0207	0.012	-0.0045	0.022	0.01167
6	-0.0205	-0.0018	-0.0013	-0.002	-0.0056	0.0086	0.01
7	0.0057	-0.0074	0.0078	-0.01	-0.013	-0.0093	-0.00136
8	-0.0089	-0.0122	-0.0089	-0.006	-0.0063	-0.0092	-0.01234
9	-0.0004	-0.0058	-0.0049	-0.0085	-0.0076	-0.0068	-0.0069
10	0.00045	-0.0058	-0.0073	-0.005	-0.0041	-0.0063	-0.0064
11	-0.00033	-0.0019	-0.0057	-0.0039	-0.0009	-0.0046	-0.002
12	0.00368	0.0011	-0.0014	-0.0014	0.0005	-0.004	-0.002

Table 5. Impulse response of variables to the CD

Step	CP	CD	BKDeposit	BKLoan	SBDeposit	SBLoan
0	0.1278	0	-0.0018	0.0188	-0.0018	0
1	0.0837	-0.0092	0.0155	0.058	0.0155	0.092
2	-0.0379	-0.065	-0.0173	-0.0288	-0.0173	-0.058
3	-0.019	-0.057	-0.0534	-0.0676	-0.053	0.015
4	-0.0378	-0.059	-0.048	-0.04	-0.048	-0.033
5	-0.0282	-0.026	-0.039	-0.024	-0.039	-0.04
6	-0.0289	-0.014	-0.019	-0.011	-0.019	-0.04
7	-0.0242	-0.0024	-0.0083	-0.00038	-0.0083	-0.013
8	-0.0072	0.0072	-0.0013	0.0055	-0.00134	0.0007
9	-0.00097	0.01	0.0061	0.012	0.0061	0.0034
10	0.0069	0.013	0.0088	0.01	0.00876	0.005
11	0.007	0.0089	0.0098	0.0078	0.0098	0.0056
12	0.0064	0.0049	0.0067	0.004	0.0067	0.0075

Table 6. Impulse response of variables to the CP

Step	CD	CP	BKDeposit	BKLoan	SBDeposit	SBLoan
0	0.157	0.0695	0.047	0.087	0.029	0
1	0.0171	0.084	0.0634	0.0824	0.075	-0.0059
2	-0.015	0.01	0.0374	-0.0036	0.092	0.0767
3	-0.0296	0.02	-0.018	-0.0415	0.027	0.0243
4	-0.045	-0.013	-0.0273	-0.0276	-0.0287	-0.0006
5	-0.0228	-0.0093	-0.033	-0.025	-0.041	-0.0254
6	-0.018	-0.019	-0.0177	-0.016	-0.0284	-0.039
7	-0.012	-0.0234	-0.012	-0.0084	-0.011	-0.0169
8	-0.0034	-0.01	-0.0088	-0.0043	-0.0098	-0.00326
9	0.0016	-0.008	-0.0022	0.0045	-0.0081	-0.00156
10	0.008	0.0012	0.00198	0.0064	-0.0033	-0.0005
11	0.0072	0.0024	0.0064	0.0067	0.0036	0.00005
12	0.0054	0.0034	0.0058	0.0046	0.0075	0.0046

5.3.2 Forecast Error Variance Decomposition Test Results

According to the forecast error variance decomposition tests, CD rate had the highest explanation power for the impulse of the mutual savings bank's deposit interest and loan rate. In other words, when looking into the forecast error variance decomposition test results for CD rate, the forecast error variance was mostly explained by the impulse of self-variable. And, the mutual savings bank's deposit interest explained 0.0069% till four months and 2.2514% till one year. In case of CP rate, according to the forecast error variance decomposition test results, it was found that forecast error variance was what was explained by the impulse of self-variable at the most parts.

It was found that CD rate and CP rate are the variable affecting the mutual savings bank's deposit interest and loan rate.

It seems obvious to achieve policy targets by employing RP rate which is the base rate of the central bank as a policy variable; as seen in the results of the study, it is advised to fully understand the fact that the base rate of the central bank affects the interest rate of the savings banks which are the last resort for ordinary people and to make cautious decisions over the base rate.

6. Conclusion

The study analyzed reciprocal effects of base rate of the central bank, CD, CP, interest rates for bank deposits, bank loan interest, interest rate for savings bank deposits and savings bank loan interest. In particular, the study attempted to find an interest rate which affects interest rates of savings banks. If these variables affected interest rate decisions by savings banks, it would be possible to predict that movements of these variables in the future may affect changes of interest rates as well.

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Note

Note 1. Savings bank is similar to Savings and Loan Company in the US.