

THE LIQUIDITY EFFECTS: EVIDENCE FROM REGULATED FINANCIAL MARKETS

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The liquidity effect is a key to explaining monetary transmission mechanism in both traditional and recent theoretical monetary models. The empirical support for the liquidity effect, however, is not strong enough to corroborate its significance in the actual economy. Since interest rates have been regulated strictly in the Korean financial markets, one can conjecture that interest rates would not be responsive to monetary shocks. This paper investigates whether the liquidity effect can be found in the Korean economy. The money supply shocks can be identified easily because the Korean central bank has adopted monetary targeting until recently. A VAR model is used to examine whether the short-run interest rate declines in response to expansive monetary shocks. The main finding is that the liquidity effect can be found only after the deregulation in the financial markets in the early 1980s.

JEL Classification: E4, E5

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I. INTRODUCTION

The liquidity effect is defined as a short-run decline of interest rates in response to an increase in the money supply. Most monetary theories are based on the liquidity effect to explain why monetary shocks have substantial impacts on economic activities. Recent monetary real business cycle models as well as traditional Keynesian approach share the feature of the liquidity effect. In contrast to the theoretical importance of the liquidity effect, its empirical support

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has been mixed. In fact, Mishkin(1982), Melvin(1983), and Reichenstein(1987) find no evidence for the liquidity effect in the U.S. financial market.

Recent attempts to search for the liquidity effect have been made in two directions. First, different monetary aggregates are used as a proxy for monetary shocks. Christiano and Eichenbaum(1992) and Christiano, Eichenbaum, and Evans(1994) claim that innovations in nonborrowed reserves are the correct measure of monetary policy. Strongin(1995) proxies the ratio of nonborrowed reserves to total reserves for monetary policy shocks. Bernanke and Blinder(1992) show that the federal funds rate rather than monetary aggregates represents monetary policy stance fairly well. As summarized in Pagan and Robertson(1995), defining money with narrow aggregates is more likely to present evidence for the liquidity effect.

The second stream of literature focuses on new identification methods. Many authors agree that the estimated liquidity effects are sensitive to the methods used to isolate monetary shocks. While most studies using a single equation method fail to find a significant liquidity effect, a number of systematic approaches succeed in finding the liquidity effect. Using multivariate time series method, Sims(1992) show that the liquidity effect exists in several countries. A structural vector autoregression method has been widely used since Gordon and Leeper(1994). Lastrapes and Selgin(1995) also demonstrate a strong liquidity effect by imposing the long-term restrictions on the VAR specification. However, such a structural approach is also vulnerable to the criticism because it is based on the debatable assumptions.

In their extensive study, Leeper and Gordon(1992) conclude that the characterization of the liquidity effect is sensitive to: changes in sample period, conditioning the correlation on past information, assuming that money growth is exogenous, and treating monetary changes as anticipated or unanticipated. Despite a lot of effort in search of the liquidity effect, as Pagan and Robertson(1995) claim, a number of studies conclude that, if any, the measured liquidity effect seems to be small in the U.S. economy.

Numerous studies using the Korean data also failed to find a strong evidence for the liquidity effect. Ham and Choi(1991) argue from the estimation results of error-correction models that the income and Fisher effects quantitatively dominate the liquidity effect. Estimating a four-variable VAR, Park(1996a) also claims that the liquidity effect vanishes rapidly over time in the Korean economy. However, he reports that the liquidity effect persists for a year in the 1980s. Nam(1993) presents a strong evidence for the liquidity effect using a VAR method. It is noteworthy that his expected inflation rate series is computed from the Fisher equation after estimating the *ex ante* real interest rate. In sum, most studies using the Korean data find little liquidity effects, except for Nam(1993). It is hardly surprising that negligible liquidity effects are found in Korean financial markets, since interest rates have been under a strict regulation by the central bank.

This paper is yet another attempt to investigate the liquidity effect by using the Korean aggregate data. Korea is a good place to test for the liquidity effect because the central bank in Korea has adopted the money stock as an intermediate target since the late 1970s. Money supply shocks can be easily identified under monetary targeting regime. Many authors observe that the liquidity effect appears to exist especially during 1979-1982 in the US economy during which the Federal Reserve Bank adopted the M2 as a target.¹

Since interest rates have been strictly regulated by the central bank in Korea, monetary shocks have difficulties affecting interest rates significantly and immediately. Financial deregulation process started in the early 1980s. One can easily conjecture that wide deregulation on financial markets may affect the transmission mechanism in Korea. Kang and Shin(1994) have already demonstrated that financial deregulation reinforces the role of interest rates in

transmitting monetary policy. They show that the interest rate and the spread between interest rates have higher predictive power for economic activities after deregulation. However, it is not clear whether the liquidity effect gets also stronger in the post-deregulation era. This paper attempts to clarify whether monetary shocks have larger, negative impacts on interest rates since various interest rates were freed from strict regulations.

Using a VAR method of Bernanke and Blinder(1992), I find that a significant liquidity effects work in the Korean call market since interest rates were liberalized. This result implies that institutional changes in financial markets affect the magnitude of the liquidity effect.

In section II, I will briefly describe monetary policy in Korea. A typical VAR model is constructed and, by using impulse response and variance decomposition methods, the liquidity effect is investigated in section III. The last section contains a brief summary and concluding remarks.

II. OVERVIEW OF MONETARY POLICY IN KOREA

The Korean monetary policy is mainly implemented by the Bank of Korea (BOK) but with close cooperation with the Ministry of Finance and Economy.² The Monetary Operation Board at the BOK has the formal responsibility for the formulation and execution of monetary policy. However, despite the strenuous efforts for attaining the independence of the Monetary Operation Board, the

maintenance of arbitrarily low interest rates and rationing of bank credit into priority sectors.³ A continuous increase in money supply was required to keep the interest rate level low. Meanwhile a kind of monetary targeting has been implemented to rein on the high inflation rate. The domestic credit was initially used as a target in the 1970s. When the monetary authority, however, introduced a comprehensive stabilization program in 1979, it also announced that the new monetary indicator would be M2. The M2 is defined as the sum of currency in circulation and all deposits at deposit money banks.

In general, a modified version of the Fisher equation was used to calculate the target rates. The monetary growth rates were determined at the level equal to the sum of the real GNP growth rate and target inflation rate. If necessary, the BOK took into account the possible changes in the velocity of money. The target rate was announced around the end of the year together with other economic goals of the government.

Even with efforts for maintaining strict monetary targeting policy, actual growth rates of the M2 exceeded the target on occasion. In fact, Korean monetary policy was generally accommodative until the late 1970s. After the introduction of the comprehensive stabilization program in April 1979, the monetary policy has become more restrictive than in the 1970s, and the monetary targeting has been enforced more strictly. In January 1997, the monetary authority abandoned the M2 as the target and instead adopted a new target variable, MCT, which is the sum of M2, CD (certificate of deposit) and money in Trust.

While monetary targeting has been imposed, interest rates have also been strictly regulated at the low level. Korea's regulated financial system gradually gave way to market forces from the beginning of the 1980s.⁴ Most preferential interest rates applied to policy loans were removed in June 1982, and further policy loans were retained. The interest rate for call transactions between banking institutions were liberalized, and those for issuance and loans of certificates of deposits (CD) were also liberalized in March 1983. In early 1984, financial institutions were allowed to determine their own lending rates within a given range. The measure of lifting the upper limit on call rates was taken in 1984, and the deregulation of yields on convertible bonds and debentures with bank payment guarantees was followed in 1985. The government decontrolled interest rates on CDs and issuing rates for debentures with bank payment guarantees and financial debentures issued by deposit money banks in 1986. The ceilings on most lending rates of financial institutions as well as in a few long-term deposits rates were removed on December 15, 1988. It was not until August 1991 that the four-phase schedule for the full liberalization of interest

³ For a brief overview of monetary policy in Korea, refer to Ro(1993).

⁴ The detailed measures of deregulation on interest rates in Korean financial markets are described in Park(1996b).

rates was launched. As the final phase, all deposit and lending rates were deregulated at the end of 1997.

III. EMPIRICAL ANALYSIS

The Data

The main nominal interest rate series investigated in the paper is monthly call rate (CALL) between nonbank financial institutions measured at the annual rate.⁵ As claimed in Leeper and Gordon(1992), high frequency data is more useful in separating liquidity effects from expected inflation effects. The call rate is derived from money market rate series in the International Financial Statistics (IFS) data set. The corporate bond yield (CBR) is also used, if necessary, because some argue that the corporate bond yield is a good candidate for the market interest rate in Korea.⁶

The economic activity is measured by the industrial production index (IP; 1990=100), which is the only available series measuring income at the monthly frequency. Although the industrial production is conceptually different from income, a lot of research including Sims(1992) uses IP.

The consumer price index (CPI; 1990=100) is adopted as the price variable. As monetary aggregates, I use M2 and the Monetary Base (MB).⁷ M2 was chosen because it had been used as an intermediate target from 1979:04 to 1996:12 in Korea. However, if M2 is contaminated with money demand shocks, exogenous money supply shocks are difficult to be isolated from M2. The MB can be an alternative since the monetary base is more likely to be directly controlled by the central bank, as claimed by Leeper(1992).

Because of the gradual pace of financial liberalization in Korea, it is difficult to find an obvious single break point. Likely point of time is somewhere between 1981 and 1988. I chose the 1984:11 as a break point. The removal of upper limit on the call rate seems to have a crucial affect on the relationship between money shocks and interest rates when excess demand for money has chronically prevailed.

The sample period covers from 1979:04~1996:12 during which monetary targeting was officially implemented. Furthermore, it is noted that the Korean monetary policy was less accomodative during that period. Both features imply

⁵ The average of call rates between nonbank financial institutions and banks is used if necessary but the results do not change a lot.

⁶ Lee(1993) claims that the corporate bond yield is a representative market interest rate since the size of corporate bond market is relatively large and the market is relatively free from the regulation. Moreover, many interest rates are determined around the corporate bond yield level.

⁷ In the US, Chrisitiano and Eichenbaum(1992) exploit nonborrowed reserves because they may reflect monetary policy shocks well. However, the BOK does not report nonborrowed reserves separately.

that monetary aggregates themselves may reflect monetary shocks well.

The Model

Following Bernanke and Blinder (1992), it is assumed that the economy can be described by the following model:

$$Y_t = A_0 Y_t + A_1 Y_{t-1} + B_0 M_t + B_1 M_{t-1} + u_t \quad (1)$$

$$M_t = C_0 Y_t + C_1 Y_{t-1} + D M_{t-1} + v_t \quad (2)$$

where Y is a vector of nonpolicy variables including interest rate, output and inflation; M is a monetary variable; and u and v are orthogonal disturbances. For the sake of convenience, I restrict the lag to one in this illustrative model.

Two types of identification method are suggested by Bernanke and Blinder (1992). If $C_0 = 0$, i.e., there is no feedback from the economy to policy actions within the same period, we can convert the system into a standard VAR. In this case, M is placed first in ordering. Another assumption for the identification is that $B_0 = 0$, i.e., the policy affects the economy with a lag. With this assumption, the system can be converted to a standard VAR with M placed in the last.

$$M_t = B_1 Y_{t-1} + D M_{t-1} + v_t \quad (3)$$

$$Y_t = (I - A_0)^{-1} [(A_1 + B_0 C_1) Y_{t-1} + (B_0 D + B_1) M_{t-1} + u_t + B_0 v_t] \quad (4)$$

The first assumption is more appropriate for the Korean economy. Since monetary targeting has been consistently maintained during the sample period, it can be assumed that money growth rates do not respond to current (i.e. within a month) changes in economic conditions.

Under the assumption of $C_0 = 0$, the model can be transformed as follows:

The money innovations v can be easily identified by the ordinary least squares methods. However, this identification technique can be criticized on various grounds. First, it is difficult to interpret the estimated shocks. Orthogonalized innovations in money may not reflect shocks to money supply but money demand. The v is, however, more likely to reflect money supply shocks than money demand shocks since the central bank adopted monetary targeting during the sample period.⁸ Second, the results can be sensitive to the ordering of the variables included in Y . Serious misspecification, however, can be avoided if contemporaneous correlations between the residuals of the VAR model are low.

⁸ This observation is consistent with Christiano and Eichenbaum (1992)'s M-rule. It indicates that unanticipated changes in monetary policy can be measured by some orthogonalized component of innovation to the monetary aggregates under the regime of perfectly inelastic money supply.

Choleski identification procedure is still widely used in VAR models. If the responses to shocks broadly conform to theoretical predictions, it can be argued that the Choleski procedure is a reasonable approximation to a model that is based on economic theories. Models based on economic theories are not immune from the criticisms on various grounds. As Hamilton(1997) points out, the structural vector autoregression approach can be too readily challenged. Therefore, the results based on the standard VAR is another experiment to shed light on the macroeconomic properties of Korea. Furthermore, the model I used in this paper is not a pure standard VAR. It is derived from the structural model under the assumption that the money stock is predetermined. Thus the model allows us to trace out the effects of policy without developing an explicit structural model.

The VAR model comprises the money stock (M2), industrial production index (IP), consumer price index (CPI), and the call rate (CALL) along with a constant. All variables except CALL are log-transformed. The IP, and CPI are seasonally adjusted by X-11 ARIMA method. The ordering between IP, CPI, and CALL does not make much difference in results because the contemporaneous correlations of the residuals of the estimated VAR model are low.⁹ The adopted ordering is {M2, CALL, IP, CPI}.¹⁰

To conserve the degree of freedom, I set the lag number to 12 for the full-sample VAR. Low Ljung-Box Q statistics indicate that the error terms under this lag scheme do not seem seriously autocorrelated. The log-likelihood ratio test also supports the twelve lags. For sub-period analysis, I set the lag numbers equal to 6. It turns out that this lag number is sufficient to whiten the VAR residuals.

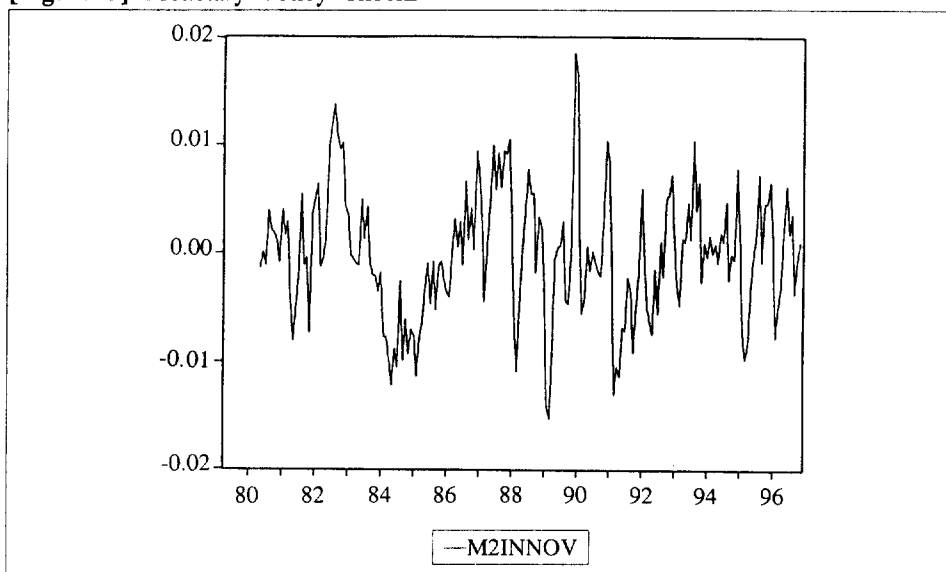
The specification mixes three nonstationary series, M2, IP, and CALL and a stationary series, CPI.¹¹ According to Sims, Stock, and Watson (1990), the most conservative method of estimation in this case is not to take difference in variables since there is little damage from failing to impose true cointegration or stationarity inducing transformations. Furthermore, many researchers recently claim that typical unit root tests such as Dickey-Fuller and Phillips-Perron tests have a very low power against trend-stationary alternatives. Using a Bayesian approach, DeJong and Whiteman(1991) show that the inferences derived from classical unit-root

⁹ The correlation matrix of residuals in VAR is

	M2	CALL	IP	CPI
M2	1.0	-0.21	-0.025	0.068
CALL		1.0	-0.081	0.166
IP			1.0	-0.009
CPI				1.0

¹⁰ This ordering is consistent with the generally accepted theories. The traditional transmission mechanism suggests that changes in the money stock affect the output through changes in short-term interest rates. Because of price stickiness, monetary shocks are non-neutral in the short-run. The effect of monetary shocks on the price level persists over time.

¹¹ Augmented Dickey-Fuller test result shows that log CPI does not have a unit root, but that other variables have one at the 5 percent level.

[Figure 1] Monetary Policy Shocks

tests have a low power. Rudebusch(1993) also reports that a unit root test is not able to distinguish between a trend-stationary model and a difference-stationary model. For these reasons, I do not take differences in variables.¹²

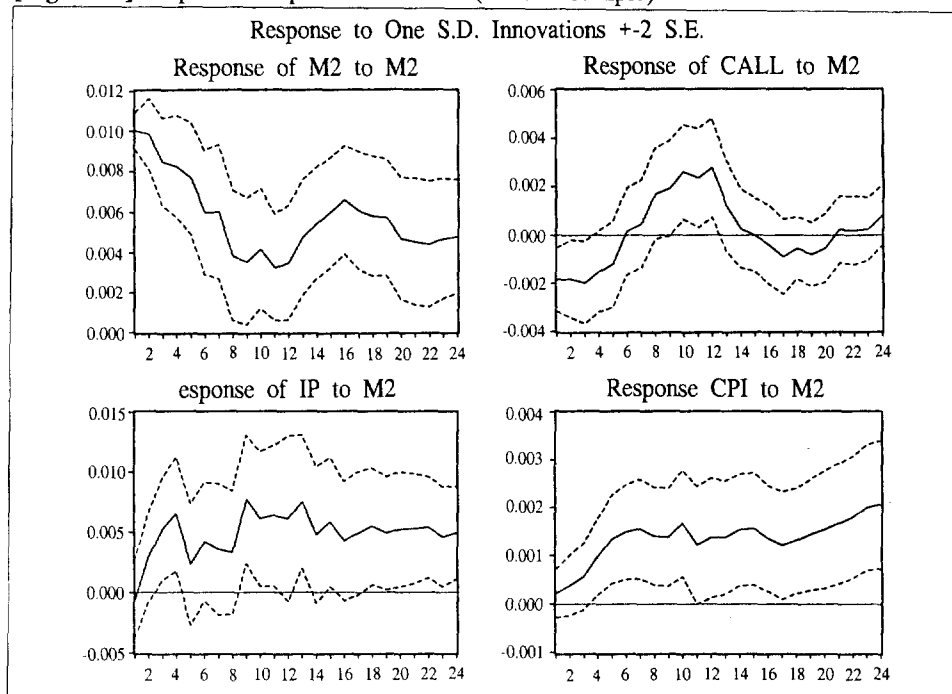
The Estimation Results

A plot of the estimated money innovations is presented in Fig. 1. The series is drawn from the full-sample VAR. Since the policy shock measures are serially uncorrelated by construction, they tend to be noisy. For the sake of easy interpretation, the 3 month moving average of the innovations, i.e. $(v_{t-1} + v_t + v_{t+1})/3$, is displayed in the Fig. 1. Downward movements of the plot represent monetary tightening and upward ones represent monetary easing actions. I included also shaded regions, which begins at a business cycle peak and ends at a trough.

The money innovations match well with the observed business cycles. There are tightening actions before the 1984, 1988, and 1991 recessions. After each recession, monetary shocks appear to be expansive as recovery phase proceeds. The displayed money innovations are also consistent with the timing of monetary contraction identified in Kim(1995).¹³ The plot shows clearly that money innovations are negative in October 1983, May 1984, and March 1990. Thus I

¹² When the growth rate of M2 is used instead of the level of log M2 in the VAR model, as in Gordon and Leeper(1992), the results are basically unchanged.

¹³ Kim(1995) adopts the narrative method of Romer and Romer(1990) and identifies four monetary contraction periods in Korea.

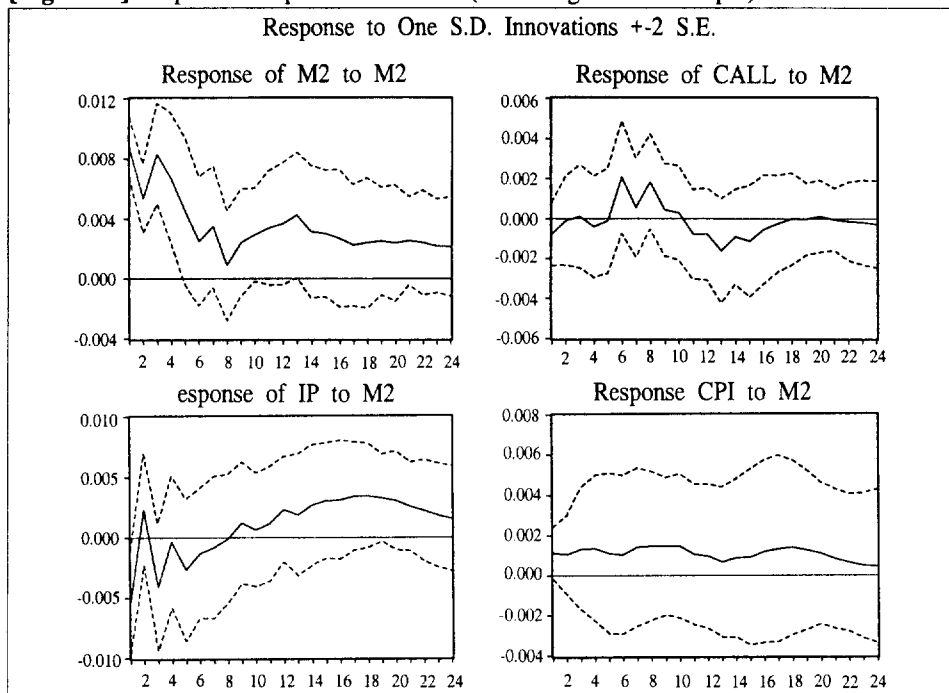
[Figure 2] Impulse Response Function (Whole Sample)

conclude that the VAR model in this paper represents monetary shocks well.

To investigate whether monetary shocks have impacts on the interest rate, the impulse response functions were obtained. Fig. 2, 3 and 4 reveal the impulse responses of M2, IP, CPI, and CALL to M2 shocks for the whole sample and two sub-samples of pre-deregulation and post-deregulation eras, respectively. The error bands represent plus and minus two standard errors generated by Monte Carlo techniques. All impulse response functions represent the responses to a one-standard deviation shock.

The overall results in Fig. 2 are consistent with the prediction of conventional macroeconomic theories. The monetary shocks affect the price level even in the long run. The price increases in response to money shocks are evident in 24 months. The impacts of monetary innovations on the output are, however, found to be insignificant. Of the most important, Fig. 2 shows that a little, if any, liquidity effect exists for the whole sample period. The impacts of money on the call rate are negative for the initial five months, but become positive and statistically insignificant after 4 months. These results are similar to those in the previous studies including Park(1996a).

The interest rates are not responsive to monetary shocks for the first subsample of pre-deregulation era. Fig. 3 displays that the impacts of monetary shocks on interest rate are statistically insignificant for the entire horizon of 24 months. In fact, the impulse response functions of all variables are not satis-

[Figure 3] Impulse Response Function (Pre-deregulation Sample)

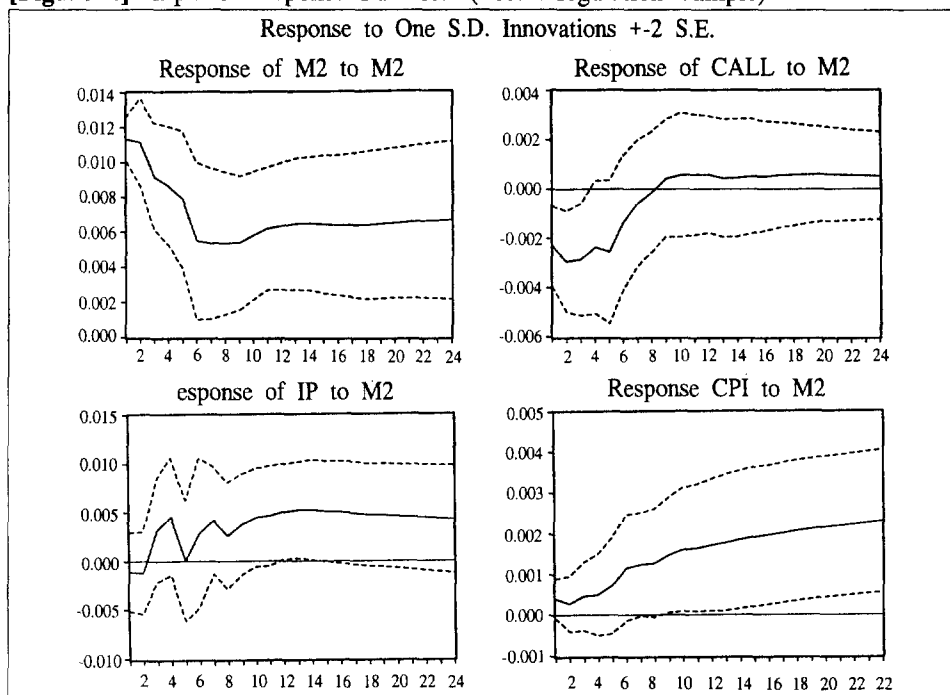
factory for the first subsample. The price level does not respond significantly to monetary shocks at all.

The key result in Fig. 4 is that the liquidity effect appears strong after deregulation. In contrast to the results of the first subsample, the effects of money shocks on interest rates are negative and highly significant at least in the first half a year. The other impulse response functions are also consistent with the predictions of standard theories. The alternative ordering between CALL, IP, and CPI made little difference in the main results.

In sum, the liquidity effect existent for the whole sample is mainly attributed to the post-deregulation sample. I fail to find any liquidity effect for the pre-deregulation sample.

To check the robustness of the results I substituted M2 by the monetary base (MB) as a proxy for monetary shock. The results are generally consistent with the above results. After the deregulation, the impacts of money shocks on the interest rate become significant. These results are quite robust to reversing the ordering of IP and CPI.

However, replacing CALL with corporate bond yield (CBR) provides a little different result. It is difficult to generate liquidity effects from the VAR model with CBR for both pre- and post-deregulation subsamples.

[Figure 4] Impulse Response Function (Post-deregulation Sample)

EXC, IP, and CPI in the order that appears. The addition does not call for a change in the main conclusion that the liquidity effect is present only for the post-deregulation sample.

Overall, the result that the liquidity effect is intensified as financial market is liberalized since the early 1980's is quite robust.

The impulse response function shows how money innovations affect other variables as time passes. I will rely on the variance decomposition approach to examine whether monetary shocks are quantitatively important in affecting the interest rate. Does a shock to money generate an economically significant change in the interest rate?

Table 1 reports the variance decompositions of call rates at a two-year horizon for the entire data, pre-deregulation data, and post-deregulation data, respectively. The numbers in the table denote the percentage of the forecast error variance of the interest rate due to the shocks to M2. The first column illustrates that M2 innovations account for 15.95 percent of the variance of CALL at the end of two years. Using the pre-deregulation data, I found that money innovations explain 9.19 percent of the CALL variation. After deregulation, the number is estimated to be 9.21 percent. These results indicate that the magnitude of the liquidity effect is not large even in the post-deregulation era.

Another question is if there is a chronology to the apparent increase in the

[Table 1] Variance Decompositions for CALL due to M2 Shocks

	Whole Sample	Pre-deregulation	Post-deregulation
End of 6 month	7.94	3.56	12.21
End of 12 month	15.86	6.54	9.94
End of 18 month	15.83	9.16	9.23
End of 24 month	15.95	9.19	9.21

[Table 2] Variance Decompositions for CALL due to M2 Shocks
(Chronological Regressions)

	1987	1990	1993	1996
End of 6 month	5.91	13.28	15.80	7.53
End of 12 month	20.81	18.68	21.78	15.86
End of 18 month	17.55	16.50	20.63	15.83
End of 24 month	17.31	15.94	20.13	15.95

importance of money innovations in explaining the interest rate. To address this question, the VAR model is re-estimated for the sample beginning in 1979:04 and ending in 1984:12. The sample is then updated annually until the final estimate is for the full 1979:04-1996:12 sample. I chose 12 as the lag number for all estimations. For the sake of convenience, the variance decomposition results from this sequential estimation are reported in Table 2 for the 1984, 1987, 1990, 1993, 1996 endpoints. It is expected that the variance decomposition of CALL due to M2 shocks gets larger as the deregulation proceeds. It is, however, hard to find a monotonic increase in the variance decomposition for call rate due to monetary shocks in Table 2. If the deregulatory process was not consistently implemented during the sample period, it is natural that the variance decompositions of the interest rate in response to monetary shocks do not increase monotonically.

IV. CONCLUDING REMARKS

The main question addressed in the paper is whether the liquidity effects exist in a regulated financial market. It is alleged that the interest rate is not responsive to monetary shocks because of a strict regulation on interest rates in Korea. As expected, it is difficult to find a clear evidence for the liquidity effects in Korea. This paper, however, demonstrated that the liquidity effect has been emerged since interest rates were deregulated in the early 1980s. The impacts of money innovations on call rates are significantly negative for at least 6 months in the post-deregulation sample.

The VAR results obtained from monthly data show that a little liquidity

effects exist for the 1979-1996 period. The post-deregulation data exhibits a reinforcement in the liquidity effect. The impulse response function analysis leads to the conclusion that the negative impact of money shocks on interest rates was intensified after the deregulation on interest rates.

Many researchers have reported that the estimated liquidity effect is sensitive to the sample period, the monetary policy regime, and the identification method. The empirical finding in this paper suggests that the institutions in financial markets also affect the magnitude of liquidity effects. If the regulations on interest rates are lifted, the negative relationship between money shocks and interest rates are strengthened.

Some caveats on the interpretation of the results in the paper are in order. The estimated money shocks may be contaminated with money demand shocks. However, the monetary targeting policy maintained in the sample period can mitigate the problem.

REFERENCES

- Bernanke, B.S., and A.S. Blinder (1992), "The Federal Funds Rate and the Channels of Monetary Transmission," *American Economic Review*, 82(4), 901-921.
- Christiano, L.J., and M. Eichenbaum (1992), "Identification and Liquidity Effects of a Monetary Shock," in *Political Economy, Growth, and Business Cycles*, eds. by A. Cuikerman, L.Z. Hercowitz, and L. Leiderman, Cambridge, MA: MIT Press, 335-370.
- Christiano, L.J., M. Eichenbaum, and C.L. Evans (1994), "The Effects of Monetary Policy Shocks: Some Evidence from the Flow of Funds," National Bureau of Economic Research Working Paper No. 4699.
- DeJong, D.N., and C.H. White (1991), "Reconsidering Trends and Random Walks in Macroeconomic Time Series," *Journal of Monetary Economics*, 221-54.
- Gordon, D.B., and E.M. Leeper (1994), "The Dynamic Impacts of Monetary Policy: An Exercise in Tentative Identification," *Journal of Political Economy*, 1228-47.
- Ham, J., and W. Choi (1991), "The Analysis of the Determination of Interest Rate: The Case of Korea," *Monthly Bulletin of the Bank of Korea*, 3-49 (in Korean).
- Hamilton, J.D. (1997), "Measuring the Liquidity Effect," *American Economic Review*, 87(1), 80-97.
- Kang, T., and Shin (1994), "Changes in Transmission Mechanism of Monetary Policy," *Monthly Bulletin of the Bank of Korea*, 3-22 (in Korean).
- Kim, H. (1995), "A New View on the Transmission Mechanism of Monetary Policy," *Economic Analysis*, 1(1), 31-65 (in Korean).
- Lastrapes, W.D., and G. Selgin (1995), "The Liquidity Effect: Identifying Short-run Interest Rate Dynamics Using Long-run Restrictions," *Journal of Macroeconomics*, 17(3), 387-404.
- Lee, K. (1993), "The Determinants of Interest Rates in Korea," *Financial Economy Review*, No. 51 (in Korean).
- Leeper, E. (1992), "Facing Up to Our Ignorance about Measuring Monetary Policy Effects," *Economic Review*, Federal Reserve Bank of Atlanta, May/June, 1-16.
- Leeper, E., and D.E. Gordon (1992), "In Search of the Liquidity Effect," *Journal of Monetary Economics*, 29, 341-369.
- Melvin, M. (1982), "The Vanishing Liquidity Effect of Money on Interest: Analysis and Implications for Policy," *Economic Inquiry*, 21, 188-202.
- Mishkin, F.S. (1982), "Monetary Policy and Short-term Interest Rates: An Efficient Markets-Rational Expectations Approach," *Journal of Finance*, 37(1), 63-72.

- Nam, J. (1993), "The Liquidity, Income, and Fisher Effects of Money on Interest: The Case of a Developing Country," *Seoul Journal of Economics*, 6(3), Autumn, 223-39.
- Pagan, A.B., and J.C. Robertson (1995), "Resolving the Liquidity Effect," *Review*, Federal Reserve Bank of St. Louis, 33-54.
- Park, W. (1996), "The Structure of Interest Rate Determination and the Role of Expectations in Korea," *Economic Analysis*, 1, 137-167 (in Korean).
- (1996), "Financial Liberalization: The Korean Experience," in *Financial Deregulation and Integration in East Asia*, eds. by T. Ito and A.O. Krueger, NBER, 247-273.
- Reichenstein, W. (1987), "The Impact of Money on Short Term Interest Rates," *Economic Inquiry*, 25, 67-82.
- Ro, S. (1993), *Korea's Monetary Policy: 1962-1992*, First Economic Research Institute.
- Romer, C.D., and D.H. Romer (1990), "New Evidence on the Monetary Transmission Mechanism," *Brookings Papers on Economic Activity*, 149-213.
- Rudebusch, G.D. (1993), "The Uncertain Unit Root in Real GNP," *American Economic Review*, 83(1), 264-72.
- Sims, C.A. (1992), "Interpreting the Macroeconomic Time Series Facts: The Effects of Monetary Policy," *European Economic Review*, 36(5), 975-1000.
- Sims, C.A., J.H. Stock, and M.W. Watson (1990), "Inference in Linear Time Series Models and Some Unit Roots," *Econometrica*, 58, 113-44.
- Strongin, S. (1995), "The Identification of Monetary Policy Disturbances; Explaining the Liquidity Puzzle," *Journal of Monetary Economics*, 35(3), 463-97.