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## Monetary Policy in A Changing Financial Environment – Searching for An Efficient Monetary Policy Framework in Korea

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---Searching for An Efficient Monetary Policy Framework in Korea---

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## ABSTRACT

This paper reviews how the changing financial environment in Korea has affected the conduct of monetary policy and examines the extent to which the Bank of Korea now uses the short-term interest rate rather than money aggregates as an operating target. Empirical results from estimation of monetary reaction functions suggest that the Bank of Korea has been following an interest rate target recently, even though it has not explicitly admitted to doing so. The paper also discusses how the conduct of monetary policy can be further enhanced by reforming the call money market and developing the long-term government securities market.

## I. Introduction

Over the past quarter century, the Korean economy has experienced dramatic growth and structural change. As in many other rapidly developing economies, this growth has been accompanied by chronic inflation. In the 1970s and the early 1980s inflation was typically in double digits.<sup>1</sup> Since the early 1980s, however, owing to the government's disinflation efforts, the inflation rate has slowed remarkably, to around 5 percent. However, it is widely recognized both outside and inside the Bank of Korea that the current inflation rate is still not satisfactory and lower inflation is necessary to sustain further steady growth.

Price stability is explicitly identified as one of the major objectives of monetary policy in the Bank of Korea Act. To this end, the Bank of Korea has implemented monetary policy and focused on the management of various monetary aggregates, such as M1, domestic credit, and M2, as intermediate targets. In carrying out monetary policy during the 1960s and 1970s, the Bank has relied heavily on direct credit control and reserve requirement policy rather than indirect control schemes, such as open market operations. This reliance on direct credit controls was necessitated by the limited development of financial markets. In Korea's case this approach has seemed to be broadly successful in mobilizing available financial resources for economic growth.

In recent years, however, Korea's financial sector has undergone extensive structural changes as a result of regulatory reform and technological innovation, similar to what other industrial and developing countries have experienced since the late 1970s and early 1980s (Edey and Hviding 1995). In particular, as a result of the step-by-step interest rate deregulation process initiated in 1991, interest

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<sup>1</sup>The inflation rate experienced a structural break around the early 1980s. The average annual increase in the GDP deflator was 20.7% from 1971 to 1981, and 6.1% from 1982 to 1995.

rates were largely liberalized, except for short-term bank deposit rates. Foreign exchange and capital markets were also increasingly liberalized. Further liberalization to meet OECD requirements is expected by the late 1990s.<sup>2</sup> As a result, while Korea's financial markets have become more diversified, integrated, and efficient, they have also become more volatile and unstable. In particular, money demand has become more unpredictable, and money growth targeting policies have become less effective (Kim 1995).

These changes in the monetary policy environment have motivated the examination of new operating procedures targeting interest rates or other nominal variables, rather than monetary aggregates. Several recent studies have confirmed the plausibility of targeting interest rates or nominal GNP in Korea (Kim 1995, Oh 1995). While both the Bank of Korea and the Ministry of Finance implicitly have acknowledged the need to change the framework of monetary policy, it is unclear what will be the nature of any new policy framework. However, there is widespread recognition that interest rate targeting is a particularly promising alternative framework for monetary policy.

This paper critically reviews the problems of money growth targeting and alternative policy targets in Korea. In this context, this paper is an extension of my previous paper (Kim 1995) paper (Kim 1995) in which I explored the applicability of interest rate targeting in Korea. In this paper, I focus more on operational and practical aspects of an interest rate targeting policy. The following section provides an overview of recent developments in Korean financial markets and their implications for monetary policy. The third section presents a policy framework for analyzing the monetary

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<sup>2</sup>Korea joined the OECD in December 1996.

transmission mechanism through interest rates, and estimates monetary reaction functions to show whether, and if so, when, the Bank of Korea appeared to have already begun focusing more on the short-term interest rate as an operating target for achieving price stability and economic stabilization. The fourth section discusses the feasibility of the Bank of Korea adopting an interest rate target framework. The final section concludes the paper.

## II. Changing Financial Environment and Major Monetary Policy Issues in Korea

Since the late 1980s, Korean financial markets have experienced remarkable structural change due to various deregulation and liberalization measures. These changes have resulted in substantial instability in money demand as well as volatility in major financial variables. In this section, we first briefly review the history of money growth targeting in Korea, and then discuss recent steps to deregulate interest rates, as well as major issues facing Korean monetary policymakers.

### 1. History of Money Growth Targeting in Korea

In carrying out monetary policy, central banks typically set intermediate operating targets that enable achievement of final policy objectives, such as price stability, economic stabilization, and/or balance of payments equilibrium. Beginning in 1957, the Bank of Korea began focusing on the management of monetary aggregates. In controlling monetary aggregates, the Bank relied heavily on direct controls, utilizing reserve requirement and rediscount policies, rather than market-based operations. This policy practice continued throughout the 1960s and 1970s, periods of rapid economic growth and development.

Until 1979, the Bank of Korea focused on narrow monetary aggregates, including M1<sup>3</sup> (1957-69), the monetary base (during the second half of 1969), and domestic credit (1970-78). During these periods, there were no major changes in the monetary policy environment or in the definition of money, no drastic financial innovations, nor new money market instruments. Consequently, narrow monetary aggregates, e.g. M1, displayed stable relationships with real economic activity, and could be utilized as informative monetary policy indicators.

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<sup>3</sup>MI = currency in circulation + demand deposits at monetary institutions.

As a result of accumulated changes in the financial and macroeconomic environment the late 1970s, the Bank of Korea adopted M2<sup>4</sup>, as the main intermediate target of its monetary policy in 1979. The adoption of M2 was primarily based on empirical findings of a relatively stable relationship between M2 and major macroeconomic variables, such as income and the price level. In addition, M2 was found to be superior to other aggregates in terms of its predictability for real economic activity.

However, since the beginning of the 1990s, the relationship between M2 and income, price, and other variables has become increasingly more unstable and weak (Kim 1995). Newly introduced financial instruments and the increasing share of non-bank financial institutions have made the traditional distinction between various financial assets less clear and weakened the role of M2 as a target variable. In response to these changes, the Bank of Korea changed its officially designated intermediate target from M2 to MCT (M2 + CDs + money in trust institutions) in the beginning of 1997.<sup>5</sup>

The Bank of Korea preference for targeting various monetary aggregates rather than interest rates or other financial prices during its development process was motivated by a number of reasons. First, direct money growth targeting was regarded as more effective in grappling with the persistently high inflation accompanying rapid economic growth. From the mid 1960s to the early

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<sup>4</sup>M2 = M1+quasi-money (time and saving deposits and residents' foreign currency deposits at monetary institutions).

<sup>5</sup>As new intermediate targets, the Bank of Korea examined the possibility of MCT (M2 + CDs + money-in-trust), M2B (M2 - long-term deposits in banking institutions + short-term deposits in non-banking institutions) or M3 (the broadest monetary aggregate in Korea, representing total liquidity). Kim (1996) finds M3 is superior to other aggregates as an intermediate target. MCT also turned out to be a good intermediate target.

1980s, liquidity was excessively supplied to fulfill economic development demand.<sup>6</sup> Such excessive liquidity seemed to be broadly successful in fostering economic growth. As a result, accompanying high inflation was deemed acceptable. Under this circumstance, direct money growth control seemed appropriate. In addition, during the development period through the early 1980s the central bank's independence was very limited. Before the early 1980s, Korean monetary policy could not be conducted independently due largely to the need to finance expansionary fiscal policy and the government's influence over monetary policy management.

Another reason for direct money growth targeting is related to the nature of Korea's financial markets. Korean financial markets have developed remarkably during the relatively short period since the modern financial system was founded in the mid 1950s. However, due to development demand, financial demand always exceeded supply, and interest rates were widely regulated in order to mobilize limited financial resources for economic development. Before fullscale financial liberalization and interest rate deregulation were enacted in the late 1980s, there did not exist any truly representative short- or long-term financial instruments of the kind that is essential to conduct indirect market-based money control or interest-target monetary policies.

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<sup>6</sup>From 1971 to 1982, the average annual growth rates of M1 and M2 were 26.9% and 29.8%, respectively. However, since 1983, when the Korean economy has been relatively stable, their growth rates were below 20 % level. This decline in money supply growth contributed to a decline in inflation, as mentioned in footnote 1.

## 2. Interest Rate Deregulation

Interest rate deregulation has resulted in substantial change in the structure of financial markets as well as in the monetary policy environment in Korea. Financial liberalization was first initiated in the early 1980s, but wide implementation, particularly the opening of foreign exchange and capital markets, was delayed until the beginning of the 1990s.

These changes led to several problems. Interest rate regulation and persistently high inflation hampered financial deepening, and retarded the development of both money and bond markets. The financial market also remained highly segmented as a result of various controls and regulations placed upon it. Also with the existence of strict credit rationing and a huge curb market, the cost of financial intermediation remained high.

Facing these problems, the Korean government implemented various financial reforms and restructuring packages in the early 1980s. Financial liberalization was largely instituted not only to reduce government regulations and intervention, but also to harmonize regulation of bank and non-bank financial institutions. The move toward a market-oriented system seemed inevitable and appropriate as the economy developed, making government-led development no longer a viable option. By the late 1980s, with the expanding financial sector, further financial liberalization, primarily in the form of interest rate deregulation, became urgent. Consequently, a "medium and long-term plan for interest rate deregulation," was announced in August 1991. According to this plan, interest rates were to be deregulated in stages with the process to be completed around the late 1990s.<sup>7</sup>

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<sup>7</sup>Another far-reaching measure was unveiled in 1993 in the form of a blueprint for financial liberalization and capital market opening. The blueprint took a three phase approach, with the first stage scheduled for 1993, the second for 1994-95, and the third for 1996-97, so as to ensure smooth coordination between the process of interest rate deregulation and that of capital market liberalization.

A significant advance toward interest rate deregulation occurred in December 1988, when most of the lending rates of banks and non-bank financial institutions were liberalized.<sup>8</sup> With regard to rates on deposits, only long-term deposits were deregulated so as to avoid excessive competition among financial institutions for short-term funds. At the same time, interest rates on capital market instruments, such as certificates of deposits, RPs, CP, and corporate bonds were liberalized.

The process of interest rate deregulation, however, was soon cut short of its goal when the Korean government restored direct measures to stabilize unexpectedly rising interest rates. In the beginning of 1989, with soaring interest rates and unfavorable macroeconomic conditions, the government placed extensive control over interest rate movements. During this period, macroeconomic instability, manifested in the form of labor disputes, declining exports, and rising wage rates and real estate prices, contributed to hikes in interest rates. In response, in the middle of 1989, the government resorted to window guidance to prevent interest rates from rising further.

In August 1991, the government announced "the four-stage interest rate deregulation plan," and implemented the first stage of the plan in mid-November 1991. As a result of its prior poor performance in interest rate management during the 1980s, when interest rate deregulation had brought on high inflation and soaring interest rates, the government took a very cautious approach and adopted a step-by-step plan. The first stage (1991-92) therefore involved deregulation of

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<sup>8</sup>Limited interest rate deregulation was first implemented in June 1981 when commercial paper (CP) not subject to government regulations was introduced in domestic markets. Shortly thereafter, however, limits on CP rates were reintroduced when rates rose too rapidly. In 1984, banks were permitted to charge different lending rates within a limited range on the basis of the borrower's creditworthiness. Also, call money rates and yields on convertible bonds and debentures with bank payment guarantees were deregulated. With the exception of several interest rates in the non-banking sector, interest rates were largely regulated until the early 1990s when the step-by-step interest rate deregulation process was implemented.

limited categories of long-term deposit rates whose effective rates were already close to market rates. With the aid of favorable macroeconomic conditions in 1994 and 1995, the Bank of Korea and the government completed the third stage of interest rate deregulation ahead of the original schedule of between 1994 and 1996. After the third stage was successfully implemented, all rates on deposits except for demand deposits and lending rates on policy loans, apart from a few special loans partially supported by fiscal funds, were liberalized.

At the end of June 1995, relative to the stock of deposits, 64.7% of bank deposit rates, and 92.1% of non-bank financial institutions' (NBFIs) deposit rates were liberalized. More details about the liberalized ratios of the deposit interest rates for banks and NBFIs in each stage are shown in Table 1.<sup>9</sup>

### 3. Major Issues of Monetary Policy

As reviewed above, the environment for the conduct of monetary policy in Korea has been rapidly changing with financial reforms such as interest rate deregulation. Interest rate deregulation and the associated structural changes in the financial market have potentially far reaching implications for the design and implementation of monetary policy. While some argue that financial reforms in Korea have still not advanced far enough to warrant changing the operation of monetary control to any significant degree, it is widely recognized that financial liberalization and interest rate deregulation have affected the policy transmission mechanism as well as created problems for the effective conduct of monetary policy. In this section, we review these problems.

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<sup>9</sup>According to the plan, interest rate deregulation is scheduled to be completed by the late 1990s. However, the deregulation of remaining interest rates may be implemented ahead of schedule, if financial market and macroeconomic conditions permit.

### 3.1 Instability in Velocity and Money Demand

With interest rate deregulation, new financial instruments combining liquidity and better yields have expanded remarkably. In Korea, these new products have been issued largely by nonbank financial intermediaries. Under such circumstances, the monetary authorities can no longer ensure the effectiveness of monetary policy merely by monitoring movements of M2, MCT, or other monetary aggregates, because they provide a limited reflection of the true state of market liquidity.

There are also notable signs that financial liberalization has created instability in money demand, which plays an important role in the transmission mechanism of monetary policy. The stability of money demand can be judged by movements in the income velocity of money. As shown in Figure 1 the velocities of major monetary aggregates have exhibited increased volatility since the early 1990s. Such velocity instability may be attributed in great part to recent financial innovations, interest rate deregulation, and other changes, such as the introduction of the "realname" system for financial transactions in August 1993. In addition, as cash management techniques have improved and credit cards and household checks have become widely used as means of payment, individuals have tended to economize on their holdings of money balances. This phenomenon also occurred in many industrial countries during their periods of financial innovation and liberalization.

Increasing instability in money demand implies that the usefulness of the money stock as an intermediate target has become questionable, even if it can be measured and controlled satisfactorily. In support of this review, Table 2 shows that the forecasting ability of major monetary aggregates for real economic activity, as judged by the variance decompositions from VAR models, has decreased since the early 1990s.<sup>10</sup> Judging from changes in the financial environment and these empirical results,

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<sup>10</sup>Note that money aggregates, particularly M3, have better forecasting ability for inflation than for output.

it is very likely that the recent instability in velocity and in money demand represent, not transitory phenomena, but rather structural changes. It seems clear that the role of monetary aggregates in the conduct of monetary policy should be changed (Kim 1995). As a result, the Bank of Korea must develop new approaches to effectively conduct monetary policy.

### 3.2. Monetary, Exchange Rate, and Interest Rate Policies

Due to the liberalization and internationalization of the financial sector, the links between monetary aggregates and other financial variables, particularly interest rates and exchange rates, have been substantially increased. Financial liberalization increased the volatility and unpredictability of interest rates. In addition, the degree of interaction between interest rates and exchange rates increased with the liberalization and internationalization of financial markets.

The influence of international interest rate fluctuations on domestic interest rates has also intensified (Kim 1995, Chinn and Maloney 1996). Since financial markets became almost completely open in accordance with the requirements for Korea joining the OECD in 1996, domestic monetary policy is no longer independent of international financial markets.

In March 1990, Korea adopted a market average exchange rate system in which the exchange rate is determined by market forces. Domestic monetary control, however, has become more complicated and problematic as the Bank of Korea has sought to smooth movements of the exchange rate. In particular, as international capital mobility has increased, short-term speculative capital inflows and outflows have caused the exchange rate to deviate from the level perceived to best reflect economic fundamentals. This has made it more difficult to stabilize the real economy. This implies that Korean monetary authorities face the difficult task not just of controlling the money supply, but also for

harmonizing monetary, interest rate, and foreign exchange policies.<sup>11</sup> Thus, it needs to develop a new policy schema in which to achieve the most appropriate policy-mix.

### 3.3 Uncertainty, Risk, and Financial Instability

In liberalized financial markets, the movements of financial variables, such as interest rates, exchange rates, and other financial asset prices, can become more volatile, with financial risk and uncertainty increasing correspondingly. The higher cost of funds in a more competitive environment also tempts financial institutions to focus on high-yield, high-risk investments in their overall portfolio strategy, leading to a build-up of non-performing assets. Furthermore, as financial markets are increasingly integrated, destabilizing impulses generated in one institution or market tend to spread quickly through the whole financial system. This greater financial instability creates difficulties for monetary policy by distorting the relationships between monetary instruments and intermediate and final targets of monetary policy, as well as affecting the overall stance of monetary policy (Goldstein and Turner 1996).<sup>12</sup>

Greater financial instability, risks, and financial crisis have not yet been much in evidence in Korea. But as seen above, major financial variables in Korea have become more volatile as the result of deregulation and liberalization. Also, financial institutions have pursued more aggressive management strategies as competition has become fiercer. In addition, the Korean banking sector has shrunk with

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<sup>11</sup>Until recently it seemed that the Korean government had successfully coped with capital inflows through sterilized intervention. However, with complete capital liberalization, such intervention cannot be a viable long-term policy option since resulting increases in domestic interest rates lead to more capital inflows, and greater appreciation pressure on the Korean won.

<sup>12</sup>As Mishkin (1994) has discussed, other countries have experienced financial crises when financial markets have become more competitive and portfolios riskier as the result of rapid deregulation. The secondary banking crisis of England in the mid 1970s, the U.S. savings and loans recent financial developments. Faced with milder regulations than banks, nonbanking financial institutions have enlarged their market shares by introducing new high-return, high-risk financial assets.

The decline in the share of the banking sector has made the financial system more fragile and lessened the Bank of Korea's ability to manage market liquidity. The shift in funds from banks to non-banks has resulted in the central bank's losing control over the high-risk high-return financial assets in the non-banking sector. Moreover, strong competition among small fragile non-bank institutions, has increased monetary instability as well as the possibility of financial crisis (Kim 1996). With the greater diversification of monetary policy channels and more uncertainty about the monetary transmission mechanism, appropriate policy measures are required to maintain monetary policy effectiveness. In this environment, interest rate targeting may be more effective than money growth targeting in reducing financial and macroeconomic volatility.

### III. The Search for A New Monetary Policy Framework

#### -----An Examination of the Applicability of Interest Rate Targeting in Korea----

As discussed in the previous section, Korean financial markets have substantially changed since the late 1980s as the result of deregulation and liberalization. Consequently, the transmission channel of monetary policy has become more diversified, working through price effects on interest rates and exchange rates, as well as through liquidity effects.

The current monetary transmission channel -- the set of linkages that run from the instrument that the central bank directly controls to its ultimate goals, such as growth, low inflation, and/or balance of payment equilibrium -- presumes that the central bank adjusts the short-term interest rate, such as the "federal funds" rate in the U. S., or the "call money" rate in Germany. This affects the rates on longer-term credit market instruments,<sup>13</sup> and expected real rates on longer-term instruments, which in

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<sup>13</sup> If short-term interest rate movements can be operationally controlled by a central bank to maintain the long-term rate at an appropriate level, the short-term rate can be labeled as an "operating target" variable. The long-term rate can be interpreted as an "intermediate target" variable, since its movements are indirectly influenced through short-term rate operations toward final objectives, such as turn affect real spending on interest-sensitive goods, growth, and inflation. As the role of monetary

aggregates in the conduct of monetary policy has declined, some recent work has focused on the role of interest rates as an indicator of the stance of monetary policy. While Bernanke and Blinder (1992), among others, have observed with VAR models applied to the U.S. that the federal funds rate has been very correlated over the past 30 years with subsequent movements in real activity, Taylor (1993) and Fuhrer and Moore (1995) have modeled monetary policy reaction functions, and found that the federal funds rate has played a key role in the transmission mechanism.<sup>14</sup>

This section examines whether such interest rate targeting policy rules can be applied in Korea. To this end, various monetary policy reaction functions both in single and simultaneous equation systems are proposed and estimated.<sup>15</sup>

### 1. A Single Equation Model

Following the policy reaction functions suggested by Taylor (1993) and Fuhrer and Moore (1995), in this section we first estimate the regression equation (1) to show whether the Bank of Korea adjusted the short-term interest rate in response to the inflation rate and the deviation of GNP from its potential level. In addition, we investigate whether the Bank of Korea's money growth targets have actually affected its monetary policy actions; that is, we look for any independent effects of fluctuations in money, relative to the stated growth target, that are not already accounted for by inflation and real

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inflation and growth. On the distinction between operating and intermediate target variables, see, for example, Friedman (1993).

<sup>14</sup> Further discussion is provided in Taylor (1995).

<sup>15</sup> In previous work (Kim 1995), I assessed the merits of interest rates targeting in Korea's maturing financial environment utilizing VAR analysis.

economic activity. The approach taken here is to estimate whether the short-term rate has also responded to departures of money from stated targets. Consequently, the money gap is included as an additional independent variable in the regression:

$$r_t = c + \sum_{i=0}^l \sigma_i p_{t-i} + \sum_{j=0}^m \beta_j y_{t-j} + \sum_{k=0}^n \delta_k m_{t-k} + \varepsilon_t \quad (1)$$

where  $r$  is the call money rate (overnight rate on interbank loans),  $p$  is GNP deflator inflation measured over the preceding four quarters,  $y$  is the percentage deviation of real GNP from potential GNP,  $m$  is the midpoint of the corresponding target range of M2, and  $E$  is a disturbance term.

The estimates for equation (1) are shown in Table 3. They are largely consistent with standard interpretations of monetary policy behavior, including Taylor (1993) and Friedman (1996). Faster inflation and increasing GNP (relative to the "potential" rate) lead the Bank of Korea to set a higher call money rate. The weak estimated response to the output gap can be largely attributed to the Bank of Korea's financial policy. Until recently, the Bank's rediscount policy was utilized in support of any policy-based lending, automatically leading to an expansion in the supply of base money. Since "policy loans" and "automatic rediscount" for specific industrial and export promotion purposes constitute a significant share of base money, as real economic activity (industrial production, export, etc.) expands, the base money correspondingly expands.<sup>16</sup> With such an accommodating money supply response, the short-term rate could not be raised to stabilize output fluctuations (Kim 1995).

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<sup>16</sup> In accordance with the progress of financial liberalization, in March 1994 the Bank of Korea replaced the automatic rediscount facility for policy-based loans with an aggregate credit ceiling system in order to enhance the controllability of the money supply. Furthermore, several several policy-based loans previously provided through the automatic rediscount facilities of the Bank, such as loans to small and medium firms and to military industry, were transferred over from the Bank to fiscal fund accounts. Under the new system it is expected the Bank will respond more positively to output deviations.

Looking at the estimated equations (7) - (9) in Table 3, observe that the estimated coefficients on the money gap generally are not statistically significant. This suggests that the Bank of Korea has not responded to deviations of M2 growth from the target path. These results suggest that even though the Bank of Korea publicly declares it targets money growth, it appears to follow Taylor rate behavior.<sup>17</sup>

Based on the results in Table 3, we conclude that a "Taylor style," interest rate targeting policy has been employed in Korea. The next step is to find a more explicitly applicable policy rule. Given the the output gap given as follows:

$$r_t = 7.17 + 0.75p_{t-1} + 0.25y_{t-1} \quad (2)$$

According to the policy rule equation (2), the Bank of Korea responded more vigorously to inflation pressure than to output, as suggested by the results in Table 3. Also note that the "equilibrium" real rate, 7.17%, is quite close to the potential GNP growth rate, 7.2% (Chang 1996), further confirming the reliability of the estimated policy rule.

Figure 2 compares the path of the call money rate generated by the policy rule (2) with actual rate movements. According to the Figure, the estimated policy rule works well; since 1991 the policy rule rate has traced the actual rate very well.<sup>18</sup>

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<sup>17</sup> The Bank of Korea publicly states that it is targeting money growth instead of interest rates. In that sense these findings are quite similar with results about German monetary policy. Despite the Bundesbank's public declaration that it targets monetary aggregates, in practice German monetary policy appears to involve the management of short-term interest rates (Clarida and Gertler, 1996). results of Table 3, a simple monetary policy reaction function is proposed, with weights on inflation and

<sup>18</sup> The ability to conduct monetary policy through interest rate targeting has been enhanced by liberalization of the call market. In the early 1990s, the Korean government implemented various measures to enhance operation of the call market in order to improve indirect market-based monetary control.

## 2. A Simultaneous Model

For a more comprehensive examination of monetary policy, we estimate a simultaneous equation system which focuses on the role of interest rates in monetary policy transmission. The system consists of three equations: an aggregate demand (IS) equation that relates output to the long-term interest rate, a term structure equation relating the short-term interest rate to the longterm rate, and a monetary policy reaction function that adjusts the short-term interest rate in response to inflation and the output gap.

**Aggregate demand.** The real economy is represented in the structural model with a simple aggregate demand curve that relates the output gap to its own lagged values and (negatively) to the expected long-term interest rate:

$$y_t = a_0 + a_1 y_{t-1} + a_2 y_{t-2} - a_3 R_{t-1} + e_{yt} \quad (3)$$

**The link from short- to long-term interest rates.** The long-term interest rate is primarily determined by short-term rate movements. It is assumed that the short-term rate is largely controlled by the Bank of Korea, and that its movements are exogenous to the long-term rate. In addition, the inflation rate and lagged long-term rate are included to capture the effects of inflation expectations and persistence.<sup>19</sup>

$$R_t = b_0 + b_1 r_t + b_2 p_t + b_3 R_{t-1} + e_{Rt} \quad (4)$$

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<sup>19</sup> Fuhrer and Moore (1995), employing the concept of bond duration, propose linking the long- and short-term rates through an algebraic identity rather than a stochastic relationship. The specification of the linking equation is an empirical issue.

**Policy reaction function.** Monetary policy is represented by a policy reaction function that relates the short-term rate to lagged levels of the inflation rate and output gap, as suggested by the results in Table 3. The extent to which the Bank of Korea adjusts the short-term interest rate in response to deviations of its ultimate concerns from their targets is captured by the reaction coefficients  $c_1$  and  $c_2$ .<sup>20</sup>

$$r_t = c_0 + c_1 p_{t-1} + c_2 y_{t-1} + e_{rt} \quad (5)$$

The simultaneous equation system is estimated by full-information maximum likelihood. The sample period is the 3rd quarter 1988 through the 2nd quarter 1996. The short-term interest rate is the overnight call money rate, and the long-term rate is the corporate bond (3 year) yield rate. Both rates are widely recognized as the most representative short- and long-term interest rates, respectively, in the Korean financial market. Other variables are as defined before. Parameter estimates, t values, and summary statistics are reported in Table 4. Overall, estimated parameters are of the expected sign and of reasonable magnitude.<sup>21</sup>

First, according to the estimated aggregate demand equation which captures the influence of the long-term interest rate on real output, the rate exerts a depressing effect on output. In terms of statistical significance one might argue that the effect is not meaningful. However, since Korean financial markets are still far from being highly organized or fully competitive, the results do not seem bad at all. If financial liberalization including interest rate deregulation continues, the interest sensitivity of output should increase in the future. Note that the output effect of the interest rate has not

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<sup>20</sup>Bryant, Hooper and Mann (1993) provide a review of central bank reaction functions and policy rules that appear in the literature.

<sup>21</sup> An important issue is whether the monetary transmission mechanism has changed over time. However, the available data series are too short to test for structural change or coefficient stability.

been found to be very significant even in well developed economies like the U.S. (Fuhrer and Moore 1995).

Looking at the estimated link equation (4), the long-term interest rate is well explained by the short-term rate and inflation expectations. The influence of inflation on the long-term rate is particularly impressive, confirming previous estimates (Kim 1995).<sup>22</sup>

The estimated monetary-policy reaction function reveals that despite public focus on monetary aggregates, the Bank of Korea in practice has used the short-term interest rate as its operating target. As already pointed out in Table 3, the Bank's weak response to the output gap is largely due to the Bank's accommodating reserve money supply process. In response, the Bank of Korea recently reformed the money supply process in order to enhance the controllability of the base money supply (see footnote 17) through adoption of an aggregate credit ceiling system. Thus it is too early to evaluate the Bank of Korea's policy reaction to the output gap from these estimated results.

In summary, modeling the Bank of Korea's monetary policy as targeting interest rates works well. Despite the insignificant estimated response to the output gap, a stronger response might be expected to occur as financial deregulation and liberalization proceed.

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<sup>22</sup> Considering the increasing role of the exchange rate in determining the domestic interest rate, the exchange rate was added to regression equation (4). The results, however, were not improved much and are not reported.

#### IV. Policy Tasks for Interest Rate Targeting

In the previous section, we examined whether the Bank of Korea has targeted interest rates. Based on the empirical evidence we concluded that the Bank of Korea has managed the short-term interest rate in order to keep the long-term rate at a level consistent with price stability and economic stabilization. Although the Bank has never publicly stated that it targets interest rates in the conduct of monetary policy, such a policy framework fits the data well. However, despite the fact that the environment is increasingly appropriate for adopting financial price-based monetary policy, there remain some important issues concerning the practical and operational aspects of the Bank of Korea adopting such a new policy framework.

The first to note is the Bank of Korea's manageability of base money. To manage the short-term interest rate, the central bank should be able to indirectly control the base money, whose change directly influences the short-term rate. However, until recently the Bank's manageability of base money was limited. For example, rediscount policy was utilized automatically in support of policy-based lending, leading to expansion in the supply of base money.<sup>23</sup> In consequence, the Bank's lending amount accounted for 37.8% of base money in 1995. Since such a significant portion of base money is created automatically, it is difficult for the Bank of Korea to maintain the base money at a targeted level. Fortunately, due to the Bank of Korea's recent efforts to improve the monetary policy environment, a new lending system, called the aggregate credit ceiling system, was introduced. As a result, the

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<sup>23</sup> In addition to the rediscount window, a large portion of the base money is supplied through the foreign sector. Since the beginning of the 1990s capital inflows have increased remarkably despite a large current account deficit. In response to the large capital inflows the Bank of Korea not only raised the reserve ratios but also issued a large volume of Monetary Stabilization Bonds (MSBs) to absorb the excess liquidity. In consequence, the issued stock of MSBs has geometrically increased (the MSBs balance amounted to 81% of the base money in the end of 1995). As a concomitant problem, interest payments for the issued MSBs act as another source of increase in base money requiring the Bank of Korea to issue more MSBs to absorb the interest payments. The best solution might be to transfer this burden to the fiscal sector, requiring that the government pay interest costs.

automatic increase in base money has declined. However, the Bank of Korea still believes that further changes in the supply structure of base money are necessary to enable more efficient conduct of market-based monetary policy.

The next task is to select the appropriate short- and long-term interest rates as the operating, and intermediate target variables. Despite recent financial liberalization measures, there do not exist obvious short- and long-term interest rates which can be utilized as policy target variables. One plausible candidate, however, is the call money rate. As shown in the link equation (14), the call rate explains long-term rate movements very well. Moreover, it has an exogenous causal relationship with the long-term rate (Kim 1995). But the call rate also has some problems. Its trading volume is still small and the market is an incomplete interbank market, open to all financial institutions regardless of whether they are reserve-requirement institutions or not, so that the Bank of Korea can not effectively send policy signals through reserve management. Despite such drawbacks, the overnight call rate is superior to any other short-term rate. For effective policy signaling through reserve targets, the current call market should be structurally reorganized. It might be appropriate that the interbank market be restricted only to reserve requirement institutions, with other short-term financial transactions handled in the open market.

In the case of long-term rates, there are even greater disagreements on a representative rate. Because of the lack of availability of government debt instruments in sufficient volume or range of maturities, neither primary nor secondary markets for these instruments have developed. In terms of market volume, participants, etc., the corporate bond (3 year) yield rate is widely considered as one of the most representative long-term rates in Korea. However, this rate has been criticized on the grounds that a three-year maturity is relatively too short to cover long-term transactions. More

seriously, it is not as risk-free as the rates on government or public bonds. As long as the long-term government securities market is not well developed, the 3-year corporate bond yield rate can be regarded as a second-best, intermediate target.

## V. Concluding Remarks

In this paper, we have reviewed how the changing Korean financial environment has affected the conduct of monetary policy, and examined whether the Bank of Korea manages the short-term interest rate as an operating target for achieving price stability and economic stabilization. Our empirical results suggest that the Bank of Korea has been following such an interest rate target recently, even though it has not explicitly admitted to doing so. Several practical and institutional problems in following such a target remain. First, the Bank of Korea's ability to manage the base money supply is limited. Second, since the short- and long-term financial markets are still not highly developed and their rates do not well represent market transactions, it is uncertain which rates should be utilized as the best operating or intermediate target variables. However, since the Korean government has been ambitiously implementing further financial liberalization measures, the financial environment for the conduct of interest-based monetary should improve substantially in the near future. During this process the government and the Bank of Korea should reform the call money market and develop the long-term government securities market.

Table 1: Liberalized Ratio of Deposit Interest Rates (%)

|  | 1 <sup>st</sup> Stage<br>(1991-1992) | 2 <sup>nd</sup> Stage<br>(1993) | 1 <sup>st</sup> 3 <sup>rd</sup> Stage<br>(July 1995) | 2 <sup>nd</sup> 3 <sup>rd</sup> Stage<br>(Nov. 1995) | 4 <sup>th</sup> Stage |
|--|--------------------------------------|---------------------------------|--|--|-----------------------|
| Banks  | 17.8 (17.8)*                         | 24.8 (42.6)                     | 15.1 (57.7)  | 7.0 (64.7)   | 35.3 (100)            |
| Non-bank<br>Finan. Institutions  | 69.5 (69.5)                          | 14.2 (83.7)                     | 6.7 (90.4)   | 1.7 (92.1)   | 7.9 (100)             |
|  | 52.7 (52.7)                          | 17.6 (70.3)                     | 9.5 (79.8)   | 3.4 (83.2)   | 16.8 (100)            |
| *The figures in parenthesis represent the accumulated liberalized ratio. |                                      |                                 |  |  |                       |

Table 2: Decomposition of Error Variance (%)\*

|   | M2        |           | M3        |           |
|---|-----------|-----------|-----------|-----------|
|   | 1983 - 89 | 1990 - 96 | 1983 - 89 | 1990 - 96 |
| GNP Deflator  | 18.9      | 23.8      | 19.3      | 34.8      |
| CPI   | 17.0      | 17.8      | 18.4      | 31.4      |
| GNP   | 32.8      | 19.5      | 25.7      | 18.8      |
| Consumption   | 31.8      | 20.8      | 29.4      | 22.8      |
| Investment  | 20.2      | 8.3       | 27.4      | 12.1      |
| *Explained percentage of inflation rate and real economic activity by monetary (M2,M3) shocks after 12 quarters |           |           |           |           |

Table 3. Estimated Monetary Policy Reaction Functions\*

| Eqn. | Const.          | Independent Variable |                   |                 |                 |                   |                 |                 |                   |                 |                 |                   |  | Summary Statistics |                |      |      |
|------|-----------------|----------------------|-------------------|-----------------|-----------------|-------------------|-----------------|-----------------|-------------------|-----------------|-----------------|-------------------|--|--------------------|----------------|------|------|
|      |                 | Inflation            |                   |                 |                 | GNP Gap           |                 |                 |                   | Money Gap       |                 |                   |  | SER                | R <sup>2</sup> | D.W. |      |
|      |                 | t                    | t-1               | t-2             | t-3             | t                 | t-1             | t-2             | t-3               | t               | t-1             | t-2               |  |                    |                |      |      |
| (1)  | 10.51<br>(9.46) | 0.552<br>(3.80)      |                   |                 |                 | -0.067<br>(-0.44) |                 |                 |                   |                 |                 |                   |  |                    | 1.67           | 0.30 | 0.96 |
| (2)  | 9.93<br>(8.77)  | 0.536<br>(3.56)      |                   |                 |                 |                   | 0.037<br>(0.24) |                 |                   |                 |                 |                   |  |                    | 1.67           | 0.30 | 1.30 |
| (3)  | 10.10<br>(9.10) | 0.514<br>(3.52)      |                   |                 |                 |                   | 0.043<br>(0.29) |                 |                   |                 |                 |                   |  |                    | 1.67           | 0.30 | 0.99 |
| (4)  | 9.77<br>(8.60)  | 0.276<br>(1.12)      | 0.304<br>(1.19)   |                 |                 |                   | 0.019<br>(0.13) |                 |                   |                 |                 |                   |  |                    | 1.66           | 0.31 | 1.13 |
| (5)  | 8.69<br>(7.84)  | 0.008<br>(0.03)      | 0.569<br>(2.39)   |                 |                 |                   | 0.008<br>(0.05) | 0.173<br>(1.35) |                   |                 |                 |                   |  |                    | 1.50           | 0.44 | 1.14 |
| (6)  | 7.44<br>(5.72)  | 0.297<br>(1.24)      | -0.299<br>(-0.93) | 0.456<br>(1.98) | 0.259<br>(0.89) | 0.047<br>(0.26)   | 0.091<br>(0.49) | 0.102<br>(0.77) |                   |                 |                 |                   |  |                    | 1.44           | 0.48 | 1.36 |
| (7)  | 6.95<br>(2.84)  | 0.443<br>(2.83)      |                   |                 |                 | -0.114<br>(-0.75) |                 |                 |                   | 0.255<br>(1.62) |                 |                   |  |                    | 1.63           | 0.34 | 0.97 |
| (8)  | 7.94<br>(3.07)  | 0.481<br>(2.92)      |                   |                 |                 |                   | 0.011<br>(0.07) |                 |                   |                 |                 | 0.140<br>(0.85)   |  |                    | 1.68           | 0.30 | 1.33 |
| (9)  | 5.27<br>(1.70)  | 0.163<br>(1.70)      | -0.208<br>(-0.62) | 0.314<br>(1.04) | 0.390<br>(1.59) | 0.017<br>(0.09)   | 0.054<br>(0.27) | 0.125<br>(0.87) | -0.037<br>(-0.29) | 0.242<br>(1.16) | 0.005<br>(0.02) | -0.077<br>(-0.36) |  | 1.48               | 0.45           | 1.33 |      |

\*Dependent variable is the call money rate. Data are quarterly and seasonally adjusted. Sample is 3<sup>rd</sup> quarter 1988 through 2<sup>nd</sup> quarter 1996. T-statistics shown in parenthesis.

Table 4: FIML Parameter Estimates

| Equation                | Parameter      | Estimate | t Statistic | Summary Statistics |                |      |
|-------------------------|----------------|----------|-------------|--------------------|----------------|------|
|                         |                |          |             | SER                | R <sup>2</sup> | D.W. |
| Aggregate Demand        | a <sub>0</sub> | 6.7403   | 2.66        | 1.18               | 0.30           | 2.11 |
|                         | a <sub>1</sub> | 0.3399   | 2.28        |                    |                |      |
|                         | a <sub>2</sub> | 0.2660   | 1.85        |                    |                |      |
|                         | a <sub>3</sub> | -0.2769  | -1.75       |                    |                |      |
| Long-term Interest Rate | b <sub>0</sub> | -0.9259  | -1.02       | 0.70               | 0.92           | 1.63 |
|                         | b <sub>1</sub> | 0.4621   | 5.16        |                    |                |      |
|                         | b <sub>2</sub> | 0.1858   | 2.66        |                    |                |      |
|                         | b <sub>3</sub> | 0.5472   | 6.44        |                    |                |      |
| Reaction Function       | c <sub>0</sub> | 9.4102   | 9.11        | 1.57               | 0.38           | 1.67 |
|                         | c <sub>1</sub> | 0.5412   | 4.05        |                    |                |      |
|                         | c <sub>2</sub> | 0.1306   | 0.91        |                    |                |      |

\*The sample period is the 3<sup>rd</sup> quarter 1988 through the 2<sup>nd</sup> quarter 1996.

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Figure 1. Trend of Change Rates of Velocity

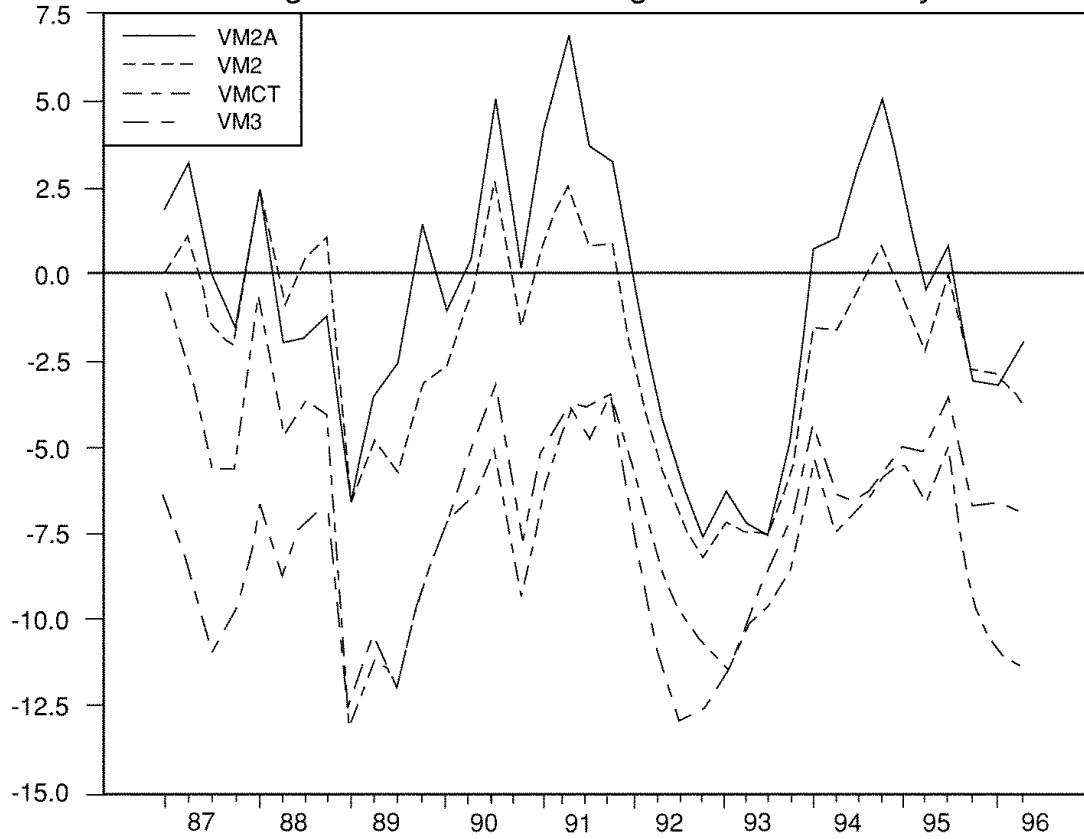


Figure 2. calla (actual) vs callr (policy rule)

