Inflation Targeting: The Korean Experience and Issues

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I. Introduction

Central banks generally carried out monetary policy in the 1970s making use of an intermediate targeting system whereby they set up an intermediate target such as a broad monetary aggregate and worked in accordance with it so as to achieve price stability. The rapid financial innovation and liberalization in the 1980s, however, blurred the distinctions between the monetary aggregates and destabilized the relationship between the real sector and monetary aggregates, greatly reducing the effectiveness of this method of conducting monetary policy. Therefore central banks started to grope for an alternative and turned their attentions to the potential of inflation targeting in the early 1990s as a new framework for the operation of monetary policy. Under it, the central bank specifies an inflation target and the focus of its monetary policy is placed on achieving it. An inflation target framework was first introduced in 1990 by New Zealand, and the system has spread to other countries such as Canada and the United Kingdom[1].

Only about ten years have passed since inflation targeting was first introduced as a new method of operating monetary policy. So its performance cannot be reviewed thoroughly at the present stage. The experience of these countries, though, generally shows that the effectiveness of monetary policy has improved since the introduction of the system. Viewing the macroeconomic indicators, most countries experienced more stable prices and higher economic growth, and reduced public expectations of inflation after the introduction of an inflation targeting framework, although it is difficult to set an exact figure on the contribution to this made by inflation targeting.

Central banks in these countries previously had multiple objectives in monetary policy including economic growth, price stability, the balance of payments, and full employment. Those objectives were simplified to the single objective of price stability with the introduction of the system and the independence and neutrality of the central bank were strengthened. Moreover, the general assessment is that the credibility of the central bank's monetary policy was heightened in the view of economic agents and that effectiveness of its monetary policy was raised correspondingly.

[1]It is reported that 19 countries including New Zealand, Canada, Israel, U.K., Sweden, Finland, Australia ,Spain, Chile, Brazil, The Czech Republic, and Korea adopt inflation targeting at the year of 2001(Mishkin and Schmidt-Herbel(2001)

In Korea, an inflation targeting system was introduced in 1998 under the provisions of the fully-revised Bank of Korea Act[2] of 1997. In this paper we discuss the inflation targeting framework and then review the inflation targeting system in Korea

[2] Related codes of the Act:

Article 1(Purpose) The purpose of this Act shall be to establish the Bank of Korea and to contribute to the sound development of the national economy by pursuing price stability through the formulation and implementation of efficient monetary and credit policies.

Article 6(Formulation of an Operational Plan for Monetary and Credit Policies) (1) The Bank of Korea shall set a price stability target every year in consultation with the Government and formulate and promulgate an operational plan for monetary and credit policies including this price stability target. (2) The Bank of Korea shall do its best to achieve the price stability target as provided for in Paragraph (1).

II. Inflation Targeting Framework

1. Basic Framework

An inflation targeting system is a system of operating monetary policy in which the central bank sets up an inflation target within a pre-designated time horizon and makes use of the available policy instruments preemptively to attain that target. Inflation targeting is a monetary policy framework having three main characteristics: (i) an inflation target is decided in a medium-term perspective, (ii) a future inflation rate is forecast, and then (iii) a short-term interest rate is used as an operating target, without an explicit intermediate target, to achieve the inflation target taking into account the forecast inflation.

Accordingly, the framework of monetary policy is changed towards forward looking pre-emptive methods based on the medium-term inflation forecast, and a close relationship between the operating target and a final target such as price stability is crucial since no intermediate target is employed. In inflation targeting, an intermediate target is not explicitly set in contrast to conventional usage in monetary policy where one such as a monetary aggregate or the exchange rate has been frequently used[3].

As the operating target under inflation targeting, a short-term interest rate such as the call rate is generally used. Information variables such as the monetary aggregates, interest rate spreads (Oh, 1998), and MCI are also jointly taken into account. As a consequence, it is important to find whether there is a transmission channel through which the short-term interest rate affects prices. It is necessary to figure out the effect of the short-term interest rate on prices in terms of time lag, coefficients etc. in order to establish a practical plan for monetary policy.

[3] In Finland exceptionally, the exchange rate was retained until the end of 1998 as an intermediate target in spite of the adoption of inflation targeting.

[Table 1] Inflation Targeting and Intermediate Targeting

	Operation System
Inflation Targeting	Policy Instruments ⟶ Operating Targets ⟶ Policy Goals or Objectives ↑ Information Variables
Intermediate Targeting	Policy Instruments ⟶ Operating Targets ⟶ Intermediate Targets ⟶ Policy Goals or Objectives

A central bank operates monetary policy under an inflation targeting system as follows. First, it sets an inflation target in advance as an anchor for the operation of monetary policy over the medium term. Second, it forecasts the future inflation rate using information variables such as monetary aggregates, interest rates, the exchange rate, the expected inflation rate, asset prices, and key raw-material prices. It then formulates and implements monetary policy so that the actual inflation rate converges on its established inflation target. Lastly it reviews the performance of monetary policy and then feeds back the results into the monetary policy for the next term. Such a feedback process will lead to the convergence of the actual inflation rate with the inflation target over the long run and lead to the construction of a basis for price stability.

Svensson(1997b) explains the inflation targeting system with the following the central bank's objective function

$$L_t = E_t \sum_{t=0}^{\infty} \delta^t \left[(1-\lambda)(\pi_t - \pi^*)^2 + \lambda (y_t - y_t^*)^2 \right] \qquad (1)$$

where π is inflation, π^* is the inflation target, y is output, y^* is potential output, and δ is a discount factor.

Through the choice of its policy instrument (the short-term interest rate), the central bank minimizes the loss function, which is the weighted sum of inflation and output deviations from their target levels. Svensson (1997b) interprets the objective function with λ=0 as strict inflation targeting, where no direct concern is paid to output variability. Mervyn King (1997) has referred to a policy-maker with such an objective function as an 'inflation nutter'. Flexible inflation targeting refers to the

case where $l>0$. In practice, it appears that all the inflation-targeting central banks have adopted flexible inflation targets to varying degrees.

2. Rationale behind the Adoption of the Inflation Targeting System

The following two main reasons may be pointed out as the rationale behind the adoption of an inflation targeting system. First, in policy perspective, central banks generally carried out monetary policy in the 1970s making use of an intermediate targeting system whereby they set up an intermediate target such as a broad monetary aggregate and worked in accordance with it so as to achieve price stability. The rapid financial innovation and liberalization in the 1980s, however, blurred the distinctions between the monetary aggregates and destabilized the relationship between the real sector and monetary aggregates, greatly reducing the effectiveness of this method of conducting monetary policy.

In addition, it has been emphasized that transparency and accountability are crucial to strengthening the credibility of monetary policy that is essential to carry out monetary policy effectively with less social cost. And then it has been argued that a nominal anchor for monetary policy is necessary to enhance transparency and accountability of monetary policy

Therefore central banks started to grope for an alternative and turned their attentions in the early 1990s to the potential of inflation targeting as a new framework for the operation of monetary policy to overcome the problem of the intermediate targeting system based on monetary aggregates and to strengthen the credibility of monetary policy. Under it, the central bank specifies an inflation target as a nominal anchor and the focus of its monetary policy is placed on achieving it.

Second, in a theoretical perspective, it has been realized that higher inflation is detrimental to economic growth, and that there is no negatively sloped long-run trade-off between inflation and growth, although there is a negative short-run trade-off between them. Also it has been realized that excessively high inflation variability reduces the credibility of monetary policy, which may be reflected in a drift upwards in inflation expectations above the target, which in turn will increase the costs of bringing inflation back to the target (Debelle, 2000).

3. Necessary Conditions for Inflation Targeting

A. Central Bank Independence

One of the main contributions of recent studies in monetary economics is the finding that central bank independence (CBI) is crucial to price stability. The theoretical argument has focused on credibility effects as an important channel for the impact CBI has on the economy. Empirical studies, however, have shown only a negative relationship between CBI and inflation rates.

The theoretical argument stems from the so-called time-inconsistency problem based upon the assumption that central banks' preferences are more inflation averse than those of governments. It is, in general, accepted that the long-run Phillips curve is vertical; that is, inflation has no permanent effect on real outcomes. Governments, nonetheless, have an incentive to spring inflationary surprises upon the public. As a result, a primary cause of inflation is the government's inability in the eyes of the public to commit itself credibly to a low inflation policy. One could remove the time-inconsistency problem by making government unable to renege upon a commitment to low inflation. In Rogoff (1985), the appointment of a conservative central banker was shown to be one means to achieve low inflation. These theoretical arguments subsequently stimulated empirical research.

Several empirical studies including those of Alesina & Summers (1993), Cukierman (1992), Cukierman et. al. (1993) and Fischer (1994) found that greater CBI is associated with lower levels of inflation. These studies conclude that countries with low CBI have experienced high levels of inflation and high variance of inflation rates because political and economic dependence restrict the ability of the central bank to select its policy objectives free of government influence. This political and economic dependence of the central bank in countries with high inflation experiences makes agents assign low credibility to the central bank's monetary policy. Since these theoretical and empirical studies, legal CBI has been identified with a credible commitment to price stability. This credibility bonus is presumed to be the source of the widely-known negative correlation between CBI and average inflation rates.

On the basis of these results of studies, in recent years many countries have adopted or made progress toward adopting legislative proposals making their central banks more independent. Between 1989 and 1991, New Zealand, Chile, and Canada enacted legislation that increased the independence of their central banks. The 1992

Treaty on European Union, the Maastricht Treaty, required EU members to give their central banks more independence to establish a new European System of Central Banks.[4] More recently, in 1997, the government of Japan revised the Bank of Japan Law, which came into effect on April 1, 1998 and the U.K enhanced the independence of the Bank of England by giving it more autonomy in decision-making on monetary and interest-rate policy.

The recent changes in legislation usually give more authority to central banks and also direct them to focus mainly on the objective of price stability. The success of the highly independent Deutsche Bundesbank and Swiss National Bank in maintaining comparatively low rates of inflation for prolonged periods of time as well as recent empirical and theoretical studies focused on central bank independence have contributed to this tendency.

In this context, in the inflation targeting system, CBI is an essential element. First, legal independence should be established. Second, goal independence whereby the monetary policy committee of central banks can decide the inflation target independently, albeit, in consultation with the government is also important. Third, the operational independence for central banks, in practice, to implement their monetary policies independently of government, political and social pressures must be enhanced. In this regard, if any past implicit or explicit convention of intervention by government in monetary policy remains, it should be totally removed. In addition, a political commitment to price stability is also important.

B. Capacity of Inflation Forecasting

Given the lags in the monetary transmission mechanism, control over inflation requires an inflation forecast. In particular, an inflation targeting system is a forward looking pre-emptive framework for monetary policy based on a medium-term inflation forecast. That is, it is a system in which monetary policy is implemented using a short-term interest rate as an operating target, without an explicitly selected intermediate target, to converge the future forecast inflation on the inflation target selected in the medium-term. Accordingly correct forecasting of inflation is crucial in an inflation targeting system.

[4] To meet the level of independence prescribed by the Maastricht Treaty, a central bank must be prohibited from taking instructions from the government. The term for central bank governors must be set at a minimum of five years. In addition, the central bank must be prohibited from purchasing debt instrument, directly from government and from providing credit facilities to government.

The increasing uncertainty of the economic and financial environments, however, makes it more difficult to forecast future inflation. Most central banks use various models including structural and time series models, and compile inflation pressure indexes to enhance their capacity for inflation forecasting.

C. Controllability of Monetary Policy Instruments over Operating Targets

A short term interest rate selected as an operating target must satisfy certain conditions: (i) there must exist exogeneity such that the short-term interest rate unilaterally cause long-term interest rates or real variables, but not vice versa; (ii) controllability is necessary, so that the central bank can adjust the short-term interest rate with appropriate policy instruments; and (iii) a signaling effect is also important so that the central bank can signal its intentions effectively to the public in such ways that a change in an operating target will affect short-term interest rates and then long-term interest rates through a change in inflation expectations.

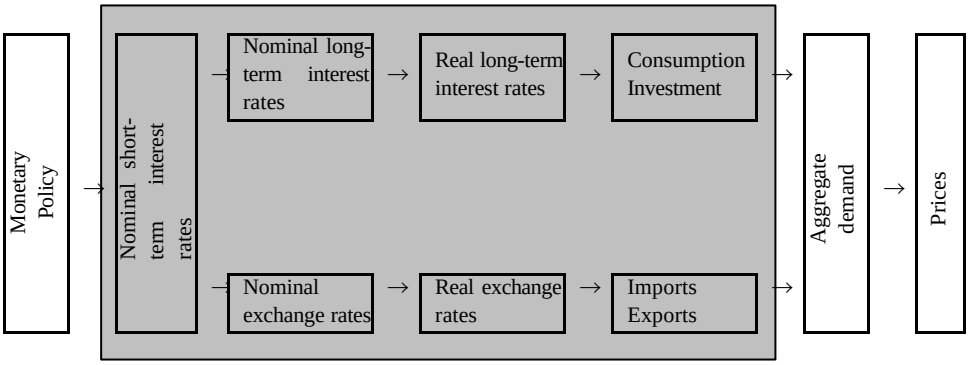
Among these, establishing the relationship between monetary policy and the operating target is just an issue of whether the central bank has control over the operating target. The development of short-term money markets and indirect monetary policy instruments are important to strengthen the controllability of the central bank over the operating target.

D. Effective Channel of Interest Rates on Prices

The transmission mechanism of monetary policy refers to the series of processes through which monetary policy affects prices and quantities of various financial instruments, and, ultimately, real economic activities such as inflation and growth. The channels of monetary transmission can be broadly categorized into price and quantity channels: the former again can be subdivided into an interest rate, an exchange rate, and an assets price channel, and the latter into a money and a credit channel. Monetarists traditionally have emphasized the quantity of money, assuming the stability of the money demand function, whereas Keynesians have focused on the price function of interest rates on the basis of a stable investment function.

[Figure 1]

Transmission Channels of Interest Rates to Prices



In an inflation targeting system, the interest rate channel is important since it is a system where a short-term interest rate is used as an operating target, without an explicit intermediate target, to achieve the inflation target. Developed money and capital markets, zero intervention by government in the market and no distortion of the structure of interest rates are important to enhance the effectiveness of the transmission mechanism of monetary policy.

E. Transparency, Consistency and Credibility of Monetary Policy

Transparency and consistency are crucial to strengthening the credibility of monetary policy. They make it possible for those responsible for monetary policy to be held publicly accountable for their decisions. That increases their incentive to achieve the inflation target, and it therefore increases the public confidence that the inflation target will be achieved.

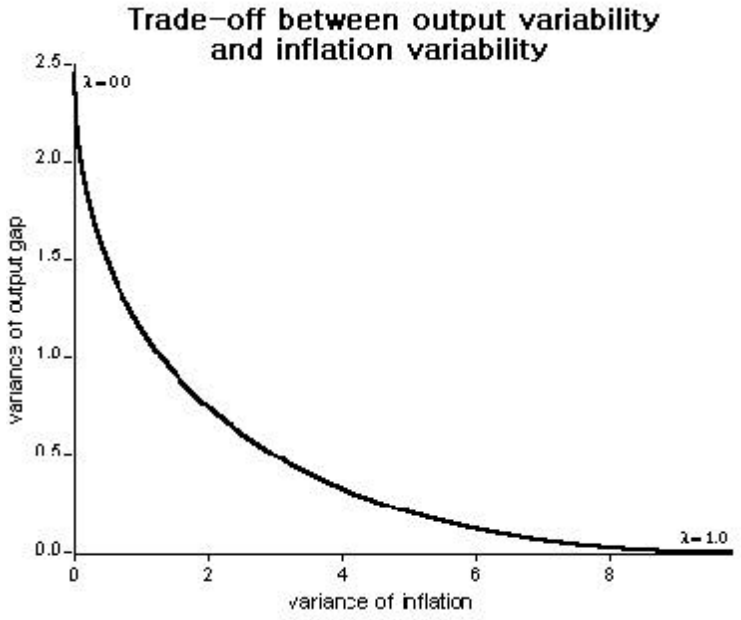
Central banks of inflation targeting countries have introduced various measures to enhance the transparency and consistency of their monetary policies; First, central banks publish an Inflation Report or Monetary Policy Report containing the forecast of inflation and output growth over the coming years, and, in some countries, submit it to the Parliament. Second, the minutes of the Monetary Policy Committee meetings are disclosed. Third, the Governor or members of the Monetary Policy Committee are questioned by the Parliament on monetary policies. Fourth, if the inflation rate strays from the target, in some countries, the Governor has to write an open letter to the Parliament. or to the government explaining how the discrepancy

arose, and what the Monetary Policy Committee intends to do to correct it.

The loss of the credibility of monetary policy raises inflation expectations, which in turn will increase the costs of bringing inflation back under control and thus a high level of credibility is crucial for monetary policy. If monetary policy is, however, strictly focused on only price stability to enhance its credibility, the short-run variability of output may unnecessarily increase, since there is a negative short-run trade-off between inflation and growth, although there is no negatively sloped long-run trade-offs between them. There may be some trade-off between credibility and flexibility. In general, an inflation targeting system has some flexibility to allow for the short-run trade-off between inflation and growth. The extent to which it does so, in part, reflects the design of the inflation targeting system, such as targeting bands and policy horizon.

As Figure 2 shows, the trade-off between inflation and output variability estimated for Korea by Kim(2000) is convex: increasing the weight on output(λ in the above equation (1)) in the central bank's objective function (moving south-east on the curve), increases the variability of inflation while reducing the variability of output relatively substantially in the upper-left portion of the curve, but less so in the lower-right portion.

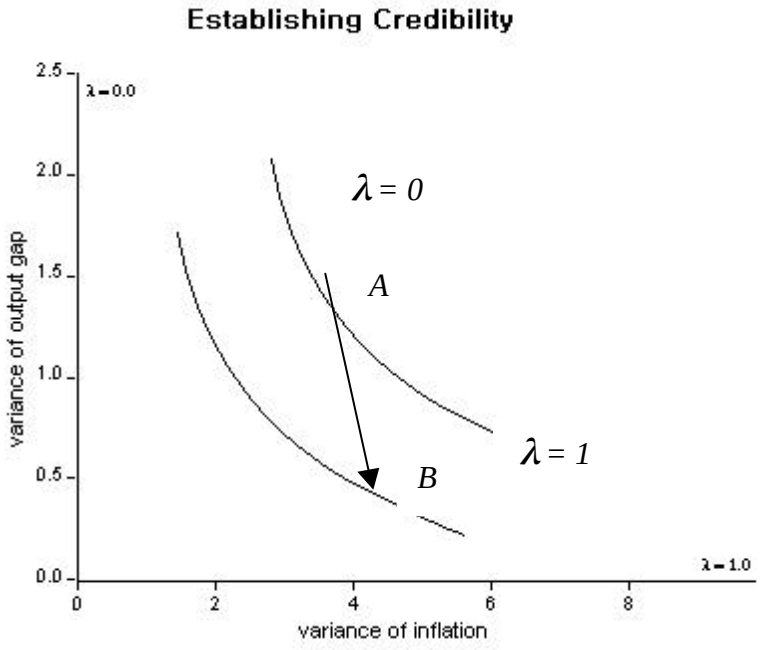
[Figure 2]



Source: Kim (2000)

In deciding upon the appropriate weight to put on output stabilization in the objective function, the following consideration should be borne in mind. The initial choice on the variability frontier may influence the speed with which the central bank acquires credibility, and hence, the choices available to it in the longer term (that is, the long-run position of the trade-off curve). A point such as A in Figure 3 where the aim is lower inflation variability may enable a central bank to establish its inflation-fighting credentials earlier than one which aims for lower output variability. As its credibility becomes established, the central bank might then be able to follow a more flexible approach (point B), potentially on a variability frontier closer to the origin. These result can be used to consider the issue of the appropriate width of the inflation target band(Debelle, 2000).

[Figure 3]



The allowance of too much flexibility, that is, of too wide powers of discretion may, however, increase the variability of inflation. When the monetary authorities implement a discretionary monetary policy, the problem of time inconsistency arises. In this case, an increase in money supply brings about a high inflation rate without increasing either employment or production. Accordingly, we need a more scientific way of implementing monetary policy to reflect the optimal degree of trade-off between credibility and flexibility. One such procedure is a discretionary rule of monetary policy. Therefore inflation targeting alone is not

enough. Some procedure for setting the interest rate instrument must be put in place. That is a monetary policy rule. It can be used as a guideline for the implementation of inflation targeting (Taylor, 2000). The monetary authorities usually make a public commitment and implement monetary policy according to monetary policy rules so that financial markets can form clear expectations of future policy actions.

Several monetary policy rules including the Taylor rule, the nominal income rule, and the inflation-only rule have been suggested. It is reported that among them the Taylor rule outperforms the other monetary policy rules in terms of reducing both inflation and output variability (Debelle, 2000). Taylor(1992, 1993, 1995) developed a reaction function to characterize how the Federal Reserve Board has set the Federal Funds rate during the Greenspan era. In particular, the Fed adjusts the short-term interest rate in response to gaps between inflation and its target and between output and potential output.

The Taylor rule can be derived from the reaction function of central banks. The role of output stabilization in inflation targeting can be illustrated by the following simple model (Taylor, 1994; Svensson, 1997a; Ball, 1997) which consists of a Phillips curve, an aggregate demand equation and the central bank's loss function:

$$\pi_t = \pi_{t-1} + \alpha(y_{t-1} - y^*_{t-1}) + \varepsilon_t \qquad (2)$$

$$y_t = y^*_t + \beta(y_{t-1} - y^*_{t-1}) - \gamma(r_{t-1} - \bar{r}) + \eta_t \qquad (3)$$

$$L_t = E_t \sum_{t=0}^{\infty} \delta^t \left[(1-\lambda)(\pi_t - \pi^*)^2 + \lambda(y_t - y^*_t)^2 \right] \qquad (1)$$

where π is inflation, π^* is the inflation target, y is output, y^* is potential output, r is the short-term interest rate which is assumed to be the instrument of monetary policy, δ is a discount factor, and ε_t and η_t are i.i.d. shocks which are not known to the policy-maker when the interest rate in time t is chosen.

In this model, interest rate affect output with a one-period lag, and inflation with a two-period lag indirectly through the impact of interest rates on the output gap. This accords with the lag structure in many economies.

The model can be solved to yield a reaction function for the central bank of the form:

$$r_t^* = \bar{r} + \sigma_1(\pi_t - \pi^*) + \sigma_2(y_t - y_t^*) \qquad (4)$$

where r^* is the long-term equilibrium interest rate, and σ depends on the parameters in the model, and in particular, the relative weight on output stabilization in the objective function(λ).

Monetary policy is adjusted in response to deviations of inflation from its target value and of output from its potential. Such a reaction function for monetary policy is often referred to as a Taylor rule. In this instance, optimal policy can be described by a simple Taylor-type rule because of the simple structure of the economy.

Inflation targeting has sometimes been criticized for being 'inflation only' targeting and ignoring output consideration. Such criticism, however, is misplaced(Debelle, 2000; Macklem and Srour, 2000). From a theoretical perspective, even if a 'strict' inflation target is adopted, output considerations are still important because of the critical role that output plays in determining future inflation. The central bank will still have output in its reation function. Rather, the argument would be better conducted in terms of the weight that should be placed on output stabilization in the central bank's objective function; that is, how flexible the inflation-targeting regime should be.

Another issue regarding the credibility of monetary policy is the problem of how well the public understands the underlying inflation rate. They may have some doubts as to the plausibility of an underlying inflation rate that excludes the prices of agricultural and marine products and energy which are of everyday importance, and, as a consequence, its overhasty introduction as a target indicator might lower the credibility of monetary policy. Efforts are required to foster a popular understanding of the concepts and purposes of inflation targeting and of an underlying inflation rate, as well as to calculate a better underlying inflation rate to arrive at a better measure of underlying inflation.

III. Korean Experiences in Inflation Targeting

1. Background of the Adoption of the Inflation Targeting System

The Bank of Korea had carried out monetary policies until 1997 making use of an intermediate targeting system whereby the rate of increase in the monetary aggregate had been used as an intermediate target. From 1979 to 1997, the rate of increase in M2 was employed. In 1997, the rate of increase in MCT (M2+CD+Money in Trust) was also used together (See Table 2).

The rapid financial innovation and liberalization in the 1980s, however, blurred the distinctions between the monetary aggregates and, thus the rates of increase in each monetary aggregate such as that in M2 and that in M3 had shown, sometimes, different movements (See Figure 4). In particular, the share of M2 in total liquidity (M3) had continuously decreased until 1998 due to the sustained unbalanced growth between the banking sector and the non-bank financial institutions. Accordingly, the effectiveness of the rate of increase in M2 as the intermediate target of monetary policy had considerably decreased.

[Table 2] Monetary Target Variables

Years	*Monetary Target Variables*	
1957 1969 first half	*M1*	
1969 second half	*Reserve money*	
1970 1997	*Domestic credit*	
1978 1979	*M1*	
1979 1996	*M2*	
1997	*M2 and MCT*	*Double Intermediate Targets*
1998 2000	*M3*	*Indicative Limit*

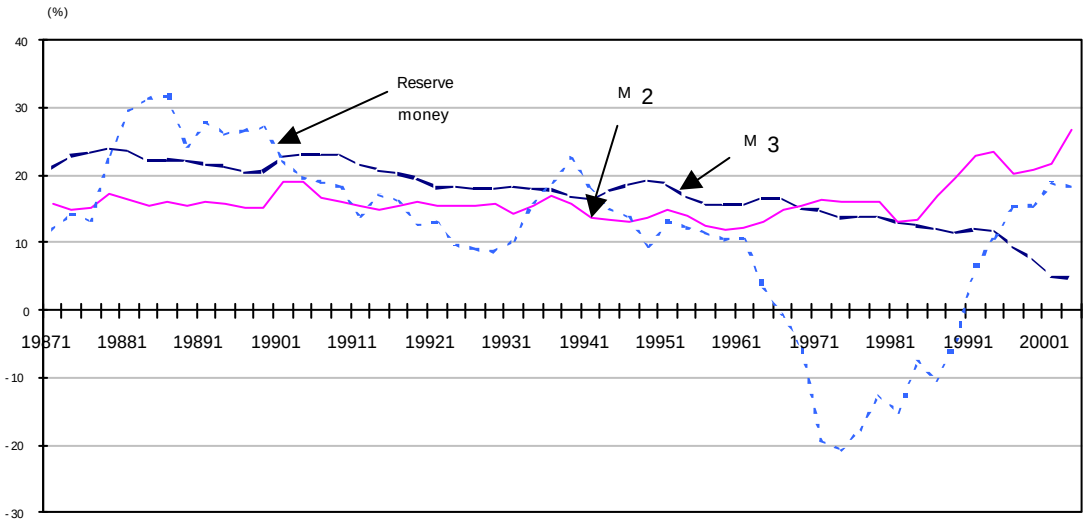
[Table 3] Monetary Aggregate Targets* and Their Performances

Years	*Targets*	*Results*
1979	*25*	*24.6*
1980	*20*	*27.0*
1981	*25*	*25.2*
1982	*20 22*	*27.0*
1983	*18 20*	*14.7*
1984	*11 13*	*8.9*
1985	*9.5*	*13.9*
1986	*12 14*	*17.3*
1987	*15 18*	*22.5*
1988	*15 18*	*18.8*
1989	*15 18*	*18.4*
1990	*15 19*	*21.2*
1991	*17 19*	*18.3*
1992	*18.5*	*18.6*
1993	*13 17*	*17.3*
1994	*14 17*	*17.6*
1995	*12 16*	*15.5*
1996	*11.5 15.5*	*16.2*
1997	*14 19*	*19.2*
*1998***	*15.4*	*19.0*
*1999***	*13 14*	*11.3*
*2000***	*7 10*	*5.6*

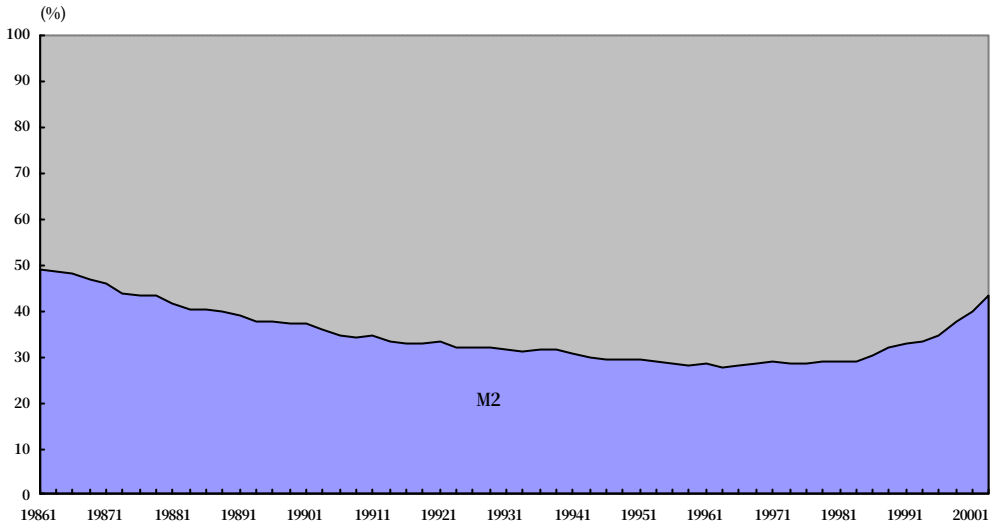
* *M2 except the years from 1998 to 2000*

** *Indicative Limit of M3*

[Figure 4] The Rates of Increase in Monetary Aggregates



[Figure 5] The Share of M2 in M3



The main transmission channel has consequently shifted, reflecting these changes in the financial market environment. The monetary channel was predominant in the 1970-80s when inflation was relatively high and demand for money relatively stable (Kim and Oh 1990), while the role of the interest rate channel became significant in the early and mid 1990s when demand for money became unstable due to financial innovation and the liberalization of interest rates (Kang 1994, Kim 1995, Park et al. 1996, Oh, 1999b). Therefore The Bank of Korea felt needs to grope for an alternative as a new framework for the operation of monetary policy.

[Table 4] Variance Decomposition from 3 variable VAR Model

(Money, Interest rate and GNP Deflator)

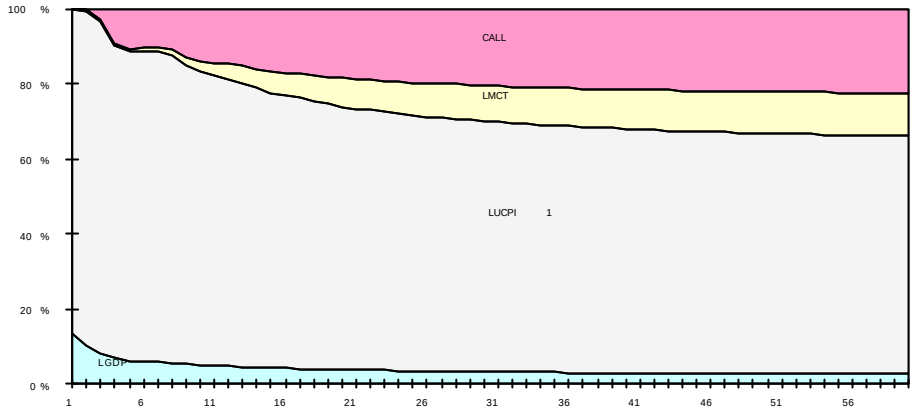
(%)

	1983~88		*1989~94*	
	M2	*Corporate Bond Yield*	*M2*	*Corporate Bond Yield*
GNP	*17.8*	*15.2*	*16.0*	*20.3*
GNP deflator	*15.3*	*4.6*	*19.7*	*10.5*

[Figure 6]

Results of Forecast Error Variance Decomposition of Prices (C P I)

(1990-1998)



2. The Inflation Targeting System in Korea

A. The Adoption of the Inflation Targeting System

An inflation targeting system was introduced in Korea under the provisions of the fully-revised Bank of Korea Act of 1997. The Act is concerned to establish the neutrality and autonomy of monetary policy, with price stability being declared the sole objective of the Bank of Korea. Under its provisions, the Bank of Korea is required to set an inflation target every year and do its best to achieve it. The Bank of Korea has set an annual target since 1998 in accordance with the related provisions of the Act.

The Bank of Korea adopted the Consumer Price Index (CPI) in 1998 as its benchmark indicator when the inflation targeting system was first implemented. This is because the CPI was thought most appropriate as the key anchor for the operation of monetary policy as it represents the indicator of inflation most familiar to the general public [5]. Additionally, the CPI was considered one of the most important

[5] Those countries which introduced inflation targeting before Korea adopted without exception the Consumer Price Index(Retail Price Index in the case of the United Kingdom) as the benchmark indicator in order to set the inflation target. This is because the CPI satisfies the characteristic criteria, such as recognition, promptness, etc., required of a benchmark indicator for the operation of monetary policy better than other inflation indicators such as the

macroeconomic indicators in the annual consultations that have been conducted since the currency crisis of 1997 between the International Monetary Fund and the Government of the Republic of Korea and the Bank of Korea in order to decide on policy options.

There are, however, some problems that arise in making decisions on monetary policy options based on the CPI and in reviewing the subsequent performance of the operations of monetary policy. The CPI is seriously affected by temporary or transitory shocks such as natural disasters or sharp fluctuations of international oil prices. In the case of supply-side-shock inflation attributable to those factors, there would be difficulties in absorbing the consumer price inflation by monetary policy and it would not in fact be desirable to counter these supply-side shocks through the conduct of monetary policy.

For example, when external shocks such as an oil crisis cause consumer price inflation to soar beyond the upper bound of the inflation target range and bring about an economic recession, if the central bank tightened money supply in order to contain the inflation rate within its target range, the economic recession would deepen more rapidly but inflation would not be effectively suppressed. Solving such problems requires a supplementary scheme whereby the sharp fluctuations in price inflation attributable to external shocks do not have a serious impact on monetary policy when the central bank sets up the inflation target.

Taking this into consideration, the Bank of Korea when adopting the CPI as the benchmark inflation indicator in setting its inflation target for 1999 added a provisory clause that the benchmark indicator should exclude changes in the inflation rate caused by *force majeure* such as price fluctuations of agricultural products attributable to natural disasters and price adjustments due to the revision of tax legislation. However, it was found problematic to apply such a conditional clause in practice even if the actual economic situation warranted it, because there were no specific descriptions and objective criteria attached as to which situations could be acknowledged as cases of *force majeure* and no procedures that could be applied in dealing with cases of *force majeure*.

GDP deflator or the Producer Price Index.

B. The Use of an Underlying Inflation Rate

Reviewing this situation, the Bank again decided to adopt the CPI as the benchmark inflation indicator in setting its inflation target for 2000 as in 1998 and 1999, but to clarify the provisory clause so that monetary policy should be formulated and implemented on the basis of the underlying trend of prices. There are various methods of adjusting the CPI to find the underlying trend of prices. There are several methods that adjust temporary or transitory factors having influences on the CPI in order to find the underlying trend of prices. First, after identifying items whose price transitory shocks cause sharp fluctuations in historical data, these items are excluded from the CPI. Second, after identifying items whose prices fluctuate greatly ex post, they are excluded from the CPI. For example, after arranging in order the price changes of all items which are included in the basket of the CPI, those at two margins are excluded from the CPI. Third, after ranking the price changes of all items in the basket of the CPI in order, their weighted median is regarded as the underlying inflation which best reflects the underlying trend of prices.

There are some advantages and disadvantages to each method.Among them, the most popular method is that of identifying and then excluding items of the CPI which are most highly volatile in response to external shocks because this method can not only be understood more easily and be calculated more conveniently than other methods but objectivity and credibility are obtained once it is acknowledged that the excluded items are selected on a rational basis.

Oh(1999b) estimates two underlying inflation rates using the method of 'adjustment by exclusion' and another using the 'trimmed mean' method. He then examines their stability and usefulness for monetary policy to find which would be the most suitable for inflation targeting in Korea. Among the two types of the underlying inflation rates produced by the method of adjustment by exclusion, one strips out the prices of agricultural and marine products and of energy from the components of the Consumer Price Index and the other additionally excludes the prices of public utilities. On the other hand, a trim of 15 percent of both tails of the frequency distribution was adopted to estimate the trimmed mean inflation rate.

The results of his empirical analysis are as follows: First, underlying inflation rates are lower and more stable than the rate of increase in CPI. The target interest rates estimated based on the rate of increase in CPI also differ from those based on the underlying inflation rates. Therefore, employing an underlying inflation rate that

excludes temporary and short-term factors with little relevance for monetary policy as an inflation target seems to increase monetary policy's efficiency and accountability.

Second, according to the coefficients of variation and RMSEs from the long-run trend of the rate of increase in CPI, underlying inflation rate 1, which excludes the prices of agricultural, marine products and energy, is shown to be more stable than the two other underlying inflation rates.

Third, the results of the analyses of cross correlation coefficients, the transmission effects of the call rate, forecast error variance decomposition of prices and the long-run multipliers of the call rate reveal that underlying inflation rate 1 and underlying inflation rate 2 have similar usefulness for monetary policy. But the effect of the call rate on underlying inflation rate 3 is relatively small, according to variance decomposition and long-run multiplier analysis. Moreover, because of the difficulty of fostering a popular understanding of the trimmed mean method and of its characteristic that the items to be excluded may differ in each periods despite employing the same trimming percentile, the credibility of monetary policy could be reduced.

On the basis of these findings, although it is hard to say that any one rate is clearly the best target variable for inflation targeting, underlying inflation rate 1 shows relatively better performance in terms of stability and usefulness for monetary policy. Thus it can be considered a better alternative than the other available variables as the target variable for inflation targeting.

[Table 5] Stability and Usefulness for Monetary Policy of Underlying Inflation Rates

(Sample Period: 1990~98)

	Stability				Usefulness for Monetary Policy			
	Increase Rates on Average (%)	Coefficients Of Variation	RMSE[1]		Cross Correlation with the Call Rate	Transmission Effects of a Call Rate Shock	Results of Variance Decomposition	Long-run Multiplier (Call→Price)
			Case 1[2]	Case 2[3]				
Rate of Increase In CPI	6.3	0.30	1.43	2.30	Negative With 4 quarters lag	Lowest in the 4th quarter after the shock and then rises	The effects of a change in the call rate appear in the 3rd quarter and persist for a long time	Negative Value (-0.0499)
Underlying Inflation Rate1 1	5.7	0.24	0.97	1.70	Negative with 3 quarters lag	〃	〃	Negative Value (-0.0480)
Underlying Inflation Rate 2	5.4	0.29	1.18	1.68	〃	〃	〃	Negative Value (-0.0417)
Underlying Inflation Rate 3	5.8	0.31	1.14	1.85	Negative With 4 quarters lag	Falls in the 2nd quarter after the shock, and lowest in the 15th quarter after the shock	The effects of a change in the call rate are not clear	Negative Value (-0.0347)

Notes: 1) The RMSE from the long-run trend of the rate of change in CPI.

2) The rate of change in the HP filtered CPI is used as the long-run trend.

3) The five-year moving-average of the rate of increase in CPI estimated with the SVAR model is used as the long-run trend.

The Bank of Korea judged the method of 'adjustment by exclusion' best suited for the adjustment of the CPI in Korea, and selected the excluded items as follows: On the basis of historical data and experience, it was thought most reasonable that they should be selected from among those agricultural, livestock, and marine products whose prices fluctuate substantially depending on the harvest and from those manufacturing industry products most sensitive to changes in the international prices of the raw materials due to an input structure in which key component and materials are imported from overseas.

First, we identify one hundred and twenty-four items among the five hundred and nine items making up the Consumer Price Index basket. Of these, seventy-six are agricultural, livestock, and marine products and forty-eight are manufacturing industry products(including piped natural gas) in whose input structure import dependency is higher than the average for manufacturing[6].

[6] The forty-eight items of manufacturing industry products are selected on the basis that the input coefficients of imported goods in the input-output statistics 1995 are larger than the average coefficient

The standard deviations of the year-on-year change of the prices of the selected items are then reviewed. The analysis shows that the standard deviations of a set of items which includes all CPI components in fruits, about eighty per cent of vegetables, about ninety per cent of other agricultural products and eighty per cent of petroleum fractions[7] are larger than the average standard deviation(fifteen per cent level) of the total of one hundred and twenty-four items identified. This means that the price volatility of this set of items is greater than that of other items.

This analysis implies that the possibility that the CPI cannot reflect the underlying trend of price movements exactly becomes greater when the prices of vegetables, fruits, other agricultural products, that is, agricultural products except cereals, and petroleum fractions fluctuate temporarily and transitorily within a wide range and in isolation from price changes in other items. It follows that a measure of underlying inflation which strips out price changes of these items needs to be utilized as a benchmark so that the effectiveness of monetary policy can be secured.

In consideration of the above analysis, the Bank decided to make it clear that the CPI would continue to be adopted as the benchmark from 2000 onwards, but that it would be defined in terms of underlying inflation which strips out from the index the price changes of petroleum fractions and agricultural products except cereals.

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of total manufacturing industry products and piped natural gas. Piped natural gas is included in manufacturing industry products as its input structure is similar to manufacturing industry products even though it is classified as a public service in the Consumer Price Index due to price-setting by local governments.

[7] Including gasoline, kerosene, light oil, liquefied petroleum gas, and piped natural gas.

[Table 6]
Items with High Price Volatility

Classification of Subdivision1)		Items Whose Standard Deviation of Price Changes Is Larger than Fifteen Per Cent2)
<Agricultural, Livestock and Marine Products>	(67.6/144.8)	—
Cereals	(1.7/29.7)	Glutinous Rice<34>, Soybeans<15>, Redbeans<24>
Vegetables	(19.6/23.4)	Radishes<28>, Young Radishes<26>, Chinese Cabbages<31>, Cabbages<49>, Welsh Onions<145>, Onions<80>, Spinach<29>, Lettuce<52>, Carrots<37>, Cucumbers<22>, Pumpkins<21>, Eggplants<19>, Tomatoes<27>, Potatoes<44>, Sweet Potatoes<17>, Unripe Hot Peppers<23>, Perilla Leaves<16>, Scallions<18>
Fruits	(23.3/23.3)	Apples<27>, Pears<25>, Peaches<17>, Grapes<27>, Persimmons<33>, Chestnuts<54>, Mandarin Oranges<49>, Oranges<19>, Melons<20>, Watermelons<31>, Strawberries<16>, Bananas<31>, Dried Persimmons<15>
Other Agricultural Products	(9.8/11.0)	Red Peppers<29>, Red Pepper Powder<23>, Garlic<32>, Ginger<47>, Ginseng<25>, Fresh Flowers<19>
Livestock Products	(2.3/33.0)	Chickens<17>
Marine Products	(10.9/24.4)	Hairtail<27>, Walleye Pollack<31>, Mackerel<39>, Frozen Squid<17>, Oysters<15>, Dried Anchovies<29>, Dried Pollack<19>, Salted Roe of Pollack<17>
<Manufacturing Industry Products>	(40.4/375.4)	—
Processed Foods	(3.4/69.3)	Wheat Flour<20>, Cooking Oils<21>, Sugar<21>, Instant Coffee<18>, Whisky(imported)<15>
Textile Products	(—/76.7)	—
Durable Products	(—/82.0)	—
Publications	(—/18.9)	—
Petroleum Fractions3)	(35.1/43.5)	Kerosene<18>, Light Oil<20>, Gasoline<15>
Medicine and Cosmetic Products	(—/31.3)	—
Other Industrial Products	(1.9/53.7)	Paint<15>, Plywood<18>, Films<20>, Cigarettes(imported)<16>

Notes : 1) In (A/B), A refers to the sum of the weights in the Consumer Price Index of those items the standard deviation of whose year-on-year price changes using monthly data is larger than the average(fifteen per cent level) of the total of one hundred and twenty-four items. B refers to the weight of the relevant subdivision of the Consumer Price Index.(Total sum of the weights in the Consumer Price Index is one thousand.)

2) Figures in angle brackets < > refer to the standard deviation of the year-on-year price changes.

3) Gasoline, kerosene, light oil, liquefied petroleum gas, and piped natural gas.

C. The Introduction of a Mid-term Inflation Target

The Bank of Korea used a short-term inflation target with a one-year time horizon when it established the inflation targets for 1998 and 1999. However, there is a time lag before monetary policy's effects are felt in the various economic sectors. And once they begin to be felt, they continue for a long time.

These analytical results imply that the Bank would suffer a great deal of difficulty if it formulated and implemented monetary policy focusing only on the goal of achieving the short-term inflation target for that one year. Additionally, such a myopic monetary policy would not exploit one of the main merits of the inflation targeting system, which is to give the public the confidence that the central bank will formulate and implement monetary policy consistently to keep the inflation rate stable over the mid-term horizon, thus eliminating concerns over an inflationary spiral.

The Bank of Korea therefore resolved to set, in addition to an annual inflation target for the coming year, a mid-term inflation target from 2001 onwards, so as to maintain the consistency of monetary policy over the medium term. The mid-term inflation target was set at the same level as or lower than the short-term inflation target for the year in order to inspire confidence that the Bank would keep inflation low and stable in the long run. The mid-term target was quoted as a point target without a toleration band, because it was judged more important to demonstrate the strong commitment of the central bank to prevent the spread of inflationary expectations among the public than to take economic uncertainties into account. The Bank set the mid-term inflation target from 2001 as 2.5 per cent level on an annual average basis each year after 2001.

An inflation targeting regime emphasizes price stability as its primary concern. A strict definition of price stability seems to suggest an inflation rate at or very near zero. But, as well known, targeting zero inflation rate would create some problems. One reason against targeting zero inflation rate is the bias in the measurement of inflation rate. According to studies of inflation in the United States, including the officially commissioned study known as the "Boskin Report," the CPI overstates inflation by from 0.5 to 2.0 percentage points per year.

A more persuasive argument against aiming for an inflation rate of zero is that such policy risks tipping the economy into deflation. Persistent deflation, particularly if unanticipated, can create serious liquidity and insolvency problems

that may interfere with the financial systems' normal functioning, precipitating an economic contraction. Undershooting a zero inflation target is potentially more costly than overshooting a zero inflation target by the same amount.

Another reason is, as Akerlof, Dickens, and Perry (1996) pointed out, that if nominal wages are rigid downward, then reductions in real wages could occur only through inflation. That means that a very low rate of inflation might prevent real wages from falling in response to declining labor demand in certain industries or regions, thereby leading to increased unemployment and blocking the re-allocation of labor from declining sectors to expanding sectors. In practice, based on these considerations, most inflation targeting countries set their inflation targets as around 1 to 3 percent per annum.

These arguments can be applied to Korea. Taking account into these arguments and the attainability of the target based on the forecast of future inflation rate[8], the Bank set the mid-term inflation target from 2001 as 2.5 per cent on an annual average basis. In recent studies on NAWRU (Non-Accelerating Wage Rate of Unemployment) in Korea, the NAWRU in 2000 is estimated as about 4%(KDI, 2000). In 2000, the rate of unemployment is expected to be around 4%, and consumer price inflation and underlying inflation are predicted to rise by 2.2 per cent and by 1.8 per cent respectively. Considering these points, the mid-term inflation target of 2.5 per cent looks a reasonable level to reflect an equilibrium unemployment rate

D. Transparency, Credibility and Accountability

The Bank of Korea also introduced various measures to enhance the transparency, credibility and accountability of monetary policy: First, the Bank of Korea sets a price stability target for the next year in consultation with the Government before the end of each year, and formulates and promulgates an operation plan for monetary and credit policies including this price stability within 15 days after the setting of the price stability target.

Second, every month the Bank of Korea officially announces the monthly direction of monetary policy immediately after the Monetary Policy Committee of the Bank has decided it, and the Governor explains its details in a press briefing.

[8] Note that hitting the target is very important in enhancing the credibility of inflation targeting and in 2000, consumer price inflation is expected to rise by 2.2 per cent on an annual average basis, while

Third, the Bank of Korea regularly publishes the minutes of Monetary Policy Committee meetings three months after each meeting.

Fourth, the Bank of Korea submits a Monetary and Credit Policy Report to the National Assembly twice a year, normally in March and October, and the Governor is required to answer the questions of member of the National Assembly on the report.

3. Necessary Conditions for Inflation Targeting

A. Central Bank Independence

The inflation targeting system was introduced in Korea, when the Bank of Korea Act was fully revised in 1997. The new Act is concerned to establish the neutrality and autonomy of monetary policy. The Governor of the Bank of Korea is now the Chairman of the Monetary Policy Committee, a post formerly the Minister of Finance and Economy. In that sense, the legal independence of the central bank has been secured.

In addition, before the end of each year, the Bank of Korea sets a price stability target for the next year in consultation with the Government, and then independently formulates and promulgates an operation plan for monetary and credit policies including this price stability. Accordingly goal independence also can be said to have been established although the inflation target itself is decided in consultation with the government.

Finally every month the Monetary Policy Committee of the Bank decides the direction of monthly monetary policy and then the Bank implements monetary policies in line with this direction. Therefore operational independence is also secured. However it has been partly pointed out that the monetary policies of the Bank should be implemented more independently of implicit or explicit government, political and social pressures.

On the other hand, bank supervision function was separated form the Bank of Korea when the Bank of Korea Act was revised in 1997 and then Financial Supervision Service was established. However, In order to implement the function of the 'lender of last resort' effectively, it is necessary for the central bank to collect

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underlying inflation is predicted to rise by 1.8 per cent.

information on financial market and financial institutions. In this regard, the BOK Act and the Act Concerning Establishment of Financial Supervisory Organizations endow the BOK with the following indirect and restrictive bank supervisory functions:

First, The BOK may request materials from banks, and from institutions engaged in financial business other than banks which enter into agreements to hold checking accounts with it.

Second, the BOK may require the FSS to examine banking institutions and to have employees of the BOK participate on a joint basis in the examination of banking institutions.

Third, the BOK may require the FSS to submit to it the findings of such examinations and on the basis of these findings to order corrective action by the banking institutions concerned.

Fourth, the BOK may, at its own initiative, check and confirm the operation and status of the assets of banks and of those profit-seeking enterprises to which the Bank extends emergency loans.

B. Capacity of Inflation Forecasting

The Bank of Korea has developed a series of macroeconometric models of the Korean economy since the early 1970s, revising the models every three or five years, and utilizing them extensively in analyzing the effects of monetary policy and predicting future economic trends. The Bank of Korea has now constructed a system of macroeconometric models by developing monthly and short-term forecasting models (quarterly models) and then an annual long-term forecasting model (Kim and Lee, 1998). Together with these structural models, the Bank has developed time series models using VAR and RegARIMA models for forecasting.

[Table 7] **System of BOK Models**

			Main Purpose	Sample Periods	Seasonal Adjustment	No. of Equations	Exogeneous Variables	Estimated Variables
Monthly Forecasting Model (July '97)		BOK97MD	Monthly Forecasting	86. I 97. I	Rate of increase compared with the corresponding previous year	7	6	GDP & Components
		BOK97MS	〃	90. I 97. I	〃	3	3	GDP, GNP, Non-Agri-cultural GDP
Short-term Fore-casting Model (July '97)	Struc-tural Model	BOK97L	Quarterly Forecasting	82. I 97. I	X12-ARIMA	24	16	GDP &, Components, BOP
		BOK97G	〃	〃	Rate of increase compared with the corresponding previous year	21	7	〃
	Time Series Model	VAR	〃	〃	Dummy Variables	5	None	GDP
		RegARIMA	〃	〃	Four Quarters Lagged	1	〃	GDP
Short-term Model (April '97)		BOK97	Policy Analysis	82. I 95.IV	X11-ARIMA	105	47	—
Annual Model (Dec. '97)		BOKAM97	Medium and Long-term Forecasting	1970 1996	—	65	23	GDP & Components, BOP, Prices

The Bank has also developed various elaborated and large-scale sectoral models in such areas as the price, financial, fiscal and external sectors, for policy effect analyses (Lee, 1999). In addition, it studies inflation pressure for monetary policy (Lee, 2000)

B. Controllability of Monetary Policy Instruments over Operating Targets

In Korea, it is reported that the call rate has unilateral causality over long-term interest rates and real economic variables and that this effect has become much more clearly marked recently, meaning that the central bank has some ability to control the call rate (Ahn and Oh ,1998; Oh, 1999a). The signaling effect has recently been becoming more pronounced.

The Bank of Korea implements open market operations through transactions involving RPs or Monetary Stabilization Bonds (MSBs). In general, MSB transactions are used for the overall adjustment of liquidity while RP transactions are carried out for fine tuning. Oh(1999a) studied whether transactions involving RPs or MSBs affect the call rate, using the Granger causality test, VAR and regression analyses on three variables: the issue rate of MSBs, the RP rate and the call rate[9]. The results of the Granger Causality test show that the RP rate significantly Granger causes the call rate, but not vice versa, while there is bilateral causality between the issue rate of MSBs and the call rate.

[Table 8] The Results of Granger Causality Tests

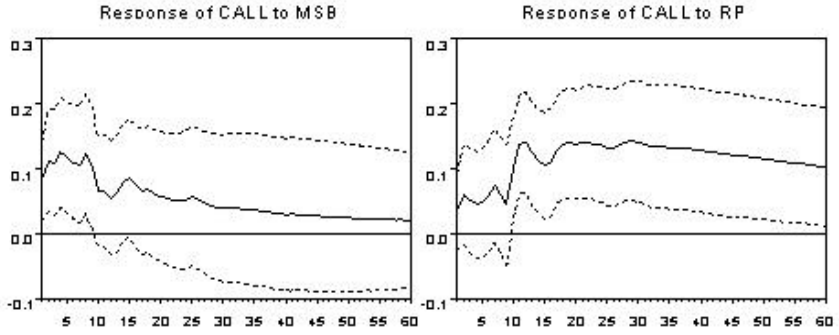
Granger	-	Causality	F-value	Significance level
RPs (1 day)	=>	Call(11day)	6.15	0.010
Call (1 day)	≠>	RPs (3day)	2.32	0.130
MSBs (1day)	=>	Call(11day)	8.25	0.005
Call (1 day)	=>	MSBs(1day)	9.13	0.003

Note: Figures in parentheses are the number of lag lengths chosen with the AIC criterion.

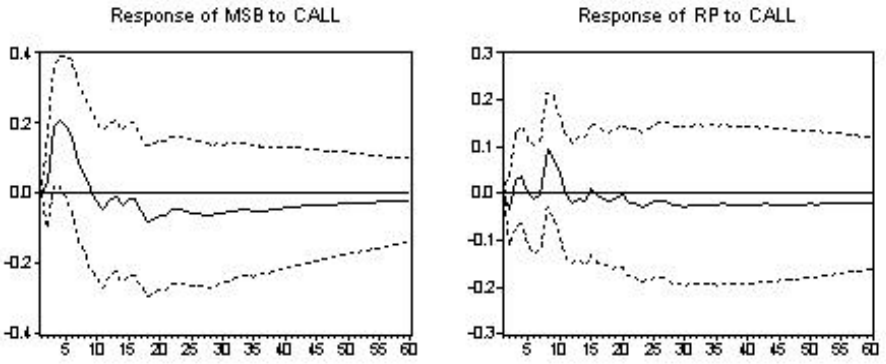
[9] In 1997, operations involving MSBs or RPs were carried out only 1-2 times a week, but they have been implemented almost every day since 1998 and, accordingly, the period form January 1 to May 30, 1998 was chosen as the sample period.
The results of unit root tests on the issue rate of MSBs, the RP rate and the call rate show that there are no unit roots on all three variables. Accordingly, the VAR model is constructed with level variables and the variables are aligned in the order of the issue rate of MSBs, the RP rate and the call rate considering the transmission mechanism. Nine days are chosen as the number of lag lengths using the Schwarz Criterion

Impulse response function analysis of the VAR model composed of the three variables shows that both the RP rate and the issue rate of MSBs affect the call rate and that the effect of the RP rate persists longer than that of the issue rate of MSBs (see Figure 7). On the other hand, the effects of the call rate on the RP rate and the issue rate of MSBs appear in the short run, which means that open market operations such as the issue of MSBs or RP transactions have been implemented in consideration of the movements of the call rate (see Figure 8).

[Figure 7] Impulse Response of MSB and RP Rates on Call Rate



[Figure 8] Impulse Response of Call Rate on MSB and RP Rates



In addition, the results of decomposition analysis show that the effect of the issue of MSBs on the call rate is stronger in the short run while that of RP transactions becomes stronger over time (see Table 9).

[Table 9] Results of Decomposition Analysis of Call Rate

(%)

Lag(days)	MSBs	RPs	Call
6	22.89	4.64	72.47
12	26.72	16.29	56.98
24	23.98	38.94	37.08
36	20.12	52.15	27.73

Besides this, the results of regression performed by the Cochrane-Orcutt method considering a serial correlation problem show that both the MSB and the RP rates affect the call rate and that the coefficient of the latter is larger than that of the former.

Call Rate = 9.755 + 0.345 RP Rate + 0.162 MSB Rate

(14.87) (9.02) (4.19)

Notes: 1) Figures in parentheses are t-values.

2) Estimated by Cochrane-Orcutt method due to a serial correlation.

C. Effective Channel of Interest Rates on Prices

In Korea, the main transmission channel has shifted, reflecting changes in the financial market environment. The monetary channel was predominant in the 1970-80s when inflation was relatively high and demand for money relatively stable (Kim and Oh, 1990), while the role of the interest rate channel became significant in the early and mid 1990s when demand for money became unstable due to financial innovation and the liberalization of interest rates (Kang, 1994; Kim ,1995; Park et al., 1996). In recent years, in line with the opening of financial markets, the importance of the exchange rate channel has begun to be emphasized (Lee, 1997; Koh, 1998). In addition, the role of information variables such as MCI and interest rate spreads has received attention (Yi, 1996; Oh, 1997; Koh,

1998).

In an inflation targeting system, the interest rate channel is important since it is a system where a short-term interest rate is used as an operating target, without any explicit intermediate target, to achieve the inflation target. Oh(1999b) examined the transmission effects of the interest rate on prices using structural vector autoregression (SVAR) models where long-run and contemporaneous identifying restrictions were employed, as in Blanchard and Quah(1989), Gali(1992), and Gerlach and Smets(1995). The SVAR model is composed of four quarterly variables;[10] namely, GDP, CPI(or underlying CPI[11]), MCT and the call rate, whose sample period is from the 1st quarter, 1990 to the 4th quarter, 1998.[12] A dummy variable is included from the 4th quarter, 1997 to the 4th quarter, 1998 to take account of the financial crisis that erupted in Korea in late November 1997[13].

The results of impulse response function analysis show that an increase in the call rate begins to reduce prices from three quarters out and its effect persists over the long run. The effect of the price reduction appears to be largest in the fourth quarter[14] [15].

The results of variance decomposition analysis show that the effects of a call rate increase both on consumer prices and on underlying consumer prices calculated by the method of adjustment by exclusion also begin to appear in the third quarter and persist over the long run. In particular, the effect of a call rate increase on prices is relatively stronger than that of a money shock.[16] [17].

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[10] Sims(1980), Stock and Watson(1989) analyze the transmission effects of monetary policy with a four- variable VAR model.

[11] Underlying inflation rate 1 is produced by the method of adjustment by exclusion to strip out the prices of agricultural and marine products and of energy from the components of the Consumer Price Index, and underlying inflation rate 2 additionally excludes the prices of public utilities. On the other hand, underlying inflation rate 3 is produced by the trimmed mean method where a trim of 15 percent of both tails of the frequency distribution was adopted to estimate a trimmed mean inflation rate.

[12] Taking into account interest rate regulation, which persisted throughout the 1980s, a sample period after 1990 was chosen.

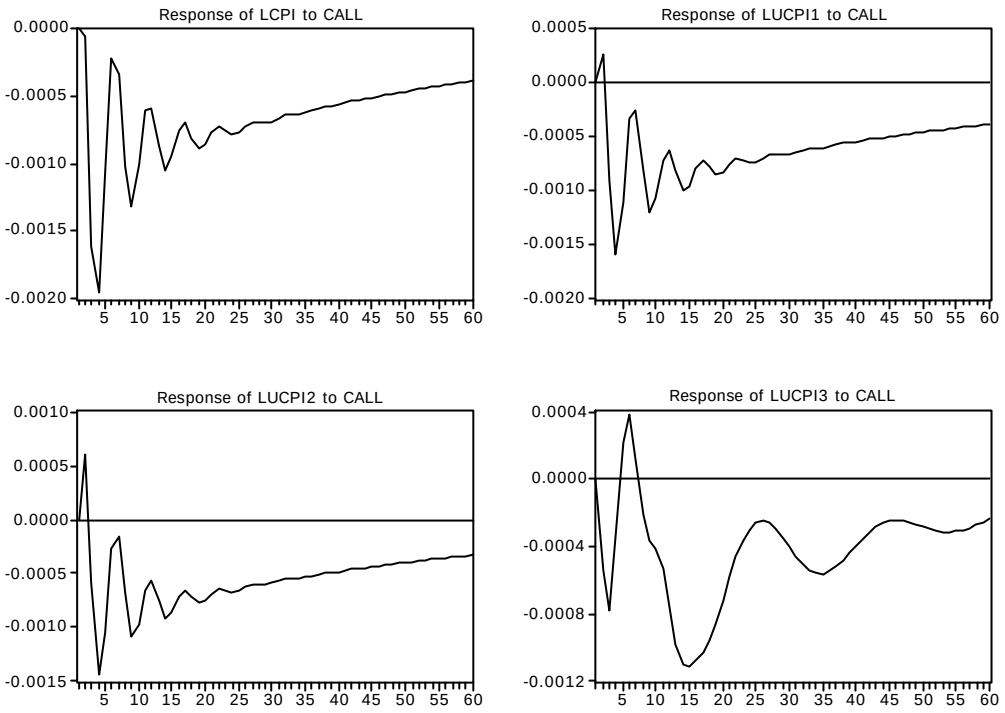
[13] See Oh(1999b) for the details of the model.

[14] This result is similar to the result of Oh(1999a) based on six-variable (real MCT, the call rate, the real exchange rate, the long-run real interest rate, industrial production index, CPI) SVAR analysis.

[15] On the other hand, trimmed mean underlying consumer prices drop in the second quarter and become the lowest in the fifteenth quarter after the call rate shock

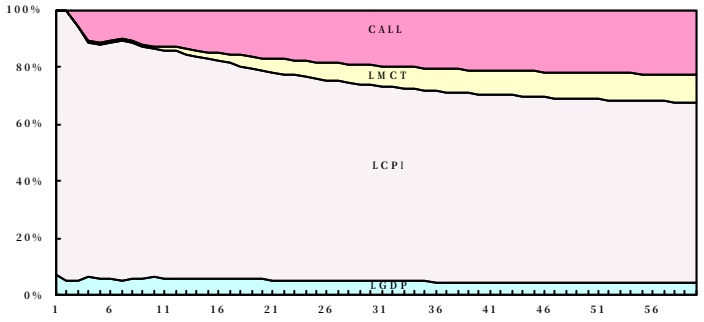
[16] It is reported that an increase in the money stock reduces prices in the beginning, due to cost-saving effects, but as aggregate demand increases, prices soon begin to increase and the rate of increase is the highest from twelve to eighteen quarters after the shock.

[Figure 9] Impulse Response of the Call Rate on Prices



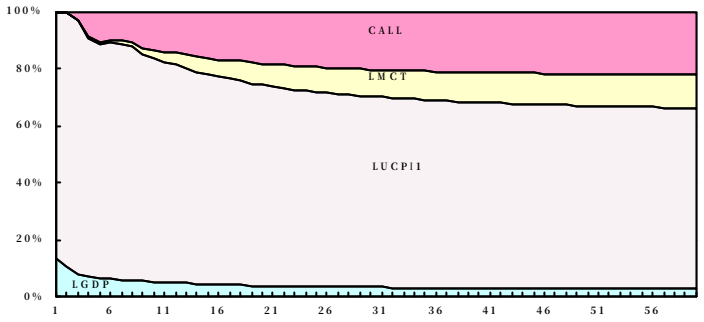
[Figure 10] Results of Forecast Error Variance Decomposition of Prices

C P I

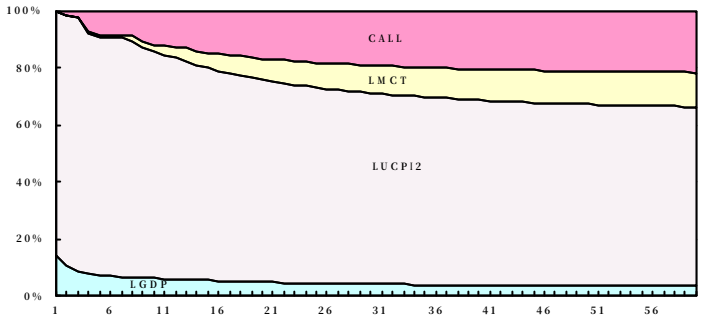


UCPI1

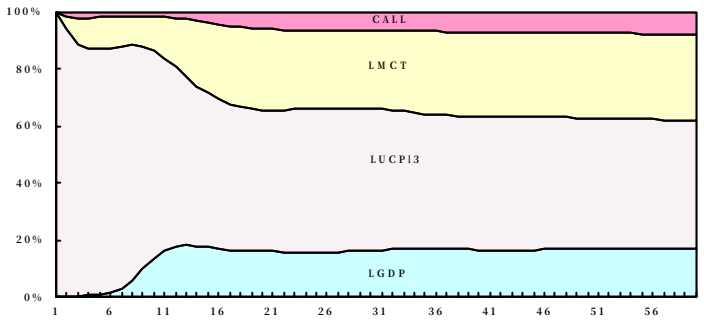
[17] But the effect of a call rate shock on underlying consumer prices calculated by the trimmed mean method is weaker than that of money.



UCPI2



UCPI3



According to the estimated long-run multiplier matrices, the multipliers of the call rate on prices have the expected negative values. The multipliers on the consumer price index and the underlying consumer price indices calculated by the method of adjustment by exclusion are greater than those on the underlying consumer price index calculated by the trimmed mean method.[18]

[18] On the other hand, the money stock is analyzed as having a positive relationship with GDP and CPI, which tells us that money is not neutral in the long-run. Stock and Watson(1989), using a four-variable VAR model, also analyzed money as not being neutral in America in the long-run.

[Table 10] Long-Run Multiplier Matrices

Model based on CPI

	U_y	U_p	U_m	U_r
LGDP	0.0179	0.0213	0.0763	-0.0713
LCPI	0.0053	0.0602	0.0335	-0.0499
LMCT	-0.0095	0.1174	0.1866	-0.2054
CALL	2.0993	0.2735	0.0000	1.7981

Model based on UCPI1

	U_y	U_p	U_m	U_r
LGDP	0.0167	0.0729	0.0697	-0.0722
*LUCPI*1	-0.0067	0.0731	0.0346	-0.0480
LMCT	-0.0211	0.2423	0.1689	-0.1996
CALL	1.5257	-0.5908	0.0000	1.8285

Model based on UCPI2

	U_y	U_p	U_m	U_r
LGDP	0.0255	0.0630	0.0695	-0.0732
*LUCPI*2	-0.0001	0.0605	0.0315	-0.0417
LMCT	0.0051	0.2099	0.1725	-0.1994
CALL	1.5266	-0.5371	0.0000	1.8382

Model based on UCPI3

	U_y	U_p	U_m	U_r
LGDP	0.0223	-0.0240	0.0994	-0.0581
*LUCPI*3	0.0168	0.0143	0.0475	-0.0347
LMCT	0.0209	-0.0265	0.2547	-0.1637
CALL	1.8173	0.1111	0.0000	1.7811

E. Credibility and Flexibility of Monetary Policies

As shown in Figure 2, there is the trade-off between inflation and output variability in Korea. Accordingly the optimal degree of the trade-off between credibility and flexibility is important. Oh(1999a, 1999b) derives Taylor-type interest rate rules for Korea to find out the optimal degree of the trade-off between credibility and flexibility. Taylor-type interest rate rules derived on the basis of the inflation rates and the underlying inflation rates are as follows. The long-run trend of the inflation rate instead of the target inflation rate was calculated by the five-year moving-average of the inflation rates estimated with the above SVAR model. However, the potential GDP growth rate was calculated through HP filtering of actual GDP. We take a two-step approach to derive the above interest rate rules following Clarida and Gertler

(1996): First, the dynamic reaction functions of the Bank of Korea are estimated, and second, policy rules are derived from the estimated reaction functions. The sample period is from the 1st quarter 1990 to the 4th quarter 1998, and the OLS method was used for the estimation.

The estimated dynamic reaction functions show that all the coefficients of inflation gaps are statistically significant, while those of the GDP gaps of the functions based on underlying inflation rate 1 and underlying inflation rate 2 are relatively insignificant. In the interest rate rules derived from the dynamic reaction functions, the coefficients of the inflation gap and the GDP gap are positive as expected. In particular, the estimated coefficients of the inflation gap are 1.4(based on the rate of increase in CPI) and 1.7~1.9 (based on the underlying inflation rates). Hence, when an underlying inflation rate is adopted as a target indicator, if the inflation gap increases by one percentage point, it seems desirable to raise the nominal call rate by 1.7 to 1.9 percentage points, which means the real call rate should be raised by 0.7 to 0.9 of a percentage point.

[Table 11]

Interest Rate Rules

A. Based on the Inflation Rate

Dynamic Reaction Function

$CALL_t = 7.037 + 0.864\ INFGAP + 0.268\ GDPGAP + 0.398\ CALL_{t-1}$

(2.894) (2.881) (2.002) (2.089)

R bar 2 = 0.413

Interest Rate Rule

$CALL_t^* = 11.695 + 1.435\ INFGAP + 0.445\ GDPGAP$

B. Based on Underlying Inflation Rate 1

Dynamic Reaction Function

$CALL_t = 6.725 + 1.208\ INFGAP + 0.196\ GDPGAP + 0.365\ CALL_{t-1}$

(2.485) (2.301) (1.390) (1.590)

R bar 2 = 0.381

Interest Rate Rule

$CALL_t^* = 10.589 + 1.902\ INFGAP + 0.309\ GDPGAP$

C. Based on Underlying Inflation Rate 2

Dynamic Reaction Function

$CALL_t = 6.798 + 1.059\ INFGAP + 0.196\ GDPGAP + 0.370\ CALL_{t-1}$

(2.505) (2.318) (1.386) (1.630)

R bar 2 = 0.382

Interest Rate Rule

$CALL_t^* = 10.797 + 1.682\ INFGAP + 0.311\ GDPGAP$

D. Based on Underlying Inflation Rate 3

Dynamic Reaction Function

$CALL_t = 5.672 + 0.983\ INFGAP + 0.256\ GDPGAP + 0.454\ CALL_{t-1}$

(2.414) (2.495) (1.849) (2.431)

R bar 2 = 0.365

Interest Rate Rule

$CALL_t^* = 10.391 + 1.800\ INFGAP + 0.470\ GDPGAP$

Note: Figures in parentheses are t-values.

4. Performance and Issues in Inflation Targeting in Korea

A. Performance

In Korea, only four and a half years have passed since the inflation targeting system was introduced. Accordingly it seems too early to assess the performance of the new system. Nevertheless, a few following points are noticeable in the Korean experiences.

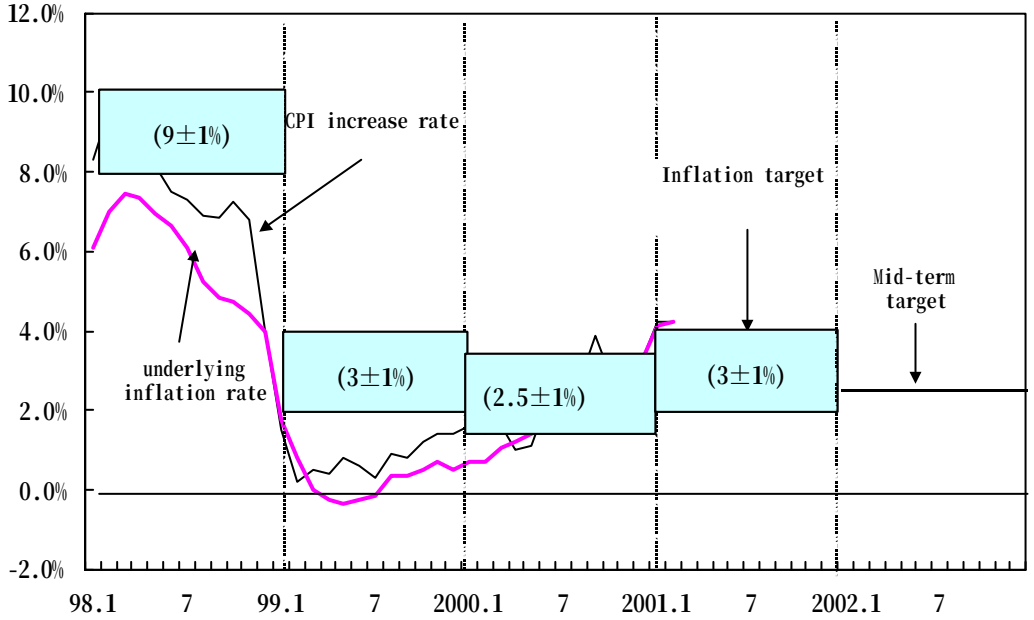
First, the average rate of inflation after the adoption of the inflation targeting system is much lower than that before it was introduced (See Figure 11). In 1998 and

1999, the actual inflation rates even remained far below the inflation targets. In 1998, CPI maintained a downward trend from March onwards, and, as a result, it rose only at an annual rate of 7.5% in 1998, which stayed below the lower bound of its target range, mainly with the help of the decline in major cost factors, such as the exchange rate and wages, and the government's restraint in raising charges for public services. In 1999, the Consumer Price Index rose by 0.8 of a percentage point, which remained well below the inflation target of three per cent thanks to excess demand pressures still remaining at a low level on the demand side, and the reduced costs of imports due to the continuing appreciation of the Korean won, the reduced burdens of financial costs borne by business firms owing to improved financial structures, and the easing of interest rates and decline in manpower costs reflecting the improved labor productivity and labor market flexibility on the production cost side.

In 2000, the economy returned back to the normal situations. In particular, the effect of sharp appreciation of the Korean Won after the depreciation during the crisis, which had contributed to make the inflation rates remain below the lower bound of the inflation target in 1998 and 1999, has almost absorbed. Nevertheless, the inflation rate in 2000 and 2001 remained in the band of the inflation target.

[Figure 11]

Inflation Target and Inflation Rates



Second, in the operating system of monetary policy, the function of the call rate as the operating target has been much strengthened. Since the adoption of inflation targeting, participants in the financial markets have become much more sensitive to a change in the call rate.

Third, the independence of the central bank and the transparency of monetary policy in inflation targeting countries have been enhanced. As a result, inflation expectation has decreased and the credibility of monetary policy has been enhanced.

B. Issues

In spite of the above performances, some issues to be considered have been observed. First, it has been raised how much importantly financial market stability should be taken into account under the inflation targeting system.

Korea was carrying out financial and corporate restructuring when inflation targeting was adopted in 1998. Accordingly the Bank of Korea had to take into account financial stability as well as price stability in implementing monetary policies. Upon the outbreak of the currency crisis, the Bank had dramatically raised its market intervention rate in consultation with IMF to 35 per cent in order to engineer a rapid stabilization of the exchange rate. Thus, major market interest rates had increased to 30 40 per cent at the end of 1997 and they remained at around the 20 per cent level until the March, 1998. This high interest rate policy was the only viable option in order to secure foreign currency liquidity and to stabilize the exchange rate, in the face of the surge in capital outflows due to the loss of international confidence.

But there were a number of malign side-effects accompanying the high interest rate policy. It accelerated the slowdown in real economic activities through its contraction of consumption and, investment, and it greatly increased the incidence of corporate failure and the accumulation of bad loans by financial institutions.

In response, in order to prevent too deep a contraction of the real economy, the Bank steadily lowered its market intervention rate from the second quarter, when foreign exchange market conditions had improved considerably, thanks to the sustained current account surplus, the arrival of support funds from the international financial institutions, and renewed inflows of foreign investment capital. Call rates consequently dropped to 8.5 per cent by the end of August in 1998. As the Bank

steadily brought down its market intervention rate, the call market rate eased to 6.5 per cent by the end of December.

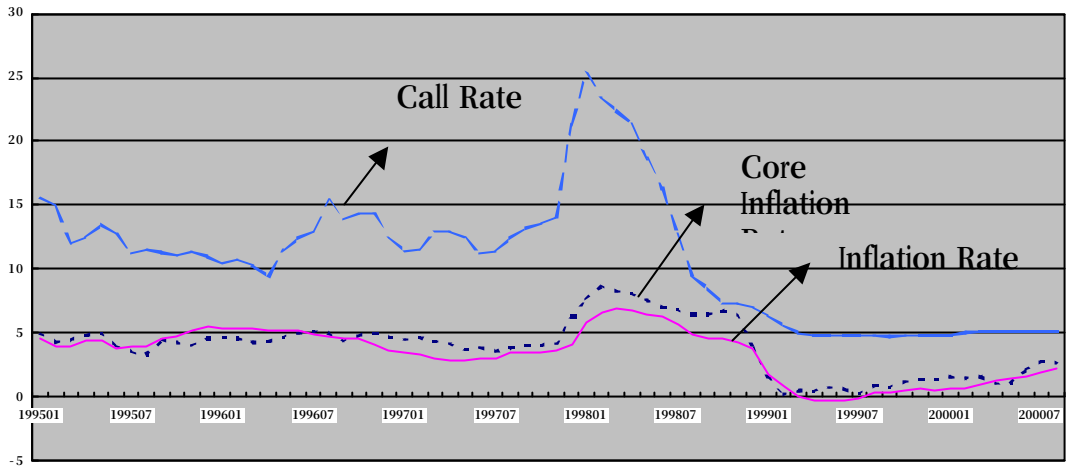
During the first half of 1999, the financial and foreign exchange markets attained a fair degree of stability. In contrast, financial markets experienced increased uncertainties during the second half of the year, and their re-stabilization became a primary consideration for policy-makers. In particular, the difficulties of the troubled Daewoo Group and investment trust companies' overhang of potential beneficiary certificates redemptions led to a renewed focus on financial market stability in the framing of interest rate policy from August onwards. The Bank regarded it as the most important to stabilize the financial markets and thus reduced the call rate step by step, finally bringing it the level of 4.75 per cent in May 1999, which was maintained until January, 2000.

With the help of the low interest rate policy, the real economy had accelerated its upward trend, with GDP growth rate of 10.7 per cent in 1999. Stock prices had been also exhibiting a sharp increase over a short period, raising apprehensions over an asset price bubble. Long-term interest rates had been also rising in response to the rapid expansion of the real economy and fears of financial market instability, thus widening the spread between long-term and short-term rates. Taking these points into consideration, the Bank of Korea has decided to raise its target for the overnight call rate from around 4.75 percent to around 5.00 percent in February.

In 2000, inflation pressures apparently increased mainly due to the surge in international oil prices and rises in public service charges and in prices of farm-livestock-fisheries products. On the other hand, the financial markets showed large fluctuations due to a combination of factors including a rapid rise in international oil prices, the drop in semiconductor prices, and the breakdown of the planned deal for Daewoo Motor Company. Taking price movements and the situation of the financial markets into consideration, the Bank of Korea raised its target for the overnight call rate from 5.00 percent to 5.25 percent in October, 2000.

[Figure 12]

Call Rates and Inflation Rates



On the other hand, inflation targeting countries tend to separate from the central banks the function of financial supervision that previously came under its aegis. It is, however, widely reported that the more detailed information on financial markets and financial institutions which can be collected during financial supervision is useful and important to enhance the effectiveness of monetary policy even in normal periods. Of course, in a period of financial crisis, central banks need detailed information on financial markets and financial institutions to play an appropriate role as the lender of last resort. Accordingly, although the primary objective of central banks in inflation targeting countries is not financial stability but price stability, it is desirable for central banks to retain some functions of financial supervision.

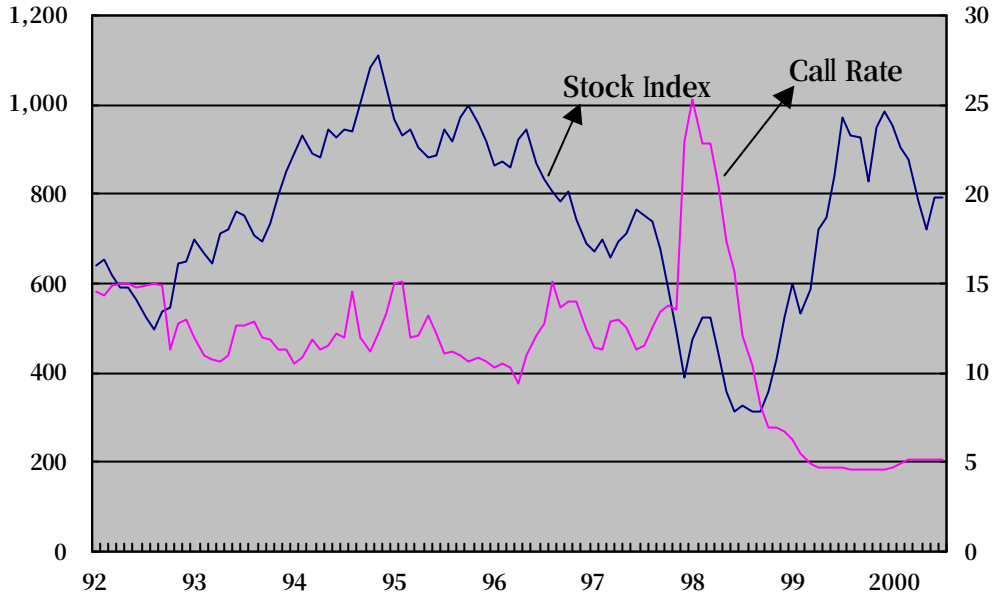
Second, it has been also raised as an important issue to what extent exchange rate should be taken into account in a small open economy adopting the inflation targeting system and what kind of exchange rate system is appropriate to the inflation targeting system.

A boom in the stock market encouraged by the low interest rate policy induced the inflow of capital into the Korean stock market, which led to the appreciation of Korean Won. As a result, the surplus of the current account began to deteriorate. Accordingly it seems difficult for a small open economy as Korea to carry out monetary policy focusing only price stability regardless of its current account situation and financial market stability, although it adopts the inflation targeting system. In other words, the problem of ‘the impossibility of the holy trinity’ may take

place.

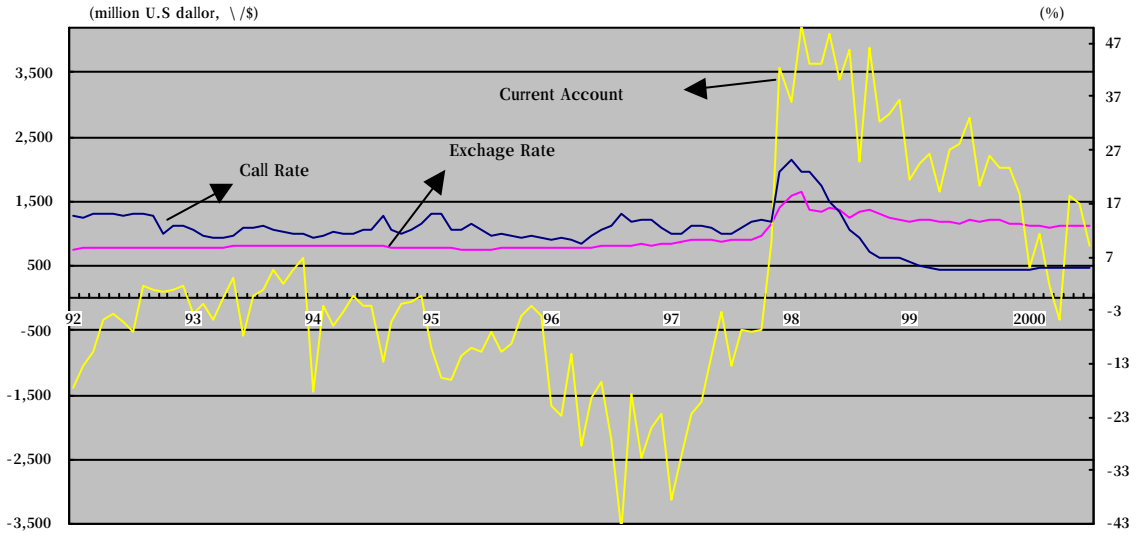
[Figure 13]

Call Rate and Stock Index



[Figure 14]

Call Rate, Exchange Rate and the Current Account



Countries with an inflation targeting system tend to adopt a freely floating

exchange rate regime. The issue is, however, whether the central bank of a small open economy can disregard the volatility of the exchange rate considering the current account position and the degree of financial stability in that country. Taking into account this issue, Israel adopts band crawling exchange rate regime in spite of inflation targeting.

Third, in order for inflation targeting to be successfully carried out, the effectiveness of the interest rate channel of monetary transmission must be strengthened. Needless to say, monetary policy instruments and financial markets should be developed and government intervention in financial markets should be avoided to strengthen the effectiveness of the interest rate channel.

IV. Conclusions

In Korea, only four and a half years have passed since the inflation targeting system was introduced. Accordingly it seems too early to assess the performance of the new system. Nevertheless, the average rate of inflation after the adoption of the inflation targeting system is much lower than that before it was introduced. Moreover, the independence of the central bank has been enhanced in legal and operational term, the controllability of the central bank over the call rate is gradually increasing, and the price effect of a change in the call rate begins to emerge three quarters later and then persists over the long run. Form these results, we may conclude that the conditions for inflation targeting have greatly improved in Korea.

Not all conditions, however, are yet satisfied for the implementation of inflation targeting. In order to improve them, we should strengthen the capacity to forecast inflation accurately, enhance the effectiveness of the interest rate channel, and increase the credibility of monetary policy. First, in order to strengthen the capacity to forecast inflation, what is desirable is the development of various techniques of forecasting inflation, the compilation of underlying inflation, and the development of inflation pressure indexes. Second, in order to enhance the effectiveness of the interest rate channel, we need to improve the function of the call rate as an operating target, to develop the government bond market, among other financial markets, and to develop more useful information variables. Finally, for the strengthening of the credibility of monetary policy, monetary policy should be conducted more consistently and transparently and central banks must also have more communications with the public to make them understand what inflation targeting is and what underlying inflation rate is.

In addition, one of important issues to be studied is whether and how the central bank of a small open economy can conduct monetary policy to achieve the final objective of price stability in harmony with maintaining its financial stability and the current account.

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