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Stabilization program in a small semi-open economy with foreign debts and controlled interest rates

Yoon, Yeo Hun, Ph.D.
The Ohio State University, 1987
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STABILIZATION PROGRAM IN A SMALL SEMI-OPEN ECONOMY
WITH FOREIGN DEBTS AND CONTROLLED INTEREST RATES

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree of Doctor of Philosophy in the Graduate
School of The Ohio State University

by

Yeo Hun Yoon, M.I.P.P.

*****

The Ohio State University
1987

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1987
To My Parents
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CHAPTER I
INTRODUCTION

Most developing countries (DCs), where foreign capital has played an important role in their economic development, have the common twin problems of a high domestic inflation rate and a balance of payment (B/P) deficit. The cause of these problems can often be attributed to government fiscal deficits, monetary expansion, or foreign debts which could result in increases in money in the process of economic development. Thus the twin problems are the side effects of growth in DCs, especially when such economies pursue high growth rates of GNP under a government-oriented strategy with foreign debts.

One of the most important issues in DCs during the 1980s is how to solve the exploding foreign debt by improving the trade balance while maintaining an increase in real income with stable domestic prices. In other words, this is a problem of how to set up and implement a reasonable stabilization program using appropriate, monetary, and foreign exchange rate policies. Therefore, in this paper, I define a stabilization program as a policy-package which aims at generating a trade surplus and minimizing recession or inflation. Economic situations, stabilization policies pursued, and the failure or success
of the stabilization program vary from economy to economy. In this paper, I will focus on the issues of the Korean stabilization.

In order to understand recent economic experiences and policy problems, we need to understand the development process before 1980. Economic development in Korea during the 1960s and the 1970s had been successful due to the strategies of outward-oriented and government-oriented development. Economic conditions included scantily endowed natural resources, a lack of capital accumulation due to a low savings ratio, a low level of technology advancement, and a narrow domestic market. Under this environment, the government established economic development plans with the help of foreign capital, expansionary fiscal and monetary policies, the imitation of advanced foreign technology, and a world-wide economic boom. In the process, the government utilized a range of policy instruments which include expansionary fiscal and monetary policies, and controlled interest rate policy. In addition, the government especially pursued an export-led development strategy due to the belief that Korean development was thought possible only by the production and export of manufactured goods through the effective use of human resources.

As a result of four five-year development plans lasting through 1980, the Korean economy was transformed to a leading developing economy. In 1961 before the economic development plan, real GNP per capita was only $105 and two thirds of the labor force were employed in the primary sector. Also, exports were only $41 million and were almost all raw materials and food. Two decades later in 1981, however,
real GNP per capita increased to $1719 and exports rose to $21 billion with the help of subsidies. In addition, the structure of industry had become more advanced.

Although some economists might argue that the B/Ps deficits and high inflation are not necessarily a prerequisite for high economic growth, the serious problems of the Korean economy before 1980 included exploding foreign debt and high chronic inflation which may have been the costs of high economic growth. The government, in early 1980, changed its economic goal from that of quantitative growth to qualitative stabilization in an effort to control inflation and improve B/Ps deficit. Thus, new stabilization policies were implemented.

The new schemes consisted of a complicated structure of the low controlled interest rates and high official rates for foreign borrowing; floating exchange rates accomplished by pegging to a basket of the Special Drawing Right(SDR) and some indexes of real income, inflation rates, and trade volumes with government intervention in foreign exchange markets; a decreased growth rate of $M_2$; and direct price controls on major commodities. In the program, the government emphasized monetary policy and government intervention in foreign exchange markets more than fiscal policy, since the government expected that a decreased growth rate of money could moderate previous high inflation rates. Also, floating exchange rates with government intervention were expected to reflect the real purchasing power of Korean currency and solve the trade deficits. The program turned out
to be successful in terms of improving trade balance and inflation control.

In this paper, I will clarify how these recent experiences stem from the stabilization policies pursued. Further, I will suggest some recommendations for the Korean stabilization program. More specifically, in the Korean economy, interest rates cannot fluctuate freely in the money market according to money supply and demand, but are arbitrarily controlled and fixed by the government. Therefore, the interdependence of money stock and interest rates does not hold. Thus, the main purposes of this paper are to show whether or not controlled interest rates, compared to flexible interest rates, have improved the effectiveness of the Korean stabilization program and to show whether or not the monetary policies pursued have been harmonized with a floating exchange rate system. The arguments in this paper are related to the debate about the effectiveness of the liberalization of controlled interest rates for stabilization in DCs. All analysis is undertaken within the given conditions of the Korean economy, which are explained later.

In chapter II of the literature review, I examine studies regarding the effectiveness of monetary and foreign exchange rate policies which are the part of the stabilization programs followed by the government. My major purpose is comparing the relative effectiveness of the money stock policy under the controlled interest rate policy with that of money stock policy under market determined interest rates under both flexible and managed floating exchange rates.
Therefore, my review will focus on the studies regarding the effectiveness of monetary and foreign exchange rate policies, and the liberalization of curb interest rates. The review consists of three parts. First, monetary policy under flexible exchange rates within the framework of the Mundell (1961)–Fleming (1962)–Dornbusch (1976) model is examined. Then I explore the effectiveness of monetary policy in the stabilization programs of DCs within the context of the so-called conventional and monetarists model defined by Dornbusch (1982). Last, studies about the liberalization of controlled interest rates are reviewed. I recognize that I cannot directly apply the above models to the Korean case, as the implicit and explicit assumption concerning interest rates is that they are freely determined by supply and demand in the money market and are therefore a function of the amount of money. Even papers about the liberalization of controlled rates failed to reflect the typical structure of controlled rates in the Korean economy. In addition, in order to evaluate the Korean stabilization program, I have to consider the typical characteristics of the Korean economy, such as an imperfect capital mobility, strong government intervention in foreign exchange markets, and lack of PPP in the short run.

In order to build an appropriate model that captures the characteristics of the Korean economy, in chapter III I analyze the Korean economy in detail. After comparing the economic situation before the stabilization of 1980 with that after the program, I examine the origin of recent economic experiences and present the merits and
problems of the controlled interest rate policy. I see the trade-off between exploding foreign debt and high growth or high inflation. Also, I see that the controlled low interest rate policy resulted in widespread black markets where curb rates were higher than official rates, and also that high official rates for foreign borrowing allowed exploding foreign debts.

The questions that arise are as follows. First, I have to examine how the typical controlled interest rate policy has attributed to these recent experiences. The government has maintained low official rates domestically and high official rates for foreign borrowing. Moreover, the government controlled official rates in the output market differently according to the priority of the project for its development. On the other hand, curb rates have been much higher than all official rates. Because all official rates were below market clearing rates and the aggregate amount of credit determined by the government was less than the demand for credit, excess demand existed in the money market. Thus, the curb markets played an important role in the financial sector and in the aggregate demand. If interest rates had been freely determined by market supply and demand, the effective market clearing rates would have been much lower than the actual curb rates. My main concern is how controlled interest rates have attributed to inflation control, amount of foreign debt, and real income in the process of stabilization.

Another question is about the foreign debt program. After examining how monetary and foreign exchange rate policies contributed
to exploding debts in the 1970s, I propose a government intervention policy in foreign exchange markets to increase the ability to meet debt service payments through increase in real income. Further, I demonstrate how controlled rates and the government intervention policy in foreign exchange markets could affect the debt problem, inflation control, and increase in real income. I do not consider the optimal amount of foreign debts.

Secondly, as I argue that the exogenous changes in foreign demand for domestic commodities play an important role in aggregate output and in the trade balance, and that strict purchasing power parity (PPP) in the short run is not a dominant feature in the Korean economy, I have to examine how those features affect real income, the amount of foreign debt, and inflation rates under both controlled interest rates and flexible rates. Finally, the role of flexible exchange rates is examined and compared with the role of managed floating rates with foreign exchange intervention.

In order to answer the above questions and suggest an appropriate policy rule, in chapter IV I build a macro model under the assumptions of a small economy, PPP not holding in the short run, imperfect capital mobility, and sticky domestic prices which could be regarded as appropriate phenomena in the Korean economy. The model is an extension of the Mundell-Fleming-Dornbusch model incorporating the characteristics of the Korean economy such as the foreign debt problem, and controlled interest rates.
In chapter V, I derive the reduced forms of real income, trade balance or inflow of foreign capital, inflation rates, and interest rates which can be used for comparing the merits and disadvantages of the controlled interest rate system with those of flexible interest rates for the purpose of stabilization. The reduced forms are used for presenting reasonable policy rules for stabilization. Besides that, I derive stability conditions for the structural model from which I can exclude unstable cases and prove the long run neutrality of the model.

In chapters VI, and VII, I focus on the comparisons of the effectiveness of the controlled interest rate policy with that of the flexible interest rate under flexible and managed floating exchange rates. In examining the policy effectiveness, I calculate and compare how an expansionary monetary policy and an increase in foreign demand for domestic commodities would affect real income, trade balance or the amount of inflow of foreign capital, and inflation rates under each different interest rate system. By doing this, I can evaluate the merits and disadvantages of each interest rate system and propose a reasonable stabilization policy which aims at obtaining the simultaneous effects of improving trade balance, moderating high inflation, and increasing real income.

In chapter VIII, I evaluate the roles of curb rates and the degree of government intervention in foreign exchange markets under the curb rates as well as under the flexible rates. I will demonstrate that, in a small economy where interest rate differentials cannot play a role of arbitraging for international capital movements, curb rates could play
a role in paradoxically moderating high inflation rates and exploding foreign debt under certain circumstances, so that controlled interest rates could play the role of built-in stabilizer in the process of stabilization while flexible interest rates could not. This argument coincides with the second best arguments in welfare economics where a distorted policy (controlled interest rates) could make the distorted economy be better off than a perfectly competitive price (flexible interest rate). I also suggest a reasonable range of the degree of government intervention in order for a small economy to obtain a trade surplus and a positive real income effect with a tolerable inflation rate. The target of a stabilization program could be different from time to time according to economic situations; however, in this paper, I define a goal of stabilization as obtaining the simultaneous effects of generating trade surplus and increasing real income with stable prices.

Also, by combining the effects of changes in terms of trade and real money, I suggest a desirable government intervention policy in foreign exchange markets with which the economy could exploit the merits of controlled interest rates. I also suggest that, in a small semi-open economy, a managed exchange rate system would be superior to a flexible exchange rate system for stabilization. In a perfectly flexible exchange rate system, the effects of an expansionary monetary policy and an increase in foreign demand for the domestic commodities depend only on the parameter values of the structural model, so that
there is no room for a government to exploit the merits of government intervention rules for stabilization.

The final chapter contains my summary and some recommendations for the Korean stabilization program, as well as concluding remarks about the limitations and further research of this subject.
CHAPTER II

LITERATURE REVIEW

The review consists of three parts. First, I discuss the effectiveness of monetary policy in the stabilization with the aim of achieving full employment. I examine the seminal models of Mundell(1961), Fleming(1962), and Dornbusch(1976), which point out the effectiveness of monetary policy under flexible exchange rates. Second, I explore the effectiveness of monetary policy in the stabilization programs of DCs towards reducing high inflation and improving B/Ps. I introduce the so-called conventional and monetarists' model defined by Dornbusch (1982). Finally, I examine some related studies about the liberalization of controlled interest rates in DCs.

Based upon the so-called assignment problem of Mundell(1961) and Fleming(1962), Mundell(1963) shows the effectiveness of monetary policy under flexible exchange rates within the context of the monetary approach to the B/Ps. Monetary policy can affect real output under flexible exchange rates; however, fiscal policy cannot. Under the assumptions of perfect capital mobility and fixed domestic prices, flexible exchange rates are the transmission mechanism by which a
monetary expansion increases real output consistent with money market equilibrium, so that the increase in income is brought about by a depreciation of the home currency.

Dornbusch (1976) extended the Mundell-Fleming model. He added exchange rate dynamics under the assumptions of sticky domestic prices, rational expectations concerning foreign exchange rates, perfect capital mobility, and a small country, and showed the effectiveness of monetary policy and short run overshooting of exchange rates under flexible exchange rates. According to Dornbusch, a restrictive monetary policy raises domestic interest rates due to sticky prices, and threatens to disturb the interest parity condition resulting in a capital inflow. To maintain interest parity, the entire expected exchange rate path must adjust to generate subsequent expected depreciation sufficient to offset higher interest rates. For this to happen, the initial decrease in money causes the exchange rate to appreciate suddenly (overshooting), and subsequently, to depreciate gradually. The initial appreciation raises the real exchange rates, and reduces the demand for domestic goods. These recessionary effects of appreciation are reinforced by higher interest rates, so that restrictive monetary policy results in recession. In the above Mundell and Dornbusch models, monetary policy moves domestic prices in the long run, and level of output in the short run. The conclusion of the effectiveness of monetary policy depends upon these crucial assumptions.
Within the context of stabilization programs in DCs which aim at reducing high inflation rates and improving the B/Ps, Dornbusch (1982) explained the so-called conventional and monetarists' models. Both models suggest that inflation and external deficit in DCs often have common sources of monetary expansion due to budget deficits and external debts. The conventional model is represented by the Poincare stabilization program in 1926-28 in France (Sargent 1983). Focusing on money-financed budget deficits, the symmetry between budget and B/Ps imbalances, and the role of the real exchange rate, this program suggests that the correction of inflation and external deficits should come from monetary and fiscal reduction, and a real depreciation. On the other hand, the monetarists' model, under the assumptions of strict PPP and perfect capital mobility with rational expectations, argues that disinflation is costless and a stabilization scheme involves merely finding and implementing an appropriate exchange rate. Dornbusch (1982) showed that both models are incorrect as the short run description of inflation control. The conventional model is basically a long-run model, and the short run failure of the monetarists' model is attributable to the strong assumptions of strict PPP and perfect capital mobility, which are not considered as appropriate features in the Korean economy.

After the collapse of the Bretton Wood System in 1973, the model of exchange rate determination under the asset market approach was extended to explain the effectiveness of stabilization policies. Based upon the contracting model [Fischer (1977), Phelps and Taylor (1977),
Taylor (1980) and the incomplete information model [Lucas (1972, 1975), Barro (1976)], monetary policy has no capacity to affect long run real output. However, unanticipated changes in the money supply may temporarily affect the real output.

Research on the beneficial effects of the liberalization of controlled rates in DCs in terms of economic development has been active since the seminal works by McKinnon (1973) and Shaw (1973). McKinnon (1973), Shaw (1973), Galbis (1977, 79), Kapur (1976, 78), Mathieson (1978, 80), Lee (1980), and others showed within the context of the neoclassical growth model that interest rate ceilings could exacerbate economic instability through reducing the competition among commercial banks. They claimed instead that liberalization of controlled rates would facilitate economic development. Higher interest rates due to liberalization could foster free competition among banks and lead to both increased savings and greater efficiency. Cho (1985), on the other hand, used the Stiglitz-Weiss (1981) micro banking theory to argue against the liberalization of controlled rates in DCs without well developed security markets, especially equity markets. He claimed that inefficient credit allocation through adverse selection effects could result from imperfect information in the banking industry even when banks are freed from interest rate ceilings. Thus, the existence of well functioning security markets with perfect information are prerequisite for the liberalization of controlled rates to be beneficial in DCs.
I cannot apply the above models directly in this paper because, first, the implicit and explicit assumptions about interest rates are that they are freely determined by supply and demand in the money market, such that interest rates are interrelated to the amount of money. Secondly, even papers about the liberalization of controlled rates fail to reflect the typical structure of controlled rates in the Korean economy. I am examining the effect of controlled rate liberalization for producers by a small government in a general equilibrium model. Finally, I have to consider the combined effects of all the typical characteristics of the Korean economy, such as exploding foreign debt, PPP not holding in the short run, and the important role of real exchange rates and imperfect capital mobility.
CHAPTER III

THE ECONOMIC PERFORMANCES AND THE KOREAN STABILIZATION POLICIES

In order to see how these policies have affected recent economic experiences, I examine the economic performance of each stabilization policy pursued. Economic performance before 1980 was characterized by high inflation rates, high growth rates of GNP, and trade deficit with exploding foreign debts. On the other hand, after 1980, there existed stable prices, a decrease in foreign debts, and continuous increase in real income. The stabilization program could solve the inflation problem and foreign debt problem at the expense of a lowered growth rate of real GNP. Thus, the stabilization program could be regarded as successful in terms of solving the B/Ps problem and inflation problem. Therefore, in this chapter, I examine how these Korean stabilization policies have contributed to recent economic experiences.
A. Economic Performances

1. Real GNP and Inflation

Figure 1 shows trends of real GNP and price level. Real GNP has continuously increased from 1976 to 1984, except for 1980, although the growth rates of real GNP have been relatively slowed after the stabilization program compared to the rates before 1980. Domestic prices have risen rapidly before 1981; however, prices have remained stable after the program. On the other hand, growth rates of real GNP and Inflation rates are shown in figure 2. Annual real GNP growth rate during 1976-78 was on the average of 12.2%, with a peak at 14.1% in 1976, and continuously declined from 1976. The rate dropped more to 6.5% in 1979, even to negative 5.2% in 1980, and averaged 5.4% during 1980-84. The domestic inflation rate, based upon consumer prices, was on average 13.3% in 1976-78, 23.5% in 1979-80, and sharply reduced after the program to 7.3% in 1982, 3.4% in 1983, and 2.3% in 1984. The time paths of \( \dot{p} \) and real GNP, except in 1980, strongly reflect the expansionary fiscal and monetary policies before 1979 and contractionary policies after the program.

In figure 2, a simple Phillips curve argument explains high inflation and high GNP growth rates before 1978, and very low inflation and relatively moderate GNP growth rates after 1982. However, the serious stagflation during 1979-81 cannot be explained by Phillips curve arguments, but by other factors. In fact, during fiscal year
1980, an inflation rate of 28.7% and negative GNP growth rate of -5.2% was recorded. The serious stagflation was the result of the accumulated loss of competitiveness in international trade due to real appreciation, the second world oil shock in 1978, and, especially, the

![Real GNP and Price Level](image)

**Source:** The Bank of Korea, The Monthly Statistical Bulletin Vol. 24-40

**Figure 1**

Real GNP and Price Level

Figure 2

Real GNP and P(Consumer Prices)
political instability after the presidential assassination of Mr. Park in 1979.

2. The B/Ps and Foreign Debts

As we can see from table 1, the trade deficit increased by six-fold during 1976-81; however, after the stabilization program, the trade deficit began to decrease gradually. The major cause for the continuously increased trade deficit before 1982 is the effects of the overvaluation of the Korean currency due to the deteriorated terms of trade. Deterioration in terms of trade, or the loss in competitiveness in the international trade due to real appreciation, adversely affected the trade balance. Although the effects on exports were largely offset by some measures of export promotion, relatively cheap foreign prices brought about increases in imports and decreases in import substitution, hence the continuous trade deficit so that the stock amount of total foreign debt greatly increased. Foreign debt was $6.1 billion in 1976, $11 billion in 1979, $17.4 billion in 1982, and $20 billion in 1984. Per capita debt rose from $170 in 1976 to $540 in 1984. However, after 1981, inflow of foreign capital has continuously decreased, and surprisingly, in 1986, trade balance was recorded as surplus so that the stock amount of debt began to decrease. The improvement of the trade balance could be achieved with the help of
Table 1: Exports and Foreign Debt

<table>
<thead>
<tr>
<th>Year</th>
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<th>(stock) Foreign Borrowing</th>
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<td>0.6</td>
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<td>0.5</td>
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<td>1.8</td>
<td>2.2</td>
<td>8.8</td>
</tr>
<tr>
<td>1979</td>
<td>14.7</td>
<td>4.4</td>
<td>2.7</td>
<td>11.0</td>
</tr>
<tr>
<td>1980</td>
<td>17.2</td>
<td>4.4</td>
<td>1.9</td>
<td>12.7</td>
</tr>
<tr>
<td>1981</td>
<td>20.7</td>
<td>3.6</td>
<td>2.8</td>
<td>14.6</td>
</tr>
<tr>
<td>1982</td>
<td>20.9</td>
<td>2.6</td>
<td>1.2</td>
<td>17.4</td>
</tr>
<tr>
<td>1983</td>
<td>23.2</td>
<td>1.8</td>
<td>1.3</td>
<td>18.6</td>
</tr>
<tr>
<td>1984</td>
<td>26.3</td>
<td>1.0</td>
<td>2.1</td>
<td>20.9</td>
</tr>
</tbody>
</table>

greatly increased exports, mainly due to increase in foreign demand for Korean commodities combined with the appropriate government intervention in foreign exchange markets.

B. The Effects of Stabilization Policies

In this section, in order to clarify recent experiences of the successful improvement in trade balance and price control, I present the stabilization policies implemented and analyze how these policies affected economic conditions.

1. Monetary Policies

Monetary policy can be divided by instruments: one is the money stock policy based upon $M_2$, and the other is the controlled interest rate policy in which the government sets the rates from time to time. The money stock policy seeks to control $M_2$, mostly by changes in required reserve ratios, while open market operations play a minor role. The government determines the amount of money based upon a target and prediction of future credit needs. These needs depend on the rate of increase in real income, the inflation rate, and changes in the income velocity of money. In order to understand the effects of monetary policy, I must examine characteristics of the Korean financial market. Because capital markets, including securities and
government bond markets, are relatively under-developed, the Korean financial sector has been dominated by commercial banking and the so-called "curb" money markets. A typical instrument of monetary policy is the interest rate policy in which official rates have been controlled by the government with commercial banks incapable of affecting these rates. As long as interest rates are not determined by supply and demand, but fixed by government at a controlled low level, there has always been excess demand for money at the official rates. Thus, the interdependence of money and interest rates in modern monetarism does not hold in the Korean money market.

2. Money stock policy

As figures 3 and 4 show, the trend of real money supply \( M_2 \) has continuously increased during the entire 1976-84 period, since nominal money has increased faster than price level. Also, growth rates of nominal money are shown in figure 5. Money growth rates before 1979 strongly reflect an expansionary monetary policy to attain a high GNP and employment level. The annual growth rate of nominal \( M_2 \) was 29.2% in 1976, 37.0% in 1977, 39.3% in 1978, and 26.8% in 1979. The money stock policy in the stabilization program called for a reduction in the money growth rate. After the program, the money growth rate began to reduce from 28.1% in 1982 to 19.5% in 1983, and even to 10.7% in 1984. Figures 3, 4, and 5 show that both nominal and real money have continuously increased despite the decrease in monetary growth. In
The base year is the end of 1980


Figure 3
Nominal Money($M_2$) and Price Level($P$)

Figure 4
Real Money supply($M_2/p$)

Figure 5

\( \hat{M}_2 \) and \( \hat{p} \)
inflation rates in figure 5, it is important to note that fiscal year 1980 could be regarded as an exceptional year due to serious political instability and the second world oil shock, characteristics of this period.

3. Interest Rate Policy

Official, nominal interest rates are determined by the government. The government has adopted a complicated controlled interest rate structure where the rates for producers in the output market are different from the rates in the money market. First of all, the government has controlled rates of loans for producers in the output market differently from project to project, according to the priority for Korean economic development. Exporters could obtain unlimited credit at a subsidized low rate(5%) throughout the entire period due to the export promotion policy. However, non-exporting producers were subject to different controlled rates depending upon projects as in table 2. Figure 6 shows controlled rates on saving deposits in official banking in the money market and curb rates. Official rates on savings deposits in the money market were on the average 18% during 1976-80, 17% in 1981, and 10% from 1982 to 1984. One interesting fact is that all controlled rates have been maintained at a much lower level than curb market rates. The curb rates were on the average 41% during 1976-80 and reduced to 30.6% in 1982, 25.8% in 1983, and 24.7% in 1984.
The reasons why the government maintains lower official rates compared to market clearing rates are as follows. First, the government desired to decrease the interest-burden of business firms, as the debt/capital ratio in most firms was high and interest expenses accounted for the major portion of total expenses. Second, the government assumed that inflation during the 1970s was of the cost-push rather than demand-pull variety, so that a low interest rate policy could moderate the recession in 1979-81 while having little impact on inflation. Also, the government maintained interest rates for foreign borrowing at the international rates plus some premium. This was done in order to induce foreign capital inflows by intervening in each contract of foreign debts, where the rates were not related to the domestic interest rates. The high rates have contributed to the exploding debt levels which subsequently occurred.

The effects of changes in nominal money and changes in foreign demand on real income, the amount of inflow of foreign capital, and inflation rates are different under controlled interest rates from those under flexible interest rates. As official rates were below market clearing rates, and the aggregate quantity of credit fixed by the government was less than demand, excess demand always existed for loans. This excess demand gave rise to credit rationing by commercial banks, with unsatisfied borrowers resorting to unofficial curb markets where interest rates are higher. Therefore, the curb markets have played an important role as fund suppliers for producers, since the official banking system could not support all the money needed in the

* The curb rates are not official data.

Figure 6

Controlled Rates on Saving Deposits and Curb Market Rates
Table 2: The structure of the controlled rates both in the output market and in the money market (as of end of 1984)

1) **Official rates (annual) for producers in the output market**

- *loans for exporters* 5%
- *loans for housing construction* 11.5%
- *loans for agricultural development* 10.0%
- *loans for irrigation* 5.5%
- *loans for equipments of medium industries* 10.0–11.5%
- *loans for school expenses* 5.5%
- *loans for livestock operation* 10.0–10.5%
- *loans for planned shipbuilding* 10.5–11.5%

2) **Official rates in the money market**

- *on savings deposits (long term)* 10.0%
  
  *(short term)* 6.0%

3) **Curb market rate** 24.7%
output market. If market interest rates are freely determined by
demand and supply, the effective market clearing rates would have been
lower than the actual curb rates. Therefore, I have to examine how
curb rates, compared to flexible rates, have affected real income,
trade balance or inflow of foreign capital, and the inflation rate.

4. Foreign Exchange Rate Policy and The Government Intervention

In Foreign Exchange Markets

Before 1982, the accumulated loss of competitiveness in
international trade due to continuous real appreciation or deteriorated
terms of trade was one of the major sources of the debt problem and
trade deficit. However, after 1982, continuous increase in foreign
demand for Korean commodities and the appropriate intervention policy
in foreign exchange markets could improve the trade balance and
increase real income with stable domestic prices.

The Korean currency was pegged to the US Dollar until 1979, but in
early 1980, switched to a floating rate pegged to a basket of SDR and
some indexes of inflation rates, real income, and trade volumes. The
basket system, close to a flexible rate system, was adopted because it
was thought capable of achieving relatively stable fluctuations of the
exchange rate and of reflecting real purchasing power of the Korean
currency, while the government wanted to exploit the merits of flexible
rates. The rates pegged to a basket may be regarded as the suitable
average of the market rates.

In early 1980 when the government adopted the new system, Korean
currency was instantaneously devalued by 19.8%, and floating has been
maintained thereafter. Figures 7 and 8 show that nominal exchange
rates and domestic prices have continuously increased. On the other
hand, real exchange rates have been appreciated until 1982, since
domestic prices rose faster than nominal exchange rates. However,
after 1982, terms of trade began to improve and real exchange rates
were reversed to become depreciated due to stable domestic prices
compared to foreign prices. I argue that the trade sector and real
aggregate demand are strongly sensitive to (real)exchange rates and
that PPP does not hold in the short run in the Korean economy. This
argument is based on the fact that aggregate output in the economy is
heavily dependent on the trade sector. The volume of exports and
imports accounts for about 40% of GDP and the economy continuously
needs imports of foreign raw materials and capital goods due to the
import-inducing structure of the economy.

Real appreciation has played a major role in controlling high
inflation. I present two major channels through which real
appreciation has reduced the inflation rate. First, as long as the
volume of imported raw materials and capital goods is large, when the
prices of imported goods fall due to deteriorated terms of trade,
domestic inflation rates are reduced. Second, import-competitive
domestic firms could not increase or even decrease their prices because
Figure 7

Foreign Exchange Rates and Price Level


Figure 8

Terms of trade (TOT) and changes in foreign reserves (R)
of the competition with cheap foreign commodities. The total combined effect is a significantly reduced inflation rate. Also, from the argument that aggregate demand is sensitive to the real exchange rate, accumulated real appreciation has played a role in moderating high real income through deflationary crowding-out effects.

5. The direct price control for major commodities

The government has controlled the prices of major commodities in an effort to discourage price increases while compensating low-income losers and solving the problem of sectoral imbalances. The selective price controls directly moderate the inflation rate while contributing to recession and trade deficits. The policy induces higher consumption and lower production from existing capacity. Therefore, formal and informal rationing of controlled commodities and greater imports occur in order to eliminate excess demand. Because my main concern in this paper is not about the effects of direct price controls in a stabilization program, I will not analyze direct price controls further.
CHAPTER IV

THE MODEL

In this chapter, in order to both explain the effects of an increase in nominal money and changes in foreign demand for domestic commodities and also to compare the effects under controlled interest rates with those under flexible interest rates, I build a macro model which focuses upon the characteristics of the Korean economy. I consider a small, semi-open economy with foreign debts which produces imperfect substitute goods for goods other countries produce. The model in this paper is an extended version of the conventional Mundell-Fleming-Dornbusch models. In building the model, I adopt from the seminal models the basic framework and appropriate assumptions of a small country and sticky domestic prices as these assumptions are regarded as appropriate in the Korean economy.

However, I modify the seminal models as follows to consider the unique characteristics of the Korean economy. First, I explicitly include the important policy variable of official interest rates and distinguish them from curb market rates in order to compare the effectiveness of money stock policy under controlled rates with that under flexible rates. Also, I include the share of the amount of loans
from the official banking system and from curb markets both in the output market and in the money market. Second, I explicitly include the shift variable of changes in foreign demand for domestic commodities in the output as well as in the B/Ps and also include the policy parameter of the degree of government intervention in foreign exchange market in order to examine the roles of those variables in the process of stabilization. Third, as the assumptions of strict PPP in the short run and perfect capital mobility across countries cannot explain recent economic phenomena in the Korean economy, I depart from these assumptions. In their place, I introduce terms of trade and imperfect capital mobility. Also, I assume that the interest rate differentials from country to country cannot play a role of arbitraging for the international movements of capital. Instead, I assume that the amount of the inflow of foreign capital is affected by some default premium charged by foreign lenders and allowed by the home government. Last, I assume that there is no security market.

From the model, I can analyze the interrelations among key variables and compare the effectiveness of controlled rates with that of flexible rates with respect to changes in real income, trade balance or the amount of inflow of foreign capital, and inflation rates, when the government increases nominal money and foreign demand for domestic commodities changes exogenously. In the model, real income, curb and flexible interest rates, nominal exchange rates, and the inflation rate are endogenous variables. On the other hand, nominal money is an exogenous variable, and domestic price is a predetermined variable.
Also, the variable of changes in foreign demand for domestic commodities is a shift variable, and the risk premium for foreign capital is a policy variable. I assume that domestic prices are sticky in the short run, and nominal money is exogenously determined by the government.

A. Output Market

In the market, output is assumed to be demand determined. Since I do not assume strict PPP, I can express aggregate demand as a function of relative prices or terms of trade, and nominal official and curb market interest rates.

\[
y_t = a_1 (e_t + p_t^* - p_t) + k - a_2 \left( \theta_1 i_t^c + (1 - \theta_1) i_t^o \right)
\]

\[a_1, a_2 > 0, \text{ and } 0 \leq \theta_1 \leq 1\] (4.A.1)

where \(y_t\) = real output \(e_t\) = nominal exchange rate \(p_t\) = domestic price \(p_t^*\) = foreign price \(k\) = shift variable reflecting changes in foreign demand \(i_t^c\) = curb market interest rate \(i_t^o\) = official rate all variables are in logarithms except interest rates.
From this equation, aggregate demand is assumed to be positively related to the terms of trade and an increase in foreign demand for domestic commodities, but negatively related to the nominal curb and official interest rates. Real interest rates are more sensible than nominal interest rates in aggregate demand; however, I include nominal rates for no large qualitative difference. I assume that magnitudes of income elasticity to interest rates are the same regardless of curb or controlled rates although they are actually different, since I want to analyze and focus the role of the existence of curb rates. \( \theta_1 \) indicates the share of the amount of loans available for producers from the curb markets, and \( (1 - \theta_1) \) represents the share of loans out of total loanable funds from the official banking system. When \( \theta_1 = 1 \), the system is reduced to a flexible rate system. Larger \( \theta_1 \) implies a more liberalized controlled rate system in a sense that more loanable funds are available for producers from the curb markets compared to the official banking system. I also assume that curb rates are competitive market rates.

B. Money Market

The demand for real cash balances is assumed to depend on curb rates, official rates on saving deposits, and real income, while the nominal money supply and the official rates are assumed to be determined by government.
$M_t - P_t = -b_1 \left[ \theta_2 l^c_t + (1 - \theta_2) l^o_t \right] + b_2 y_t \tag{4.8.1}$

$0 \leq \theta_2 \leq 1$, and $b_1, b_2 > 0$.

$M_t$ denotes nominal money stock. I assume that official interest rates are determined by the government independently of the amount of money. In the interest sensitivity of demand for money, $\theta_2$ indicates the share of the amount of lending or borrowing in the curb markets out of the total lending or borrowing in the money market. When I consider the effects of the liberalization of controlled rates in the output market, I assume that lenders in the money market would not respond, since they would be sensitive to changes in curb rates and not very sensitive to changes in official rates because of low official rates compared to curb rates. In the small economy, since official rates are below market clearing rates and the aggregate quantity of credit fixed by the government is less than demand, excess of demand always exists for loans.
C. Balance of Payments

I use the conventional flow-equilibrium model rather than the Niehans-type stock-flow model. I include a shift variable reflecting changes in foreign demand for domestic commodities in the trade account, and assume that interest differential from country to country cannot arbitrage for international capital movements.

\[ c_1 (e_t + p_t^* - p_t) + k - c_2 y_t + c_3 (a_t - \dot{e}_t) = R \]  \hspace{1cm} (4.C.1)

\[ \dot{e}_t = \phi (\bar{e}_t - e_t), \text{ where } c_1, c_2, c_3, \phi > 0 \]  \hspace{1cm} (4.C.2)

Intervention in foreign exchange: \[ R = -\delta (e_t - p_t) \]  \hspace{1cm} (4.C.3)

The fact of positive \( c_1 \) reflects that the Marshall-Lerner condition holds. \( c_2 \) measures the income effect in the trade balance, and \( c_3 \) represents the degree of capital mobility. In the capital account, I assume that a default risk premium charged by foreign lenders and agreed upon by the home government affects the amount of capital inflow. The inflow of foreign capital is assumed to be affected by the magnitude of default risk premium and depreciation rate. \( R \) represents the changes in foreign reserves. With flexible exchange rates, \( R = 0 \), while in managed floating, \( R \) changes. The policy parameter of \( \delta \) measures the degree of government intervention in
foreign exchange markets. In managed floating exchange rates, \( \delta \) could be (+) or (-). Positive \( \delta \) implies that government changes reserves according to the so-called "leaning against the wind" policy, while negative \( \delta \) represents "leaning for the wind" policy. "Leaning against the wind" implies that, when exchange rates increase more than domestic prices, the government would decrease foreign reserves to offset depreciation by selling foreign currencies in the foreign exchange market. In the capital account, a rise in \( \alpha_t \) leads to an increase in capital inflow or a decrease in capital outflow, while increased depreciation leads to an increase in capital outflow or a decrease in capital inflow. I assume that exchange rates adjust to a long run level according to (4.C.2) as in Dornbusch(1976). It implies the possibility of overshooting or undershooting of exchange rates and a monotonic approach to a long run level. \( \phi \) indicates the speed of the adjustment.

D. Price Adjustment Process

The model is closed with a price adjustment equation. The inflation rate is assumed to be governed by the deviation of output from the full employment level.

\[
p_t = \psi (y_t - \bar{y}_t) \quad \psi > 0
\] (4.D.1)
Commodity prices are assumed to adjust gradually to an imbalance in the output market, and the adjustment process implies the sluggishness of domestic prices in terms of a simple Phillips curve argument. $\psi$ indicates the speed of adjustment.

From the above model, I can analyze the short run effects (under sticky domestic prices) of changes in nominal money and foreign demand for domestic commodities on trade balance or inflow of foreign capital, real income, interest rates, and inflation rates.
One of the main purposes of this paper is to examine whether and how controlled official interest rates could aggravate or moderate increases in real income, inflation, and the amount of inflow of foreign capital compared to flexible rates, in a small semi-open economy with foreign debt. Throughout 1976-84, in the Korean economy, since exogenous foreign demand for Korean commodities and the amount of nominal money have continuously increased despite the world recession and the stabilization policy of decreased monetary growth, I have to explain how exogenous changes have affected real income, inflation, and inflow of foreign capital in the process of the Korean stabilization. The effects of change in foreign demand for domestic commodities and of change in nominal money would be moderated or exaggerated by the degree of government intervention in foreign exchange markets.

Thus, in order to examine the effects of the increase in foreign demand and the amount of nominal money under controlled rates and also to evaluate the role of the government intervention policy in foreign exchange markets, I derive the reduced forms of real income, trade balance or inflow of foreign capital, inflation rates, interest rates,
and exchange rates with respect to the exogenous variables. Each reduced form will be used to compare the effects of exogenous changes under controlled rates with those under flexible rates. The reduced forms are also used to suggest a reasonable government intervention policy in the remaining chapters. In the reduced forms, endogenous variables are nominal exchange rate ($e_t$), real income ($y_t$), curb rate ($i_t^c$), and inflation rate ($p_t$); however, right hand side variables are nominal money ($M_t$), foreign demand for domestic commodities ($K$), default risk premium for foreign loans ($\alpha$), and predetermined domestic price ($p_t$). Also, the degree of government intervention in foreign exchange markets is an important policy parameter, since one of the main goals in this paper is to find a reasonable government intervention rule for stabilization.

A. Reduced Forms (* Derivations: Appendix 1)

When I combine the output equation of (4.A.1), the money equation of (4.B.1), and the B/Ps equation of (4.C.1) by eliminating interest rate, I can obtain the following reduced forms by subtracting $p_t^*$.

$$e_t = (1/g)(a_2 c_2) M_t + (1/g)[b_1 c_2 (\theta_2/\theta_1) - b_1 (\Theta_2/\Theta_1) - a_2 b_2] k$$
$$- (1/g)[b_1 c_3 (\theta_2/\theta_1) + a_2 b_2 c_3] \alpha_t$$
\[ y_t = \frac{1}{g}[a_2(c_1 + \delta + c_3\phi)] M_t \]
\[ + \frac{1}{g} b_1(\Theta_2/\Theta_1)(c_1 + \delta + c_3\phi - a_1) k - \frac{1}{g}(a_1 b_1 c_3(\Theta_2/\Theta_1) \sigma_t \]
\[ - \frac{1}{g}[a_2(c_1 + \delta) + [a_2 + a_1 b_1(\Theta_2/\Theta_1)] c_3\phi] p_t \]
\[ + \frac{1}{g}[a_1 b_1(\Theta_2/\Theta_1) c_3\phi] \bar{\sigma} \]
\[ + \frac{1}{g} a_2 b_1(c_1 + \delta + c_3\phi)[1 - (\Theta_2/\Theta_1)] l^0_t \]  
(5.A.2)

\[ l^c_t = -\frac{1}{g}(c_1 + \delta + c_3\phi - a_1 c_2) M_t + (b_2/g\Theta_1)(c_1 + \delta + c_3\phi - a_1) k \]
\[ - \frac{1}{g}(a_1 b_2 c_3) \sigma_t + \frac{1}{g}[(c_1 + \delta + c_3\phi) - a_t(c_2 + b_2 c_3)] p_t \]
\[ + \frac{1}{g}[a_1 b_2 c_3\phi] \bar{\sigma} \]
\[ - \frac{1}{g}[(c_1 + \delta + c_3\phi)(b_1(1 - \Theta_2) + \hat{a}_2 b_2(1 - \Theta_1)) - a_1 b_1 c_2(1 - \Theta_1)] l^0_t \]  
(5.A.3)

\[ \hat{\phi}_t = \psi \text{ reduced form of real income} \]  
(5.A.4)
in the above reduced forms, \( g = (c_1 + \delta + c_3\phi)[b_1(\theta_2/\theta_1) + a_2b_2] - a_1b_1c_2(\theta_2/\theta_1) \) and is positive from the stability conditions which will be explained in the next section. When I plug \( (\theta_2/\theta_1) = 1 \) into the reduced forms of (5.A.1), (5.A.2), and (5.A.3) under controlled rates, I can derive the reduced forms under flexible rates since, when the controlled interest rates are fully liberalized, both \( \theta_1 \) and \( \theta_2 \) are reduced to 1 in the model.

B. Stability Conditions

When I examine the effects on real income, trade balance or inflow of foreign capital, and inflation rate of changes in nominal money or changes in foreign demand for domestic commodities, I only consider the stable case. In this section, I derive stability conditions for the system. I rewrite the output, money, and the B/Ps equilibrium conditions of (4.A.1), (4.B.1), and (4.C.1) in terms of real income and interest rate as the following ISLM type framework.

\[
\text{IS: Output & B/Ps: } a_2y_t = \left[\left(\frac{a_1c_2}{(c_1 + \delta + c_3\phi)}\right) - 1\right]y_t + ... \tag{5.B.1}
\]

\[
\text{LM: Money: } b_1(\theta_2/\theta_1)y_t = b_2y_t + .... \tag{4.B.1}
\]

From the above IS and LM, I derive the excess demand for outputs and money as follows.
Excess demand for outputs: \[[a_1 c_2/ (c_1 + \delta + c_3 \phi) - 1] y_t - a_2 l_t\]

Excess demand for money: \[b_2 y_t - b_1 (\Theta_2/\Theta_1) l_t\]

When I linearize the above IS and LM by first order Taylor's expansion, I obtain a set of differential equations given by:

\[
\dot{x}_1 = k_1 \left[\left[a_1 c_2/ (c_1 + \delta + c_3 \phi) - 1\right] y_t - a_2 l_t\right] \tag{5.8.3}
\]

\[
\dot{x}_2 = k_2 \left[b_2 y_t - b_1 (\Theta_2/\Theta_1) l_t\right] \tag{5.8.4}
\]

where \(x_1 = y_t - y^*, x_2 = l_t - l^*,\) and \(k_1, k_2 > 0.\)

Thus, the coefficient matrix \(A\) of the differential system of \(\dot{x}_1\) and \(\dot{x}_2\) is given by:

\[
A = \begin{bmatrix}
k_1 \left[\left[a_1 c_2/ (c_1 + \delta + c_3 \phi) - 1\right] - k_1 a_2 \right] \\
k_2 b_2 \\
\end{bmatrix}
\]

In order for the system to be stable, the sum of trace should be negative and the determinant should be positive in the coefficient matrix of \(A\). And I assume that the system is stable.

\[
\text{trace} (A) = k_1 \left[\left[a_1 c_2/ (c_1 + \delta + c_3 \phi) - 1\right] - k_2 b_2 (\Theta_2/\Theta_1)\right] < 0
\]

\[
\text{Determinant} = k_1 k_2 \left[b_1 (\Theta_2/\Theta_1) + a_2 b_2 (c_1 + \delta + c_3 \phi) - a_1 b_1 c_2 (\Theta_2/\Theta_1)\right]
\]
From the above stability conditions, I obtain the restrictions on parameter values for the stable system.

** Stability conditions: (5.8.5)**

\[ g = (c_1 + \delta + c_3 \phi)[b_1(\theta_2/\theta_1) + a_2b_2] - a_1b_1c_2(\theta_2/\theta_1) > 0 \]

and negative trace \((A)\)

Even when I consider the differential system including \(\dot{x}_3\), where \(x_3 = \dot{e}_t - e^*\), I derive the exactly identical stability condition of positive \(g\) as follows. The set of differential equations are given by:

\[
\begin{align*}
\dot{x}_1 &= k_1[-y_t - a_1e_t + a_1e_t] \\
\dot{x}_2 &= k_2[b_1y_t - a_1(\theta_2/\theta_1)e_t] \\
\dot{x}_3 &= k_3[-c_2y_t + (c_1 + \delta + c_3 \phi)e_t]
\end{align*}
\]

where \(x_1 = y_t - y^*, x_2 = l_t - l^*, x_3 = e_t - e^*, \) and \(k_1, k_2, k_3 > 0.\)

Thus, the coefficient matrix \((A)\) of the differential system of \(\dot{x}_1, \dot{x}_2, \dot{x}_3\) is given by:
Therefore, for a stable system,

\[
(A) = \begin{bmatrix}
- k_1 & - k_1a_2 & k_1a_1 \\
 k_2b_2 & - k_2b_1 & 0 \\
- k_3c_2 & 0 & k_3(c_1 + \delta + c_3\phi)
\end{bmatrix}
\]

\[
\text{trace } (A) = [-k_1 - k_2b_1 + k_3(c_1 + \delta + c_3\phi)] < 0
\]

\[
\text{Determinant} = k_1k_2k_3[(b_1(\Theta_2/\Theta_1) + a_2b_2)(c_1 + \delta + c_3\phi)
- a_1b_1c_2(\Theta_2/\Theta_1)] > 0
\]  

(5.B.6)

From the above, I recognize that the determinant in (5.B.6) is exactly identical to the determinant in (5.B.5).

In all analysis in this paper, I will consider only the above stable case and assume that stability conditions hold in the structural model. The slope of LM is positive; however, the slope of IS would be (+) or (-). From the stability conditions in (5.B.5), I recognize that the slope of LM should be always greater than that of IS even if IS is positive. (* Appendix 2)
C. Long run neutrality

In order to examine whether the structural model holds long run neutrality, I calculate \( \frac{dy_t}{dM_t} \) and \( \frac{dy_t}{dp_t} \) from the reduced form of real income in (5.2). In deriving, I use \( M_t = \bar{e}_t \).

\[
\frac{dy_t}{dM_t} = \frac{1}{g}[a_2(c_1 + \delta) + [a_2 + a_1b_1(\theta_2/\theta_1)]c_3\phi] > 0 \quad (5.C.1)
\]

\[
\frac{dy_t}{dp_t} = -\frac{1}{g}[a_2(c_1 + \delta) + [a_2 + a_1b_1(\theta_2/\theta_1)]c_3\phi] < 0 \quad (5.C.2)
\]

By inspection of (5.C.1) and (5.C.2), we see that \( \frac{dy_t}{dM_t} = -\frac{dy_t}{dp_t} \) or \( \frac{dy_t}{dM_t} + \frac{dy_t}{dp_t} = 1 \). Moreover, we know that, \( dM_t = dp_t \) in the long run. This implies that, in the long run, the positive real income effect of an increase in nominal money would be exactly offset by the negative real income effect of the same increase in nominal money. Therefore, in the structural model, a one-time increase in nominal money would have no real income effect at all in the long run.
CHAPTER VI
THE SHORT RUN EFFECTS OF AN EXPANSIONARY MONETARY POLICY

In this chapter, I analyze and compare the different short run effects of an increase in nominal money on real income, trade balance or the amount of inflow of foreign capital, interest rate, and inflation rate under both flexible and controlled rates. The analysis is about the short run effects of one shot increases in nominal money under predetermined domestic prices. I evaluate the short run relative merits or disadvantages of controlled rates compared to flexible rates, and also examine the role of the degree of government intervention in foreign exchange markets with respect to changes in real income, inflow of foreign capital, and inflation. One of the main goals is to analyze under what circumstances controlled rates could aggravate or moderate increases in real income, exploding foreign debt, and inflation compared to flexible rates when government increases nominal money.

The economy has two kinds of interest rates; one is a competitive curb market rate, and the others are controlled official rates. I assume that the structure of controlled rates for producers in the output market are complicated, since the small government determines
the official rates for producers differently project by project depending upon the priorities for the country's economic development. When I examine the effects of an expansionary monetary policy under controlled rates, I assume that although the government liberalizes some official rates for producers in the output market, money suppliers in the money market do not change both the amount of their deposits in the official banking system and the amount of their loans made in the curb markets, because of high curb rates compared to low official rates for savings deposits. Therefore, in this paper, I regard an interest rate system with a larger $\theta_1$ as a more liberalized controlled rate system, since larger $\theta_1$ implies that producers in the output market would borrow more money from the competitive curb market than from the controlled banking system. When both $\theta_1$ and $\theta_2$ become 1, the economy has fully liberalized interest rates in all markets, which is the same as perfectly flexible rates. I explain and mathematically derive the effects of an expansionary monetary policy under controlled as well as under flexible rates. In all cases, the direction of inflation is the same as that of real income.

A. Under Flexible Interest Rates

By combining both reduced forms of nominal exchange rates in (5.A.1) and that of real income in (5.A.2) with the trade balance in the B/Ps, I can obtain the following reduced form of trade balance (TB)
or that of (negative) inflow of foreign capital. In deriving, I use the fact of \((\text{d}M_t = \text{d}e_t^*)\), and substract foreign prices\(p_t^*\) from the assumption of a small economy.

\[
TB = (c_1 + \delta)(e_t - p_t^*) + k - c_2y_t
\]

\[
(6) \quad TB = c_3\Phi[(c_1 + \delta)(b_1 + a_2b_2) - c_2(a_2 + a_1b_1)] M_t
\]

\[
+ c_3\Phi(b_1 + a_2b_2 - b_1c_2) k
\]

\[
(6.A.1)
\]

From reduced forms of nominal exchange rate, real income, interest rate, inflation rate, and trade balance or inflow of foreign capital in (5.A.1), (5.A.2), (5.A.3), (5.A.4), and (6.A.1), I can derive the effects of an increase in nominal money on nominal exchange rate, real income, flexible interest rate, inflation, and trade balance or inflow of foreign capital as follows.

\[
de_t / \text{d}M_t = (1/\gamma)[a_2c_2^2 + (a_2b_2 + b_1)c_3\Phi] = (+)
\]

\[
dy_t / \text{d}M_t = (1/\gamma)[a_2(c_1 + \delta) + (a_2 + a_1b_1)c_3\Phi] = (+)
\]

\[
dl_t / \text{d}M_t = - (1/\gamma)(c_1 + \delta + c_3\Phi - a_1c_2 - a_1b_2c_3\Phi) = (+) \text{ or } (-)
\]

\[
d\phi_t / \text{d}M_t = (\psi/\gamma)[a_2(c_1 + \delta) + (a_2 + a_1b_1)c_3\Phi] = (+)
\]

\[
dd_t / \text{d}M_t = - (c_3\Phi/\gamma)[(c_1 + \delta)(b_1 + a_2b_2) - c_2(a_2 + a_1b_1)] = (+) \text{ or } (-)
\]

\[
(6.A.6)
\]
\[
d\frac{TB}{dM_t} = \left( c_3 \frac{\phi}{g} \right)[(c_1 + \delta)(b_1 + a_2b_2) - c_2(a_2 + a_1b_1)] = (-) \text{ or } (+)
\]

(6.A.7)

where \( g = (c_1 + \delta + c_3 \phi)(b_1 + a_2b_2) - a_1b_1c_2 \) and is \( (+) \) from the stability conditions in (5.B.5). In this paper, I only consider the stable case of positive \( g \). From the above, I recognize that the effects of an expansionary monetary policy are \( dy_t/dm_t = (+) \), \( dp_t/dm_t = (+) \); however, \( dd_t/dm_t \) or \( dTB/dm_t = (+) \) or \( (-) \), and \( dl_t/dm_t = (+) \) or \( (-) \) according to the parameter values.

A-1. Overshooting or undershooting of exchange rates

When the government increases nominal money once, nominal exchange rates might overshoot or undershoot in the short run according to the parameter values. From \( de_t/dM_t = (1/g)[a_2c_2 + (a_2b_2 + b_1)c_3\phi] \), I can express the conditions for overshooting \( (de_t/dM_t > 1) \) or undershooting \( (de_t/dM_t < 1) \) in terms of the degree of government intervention in foreign exchange markets.

If \( \delta < \frac{[(a_2 + a_1b_1)c_2}{(b_1 + a_2b_2)} - c_1, \) then \( e_t \) overshoots.

If \( \delta > \frac{[(a_2 + a_1b_1)c_2}{(b_1 + a_2b_2)} - c_1, \) then \( e_t \) undershoots.
Strong government intervention in foreign exchange markets works favorably for exports; however, weak intervention would cause decreased exports or increased imports. An increase in nominal money should be supported by an increase in real income or a decrease in interest rate for the equilibrium money market, and the increase in real income would be reinforced by the decrease in interest rates in the output market. Thus, in the B/Ps, imports increase. In this case, if the import elasticity to real income ($c_2$) is large, the increase in imports would be much larger. If the degree of government intervention in foreign exchange markets is sufficiently weak such that $\delta < \frac{[(a_2 + a_1 b_1) c_2]}{(b_1 + a_2 b_2)} - c_1$, the exchange rate should overshoot in the short run beyond long-run $\bar{e}$ in order to support enough exports to offset imports due to a high import elasticity to real income ($c_2$), so that the B/Ps would be in equilibrium.

Short run overshooting or undershooting occurs due to the assumption of sticky domestic prices in our model. When the exchange rate overshoots as it does at A in the following figure 9, it subsequently appreciates up to long-run $\bar{e}$ from point A. On the other hand, when the exchange rate undershoots as it does at B, it thereafter depreciates monotonically from point B up to the long run $\bar{e}$ according to $\dot{e}_t = \phi (\bar{e} - e_t)$ as in Dornbusch (1976).

By inspection of the reduced form of the exchange rate in (5.A.1), I recognize that $(de_t/dM_t) + (de_t/dp_t) = 1$. During sticky domestic
prices in the short run, the effect of \( \frac{d\epsilon_t}{d\epsilon_t} \) does not appear so that overshooting or undershooting occurs. However, in the long run,

\[
(\frac{d\epsilon_t}{dM_t}) = (\frac{d\epsilon_t}{d\epsilon_t}) = 1, \text{ where } dM_t = d\epsilon_t = \ddot{\epsilon}.
\]

Figure 9

Short Run Overshooting or Undershooting
A-2. The effects on real income, interest rate, trade balance or inflow of foreign capital, and inflation rate: \( y_t \uparrow, I_t \downarrow \) or \( \uparrow, TB \) or \( d_t \downarrow \) or \( \uparrow, \hat{p}_t \uparrow \).

In the stable structural model, an expansionary monetary policy always has a positive real income effect; however, it has a positive or negative effect on interest rates depending upon the different parameter values. When \( (c_1 + \delta + c_3) > a_1(c_2 + b_2c_3) \), the IS and LM have conventional shapes: the slope of IS is negative, while the slope of LM is positive. In this negatively sloped IS curve, an increase in nominal money would result in higher real income and lower interest rate in order for the money market to be in equilibrium. An increase in real income would be reinforced by the lowered interest rate in the output market.

On the other hand, if the elasticity of imports to income \( c_2 \) or the elasticity of demand for money to real income \( b_2 \) is sufficiently large such that \( (c_1 + \delta + c_3) < a_1(c_2 + b_2c_3) \), an increase in nominal money would raise both real income and interest rate. Under these parameter values, the slopes of both IS and LM are positive although the slope of LM is larger than that of IS from the stability conditions in (5.B.5). In the output market, the higher positive real income effect of an increase in exchange rates would offset the negative real income effect of the increased interest rate. In the money market,
since the income elasticity of real cash balance \( b_2 \) is sufficiently large, even if the interest rate rises, an increase in real cash balance from higher income would offset the negative real cash balance effect from the higher interest rate.

In both \((-)\) or \((+)\) IS, the effects of an expansionary monetary policy on trade balance or inflow of foreign capital are \((+)\) or \((-)\). If the increase in exports due to the increase in exchange rates is larger than the increase in imports due to the increase in real income, trade balance would be improved or inflow of foreign capital would decrease for the equilibrium B/Ps.

A-3. The relationship between the effects of an expansionary monetary policy and the degree of intervention in foreign exchange markets

In order to examine the relationships between the real income effect and the trade balance effect of an expansionary monetary policy and the degree of government intervention in foreign exchange markets, I differentiate the effects of \( \frac{dy_t}{dM_t} \) and \( \frac{dT_B}{dM_t} \) in (6.A.3) and (6.A.7) with respect to the degree of intervention as follows:

\[
\frac{\partial (dy_t/dM_t)}{\partial \delta} = - \left( \frac{a_1 b_1}{g^2} \right) [b_1 + a_2 (b_2 + c_2)] = (-) \tag{6.A.8}
\]

\[
\frac{\partial (dT_B/dM_t)}{\partial \delta} = \left[ \frac{c_3 \phi (b_1 + a_2 b_2)}{g^2} \right] [c_3 \phi (b_1 + a_2 b_2) + a_2 c_2] = (+) \tag{6.A.9}
\]
I draw the effects of \( \frac{dy_t}{dM_t} \) and \( \frac{dT_B}{dM_t} \) in the space of the degree of government intervention(\( \delta \)) and \( \frac{dy_t}{dM_t} \) & \( \frac{dT_B}{dM_t} \) in Figure 10. From (6.A.8) and (6.A.9), the slope of \( \frac{dy_t}{dM_t} \) is negative and that of \( \frac{dT_B}{dM_t} \) is positive. Also,

\[
\frac{dy_t}{dM_t} \bigg|_{\delta = + \infty} = \frac{a_2}{(b_1 + a_2 b_2)} = (+) \quad (6.A.10)
\]

\[
\frac{dy_t}{dM_t} \bigg|_{\delta = \eta} = \left( a_1 b_1 / g \right) \left[ \frac{a_2 c_2}{(b_1 + a_2 b_2)} + c_3 \phi \right] / 0 = (+) \quad (6.A.11)
\]

\[
\frac{dT_B}{dM_t} \bigg|_{\delta = + \infty} = c_3 \phi = (+) \quad (6.A.12)
\]

\[
\frac{dT_B}{dM_t} \bigg|_{\delta = \eta} = - \left( c_3 \phi / g \right) \left[ (b_1 + a_2 b_2) c_3 \phi + a_2 c_2 \right] = (-) \quad (6.A.13)
\]

where \( \eta = \left[ \frac{a_1 b_1 c_2}{(b_1 + a_2 b_2)} \right] - (c_1 + c_3 \phi) \). From (6.A.10) and (6.A.12), I recognize that, as the degree of government intervention in foreign exchange markets increases to the positive direction infinitely, both \( \frac{dy_t}{dM_t} \) and \( \frac{dT_B}{dM_t} \) approach asymptotically to different positive amounts. Also, when \( \delta = \eta \), \( \frac{dy_t}{dM_t} \) becomes infinitely positive while \( \frac{dT_B}{dM_t} \) becomes infinitely negative. Also, if the degree of government intervention is stronger than \( A \), undershooting of exchange rates occurs; however, if the degree of intervention is smaller than \( A \), overshooting occurs. If the degree of government intervention becomes strong enough such that \( \delta > \left[ \frac{c_2 a_1 b_1^+}{(b_1 + a_2 b_2)} \right] - (c_1 + c_3 \phi) \),
\[
\frac{a_2}{b_1 + a_2b_2} - c_1 \]

the increase in exports from increased exchange rates would outweigh the increase in imports from the increase in real income, although exchange rate undershoots from the long run level. Since export elasticity to exchange rate \( c_1 \) is large and import elasticity to real income \( c_2 \) is small, exports would increase more than imports so that trade balance would improve or the inflow of foreign capital would fall, even though exchange rates undershoot. On the other hand, when exchange rates overshoot, an expansionary monetary policy causes high real income and exploding foreign debt. Therefore, in order to improve the trade balance or to decrease inflow of foreign capital, stronger intervention in foreign exchange markets or undershooting of exchange rates is required in the system.
Figure 10

The Effects of An Expansionary Monetary Policy
B. Under Controlled Interest Rates

In this section, I examine the effects of an expansionary monetary policy under officially controlled rates on real income, trade balance or inflow of foreign capital, interest rates, and inflation. By comparing these effects with those of flexible rates, I can evaluate the relative merits or disadvantages of each interest system. In analyzing, I assume that when the government increases nominal money, it does not change the official rates at the same time. The curb markets are a subset of the total money market, and curb markets are assumed to be perfectly competitive markets without any distortion.

B-1. The effects on real income, interest rate, trade balance or inflow of foreign capital, and inflation rate

I can derive the effects of an increase in nominal money on endogenous variables from the reduced forms in (5.A.1), (5.A.2), (5.A.3), and (6.A.1) as follows:

\[
\frac{dL_t}{dM_t} = \frac{1}{g} \left[ a_2 c_2 + \phi (a_2 b_2 c_3 + b_1 c_3 (\theta_2 / \theta_1)) \right] = (+)
\]

\[
\frac{dY_t}{dM_t} = \frac{1}{g} \left[ a_2 (c_1 + \delta) + \left[ a_2 + a_1 b_1 (\theta_2 / \theta_1) \right] c_3 \phi \right] = (+)
\]

\[
\frac{dL^C_t}{dM_t} = \frac{1}{g} \left( c_1 + \delta + c_3 \phi - a_1 c_2 - a_1 b_2 c_3 \phi \right) = (+) \text{ or } (-)
\]

\[
\frac{dP_t}{dM_t} = \left( \frac{\psi}{g} \right) \left[ a_2 (c_1 + \delta) + \left[ a_2 + a_1 b_1 (\theta_2 / \theta_1) \right] c_3 \phi \right] = (+)
\]
\[
\frac{dd_t}{dM_t} = -(c_3 \phi/g)\left[ (c_1 + \delta) \left( b_1(\theta_2/\theta_1) + a_2b_2 \right) + c_2[a_2 + a_1b_1(\theta_2/\theta_1)] \right] = (+) \text{ or } (-)
\]

\[
\frac{dT_B/dM_t}{c_3[ (c_1 + \delta) \left( b_1(\theta_2/\theta_1) + a_2b_2 \right) - c_2[a_2 + a_1b_1(\theta_2/\theta_1)])} = (+) \text{ or } (-)
\]

From the above, I recognize that the directions of all effects of an expansionary monetary policy under controlled rates are the same as those under flexible rates; however, the magnitude of all effects under controlled rates would be exaggerated or moderated compared to those under flexible rates. By comparing the above effects with those under flexible rates, I recognize that the parameter of \( b_1 \) in all effects under flexible rates is replaced by \( b_1(\theta_2/\theta_1) \) in those effects under controlled rates.

When \( \theta_1 = \theta_2 = 1 \), the interest rate system is reduced to a perfectly flexible interest rate system without any curb market. However, if \( \theta_1 = \theta_2 = 0 \), there is no competitive curb market and only controlled rates exist. I assume that even if some controlled rates in the output market are liberalized by the government, people do not respond to liberalization in their lending pattern in the money market because of the high curb rates. Larger \( \theta_1 \) implies that producers in the output market could borrow larger amounts of money for their production from competitive curb markets rather than from the controlled official
banking system. As $\theta_1$ becomes larger, the economy seems to have a more liberalized controlled rate system.

In order to compare the magnitude of the effects of $(dy_t/dM_t)$, $(dTB/dM_t)$, and $(dd_t/dM_t)$ under controlled rates with those under flexible rates, I differentiate those effects with respect to the degree of liberalization of controlled rates in the output market($\theta_1$) holding $\theta_2$ constant as follows: (*Appendix 3)

\[
\text{If the slope of IS is } (-) \text{ such that } (c_1 + \delta + c_3) \geq a_1(c_2 + b_2c_3\phi), \\
\text{then } \left[ \frac{\partial (dy_t/dM_t)}{\partial \theta_1} \right] \geq 0, \text{ and } \left[ \frac{\partial (dTB/dM_t)}{\partial \theta_1} \right] \leq 0. \quad (6.B.1)
\]

On the other hand,

\[
\text{If the slope of IS is } (+) \text{ such that } (c_1 + \delta + c_3) \leq a_1(c_2 + b_2c_3\phi), \\
\text{then } \left[ \frac{\partial (dy_t/dM_t)}{\partial \theta_1} \right] \leq 0, \text{ and } \left[ \frac{\partial (dTB/dM_t)}{\partial \theta_1} \right] \geq 0. \quad (6.B.2)
\]

The above demonstrates that the real income and trade balance effects under controlled rates are different from those under flexible rates, according to whether the slope of the IS is (+) or (-). If the slope of IS is (-) such that $(c_1 + \delta + c_3) \geq a_1(c_2 + b_2c_3\phi)$, which is normally the situation, then $\left[ \frac{\partial (dy_t/dM_t)}{\partial \theta_1} \right] > 0$, and $\left[ \frac{\partial (dTB/dM_t)}{\partial \theta_1} \right] < 0$. This situation of (-) IS is explained by figure 11.
This demonstrates that as long as \( 0 < \theta_1 < 1 \),

\[
\frac{dy_t}{dM_t} \text{ in flexible rates} > \frac{dy_t}{dM_t} \text{ in curb rates}, \quad \text{and}
\]

\[
\frac{dTB/dM_t}{dM_t} \text{ in flexible rates} < \frac{dTB/dM_t}{dM_t} \text{ in curb rates}.
\]

The reason why real income effect under flexible rates would be larger than real income effect under controlled rates is as follows. In the money market, increased nominal money would be supported by increased real income and decreased interest rates for the money market equilibrium. However, in the output market, increased real income is reinforced by the decreased interest rate from the money market. In
this case, if \( \theta_t \) becomes larger, decreased curb rates would raise real income further in the output market given other parameter values.

On the other hand, an expansionary monetary policy improves trade balance more under controlled rates than under flexible rates, since the positive real income effect is smaller under controlled rates than under flexible rates. Thus, the increase in imports from increased real income is smaller under controlled rates compared to increased imports under flexible rates. The effects under controlled and flexible rates are compared in figure 12.

Figure 12: when IS is negative
Figure 12 tells us the following about the effects of an expansionary monetary policy when the IS is in normal shape of (-). First, the curb rates would decrease or moderate positive real income effect; however, it would improve the trade balance or decrease the inflow of foreign capital compared to flexible rates. Especially when the degree of government intervention in foreign exchange markets is sufficiently weak or negative such that the degree of intervention is near \( \eta \), controlled rates would play a role of moderating exploding foreign debt, high real income, and high inflation. Therefore, I argue that in the late 1970s in the Korean economy, curb rates could have played the role of built-in stabilizer in terms of moderating high growth, high inflation, and exploding foreign debt. If there had been no curb market in the economy, high inflation and exploding foreign debt would have been more serious.

Second, in order for the economy to maintain the same level of \( \frac{dy_t}{dM_t} \) or \( \frac{dT B/dM_t}{dM_t} \) as in flexible rates, the government may decrease the degree of government intervention under curb rates compared to the degree under flexible rates. This implies that the distorted policy of the controlled rate system itself could play the same role as an increase in the degree of government intervention in foreign exchange markets.

On the other hand, if the slope of IS is positive such that \( (c_1 + \delta + c_3) \leq a_1(c_2 + b_2c_3\theta) \), then \( [\Theta(dy_t/dM_t)/\Theta_1] \leq 0 \), and \( [\Theta(dT B/dM_t)/\Theta_1] \leq 0 \).
\theta_1 \geq 0. \text{ When IS is positive, both real income and the interest rate could increase for the equilibrium money market due to a given increase in nominal money, if increased demand for money from the higher real income could offset decreased demand for money from the higher interest rate. If the interest rate increases, the positive real income effect due to an expansionary monetary policy would be larger under controlled rates than the positive real income effect would be under flexible rates, since the negative real income effect from increased interest rate in the output market would be smaller under controlled rates than under flexible rates. Thus, with an expansionary monetary policy, the trade balance would deteriorate more under controlled rates than under flexible rates, because imports would increase more due to the larger real income effect under controlled rates than under flexible rates. This situation is demonstrated in figure 13 and figure 14.}

\begin{figure}
\centering
\begin{tikzpicture}
\fill (0,0) circle (2pt) node[above] {0} -- (1,0) circle (2pt) node[above] {1};
\fill (0,1) circle (2pt) node[below] {0} -- (1,1) circle (2pt) node[below] {1};
\draw (-0.5,0.5) -- (1.5,0.5) node[midway,above] {$\theta_1$};
\draw (0.5,-0.5) -- (0.5,1.5) node[midway,left] {$\theta_1$};
\end{tikzpicture}
\caption{(dy$_t$/dM$_t$) and (dTB/dM$_t$) when the slope of IS is positive}
\end{figure}
From figure 13, if the slope of IS is positive such that \((c_1 + \delta + c_3) \leq a_t(c_2 + b_2c_3 \phi)\),

\((dy_t/dM_t)\) in flexible rates < \((dy_t/dM_t)\) in curb rates, and

\((dT_B/dM_t)\) in flexible rates > \((dT_B/dM_t)\) in curb rates.

Figure 14: when IS is (+)
Figure 14 demonstrates that when IS is positive, curb rates would raise the positive real income effect further and make the trade balance worse at the entire range of the degree of government intervention than flexible rates would. Especially when the degree of government intervention is sufficiently weak, curb rates would exaggerate high real income, high inflation, and exploding debt. Also, in order for the economy to maintain the same level of $dy_t/dM_t$ or $dTB/dM_t$ as in flexible rates, the government should intervene in foreign exchange markets more under curb rates than under flexible rates. In this case, the distorted policy of a controlled rate system itself would play the same role as the increased degree of government intervention in foreign exchange markets.
CHAPTER VII

THE EFFECTS OF AN INCREASE IN FOREIGN DEMAND FOR DOMESTIC COMMODITIES

Since the exogenous foreign demand for Korean commodities has continuously increased from 1976 to 1984 in the Korean economy, in this chapter I analyze the effects of an increase in foreign demand for domestic commodities on real income, trade balance or inflow of foreign capital, and inflation rate.

The foreign demand for Korean commodities has increased in the 1970s, despite world recession primarily due to the oil crisis, and foreign demand has also continuously increased after 1980 not only because Korean commodity prices have remained stable compared to foreign prices, especially after 1982, but also because foreign economies have imported mostly necessities from Korea and the quantity of these imports is small compared to total imports in major economies including the U.S and Japan.

As in chapter 6, I examine only the stable parameter case of positive $g$ from the stability conditions in (5.8.5). I compare the effects under controlled rates with those under flexible rates. Also, I examine the role of government intervention in foreign exchange...
A. The effects on real income, interest rate, trade balance or inflow of foreign capital, and inflation rate

The effects of an increase in foreign demand depend upon the magnitudes of parameter values and the degree of government intervention in foreign exchange markets. I derive those effects under controlled rates from reduced forms of endogenous variables in equations (5.A.1), (5.A.2), (5.A.3), (5.A.4), and (6.A.1) as follows:

\[ \frac{d\theta}{dk} = \frac{1}{g} [b_{1} c_{2}(\theta_{2}/\theta_{1}) - b_{1}(\theta_{2}/\theta_{1}) - a_{2} b_{2}] = (+), (-) (7.A.1) \]

\[ \frac{dy}{dt} = \frac{1}{g} b_{1}(\theta_{2}/\theta_{1})(c_{1} + \delta + c_{3} \phi - a_{1}) = (+) (7.A.2) \]

\[ \frac{dl_{c}}{dt} = \frac{b_{2}}{g \theta_{1}}(c_{1} + \delta + c_{3} \phi - a_{1}) = (+) (7.A.3) \]

\[ \frac{d\theta}{dt} = \frac{\psi}{g} b_{1}(\theta_{2}/\theta_{1})(c_{1} + \delta + c_{3} \phi - a_{1}) = (+) (7.A.4) \]

\[ \frac{dTB}{dk} = \frac{c_{3} \phi}{g} [b_{1}(\theta_{2}/\theta_{1}) + a_{2} b_{2} - b_{1} c_{2}(\theta_{2}/\theta_{1})] = (-), (+) (7.A.5) \]

\[ \frac{dd_{t}}{dk} = - \frac{dT}{dk} = (+) or (-) (7.A.6) \]

By replacing \( b_{1}(\theta_{2}/\theta_{1}) \) by \( b_{1} \) ln (7.A.1) through (7.A.6), we can obtain the effects of an increase in foreign demand under flexible rates. In the above effects, \( g \) and \( (c_{1} + \delta + c_{3} \phi - a_{1}) \) are positive from the stability conditions in (5.B.5). In this instance, increased foreign
demand for domestic commodities always leads to an increase in real income and the inflation rate. The interest rate also increases due to an increase in foreign demand since in the money market, the increased demand for money from increased real income should be offset by an increase in the interest rate for the equilibrium money market.

The effects on exchange rates, trade balance, and inflow of foreign capital are different according to the magnitudes of parameters. If \( c_2 < \left(\frac{a_2 b_2}{b_1} + 1\right) \), then \( \frac{d e_t}{dk} \) and \( \frac{d d_t}{dk} \) are \((-)\); however, \( \frac{d TB}{dk} \) is \((+)\). On the other hand, if \( c_2 > \left(\frac{a_2 b_2}{b_1} + 1\right) \), then \( \frac{d e_t}{dk} \) and \( \frac{d d_t}{dk} \) are \((+)\); however, \( \frac{d TB}{dk} \) is \((-)\). In this paper, I assume that \( c_2 < \left(\frac{a_2 b_2}{b_1} + 1\right) \) since \( c_2 \) would be less than 1 in normal economic situations.

If the elasticity of imports to real income (\( c_2 \)) is less than 1 or at least smaller than \( \left(\frac{a_2 b_2}{b_1} + 1\right) \), as foreign demand for the domestic commodities increases, increased exports in the trade balance could outweigh increased imports due to increased real income so that trade balance could be in surplus. In this case, the exchange rate would decrease or appreciate for the equilibrium B/Ps, since increased exports due to the increase in foreign demand are much larger than increased imports.
B. Comparison of the effects under controlled rates with the effects under flexible rates

In this section, I compare the effects of an increase in foreign demand for domestic commodities on real income, interest rates, trade balance or inflow of foreign capital, and inflation rates under controlled rates with those effects under flexible rates. In comparing, I only consider the normal case when \( c_2 < \left[ (a_2b_2 / b_1) + 1 \right] \).

By differentiating the effects of \((+)(dy_t / dk)\), \((+)(dTB / dk)\), and \((-)(dd_t / dk)\) with respect to the degree of liberalization of controlled rates in the output market \(\Theta_1\), I obtain the following: (* Appendix 4)

\[
\begin{align*}
\Theta(dy_t / dk) / \Theta_1 &= (a_2b_1b_2 / g^2)(c_1 + \delta + c_3\phi)[a_1 - (c_1 + \delta + c_3\phi)] \\
&= (-) \tag{7.B.1} \\
\Theta(dTB / dk) / \Theta_1 &= (a_2b_1b_2c_2\phi / g^2)[- a_1 + (c_1 + \delta + c_3\phi)] \\
&= (+) \tag{7.B.2} \\
\Theta(dd_t / dk) / \Theta_1 &= - [\Theta(dTB / dk) / \Theta_1] = (-) \tag{7.B.3}
\end{align*}
\]

This suggests that as the government gradually liberalizes curb rates in the output market (or as \( \Theta_1 \) increases), the positive real income effect of an increase in foreign demand becomes smaller. However, as curb rates in the output market liberalize, the positive trade balance effect of an increase in foreign demand becomes larger. Similarly, the
negative effect of an inflow of foreign capital due to an increase in foreign demand becomes smaller. Comparison of the effects of curb and flexible rates is shown in figure 15.

\[ (\frac{dy_t}{dk_t})_t \text{ in flexible rates} < (\frac{dy_t}{dk_t})_t \text{ in curb rates}, \]
\[ (\frac{dTB}{dk_t})_t \text{ in flexible rates} > (\frac{dTB}{dk_t})_t \text{ in curb rates}, \]
\[ (\frac{dd_t}{dk_t})_t \text{ in flexible rates} < (\frac{dd_t}{dk_t})_t \text{ in curb rates}. \]

Accordingly, an increase in foreign demand could raise real income more under controlled rates than under flexible rates; it could also improve trade balance less under controlled than under flexible rates. Therefore, in the entire range of the degree of government
Intervention, controlled rates could play a role of exaggerating the positive real income effect and causing deterioration of foreign debt effect when foreign demand for domestic commodities increases exogenously, holding other variables constant. In the Korean economy, controlled rates might have attributed to high growth in terms of real income, high inflation, and exploding foreign debt in the late 1970s.
The main purpose of this paper is to identify merits or disadvantages of a controlled interest rate system compared to those of flexible interest rates in the process of stabilization and to suggest some recommendations for a stabilization program in a small economy. In this paper, I define a goal of stabilization as not only achieving a surplus in trade balance in order to solve the problem of foreign debt, but also maintaining positive real income with a tolerable inflation rate. I consider how to achieve stabilization when a small government continuously increases nominal money and at the same time the foreign demand for the commodities of the economy increases exogenously.

I focus on the roles of controlled interest rates and the degree of government intervention in foreign exchange markets in the process of stabilization. In this chapter, I compare the combined effects of an expansionary monetary policy and an increase in foreign demand for the domestic commodities on real income, trade balance or inflow of foreign capital, and inflation rate under controlled rates with the effects under flexible rates. And then, I suggest a reasonable
government intervention rule in foreign exchange markets to achieve a stabilization program which aims at mainly solving foreign debt problems by obtaining a trade surplus while maintaining positive real income and a tolerable inflation rate.

Consideration of these combined effects is important because in the Korean economy, the exogenous foreign demand for Korean commodities has continuously increased and the government has also consistently increased nominal money from 1976 to 1984. Thus, it is important to evaluate how these continuous increases in exogenous variables have affected real income, trade balance or inflow of foreign capital, and inflation rates in the Korean economy with controlled rates. By this analysis, I can evaluate the role of controlled rates and suggest a reasonable government intervention policy in foreign exchange markets that would help the small government to achieve a trade surplus and some positive real income effect with a tolerable inflation rate.

One of the main goals of this chapter is to show how a small economy could obtain a trade surplus by implementing a government intervention policy in foreign exchange markets and also by exploiting the role of controlled rates in order to solve the foreign debt problems in most developing countries especially after 1980. Also, I compare the government intervention rules in combination with flexible interest rates with the same rules under controlled rates. In this chapter, I also confine the analysis only on the stable case of the positive g.
A. The combined effects of an expansionary monetary policy and an increase in foreign demand for domestic commodities

I can derive the combined effects on real income, trade balance or inflow of foreign capital, and inflation rate of an increase in nominal money and an increase in foreign demand for domestic commodities from the reduced forms of endogenous variables in the equations of (5.A.2), (5.A.4), and (6.A.1) as follows:

\[ g \frac{dy_t}{dt} = [a_2(c_1 + \delta + c_3 \phi) + a_1 b_1(\theta_2/\theta_1)c_3 \phi] dM_t + b_1(\theta_2/\theta_1)(c_1 + \delta + c_3 \phi - a_1) dk = (+) \quad (8.A.1) \]

\[ g \frac{dT_B}{dt} = c_3 \phi[(c_1 + \delta)(b_1(\theta_2/\theta_1) + a_2 b_2) - c_2(a_2 + a_1 b_1(\theta_2/\theta_1))] dM_t + c_3 \phi[b_1(\theta_2/\theta_1)(1 - c_2) + a_2 b_2] dk = (+) \text{ or } (-) \quad (8.A.2) \]

\[ dd_t = - dTB = (-) \text{ or } (+) \quad (8.A.3) \]

\[ g \frac{d\phi_t}{dt} = \lambda [a_2(c_1 + \delta + c_3 \phi) + a_1 b_1(\theta_2/\theta_1)c_3 \phi] dM_t + \lambda b_1(\theta_2/\theta_1)(c_1 + \delta + c_3 \phi - a_1) dk = (+) \quad (8.A.4) \]

Moreover, in order to explain the combined effects of both an expansionary monetary policy and an increase in foreign demand, I assume that \( dM_t = dk \) in the total differentiation of each reduced form.
for simple analysis, since I just want to examine the (+) or (−) signs of the combined effects. Then, the combined effects are given by:

\[ g[(dy_t/dM_t) + (dy_t/dk)] = \left[ (a_2 + b_1(\theta_2/\theta_1))c_1 + (a_1 + 1)b_1(\theta_2/\theta_1) \right] c_3 + a_1b_1(\theta_2/\theta_1) = (+) \quad (8.A.5) \]

\[ g[(dTB/dM_t) + (dTB/dk)] = (-) g[(dd_t/dM_t) + (dd_t/dk)] = \left[ c_3 + (c_1 + \delta + 1)(b_1(\theta_2/\theta_1) + a_2b_2) - c_2[a_2 + (a_1 + 1)b_1(\theta_2/\theta_1)] \right] = (+) \text{ or } (-) \quad (8.A.6) \]

\[ (g/\psi)[(dp_t/dM_t) + (dp_t/dk)] = \left[ (a_2 + b_1(\theta_2/\theta_1))(c_1 + \delta) + c_3 + (a_1 + 1)(\theta_2/\theta_1) \right] a_1b_1(\theta_2/\theta_1) = (+) \quad (8.A.7) \]

From the above, I know that when both nominal money and foreign demand for domestic commodities increase, the effects of real income and the inflation rate are always positive since the stability conditions in (5.B.5) are met; however, the effects on trade balance or inflow of foreign capital would be positive or negative depending upon parameter values. The above effects in (8.A.5), (8.A.6), and (8.A.7) are the key equations for use in deriving an implementable government intervention rule in foreign exchange markets for the purpose of stabilization for
obtaining a trade surplus and a positive real income effect with a tolerable inflation rate.

B. The government intervention rules in foreign exchange markets for a surplus in the trade balance

Conditions for (+ dTB) or (− ddₜ) in (8.A.6) can be rewritten in terms of the degree of government intervention in foreign exchange markets (δ) to examine how much the small government should intervene in foreign exchange markets in order to obtain some trade surplus and positive income effect with a tolerable inflation rate when both nominal money and foreign demand for domestic commodities increase. From (8.A.6) given parameter values, I can obtain the degree of government intervention in foreign exchange market for a trade surplus as follows:

For (+) dTB or (−) ddₜ, from (8.A.6),

\[ δ > c₂[a₂ + (a₁ + 1)b₁(θ₂/θ₁)]/ [b₁(θ₂/θ₁) + a₂b₂] - (c₁ + 1) = X \]

(8.B.1)

The combined real income effect in (8.A.5) would be always (+) at the entire range of the degree of the government intervention as long as stability conditions are met. In this rule, let the value of the right
hand side of (8.B.1) be denoted by (X). Also, I already have the conditions for an overshooting or a undershooting of foreign exchange rate as follows:

\[
\delta < \left[ \frac{[a_2 + a_1 b_1 (\theta_2/\theta_1)] c_2}{b_1 (\theta_2/\theta_1) + a_2 b_2} \right] - c_1 = (Y) \text{ for overshooting.}
\]

When I compare the magnitude of (X) with that of (Y), I find that (X) > (Y) (* proof: appendix 5). I explain the simultaneous effects of an expansionary monetary policy and an increase in foreign demand on real income, trade balance or inflow of foreign capital, and inflation rate graphically. In order to draw the relationships between the combined effects and the degree of government intervention, I differentiate the effects of \([(dy_t/dM_t) + (dy_t/dk)]\) and \([(dTB/dM_t) + (dTB/dk)]\) in (8.A.5) and (8.A.6) with respect to the degree of government intervention as follows: (* Appendix 6)

\[
\frac{\partial (dy_t/dM_t) + (dy_t/dk)}{\partial \delta} = \frac{a_1 b_1 (\theta_2/\theta_1)}{g^2} \frac{[b_1 (\theta_2/\theta_1) + a_2 b_2]}{g^2} - a_2 (c_2 + b_2 c_3 \phi) - b_1 (\theta_2/\theta_1)(c_2 + c_3 \phi) = (-) \quad (8.A.2)
\]

\[
\frac{\partial (dTB/dM_t) + (dTB/dk)}{\partial \delta} = \frac{[c_2 (b_1 (\theta_2/\theta_1) + a_2 b_2)]}{g^2} - b_1 (\theta_2/\theta_1)(c_2 + c_3 \phi) = (+) \quad (8.A.3)
\]
in (8.A.2) I assume that \( \partial[(dy_t/dM_t) + (dy_t/dk)]/\partial \delta = (-) \) or that the
effect of \( (dy_t/dM_t) \) dominates the effect of \( (dy_t/dk) \) with respect to
the degree of government intervention. From (8.B.2) and (8.B.3), the
slope of \( [(dy_t/dM_t) + (dy_t/dk)] \) is negative and that of \( [(dTb/dM_t) +
(dTB/dk)] \) is positive. Also,

\[
[(dy_t/dM_t) + (dy_t/dk)] \bigg|_{\delta = + \infty} = \left[ a_2^+ b_1(\theta_2/\theta_1) \right] / \left[ b_1(\theta_2/\theta_1) \right] \\
+ a_2 b_2 = (+) \quad (8.B.4)
\]

\[
[(dy_t/dM_t) + (dy_t/dk)] \bigg|_{\delta = \eta} = (+) \infty \quad (8.B.5)
\]

\[
\partial[(dy_t/dM_t) + (dy_t/dk)]/\partial \delta \bigg|_{\delta = + \infty} = 0 \quad (8.B.6)
\]

\[
[(dTb/dM_t) + (dTb/dk)] \bigg|_{\delta = + \infty} = c_3 \phi \quad (8.B.7)
\]

\[
[(dTb/dM_t) + (dTb/dk)] \bigg|_{\delta = \eta} = (-) \infty \quad (8.B.8)
\]

\[
\partial[(dTb/dM_t) + (dTb/dk)]/\partial \delta \bigg|_{\delta = + \infty} = 0 \quad (8.B.9)
\]

(* derivations: Appendix 6)

where \( \eta = [a_1 b_1(\theta_2/\theta_1)c_2 - [b_1(\theta_2/\theta_1) + a_2 b_2] - (c_1 + c_3 \phi)] = (+) \). From
(8.B.4) and (8.B.7), I recognize that as the degree of government
intervention increases to the positive direction infinitely, both
\( (dy_t/dM_t) \) and \( (dTb/dM_t) \) approach asymptotically to different positive
amounts. Also, when \( \delta = \eta \), \( (dy_t/dM_t) \) becomes positively infinite while
\( \frac{dTB}{dM_t} \) becomes negatively infinite. The combined effects are shown in Figure 16.

\[ (+) \quad dy_t \]

\[ n \quad X(+) \quad \delta \]

\[ (+) \quad \left[ a_2 + b_1 \left( \frac{\theta_2}{\theta_1} \right) \right] \]

\[ \left[ b_1 \left( \frac{\theta_2}{\theta_1} \right) + a_2 b_2 \right] \]

Figure 16
As long as an increase in foreign demand for domestic commodities raises both real income and trade balance positively at all degrees of government intervention, the combined effects of an expansionary monetary policy and an increase in foreign demand are similar to the effects of an expansionary monetary policy which were explained in chapter 6.

Figure 16 suggests a few arguments. First of all, I can see some trade-off between raising real income and improving trade balance or solving foreign debt at the entire range of the degree of government intervention. Thus, the economy could increase real income at the expense of foreign debt or trade deficit, and vice versa. When the degree of intervention is weak (or negative), the trade-off becomes larger; however, when the degree is strong (or positive), the trade-off becomes smaller. Especially when the government adopts the so-called intervention policy of "leaning for the wind," the economy would experience high growth in terms of increases in real income, high inflation, and exploding foreign debt similar to what took place in the Korean economy in the late 1970s. The small economy could obtain a surplus in trade balance by an increase in the degree of government intervention ("leaning against the wind"), so that a foreign debt problem could be solved by the surplus in trade balance.

Second, even if the government increases the degree of government intervention indefinitely, there would be a limit to the improvement of trade balance. The maximum improvement of trade balance or the maximum trade surplus would be $c_3 \phi$, and it depends upon the degree of the
capital mobility in the B/Ps(c₃) and the speed of adjustment in the
depreciation(ϕ). The reason why there is a certain limit to the
possible improvement of the trade balance when the government increases
the degree of intervention indefinitely is as follows. In [(dTB/dMₜ) +
(dTB/dk)], (dTB/dk) is not related to the degree of government
intervention, but (dTB/dMₜ) is affected by the degree of government
intervention. Moreover, in the trade balance effect of an expansionary
monetary policy, the amount of imports is not affected by the degree of
intervention, so that only exports are affected by the degree of
government intervention via changes in exchange rate. The effect of an
expansionary monetary policy on trade balance can be rewritten as
follows:

\[ \frac{dTB}{dM_t} = \frac{dTB}{de_t} \left( \frac{de_t}{dM_t} \right) \]

\[ = \left[ \frac{1}{b_1 + a_2b_2} \right] c_3 \phi(b_1 + a_2b_2)(c_1 + \delta) \]

Therefore, when \( \delta \) becomes \(+ \infty\), the roles of other parameters are
disappeared so that only \( c_3 \phi \) effects the trade balance in \( \frac{dTB}{dM_t} \).

Figure 16 also provides a reasonable range of the degree of government
intervention in foreign exchange markets when the government wants to
achieve a certain level of trade surplus and a tolerable inflation
rate. When I consider the economic environment for the Korean economy,
foreign demand for Korean commodities and nominal money continuously
increased after 1982. From the above intervention rule, I argue that strong government intervention in foreign exchange markets implemented by the Korean government after 1982 was appropriate, so that the economy could improve its trade balance and decrease gradually the amount of inflow of foreign capital with stable domestic prices.

C. The effects of the liberalization of controlled rates

in the output market

In order to compare the magnitudes of the effects of \( [(dy_t/dM_t) + (dy_t/dk)], [(dT/dM_t) + (dT/dk)], \text{ and } [(d\theta_t/dM_t) + (d\theta_t/dk)] \) under controlled rates with those under flexible rates, I differentiate those effects with respect to the degree of liberalization of controlled rates in the output market\( (\theta_1) \), holding \( \theta_2 \) constant as follows:(*Appendix 7)

If the slope of IS is \((-\) such that \( (c_1 + \delta + c_3)(1 - b_2) \geq a_1(c_2 + b_2c_3\phi - b_2) \), then \( \theta[(dy_t/dM_t) + (dy_t/dk)]/ \theta \theta_1 \geq 0 \), however \( \theta[(dT/dM_t) + (dT/dk)]/ \theta \theta_1 \leq 0 \). (8.C.1)

On the other hand,
If the slope of IS is (+) such that \((c_1 + \delta + c_3)(1 - b_2) \leq a_1(c_2 + b_2c_3\phi - b_2)\), then \(\Theta[(dy_t/dM_t) + (dy_t/dk)]/\Theta_1 \leq 0\), however \(\Theta[(dTB/dM_t) + (dTB/dk)]/\Theta_1 \geq 0\). \(8.C.2\)

From the above, the combined effects on real income and on trade balance or on inflow of foreign capital under controlled rates are different from those effects under flexible rates according to whether the slope of the IS is (+) or (-). If the slope of IS is (-) such that \((c_2 + b_2c_3\phi) \leq 1\), which is the normal situation, then \(\Theta[(dy_t/dM_t) + (dy_t/dk)]/\Theta_1 > 0\), and \(\Theta[(dTB/dM_t) + (dTB/dk)]/\Theta_1 < 0\). This situation of IS explained by figure 17.

![Diagram](image)

**Figure 17**

\([(dy_t/dM_t) + (dy_t/dk)]\) and \([(dTB/dM_t) + (dTB/dk)]\)

when the the slope of IS is negative.
Therefore, as long as $0 < \theta_1 < 1$,
\[
[(dy_t / dM_t) + (dy_t / dk)] \text{ in flexible rates} > [(dy_t / dM_t) + (dy_t / dk)] \text{ in curb rates}, \quad \text{and}
\]
\[
[(dT_B / dM_t) + (dT_B / dk)] \text{ in flexible rates} < [(dT_B / dM_t) + (dT_B / dk)] \text{ in curb rates}.
\]

The reason why the combined real income effect under flexible rates would be larger than the combined real income effect under controlled rates is the same as in the real income effect of only an expansionary monetary policy in chapter 6. In the money market, an increase in nominal money should be supported by an increase in real income and a decrease in interest rate for money market equilibrium. However, in the output market, increased real income would be reinforced both by the decreased interest rate in the money market and by an increase in foreign demand. In this case, if $\theta_1$ becomes larger, the given decreased interest rate (or curb rate under controlled rates) could raise real income further in the output market. On the other hand, an expansionary monetary policy improves trade balance more under controlled rates than under flexible rates, since the positive real income effect of an expansionary monetary policy would be smaller under controlled rates compared to under flexible rates. Increased imports would be small under controlled rates compared to under flexible rates. The improvement of trade balance would be additionally reinforced by
Increased foreign demand in the trade balance. These combined effects under controlled and flexible rates are explained in figure 18.

Figure 18

Figure 18 tells the following about the combined effects of an expansionary monetary policy and an increase in foreign demand when IS is in normal shape of (−). First, curb rates would decrease or moderate the positive real income effect at the entire range of
government intervention; however, they would improve the trade balance effect or decrease the inflow of foreign capital compared to flexible rates. Especially when the degree of government intervention is sufficiently weak or when the government adopts a policy of "leaning for the wind", controlled rates play a role of moderating the effects of exploding foreign debt and high real income. Therefore, I argue that in the late 1970s in the Korean economy, curb rates could play a role of built-in stabilizer by moderating exploding foreign debt, high growth, and high inflation. In other words, if there had been no curb market in the economy, high inflation and exploding foreign debt would have been more serious. Second, in order for the economy to obtain the same level of combined real income and trade balance effects, the government may decrease the degree of government intervention under curb rates compared to the degree under flexible rates. This implies that the distorted policy of a controlled rate system itself could play the same role as an increase in the degree of government intervention in foreign exchange markets.

On the other hand, if the slope of IS is positive or if the import elasticity to real income ($c_2$) is sufficiently large, then $\partial[(dy_t/dM_t) + (dy_t/dk)]/\partial \theta_i < 0$, and $\partial[(dTB/dM_t) + (dTB/dk)]/\partial \theta_i > 0$. In the positive IS, due to a given increase in nominal money, both real income and the interest rate could increase for the equilibrium money market, if real income increases sufficiently enough to offset the negative effect on demand for money by the increased interest rate. If the interest rate increases, the positive real income effect would be
larger under controlled rates than the positive real income effect under flexible rates. The reason is that as $\theta_1$ increases, the positive real income effect would decrease more under flexible rates ($\theta_1 = 1$) because of the negative real income effect of the higher interest rate in the output market. Thus, the combined effect would be more deterioration of the trade balance under controlled rates than under flexible rates, because imports increase more due to the larger real income effect under controlled rates than under flexible rates.

\[
\frac{dy_t}{dM_t}, \quad \frac{dT_B}{dM_t}.
\]

\begin{figure}
\centering
\begin{tabular}{cc}
0 & 1 \\
\end{tabular}
\quad \begin{tabular}{cc}
0 & 1 \\
\end{tabular}
\caption{when the slope of IS is positive}
\end{figure}

From figure 19, if the slope of IS is positive,
\[ \left( \frac{dy_t}{dM_t} + \frac{dy_t}{dk} \right) \text{in flexible rates} < \left( \frac{dy_t}{dM_t} + \frac{dy_t}{dk} \right) \text{in curb rates}, \text{ and} \]

\[ \left( \frac{dTB}{dM_t} + \frac{dTB}{dk} \right) \text{in flexible rates} > \left( \frac{dTB}{dM_t} + \frac{dTB}{dk} \right) \text{in curb rates}. \]

---

\[ (+) \]

---

\[ dy_t \]

---

\[ dTB \]

---

\[ \text{...... under controlled rates} \]

---

\[ \text{under flexible rates} \]

---

\[ (+) \]

---

\[ m \]

---

\[ \delta \]

---

Figure 20
Figure 20 shows that, when the IS is positive, curb rates would raise the positive real income effect further and make the trade balance worse than under flexible rates at the entire range of the degree of government intervention. Especially when the degree of government intervention is sufficiently weak, curb rates would exaggerate high growth, high inflation, and exploding debt. Also, in order for the economy to achieve the same level of the combined real income effect and trade balance effect, the government should increase the degree of government intervention under curb rates compared to the degree under flexible rates. In this case, the distorted policy of a controlled rate system could play the role of an increased degree of government intervention.
I have compared the combined effects of an expansionary monetary policy and an increase in foreign demand for domestic commodities on real income, trade balance or inflow of foreign capital, and the inflation rate under controlled interest rates with those effects under flexible rates. More importantly, I have evaluated the roles of curb rates and the degree of government intervention in foreign exchange markets under those rates as well as under flexible rates, and also suggested a reasonable range for the degree of government intervention in order for a small economy to achieve a trade surplus and a positive real income effect with a tolerable inflation rate. In this chapter, I summarize the findings in this paper about the roles of curb rates and government intervention policy in foreign exchange markets.

When I compared the combined effects of an expansionary monetary policy and an increase in foreign demand, I found that controlled rates could increase real income less than flexible rates; however, controlled rates could improve the trade balance more than flexible rates under the conventional shape of the \((-) IS\) curve. Therefore, I argue that controlled rates could play a role as a built-in stabilizer by moderating exploding foreign debt, high growth, and high inflation.
when a small economy adopts the so-called "leaning for the wind" policy (the degree of intervention in foreign exchange markets is negative). Thus, I argue that in the late 1970s when the Korean government adopted the "leaning for the wind" policy, curb rates would have played a role in moderating exploding foreign debt, high growth, and high inflation. If there had been no curb market in the Korean economy, the problems would have been more serious. Only in a special case when the import elasticity to real income \( c_2 \) is larger than 1, curb rates would accelerate the problems of exploding foreign debt and high inflation further.

Also, I found that in order for an economy to achieve the same level of real income effect or trade balance effect as with flexible rates, the government may decrease the degree of its intervention under controlled rates. This implies that the distorted policy of controlled rates itself could play the same role as an increase in the degree of government intervention in foreign exchange markets. Thus, distorted curb rates could supplement the government intervention policy in terms of changes in real income, trade balance, and inflow of foreign capital.

When I examine the roles of government intervention policy in foreign exchange markets, first of all, I see a fundamental trade-off between an increase in real income and improving trade balance or a decrease in foreign debt at the entire range of the degree of government intervention. Thus, the economy could increase real income at the expense of foreign debt (or high inflation), and vice versa.
When the government adopts an intervention policy of the "leaning for the wind" or when the degree of intervention is negative, the trade-off would be larger so that the economy would experience an exploding foreign debt, high growth, and high inflation; however, when the government intervenes strongly in the foreign exchange market or adopts a strong "leaning against the wind" policy, the trade-off would be small.

When the Korean government implemented strong intervention in foreign exchange markets from 1982, the trade balance began to improve and consequently the amount of inflow of foreign capital has decreased with stable domestic prices thereafter. In that sense, I argue that the degree of government intervention in foreign exchange markets implemented by the Korean government after 1982 was appropriate for improving the trade balance and decreasing inflow of foreign capital with stable prices.

Second, I found that even if a small government increases the degree of government intervention for improving trade balance, there is a certain limit to the amount that trade balance might improve so that the government cannot exploit the intervention policy for improving the trade balance without limit. The limit depends upon the degree of capital mobility in the B/Ps and the speed of adjustment in depreciation. When the degree of intervention is positively infinite, the roles of other parameters except the degree of intervention and adjustment speed are cancelled out in the trade balance effect of an expansionary monetary policy.
Third, this paper could provide a reasonable range for the degree of government intervention in foreign exchange markets when the economy determines a target level of the effects on real income, trade balance, or inflation rate when nominal money and foreign demand increase.

Whether or not the liberalization of controlled rates is desirable is a tough question. The answer would be different according to the economic situations or economic goals that the economy meets. If a small economy has a serious foreign debt problem to be solved, the liberalization of controlled rates would not be recommended, since controlled rates would work favorably for moderating exploding foreign debt. The economy would do better to maintain controlled rates with strong government intervention in foreign exchange markets. On the other hand, if a small economy does not have a significant foreign debt problem, liberalization would be desirable for obtaining high real income.

In conclusion, this paper argues that in the Korean economy, curb rates played a role as built-in stabilizer in moderating exploding foreign debt, high growth, and high inflation in the late 1970s; along with the appropriate intervention policy, these rates have attributed to improving the trade balance and stable domestic prices after 1982 so that the Korean economy could solve its problems of foreign debt.

In this paper, I could not empirically support the arguments suggested since the actual data of curb market interest rates and risk premiums for foreign loans were not available. Instead, I analyzed the roles of curb rates and the degree of government intervention in a
conventional parameter case of a negatively sloped IS curve, and explained the recent economic phenomena in the Korean economy. This analysis is also limited by the assumption that curb markets are perfectly competitive. If some friction exists in the curb markets, the effectiveness of the arguments in this paper would be diminished.

I see several directions for further study. This paper was focused only on short run analysis. By extending the model to a more dynamic one, we could examine the exact adjustment paths of the key variable so that analysis would be more complete. Intervention rules for a trade surplus when curb market rates are affected by changes in official rates could also be derived. By specifying some reasonable relationships between official interest rates and curb rates, we can obtain some reasonable intervention rules, although the computations are more complicated.
APPENDIX 1
REDUCED FORMS

I derive the reduced forms of exchange rate, real income, interest rate, and inflation rate in (5.A.1), (5.A.2), (5.A.3), and (5.A.4) in page 45 as follows.

1. The reduced form of exchange rate in (5.A.1)

When I combine the output and money equations in (4.A.1) and (4.B.1) by eliminating interest rate ($i_t$), I obtain

$$[b_1(\theta_2/\theta_1) + a_2b_2]y_t = a_1b_1(\theta_2/\theta_1)e_t - [a_1b_1(\theta_2/\theta_1) + a_2]p_t +$$

$$+ b_1(\theta_2/\theta_1)k + a_2M_t \quad (9.1.1)$$

From (9.1.1) and the B/Ps of (4.C.1), I can derive the reduced form of exchange rate ($e_t$) by eliminating real income ($y_t$) as follows.

Let $\Delta$ denote $[b_1(\theta_2/\theta_1) + a_2b_2]$. Then,
\[ [a_1b_1(\theta_2/\theta_1)c_2 - \Delta(c_1 + \delta)] e_t + \Delta c_3 \phi (\bar{e} - e_t) \]

\[ = [(a_1b_1(\theta_2/\theta_1) + a_2)c_2 - (c_1 + \delta)\Delta] p_t + [\Delta - b_1(\theta_2/\theta_1)c_2] k + \]

\[ + \Delta c_3 \alpha_t - a_2 c_2 M_t \]

Therefore, the reduced form of \( e_t \) is given by:

\[ e_t = \frac{1}{g}(a_2c_2) M_t + \frac{1}{g}[(b_1c_2(\theta_2/\theta_1) - b_1(\theta_2/\theta_1) - a_2b_2)] k \]

\[ - \frac{1}{g}[(b_1c_3(\theta_2/\theta_1) + a_2b_2c_3) \alpha_t \]

\[ + \frac{1}{g}[[b_1(\theta_2/\theta_1) + a_2b_2](c_1 + \delta) - c_2(a_2 + a_1b_1(\theta_2/\theta_1))] p_t \]

\[ + \frac{1}{g}[(a_2b_2c_3 + b_1c_3(\theta_2/\theta_1))] \bar{e}_t \]

\[ + \frac{1}{g}[(a_2b_1c_2(1 - (\theta_2/\theta_1))] l^o \]

\[ (5.A.1) \]

where \( g = [(b_1(\theta_2/\theta_1) + a_2b_2)(c_1 + \delta + c_3\phi) - a_1b_1(\theta_2/\theta_1)c_2] = (+) \)

from the stability conditions in (5.B.5).

2. The reduced form of real income in (5.A.2)

In order to obtain the reduced form of real income \( y_t \), if I plug the reduced form of \( e_t \) in (5.A.1) into the above (9.1.1),

\[ y_t = \frac{1}{g}[a_2(c_1 + \delta + c_3\phi)] M_t \]
Therefore, the reduced form of inflation rates is

\[ \dot{\pi}_t = \psi \text{ reduced form of real income} \]  \hfill (5.A.4)

3. The reduced form of interest rate

If I plug the reduced form of real income \( y_t \) in (5.A.2) into the money equation in (4.B.1), I can obtain the following reduced form of \( l_t^C \).

In the reduced form of \( y_t \),

let \( \pi_1 = - \frac{1}{g} [a_2(c_1 + \delta) + (a_2 + a_1 b_1 (\theta_2/\theta_1)) c_3 \phi] \ln p_t \)

\[ \pi_2 = \frac{1}{g} b_1 (\theta_2/\theta_1) (c_1 + \delta + c_3 \phi - a_1) \ln k \]

\[ \pi_3 = - \frac{1}{g} (a_1 b_1 c_3) (\theta_2/\theta_1) \ln \sigma_t \]

\[ \pi_4 = \frac{1}{g} [a_2(c_1 + \delta + c_3 \phi)] + \frac{1}{g} [a_1 b_1 (\theta_2/\theta_1) c_3 \phi] \ln M_t \& \bar{\sigma} \]

Then, from the money equation of (4.B.1),

\[ b_1 l_t = b_2 (\pi_1 p_t + \pi_2 k + \pi_3 \sigma_t + \pi_4 M_t) - M_t + \pi_t \]
From the above, I can derive the reduced form of interest rate as follows.

\[ l_t^C = - \frac{1}{g}(c_1 + \delta + c_3\phi - a_1 c_2) M_t + \frac{b_2}{g\theta_1}(c_1 + \delta + c_3\phi - a_1) k \]

\[ - \left( \frac{1}{g}(a_1 b_2 c_3) a_t + \left( \frac{1}{g}\right)[(c_1 + \delta + c_3\phi) - a_1(c_2 + b_2 c_3)] p_t \right. \]

\[ + \left. \frac{1}{g}[a_1 b_2 c_3]\bar{\theta} \right. \]

\[ - \left( \frac{1}{g}\right)[(c_1 + \delta + c_3\phi)[b_1(1 - \theta_2) + a_2 b_2(1 - \theta_1)] - a_1 b_1 c_2(1 - \theta_1)] l_t^0 \]

(5.A.3)

In the above reduced forms, when I plug \((\theta_2/\theta_1) = 1\) into the reduced forms of (5.A.1), (5.A.2), and (5.A.3) under controlled rates, I can derive the reduced forms under flexible rates since, when the controlled interest rates are fully liberalized, both \(\theta_1\) and \(\theta_2\) are reduced to 1 in the model.
APPENDIX 2

PROOF: THE SLOPE OF LM IS LARGER THAN THAT OF IS (IN PAGE 50)

1. The slope of IS

I can derive the slope of IS from the relationship between real income and interest rate. I can obtain the IS from combining the equations of output and the B/Ps in (4.A.1) and (4.C.1) by eliminating the endogenous variable of $e_t$ as follows.

$$(c_1 + \delta + c_3 \phi - a_1 c_2)y_t - a_2(c_1 + \delta + c_3 \phi)l_t + \ldots$$

Therefore, the slope of IS is given by:

$$(c_1 + \delta + c_3 \phi - a_1 c_2) / [ - a_2(c_1 + \delta + c_3 \phi)]$$

(9.2.1)
2. The slope of LM

From the money equation in (4.B.1), the slope of LM is \[ \frac{b_2}{b_1(\theta_2/\theta_1)} \] (9.2.2)

3. The comparison of slopes

(9.2.2) - (9.2.1)

\[
= \frac{b_2}{b_1(\theta_2/\theta_1)} - \left( - \right) \left[ \left( c_1 + \delta + c_3\phi - a_1c_2 \right) / \left[ a_2(c_1 + \delta + c_3\phi) \right] \right]
= \frac{\left( c_1 + \delta + c_3\phi \right) \left[ b_1(\theta_2/\theta_1) + a_2b_2 \right] - a_1b_1(\theta_2/\theta_1)c_2}{\left[ a_2(c_1 + \delta + c_3\phi) \right]} = (+) (9.2.3)

From the stability conditions in (5.B.5), I know that (9.2.3) is positive. Therefore, the slope of LM is always larger than that of IS for the stable system even in case of negative IS.
APPENDIX 3

COMPARISON OF THE EFFECTS OF AN EXPANSIONARY MONETARY
POLICY UNDER CONTROLLED AND FLEXIBLE RATES (IN PAGE 65)

1. \[ \frac{\partial(dy_t/dM_t)}{\partial \theta_1} |_{\theta_2 = 1} \]

In order to compare the real income effect of an expansionary
monetary policy under controlled rates with that under flexible rates,
I differentiate the real income effect with respect to \( \theta_1 \) given by:

\[ \frac{\partial(dy_t/dM_t)}{\partial \theta_1} |_{\theta_2 = 1} \]

\[ = \left[ a_2 b_1 \frac{\theta_2}{\theta_1} (c_1 + \delta + c_3 \phi) \right] \frac{g^2}{g}(c_1 + \delta + c_3 \phi - a_1 c_2 - a_1 b_2 c_3 \phi) \]

\[ = (+), \text{ when IS is } (-) \text{ such that } (c_1 + \delta + c_3 \phi) > (a_1 c_2 + a_1 b_2 c_3 \phi) \]

or

\[ = (-), \text{ when IS is } (+) \text{ such that } (c_1 + \delta + c_3 \phi) < (a_1 c_2 + a_1 b_2 c_3 \phi) \]
On the other hand,

\[ \Theta(dT_B/dM_t)/\Theta \theta_1 |(\theta_2 = 1) \]

\[ = (-)[a_2 b_1 (\theta_2/\theta_1)c_2 c_3 \phi/ \phi^2](c_1 + \delta + c_3 \phi - a_1 c_2 - a_1 b_2 c_3 \phi) \]

\[ = (-), \text{ when IS is } (-) \text{ such that } (c_1 + \delta + c_3 \phi) > (a_1 c_2 + a_1 b_2 c_3 \phi) \]

or

\[ = (+), \text{ when IS is } (+) \text{ such that } (c_1 + \delta + c_3 \phi) < (a_1 c_2 + a_1 b_2 c_3 \phi) \]
APPENDIX 4

COMPARISON OF THE EFFECTS OF AN INCREASE IN FOREIGN DEMAND UNDER CONTROLLED AND FLEXIBLE RATES (IN PAGE 75)

1. \( \frac{\partial (dy_t/dK)}{\partial \theta_1} \bigg|_{(\theta_2 = 1)} \)

In order to compare the real income effect of an increase in foreign demand for domestic commodities under controlled rates with that under flexible rates, I differentiate the real income effect with respect to \( \theta_1 \) given by:

\[
\frac{\partial (dy_t/dK)}{\partial \theta_1} \bigg|_{(\theta_2 = 1)} = \frac{a_1 b_1 (\theta_2/\theta_1) b_2 (c_1 + \delta + c_3 \phi)}{g^2} [a_1 - (c_1 + \delta + c_3 \phi)]
\]

\[
= (-), \text{ since I know that } (c_1 + \delta + c_3 \phi) > a_1 \text{ from the stability conditions in (5.8.5).}
\]
On the other hand,

\[ \frac{\partial (dTB/dk)}{\partial \Theta_1}(\Theta_2 = 1) \]

= (-) \[ a_2 b_1 (\Theta_2/\Theta_1) b_2 c_2 c_3 \phi / \ g^2 \] \[ a_1 - (c_1 + \delta + c_3 \phi) \]

= (+) , since I know that \((c_1 + \delta + c_3 \phi) > a_1\) from the stability conditions in (5.8.5).
When both nominal money and foreign demand increase, the condition for $(+) \, dT_B$ or $(-) \, d\delta_t$ is as follows from (8.A.6).

\[ \delta > c_2[a_2 + (a_1 + 1)b_1(\Theta_2/\Theta_1)]/\left(b_1(\Theta_2/\Theta_1) + a_2b_2\right) - (c_1 + 1) = (X) \]

(8.B.1)

In this condition, let the value of the right hand side of (8.B.1) be denoted by (X). Also, I already have the conditions for an overshooting or a undershooting of foreign exchange rate as follows: (chapter VI, A-1)

\[ \delta < \left[\left(a_2 + a_1b_1(\Theta_2/\Theta_1)\right)c_2 / \left(b_1(\Theta_2/\Theta_1) + a_2b_2\right)\right] - c_1 = (Y) \]

for overshooting.
The comparison of (X) and (Y):

When I compare the magnitude of (X) with that of (Y), I find that (X) > (Y) as follows.

\[
(X) - (Y) = c_2 [a_2 + (a_1 + 1)b_1(\theta_2/\theta_1)]/ [b_1(\theta_2/\theta_1) + a_2b_2] - (c_1 + 1)
- \left( b_1(\theta_2/\theta_1) + a_2b_2 \right) - c_1
= 1 - \left[ c_2b_1(\theta_2/\theta_1) / [b_1(\theta_2/\theta_1) + a_2b_2] \right]
= \left[ b_1(\theta_2/\theta_1) + a_2b_2 - c_2b_1(\theta_2/\theta_1) / [b_1(\theta_2/\theta_1) + a_2b_2] \right]
= (+) is assumed.

Therefore, (X) > (Y) is assumed.
APPENDIX 6

THE RELATIONSHIP BETWEEN THE DEGREE OF GOVERNMENT INTERVENTION AND THE COMBINED EFFECTS (IN PAGE 83)

In order to obtain the relationship between the combined effects and the degree of government intervention, I differentiate the effects of \((dy_t/dM_t) + (dy_t/dk)\) and \((dTB/dM_t) + (dTB/dk)\) in (8.A.5) and (8.A.6) with respect to the degree of government intervention as follows.

\[
\frac{\partial}{\partial \delta} \left[ \frac{dy_t}{dM_t} + \frac{dy_t}{dk} \right] = \frac{\partial}{\partial \delta} \left[ a_1 b_1 (\theta_2/\theta_1) \gamma^2 \right] [b_1 (\theta_2/\theta_1) + a_2 b_2 - a_2 (c_2 + b_2 c_3)] - b_1 (\theta_2/\theta_1)(c_2 + c_3) = (-) \quad (8.A.2)
\]

In (8.A.2), we assumed that the effect of \((dy_t/dM_t)\) dominates the effect of \((dy_t/dk)\) with respect to the degree of government intervention in chapter VIII, section B. On the other hand,

\[
\frac{\partial}{\partial \delta} \left[ \frac{dTB/dM_t} + (dTB/dk) \right] = \frac{\partial}{\partial \delta} \left[ c_3 \phi (b_1 (\theta_2/\theta_1) + a_2 b_2) / \gamma^2 \right] \left[ - b_1 (\theta_2/\theta_1) - a_2 b_2 + a_2 (c_2 + b_2 c_3) + b_1 (\theta_2/\theta_1)(c_2 + c_3) \phi \right] = (+) \quad (8.A.3)
\]

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\[
\left[ (d y_t / d M_t ) + (d y_t / d k) \right] (\delta = + \infty ) = \left[ a_2 + b_1 (\theta_2 / \theta_1 ) \right] (c_1 + \delta ) / [ b_1 (\theta_2 / \theta_1 ) + a_2 b_2 ] (c_1 + \delta ) \\
= \left[ a_2 + b_1 (\theta_2 / \theta_1 ) \right] / [ b_1 (\theta_2 / \theta_1 ) + a_2 b_2 ] = (+) \\
(8.8.4)
\]

\[
\left[ (d y_t / d M_t ) + (d y_t / d k) \right] (\delta = \eta ) = [- b_1 (\theta_2 / \theta_1 ) - a_2 b_2 + b_1 (\theta_2 / \theta_1 ) c_2 + a_2 c_2 + \\
+ c_3 \phi [ b_1 (\theta_2 / \theta_1 ) + a_2 b_2 ] ] / 0 \\
= (+) / 0 = (+) \infty \\
(8.8.5)
\]

\[
\Theta \left[ (d y_t / d M_t ) + (d y_t / d k) \right] / \Theta \delta \left| (\delta = + \infty ) \right. = 0 - 0 = 0 \\
(8.8.6)
\]

\[
\left[ (d T B / d M_t ) + (d T B / d k) \right] (\delta = + \infty ) = c_3 \phi [ b_1 (\theta_2 / \theta_1 ) + a_2 b_2 ] / [ b_1 (\theta_2 / \theta_1 ) + a_2 b_2 ] \\
= c_3 \phi \\
(8.8.7)
\]

\[
\left[ (d T B / d M_t ) + (d T B / d k) \right] (\delta = \eta ) = [(-) / 0 ] = - \infty \\
(8.8.8)
\]

\[
\Theta \left[ (d T B / d M_t ) + (d T B / d k) \right] / \Theta \delta \left| (\delta = + \infty ) \right. = 0 - 0 = 0 \\
(8.8.9)
\]

where \( \eta = [ a_1 b_1 (\theta_2 / \theta_1 ) c_2 ] / [ b_1 (\theta_2 / \theta_1 ) + a_2 b_2 ] - (c_1 + c_3 \phi ) \).
In order to compare the magnitudes of the effects of \( (\frac{dy_t}{dM_t}) + (\frac{dy_t}{dk}) \) and \( (\frac{dTB}{dM_t}) + (\frac{dTB}{dk}) \) under controlled rates with those under flexible rates, I differentiate those effects with respect to the degree of liberalization of controlled rates in the output market \( (\Theta_t) \), holding \( \Theta_2 = 1 \).

1. \( \Theta \left[ (\frac{dy_t}{dM_t}) + (\frac{dy_t}{dk}) \right] / \Theta_1 \\

\begin{align*}
= [a_2 b_1 (\Theta_2/\Theta_1)(c_1 + \delta + c_3\phi)/ g^2][ & (c_1\phi + \delta + c_3)(1 - b_2) - \\
- & a_1(c_2 + b_2 c_3\phi - b_2)] \\
= & (+) \text{ or } (-)
\end{align*}

Therefore, if the slope of IS is (-) such that \( (c_1 + \delta + c_3)(1 - b_2) \geq a_1(c_2 + b_2 c_3\phi - b_2) \), then \( [(dy_t/dM_t) + (dy_t/dk)] \leq 0 \); however, if the slope of IS is (+) such that \( (c_1 + \delta + c_3)(1 - b_2) \leq a_1(c_2 + b_2 c_3\phi - b_2) \), then \( [(dy_t/dM_t) + (dy_t/dk)] \geq 0 \).
2. \[\partial[((dTB/dM_t) + (dTB/dk))/\Theta_1]

\[= (-)[a_2b_1(\Theta_2/\Theta_1)c_2c_3\phi/ \gamma^2][(c_1\phi + \delta + c_3)(1 - b_2) - \]

\[- a_1(c_2 + b_2c_3\phi - b_2)]

\[= (-) \text{ or } (+)\]

Therefore, if the slope of IS is (-) such that \((c_1 + \delta + c_3)(1 - b_2) \geq a_1(c_2 + b_2c_3\phi - b_2),\) then \[((dTB/dM_t) + (dTB/dk)) \leq 0;\) however, if the slope of IS is (+) such that \((c_1 + \delta + c_3)(1 - b_2) \leq a_1(c_2 + b_2c_3\phi - b_2),\)
then \[((dY_t/dM_t) + (dY_t/dk)) \geq 0\)
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