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An Analytical Study of the Short-run Variability of Korea's Balance of Payments, 1961-85: Application of Keynesian and Monetary Approaches to the Problem

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AN ANALYTICAL STUDY OF THE SHORT-RUN VARIABILITY OF KOREA'S BALANCE OF PAYMENTS, 1961-85: APPLICATION OF KEYNESIAN AND MONETARY APPROACHES TO THE PROBLEM

by

Dong Yeub Kim

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of

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..... Dedicated to my parents

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Dong Yeub Kim

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ABSTRACT

An Analytical Study of the Short-run Variability of Korea's Balance of Payments, 1961-85: Application of Keynesian and Monetary Approaches to the Problem

by

Dong Yeub Kim, Doctor of Philosophy

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Major Professor: Dr. Basudeb Biswas
Department: Economics

The relationships among the balance of payments and other macroeconomic variables in the Korean economy for the period 1961-85 are analyzed in this study. Theoretical studies on the effects of government policies on the economy and the balance of payments were conducted under both the Keynesian and monetary approaches. The Keynesian approach concentrates on the commodity and capital market adjustment factors and does not focus on the money market factors, whereas the monetary approach considers the balance of payments adjustments as a symptom of money market disequilibrium alone.

The basic assumptions of those two approaches, taken separately, are not fully relevant to the Korean economy,

which has unemployed resources, a high proportion of non-traded goods to traded goods, and monetary effects of balance of payments changes. Therefore, a model combining monetary and real factors to explain the short-run behavior of Korea's balance of payments in a single framework is developed.

The empirical results of the combined model show that its explanatory power is much higher than either of the two models taken separately. For balance of payments adjustment policy in Korea during the period 1961-85, fiscal and foreign exchange rate policy instruments were found to be very effective in the short-run, but monetary policy instruments were not.

(103 pages)

CHAPTER I

INTRODUCTION

Korea, as a developing country, has achieved remarkable economic growth over the past three decades through an outward-oriented policy. Since the 1960s, the country has been radically transformed from a largely agricultural economy, plagued by underemployment and economic dualism, into one of the leading newly industralizing countries of the world. Between 1960 and 1985, Korea's nominal gross national product (GNP) increased seventy times, from $1.46 billion to $83.7 billion; per capita GNP increased twenty-four times, from $83 to $2,047; the average growth rate of real GNP was 7.8 percent per annum; and at the same time the average growth rates of exports and imports were 33.5 percent and 24 percent per annum, respectively. The degree of openness of the economy, measured by total trade as a proportion of GNP, increased from 15 percent in 1961 to 73 percent in 1985.

The current-account balance of Korea exhibited large fluctuations during this period. Table 1 shows the overall picture of Korea's balance of payments since 1970. From 1970 to 1985, exports and imports increased at an average rate of 25.9 percent and 21.8 percent per annum, respectively. Until 1980, commodity imports increased

Table 1

Exports, imports, balance of payments of Korea, 1970-87 (millions of U.S. dollars).

Year	Exports f.o.b	Imports f.o.b	Current account balance	Capital account balance	Overall balance
1970	882.2	1,804.2	-622.5	671	-4.2
1971	1,132.3	2,178.2	-847.5	808	-187.8
1972	1,676.5	2,250.4	-371.2	504	163.6
1973	3,271.3	3,837.3	-308.8	649	460.3
1974	4,515.1	6,451.9	-2,022.7	1,848	-1,093.8
1975	5,003.0	6,674.4	-1,886.9	2,254	-150.6
1976	7,814.6	8,405.1	- 313.6	1,623	1,173.6
1977	10,046.5	10,523.1	12.3	1,358	1,314.7
1978	12,710.6	14,491.4	-1,085.2	1,816	-401.9
1979	14,704.5	19,100.0	-4,151.1	5,025	-973.3
1980	17,214.0	21,598.1	-5,320.7	5,632	-1,889.6
1981	20,670.8	24,299.1	-4.646.0	4,317	-2,297.0
1982	20,879.2	23,473.6	-2,649.6	2,655	-2,711.2
1983	23,203.9	24,967.4	-1,606.0	1,370	-384.4
1984	26,334.6	27,370.5	-1,372.6	1,926	-957.5
1985	26,441.5	26,460.5	- 887.4	n.a	-1,254.5
1986	n.a	n.a	4,617.0	n.a	n.a
1987	n.a	n.a	9,800.0	n.a	n.a

Sources: Korean Economic Planning Board, 1987; International Monetary Fund, 1985.

consistently by a greater amount than commodity exports, leading to ongoing deficits in the current account larger. Current-account deficits increased in 1970 and 1971. Thereafter, the amount of the deficit declined from 1972 to 1977, except for the years of oil crisis in 1974 and 1975. Trade deficits then again increased, to $5.3 billion in 1980 and $4.6 billion in 1981 during the second oil crisis. Since 1980, the national current account has been improving, and in 1986, there were surpluses in the current account.

Domestic savings during the whole period under study were inadequate for the rapid growth in investment. The average ratio of investments to GNP increased from 20 percent in the 1960s to 29 percent in the 1970s and the early 1980s, whereas the average ratio of domestic savings to GNP was about 10 percent in the 1960s and 21 percent for the rest of the period. The government encouraged foreign capital imports to meet the savings-investment gap and to fill the current-account deficits.

During the periods of the First and Second Economic Development Plans (1967-71 and 1972-77), Korea borrowed heavily from abroad. Due to the oil crises, the amount of new foreign loans increased dramatically in 1974 and in 1979. Since 1978, financial capital inflows have increased continuously, from $1.8 billion in 1978 to $5.6 billion in 1982, in order to cover the current-account deficits and to finance expanding investments at home. By

1980, total foreign debt amounted to $28 billion -- 47 percent of the nominal GNP ($60.3 billion).

This phenomenon has led to the concern that the country might have overborrowed. The increase in debt service payments (from $3.4 million in 1972 to $5 billion in 1981) again contributed to the growth of overall deficits, which climbed from $1.9 billion in 1980 to $2.7 billion in 1982 (Lau, 1986). But after the second oil crisis and the world recession of the early 1980s, the implementation of an adjustment policy, including depreciation of the currency, led to a reduction in the current account and overall deficits. In 1986, Korea's current account recorded a surplus of $4 billion. A surplus of $10 billion was also shown in 1987, and a surplus is again expected in 1988. The overall balance-of-payments account, which is crucial in determining a country's money supply, has been in surplus since 1986.

This surplus in the current account and the overall balance needs an adjustment. Otherwise, it could cause a misallocation of resources from high-yielding domestic investment, which kept up past growth, into the accumulation of low-yielding foreign assets that might check Korea's continued economic growth (Balassa and Williamson, 1987).

Between 1961 and 1985, the average rate of inflation in Korea, based on the consumer price index, was 14.5 percent per annum, while the average annual growth rate of

money supply was 28 percent. Government expenditure as a percentage of nominal GNP was 16 percent. In 1980, Korea officially changed from the fixed exchange rate to managed floating. However, the operation of the exchange-rate policy was the same as under the adjustable pegged rate system.

The fluctuating behavior of Korea's balance of payments has not been studied systematically using any theoretically sound macroeconomic model. The relation between the balance of payments and other macroeconomic variables requires a proper investigation before any appropriate policy measures can be suggested.

The main purpose of this study is to explain and examine the factors affecting Korea's balance of payments for the years 1961-85.

Analyses of the effects of government policies on the economy and the balance of payments (BOP) were conducted under both the Keynesian and monetary approaches. The Keynesian approach concentrates on the commodity and capital market adjustment factors rather than on the money market factors. The simple version of the monetary approach, in contrast, takes money supply as an endogeneous variable in a small open economy and looks into the BOP problem as a symptom of money market adjustments alone. The major difference between the two approaches is that the monetary viewpoint considers the problem of the balance of payments as basically a monetary

phenomenon, whereas the Keynesian view analyzes it in terms of changes in real variables, such as income and relative prices.

The Korean economy has a high rate of underemployed resources. Its commodity and bond markets are not fully integrated. There is market imperfection and fragmentation. So, the basic assumptions of the simple version of the monetary approach are not fully relevant to the Korean economy. Moreover, the short-run variability of the BOP is difficult to capture in the framework of the simple monetary approach, which was designed to investigate long-run equilibrium situations. So, an appropriate model of Korea's balance of payments should combine both monetary and the real factors in a single framework to explain its short-run behavior.

The specific objectives of this study are:

(1) To analyze the short-run fluctuations in the balance of payments of Korea for the period 1961-85, using (a) the Keynesian model for income determination in an open economy, (b) the monetary approach with BOP (c), and the model combining real and monetary factors to piece the jigsaw together.

(2) To quantify the direct and indirect effects of such alternative policy variables as government expenditure, foreign exchange rates, the domestic credit component of the monetary base, and foreign capital mobility regulations on major endogeneous macroeconomic

variables such as income, international reserve, interest rates, and price level.

Chapter II presents a brief description of the macro-variables operating in Korea during the period from 1961 to 1985. Chapter III reviews the relevant literature on balance of payments. In Chapters IV and V, the Keynesian and monetary approaches to the balance of payments are applied to the Korean economy to verify their empirically testable propositions. Chapter VI develops a model which combines the Keynesian and the monetary approaches and makes an empirical test of this combined approach. Finally, Chapter VII gives a summary of the present study and its conclusions.

CHAPTER II

DESCRIPTION OF MACRO VARIABLES IN KOREA, 1961-85

The set of macro variables utilized in this study consists of: the foreign exchange reserve, domestic credit components of the monetary base, the money multiplier, the money supply and its components, aggregate real income, government expenditure, the price level, the foreign exchange rate, and the rate of interest in Korea for the period 1961-85. A brief explanation of the data is included to provide a general description of the performance of the economy at the macro level for the period under study. Most of the data on the Korean economy used in the empirical study have been taken from International Financial Statistics(1985, 1987), published by the International Monetary Fund.

1. Monetary prices and rate of inflation

The movement of money prices in the Korean economy, as in any economy, is shown by price indices. Three types of price index are constructed for Korea: the gross domestic production (GDP) deflator, the wholesale price index, and the consumer price index. Annual inflation rates, measured by the rates of changes in these three price indices, are presented in figure 1. Inflation rates

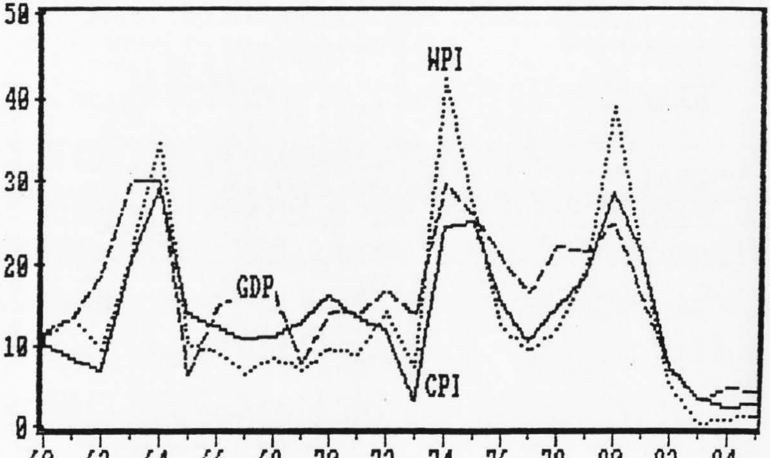

Fig. 1. Annual percent rate of change in prices, Korea, 1961-85.

between 1961 and 1985, as measured by these three indices, showed little difference. The average inflation rate during the period was 14 percent per annum. Annual inflation rates, as reflected in the movement of the GDP deflator and the consumer price index, parallel each other closely; while these rates, as reflected in the movement of the wholesale price index, are different from those shown by the other two indices. The reason behind this divergence is that the GDP deflator and the consumer price index include variations in the prices of services, whereas the wholesale price index does not take prices of services into account. The fluctuation in the annual inflation rate between 1961 and 1985 might have been caused by the impacts of changes in the prices of foreign goods and primary products and by changes in the exchange rate. Inflation rates in the years 1961-62, 1965-1973, 1976-1979, and 1982-1985 were associated with changes in import prices and devaluations of the currency. During the years 1963-64, 1974-1975, and 1980-1981, the prices of crude oil and primary raw materials increased abruptly due to oil shocks and further devaluations of the currency.

A comparison of the changes in prices during different periods shows that wholesale prices increased at a higher rate than consumer prices and the GDP deflator whenever the prices of import goods increased rapidly (i.e., in 1963-64, 1974-1975, and 1980-81). But whenever domestic demand conditions changed with stable external factors,

consumer prices and the GDP deflator increased at higher rates. Changes in prices of imported goods directly influenced changes in the prices of all industrial goods. Wholesale prices responded more quickly than consumer price changes in foreign prices. The inflationary pressure generated by excess demand for goods and services in the domestic economy caused the prices of services and agricultural goods to rise quickly. Also, consumer prices and the GDP deflator give more weight to the prices of agricultural goods and services than do wholesale prices. And finally, significant changes in domestic factors, such as weather, money supply, and wage rates, tend to exert more influence on consumer prices and the GNP deflator[1] than on wholesale prices.

The variation in Korea's annual inflation rate can be attributed to the changes in the domestic cost of production caused by the oil shocks in 1974 and 1980, the high degree of openness of the economy, the excessive rate of monetary expansion, and the rigidities in the economic structure of the country.

2. Money supply and its components

For an empirical measure of the money supply in a

[1]Wholesale prices, constructed using 1980 as the base year, are determined by assigning a weight of 82.7 percent to the prices of industrial goods, and a weight of 17.3 percent to the prices of agriculture, forestry, and fishery goods. 41 percent of consumer prices are based on the price food; 15 percent on housing prices; 7 percent on fuel & lights; 10 percent on clothing; 27 percent on services.

country, there are two different ways of defining money. Under the first definition, money is narrowly regarded as a medium of exchange, including currency, coin, and demand deposits in banks. The second approach defines money as an asset; this definition includes both money in the narrow sense and time deposits in banks. M1 stands for "money" in the narrow sense, and M2 for "money" in the broader sense. The movement of the money supply and its components in Korea for the years 1961-85, using both M1 and M2 as criteria, is shown in figures 2 and 3. Table 2 presents a summary of the average annual growth rates of money, income, and prices.

The average annual rate of increase in the money supply (M1) was 28 percent during the period 1961-85. The annual growth rates, however, deviated widely from the average. Between 1961 and 1970, it was 29.4 percent per annum; it accelerated to 30.7 percent between 1971 and 1980, then declined to 15.5 percent between 1981 and 1985.

The growth of M1 in Korea can be explained in terms of the growth of the monetary base and the money multiplier. The monetary base can be calculated either from the sources side or from the uses side, but the total is the same. From the sources side, the amount of the monetary base is composed of the net foreign assets of the Bank of Korea and its domestic credit component. The size of net foreign assets depends primarily upon past movements in the balance of payments. The Bank of Korea controls its

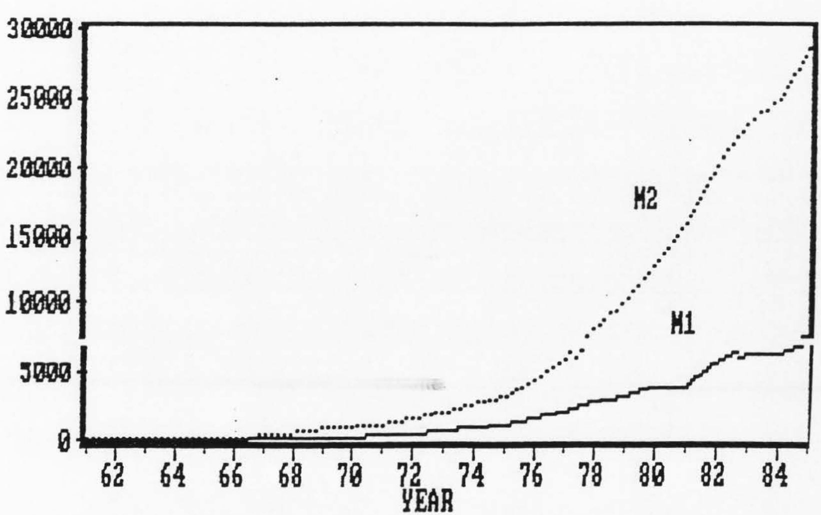

Fig. 2. Stock of money supply in Korea, 1961-85.

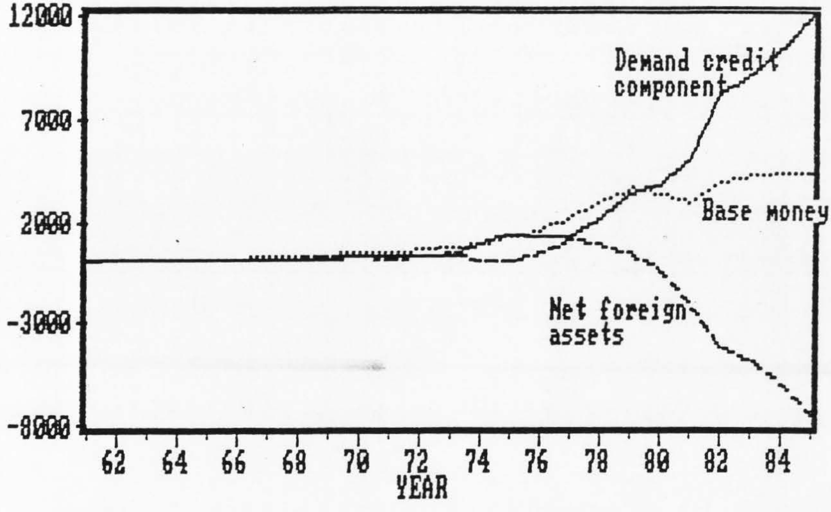

Fig. 3. Component of money supply in Korea,
1961-85.

Table 2

Growth rates of money, income and prices in Korea, 1961-85.

	Average annual percentage growth rates			
Variables	1961-85	1961-70	1971-80	1981-85
M1	28.0	29.4	30.7	15.5
M2	43.0	71.0	30.7	39.0
Nominal GNP	27.6	27.9	32.3	12.3
Nominal GDP	27.6	28.4	32.2	12.6
Wholesale prices index	14.2	12.4	18.6	0.7
Consumer prices index	27.0	14.7	16.5	3.7
Real GNP at 1980 prices	8.3	8.7	8.1	7.5
Real GDP at 1980 prices	9.3	9.9	9.1	5.7

Sources: Computed from the data shown in the Economic Statistics Yearbook, Bank of Korea, various issues; The International Financial Statistics Yearbook 1985, International Monetary Fund, Washington D.C, USA

holdings of government securities. By selling and buying government securities, the Bank of Korea can control the total amount of the monetary base. From the uses side, the monetary base consists of the sum of: (1) commercial bank reserves with the Bank of Korea and (2) total currency in circulation. The uses side appears on the liability side of the balance sheet of the Bank of Korea. These two uses of the monetary base are determined by the behavior of the public and the bank. Figures 4 and 5 show the sources and uses sides of the monetary base in Korea for the period 1961-85.

The monetary multiplier can be computed from the currency-demand deposit ratio of the public, reserve-deposit ratio of banks, and time deposit-demand deposit ratio of the public. The computation of the money multiplier is formalized on the basis of the generally accepted theory of money supply, which can be explained in a simple way (Dornbusch and Fischer 1981): Let CU stand for currency held by the public, DD for demand deposits, RE for reserves of banks, TD for time deposits, R for net foreign assets, D for the domestic credit component of the monetary base, M1 for total money supply, MB for the total monetary base, cu for the currency-demand deposit ratio of the people, re for the reserve-deposit ratio of the banks, and td for the time deposit-demand deposit ratio of the public.

The equations for money supply are:

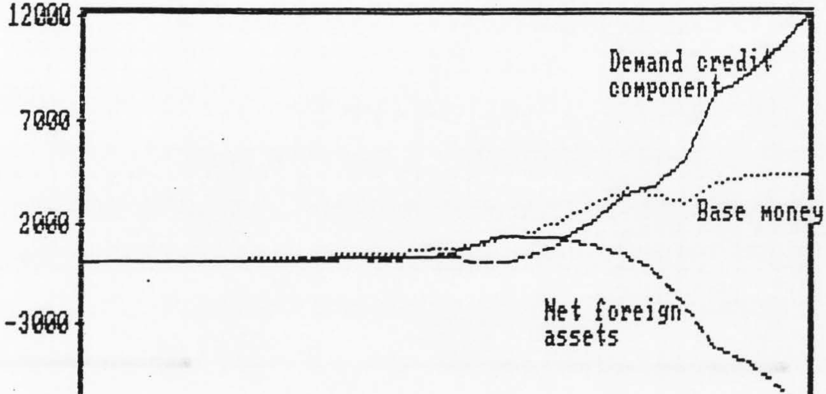

Fig. 4. Sources of the monetary base in Korea, 1961-85 (billions of won).

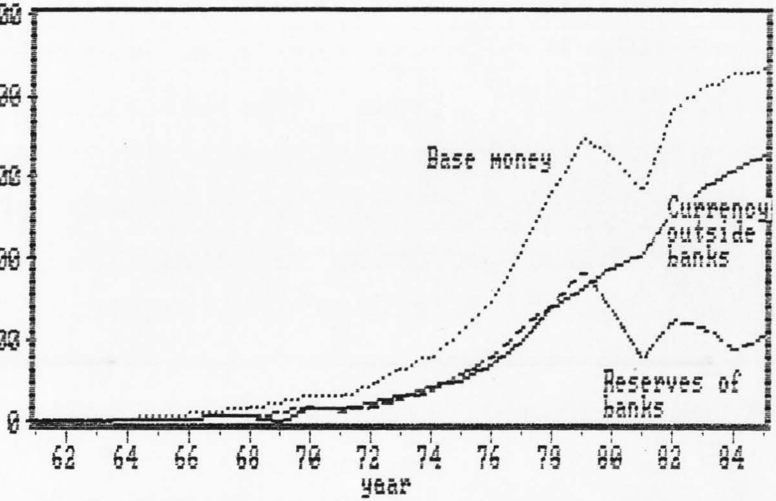

Fig. 5. Uses of the monetary base in Korea, 1961-85, (billions of won).

$$M1 = CU + DD \quad (2.1)$$

$$MB = CU + RE \quad (2.2)$$

$$cu = CU/DD \quad (2.3)$$

$$re = RE/(DD+TD) \quad (2.4)$$

$$td = TD/DD \quad (2.5)$$

Substitution from (2.3)-(2.5) in (2.2) yields

$$DD = [1/(cu + re(1+td))]MB \quad (2.6)$$

Then substitution (2.3) and (2.6) in (2.1) gives us

$$M1 = [(1+cu)/(cu + re(1+td))]MB \quad (2.7)$$

So, the money multiplier is given by

$$mm = [(1+cu)/(cu+re(1+td))] \quad (2.8)$$

From the sources side, the equation for money can be written as

$$M1 = mm(R + D) \quad (2.9)$$

from which it follows that

$$mm = M1/(R + D) \quad (2.10)$$

Figure 6 shows cu, re, and mm for Korea during the period from 1961-85.

Viewed from the sources side, the stock of nominal money balance is the product of the money multiplier and

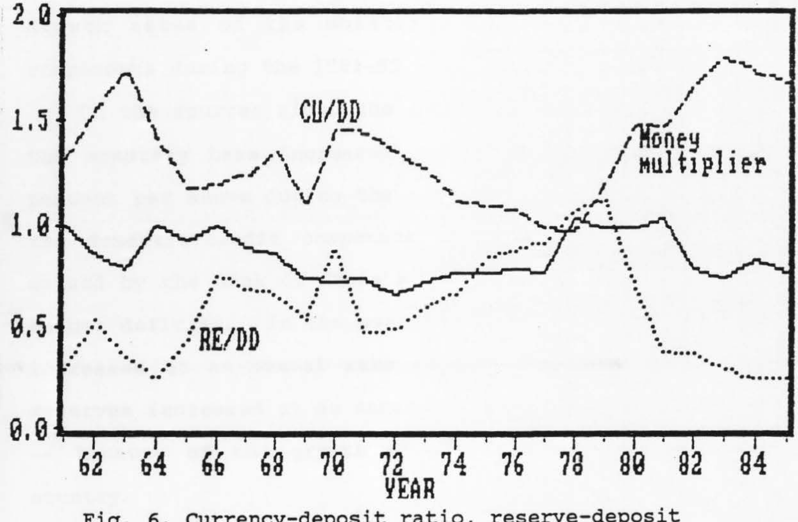

Fig. 6. Currency-deposit ratio, reserve-deposit ratio and money multiplier in Korea, 1961-85.

the monetary base; and so the growth of money supply is the result of changes in the money multiplier and the monetary base. Total base money in Korea grew at an average annual rate of 27.9 percent during the period 1961-85, which is almost equal to the rate of growth in the total supply of money. Thus, the growth of money supply in Korea was caused almost exclusively by the growth of the monetary base. The money multiplier fluctuated back and forth during this period and did not play a significant role in the growth of money supply. Growth rates of the monetary base and its different components during the 1961-85 period are shown in table 3.

On the sources side, the domestic credit component of the monetary base increased at an average rate of 37.4 percent per annum during the whole period. The growth of the domestic-credit component of the monetary base was caused by the Bank of Korea's financing of the government budget deficits. In the meantime, currency outside banks increased at an annual rate of 28.1 percent, while bank reserves increased at an annual rate of about 28.2 percent -- because of the growth of banking facilities in the country.

Using the behavior of the net foreign assets of the Bank of Korea as a criterion, this twenty-five year span can be roughly divided into two periods: 1961-77 and 1978-85. During the first period, there was a steady increase in the net foreign assets of the Bank of Korea (except

Table 3

Factors underlying the growth of money supply in Korea, 1961-85.

	Average Annual Rate of Growth			
	1961-85	1961-70	1971-80	1981-85
Source Base	27.9%	34.5%	33.1%	10.2%
Domestic Credit Component:	37.4%	35.5%	36.1%	21.7%
Net Foreign Assets:	n.a	38.2%	n.a	-32.7%
Currency Outside Banks:	28.1%	28.8%	32.0%	12.3%
Reserve with Banks:	28.2%	45.9%	37.4%	1.4%

Source: Computed form the data shown in the International Financial Statistics Yearbooks, 1985 and 1987, International Monetary Fund, Washington, D.C., U.S.A

during the oil crisis in 1974-75); while during the next period net foreign assets declined rapidly due to the increase in debt services. Because net foreign assets were declining during the period from 1980-85, the growth rates of the monetary base diverged widely from rates in the first period. From 1971-80, the total base money grew at a rate of 33.1 percent, while its growth rates declined to 10.2 percent in the early 1980s.

3. Nominal income and money supply

During the period from 1961-85, nominal GNP grew at an average annual rate of 27.6 percent, which was close to the 28 percent growth of M1. When the growth rate of M1 was 29.4 percent per annum in 1961-70, the nominal GNP growth rate was 27.9 percent; as in the M1 growth rate increased to 30.7 percent in 1970-80 and subsequently declined to 15.5 percent in 1980-85, the nominal GNP growth rate increased to 32.3 percent then declined to 12.3 percent, during the corresponding period.

When the growth rate of the money supply (M1) exceeded the growth rate of the nominal GNP, it could be explained in terms of some decrease in the income velocity of money as measured by the nominal GNP to the money supply. But this phenomenon was not uniformly exhibited during the whole period. In 1961-70 and from 1981-85, M1 grew faster than the nominal GNP; while in 1971-80 the nominal GNP grew faster than M1. The higher growth of M1 than that of

the nominal GNP could be explained in terms of increasing monetization of the economy, which required larger use of money for the same transactions, while the higher growth of the nominal GNP than that of M1 might be explained in terms of increasing efficiency of the money market, which required the use of less money for the same transactions. So, two opposite forces might have been at work in the Korean economy: (a) increasing monetization of the economy, leading to a greater use of money for the same income; and (b) increasing efficiency of the money market caused by the development of the banking system, leading to the use of less money for the same income. In the period from 1971-80, the latter conditions might have dominated, while in the first and third periods, the former conditions might have outweighed the latter. These fluctuations, however, definitely suggest some shift in demand for money in the Korean economy.

Another point that needs to be mentioned in this connection is the steadily rising growth rate of M2, as defined by M1 plus time deposits. The average rates of growth of M2 were 71 percent in 1961-70, 30.7 percent in 1971-80, and 39 percent in 1981-85. The overall rate was 43 percent per annum. Due to the faster growth of time deposits, the growth rate of M2 was higher than that of M1. Another partial explanation for the higher growth of the nominal GNP compared to M1 might be found in the faster growth of M2, sincere time deposits could be

converted into demand deposits at short notice and used as a medium of exchange.

4. Short-run demand for money

The short-run demand function for money is used in this study because long-run or desired demand variables are not directly observable, and current income relative to permanent income is important to the short-run changes in the money stock. Demand for real balances of money is measured by deflating the nominal quantity of money by a suitable price index or by expressing it in terms of the number of weeks of aggregate income to which it is equal (Friedman 1971). The real money balance in Korea, on the average, amounted to about 5.4 weeks of income. However, it fluctuated during the years 1961-85 between 4.3 weeks and 7.1 weeks of income.

To estimate the short-run demand for money in Korea, there are three sets of interest rates (the discount rate, the interest rate on time deposits at deposit money banks, and the interest rate on loans from deposit money banks), which represent the short-run rate of interest rate available for the whole period under study (see table 4). The discount rate, however, shows the theoretically inapporpriate sign of the interest-elasticity of demand for real balance of money. Thus, the interest rate on loans from deposit money banks (DMB) has been used as a data for the general interest rate in this study.

Table 4

Interest rate, price level and gross national product in Korea, 1961-85.

Year	DI (%)	TDI (%)	II (%)	WPI	CPI	GNP at current prices in Billions of Won
				1980=100		
1961	10.22	15.0	15.7	6.6	6.6	294
1962	10.22	15.0	15.7	7.2	7.0	356
1963	10.22	15.0	15.7	8.7	8.4	503
1964	10.50	15.0	16.0	11.6	10.9	716
1965	28.00	26.4	26.0	12.8	12.3	806
1966	28.00	26.4	26.0	13.9	13.9	1,037
1967	23.00	26.4	26.0	14.8	15.3	1,281
1968	23.00	25.2	25.2	16.0	17.0	1,653
1969	22.00	22.8	24.0	17.1	19.1	2,155
1970	19.00	22.8	24.0	18.7	22.2	2,736
1971	16.00	20.4	22.0	20.3	25.2	3,375
1972	11.00	12.0	15.5	23.1	28.1	4,154
1973	11.00	12.0	15.5	24.7	29.0	5,379
1974	11.00	15.0	15.5	35.1	36.1	7,503
1975	14.00	15.0	15.5	44.4	45.2	10,092
1976	14.00	16.2	18.0	49.8	52.1	13,881
1977	14.00	14.4	16.0	54.3	57.4	18,115
1978	15.00	18.6	19.0	60.6	65.7	24,225
1979	15.00	18.6	19.0	72.0	77.7	31,249
1980	16.00	19.5	20.0	100.0	100.0	37,205
1981	11.00	16.2	17.0	120.4	121.3	45,775
1982	5.00	8.0	10.0	126.0	130.1	51,789
1983	5.00	8.0	10.0	126.3	134.5	58,428
1984	5.00	10.0	10.0-11.5	127.2	137.6	65,345
1985	5.00	10.0	10.0-11.5	128.3	141.0	72,850

Sources: Compiled from the International Financial Statistics Yearbook1985 and 1987, International Monetary Fund, Washington, D.C., USA. Economic Stastistics Yearbook, 1987, Bank of Korea, p. 5.

Notes: DI = discount rate in percentage; TDI = rate of interest on time deposits at DMB; and II =rate of interest on loans of DMB. Deposit Money BanKs (DMB) comprise commercial and specialized banks.

To estimate the money demand function, the nominal quantity of money has been adjusted by the consumer price index in order to obtain the real stock of money; while aggregate real income in 1980 prices, the interest rate on loans from deposit money banks, and the lagged value of the real stock of money are used as explanatory variables. The Cochrane-Orcutt method, which eliminates autocorrelation problems, was used to estimate the short-run demand for money function in Korea for the entire period of 1961-85. The estimated money demand function is given by:

$$\begin{aligned} Ln(M1/P)_t = &\underset{(2.209)}{-6.841} - \underset{(0.093)}{0.027}Ln(r)_t + \underset{(0.201)}{0.895}Ln(y)_t + \\ &\underset{(0.201)}{0.320}Ln(M)_{t-1} \end{aligned} \tag{2.11}$$

$R^2 = 0.98$ Adjusted $R^2 = 97.5$

Durbin-Watson statistic = 1.544

F-statistic = 304.75

Here, standard deviations are shown in parentheses, M1 is the nominal quantity of money, as measured by the sum of currency in circulation and demand deposits in the banks, P is the consumer price index, y is the aggregate real income, and r is the rate of interest.

The estimated income-elasticity of demand for real-money balance in equation (2.11) is 0.895, which is not

significantly different from unity. The estimated coefficient for the interest-elasticity has the theoretically appropriate sign, but it is not statistically significant at the 5 percent level. The coefficient of adjustment is 0.68 (1.00 - 0.32). It implies that about 68 percent of the difference between the desired and actual real cash balances is eliminated in a year (Gujarati 1978).

5. The government budget and money supply

The government budget played a significant role in the growth of money supply in the Korean economy. For the entire period under study, the government budget was in deficit. Budget deficits were mainly financed by external and internal borrowing. In Korea, government bonds were not generally held by the private sector; rather the net indebtedness of the private sector to the government increased over time through loans from public institutions. So, internal government borrowing was mainly from the banking sector, and a major part of this debt was finally converted into the government's net indebtness to the central bank. As a result, the growth of the domestic credit component of the monetary base was largely caused by continued deficits in the government budget.

Using data from International Financial Statistics (International Monetary Fund, 1985 and 1987), government

budget deficits were calculated as the difference between expenditure and lending minus repayments of loans, revenue, and grants received.

Table 5 presents government expenditures, lending minus repayments, grants received, revenue, budget deficits, and external and internal financing of the deficits for the period from 1961-85. Table 6 shows the gross and net claims of the central bank on government.

Payments by the government, as measured by expenditure plus lending minus repayments, increased at an annual rate of 29.6 percent for the period 1961-85, when government revenue increased at an annual rate of 32.2 percent. Because national income also grew rapidly with the rapid growth of government expenditure, the relative position of the government sector in the economy did not significantly differ over time. Government payments as a proportion of national income fluctuated between 10 percent and 23 percent from 1961-85.

The financing of the government budget was accomplished primarily by grants, aid, and external borrowing in the 1960s and 1970s, whereas in the 1980s the main source for financing government budget deficits has been internal borrowing. The internal financing of the budget deficits caused a rapid increase in the net claim of the Bank of Korea on the government in the early 1980s. This can be clearly observed by comparing the data presented in table 6 with those in table 5.

Table 5

Government budget in Korea, 1961-85
(billions of won).

Year	GE	LMR	GRR	GOR	BSD	BDFE	BDFI
1961	47.7	8.0	27.1	28.1	-0.5	n.a	n.a
1962	71.7	0.3	30.1	32.1	-9.8	n.a	n.a
1963	59.7	5.0	26.9	37.9	0.1	n.a	n.a
1964	64.7	4.5	25.7	44.7	1.2	n.a	n.a
1965	89.3	1.1	27.5	61.8	-1.1	n.a	n.a
1966	160.2	10.4	31.2	133.6	-5.8	n.a	n.a
1967	207.8	14.1	25.0	189.6	-7.3	n.a	n.a
1968	288.2	24.1	35.9	282.4	6.0	n.a	n.a
1969	416.9	32.6	22.4	383.4	-43.7	n.a	n.a
1970	442.7	26.0	28.8	419.0	-20.9	14.2	6.7
1971	541.9	6.6	24.2	513.9	-10.4	6.8	3.6
1972	751.3	-5.1	27.0	558.1	-161.1	56.4	104.7
1973	707.2	14.0	15.7	678.8	-26.7	64.3	-37.6
1974	1,065.4	137.6	12.9	1,025.8	-164.3	94.9	69.4
1975	1,600.7	164.6	14.5	1,549.1	-201.7	155.6	46.1
1976	2,293.7	225.2	1.7	2,324.9	-192.3	214.5	-22.2
1977	2,804.3	470.1	0	2,958.4	-316.0	277.9	38.1
1978	3,781.9	626.1	0	4,107.7	-300.3	365.0	-64.7
1979	5,224.0	766.0	0	5,445.4	-544.6	273.0	271.6
1980	6,562.0	1,120.1	0	6,833.2	-848.9	325.5	523.4
1981	8,044.8	2,145.0	0	8,604.8	-1,585.0	539.2	1,045.8
1982	10,115.0	1,524.2	0	9,983.2	-1,656.0	681.2	974.8
1983	10,681.3	1,518.8	0	11,537.5	-662.6	402.6	260.0
1984	11.875.0	1,570.0	0	12,603.0	-841.0	314.0	528.0
1985	13,337.0	1,530.0	0	13,922.0	-945.0	443.0	502.0

Sources: Compiled from International Financial Statistics Yearbook, 1985 and 1987, International Monetary Fund, Washington, D.C., USA.

Note: GE = government expenditure; LMR = lending minus repayments; GRR = grants received; GOR = government revenue; BSD = budget surplus (+) or deficit (-); BDFE = budget deficit financed externally; BDFI = budget deficit financed internally.

Table 6

Claims of the Bank of Korea (BOK)
on government, 1961-85
(billions of won).

Year	Claim of the BOK on government	Government deposits in the BOK	Net claim of the BOK on government
1961	34	20	10
1962	41	17	7
1963	40	15	9
1964	42	20	11
1965	45	25	9
1966	42	26	5
1967	48	31	-10
1968	40	33	-15
1969	46	36	-28
1970	51	42	-14
1971	47	38	-19
1972	189	88	-42
1973	208	104	-16
1974	402	154	102
1975	674	217	46
1976	799	388	17
1977	910	711	-152
1978	1,172	914	-153
1979	1,155	902	34
1980	1,147	780	869
1981	1,680	544	993
1982	1,883	627	755
1983	2,176	764	174
1984	2,130	1,121	-281
1985	2,130	1,187	-857

Source: Compiled from the International Financial Statistics Yearbook 1985,1987, International Monetary Fund, Washington, D.C., U.S.A

6. Foreign trade, degree of openness and exchange rate

During the period from 1961-85, exports and imports increased at average rates of 44.5 percent and 33.4 percent per annum, respectively. Commodity imports increased consistently by a greater amount than commodity exports, leading to ongoing deficits in the trade balance. Exports and imports as a proportion of national income increased from about 2 percent and 13 percent, respectively, in 1961 to 36 percent and 37 percent in 1985. Total foreign trade constituted 15 percent of the national income in 1961 and 73 percent in 1985. Thus, the degree of openness, defined as the proportion of total foreign trade in the national income, increased consistently during the entire period of the study (see figure 7). Tables 7 and 8 show the distribution of exports and imports among major trading partners of Korea.

Korea used the U.S dollar as the benchmark in setting its exchange rates until 1970. Korea devaluated its currency with respect to the U.S dollar during the 1960s, as the country's balance of payments deteriorated. The exchange rate in 1960 was 65:1 (won to the U.S dollar); it was devalued by 100 percent in 1961, and, following repeated devaluations, reached 311:1 in 1970. In the early 1970s the system of managed floating involved small repeated devaluations with intermittent attempts to stabilize the exchange rate. This rate was stabilized at

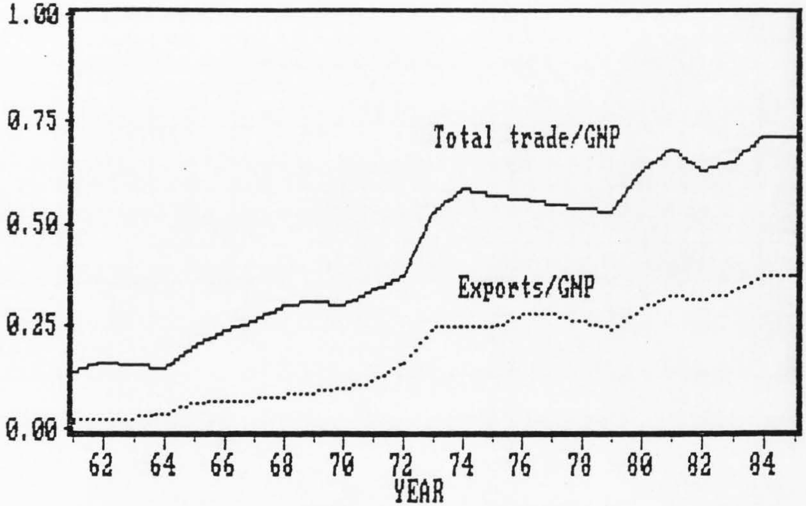

Fig. 7. Degree of openness of Korea,
1961-85.

Table 7

Geographic distribution of Korea's exports, 1961-85
(millions of U.S dollars).

Year	U.S	Japan	Canada	Germany	U.K	Total
1961	7	19	0	.8	1.7	41
1962	12	24	.1	.2	1.6	55
1963	24	25	.3	1.3	1.6	87
1964	36	38	.5	1.2	6.5	119
1965	60	46	2.5	3.1	3.6	175
1966	96	66	5.9	7.1	5.1	250
1967	137	85	7.9	5.2	7.9	320
1968	235	100	14.2	9.6	7.9	455
1969	312	133	15.2	16.5	10.7	623
1970	395	234	20.0	27.0	13.0	835
1971	532	262	29.0	31.0	14.0	1,068
1972	766	410	59.0	51.0	29.0	1,624
1973	963	1,169	115.0	111.0	70.0	3,225
1974	1,492	1.380	167.0	242.0	107.0	4,460
1975	1,536	1,293	197.0	312.0	162.0	5,081
1976	2,493	1,802	314.0	398.0	254.0	7,715
1977	3,119	2,148	299.0	480.0	304.0	10,046
1978	4,058	2,627	327.0	663.0	393.0	12,711
1979	4,374	3,353	388.0	845.0	542.0	15,055
1980	4,607	3,039	343.0	875.0	573.0	17,505
1981	5,661	3,503	484.0	804.0	705.0	21,254
1982	6,243	3,388	443.0	758.0	1,103.0	21,853
1983	8,245	3,404	629.0	775.0	1,005.0	24,445
1984	10,479	4,602	879.0	924.0	955.0	29,245
1985	10,754	4,543	1,229.0	979.0	913.0	30,283

Sources: Direction of Trade, various issues, International Monetary Fund, International Bank for Reconstruction and Development.

Table 8

Geographic distribution of Korea's imports, 1961-85 (millions of U.S dollars).

Year	U.S	Japan	Canada	Germany	U.K	Total
1961	143	69	3	27	5	316
1962	214	109	2	19	6	422
1963	282	162	4	23	5	560
1964	202	110	3	24	3	404
1965	182	167	2	16	1	450
1966	254	294	3	20	2	716
1967	305	443	8	31	5	996
1968	453	624	13	74	16	1,463
1969	552	755	25	79	32	1,824
1970	585	809	23	67	33	1,984
1971	678	954	39	74	56	2,394
1972	648	1,031	36	67	74	2,522
1973	1,202	1,727	83	132	69	4,240
1974	1,701	2,621	116	140	90	6,852
1975	1,881	2,434	150	193	123	7,274
1976	1,963	3,099	116	238	171	8,774
1977	2,447	3,927	150	347	148	10,811
1978	3,043	5,981	204	491	211	14,972
1979	4,603	6,657	326	844	499	20,339
1980	4,890	5,858	378	637	304	22,292
1981	6,050	6,374	531	672	398	26,131
1982	5,956	5,305	485	680	403	24,251
1983	6,274	6,238	444	650	468	26,192
1984	6,875	7,640	637	795	565	30,631
1985	6,489	7,560	630	979	566	31,136

Sources: Direction of Trade various issues, International Monetary Fund, International Bank for Reconstruction and Development.

484:1 in 1975 and remained at that level until 1980, when a substantial depreciation was made. This was followed by further depreciations and, at the end of 1985, the rate reached 890:1, followed by an appreciation to 720:1 in the third quarter of 1988. Table 9 shows the fluctuation of Korea's foreign exchange rate during the period under study. Figure 8 shows the nominal effective exchange rate, which is the weighted average of Korea's bilateral exchange rates for the U.S dollar, the Canadian dollar, the Japanese yen, the British pound sterling, and the Deutsche mark. The shares of these countries in the total trade of Korea have been used as the weights. The nominal effective exchange rate of Korea did not show any significant fluctuation in annual base over time (see figure 8).

Table 9

Exchange rates of Korean currency (won) to U. S dollar.

Effective data	Official rate
1960. 8. 15	65. 0
1961. 1. 1	100. 0
1961. 2. 2	130. 0

Effective date	BOK buying rate from foreign exchange banks	BOK concentration base rate	BOK selling rate to foreign exchange banks
1964. 5. 3	255. 51	-	256. 02
1965. 12. 31	271. 50	-	272. 06
1966. 12. 31	270. 90	-	271. 46
1967. 11. 24	268. 11	-	272. 48
1967. 11. 25	271. 30	271. 50	271. 70
1969. 11. 3	303. 90	304. 35	304. 80
1971. 6. 28	370. 30	370. 80	371. 30
1972. 12. 30	398. 40	398. 90	399. 40
1973. 12. 31	396. 90	397. 50	398. 00
1974. 12. 7	483. 40	484. 00	484. 60
1976. 7. 1	483. 10	484. 00	484. 90
1980. 1. 12	577. 10	580. 00	582. 90
End of			
1980	657. 90	659. 90	661. 90
1981	698. 70	700. 50	702. 30
1982	747. 30	748. 80	750. 30
1983	793. 90	795. 50	797. 10
1984	825. 70	827. 40	829. 10
1985	857. 90	861. 40	864. 90

Source: Economic Statistics Yearbook, 1987, Bank of Korea

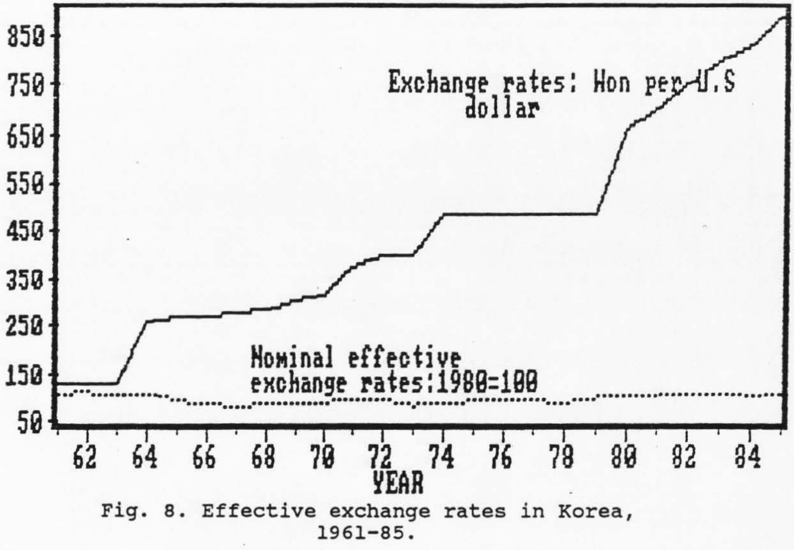

Fig. 8. Effective exchange rates in Korea, 1961-85.

CHAPTER III

REVIEW OF LITERATURE ON BALANCE OF PAYMENTS

1. Introduction

There are two distinct concepts on the balance of payments: the market balance of payments and the accounting balance of payments. The former focuses on the balance of supply of and demand for a country's currency in the foreign exchange market at a given rate of exchange. The latter is a statistical record of all transactions taking place between the residents of a country and the rest of the world within an arbitrary accounting period. The market balance of payments would be in balance only by chance under the fixed exchange rate system, whereas it will always balance under the floating exchange rate system because the exchange rate is the price which equates the supply of and demand for a currency in the foreign exchange market. The market balance of payments is an _ex ante_ concept, whereas the accounting balance of payment is an _ex post_ concept.

Thus, the meaning of a balance-of-payments deficit or surplus will be different depending on which definition is used as a frame of reference; and movements of the two different balances might be quite unrelated to each other, because the accounting balance of payments includes some transactions which never pass through the foreign exchange

market. For instance, unilateral transfer in kind, barter deals, and direct investments in plant and machinery are not accounted for.

A balance-of-payments adjustment theory, under either the fixed or flexible exchange rate system, is concerned with the influence of different polices on the level of foreign currency reserves. It examines whether a policy will reverse the loss of reserves in the case of balance of payments deficits or whether it might destabilize the flow of reserves. A study of the historical developments of the theory of balance of payments is needed for better understanding of a country's economic achievements.

For a long time after the collapse of the international gold standard in 1931, economic analysis of the balance of payments had been dominated by the elasticity approach, with an emphasis on the effect of exchange-rate variations on changing the demands for exports and imports in international trade. After the Keynesian evolution in the 1930s, the theory of balance of payments incorporated effects of changes in both price and income on foreign exchange rates. However, there was a general dissatisfaction with the partial equilibrium framework of the elasticity approach, and thus the absorption approach to the balance of payments was developed in the early 1950s.

Since the late 1960s, the monetary approach has been a dominating theory of the balance of payments. This is essentially an extention of the absorption approach; it

considers a balance of payments imbalance as a monetary phenomenon, to be corrected by monetary policy instruments.

2. The classical price-specie flow mechanism

The classical price-specie flow mechanism describes the automatic adjustment that is supposed to have taken place as a result of payments imbalances under gold standard. The mechanism assumes a rise or a fall in the price level according to whether the balance of payments is in surplus or in deficit. A surplus would lead to the accumulation of gold and to the expansion of the domestic money supply, causing prices to rise and the balance of payments surplus to be reduced. A deficit would lead to a loss of gold and the contraction of the domestic money supply, causing prices to fall and the balance of payments deficit to be improved. David Hume (1969) used this concept to argue against the mercantilist belief that a country could achieve a persistent balance of trade surplus by the mercantilist policies of trade protection and export promotion. His theory is the classical pioneer of new monetary theories of the balance of payments, which analyze the balance of payments in terms of the relation between the supply of and demand for money.

3. The elasticity approach

The elasticity approach to balance of payments was

developed in the 1930s in response to the need for a theory of balance of payments under flexible exchange rates (Robinson 1937). Whether devaluation will reduce a balance of payments deficits is studied within the framework of partial-equilibrium analysis, focusing on the price elasticities of demand for exports and imports. The elasticity approach is based on the Marshall-Lerner condition (i.e., the sum of the price elasticities of demand for exports and imports should exceed unity) and rests on several assumptions. First, it is a partial equilibrium analysis based on the effect of exchange rate variations on the market for exports and imports, when everything else is held constant, so that the position of demand curves for exports and imports themselves are also held constant. But everything else obviously will not remain constant. Devaluation will have price effects elsewhere in the system which will shift the demand curves for exports and imports. Moreover, income will also change, affecting the demand for exports and imports. Second, all relevant elasticities of output supply are assumed to be infinite, so that: (1) the price of exports in the home currency does not rise as demand increases; (2) the price of foreign goods that compete with exports does not fall as demand for them falls; (3) the price of imports in foreign currency does not fall as demand for imports falls; and (4) the price of domestic goods competing with imports does not rise as the demand for

import substitutes increases. Third, the elasticity approach ignores the monetary effects of exchange rate fluctuations. Finally, the elasticity approach assumes that trade is initially balanced and that the change in the exchange rate is a small one. A modified Marshall-Lerner condition could explain the case where trade is initially unbalanced, but the small-change assumption is necessary so that second-order interaction terms involving multiplication of changes in variables can be ignored.

Below is simple proof of the Marshall-Lerner condition: Let

$$TB = eX - M \tag{3.1}$$

where TB is the trade balance measured in terms of foreign currency, X is exports measured in domestic currency, e is the exchange rate in terms of foreign currency, and M is imports measured in foreign currency. Devaluation will improve the balance of payments if $(dTB/de)<0$. Differentiating equation (3.1) with respect to a small change in e, one gets

$$\begin{aligned} dTB/de &= X+e(dX/de)-(dM/de) \\ &= X[1+(e/X)(dX/de)-(dM/de)(e/M)(M/e)] \\ &= X(1-n-n^{*}) \end{aligned} \tag{3.2}$$

where n is the price elasticity of demand for exports, n^{*}

is the price elasticity of demand for imports, and d is the differential parameter. If $n+n^{*}>1$, $(dTB/de)<0$. That is, the balance of payments will improve with a depreciation in the exchange rate if the sum of the price elasticities in demand for exports and imports exceeds unity.

Under conditions of economic depression, with unemployed resources, as in the 1930s, the assumption of infinite elasticities might be reasonable. But under conditions of full employment, the assumption is questionable. Devaluation in an economy with unemployment raises income in the devaluing country, which will increase imports and decrease exports. So the income effect of devaluation should be incorporated into the Marshall-Lerner condition. Stern (1973) suggests that the income effects of devaluation alter the Marshall-Lerner condition, making it more stringent. Traditional elasticity analysis assumes no change in income, or assumes that income was stabilized by the monetary authorities. However, in general, neither assumption could be valid.

Incorporation of income effects from devaluation into the elasticity approach, however, does not remove its fundamental weakness. In the framework of partial equilibrium analysis, it still emphasizes only the effect of exchange rate changes within the markets for exports and imports and ignores the monetary effects. Price

changes in these two markets will have ripple effects throughout the economic system, which will feed back to the export and import markets; and the money market equilibrium will also be affected. Once it is recognized that the balance of payments is an aggregate phenomenon, the partial equilibrium framework becomes inappropriate.

4. The absorption approach

The absorption approach developed by Alexander (1952) and Johnson (1958) views the balance of payments as the outcome of the difference between a country's expenditure and its income, and states that the balance of payments can be improved only if expenditure is reduced relative to income or if income is raised relative to expenditure.

The absorption approach can be applied either to the balance of payments as a whole or to the balance of payments on current account. In the latter case the BOP is the difference between national income (Y) and national expenditure (E). From the national income equation

$$Y = C + I + X - M \tag{3.3}$$

it follows that

$$BT = X - M = Y - (C + I) = Y - E \tag{3.4}$$

where BT is the balance of trade, C is the aggregate consumption, and I is the investment. The balance of payments on current account is the difference between

national income and national expenditure (E = C + I). Thus, any policy for balance of payments adjustments can be explained in terms of Y and E. From equation (3.3), since (Y - C) equals savings (S), the balance of payments can be expressed in another way as

$$BT = X - M = S - I \qquad (3.5)$$

Any BOP adjustment policy can be analyzed by testing to see whether the policy raises savings relative to investment.

In conditions of underemployment, when expenditure-switching policies (eg., devaluation, tariffs, etc.) are adopted to increase income, expenditure must be held constant or increased only by an amount less than the rise in income in order to improve the BOP. Under full employment conditions, when income can not be increased, expenditure-switching must be combined with reduction in expenditure (E) to improve the BOP. Expenditure-reducing policies accompanying expenditure-switching policies at full employment levels must reduce expenditure on traded goods. Otherwise, expenditure-switching will not be successful.

The major contribution of the absorption approach to the BOP adjustments is that it brings into focus the macroeconomic policy instruments so far used in restoring internal balance in an economy. Particularly, it emphasizes the fact, in a way the elasticity approach does

not, that under full employment a devaluation must be combined with expenditure-reducing policies if it is to be successful. Otherwise, with no resources to supply more exports or import substitutes, devaluation will fail to improve the balance of payments without any productivity improvement.

The other major contribution of the absorption approach is its focus on the monetary aspects of BOP deficits. A balance of payments deficit implying an excess of expenditure over income is possible only when the money supply exceeds the money demand. However, the major shortcoming of the absorption approach to the BOP is that the cause of BOP disequilibrium may be misinterpreted, and incorrect policy prescriptions may be suggested in an effort to achieve two goals of economic policy simultaneously.

Alexander (1959), Michaely (1960), and Tsiang (1961) made an attempt to synthesize the elasticity and absorption approaches to the BOP. They explain that relative price and income effects interact with each other and so the two effects could not be dichotomized. In fact, the two approaches are not in conflict. The absorption approach is built on the basis of the elasticity approach. Given the elasticity approach, the relative price effect produces the income effect, which then causes the final effect of devaluation.

5. The monetary approach

The absorption approach actually paved the way to the the monetary approach, which emphasizes the monetary aspects of balance of payments adjustment under the system of fixed exchange rates. The real balance effect of inflation caused by devaluation under the condition of full employment shows how an increase in the demand for real money balance will improve the balance of payments. BOP disequilibrium in the monetary approach is considered as the result of stock imbalance between the supply of and demand for money, so that a BOP disequilibrium is equivalent to a change in the level of international reserves. Money supply in the domestic economy then becomes demand determined.

The monetary approach assumes that (1) the economy is in long-run full employment equilibrium; (2) the demand for money is a stable function of income; (3) changes in the money supply do not affect real variables in the long run; (4) price level and interest rate are determined exogeneously because of high mobility of capital and goods between countries; (5) monetary authorities do not sterilize the changes in foreign reserves; and (6) exchange rates are pegged.

Therefore, the main difference between the monetary and traditional approaches is that the former assumes no sterilization of changes in foreign reserves, so that any BOP disequilibrium is regarded as a temporary phenomenon

representing a stock disequilibrium in the money market which will ultimately correct itself. In contrast, the traditional approach assumes that the monetary consequences of deficit or surplus are sterilized, so that deficit or surplus is treated as a flow equilibrium (Johnson 1958).

The monetary approach to the balance of payments hypothesizes that monetary expansion associated with government borrowing from the banking system is a key factor contributing to both balance of payment deficits and inflation. Wilford (1986) enumerated several factors pointing to the relevance of the monetary approach for developing countries.

First, this approach is rooted in the simple premise that the BOP is essentially a monetary phenomenon. Therefore, it places principal responsibility for orderly growth with the developing country's central bank monetary planners, who cannot take a passive position on the government's expenditure policy goals.

Second, the monetary approach provides a less complicated empirical framework for policy evaluation. Emphasizing the relevant monetary aggregates eliminates problems associated with the estimation of numerous elasticities involved in international transactions, as well as other parameters of the traditional approach.

Third, the monetary approach states that a developing country can maintain a negative current-account balance

while still promoting balance-of-payments stability, through the attraction of capital flow.

Fourth, policy prescriptions under this approach are more simple and manageable for developing countries, where nonavailability of detail data on exports and imports precludes the use of the elasticity approach.

In a small and open economy, the monetary approach may allow planners to implement and evaluate development strategies by focusing on relatively few monetary variables, which generally are more statistically reliable than the myriad of national-accounts data required by more traditional approaches. Furthermore, the monetary approach requires less discretionary intervention in planning decisions.

The monetary approach presumes that the factors affecting the demand for money are exogeneous in the balance-of-payments equation. If exogeneous variables affect the factors determining the demand for money, the balance of payments cannot be predicted from changes in the money supply alone. The assumption of exogeneity of the real output and interest rates which are not affected by money is not relevant in a developing country where gradual price adjustment is associated with short-run output flexibility.

6. Integration of traditional and monetary approaches

There has been a long debate over the general

applicability of the monetary approach to the balance of payments, the logical consistency of the Keynesian approach, and the relationship between the two approaches. Proponents of the monetary approach define the balance of payments disequilibrium as a short-run phenomenon arising from money market imbalances, when all other markets are cleared (Miller 1981, 1986). Therefore, they argue that the balance of payments is a monetary phenomenon (Frenkel and Johnson 1976). The Keynesian approach implicitly views the balance of payments as a measure of the magnitude of disequilibrium in the bond and commodity market, and regards this disequilibrium as a result of government policies and spontaneous shifts and switches in demand. It thus contends that the various components of the aggregate demand are at least as important as monetary variables in influencing the balance of payments.

These two different theories may be due to a difference in the monetary and Keynesian definitions of the balance of payments (Miller 1981). Taking this view, there would be no difference between monetary and Keynesian approaches to the balance of payments if their definitions of "balance of payments" could be made to coincide, and if the model were correctly specified (Miller 1981; Mundell 1968; and Frenkel and Johnson 1976).

A simple version of the monetary approach assumes that prices, interest rates, and output have their own effects

on the balance of payments through the demand for money, because commodity and bond markets are in equilibrium. The increase in output and price level improves the balance of payments by way of increasing the demand for money, whereas an increase in the interest rate causes deterioration in the balance of payments through decrease in demand for money. In this approach, output, the interest rate, and the price level are treated as exogeneous variables. But if a country has a low degree of capital mobility, high unemployment, and a large proportion of nontraded to traded goods, these variables will be endogeneous, at least in the short-run.

A short-run Keynesian approach states that the BOP deteriorates when output rises, since real income growth increases the demand for imports, which widens current-account deficits. Conversely, BOP improves as the interest rate rises. The Keynesian approach presumes complete sterilization and takes money supply as a policy-determined independent variable. But complete sterilization is not feasible in a system of fixed exchange rates, particulary under conditions of prolonged balance-of-payments deficits. So the money supply in an open economy should be treated as an endogeneous variable. Thus, the long-run monetary approach should be combined with the short-run Keynesian approach to understand the short-run effects of policy variables on the endogeneous variables with which policy makers are concerned.

There are some theoretical works on the integration of the two approaches to the balance of payments. Chen (1975) attempted a simplified synthesis of the two approaches to devaluation by incorporating the tight money effect of devaluation into the open economy IS-LM model with full employment and flexibility of prices. Frenkel et al (1980) studied the short-run balance-of-payments theory by integrating the simple version of the Keynesian and Monetary approaches. Tribedy (1984) suggested an integration of both approaches to the BOP by using Patinkin's method of integrating the real sector with the monetary sector in a closed economy. He found better the combined model a much more powerful tool for explaining economic conditions in India than the unmodified monetary model.

Jullaman (1986) followed Frenkel's study and estimated the BOP equation for Thailand by using an reduced-form equation model. Miller (1986) used Walrasian identities for an open economy to develop a general approach to the BOP, into which various individual approaches can be fit. The basic framework used in this study for Korea is that of Frenkel's model, with the assumption of the existence of underemployment and government regulations restricting the inflow of international capital into the economy.

CHAPTER IV

THE SHORT-RUN KEYNESIAN APPROACH

The Keynesian theory of income determination in the short run, designed for a closed economy can be extended to the case of an open economy, with the balance of payments as an endogeneous variable to be determined within the system. Extension of the closed economy model requires two major modifications. First, the aggregate demand for domestic output now must consist of the aggregate domestic expenditure and the net-trade balance defined as the value of exports minus the value of imports. Second, the balance-of-payments equation has to be explicitly introduced into the model, along with the equilibrium condition in the commodity and money markets. Then the model can be used to evaluate the comparative static effects of fiscal, monetary and exchange rate policy changes under the different conditions of international capital mobility.

Aggregate domestic expenditure is divided into private expenditure and public expenditure. Private consumption expenditure and private investment expenditure are lumped together in the model for the sake of simplication, without creating any major analytical difference. The model also abstracts from taxation and transfer payments so that all fiscal policy changes are captured under the

category of changes in public expenditure.

1. Specification of the model

The structural equations of the model consist of (a) the aggregate private expenditure function; (b) the demand function for money; (c) the net trade balance function; (d) the net international capital inflow function; and (e) the aggregate supply function. Equilibrium in the system is determined by conditions for equilibrium in the commodity and money markets.

Aggregate real domestic private expenditure (E) is a rising function of the aggregate real income (Y) and a falling function of interest rate (r). The marginal propensity to spend is a positive fraction between zero and one. Thus, the aggregate private expenditure function is written as

$$E = E(Y, r); \quad 0<E_Y<1 \text{ and } E_r<0 \qquad (4.1)$$

The demand for nominal money balances is an increasing function of both income and price level (P) and a decreasing function of the interest rate. Thus, the money demand function is written as

$$M_d = L(Y, P, r); \; L_Y>0, \; L_P>0, \; L_r<0 \qquad (4.2)$$

As defined before, the net trade balance is the excess of the value of exports over the value of imports. If this balance is positive, there is a surplus in the trade

balance and if it is negative, there is a deficit in the trade balance. The value of exports depends on foreign demand for domestic output, which in turn depends on foreign income and exchange rate (e). Foreign income is given exogeneously. The exchange rate is the price of foreign currency in terms of domestic currency. Since an increase in the exchange rate makes domestic goods cheaper to foreigners, exports will increase with any increase in the exchange rate.

The value of imports depends on the domestic demand for foreign goods. It is an increasing function of domestic income. An increasing exchange rate will raise the domestic price of foreign goods and then the domestic demand for imports will fall. If the domestic demand for imports is elastic, the value of imports will fall with an increase in the exchange rate. The net real trade balance (T), then, is a decreasing function of domestic income and rising function of the exchange rate. Therefore the net trade balance function is written as

$$T = T(Y, e); \; T_Y<0, \; T_e>0 \tag{4.3}$$

The positive relationship between e and T depends on the elasticity condition known as the Marshall-Lerner condition, which is assumed to hold in this model.

The net international capital inflow (F) is defined as the inflow of foreign capital funds into the country minus the outflow of domestic capital funds out of country. If

there is net international capital outflow from the country, the value of F is negative. If there is net international capital inflow, it is positive. When there is no official restriction on international capital mobility, the net inflow will depend on the difference between the domestic and foreign interest rates. The foreign interest rate is exogeneous. Therefore, the net international capital inflow is an increasing function of the domestic interest rate. Thus the net international capital inflow function is expressed as

$$F = F(r); \quad F_r > 0 \tag{4.4}$$

The absence of international capital mobility will affect the value of F_r. To capture the change in the official restriction on capital mobility, a coefficient can be attached to the F function, so that

$$F = AF(r) \tag{4.5}$$

where A = 1 without any restriction and A = 0 with complete restriction on capital mobility. If such a restriction exists but it is not complete, A is greater than zero but less than unity. Increasing domestic income may also attract foreign capital in a country by opening up new investment opportunities. Then, a complete description of the capital inflow function will be

$$F = AF(Y, r); \; F_Y > 0, \; F_r > 0 \tag{4.6}$$

The short-run aggregate supply function in the Keynesian system states that the domestic price level is an increasing function of real income. The supply function in the Keynesian model has been rationalized by short-run wage rigidity. It can be also be formulated in terms of the adaptive expectation hypothesis, in which the expected price level is equal to the price level in the preceding period. Then the aggregate supply function can be written as

$$P = P(Y);\ P_Y > 0 \tag{4.7}$$

The commodity market equilibrium condition is derived from the equation for the IS-curve:

$$Y = E(Y,\ r) + T(Y,\ e) + G \tag{4.8}$$

where G is the public expenditure. The money market equilibrium condition is given by

$$M = L(Y,\ P,\ r) \tag{4.9}$$

where M is stock of money supply given exogeneously. The balance of payments is defined as the sum of the balance on the trade account and that on the capital account. So the balance of payments equation is given by

$$B = PT(Y,\ e) + AF(Y,\ r) \tag{4.10}$$

Equations (4.7)-(4.10) simultaneously determine the endogeneous variables Y, P, r, and B , in terms of the

exogeneous variables G, e, and M. In this model the domestic money supply is treated as a policy-determined exogeneous variable. Therefore, a non-zero balance of payments has no effect on the domestic money supply. That is, the money supply effect of changes in the foreign exchange component of the monetary base is completely sterilized by opposite changes in domestic credit of monetary base.

2. Equilibrium solution

The solution for the equilibrium value of the endogeneous variable in the model can be determined in the following manner. The IS-curve equation (4.8) can be used to express the aggregate real income as a function of the interest rate, exchange rate, and government expenditure. Thus, one can write

$$Y = f(r, e, G); \; f_r < 0, \; f_e > 0, \; f_G > 0 \tag{4.11}$$

An increase in the domestic interest rate will lead to a fall in private expenditure, and so aggregate demand will fall; but an increase in exchange rate will stimulate the aggregate demand through an improvement in the net trade balance. This is the expansionary effect of expenditure switching caused by the devaluation of domestic currency. An increase in government expenditure leads to a direct increase in aggregate demand.

The LM-curve equation (4.9) describing the condition

for equilibrium in the money market also gives the relation between aggregate real income and the rate of interest, the price level and the money supply. This relation is written as

$$Y = g(r, P, M); \; g_r>0, \; g_P<0, \; g_M>0 \tag{4.12}$$

An increase in the interest rate will lead to a fall in the demand for money; then, with a given money supply and price level, real income must rise to maintain equilibrium in the money market. An increase in the price level leads to an increase in the demand for money; and so with a given rate of interest and money supply, real income must fall to maintain equilibrium in the money market. An increase in money supply will be absorbed by an increase in money demand with a constant price level and interest rate only if real income rises.

The relation captured in equations (4.11)-(4.12) can be used to solve the equation for rate of interest in terms of M, P, e, and G. Thus the solution for r is written as

$$r = r(M, P, e, G); \; r_M<0, \; r_P>0, \; r_e>0, \; r_G>0 \tag{4.13}$$

In the standard IS-LM model an increase in money supply leads to a fall in the interest rate, while an increase in government expenditure leads to a rise in the interest rate. This explains why $r_M<0$ and $r_G>0$. An increase in P is equivalent to a decrease in supply of real money

balance; hence, it leads to an increase in the interest rate: so $r_p>0$. An increase in exchange rate improves the trade balance and the resultant increase in income leads to an increase in interest rate. This explains why $r_e>0$.

Now, if the aggregate supply function in equation (4.7) is substituted for P in equation (4.13),

$$r = r(e, G, P(Y), M) \tag{4.14}$$

If equation (4.14) is substituted for Y in equation (4.11), then the endogeneous variable Y can be expressed in terms of the exogeneous variable G, e, and M. Thus, the reduced-form solution[3] for Y is given by

$$Y = Y(M, e, G);\ Y_M>0,\ Y_e>=<0,\ Y_G>0 \tag{4.15}$$

Substituting the value of the reduced-form solution for Y given in equation (4.15) in equation (4.14), the reduced-form solution for r is derived as

$$r = H(M, e, G);\ H_M<0,\ H_e>0,\ H_G>0 \tag{4.16}$$

Now, substitution of the reduced-form solution for Y in the aggregate supply function (4.7) gives the reduced-form solution for P as

$$P = K(M, e, G);\ K_M>0,\ K_e>0,\ K_G>0 \tag{4.17}$$

Finally, the equilibrium values of Y, P, and r yield the

[3]The comparative static analysis of exogeneous variables on the endogeneous variables is presented in Appendix A.

following reduced-form solution for balance of payments (B);

$$B = B(M,\ e,\ G);\ B_M<0,\ B_e<>=0,\ B_G<>=0 \qquad (4.18)$$

3. Comparative static effects

Now, the short-run effects of changes in fiscal, exchange rate, and monetary policies on the balance of payments and other endogeneous variables (P, r, and Y) can be obtained from the reduced-form equations (see Appendix C). From the reduced-form equations (4.15)-(4.18), we can test the following Keynesian propositions:

(1) When money supply increases:

(a) the balance of payments may deteriorate;

(b) real income increases;

(c) the interest rate falls;

(d) the price level will rise.

An increase in money supply will raise income and lower the interest rate. The balance of payments depends on two opposing forces: an increase in income worsens the current account, and a reduction in interest rates encourages capital outflow or checks capital inflow, thus worsening the capital account. But the increase in income tends to attract foreign capital, and if this effect is strong enough, it might outweigh the adverse effects. In this case, the effect on the balance of payments is uncertain. But if we assume that income expansion increases the capital account less than it worsens the current account,

market is not integrated, the balance of payments deteriorates;

(b) real income increases;

(c) the interest rate rises;

(d) the price level increases.

4. Empirical results

The four reduced-form equations (4.15)-(4.18) have been estimated empirically in their linear form. The balance-of-payments equation in its empirical form is written as $B = R_t - R_{t-1}$, and hence $R_t = B + R_{t-1}$, where R_{t-1} stands for stock of foreign exchange reserves at the end of the preceding period.

The estimated reduced-form equations are shown in table 10. The Keynesian balance-of-payments equation shows that the coefficients on the monetary, foreign exchange, and fiscal policy variables have a theoretically appropriate sign according to the Keynesian propositions mentioned above.

First, the estimated coefficient of money supply (M) is -0.65, which is significantly different from zero. An expansionary monetary policy will reduce the BOP in Korea because both the increase in income and the decrease in interest rate caused by the monetary expansion will make the BOP deteriorate.

Second, the coefficient of the exchange rate has a theoretically correct sign (negative), but it is not

Table 10

Reduced form equations based on the Keynesian approach.

	R	Y	P	r
Constant	77.531 (0.236)	1922.293 (1.127)	-16.482 (1.400)	19.834 (2.870)
M	-0.650 (2.491)	-1.601 (2.352)	0.005 (1.075)	-0.002 (1.028)
e	-1.678 (1.190)	15.100 (2.504)	0.089 (3.478)	0.0002 (0.109)
G	0.398 (1.891)	5.213 (8.287)	0.005 (1.474)	0.0004 (0.211)
R_{t-1}	0.779 (5.764)			
R-squared	0.972	0.989	0.988	0.683
D-W	1.745	1.97	1.689	1.620
F-stat.	173.570	448.039	438.182	10.224

Note : t-values are given in parentheses and D-W stands for Durbin-Watson statistic.

statistically significant at the five percent level. Devaluation will improve the trade balance in the very short-run, but in the moderate short-run, trade balance might deteriorate due to the increase in income. The capital accounts improve because of the increase in interest rate. So, the net effect of devaluation depends on the interplay of these conflicting forces.

Third, the estimated coefficient of fiscal policy variable (G) is 0.398, which has the theoretically correct sign, but is statistically significant only at the 10 percent level. The positive effect of expansionary fiscal policy (i.e., a higher interest rate) on BOP might dominate the negative effect of the expansionary fiscal policy (i.e., economic growth). That is, capital inflows can exceed the current-account deterioration caused by the increase in government expenditure.

The effect of foreign exchange reserves from the end of the preceding period on the balance of payments is positive, which is opposite to the theoretical prediction of the Keynesian model.

Other estimated reduced-form equations are presented in table 10. The coefficients of monetary (M), fiscal (G), and exchange rate (e) policies in the reduced-form solution for the price level have theoretically appropriate signs, but are statistically insignificant except for the exchange rate policy variable. The estimated reduced-form solution for interest rate shows

that the coefficients of policy variables have relevant signs but are not significant. In the estimated reduced-form equation for income, the coefficient of the monetary variable has a negative sign and is significant statistically, which is contradictory to the proposition described above.

CHAPTER V

THE MONETARY APPROACH

The monetary approach to the balance of payments is based on the condition for equilibrium in the money market. The structural equation of the model consists of the demand and supply function of money. Income, the interest rate, and the price level are treated as exogeneous variables. Exogeneity of income as a variable depends on assumption that full employment in the labor market, along with technology, gives the equilibrium value of income. The price level and rate of interest are given to the domestic economy under the assumption that the economy is a small one. However, the domestic price level depends on the prices of both traded and non-traded goods. In a small open economy prices for traded goods prices are given but prices of non-traded goods are endogeneous. So the domestic price level should be treated as an endogeneous variable.

1. Specification of the model

The structural equations of the model consist of the supply function of money, the demand function of money, the equation for domestic price levels and purchasing-power parity condition. The supply of money is the product of the money multiplier and the monetary base.

The monetary base in an open economy is the sum of foreign exchange reserves (R) and the domestic credit component (D). Thus, the equation for money supply is written as

$$M_s = a(R + D) \qquad (5.1)$$

where **a** stands for the money multiplier.

The demand for real money balance is a rising function of real income and a falling function of interest rate. The demand function for nominal money balance is written as

$$M_d = P\ L(Y,\ r);\ L_Y>0,\ L_r<0 \qquad (5.2)$$

The domestic price level is defined as the weighted geometric mean of the price levels of traded and non-traded goods. The equation for the domestic price level is written as

$$P = P_T{}^s P_N{}^{1-s} \qquad (5.3)$$

where P_T is the price level of traded goods, P_N is the price level of non-traded goods and **s** is the share of traded goods in the total expenditure. In a small open economy, P_T is determined by the purchasing power parity condition.

$$P_T = eP_W \qquad (5.4)$$

where P_W is the world price of traded goods and **e** is the exchange rate. The domestic money market is in

equilibrium when the following equation falls

$$a(R+D) = PL(Y, r) \tag{5.5}$$

Logarithmic transformation of equation (5.5) and differentiation with respect to time yield the following equation:

$$a^* + [R/(R+D)]R^* + [D/(R+D)]D^* = P^* + L^* \tag{5.6}$$

Where the asterisk indicates the percentage rate of change in the variable. Similiar logarithmic transformation and total differentiation of equation (5.3) produces

$$P^* = sP_T^* + (1-s)P_N^* \tag{5.7}$$

$$P_T^* = P_W^* + e^* \tag{5.8}$$

respectively. The price of non-traded goods is affected by the domestic demand condition. So the non-traded goods price relative to the traded goods price can be expressed as a function of the _ex ante_ excess supply of money. Thus, the following equation captures the price of the non-traded goods:

$$P_N = P_T \exp^{ng} \tag{5.9}$$

where g is the measure of _ex ante_ excess supply of money and n is the elasticity of the relative prices of non-traded goods with respect to _ex ante_ the excess supply of money. In a small open economy, the actual money supply

is beyond the control of monetary authority which can determine the *ex ante* quantity of money by changing the domestic credit component and the money multiplier. Hence, the *ex ante* excess supply of money (in percentage terms) is given by

$$g = a^{*} + D^{*}(D/(D+R)) - L^{*} \tag{5.10}$$

Logarithmic transformation and total differentiation of equation (5.9) yields

$$P_N^{*} = P_T^{*} + ng \tag{5.11}$$

Then substitution of equation (5.10) for g in (5.11) gives

$$P_N^{*} = P_T^{*} + n[(D/H)D^{*} + a^{*} - L^{*}] \tag{5.12}$$

Then substitution for P_T^{*} from equation (5.8) and for P_N^{*} from equation (5.11) in equation (5.7) expresses the domestic rate of inflation as a function of the world inflation rate, the rate of devaluation, and the *ex ante* excess supply of money in the domestic economy. The final result is

$$P^{*} = [1/\{1+ n(1-s)\}](P_W^{*} + e^{*}) + [n(1-s)/\{1+n(1-s)\}][(D/(D+R))D^{*} + a^{*} - L^{*}] \tag{5.13}$$

Now substitution for P^{*} from equation (5.13) in (5.6) with some manipulation gives the following reserve flow equation:

$$(R/(R+D))R^* = [(1/(1+n(1-s))][P_w^* + e^* + m_d^* - (D/(R+D))D^* - a^*]$$

$$= [(1/(1+n(1-s))][P_w^* + e^* + n_y Y^* + n_r r^* - (D/(D+R))D^* - a^*] \quad (5.14)$$

where n_y and n_r are the income and interest rate elasticities of the demand for real money balance respectively. Equations (5.13) and (5.14) are the reduced-form solution for the domestic inflation rate and rate of change of foreign exchange reserves.

2. Comparative static effects

In the reduced-form solutions presented above, P^* and $R^*(R/(D+R))$ are the endogeneous variables determined by P_w^*, e^*, a^*, Y^*, and r^*. The domestic monetary policy produces changes in D^* and a^*. The exchange rate policy affects e^*, while P_w^*, Y^* and r^* are exogeneously given. The reduced-form solutions suggest the following propositions:

(1) When Y rises, domestic inflation rate declines, while the balance of payments improves.

(2) When r rises, domestic inflation rate increases and the balance of payments deteriorates.

(3) When the domestic currency depreciates, domestic inflation rate increases and the balance of payments improves.

(4) When D increases, domestic inflation rate increases, while the balance of payments deteriorates.

3. Empirical results

Equation (5.13) and (5.14) have used the OLS method to analyze the effects of changes in monetary and exchange policy variables on world inflation rate, income growth, rate of interest, on the balance of payments and the domestic inflation rate in the Korean economy.

The exchange rate used in this analysis is based on the weighted average of Korea's bilateral exchange rates for the U.S dollar, Canadian dollar, Japanese yen, British pound sterling and Deutsche mark; the shares of these countries in the total trade of Korea have been used as the weight. Similiarly, world inflation rates have been calculated on the basis of the trade-weighted price indices of Korea's major trade partners.

All estimates are based on annual data for Korea. The smple period, 1961 through 1985, contains 25 observations. Empirical tests of the monetary propositions in the Korean economy are presented in table 11.

It is obvious from the estimated reduced-form equation for domestic inflation in table 11 that none of the coefficients of independent variables is statistically significant. A partial F-test also yields failure to rejection of the null hypothesis that all of them are simultaneously equal to zero. So, changes in exogeneous variables have no significant effect on domestic inflation.

The international reserve equation, which contains the same exogeneous variables as in the reduced-form equation for domestic inflation, is presented in table 11. The coefficient of the income-growth variable is not significant and income growth did not lead to a gain in international reserves --which is contradictory to the monetary proposition explained above. The exchange rate variable is significant at ten percent level of significance but depreciation led to a loss in international reserves which again contradicts the monetary proposition stated above.

The world inflation variable is also significant, but did not follow the propositions of monetary approach to the balance of payments. An increase in the domestic credit component of the monetary base and money multiplier led to a loss in the balance of payments. The offset coefficient is -0.733, which is significantly different from the unity anticipated by the monetary approach. Also, the estimate of the interest rate variable has a relevant sign (negative), but was not statistically significant.

In summary, the results of international reserve and inflation equations for the Korean economy are not consistent with the propositions of the monetary approach to the balance of payments.

Table 11

Reduced form equations based on the monetary approach.

	$(R/(R+D))R^*$	P^*
Constant	0.589	0.154
	(1.681)	(2.603)
Y^*	-1.962	-0.300
	(0.670)	(0.689)
e^*	-2.132	-0.114
	(1.970)	(0.736)
$P_w{}^*$	-2.095	0.045
	(2.187)	(0.350)
r^*	-0.170	-0.003
	(0.305)	(0.039)
a^*	-4.284	0.023
	(3.545)	(0.135)
$(D/(D+R))D^*$	-0.733	0.019
	(2.781)	(0.485)
R-squared	0.624	0.276
D-W statistic	1.868	1.342
F-statistic	3.563	0.818

Note: t-values are given in parentheses.

CHAPTER VI

KEYNESIAN AND MONETARY APPROACHES COMBINED

The short-run Keynesian approach presented in Chapter IV is based on the assumption that the domestic money supply is an exogeneous variable. In a small open economy, the balance of payments has monetary effects because of the change in the monetary base of the economy. Only when international reserve flows are completely sterilized by opposite changes in the domestic credit component of the monetary base, the domestic money supply can be treated as an exogeneous variable. But complete sterilization is not feasible because of the scarcity of foreign exchange reserves. Hence, in an economy such as Korea, the money supply effects of international reserves flows must be incorporated into the model.

The monetary approach is also inadequate to capture the endogeneous changes in income and rate of interest in the presence of unemployed resources and short-run wage rigidity. The endogeneity of domestic price levels in the monetary approach presented in Chapter V is based on the assumption of full employment. Hence, the pressure of aggregate demand is assumed to be channelled through an increase in the domestic price level and the balance of payments. But in the presence of unemployed resources, domestic output, price levels, and the balance of payments

will be affected by changes in the aggregate demand.

This chapter thus presents a model combining the essential elements of the two separate approaches presented in Chapters IV and V.

1. Specification of the model

The structural equations of the model are the same as those of the Keynesian model. The only difference is that the money supply equation of the monetary approach is incorporated in an otherwise Keynesian model. Hence, the equations of the model are as follows:

$$Y = E(Y, r) + T(Y, e) + G \tag{6.1}$$

$$a(R + D) = L(P, Y, r) \tag{6.2}$$

$$P = P(Y)^{4} \tag{6.3}$$

$$B = R - R_{-1} = PT(Y, e) + AF(Y, r) \tag{6.4}$$

Equations (6.1) through (6.4) contain four endogeneous variables: Y, P, r, and R. The exogeneous variables of the model are G, e, a, D, and A.

For reduced-form solution of the model, equation (6.1) is solved for r in terms of G, Y, and e. Then we can write

$$r = W(G, Y, e);\ W_G>0,\ W_Y<0,\ W_e>0 \tag{6.5}$$

[4] A short-run aggregate supply function derived from labor market equilibrium condition under rigid money wage are presented in Appendix B.

Substitution of P by equation (6.3) and of r by equation (6.5) in equation (6.4) yields the following balance of payments equation:

$$dR = P(Y)T(Y, e) + AF(Y, r(Y, G, e)) \qquad (6.6)$$

If R_{-1} is taken to represent the foreign exchange reserves at the end of previous period, the balance of payments equation (6.6) can be converted into the following reserve flow equation:

$$R = Z(Y, e, G, A) + R_{-1} \qquad (6.7)$$

Similarly, substitution of P by equation (6.3) and of r by equation (6.5) in equation (6.2) produces the following money market equilibrium condition:

$$R = (1/a)L(Y, r(Y, G, e), P(Y), e) - D \qquad (6.8)$$

which can be written as

$$R = J(Y, G, e, D, a) \qquad (6.9)$$

Now, substituting the value of R from equation (6.7) in (6.9), the reduced-form solution[5] for Y is obtained in terms of G, e, D, a, A, and R_{-1}. Thus:

$$Y = Y(G, e, D, a, A, R_{-1});\ Y_G>0,\ Y_e<=>0,\ Y_D>0,$$

$$Y_a>0,\ Y_A>0,\ Y_{R-1}>0 \qquad (6.10)$$

[5]The comparative static effects determining the sign of the derivatives of all reduced-form solutions are shown in Appendix C.

When the reduced-form solution for Y given in equation (6.10) is plugged into equation (6.9), we get the reduced-form solution for R as

$$R = U(G,\ e,\ D,\ a,\ A,\ R_{-1});\ U_G ><= 0,\ U_e <=> 0,\ -1 < U_D < 0,$$

$$U_a < 0,\ U_{R-1} > 0,\ U_A > 0 \qquad (6.11)$$

Again, plugging the reduced-form solution for Y into equations (6.3) and (6.5), we get the reduced-form solution for r and P respectively. Thus:

$$r = r(G,\ e,\ D,\ a,\ A,\ R_{-1});\ r_G <>= 0,\ r_e > 0,\ r_D < 0,$$

$$r_a < 0,\ r_A < 0,\ r_{R-1} < 0 \qquad (6.12)$$

$$P = P(G,\ e,\ D,\ a,\ A,\ R_{-1});\ P_G > 0,\ P_e > 0,\ P_D > 0,\ P_a > 0,$$

$$P_A > 0,\ P_{-1} > 0 \qquad (6.13)$$

The reduced-form equations (6.10) - (6.13) can be estimated by the OLS method. The variable A has a range from zero to unity, depending on the strictness of the restrictions on capital mobility. The period under investigation can be divided into three parts: total restriction for the period 1961-70, with A=0; weak restriction for the period 1971-80, with A=0.5; and no restriction for the period 1981-85, with A=1.

2. Testable hypothesis

The reduced-form equations can be used to examine the

short-run impact of the policy variables (D, G, e, a, and A) on the endogeneous variables (P, Y, r, M, and R).

First, the model presented above implies that an increase in government expenditure will improve the balance of payments if the capital market is completely integrated, since capital inflow caused by the expansion outweighs the reduction in the trade balance. This result can be compared with the implication of the simple Keynesian model that an increase in the government expenditure does not produce an unambiguous effect on the BOP.

Second, the monetary approach states that devaluation improves the BOP by increasing the demand for money. But the effect of devaluation in the model presented above is uncertain because the contractionary effect in the money market and the expansionary effect in the commodity market go in opposite directions; so the actual effect of devaluation on the BOP depends upon the relative strength of the two.

Third, the Keynesian approach proposes that an expansion of money supply would cause a deterioration of the BOP through increases in income and a fall in the interest rate. The offset coefficient in the monetary approach is minus one, and so an increase in the domestic credit component of the monetary base would be expected to produce an opposite change in the international reserves by the same amount. In the present model, a negative sign

of the offset coefficient is expected, but it is greater than one in absolute value because government may sterilize international reserve flows in part as a measure of adjustment to the BOP. The expansion of the domestic credit component of the monetary base would also affect other real variables, like income, through which a favorable effect on the BOP might be encountered.

Fourth, a test can be made with regard to the effect of a change in the money multiplier. A simple version of the monetary approach implies that [(dR/da)(a/(R+D))] is negative in sign and unity in absolute value. But the present model anticipates a negative sign not necessarily minus one in its coefficient.

3. Empirical results

The reduced-form solution equations estimated are shown in tables 12 and 13.

All results of the reduced-form equation for R are consistent with the theoretical presumptions of the model. Column 1 in table 12 represents the balance of payments without lagged variables of G, e, D and A; results in column 2 show the balance of payments equation with the introduction of the captial restriction coefficient; columns 3 and 4 show the results with the incorporation of the lagged policy variables. Most estimates of the reserve flow equations shown in table 12 are highly significant and have relevant signs.

Table 12

Balance of payments equations based on the combined model.

	1	2	3	4
C	-257.176	-741.682	147.228	-267.400
	(0.436)	(1.070)	(0.174)	(0.238)
G	0.508	0.543	0.412	0.418
	(5.686)	(5.898)	(3.450)	(2.379)
G(-1)	-	-	-	0.043
				(0.195)
G(-2)	-	-	-	-0.448
				(1.081)
e	-1.656	-0.931	-1.675	-1.262
	(2.396)	(1.053)	(1.456)	(0.798)
e(-1)	-	-	-	-0.725
				(0.424)
e(-2)	-	-	-	1.337
				(0.826)
a	97.707	332.263	-87.747	340.320
	(0.250)	(0.780)	(0.175)	(0.497)
R_{-1}	0.248	0.245	0.425	0.850
	(2.652)	(2.667)	(2.523)	(1.862)
A	-	-451.473	-153.482	485.349
		(1.280)	(0.391)	(0.671)
D	-0.763	-0.799	-0.798	-0.667
	(7.838)	(8.006)	(7.962)	(3.803)
D(-1)	-	-	0.356	0.472
			(2.087)	(1.650)
D(-2)	-	-	-0.141	0.001
			(1.542)	(0.004)
R^2	0.994	0.994	0.996	0.996
D-W	1.656	1.593	1.798	1.791
F-stat.	587.548	506.351	364.916	227.206

Note: t-values are given in parentheses, and D-W stands for Durbin-Watson statistic.

Table 13

Reduced form equations based on the combined model.

	Y	P	r
Constant	3362.337	-45.016	22.182
	(0.587)	(2.216)	(1.418)
G	5.378	0.005	-0.002
	(8.185)	(2.142)	(1.276)
e	13.624	0.075	0.040
	(1.777)	(2.742)	(2.003)
D	-1.785	0.008	0.002
	(2.527)	(2.742)	(1.129)
R_{-1}	-1.439	0.010	0.003
	(2.122)	(3.957)	(1.864)
a	-1238.651	26.225	-7.000
	(0.370)	(2.207)	(0.799)
R^2	0.992	0.991	0.666
D-W statistic	2.112	1.744	1.714
F-statistic	399.812	338.564	5.985

Note: t-values are given in parentheses.

Increase in government expenditure leads to increases in income and interest rate. For an expansionary fiscal policy (G), the conventional Keynesian approach anticipates a deterioration in the balance of trade and an improvement in the capital account. So, the position of the balance of payments depends upon the relative strength of the changes in the two accounts. The monetary approach expects that balance of payments will improve as the increase in income leads to an increase in the demand for money, but that it will be deteriorate as higher interest rates lead to a decrease in the demand for money. Hence, both approaches are uncertain about the effects of an increase in governement expenditure on the balance of payments. To explain economic interactions in a small open economy like Korea, the combined approach of this chapter does a better job.

Since the Korean government has restricted capital mobility between countries, significant positive effects of government fiscal policy could be better explained by the monetary than Keynesian approach. Column 4 of table 12 shows that lagged effects of the fiscal policy variable did not significantly change the direction of movements in the balance of payments.

Second, the effects of exchange rate depreciation on the balance of payments yield a negative sign, but this is significant only when lagged variables are not included. A simple explanation of this is that depreciation will

make the money market contractionary and the commodity market expansionary, showing opposite effects on the balance of payments. From the empirical results, it can be observed that the expansionary effect in the commodity market dominated the contractionary effect in the money market. Thus, the effect of depreciation on the balance of payments in this approach is qualitatively the same as that in the Keynesian approach. When the exchange rate variable lagged by one and two periods, the sign of the effect of depreciation on the balance of payments changed from negative to positive. But still the net effects of depreciation for a three-year period remain negative.

Third, the money multiplier and capital mobility coefficients in the four equations did not have significant effects on the balance of payments.

Fourth, the domestic credit component of the monetary base has an appropriate sign, and its coefficient is statistically significant. However, the offset coefficient is significantly different from unity. This contradicts the implication of the monetary approach. It seems that the Korean government sterilized international reserve flows in part as a measure of adjustment to the balance of payments.

Column 3 of table 12 shows that an increase in the domestic credit component of the monetary base led to (i) a loss of foreign exchange reserve within the same year, (ii) a gain in reserves after one year, and (iii) a

negative net effect in a two-year period. The effects of D on other endogeneous variables such as Y, r, and P, might lead to a smaller offset coefficient, and even change its sign from negative to positive.

Table 13 presents the estimated reduced-form solution equations for price level, interest rate and income.

The effects of fiscal policy (G) and exchange rate variables on interest rate and income are appropriate in sign and they are statistically significant; but effects of the monetary policy variables (D and a) did not follow the presumption of the combined model.

CHAPTER VII

SUMMARY AND CONCLUSIONS

Fluctuations in Korea's balance of payments have not been studied systematically with the help of any theoretically sound macroeconomic model. The relation between the balance of payments and other macroeconomic variables has needed proper investigation in order to identify appropriate policy measures. The main purpose of this study is to explain critically the factors affecting Korea's balance of payments for the years 1961-85.

Analysis of the effects of government policies on the economy and the balance of payments has been conducted under both the Keynesian and monetary approaches. The Keynesian approach concentrates on commodity and capital market adjustment factors and does not emphasize money market factors. The short-run Keynesian approach is based on the assumption that the domestic money supply is an exogeneous variable. In a small open economy, the balance of payments has monetary effects because of resulting changes in the monetary base of the economy. Only when international reserve flows are completely sterilized by the off-setting changes in the domestic credit component of the monetary base, the domestic money supply can be treated as an exogeneous variable. But complete sterilization is not feasible because of the scarcity of

foreign exchange reserves. Hence, in an economy like Korea, the money supply effects of international reserve flows must be incorporated into the model.

The simple version of the monetary approach takes money supply as an endogeneous variable in a small open economy and looks into the balance of payments problem as a symptom of money market adjustments alone. The monetary approach is also inadequate to capture the endogeneous changes in income and rate of interest in the presence of unemployed resources and short-run wage rigidity. The Korean economy has a high degree of underemployment of resources. Its commodity and bond markets are not fully integrated. There are market imperfections and fragmentations. So the basic assumptions of the simple version of the monetary approach are not fully relevant to the Korean economy. Morever, the short-run variability of the balance of payments is difficult to capture in the simple monetary approach, which basically focuses on the long-run equilibrium position. So an appropriate modeling of Korea's balance of payments should combine both the monetary and the real factors in a single framework to explain short-run behavior.

In Chapter IV, the Keynesian approach was tested empirically with the help of the theory of income determination in the short-run designed for an open economy. In Chapter V, the monetary approach was modified by making the price level an endogeneous variable. In a

small open economy, traded goods prices are given, but non-traded goods prices are endogeneous. So the domestic price level is treated as an endogeneous variable. The combined approach has been presented in Chapter VI.

The empirical results of the Keynesian, the monetary and the combined approaches are compared with theoretical propositions. The effects of government fiscal policy (G) and foreign exchange rate policy (e) variables on the balance of payments have relevant signs in both the Keynesian and the combined approaches. But the estimated Keynesian approach shows that the effect of changes in the foreign exchange rate on the balance of payments is not statistically significant, whereas in the combined model the effect is significant.

The results from the estimated Keynesian model show that the effect of money supply on the balance of payments has an appropriate sign and is statistically significant, whlie the effect of money supply on income is negative, which is contradictory to the proposition of the Keynesian approach. But other estimated reduced form equations have appropriate, though not statistically significant sign. The offset coefficients in the estimated combined and monetary approaches show that they are significantly different from unity, which the monetary approach anticipates but the combined model does not. The effect of changes in the foreign exchange rate on the balance of payments in the monetary approach is negative, which is

contrary to the propositions of the monetary approach. The effects of changes in other exogeneous variables in the monetary approach on domestic inflation did not confirm the propositions of the monetary approach. A F-test fails to reject the null hypothesis that all of exogeneous variables are simultaneously equal to zero.

Direct and lagged effects of policy variables on the endogeneous variables are estimated in the combined model. The direct effects of government expenditure, foreign exchange rate, and the domestic credit component of monetary base on the balance of payments confirm the propositions implied in the combined approach. The effect of the domestic credit component of the monetary base on the balance of payments changed the sign from negative to positive through the indirect effects of D on other endogeneous variables.

In conclusion, the combined approach improved the power of the model to describe and explain the performance of the Korean economy for the period from 1961-85. For balance of payments adjustment policy in Korea, the following policy instruments--fiscal policy, foreign exchange rate policy, and monetary policy--are found to be very effective in the short run. For instance, the balance of payments surplus in Korea can be reduced by (i) either reducing the government budget deficit or increasing the government budget surplus; (ii) depreciating the domestic currency; (iii) increasing the

domestic credit component of the monetary base; (iv) liberalizing restrictions on capital outflows.

However, an expansionary domestic credit component of the monetary base may reverse the effect of it on the balance of payments through the indirect effect.

The combined model to the balance of payments might be useful for a developing country which has short-run output flexibility, a high proportion of non-traded goods to traded goods, and restrictions of capital mobility between countries in a fixed exchange rate system.

Incorporating liberalization of the capital market and the floating of the exchange rate into this model would convert the theory of balance of payments adjustments into a theory of exchange rate determination. Also the incorporation of expectation, which is a key factor in long-run macroeconomic analysis, might further improve the explanatory power of the model.

REFERENCES

Alexander, S. S., 1952, Effects of a devaluation on a trade balance, IMF Staff Papers, April, 263-278.

----, 1959, Effects of a devaluation: A simplified synthesis of elasticities and absorption approaches, American Economic Review, 49, 22-42.

Balassa, Bela and John Williamson, 1987, Adjusting to success: Balance of payments policy in the East Asian NICs, Institute for International Economics, 1-18.

Bank of Korea, 1987, Economic Statistics Yearbook, 2-9, 217.

Chen, Chau-Nan, 1975, IS, LM, BT, and a simplified synthesis of the elasticity, absorption, and monetary approach to devaluation, Southern Economic Journal 42, 132-136.

Dornbusch, Rudiger and Stanley Fischer, 1981, Macroeconomics (McGraw-Hill, New York).

Frenkel, Jacob A., Thorvaldur Gylfason, and F. John Helliwell, 1980, A synthesis of monetary and Keynesian approaches to short-run balance of payment theory, The Economic Journal, 90, 582-591.

Frenkel, Jacob A and Harry G. Johnson, 1976, The monetary approach to the balance of payments theory: Essential concepts and historical origins, in: Frenkel and Johnson, eds., The monetary approach to the balance of payments (Allen and Urwin, London and University of Toronto Press, Toronto).

Friedman, M, 1971, A theoretical framework for monetary analysis, National Bureau of Economic Research, NBER Occasional Paper No. 112, New York.

Gujarati, Damodar, 1978, Basic econometrics (McGraw-Hill Company, New York).

Hume, David, 1969, Of the balance of trade, in: R. N, Cooper, ed., International finance selected readings (Penguin Books Ltd, Baltimore).

International Monetary Fund, 1985, International financial statistics, Washington, D. C.

International Monetary Fund, 1987, International financial statistics, Washington, D.C.

International Monetary Fund and International Bank for Reconstruction and Development, various issues, Direction of Trade, Washington, D.C.

Johnson, H. G, 1958, Toward a general theory of the balance of payments, in: International trade and economic growth (Harvard University Press, Cambridge, MA).

Jullaman, Chan, 1986, Keynesian approach and monetary approach to balance of payments: A case study of Thailand, unpublished Ph.D dissertation, Utah State University.

Korean Economic Planning Board, 1987, Major statistics of Korean economy (Seoul, Korea).

Lau, Lawrence J, 1986, Model of development (ICS Press, Institute for Contemporary Studies, San Franciso).

Michaely, M, 1960, Relative prices and income-absorption approaches to devaluation: A partial reconciliation, American Economic Review 50, 144-147.

Miller, Norman C, 1981, The adequacy of Keynesian models of the balance of payments, American Economic Review 71, 778-783.

----,1986, The structure of open economy macro models, Journal of International Money and Finance 5, 75-89.

Mundell, Robert A, 1968, Barter theory and the monetary mechanism of adjustment, in: International economics (Macmillan, New York).

Robinson, J, 1937, The exchange in essays, in: The theory of employment (Blackwell, Oxford).

Stern, R. M, 1973, Balance of payments theory and economic policy (MacMillan, London).

Tsiang, S. G, 1961, The role of money in trade balance stability: Synthesis of the elasticity and absorption approaches, American Economic Review 51, 912-936.

Tribedy, Gopal, 1984, A macroeconomic analysis of India's balance of payments: 1952-80, unpublished Ph.D dissertation, Utah State University.

Wilford, Walton T, 1986, The monetary approach to balance

of payments and developing nations: A review of the literature, in: Putnam and Wilford, eds., The monetary approach to international adjustment (Praeger, New York).

APPENDICES

Appendix A: Comparative static analysis in the Keynesian model

Short-run effects of policy variables on the balance of payments in the Keynesian model are shown in this appendix by comparative exercises on the following equations of the model:

$$E(Y, r) + G + T(Y, e) - Y = 0 \tag{A1}$$

$$L(P, Y, r) - M = 0 \tag{A2}$$

$$PT(Y, e) + AF(Y, r) - B = 0 \tag{A3}$$

$$Y(P) - Y = 0 \tag{A4}$$

Differentiating (A1)-(A4) totally, we get

$$E_Y dY + E_r dr + dG + T_Y dY + T_e de - dY = 0 \tag{A1'}$$

$$L_p dP + L_Y dY - dM = 0 \tag{A2'}$$

$$TdP + PT_Y dY + PT_e de + AF_Y dY + AF_r dr - dB = 0 \tag{A3'}$$

$$Y_p dP - dY = 0 \tag{A4'}$$

which in matrix form can be written as

$$\begin{pmatrix} E_Y + T_Y - 1 & E_r & 0 & 0 \\ L_Y & L_r & L_p & 0 \\ PT_Y + AF_Y & F_r & T & -1 \\ -1 & 0 & Y_p & 0 \end{pmatrix} \begin{pmatrix} dY \\ dr \\ dP \\ dR \end{pmatrix} = \begin{pmatrix} -dG - T_e de \\ dM \\ -PT_e de \\ -dR_{-1} \end{pmatrix}$$

Using Cramer's rule, the short-run effects of policy

variables on the four endogeneous variables can be shown as

$dY/dM = -E_rY_P/H > 0 \qquad dY/dG = -L_rY_P/H > 0$

$dY/de = (-T_eL_rY_p)/H >= 0 \quad dY/dR_{-1} = -E_rL_p/H > 0$

$dr/dM = (E_Y+T_Y-1)Y_P/H < 0 \quad dr/dG = L_p + L_YY_P/H > 0$

$dr/de = ((L_p+PL_YY_P)T_e)/H > 0 \qquad dr/dR_{-1} = L_p(E_y+T_y)/H < 0$

$dP/dM = -E_r/H > 0 \qquad dP/dG = -L_r/H > 0$

$dP/de = (-L_rT_e)/H >= 0 \quad dP/dR_{-1} = [-L_r(E_y+T_y-1) + E_rL_y]/H < 0$

$dR/dM = [AF_rY_P(E_Y+T_Y-1) - E_rY_P(PT_Y+AF_Y) - E_rT]/H < 0$

$dR/dG = [L_YAF_YY_P - L_rT + AF_rL_p - L_rY_P(PT_Y+AF_Y)]/H <>= 0$

$dR/de = [(E_Y+T_Y-1)(-L_rY_pT_e) - E_r(L_pPT_e) + T_e\{L_YAF_rY_P - L_rT - AF_rL_p + L_rY_P(PT_Y+AF_Y)\}]/H <>= 0$

$dR/dR_{-1} = [(E_y+T_y-1)(L_pAF_y)-E_rL_p(PT_y+AF_y)]/H < 0$

$$\text{where } H = \begin{vmatrix} E_Y+T_Y-1 & E_r & 0 & 0 \\ L_Y & L_r & L_p & 0 \\ PT_Y+AF_Y & F_r & T & -1 \\ -1 & 0 & Y_P & 0 \end{vmatrix}$$

$$= Y_PL_r(E_Y+T_Y-1)-E_rL-E_rL_YY_P > 0$$

Appendix B: Short-run aggregate supply function

The short-run aggregate supply function noted in equation (4.7) can be derived from the labor market equilibrium condition under rigid money wage. The aggregate output is related to labor inputs, N, and capital stock, K. The aggregate production function is written as

$$Y = Y(N, K) \tag{B1}$$

The time horizon considered in the model is such that the capital stock is fixed at K_0, leaving labor as the only variable factor of production. So, the function becomes

$$Y = Y(N, K_0) = Y(N) \tag{B2}$$

where $Y_N>0$, $Y_{NN}<0$, implying that labor has a positive but diminishing marginal product.

The demand for labour is derived from the profit-maximizing behavior of a competitive firm. The objective of the firm is to maximize

$$\pi = PY(N^d) - WN \tag{B3}$$

where W denotes the nominal wage of labour. Demand for labour, N^d, is determined from the first order condition that the firm should employ labour up to the point where

the value of its marginal product equals it wage rate, i.e.:

$$PY_N(N^d) = W \tag{B4}$$

The supply of labour is determined by the labour-leisure choice of workers. An individiual worker maximizes a concave utility function, which depends on real income and leisure S, subject to the income constraint. So, the worker maximizes

$$U = U(Y,\ S), \tag{B5}$$

subject to $S = H - N^s$, and

$$Y = (W/P^e)N^s,$$

where H is the fixed number of hours available to the worker, P^e is the expected price level, and N^s measures labour hours worked.

The optimal condition for (B5) is

$$U_1(W/P^e) - U_2 = 0, \tag{B6}$$

which gives the labour supply function;

$$N^s = N^s(W/P^e) \tag{B7}$$

Eliminating N from (B4) and (B7) gives the short-run aggregate supply function

$$P = P(Y,\ P^e,\ K,\ W) = P(Y), \tag{B8}$$

where $dY/dP = -\ (W/\bar{P}^e)(1/Y_{NN})>0$, and $\bar{P}^e$ is given.

Appendix C: Comparative static analysis of the combined model

The equilibrium values of the endogeneous variables (P, r, Y, and R) are an implicit function of exogeneous variables (e, G, R_{-1}, and D), and the parameters (a and A). To find the anticipated sign of the partial derivatives of endogeneous variables in the model with respect to the exogeneous variables, we need total differentiation of equations (6.1)-(6.4).

The implicit functions from equations (6.1)-(6.4) are as follows;

$$Y - E(Y, r) - G - T(Y, e) = 0 \tag{C1}$$

$$R - R_{-1} - PT(Y, e) - AF(Y, r) = 0 \tag{C2}$$

$$a(R + D) - L(P, Y, r) = 0 \tag{C3}$$

$$Y - Y(P) = 0 \tag{C4}$$

Total differentiation of equations (C1)-(C4) gives

$$\begin{pmatrix} 1-E_Y-T_Y & -E_r & 0 & 0 \\ -PT_Y-AF_Y & -AF_r & -T & 1 \\ -L_Y & -L_r & -L_p & a \\ 1 & 0 & -Y_p & 0 \end{pmatrix} \begin{pmatrix} dY \\ dr \\ dP \\ dR \end{pmatrix} = \begin{pmatrix} dG+T_e de \\ dR_{-1}+PT_e de+FdA \\ -adD-(R+D)da \\ 0 \end{pmatrix}$$

Using Cramer's rule, partial derivatives of each endogeneous variable with respect to exogeneous variables and parameters are as follows;

$dY/dG=(L_rY_p-aY_pAF_r)/Q>0$

$dY/de=\{T_e(L_rY_p-aY_pAF_r)+E_raY_pPT_e\}/Q>=0$

$dY/dD = E_raY_p/Q>0$ $\quad$ $dY/da = E_rY_p(R+D)/Q>0$

$dY/dA = E_raY_pF/Q>0$ $\quad$ $dY/dR_{-1} = E_raY_p/Q>0$

$dr/dG =[aY_p(PT_y+AF_y)+aT-L_p-L_yY_p]/Q><=0$

$dr/de =[T_e\{aY_p(PT_y+AF_y)+aT-L_p-L_yY_p\} + aY_pPT_e(1-E_y-T_y)]/Q<>=0$

$dr/dD = a(1-E_y-T_y)/Q<0$

$dr/da =(1-E_y-T_y)(R+D)/Q<0$

$dr/dA =(1-E_y-T_y)aY_pF/Q<0$

$dr/dR_{-1} = aY_p(1-E_y-T_y)/Q<0$

$dP/dG =(-AF_r+L_r)/Q>0$

$dP/de = [E_raPT_e+T_e(-AF_r+L_r)]/Q>=0$

$dP/dD = E_ra/Q>0$ $\quad$ $dP/dA = E_raF/Q>0$

$dP/da = E_r(R+D)/Q>0$ $\quad$ $dP/R_{-1} = aE_r/Q>0$

$dR/dG = [L_rY_p(PT_y+AF_y)-AF_rL_p+TL_r-AF_rL_yY_p]<>=0$

$dR/de = [(1-E_y-T_y)(L_rY_pPT_e) + E_rL_yY_pPT_e-E_rL_pPT_e- T_eL_rY_p(PT_y+AF_y)-T_eAF_rL_p + T_eTl_r - T_eAF_rL_yY_p]/Q<>=0$

$$dR/dD = [(1-E_y-T_y)AF_rY_pa + E_rTa + E_rY_pa(PT_y+AF_y)]/Q<0$$

$$dR/dR_{-1} = [(1-E_y-T_y)L_rY_p + E_rL_yY_p + E_rL_p]/Q>0$$

$$dR/dA = [(1-E_y-T_y)L_rY_pF + E_rY_pL_y + E_rL_pF]/Q><=0$$

$$dR/da = [(1-E_y-T_y)AF_rY_p(R+D) + E_rT(R+D) + E_rY_p(PT_y+AF_y)(R+D)]<0$$

$$\text{where } Q = \begin{vmatrix} 1-E_y-T_y & -E_r & 0 & 0 \\ -PT_y-AF_y & -AF_r & -T & 1 \\ -L_y & -L_r & -L_p & a \\ 1 & 0 & -Y_p & 0 \end{vmatrix}$$

$$= [(1-E_y-T_y)(L_rY_p-aAF_rY_p) + E_r\{-aT+L_yY_p+L_p- aY_p(PT_y+AF_y)\}]<0$$

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