Economic Impact of Foreign Debt in Korea

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Abstract

Korea has recently experienced a rapid increase of total external debt and a predominance of short-term loans. Instead of the level of debt itself, the debt structure and the increase in the growth rate of debt are the most important factors involved in the current debt crisis.

The empirical analysis on Korea's foreign debt indicates that an increase in the growth of debt is harmful to Korea's economy and that total external debt may not be sustainable. The result of the sustainability test implies that the gradual reduction of foreign debt is desirable. In order to decrease the foreign debt, Korea needs to increase its current account surplus, either by increasing savings or by decreasing investment, and increase foreign direct investment through deregulation.

The structural problems associated with a rapid increase in debt are: accumulation of current account deficits; over-investment; a large amount of bank liabilities due to government intervention; labor market inflexibility; and a loss of policy credibility. These contribute directly or indirectly to the tremendous increases of foreign debt.

The current debt crisis was difficult to predict because it was caused by complex economic, financial and political events. For the efficient debt management, a possible solution is to set up an early warning system that can predict debt crisis. It is necessary for the government at this point to improve the national debt management system in order to monitor and manage the scale and structure of outstanding debt. Then, Korea will be able to track down the flow of its debt structures and trends. In this way, Korea can plan and prepare well in advance to prevent future debt problems.

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I. Introduction

Foreign debt, in addition to the Korean government's active economic policy, played an important role in Korea's economic growth in the 1980s. In the early 1980s, Korea was one of the largest debtor countries in the world. However, in 1987, upon reaching a current account surplus, (due to a stronger yen, low international interest rates and low oil prices), the Korean government revised its schedule for repaying existing debt.

The situation changed during the 1990s due to financial liberalization. The economic environment has become more vulnerable to external shocks. Krugman (1994) argues that the Asian economy will be shaky since it has simply accumulated capital and labor without improving technology. The recent Asian crisis seems to support Krugman's argument.[1]

Korea's foreign debt has increased rapidly due to trade deficits during the 1990s. At the end of 1996, the total foreign debt reached $104.5 billion. The debt to output ratio increased from 17.5 percent in 1995 to 21.6 percent in 1996. This rapid increase in foreign debt has been a major risk factor for Korea, considering its economic slowdown. In particular, due to the rapid accumulation of short-term debt, Korea had to turn to the International Monetary Fund (IMF) for financial aid in December of 1997.

The purpose of this paper is to investigate Korea's foreign debt structure, the effects of foreign debt on Korea's economy and the sustainablility of this debt. This paper is organized as follows. Section

two examines Korea's debt structure. Section three deals with empirical analysis on the economic effects of debt and the sustainability of debt. Section four discusses structural problems that have caused the rapid increase in debt.

Ⅱ. Foreign Debt Analysis

When a country is running a current account deficit in international payments, it relies on foreign borrowings to cover a shortfall in domestic savings relative to domestic investment. In other words, a current account deficit leads to an increase in a country's stock of external debt. The balance of payment account identity implies that increases in the stock of gross external debt must be equal to the sum of the current account deficit, acquisitions of official foreign exchange reserves and capital inflows.[2] That is:

Δ Gross External Debt = Current Account Deficit + Δ Official Reserves + Short-term Private Capital Outflows − Long-term and Direct Capital Inflows

The above equation implies that current account deficits, reserve accumulations and short-term capital flows (capital flight if it leaves the country) must be financed either by long-term capital movement and foreign direct investment, or by accumulation of external debt.

The excessive liquidity and enhanced speed of the world capital market encouraged indiscriminate lending to Asia during the 1990s. The total net private capital inflows to emerging markets more than tripled between 1990 and 1996, from about $60.1 billion to $193.6 billion. Looking at international capital flows during the past 15 years, a structural transformation occurred from syndicated bank lending, which dominated flows in the early 1980s, to international bonds, direct investment, and portfolio equity flows in the early 1990s. Latin America's debt problem made the Asian market more attractive to

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2) The external debt implies foreign debt.

international investors in the late 1980s. These factors contributed to speeding up of cross-border capital flows. Also, international investors lent recklessly to Asia, making it easier for Korea to borrow from the international capital market in the 1990s.

The debt to GNP ratios of Korea and other countries are shown in Table 1.[3] Korea's overall debt to GNP ratio was relatively low compared to international average up until 1996. This ratio declined after 1987 but continued to rise after 1991. In particular, the change in the ratio of debt over GNP increased by 2.5 percent in 1995 and 4.1 percent in 1996. These increases were relatively higher than other countries, even though Korea's debt to GNP ratio was still low compared to other problematic developing countries such as Brazil and Argentina. The rapid growth of debt has played a critical role in Korea's recent financial crisis.

Table 2 shows Korea's gross external debt during the last 10 years. Total debt decreased in the late 1980s due to an economic boom, but started to increase above 30 percent as Korea's trade deficit had especially worsened since 1994. Table 3 shows the tendency of Korea's short-term debt accumulation in recent years. The level of short-term debt has also increased rapidly since 1995, more than doubling from 26% in 1994 to 58% in 1995. This was primarily due to the government's ill-advised policy toward the banking system and negligence of necessary banking supervision. Expecting a decline in interest rates, along with joining the OECD, the government may have encouraged

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3) Table 1, 2 and 3 present different aspects of Korea's debt burden. Overseas borrowing by Korean enterprises and financial institutions, which is one of the major causes of the financial crisis, is not included in the external debt statistics.

short-term instead of long-term borrowings. Also, overseas borrowing by Korean banks, with the exception of interbank loans, are allowed with permission from the government. After the Hanbo bankruptcy, the government strictly regulated the price of bonds which commercial banks had issued in the international financial market.[4] As a result, interbank loans (i.e. short-term borrowings) have been increasing rapidly.

These tables highlight the important characteristics of Korea's foreign debt: a rapid increase in change of debt to output ratio and a predominance of short-term debt in recent years.

Table 1. Gross External Debt/GNP

(unit: %)

Year	Argentina	Brazil	Mexico	Philippines	Indonesia	Thailand	Korea
1986	51.9	44.4	82.9	96.4	55.9	43.8	42.2
1987	56.3 (4.4)	43.8 (−0.6)	82.1 (−0.8)	91.3 (−5.1)	72.6 (16.7)	40.9 (−2.9)	26.7 (−15.5)
1988	48.7 (−7.6)	37.0 (−6.8)	59.8 (−22.3)	77.3 (−14.0)	63.9 (−8.7)	35.8 (−5.1)	17.3 (−9.4)
1989	92.9 (44.2)	26.3 (−10.7)	46.9 (−12.9)	68.2 (−9.1)	61.3 (−2.6)	32.9 (−2.9)	13.3 (−4.0)
1990	46.0 (−46.9)	28.1 (1.8)	43.8 (−3.1)	68.7 (0.5)	64.0 (2.7)	33.2 (0.3)	12.6 (−0.7)
1991	35.6 (−10.4)	32.2 (4.1)	40.4 (−3.4)	70.5 (1.8)	64.9 (0.9)	39.0 (5.8)	13.4 (0.8)
1992	30.4 (−5.2)	34.9 (2.7)	34.6 (−5.8)	60.7 (−9.8)	66.2 (1.3)	38.3 (−0.7)	14.0 (0.6)
1993	27.7 (−2.7)	33.9 (−1.0)	36.9 (2.3)	64.9 (4.2)	58.7 (−7.5)	34.9 (−3.4)	13.3 (−0.7)
1994	27.9 (0.2)	27.8 (−6.1)	38.4 (1.5)	60.8 (−4.1)	57.2 (−1.5)	34.4 (−0.5)	15.0 (1.7)
1995	33.1 (5.2)	24.0 (−3.8)	69.9 (31.5)	51.5 (−9.3)	56.9 (−0.3)	34.9 (0.5)	17.5 (2.5)
1996	n.a	n.a	n.a	n.a	n.a	n.a	21.6 (4.1)

Note: Figures in parentheses are changes in the ratio of debt over GNP.
Source: World Bank, *Global Development Finance*, 1997.
    Bank of Korea, *Monthly Bulletin*, various issues

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4) For example, after the Hanbo bankruptcy, the government cancelled Shin-Han Bank's attempts to borrow at Libor + 17bp interest rates, which the government thought was too high. However, afterwards, borrowing conditions were worsened further.

Table 2. Korea's Gross External Debt

(unit: billion US$, %)

	86	87	88	89	90	91	92	93	94	95	96
Gross Debt	44.5	35.6	31.2	29.4	31.7	39.1	42.8	43.9	56.9	79.0	104.5
(Change)	(−2.2)	(−8.9)	(−4.4)	(−1.8)	(2.3)	(7.4)	(3.7)	(1.1)	(13.0)	(22.1)	(25.5)
(% Change)	(−4.7)	(−20.0)	(−12.4)	(−5.8)	(7.8)	(17.0)	(9.5)	(2.6)	(29.6)	(38.8)	(32.3)

Source: Bank of Korea, *Monthly Bulletin*, various issues

Table 3. Gross External Debt by Maturity

(unit: mil. US$)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	Sept. 1997
INDONESIA										
Total	54,079	59,402	69,872	79,548	88,004	89,148	96,543	107,831	n.a	n.a
Long-term	46,729	50,818	58,242	65,067	69,947	71,161	79,434	85,481	n.a	n.a
Short-term	6,727	7,975	11,135	14,315	18,057	17,987	17,109	22,350	n.a	n.a
	(12.4%)	(13.4%)	(15.9%)	(18.0%)	(20.5%)	(20.2%)	(17.7%)	(20.7%)	n.a	n.a
MALAYSIA										
Total	18,567	16,278	16,421	18,155	20,024	26,148	29,537	34,352	n.a	n.a
Long-term	16,972	14,005	14,514	16,081	16,385	19,197	23,348	27,078	n.a	n.a
Short-term	1,595	2,273	1,906	2,074	3,639	6,951	6,189	7,274	n.a	n.a
	(8.6%)	(14.0%)	(11.6%)	(11.4%)	(18.2%)	(26.6%)	(21.0%)	(21.2%)	n.a	n.a
MEXICO										
Total	99,216	93,841	104,442	114,068	112,265	131,572	139,955	165,743	n.a	n.a
Long-term	86,532	80,088	81,809	85,445	81,780	90,528	96,772	112,614	n.a	n.a
Short-term	7,879	8,662	16,082	21,857	24,535	36,257	39,323	37,300	n.a	n.a
	(7.9%)	(9.2%)	(15.4%)	(19.2%)	(21.9%)	(27.6%)	(28.1%)	(22.5%)	n.a	n.a
THAILAND										
Total	21,717	23,496	28,088	37,705	41,812	42,697	48,095	56,789	n.a	n.a
Long-term	16,255	17,111	19,765	25,213	27,085	29,312	34,058	38,476	n.a	n.a
Short-term	4,800	6,112	8,322	12,492	14,727	13,385	14,037	18,312	n.a	n.a
	(22.1%)	(26.0%)	(29.6%)	(33.1%)	(35.2%)	(31.4%)	(29.2%)	(32.3%)	n.a	n.a
KOREA										
Total	35,716	32,799	34,987	39,734	44,157	47,203	54,542	78,438	104,695	105,495
Long-term	25,936	22,999	24,187	28,534	32,237	35,003	40,652	33,137	43,711	39,869
Short-term	9,780	9,800	10,800	11,200	11,920	12,200	13,890	45,301	60,984	65,626
	(27.4%)	(29.9%)	(30.9%)	(28.2%)	(27.0%)	(25.9%)	(25.5%)	(57.8%)	(58.2%)	(62.2%)

Note: Figures in parentheses are the ratio of short-term over total debt.
Source: World Bank, *Global Development Finance*, 1997.
　　　　Bank of Korea.

Ⅲ. Economic Effects of Debt

1. Recent Research on Debt

There are several empirical studies on the effects of debt on economies. Grosse and Goldberg (1996), after examining foreign debt in South American countries using OLS, conclude that the level of foreign debt is positively related to GDP and negatively related to the trade deficit. Ajayi and Choi (1993), by studying the major developing countries using autoregression, find that foreign debt has a negative impact on the nominal exchange rate. Collins and Park (1989) show a positive impact of Korea's foreign debt on output using a KDI model for the 1980s.

Cashin and McDermott (1996) and Pitchford (1989) have reached conflicting conclusions by using intertemporal approaches to the trade deficit of Australia. Pitchford argues that the trade deficit is an optimal consequence of forward looking behavior and is not a problem. On the other hand, Cashin and McDermott argue that Australia has a large deficit problem and its trade deficits must be curtailed.

Using vector-autoregression (VAR) approach, I will examine the behavioral relationship between foreign debt, output, exchange rate, interest rates, and M_2 in Korea. The advantage of VAR is that it overcomes the usual limitations of a structural model and investigates the dynamics of variables without explicitly imposing endogeneity and exogeneity.[5]

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5) For the usual structural model, the parameters in the model are fixed despite policy changes. See Lucas' critique (1976).

Moreover, from the previous section, I emphasized the increase in change of debt, not the level of debt itself. Therefore, for the debt variable, I use the change of the debt in the actual VAR analysis. This is another important difference between previous research and mine.

2. VAR Approach

I consider the behavior of five variables, the logarithm of real output, Y^*, the logarithm of real effective exchange rate, ER, interest rate, R, the ratio of debt over output, D, and the logarithm of real M2, M.

An n-th order autoregressive representation form VAR is defined as follows[6]:

$$Y_t = \sum_{k=1}^{n} A_k^* Y_{t-k} + y_t \tag{1}$$

where Y_t is an N-variate stochastic process with $Y = |\ Y^*, ER, R, D, M|$, A_k^* is an $N \times N$ coefficient matrix and y is the error term vector with a non-diagonal variance-covariance matrix.

The data on output, exchange rate, interest rate, foreign debt and M2 were collected from the Bank of Korea, International Financial Statistics, etc. For the interest rate, that of corporate bonds of 3 year maturities is used. The real effective exchange rate is calculated based on the trade-weighted exchange rate.[7] The quarterly data series for

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6) This VAR form is based on a non-structural VAR. For the general form such as a structural VAR, see Appendix I.

7) $ER = \sum^{n} \omega_i \log(real\ exchange\ rate_i)$

the period 1988:1– 1996:2 is used in the analysis.[8] The VAR is done with 2 lags (n=2).

In estimating the VAR, it is assumed that the macroeconomy may be treated as stable over the period of estimation. The presence of a unit root in the time series indicates nonstationarity, which allows the possibility of cointegration between relevant variables.[9] By rearranging equation (1), it becomes an error–correction representation as follows;[10]

$$= \sum_{i=1}^{n} \omega_i \ \log \left(\frac{Korean \ currency}{Foreign \ currency^i} \right) * \left(\frac{Foreign \ price^i}{Korean \ price} \right)$$

$$= \sum_{i=1}^{n} \omega_i \ \log \left(\frac{Korean \ currency/American \ currency}{Foreign \ currency^i/American \ currency} \right) * \left(\frac{Foreign \ price^i}{Korean \ price} \right)$$

where ω_i is trade-weight and $\sum \omega_i = 1$ for i = America, Japan, Germany, Australia, Malaysia, Singapore.

Since data for China and Hong-Kong have missing periods, these countries are not included in this calculation. The price of goods are related to trade sector. Therefore, PPI is used instead of WPI.

8) The quarterly data for foreign debt are only available from 1998. Because the data for short-term debt are not available quarterly, we didn't include short-term debt.

9) Cointegration implies that the linear transformation of deviations between the series becomes stationary even though the series themselves are non-stationary.

10) Add and subtract $A_n^* Y_{t-n+1}$ in equation (1) to obtain:

$Y_t = A_1^* Y_{t-1} + ... + A_{n-2}^* Y_{t-n+2} + (A_{n-1}^* + A_n^*) Y_{t-n+1} - A_n^* \Delta Y_{t-n+1} + y_t$

In next step, add and subtract $(A_{n-1}^* + A_n^*) Y_{t-n+2}$ in the above equation to obtain: $Y_t = A_1^* Y_{t-1} + ... + (A_{n-2}^* + A_{n-1}^* + A_n^*) Y_{t-n+2} - (A_{n-1}^* + A_n^*) \Delta Y_{t-n+1} - A_n^* \Delta Y_{t-n} + y_t$

Continuing in this fashion, it becomes

$\Delta Y_t = \lambda Y_{t-1} + \sum_{i=1}^{n-1} \Phi_i \Delta Y_{t-i} + y_t$

where $\lambda = \sum_{k=1}^{n} A_k^* - I$ and $\Phi_i = \sum_{i=i+1}^{n} A_j^*$ for $i = 1, ..., n-1$

$$\Delta Y_t = \lambda Y_{t-1} + \sum_{i=1}^{n-1} \Phi_i \Delta Y_{t-i} + y_t \tag{2}$$

where $\lambda = \sum_{k=1}^{n} A_k^* - I$ and $\Phi_i = \sum_{j=i+1}^{n} A_j^*$ for $i = 1, \ldots, n-1$

The rank condition of λ determines the existence of cointegration.

If there is cointegration, the VAR has to be done with a cointegration vector. The VAR without considering the relevant cointegration vector makes the regression results spurious. To avoid this possible problem, a Johansen test on cointegration is employed. As Table 4 shows, with a maximum eigen value test, the null hypothesis that there is one cointegration is rejected, but that of no cointegration is not rejected. However, from the trace test, the null hypothesis that the number of cointegration vectors is less than zero is not rejected. This implies that there is no cointegraion between relevant variables.

From the Johansen test, I found that there is no cointegration. Therefore, I ran the VAR by differencing each variable.[11] This

Table 4. Johansen Test for Cointegration

Trace Test					
$H_0 : r \leq$	0	1	2	3	4
	66.9	25.4	14.4	5.8	2.5
C	70.0	48.4	31.3	27.3	14.6
Maximum Eigen Value Test					
$H_0 : r =$	0	1	2	3	4
	41.5	10.9	8.6	3.2	2.5
C	33.3	27.3	21.3	14.6	8.1

Notes: C in 95% critical value taken from Table A.2 of Johansen and Juselius (1990)

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11) See Campbell and Perron (1991).

procedure allows me to look at the effects of the change of foreign debt, not just the level of foreign debt.

3. Economic Effects

The economic effects of the shock in change of foreign debt is shown in Figure 1. The reported output (Y^*), exchange rate (ER), interest rate (R), debt (D) and money (M) are the levels of each variable. Each impluse response function is shown as a real line and its confidence band as a dotted line.[12]

From the definition of foreign debt, a shock in change of foreign debt can be interpreted as an increase in either the current account deficit, the change of official reserves, or capital inflow.

The effect of a shock to the change in debt on output is initially positive but becomes negative later with minor fluctuations. Output, after 11 quarters, stabilizes at a significantly negative level. This indicates that the rapid increase of debt growth rate is harmful to the economy. This results is consistent with Cashin and McDermott's argument that the current account deficit has a negative impact on GDP. Considering the fact that the current account deficit is investment minus savings, it also suggests that Korea's over-investment, based on foreign debt, in unproductive sectors has had a negative impact on output.

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12) For the standard errors, I followed Shapiro and Watson's (1988) Monte Carlo simulation procedure. The Monte Carlo simulation is done assuming normally distributed errors rather than bootstrapping. Three hundred Monte Carlo draws were carried out.

Figure 1. Dynamic Response to the Change in Debt

Output(Y*)

Exchange Rate (ER)

Interest Rate (R)

Debt (D)

Money (M)
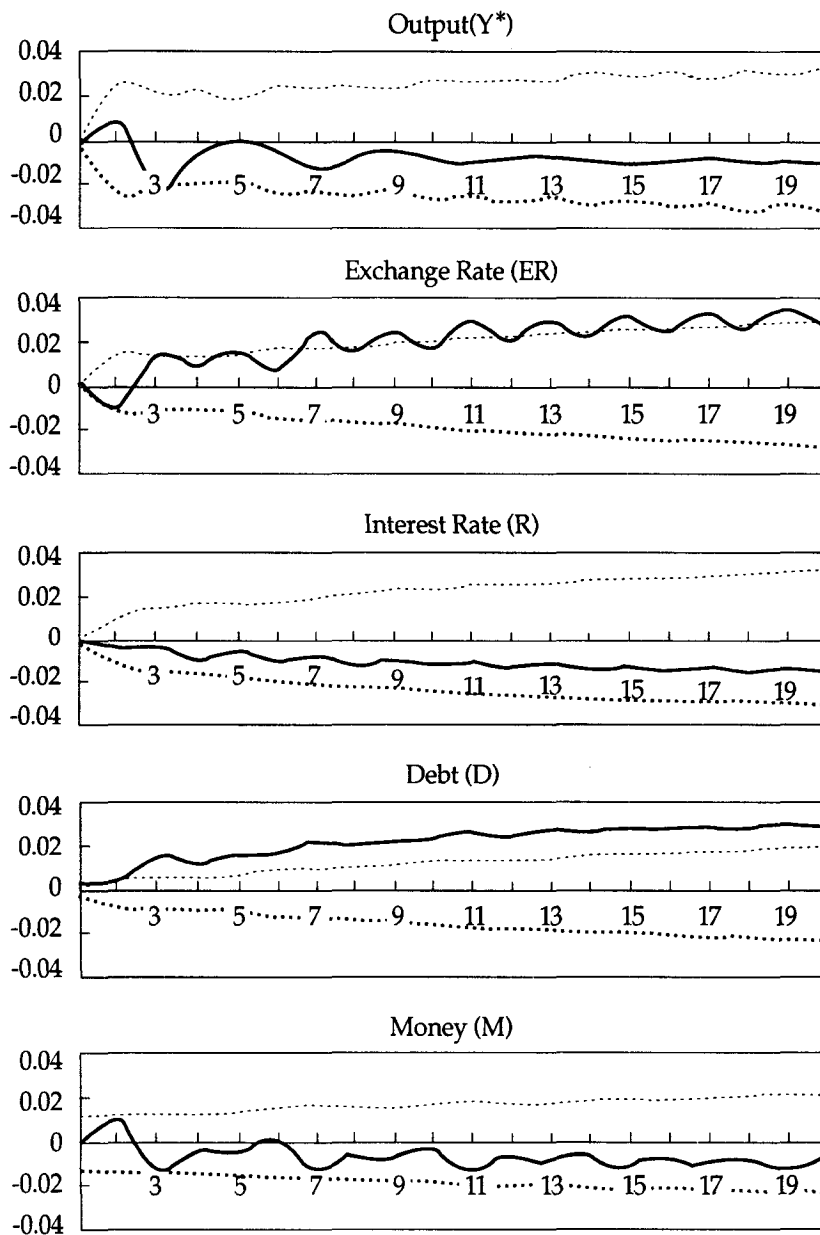
The effect of a shock to the change in debt on the real effective exchange rate is negative (appreciates) initially and becomes positive (depreciates) after 3 quarters, but the effects become insignificant after 7 quarters.[13] Obstfeld (1986) shows that after capital liberalization, the real exchange rate appreciates initially and depreciates later. Our results with capital inflows are consistent with Obstfeld (1986) except that the effects are insignificant after a few periods.

The effect of a shock to the change in debt causes the interest rate to decrease gradually. This indicates that the interest rates decline in reaction to capital inflows. The effects on debt itself are positive but insignificant. The effects on real money stock are initially positive but negative after 3 quarters.

When borrowing costs are used instead of interest rates, the VAR results are similar in all aspects.[14]

4. Sustainability

Suppose there is an optimal ratio of foreign debt over GDP. The optimal ratio provides a long-run condition for stability of the foreign debt to GDP ratio. Cline (1995) argues that a threshold of 40 percent of GDP for external debt can be justified by the historical tendency of countries which go beyond it to get into debt difficulties. Oum and Cho (1995) presume that the optimal ratio of foreign debt over GDP

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13) If the impulse responses are inside the confidence band, then these effects are significant. If not, they are insignificant.

14) For borrowing cost, I use the difference between the interest rate and 1-year Libor rate.

is 30% for Korea.

Let the optimal level be some constant, a . Then,

$$x_t = \frac{debt}{GDP} - \alpha \qquad\qquad (3)$$

If x_t is stationary, this implies that the foreign debt is sustainable.[15] Since the shape of x_t and the debt to GDP ratio are the same, we can test the stationarity of the debt to GDP ratio. The plot of the debt to GDP ratio is shown in Figure 2. The result of the unit root test on stationarity is shown in Table 5.

The null hypothesis that the unit root of the debt to GDP ratio series exists is not rejected. This implies that Korea's foreign debt may not be sustainable. The results of the unit root test need to be treated carefully.[16] However, it is possible that Korea's foreign debt may not be sustainable, particularly if the figures of overseas borrowing by firms are included in Korea's foreign debt statistics. This suggests that the gradual reduction of foreign debt is desirable. In order to decrease the foreign debt, Korea would have to increase its current account surplus, either by increasing savings or by decreasing investment, and increase foreign direct investment through deregulation.[17]

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15) Cashin and McDermott (1996) calculated optimal foreign debt, under the assumption that the interest rate is fixed, using an intertemporal model. They test the sustainability of foreign debt, with a unit root test on the difference between actual level of foreign debt and the optimal level of foreign debt.

16) The result of non-sustainability is not strong, since the power of the unit root test is weak and the data span for the test is only 34 observations.

17) Note that the current account identity implies that current account deficits are investment minus savings. Also, from the definition of foreign debt,

Table 5. Test for Unit Root of $\left|\dfrac{Debt}{GDP}\right|$

Dickey–Fuller t–statistic		Mackinnon Critical Values 10%	
constant	constant and trend	constant	constant and trend
−2.84	−2.046	−3.43	−2.61

Figure 2. Quarterly Debt to GDP Ratio, 1988:1–1996:2
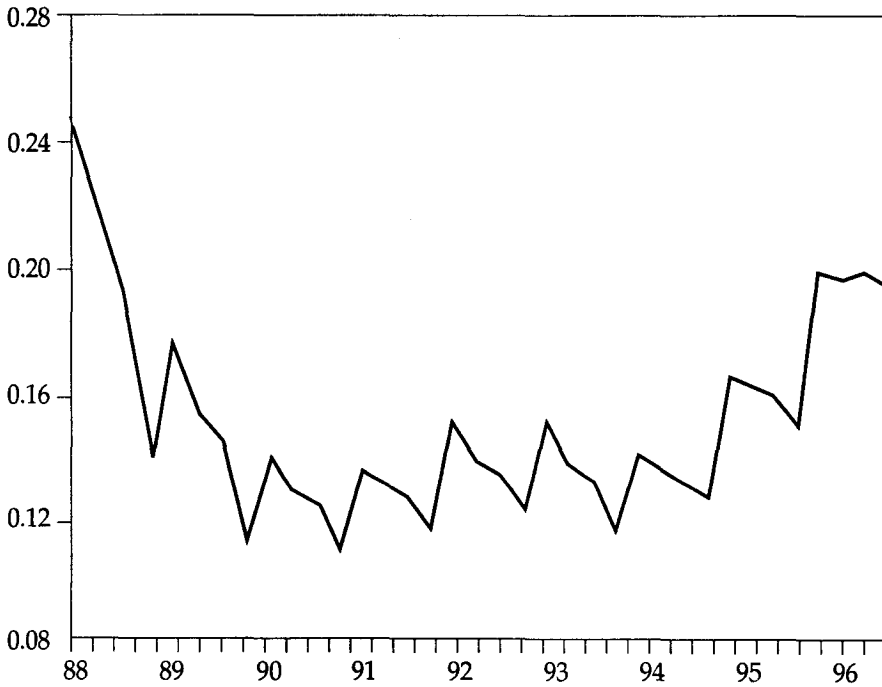
an increase in foreign direct investment reduces the foreign debt.

Ⅳ. Structural Problems of Foreign Debt

Foreign debt analysis shows that the rapid increase of short-term debt and the rapid increase in the growth rate of total debt in recent years are potentially serious problems for the Korean economy. Based on the empirical results, the increase in the growth of debt, not just the increase of the level of debt, is harmful to the Korean economy.

What causes this type of unstable debt structure? These are a combination of economic, social and political factors. Among these, the major causes are: the accumulation of current account deficit; over-investment; the large amount of bank liabilities due to government intervention; labor market inflexibility; and the lack in policy transparency and credibility.

1. Current Account Deficit

Korea has been suffering from persistent current account deficits (see Table 6) and much of these have been due to a sharp deterioration in the terms of trade. This deterioration was magnified by other external developments such as a drastic decline in the export price of semi-conductors. This phenomena closely resembled the Mexican case. In the early 1980s, Mexico also underwent a currency crisis, accumulating foreign debt due to the abrupt decline in oil prices. In addition to its export items not being diversified, Korea's exports are concentrated in East Asia and Korea competes with developing countries such as China. Moreover, capital goods account for around 50 percent of Korea's imports. These factors led to a rapid increase in

Table 6. Balance of Payments

(unit: 100 mil. US$)

	1992	1993	1994	1995	1996
current account balance	−45.3	3.9	−45.3	−88.2	−237.2
trade balance	−21.5	18.6	−31.5	−47.5	−152.8
exports	751.7	809.2	936.8	1,232.4	1,282.5
imports	773.2	790.9	968.2	1,279.9	1,435.3
invisible trade balance	−26.1	−19.7	−19.9	−35.1	−76.8
unrequited transfers	2.3	4.9	6.0	−5.6	−7.6

the trade deficit over the last two years.

2. Over-investment

Korea appears to be following the path predicted by Krugman (1994). In recent years, chaebols have invested too heavily in petro-chemicals, semi-conductors and autos, causing overcapacity in these sectors without technology improvement. Furthermore, these over-investment comes from being hugely leveraged with very high debt-equity ratios. These inefficient and non-competitive enterprises never worried about the possibility of default since they became too big and too important to the domestic economy. In addition, As East Asia, a major trading region with Korea, becomes weakened economically, Korea's export volume in this region will contract significantly, dealing a great blow to the korean economy which is still export-oriented.[18] Over-capacity problem can cause to add a persistent trade deficit. As a result, the restructuring in petro-chemicals, semi-conductors and

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18) While exports account for just 8 percent of the economic output in the United States and 10 percent in Japan, exports account for up to 27 percent in Korea.

autos industries is needed.

3. Bank Liability

Korea's bad debt has not resulted from credit extensions to real estate or securities businesses in East Asia, but rather from lending activities to chaebol in compliance with government policy. Financial liberalization in the 1990s has not been accompanied with market mechanisms since previous practices such as government intervention have not been overcome yet. The government intervened to have various banks extend low–interest rate loans even though some of the recipient industries had high commercial risks. Operations of Korean banks were not in accordance with market mechanisms. In these circumstances, a large amount of bank liability was inevitable. In early 1997, especially large corporate insolvencies such as Hanbo have resulted in an increase in non–performing loans followed by substantial financial instability. Domestic financial distress has trig-gered unfavorable market sentiment. As overseas borrowing conditions are worsened, banks have tended to increase interbank loans which make short–term debt increase. Also, the financial turmoil in Southeast Asia has compounded market uncertainty by placing a negative pressure on markets all over Asia, including Korea.

As a consequence, the large amount of non–performing loans, lack of prudential supervision on the financial system, and restrictions on capital flows deteriorated financial institutions and intensified market distortions created by government intervention.

4. Labor Inflexibility

Korean democratization has changed the workplace since the late 1980s, bringing an end to a situation where wages lagged productivity by years. To enhance labor market flexibility, in early 1997, the government tried to postulate the new labor law which would make layoffs and wage freezes easier, but failed and ended up causing massive labor unrest. This labor unrest has added more uncertainty and instability into an already troubled economy. To improve Korea's competitiveness, Korea needs flexibility in its labor market through such means as layoffs. At the same time, though, Korea has to create more jobs in high-tech and service industries by introducing job training systems. A more flexible labor market will facilitate industrial restructuring as well as increase foreign direct investment (FDI), which is urgently needed factor in reducing debt. In particular, by accommodating FDI in capital goods industries, Korea's competitiveness will be improved.

5. Policy Credibility

Credibility is a fundamental ingredient of a successful economy. Suppose that the public attaches a non-trivial probability to policy reversal. Then, the public will try to anticipate this event, generally introducing strong destabilizing forces into the government policy. There is wide-spread apprehension in Korea towards government announcements because of those that have failed in the past. For example, in recent months, the government announced that it would defend the won to dollar exchange rate. However, the government

failed to do so, having exhausted its foreign reserves.[19] Foreign investors question Korea's policy credibility and the correctness of foreign reserve statistics. Short–term capital outflow, which is one component of an increasing debt, has increased due to loss of policy credibility. In Korea's current situation, to improve policy credibility, the central bank has to be made independent. Furthermore, policymakers should always pay special attention to the establishment of credibility when pursuing important long–term structural changes.

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19) J. Sachs et al. (1996) argues that a low level of foreign reserve signals financial crisis. If a country has weak fundamentals (that is, real exchange appreciation, or a weak banking system, or both) in addition to low levels of international liquidity, it is likely to become victim to a currency crisis.

V. Conclusion

Korea has recently experienced a rapid increase of total external debt and a predominance of short–term loans. Instead of the level of debt itself, the debt structure and the increase in the growth rate of debt are the most important factors involved in the current debt crisis.

The empirical analysis on Korea's foreign debt indicates that an increase in the growth of debt is harmful to Korea's economy and that total external debt may not be sustainable. The result of the sustainability test implies that the gradual reduction of foreign debt is desirable. In order to decrease the foreign debt, Korea needs to increase its current account surplus, either by increasing savings or by decreasing investment, and increase foreign direct investment through deregulation.

The structural problems associated with a rapid increase in debt are: accumulation of current account deficits; over–investment; a large amount of bank liabilities due to government intervention; labor market inflexibility; and a loss of policy credibility. These contribute directly or indirectly to the tremendous increases of foreign debt. To resolve these structural problems, over–invested sectors need to be restructured. All major corporations' consolidated financial statements need to be audited by outside accounting firms according to international standards to resolve bank liability problems. As for the flexibility of the labor market, layoffs must be allowed to facilitate industrial restructuring. At the same time, Korea has to create more jobs in high–tech and service industries by introducing job training systems. To improve policy credibility, the central bank has to be made independent. Overall, government should not over–protect firms and

other financial institutions, but instead let them function in accordance to market principles with proper supervision.

The current debt crisis was difficult to predict because it was caused by complex economic, financial and political events. For the efficient debt management, a possible solution is to set up an early warning system that can predict debt crisis. It is necessary for the government at this point to improve the national debt management system in order to monitor and manage the scale and structure of outstanding debt. Then, Korea will be able to track down the flow of its debt structures and trends. In this way, Korea can plan and prepare well in advance to prevent future debt problems.

Appendix I. VAR and Impulse–Response Functions

An *n–th* order autoregressive representation reduced form VAR is defined as follows:

$$Y_t = \sum_{k=1}^{n} A_k^* Y_{t-k} + y_t \tag{A.1}$$

where Y_t is an N–variate stochastic process and A_k^* is an $N \times N$ coefficient matrix and $E(y_t y_s) = \Sigma$ for $t=s$ and $E(y_t y_s) = 0$ for $t \neq s$.

An *n–th* order autoregressive representation structural VAR takes the form:

$$Y_t = \sum_{k=0}^{n} A_k Y_{t-k} + H\epsilon_t \tag{A.2}$$

where Y_t is an N–variate stochastic process, ϵ_t is assumed to be composed of white noise structural disturbances, and $E(\epsilon_t \epsilon_t') = D$, a diagonal matrix. A_k is an $N \times N$ coefficient matrix. H is an $N \times N$ non-singular matrix whose diagonal elements are normalized to equal one. A_0 and H represent the contemporaneous movements between variables and disturbances. Note that in a non–structural VAR, $A_0=0$, $H=I$ and $E(\epsilon_t \epsilon_t')$ is a non–diagonal matrix.

If $[I-A_0]^{-1}$ exists, then equation (A.2) can be written as the following reduced form:

$$Y_t = \sum_{k=1}^{n} A_k^* Y_{t-k} + y_t \tag{A.3}$$

where $A_k^* = [I-A_0]^{-1} A_k$ and $y_t = [I-A_0]^{-1} H\epsilon_t$.

Therefore, the relationship between the structural innovations and the reduced form innovations is

$$y_t = A_0 y_t + H\epsilon_t \tag{A.4}$$

where $E(y_t y_s) = \Sigma = ([I-A_0]^{-1})HDH'([I-A_0]^{-1})'$ for $t=s$ and $E(y_t y_s)=0$ for $t \neq s$.

The reduced form VAR equation (A.3) may be estimated by ordinary least squares (OLS). Because the right-hand side variables in equation (A.3) are all predetermined and the error terms are assumed to be serially uncorrelated, OLS estimates are consistent and asymptotically efficient.[20]

We transform equation (A.3) into[21]

$$B(L)Y_t = y_t \tag{A.5}$$

where $B(L) = I - A^*(L)$.

By Wold's Theorem, under the assumption that $|Y_t|$ is a stationary process, there exists a moving average representation of the $|Y_t|$ process:[22]

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20) Even though the errors are correlated across equations, seemingly unrelated regressions (SUR) do not add to the efficiency of the estimation procedure since both regressions have identical right-hand side variables.

21) If $A^*(L) = A_1^*(L) + A_2^*(L) + \ldots + A_k^*(L)$, the equation (A.3) is $Y_t = A^*(L)Y_t + y_t$. Therefore, $(I - A^*(L))Y_t = y_t$

22) We have to assume the existence of the inverse of $B(L)$. If the roots of the characteristic equation $\det[B(L)]=0$ lie outside the unit circle, then $B(L)$ is invertible.

$$Y_t = C(L)y_t \tag{A.6}$$

where $C(L) = B^{-1}(L)$.

To identify the system, the set of identifying restrictions on A_0 and H is made explicit on the basis of a theoretical interpretation. Equation (A.4) cannot be estimated by OLS, since regressors are endogenously correlated. To get consistent estimates of A_0 and H, instrumental variables estimation or method of moments is used.

Note that the non-structural VAR approach uses the non-orthogonal innovation, Choleski decomposition to identify the system, implying that $[I-A_0]H^{-1}$ is a lower triangular matrix. In the non-structural VAR model, correlations are normally hidden in the variance-covariance matrix of the innovations, due to the Choleski decomposition. In the structural model, the contemporaneous movements between relevant variables are allowed to identify the set of independent shocks by means of a number of meaningful theoretical restrictions.

If H and A_0 are identified, then the $|Y_t|$ process becomes:

$$
\begin{aligned}
Y_t &= C(L)[I-A_0]^{-1}H\epsilon_t \\
&= \Gamma(L)\epsilon_t \text{ where } \Gamma(L) = C(L)[I-A_0]^{-1}H \\
&= \sum_{k=0}^{\infty} \Gamma_k \epsilon_{t-k} \\
&= \sum_{k=0}^{\infty} \sum_{j=1}^{N} \gamma_{ij}^k \epsilon_{t-k}^j
\end{aligned}
\tag{A.7}
$$

The (i,j) element in Γ_k (γ_{ij}^k) still can be considered to be the response of variable i in Y_t after k periods to a shock of one standard deviation to the variable j in ϵ_{t-k} (ϵ_{t-k}^j) at time $t-k$. Equation (A.7) is an impulse-response function with contemporaneous identifying restrictions. Also,

from $\Gamma(L) = C(L)[I - A_0]^{-1}H$, the relationship between contemporaneous movements and the long-run multiplier is $\Gamma(1) = C(1)[I - A_0]^{-1}H$, with $L = 1$. The impulse-response functions show the predictable response of each variable in the system to a one standard deviation movement in one of the system's variables.

Appendix II. Data Source

Data	Data Source
Debt	: MOFE
M_2	: Bank of Korea, Monthly Bulletin
interest rate	: Bank of Korea, Monthly Bulletin
PPI	: IMF, International Financial Statistics
exports, imports volume	: Bank of Korea, Monthly Bulletin
exchange rate	: IMF, International Financial Statistics
GDP	: Bank of Korea, Monthly Bulletin
GDP deflator	: National Statistical Office

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국문요약

　최근 한국의 총외채가 급격히 증가하고 그중에서도 단기외채가 특히 급증하고 있다. 총외채의 규모 그 자체보다 외채 구조상 단기외채에 치중되어 있고 총외채 증가율이 높다는 점이 현 외채위기의 주요한 요인이다. 이와 같은 급격한 외채증가의 구조적 요인으로는 경상수지 적자의 누적, 기업의 과도한 투자, 관치금융, 노동시장의 유연성 부족 및 정부정책의 신뢰성 부족 등을 들 수 있다.

　본 연구의 계량분석에 의하면, 외채증가율의 증가는 경제성장에 부정적인 영향을 미치고 있고, 외채가 적정수준으로 유지되기가 어렵다. 따라서, 저축을 늘리거나 투자를 줄여 경상수지를 흑자로 전환해야 하며 규제완화를 통해 외국인투자를 적극적으로 유치하여야 한다. 그리고 외채에 대한 효율적인 관리를 위해, 정부는 외채의 규모와 구조의 추세를 보다 면밀하게 파악하는 등 외채관리체계를 개선하는 것이 필요하다고 본다.

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