APPLICATION OF IMPLICIT EXCHANGE RATE CRITERION TO POLICIES REGARDING FOREIGN INVESTMENT IN KOREA

by

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1. INTRODUCTION

1. Many developing countries have policies to limit the proportion of foreign-owned investment in business enterprises to 50 percent of the total investment or less. The main reason for such a limitation is to bar foreign investors from a managerial control over a project and to eliminate the resulting dangers of so-called economic imperialism at the outset of the project. Several economists, however, argue for limiting foreign ownership on economic grounds of improving the balance-of-payments position of the country.

Disregarding the former managerial question, this report is addressed to the question of whether a limited foreign ownership policy contributes to the improvement of the balance of payments by use of the Implicit Exchange Rate Criterion (IER).

2. The topic and conclusion of this report are relevant to the set of the economic policies specified in the Third Five Year Economic Development Plan in Korea. The report takes as given the major economic policies in Korea and, assumes that the present economic environment and policy measures will continue to be effective for some time in the future.

3. Foreign investment in Korea, incentives for foreign investment, and investment selection criteria are sketched in Chapter II. In Chapter III, the policies of host

countries on foreign investment are illustrated. In Chapter IV, an analytic framework--the Implicit Exchange Rate criterion--is explained, including the concept, formula, interpretation and applicability of the IER; and IER is compared with the rate of return analysis, with H. B. Chenery's SMP criterion, and with D. M. Schdylowsky's DRC criterion. Finally, in Chapter V an actual case is analyzed according to the IER criterion. The summary and conclusions of the report are presented in Chapter VI.

II. FOREIGN INVESTMENT IN KOREA

1. A Summary of the Balance of Payments

Korea's exports, which stood at a mere $43 million in 1961, have since been increasing at an average annual rate of 41 percent. The export volume exceeded $100 million in 1964; in 1971 the actual export performance surpassed the $1.35 billion target.

When the base year of 1962 is represented by the figure 100, the export index for 1966 stands at 451.4, an increase of almost five fold. The 1969 index of 1,240 denotes a 12-fold rise over 1962. The recent phenomenal rate of growth in Korea's exports was far greater than the world average rate of increase in exports during the 1960's, which is calculated at 8.8 percent a year.

However, such a rapid expansion of the exports and industries has been accompanied by increased importation of required intermediate goods for these products, resulting in an epidemic deficit in the balance of payments, as shown in the following table (Table 1).

An urgent need for the improved balance of payments position has led to the adoption of a variety of policies. They include investment policies and overall monetary and fiscal policies.

Table 1

Summary of Exports and Imports 1961-1971
(Trade Balance in thousand U. S. dollars)

Years	A. Exports (FOB)	B. Imports (CIF)	Deficit (B-A)
1961	42,901	316,142	273,241
1962	56,702	421,782	365,080
1963	84,368	560,273	495,905
1964	120,851	404,351	283,500
1965	180,450	263,442	272,992
1966	255,751	716,441	460,690
1967	358,592	996,246	636,654
1968	500,408	1,468,166	967,758
1969	702,811	1,823,611	1,120,800
1970	1,003,803	1,983,973	980,170
1971	1,352,037	2,394,320	1,042,283

Source: Statistical Handbook of Korea (p. 86), and Guide to Investment In Korea: Economic Planning Board, Seoul, Korea, p. 102.

2. The Present Status of Actual Foreign Investment in Korea

There has been a steady flow of foreign investment into Korea since 1962 (Table 2)[1]. As of June 30, 1972, there were 441 investments amounting to $342,351,000.

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[1] Guide To Investment In Korea, Economic Planning Board, Seoul, Korea, pp. 133-4.

Table 2

Foreign Investments in Korea 1962-1972

Year	Number of Investments	Value of Investments ($1,000)
1962	1	1,370
1963	3	5,442
1964	5	728
1965	9	21,066
1966	11	2,618
1967	21	20,921
1968	45	31,049
1969	47	37,934
1970	120	85,135
1971	108	55,885
1972*	71	80,203
Total	441	342,351

* June 30, 1972

Source: Economic Planning Board, Seoul, Korea.

The United States leads all other countries in the value of the investments in Korea ($178,934,000), while Japan out ranks the United States in the number of individual projects as shown in Table 3.

Table 3

Foreign Investments by Country of Origin*

	Number of Investments	Value of Investments ($1,000)	Per cent of Value
U.S.A.	120	178,934	52.3
Japan	286	128,527	37.5
Other countries	35	34,890	10.2
Panama	9	9,479	2.8
West Germany	8	8,631	2.5
Netherlands	3	6,293	1.8
Hong Kong	6	3,039	0.9
Others	9	7,449	2.2
Total	441	342,351	100.0

* As of June 30, 1972.

Source: Economic Planning Board, Seoul, Korea.

Most investments have been in the form of joint ventures with Korean firms, accounting for 85.4 per cent in terms of value (Table 4).

Table 4

Foreign Investments by Types of Ownership

Type	Number of Investments	Value of Investments ($1,000)	Per cent of Value
Sole ownership	78	50,008	14.6
Joint venture	368	292,343	85.2
Total	441	342,351	100.0

Over 50 per cent of the number of investments have been in the fields of electronics, chemicals, textiles and wearing apparel, and machinery and parts (Table 5).

Table 5

Foreign Investments by Industry

	Number of Investments	Value of Investments ($1,000)	Per cent of Value
Textiles and wearing apparel	45	56,025	16.4
Electrical and electronics	79	54,423	15.8
Automobile and parts	5	36,057	10.5
Oil	4	32,984	9.7
Chemicals	53	24,271	7.1
Thermal power plants	2	20,825	6.1
Fertilizers	2	20,500	6.9
Ceramics	20	15,927	4.6
Basic metal and metal products	24	13,429	3.9
Machinery and parts	49	10,750	3.1
Tourism	5	9,794	2.8
Transportation and storage	9	6,529	2.1
Food processing	12	6,527	2.0
Fisheries	10	4,623	1.4
Private financial institutions	2	4,543	1.3
Housing	2	4,152	1.2
Pharmaceutical products	8	3,904	1.1
Wood products	4	2,893	0.8
Construction	5	1,656	0.5
Livestock	11	1,098	0.4
Mining	5	1,054	0.3
Other	85	10,387	3.0
Total	441	343,351	100.0

3. Incentives for Foreign Investment

The Korean Government has shown favorable attitudes toward foreign investment. It has preferred direct investment to foreign loans. Thus, a good set of incentives are provided under the Foreign Capital Inducement Law (FCIL).

A. Tax exemptions: The following tax exemptions are provided under FCIL:

(1) Equity Investment. Article 15 of the Law provides that corporate taxes, income taxes for unincorporated enterprises, property taxes, and property acquisition taxes on foreign invested enterprises are exempt for five years in proportion to the ratio of stocks or shares owned by the foreign investor. There is a further exemption of 50 per cent of the taxes listed above for the ensuing three years.

(2) Dividends and Distribution of Profits. Article 15 of the Law provides that no taxes will be imposed upon dividends nor the distribution of profits accruing from the stocks or shares subscribed by an authorized foreign investor for five years from the date on which the enterprise started its business operations. A further exemption of 50 per cent of the taxable amount computed under the Income Tax Law applies for the following three years.

(3) Royalties and Technical Assistance. Article 21 of the Law provides that income received through technological assistance by a foreign corporation under a technological

date the technological assistance was introduced. A reduction of 50 per cent of the tax that would be imposed under the pertinent tax law will apply for the following three years.

B. Freedom from Customs Duties and Commodity Taxes on Imported Capital.

Article 15 of the Law provides for duty free import of capital goods and the exemption from commodity taxes on the capital goods which have been approved for import by the Minister of the Economic Planning Board, such as machinery, equipment, facilities, parts and accessories to be used in industrial facilities, and the initial six-month supply of raw materials needed by the plant for operational use as approved by the Economic Planning Board under the FCIL.

C. Guarantees on Remittances:

(1) Remittance of Profits: Remittance overseas of profit in the form of dividends justly accruing from stocks or shares owned by foreign investors shall be guaranteed up to 20 per cent of the capital subscription amount each year after two years from the date on which the enterprise commenced its business operations. The above limitations may not apply when an enterprise is liquidated if a request is made to and approved by the Minister of the Economic Planning Board. Under such circumstances, the remittances may be made without restriction

D. Equality of Treatment with Local Enterprises.

Article 16 of the Law provides that foreign capital invested in enterprises and foreign investors shall receive

the same treatment as that accorded to Korean nationals.

E. Guarantee of Property Invested.

Article 14 of the Law provides that all foreign invested enterprises shall be guaranteed in accordance with the Korean laws and decrees. In case of expropriation, use, or restriction of private property for public purpose, due compensation shall be paid in accordance with the provisions of the law.

F. Restrictions in Fields of Investment.

The FCIL does not stipulate any restriction on the fields of investment that are open to foreign investors. However, they must meet the over-all investment selection criteria shown in the "Manual For Appraisal of Investment Projects." The manufacture of cigarettes and the processing of ginseng are government monopoly industries, and private investment is not permitted.

4. Investment Selection Criteria of the "Manual For Appraisal of Investment Projects."

A. The Procedure for Authorizing a Foreign Investment.

When an application for an investment is submitted to the Economic Planning Board, an initial review is conducted by the "Office of Investment Promotion" (OIP) in consultation with the applicant to determine whether all of the items are included as required by the Foreign Capital Inducement Law, and the Enforcement Decree of the Foreign Capital Inducement Law.

Following the initial screening, the application is

forwarded to the appropriate Minister or Ministers depending upon the nature of the proposed investment. The relevant Ministries are required by law to submit an opinion to the Economic Planning Board within 50 days from the date of the receipt of the application.

OIP will then review, combine, and consolidate the investment application, and then forward it to the Minister of the Economic Planning Board for clearance prior to submission to the "Foreign Capital Inducement Deliberation Committee " (FCIDC).

To summarize, an application is submitted to the EPB, reviewed by the appropriate Ministries, reviewed by the Screening Committee and the Minister of the EPB, and when applicable, reviewed by the FCIDC. In accordance with a Presidential Decree, this procedure must be completed within an 80-day period.

B. Major Investment Criteria

Investment project screening is made through an evaluation of economic and technical feasibilities and the financial soundness of the project.

(1) The major criterion for an economic feasibility study is the so-called rate of return on investment. The rate of return is composed of the internal rate of return (IRR) or direct rate of return (DRR) and the associated rate of return (ARR), which are summed into the social rate of return (SRR). "The IRR or DRR (IRR for a commercial project and DRR for a public

project which is constructed not for a revenue purpose) is the annual compound discount rate which makes the present value of the sum total of investment made during the whole project period equal to the present value of the sum total of net benefits from the project."[1] This discount rate is given by r in the formula:

$$\frac{(R_o - E_o) + \frac{(R_1 - E_1)}{1 + r} + \frac{(R_2 - E_2)}{(1 + r)^2} + \ldots + \frac{(R_L - E_L)}{(1 + r)^L}}{I_o + \frac{I_1}{1 + r} + \ldots + \frac{I_L}{(1 + r)^L}} = 1$$

where R = Annual returns

E = Annual expenditures

R - E = Annual net benefits

I = Facility investment + net increase in working capital, and

0, 1, 2, ..., L = Indication of years from the time of the commencement of project through the end of project period.

"Therefore, r = IRR (or DRR) based on discounted present value. The schedule of net benefits (R - E) used to determine the IRR for commercial projects is the projected annual sales revenue minus projected annual operating costs. And that for

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[1] Manual For Appraisal of Investment Projects, EPB, Seoul, Korea, pp. 29-30.

public projects is the projected added annual net income to the users or direct beneficiaries (R - E) of the project."[1]

Since an IRR (or DRR) means an anticipated or expected rate of earnings accruing from the project, a proposed project can be accepted only when its IRR (or DRR) is equal to or higher than the opportunity cost of capital.

(2) "Both the IRR (or DRR) and the benefit-cost ratio for an investment project reflect the direct return from an investment project itself, and do not reflect the associated benefits viewed from the over-all aspect of the national economy.

The associated rate of return of an investment project can be calculated in a way identical to that for IRR (or DRR), by annually estimating the net associated benefits and relating them to the investment schedule for the project to calculate the ARR. The ARR may be added to the IRR (or DRR) to obtain the Social Rate of Return (SRR) for the project.

Associated benefits to be included in the calculation of the ARR include (1) linkage benefits to other industries, (2) employment benefits, (3) training benefits, (4) capital gains, and (5) other directly associated benefits. Directly associated capital and annual costs should be subtracted to obtain the net associated benefit."[2]

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[1] Ibid., p. 32. Operating costs exclude interest and depreciation.

[2] Ibid., p. 48.

III. POLICIES OF HOST COUNTRIES ON FOREIGN OWNERSHIP

1. Limitation on the Proportion of Total Shares Owned by Foreign Investors

A. Limited stock ownership by foreign investors is supported mainly from the standpoint of managerial control. Anyone can control a stock company by holding more than half of the total stock (majority control). In recognition of this simple principle, "many countries have an upper limitation on shares owned by foreigners (a 50-50 joint venture or less than 50 percent). A 50-50 joint venture policy has been adopted by Malaysia, Liberia, etc., and a less than 50 percent policy by Yugoslavia, India, the United Arab Republic, etc."[1]

B. Korea places no legal limit on the number of stocks or shares to be held by foreign investors, except by the Mining Law and the Fisheries Law. These laws require that stock or share ownership must not exceed 50 percent without the approval of the National Assembly; 100 percent ownership has been granted in certain cases when all of the product is to be exported. However, the attitude of the Korean Government very recently has been favoring a 50-50 or a less than 50 percent joint venture, a position strongly supported by many professors and private research institutions in Korea.

C. Many, if not most, developing countries have

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[1]Friedman, Wolfgang Gaston. Joint International Business Venture in Developing Countries, New York: Columbia University Press, 1971, pp. 372-377.

an upper limitation on the ownership of the stocks or shares to be owned by foreign investors. A few countries, however, permit even 100 percent foreign investment in certain limited cases when all or most of the products are exported.

"In Spain, they have allowed absolute freedom of foreign capital investment up to 50 percent of the enterprises' capital and also the possibility of investing up to 100 percent of the capital if government authorization is received."[1]

"Japan and the developing countries of Asia have numerous policies on the extent of foreign ownership and the exact interpretation of these policies tends to vary by the nature of the investment. Thus, technology--intensive investment (e.g., integrated circuits) largely for export purposes--is strongly favored, and in such cases the foreign investor is often permitted to have 100 percent ownership. In less attractive types of investment, host governments adopt a far more stringent attitude on the extent of foreign ownership."[2]

As pointed out previously, such limitations are imposed mainly from the managerial viewpoint and, less importantly, from the balance-of-payments consideration. In this analysis, disregarding the non-economic aspects with attention confined to

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[1]Isaiah A. Litvak. Foreign Investment, The Experience of Host Countries, New York, Washington, London: Praeger Publications, p. 339.

[2]Kapoor. Foreign Investment in Asia, Princeton Darwin Press, 1972, p. 50.

the balance-of-payments effect, the extent of the contributions of limited foreign ownership to the improvement of the balance-of-payments position will be analyzed in detail by using the ensuing analytic framework of the Implicit Exchange Rate Criterion.

IV. AN ANALYTIC FRAMEWORK--THE IMPLICIT EXCHANGE RATE

1. The Concept of the IER

"The IER gives the won cost of earning (through export) or saving (through import substitution) a dollar during a normal year of operation. More exactly, the IER is a fraction having in the denominator the net savings or earnings of foreign exchange and in the numerator the net won cost (won is the money unit in Korea) of saving or earning foreign exchange through the construction of the project. Foreign exchange operating expenditure is subtracted to obtain net savings or earnings, while won value sales to the local market are subtracted as an off-set to won expenses."[1]

"Under the exchange-cost criterion instead of comparing total real costs with total real benefits, net domestic costs of each project are compared with the net foreign exchange saved or with the net foreign exchange earned. Thus the lower the net domestic resource cost (D.R.C.) of a given project per unit of the foreign exchange saved or earned, the more attractive it is for inclusion in the development plan."[2]

2. Formula for the Calculation of the IER

(1) When the stream of benefits and costs is uniform throughout the operation period:

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[1] Larry E. Westphal. Guidelines for Project Evaluation. 1970. pp. 73-77.

[2] U. N. Planning the External Sector: Techniques, Problems and Policies. Ankara, Turkey. 6-17 September 1965, p. 13.

(a) Using the uniform series capital recovery factor:

$$IER = \frac{E_d - R_d + I_d^a}{R_f - E_f - I_d^a}$$

where E_d = Annual won (domestic) operating expenditures,

R_d = Annual won (domestic) revenue,

I_d^a = Annualized value of won (domestic) investment,

R_f = Annual foreign exchange inflow (including exports and import-substitution),

E_f = Annual foreign exchange outflow (including foreign exchange operating costs), and

I_d^a = Annualized value of foreign investment.

This formula can be applied when E_d, R_d, R_f and E_f are uniform annual values through the operation period.

The annualized value of investment, I_d^a or I_f^a, can be computed by the Uniform Series Capital Recovery Factor with the following formula:

$$R = I\left[\frac{r(1 + r)^n}{(1 + r)^n - 1}\right]$$

where I = investment during the construction period,

r = discount rate, and

n = project's life.

The calculation of annualized value of investment requires an assumption concerning the discount rate. The assumed value should reflect the opportunity cost of investment funds, i.e., it should be approximately the IRR on the

marginal project.

(B) Using uniform series present worth factor;[1]

$$IER = \frac{(E_d - R_d)\left[\frac{(1 + r)^n - 1}{r(1 + r)^n}\right] + I_{do}}{(R_f - E_f)\left[\frac{(1 + r)^n - 1}{r(1 + r)^n}\right] - I_{fo}}$$

where I_{do} = Initial won (domestic) investment and

I_{fo} = Initial foreign investment.

In this case, the factor is used to sum up the discounted present value of the cash flow at time 0. The calculation of IER by the uniform series present worth factor also requires an assumption concerning the discount rate. The calculated IER either by formula A or B should be exactly the same.

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[1]Uniform series present worth factor can be obtained as follows:

$$P = R\left[\frac{1}{1 + r} + \frac{1}{(1 + r)^n} + \ldots + \frac{1}{(1 + r)^n}\right]$$

multiplying this equation by (1 + r):

$$P(1 + r) = R\left[1 + \frac{1}{1 + r} + \ldots + \frac{1}{(1 + r)^n - 1}\right]$$

Subtracting the first equation from the second:

$$P = R\left[\frac{(1 + r)^n - 1}{r(1 + r)^n}\right]$$

(2) Formula for IER when the stream of revenue and cost is not uniform.

Usually the cash flows are not uniform from the construction phase through the run-in period and the normal operation. When the cash flows are not uniform, the following formula can be applied to calculate the IER.

$$IER = \frac{(E_{do} - R_{do}) + \frac{(E_{d1} - R_{d1})}{(1 + r)} + \ldots + \frac{(E_{dn} - R_{dn})}{(1 + r)^n}}{(R_{fo} - E_{fo}) + \frac{(R_{f1} - E_{f1})}{1 + r} + \ldots + \frac{R_{fn} - E_{fn}}{(1 + r)^n}}$$

where E_d = Capital costs and operating costs in won (domestic) currency,

R_d = Won (domestic) revenue,

R_f = Foreign exchange inflow (including exports and import-substitutes and inflow of foreign capital, foreign loan or foreign investment),

E_f = Foreign exchange outflow composed of Fc + BI + PI + KFX, where:

Fc = Foreign exchange operating expenses,

BI = Annual amortization of foreign loan (principal and interest),

PI = Schedule of dividends and capital gains to the foreign investors,

KFX = Use of Korea's foreign exchange to import the required capital goods, and

r = the annual discount rate.

The foreign capital inflow, foreign investment or foreign loan, is first included in R_f at the point where the capital flows in. The major portion of the foreign capital

is used to import capital goods (machines, equipment, etc.) and raw materials from abroad. Or it is introduced directly in the form of foreign capital goods. The rest is converted into local currency for the purchase of local inputs. The former portion is included in E_f and the latter (conversion into local currency) is included in E_d in the converted won currency.

3. Applicability of the IER Criterion

When the IRR is greater than the opportunity cost of capital (r), the summed present value of foreign capital inflow normally is less than the summed present value of dividends and the capital gains to the foreign investors. Likewise, the summed present value of domestic capital normally is less than the summed present value of dividends and capital gains to the domestic investors.

When the proportion of foreign ownership increases in case IRR is greater than r, foreign exchange inflow will be increased by the increased proportion of foreign ownership, but the increased foreign exchange inflow will be more than offset by the much increased foreign exchange outflow, resulting in a negative effect on the denominator of the general formula of the IER. Therefore, for projects with IRR greater than r, increased foreign participation normally causes an increase in the IER.

In contrast, for projects with IRR less than r, the IER normally becomes smaller as the foreign participation increases. This is because the increased foreign exchange inflow is less than offset by the increased foreign exchange outflow.

It follows that a change in foreign participation normally exerts no influence on the IER in the case of projects for which the IRR is equal to r.

When IRR is less than r, the larger the proportion of foreign participation, the smaller the IER. Thus, the balance of payments can be enhanced by permitting foreign participation to the greatest extent possible for projects with an IRR less than the opportunity cost of capital (r).

When IRR is greater than r, it is better to reduce foreign participation to a level as low as possible in order to provide the most favorable impact on the balance of payments position. This is a common case for analysis of the IER, since the IER analysis is made after the analysis of the IRR and projects with IRR's higher than the opportunity cost of capital (r) are accepted.

It can be concluded that the proportion of ownership allowed to be held by foreign investors should be determined by calculating the IER in a case-by-case basis. The rigid 50 percent limitation applied uniformly to all projects can deteriorate the balance-of-payments position of the concerned country.

Thus far, the effects of foreign ownership on the IER value have been examined. Now attention is turned to the question of how to find the cheapest source of financing a given foreign exchange requirement, or how to determine the best combination of E_f which is composed of Fc, BI, PI and KFX in the general formula of the IER.

Let F_r be the required foreign exchange expenditure for investment in the project and ΣF_{ro} be the total sum of present value of the schedule of foreign exchange expenditure for investment in the project. Let BI be the amortization plan of foreign loans and ΣBI_o be the total sum of present value of the amortization schedule. And let PI be the schedule of dividends and capital gains benefits to foreign private investors and ΣPI_o be the summed present value of the benefit schedule to the foreign private investors.

Then, if $\Sigma BI_o + \Sigma PI_o < \Sigma F_{ro}$, foreign participation is desirable. Here, the higher the discount rate (r), the more likely $\Sigma BI_o + \Sigma PI_o$ to be less than ΣF_{ro}. The more favorable the terms (market interest, length of loan deferment before repayment starts, etc.), the lower ΣBI_o, other things equal. And the greater dividends to foreign investors, the higher ΣPI_o.

If $\Sigma BI_o + \Sigma PI_o > \Sigma FI_o$, the impact on balance of payments will be improved by using Korea's foreign exchange holding, assuming that Korea has foreign exchange enough to support the project under consideration.

This rule can be applied before or after the calculation

of IER. When the calculated IER of a project with a certain combination of financing sources turns out higher than the desirable level, other financial sources can be sought by the above decision rule. The rule also can be used to select the financial sources in the preliminary stage for programming a project before the final calculation of the IER.

However, this is an approximate decision rule. A change in the combination of financing sources frequently results in a change in revenue and/or in operating costs, E_d or E_f. Foreign participation very often produces greater profits through better management, use of established market networks, etc. If the project is to be financed by foreign loan instead of foreign investment, it may need to pay technical royalties, it may be forced to purchase its raw materials at relatively higher cost, it may need to employ foreign technical and managerial skills, or it may be operated in a relatively less efficient way.

Therefore, to finally decide whether the project should be financed by foreign investment, foreign loan, KFX, or a combination of them, the IER of each case should be calculated, and the most favorable combination of financing sources chosen.

4. Decision Rule for Three Possible Cases of the IER Analysis with Notes

(1) Normal Case when plus (+) in the denominator and plus (+) in the numerator of the IER calculation. A project of this type can be accepted only when the calculated IER turns out to be less than the shadow price of the foreign exchange.

(2) When plus (+) in the numerator but minus (-) in the denominator, this kind of project should be rejected because it costs a positive local expense (net) only to dissave a dollar.

(3) Conversely, when minus (-) in the numerator and plus (+) in the denominator, the project should be accepted. It costs a negative local expense to earn or save a dollar.

Case (2) and (3) will both turn out negative mathemathically and thus can be treated alike in the realm of mathematics. However, considering the implications of the implicit-exchange-rate criterion, they should be interpreted differently as indicated above.

In calculating IER, it should be noted that all the variables (R_d, R_f, E_d, E_f, I_d, I_f) should be recorded in constant prices just as in the IRR calculation. Similarly, the shadow price of foreign exchange is also a constant concept and thus does not change with change in domestic and foreign prices in the future.

Secondly, there is no need to convert foreign currencies into won currency and vice versa. Total revenues and costs converted and summed into won currency are unnecessary and meaningless for calculating the IER.

Thirdly, there may be no need to convert foreign currencies other than U. S. dollars into U. S. dollars and further to won currency, so far as the shadow price of these foreign currencies can be relevantly estimated. Projects involving

more than one foreign currency, can be appraised in terms of the most convenient single foreign currency, normally the one for which the foreign-currency variables used to compute the IER are largest.

5. The IRR and the IER

The IER criterion is simply a variant of the well-known IRR criterion. The relationship between the two can be shown by starting from the general IRR formula:

$$\frac{(R_o - E_o) + \frac{(R_1 - E_1)}{1 + r} + \frac{(R_2 - E_2)}{(1 + r)^2} + \ldots + \frac{(R_n - E_n)}{(1 + r)^n}}{I_o + \frac{I_1}{1 + r} + \ldots + \frac{I_n}{(1 + r)^n}} = 1$$

where r = IRR,

R = Annual revenues,

E = Annual operating expenditures,

$R - E$ = Annual net benefits,

I = Facility investment and net increase in working capital, and

$0,1,2,\ldots,n$ = Indication of years from the time of the commencement of project through the end of project period.

For the sake of simplicity, it is assumed that the life span (n) is infinity ($n = \infty$), annual revenue (R) and annual expenditure (E) are uniform through the life span, and investment (I) is made once and for all at time 0. Then the IRR can be simplified as $IRR = \frac{R - E}{I}$.

Since outputs are partly exported or import-substituted

and partly sold in local markets, and expenditures are composed of local operating costs and foreign exchange operating costs,

$$IRR = \frac{(R_d - E_d) + (R_f - E_f)X}{I_d + I_f X}$$

where R_d = Sales in local market,

E_d = Local operating expenditures,

R_f = Exports or import-substitutes,

E_f = Foreign exchange operating expenditures,

$R_d + R_f X = R$,

$E_d + E_f X = E$,

I_d = Local capital,

I_f = Foreign capital, and

X = Shadow price of foreign exchange.

Rearranging the above equation,

$$X = \frac{E_d - R_d + I_d(IRR)}{R_f - E_f - I_f(IRR)}$$

where IRR = Internal rate of return and

X = IER.

Under these assumption, the IER criterion emerges as a variant of the internal-rate-of-return criterion. But in the more general case the IRR and IER criteria do not carry the same implications and applicability. Thus far it has been assumed that there is no change in the composition of E, R, and I from period to period over the planning horizon for the project.

An investment project is accepted as economically feasible only when its social rate of return is sufficiently high and, more simply, when the internal rate of return on the project is greater than the opportunity cost of capital, if we disregard the associated rate of return.

At the same time, a change in the composition of costs and revenues (benefits) may result in a change in the calculated IER, the IRR or SRR being unchanged. An increase in the proportion of ownership held by foreign investors entails a greater IER when the IRR is greater than the opportunity cost of capital. On the other hand, the substitution of local materials which are cheaper than the previously imported intermediate goods (converted to won equivalent using the accounting exchange rate) will lower the IER. It goes without saying that a substitution into a more costly local material results in a higher IER. This occurs quite often in developing countries as a result of hasty import substitution policies.

As such, an investment programmer can reorganize the composition of the project by analyzing the two criteria IRR (or SRR) and IER at the same time. Therefore, to analyze the economic soundness of a project, first the project should be accepted by having a high rate of return, and then analyzed for the IER, which is of great help to reorganize the project so that the project could contribute to the improvement of the balance-of-payments position.

6. Comparison with H. B. Chenery's SMP Criterion

H. B. Chenery's Social Marginal Productivity criterion can be best summarized as in the following:

$$\text{"SMP} = \frac{V}{K} - \frac{C}{K} + \frac{Br}{K} = \left(\frac{V}{K}\right)\left(\frac{V - C}{V}\right) + \frac{Br}{K}$$

where K = Investment,

V = Social value added domestically,

C = Total costs of domestic factors, and

$r = \frac{\alpha Y}{\alpha B}$ which is the marginal rate of substitution between Y and B. (Y = effect on national income and B = total net effect on balance of payments). In other words "r" measures the average overvaluation of the national currency at the existing rates of exchange."[1]

The SMP is thus the product of the percentage margin of social value over cost $\left(\frac{V - C}{V}\right)$ and the rate of capital turnover $\left(\frac{V}{K}\right)$ plus the balance-of-payments premium. "To analyze the balance-of-payments effect, we may first distinguish between the effects during the investment period (B_1), which are always negative, and the operating effects (B_2).

(i) Investment Effects: $B_1 = -m_i K - m_2 (1 - m_i)K$

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[1] H. B. Chenery. The Application of Investment Criteria, Quarterly Journal of Economics, p. 83.

where m_i = proportion of investment requiring imports,

m = marginal propensity to import,

z = multiplier = $\frac{1}{m + s}$, and

s = marginal propensity to save.

(ii) Direct Operating Effects:

$$B_2' = e(1 - \bar{m}p)X + g(\bar{m}'p - \bar{m}p)X - c\bar{m}pX$$

where e = fraction of output going to export or to reduction of imports,

g = fraction of output replacing goods previously consumed,

c = fraction of output going to increase domestic use ($e + g + c = 1$),

$\bar{m}p$ = marginal ratio of producer imports to output for *project in question*, and

$\bar{m}'p$ = $\bar{m}p$ for output which has been replaced by new production.

(iii) Indirect Operating Effects:

$$B_2'' = -mzf\ (1 - \bar{m}p)X - mzB_2'$$

where f = fraction of output financed by inflationary means.

The expression for B is the total of these three components with the investment effects reduced to an annual base:

$$B = aB_1 + B_2' + B_2''$$

where a = combined amortization and interest rate required on current borrowing."[1]

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[1] Ibid., pp. 87-89.

"The discussion above is often needlessly complicated to consider simultaneously development problems and the balance-of-payments problem. Since the extent of the balance-of-payments problem will also depend on numerous other monetary conditions, both internal and external to the underdeveloped country, it is best initially to treat the two questions separately and to leave the balance-of-payments problem for another occasion."[1]

Furthermore, it will be very difficult to set up the minimum level of SMP which must be the level of SMP of the marginal project. Thirdly, since SMP is the product of the percentage margin of social value over cost $\left(\frac{V - C}{V}\right)$ and the rate of capital turn-over $\left(\frac{V}{K}\right)$ plus the balance-of-payments premium, a project in which SMP is above the assumed minimum level of SMP does not always contribute to the improvement of the balance-of-payments position. Fourthly and most important, the balance-of-payments effect $\left(\frac{Br}{K}\right)$ in the SMP criterion is not suggested to have such a demarcation level as the accounting foreign exchange rate for the IER criterion. Thus the SMP criterion, while having the advantages of reflecting additional factors, is less operational and practical than the IER as a specific indicator of the balance-of-payments impacts. In conclusion, the IER, in addition to rate-of-return analysis, is a more direct criterion for analyzing the usefulness and effect of the limited share ownership of foreign investors specifically in light of improving the balance-of-payments.

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[1] W. Galenson and H. Leibenstein. Investment Criteria: Productivity, and Economic Development, Quarterly Journal of Economics, p. 346.

7. Comparison with Domestic Resource Cost Analysis by D. M. Schdylowsky

D. M. Schydlowsky applied DRC criterion to the analysis of foreign investment proposals in his report: Benefit-Cost Analysis of Foreign Investment Proposals, the View of the Host Country.

His formula for DRC criterion can be shown in the following way:

$$DRC = \frac{I(IRR) + E_d}{R_f - E_F}$$

where, I = investment,

E_d = domestic expenditures,

R_f = foreign exchange inflow, and

E_f = foreign exchange outflow.

The concept of DRC in this case is very similar to that of the IER except that, he assumes, the outputs are all exported or import-substituted.

His conclusion is that "the net present value criterion was suggested as appropriate for a choice of a project within a sector and the DRC criterion was preferred for a choice between different sectors."[1]

But since the DRC or IER criterion is just a variant of the IRR criterion as shown in the previous section, there is no reason why one is appropriate for a choice of a project

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[1]Daniel M. Schydlowsky. Benefit-Cost Analysis of Foreign Investment Proposals, the Viewpoint of the Host Country. Economic Development Report No. 170, Center for International Affairs. Harvard University. p. 48.

within a sector and the other for a choice between different sectors.

As noted earlier, a change in the composition of costs and revenues may result in a change in the calculated IER or DRC, the IRR or SRR being unchanged. An increase in the proportion held by foreign investors entails a greater IER when the IRR is greater than the opportunity costs of capital. As such, an investment programmer can reorganize the composition of the project by analyzing the two criteria IER and IRR at the same time.

V. ACTUAL APPLICATION OF THE IER CRITERION

The following project was actually proposed to and accepted by the Economic Planning Board in 1973.

A. Company: Pung Han Electrical Machinery and Appliances Company

B. A Summary of the Project

(i) Foreign Investor: A Japanese

(ii) Capital

	Capital	Percentage
Local	$75,000 (W30,000,000)	50
Foreign	$75,000 (W30,000,000)	50
Total	$150,000 (W60,000,000)	100

(iii) Production Capacity* (unit: piece)

Item	Gauge	Annual Production
Electric Transformer	E1-14	400,000
"	E1-16	750,000
"	E1-19	400,000
"	E1-24	400,000
"	E1-28	200,000
"	E1-35	680,000
"	E1-41	250,000
"	E1-48	400,000
"	E1-45	150,000
"	E1-60	150,000
Total		3,780,000

* All products are planned to be exported.

C. Schedule of Annual Costs and Revenues

	Unit	0	1	2	3
Investment					
Local	W	30,000,000			
Foreign	$	75,000			
Production					
Exports (R_f)	$		249,000	602,000	1,242,000
Local markets (R_d)	W		---	---	---
Operating expense					
Won expense (Ed)	W		45,692,800	157,240,000	315,691,600
Foreign exchange expense (E_f*)	$		123,143	185,297	358,017
Net Profit					
To domestic investors	W		2,325,200	4,700,400	18,950,800
To foreign investors	$		5,813	11,751	47,377
E_f[1]			128,956	197,148	405,394
Ed - Rd		30,000,000	45,692,800	157,240,000	315,691,600
$R_f - E_f$[2]		---	120,077	404,352	836,606

[1] $E_f = E_f^* +$ dividends to foreign investors

[2] At time 0, net foreign exchange inflow is zero.

D. Calculation of the IER by the General Formula

The IER in this case is calculated under the assumption that the opportunity cost of capital is around 12 percent per annum and the project life is 20 years. The foreign capital ($75,000) is introduced in the form of capital goods.

Calculation of IER in Case of 50 Percent

Years	Discount Rate 12%	$E_d - R_d$ Actual	$E_d - R_d$ Discounted[1]	$R_f - E_f$ Actual	$R_f - E_f$ Discounted[1]
0	1.000	30,000,000	30,000,000	---	---
1	0.893	45,692,800	40,803,670	120,077	107,199
2	0.797	157,240,000	125,320,280	404,352	322,268
3	0.712	315,691,600	224,772,419	836,606	595,663
4	0.636	"	200,779,857	"	532,081
5	0.567	"	178,997,137	"	474,355
6	0.507	"	160,055,641	"	424,159
7	0.452	"	142,692,608	"	378,145
8	0.404	"	127,539,406	"	337,988
9	0.361	"	113,964,667	"	302,014
10	0.322	"	101,652,695	"	269,387
11	0.288	"	90,919,180	"	240,942
12	0.250	"	78,922,900	"	209,151
13	0.229	"	72,293,376	"	191,582
14	0.205	"	64,716,778	"	171,504
15	0.183	"	57,771,562	"	153,098
16	0.163	"	51,457,730	"	136,366
17	0.146	"	46,090,973	"	122,144
18	0.130	"	41,039,908	"	108,758
19	0.116	"	36,620,225	"	97,046
20	0.104	"	32,831,926	"	87,007
Total			2,019,243,253		5,260,857

[1] "Discounted" = "Actual " x "Discount Rate"

When the foreign capital is introduced totally in the form of capital goods, the net foreign exchange inflow or foreign exchange earning ($R_f - E_f$) is zero at time 0 as shown in the previous table. When a part of foreign capital is introduced in cash which will be converted into won currency and used to purchase locally-made inputs, the net inflow of foreign exchange will be greater than zero.

For this project the IRR is far greater than the opportunity cost of capital (12 percent per annum in Korea). Thus, it is expected that the IER will be greater as the proportion of the foreign ownership increases.

$$\text{IER (in case of 50\%)} = \frac{2,019,243,253}{5,260,857} = 384$$

When 50 percent of the total stock is owned by foreign investors, the IER value is 384, which is considerably lower than the accounting exchange rate (say, 400), and, therefore, the project of such a composition can be accepted without any hesitation.

Calculation of IER in Case of 100 Percent

Years	$E_d - R_d$ Actual	$E_d - R_d$ Discounted	$R_f - E_f$ Actual	$R_f - E_f$ Discounted
0	---	---	75,000	75,000
1	45,692,800	40,803,670	114,231	102,008
2	157,240,000	125,320,280	393,101	313,301
3	315,691,600	224,772,419	789,229	561,619
4	"	200,779,857	"	501,949
5	"	178,997,137	"	447,492
6	"	160,055,641	"	440,139
7	"	142,692,608	"	356,731
8	"	127,539,406	"	318,848
9	"	113,964,667	"	284,911
10	"	101,652,695	"	254,131
11	"	90,919,180	"	227,297
12	"	78,922,900	"	197,307
13	"	72,293,376	"	183,733
14	"	64,716,778	"	161,791
15	"	57,771,562	"	144,428
16	"	51,456,730	"	128,644
17	"	46,090,973	"	115,227
18	"	41,039,908	"	102,599
19	"	26,620,225	"	91,550
20	"	32,831,926	"	82,079
Total		2,019,243,253		5,050,784

Now, it is assumed that foreign exchange requirements for imported capital goods are given at $75,000 as in the 50 percent case, and thus there occurs net capital inflow of $75,000 at time 0 ($150,000 - $75,000 = $75,000). And the whole net profits are given to the foreign investors and added to E_f.

When the foreign ownership is 100 percent, the IER is 399.

$$IER = \frac{2,019,243,253}{5,050,784} = 399$$

It is very interesting to note that this wholly-foreign project is calculated to have an IER of less than 400. Even though the project is allowed to be owned and controlled solely by foreign investors, in this case, it will not deteriorate the balance-of-payments position of the country--a conclusion contrary to the general expectations of the laymen.

So much for the effect of the increased foreign participation on the IER and on the balance-of-payments position. Now, the way to find the best possible source of financing will be presented according to the already-sketched decision rule. When $\Sigma BI_o + \Sigma PI_o < \Sigma FI_o$, foreign participation is desirable. On the contrary, when $\Sigma BI_o + \Sigma PI_o > \Sigma FI_o$, it is recommended to use Korea's foreign exchange holdings (KFX).

For the 50 percent foreign participation case, the foreign exchange requirements for the imported capital goods are financed by foreign private investment. The summed present

value of the schedule of dividends (and capital gains) to the foreign investors (ΣPI_o) in this case amounts to $266,739, which is far greater than the initial foreign investment, $75,000. Thus, the decision rule recommends that the project would be financed by local investors. When the project is financed with KFX and thereby no profit dividends to the foreign investors occur, the IER is only 370, as long as other costs and benefits are not affected by the change in the financing source.

$$IER = \frac{2,019,243,253}{5,452,596} = 370$$

It is usual, however, that a change in the combination of financing source results in changes in revenue and in the operating costs. The complete substitution in Korea's capital by using KFX may result in a relatively less efficient management, thus reducing profits, or may incur greater marketing expenses by not being allowed to utilize the already-established market network, or may pay some technological royalties, or may train their employees in foreign countries, and so on.

Let it be assumed that those foreign exchange expenses incurred by not permitting foreign participation would be around 10 percent of the total $R_f - E_f$ and there would be no change in the numerator (for the sake of simple calculation). Then the denominator would decrease and so the IER would be greater. Under this assumption the IER would be around 410 which is much greater than the opportunity cost foreign

exchange of 400.

$$IER = \frac{2,019,243,253}{4,919,148} = 410$$

It goes without saying that 50 percent foreign participation should be recommended as the better financing plan under these circumstances. In this light we can find the best financing plan with the aid of the combination of the decision rule and the IER.

VI. CONCLUSION

1. It goes without saying that a managerial control over the enterprise in question and the resulting dangers of so-called economic imperialism, often maintained to be exerted by foreign investors, is a major reason for limiting shares held by foreigners. Furthermore, a few economists stand for limiting foreign investment on strictly economic ground, i.e., improving the balance-of-payments position, in addition to the point of managerial control.

The scope of this study has been confined to the latter viewpoint, disregarding foreign control--a non-economic criterion in a sense. Thus, the conclusion from this study can be off-set in a particular country if foreign control problems are viewed as more important than balance-of-payments.

2. Secondly, if it is accepted that the IER is useful and effective as a tool for analyzing the effects of limiting foreign ownership on the improvement of the balance-of-payments position, it may be concluded that the rigid limitation of stocks owned by foreign investors below 50 percent of the total can have an adverse effect on the balance-of-payments position of the country concerned.

Therefore, the percentage of foreign-owned shares which is permitted should be determined by calculating the IER of the project on a case-by-case basis. When the calculated implicit exchange rate of a project is less than the shadow price of the foreign exchange in a normal case, the project

can be owned and controlled by foreign investors, with good prospect of improving the balance-of-payments position. On the other hand, if a project with less than 50 percent foreign ownership has an IER greater than the accounting exchange rate in a normal case, the project deteriorates the balance of payments in the country and should be rejected unless there is a change in the composition of local and foreign investment, even though the IRR or SRR is high enough to be accepted.

3. When the IRR is greater than the opportunity costs of capital (r), the larger the proportion of foreign ownership, the larger the IER. Thus, it is better in this case to reduce foreign participation to a level as low as possible. On the other hand, when the IRR is smaller than the opportunity cost of capital (r), the larger the proportion of foreign participation, the smaller the IER. It can be thus recommended to induce foreign participation as large as possible, as far as the IER is less than the opportunity cost of capital (r).

4. Finally it should be noted that the period-by-period calculation of the IER has some advantages over the first formula (IV-2-1) which assumes that the stream of benefits and costs is uniform throughout the operation period.

First of all, the social time preference can be fully reflected in discounting the future stream of projected benefits and costs. A relatively lower discount rate implies that the society evaluates the increased income of the future more highly than in the case of a relatively higher discount rate.

The actual stream of benefits and costs are not uniform in reality. Moreover, when foreign investors want to reinvest their portion of profit dividends to the affiliated project (or others), there will be less remittance of profits in the earlier period of the operation but greater in the later. Thus, discounting to the present value of such variations in the stream of benefits and costs provides more accurate determination of the IER.

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APPLICATION OF IMPLICIT EXCHANGE RATE CRITERION TO POLICIES REGARDING FOREIGN INVESTMENT IN KOREA

by

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AN ABSTRACT OF A MASTER'S REPORT

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Many developing countries are limiting shares or stocks to be owned by foreign investors below 50 per cent of the total. The main reason for such a limitation is to bar foreign investors from managerial control over a project and to eliminate the resulting dangers of economic imperialism.

A few economists, however, stand for limiting foreign ownership on the economic ground of improving the balance-of-payments position.

Disregarding the managerial question, this report is addressed to the question of whether a limited foreign ownership policy contributes to the improvement of the balance of payments by use of the Implicit Exchange Rate (IER) criterion. The IER gives the won (Korean currency) cost of earning (through export) or saving (through import substitution) a dollar over the planning horizon of a project. More exactly, the IER is a fraction having in the denominator the net saving or earnings of foreign exchange and in the numerator the net won cost of saving or earning foreign exchange through the construction of the project. Foreign exchange operating expenditure is subtracted to obtain net savings or earnings, while won value sales to the local market are subtracted as an off-set to won expenses.

A project is expected to have an IER lower than the accounting exchange rate (say 400 in Korea) in order to contribute to the improvement of balance-of-payments. Therefore,

the proportion of the shares permitted to be owned by foreign investors should be determined by calculating the IER of projects individually. Thus, a rigid limitation of foreigner-owned shares often deteriorates the balance-of-payments position of the country.

Even when all shares of the project are owned solely by foreign investors and the calculated IER is less than the shadow price of the foreign exchange, then the balance of payments of the concerned country will be improved. On the contrary, if a project in which 50 per cent of the total stock is owned by foreign investors has an IER greater than the accounting exchange rate, the balance of payments will be deteriorated and thus should be rejected. One policy would be to set the maximum foreigner-owned share at a point just below where the calculated IER becomes less than the assumed shadow price.

As a conclusion, a rigid limitation of foreign-held shares often deteriorates the balance-of-payments position and, therefore, the percentage allowed to be owned by foreign investors should be determined on a case-by-case basis by calculating the IER of each project.