INTERNATIONAL CAPITAL MOVEMENTS: THEORY
AND ESTIMATION

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March, 1971

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1. INTRODUCTION

Contrasted to the widespread application of econometric techniques in the study of international trade flows, similar studies in international capital movements are not quite extensive. Even the theory of international capital movements has not yet been well organized so as to provide a basis for systematic econometric researches. Perhaps the most important reason for this is that the estimation of current account balance is essential for the aggregate income determination, whereas capital accounts do not have similar importance in the macro-econometric model. Moreover, the usual macro-econometric models centered around the concept of flow equilibrium, but the equilibrium concept appropriate for the capital account relationships is one of stock equilibrium. The recent development of the theory of portfolio selection and its application to aggregative economics must therefore be incorporated in the empirical study when one is concerned with international capital movements.

In the Project LINK the situation is a little better. An extensive research on this subject is now being conducted by the Canadian
group, especially on the capital account equations of the Canadian model and on the bilateral linkage of the Canadian and the United States economies which involves the capital account transactions. Some preliminary studies on capital accounts have also been done for the Belgian and Japanese country models. However, in view of the recent rapid growth of the international financial markets and the consequent liaison of the national economies through international capital movements, it is of great importance to consolidate the country models with the capital flow equations. This, in turn, will necessitate an amplification of the domestic financial sector of each country model as well. Furthermore, in order to implement a full-scale linkage of national models including international capital transactions, it seems indispensable to construct a separate model to deal with the Euro-dollar market.

The scope of the present paper, however, is rather limited. It simply attempts to put in order some basic problems of formulating and estimating international capital movements. Section 2 of this paper is concerned with the question of providing a suitable theoretical framework for the specification of capital account relationships. We


then apply the results of Section 2 to the Japanese data in order to show how they can serve for our purposes. Section 3 presents the implications of our statistical estimation, and Section 4 summarizes the estimated equations.

2. MODELS OF INTERNATIONAL CAPITAL MOVEMENTS AND FOREIGN EXCHANGE RATES

2.1. Short-term Capital Movements

2.1.1. Interest Arbitrage

A standard theory of international short-term capital movements is the so-called "interest parity theory" or the theory of international interest arbitrage. It explains how a certain amount of fund can be allocated among different international financial centers so as to maximize profits without incurring exchange risks. There are, however, a number of alternative formulations of this theory depending on the behavioral assumptions concerning risk and liquidity, which, in turn, lead to different functional specifications in estimating short-term capital flows. We shall, therefore, first review a few typical versions of the theory of pure interest arbitrage before taking into account such factors as speculation and trade financing.

Model 1

The simplest version of the interest arbitrage theory may be formulated as follows. Suppose that a representative institution attempts to invest its funds amounting to \( w \) (expressed in local currency) for a short period of time, say, three months. Let there be only two investment opportunities, purchases of domestic and foreign short-term

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securities bearing the interest rates $i_d$ and $i_f$, respectively. The representative institution is assumed to maximize its (concave) utility function

\[(2.1) \quad u = u(y, w_d, w_f)\]

subject to the constraints

\[(2.2) \quad y = (1 + i_d)w_d + (1 + i_f)(1 + m)w_f\]

\[(2.3) \quad w = w_d + w_f\]

where $y$ represents the total amount of fund after the investment period, $w_d$ the amount invested at home, $w_f$ the amount invested abroad, and $m$ the forward margin, i.e., the excess of the forward price of foreign exchanges over their spot price expressed as a percentage of the spot price.

The utility function contains $w_d$ and $w_f$ besides $y$, because short-term securities are considered to serve as the secondary reserve in the respective financial center.\(^3\) If we assume that $i_d$, $i_f$, $m$ and $w$ are given, the first-order condition for a maximum is given by

\[(2.4) \quad i_d + l_d = i_f + (1 + i_f)m + l_f\]

where

\[(2.5) \quad l_d = \left(\frac{\partial u/\partial w_d}{\partial u/\partial y}\right), \quad l_f = \left(\frac{\partial u/\partial w_f}{\partial u/\partial y}\right)\]

represent the marginal convenience yield at home and abroad, respectively.

Solving equations (2.2)–(2.4), among other things, for $w_f$, we obtain

\[(2.6) \quad w_f = w_f(i_d, i_f + (1 + i_f)m, w).\]

It can be shown that the function $w_f$ has the following properties:

\[
\frac{\partial w_f}{\partial i_d} = -\frac{1}{\Delta_1} - [1 + \left(\frac{\partial l_d}{\partial y} - \frac{\partial l_f}{\partial y}\right)w_d]
\]

\[(2.7) \quad \frac{\partial w_f}{\partial (i_f + (1+i_f)m)} = \frac{1}{\Delta_1} - [1 - \left(\frac{\partial l_d}{\partial y} - \frac{\partial l_f}{\partial y}\right)w_f]\]

\[
\frac{\partial w_f}{\partial w} = - \frac{1}{\Delta_1} \left[ \left( \frac{\partial l_d}{\partial w_d} - \frac{\partial l_f}{\partial w_f} \right) + (1 + i_d) \left( \frac{\partial l_d}{\partial y} - \frac{\partial l_f}{\partial y} \right) \right]
\]

where

\[\Delta_1 = - (\frac{\partial l_d}{\partial w_d} - \frac{\partial l_f}{\partial w_f}) + (\frac{\partial l_d}{\partial w_f} - \frac{\partial l_f}{\partial w_f}) - (l_d - l_f) \left( \frac{\partial l_d}{\partial y} - \frac{\partial l_f}{\partial y} \right) > 0\]

by the second-order condition for a maximum.

If we further assume, as a first approximation, that \( \partial l_d / \partial y \approx \partial l_f / \partial y \), that is, that the response of the marginal convenience yield with respect to the amount of total fund is approximately equal in each financial center, then equation (2.6) may be simplified to

\[w_f = \bar{w}_f (i_d - i_f - (1 + i_f)m, w)\]

where

\[\frac{\partial \bar{w}_f}{\partial i_d} - i_f - (1 + i_f)m < 0, \frac{\partial \bar{w}_f}{\partial w} > 0.\]

In other words, the equilibrium amount of funds invested abroad is a decreasing function of the covered interest differential (domestic minus foreign) and an increasing function of the total investible fund.

**Model 2**

The second formulation of the interest arbitrage theory is based upon a simplified theory of portfolio selection.\(^4\) Even though we may be allowed to assume that risks involved in short-term securities are negligibly small in local markets, investment in foreign short-term securities is subject to another type of risk. Exchange controls may be imposed by the foreign authorities to prevent the remittance of invested funds: the foreign securities will have to be sold before maturity either to finance domestic activities or to switch funds to other investment opportunities, which will incur exchange risks not covered by the original

swap transaction; and so on. Then, the foreign rate of return, if
+ (1 + i_d)m in equation (2.2), must be regarded as a stochastic variable.

We shall therefore re-write (2.2) as

\[ y = (1 + i_d)w_d + \{ (1 + i_d)(1 + m) + \varepsilon \} w_f, \]

where it is assumed that \( \varepsilon \) is normally distributed with the mean zero
and the variance \( \sigma^2 \).

Let \( \mu_y \) and \( \sigma_y^2 \) be the mean and the variance of \( y \), respectively:

\[ \mu_y = (1 + i_d)w_d + (1 + i_d)(1 + m)w_f \]

\[ \sigma_y^2 = \sigma^2 w_f^2. \]

Assuming away the convenience yield for simplicity, we write the utility
function (2.1) as

\[ u = u(y); \quad u' > 0, \quad u'' < 0. \]

Hence, the expected utility is given by

\[ E[u(y)] = \int_{-\infty}^{\infty} u(y) f(y; \mu_y, \sigma_y) dy, \]

where \( f \) is the probability density function of \( y \). Define

\[ z = \varepsilon / \sigma; \quad E(z) = 0, \quad E(z^2) = 1. \]

Then, from equations (2.11) – (2.13) we have

\[ y = \mu_y + \sigma_y z. \]

Substituting (2.17) into (2.15), we may write the expected utility func-
tion as

\[ v(\mu_y, \sigma_y) = \int_{-\infty}^{\infty} u(\mu_y + \sigma_y z) f(z; 0, 1) dz, \]

where

\[ v_\mu = \partial v / \partial \mu_y = \int_{-\infty}^{\infty} u'(\mu_y + \sigma_y z) f(z) dz > 0, \]

\[ v_\sigma = \partial v / \partial \sigma_y = \int_{-\infty}^{\infty} u'(\mu_y + \sigma_y z) z f(z) dz < 0. \]
Maximizing (2.18) subject to equations (2.3), (2.12) and (2.13), we have

\[ i_d = i_f + (1 + i_f)m + \sigma v_\sigma / v_\mu . \]

The last term on the right-hand side of this expression represents (a negative of) the marginal risk premium, which we shall denote by

\[ \rho(\mu_y, \sigma_y, \sigma) = - \sigma v_\sigma / v_\mu . \]

Thus, in equilibrium the foreign rate of return must be sufficiently higher than the domestic rate of return to cover this risk premium. In the normal circumstances, however, this factor will be rather small and remain fairly stable.\(^5\)

Solving equations (2.3), (2.12), (2.13) and (2.20) for \( w_f \) as before, we obtain

\[ w_f = w_f(i_d, i_f + (1 + i_f)m, \sigma, w) \]

where

\[ \frac{\partial w_f}{\partial i_d} = - \frac{1}{\Delta_2} (1 + \frac{\partial \rho}{\partial \mu_y} w_d) \]

\[ \frac{\partial w_f}{\partial (i_f + (1 + i_f)m)} = \frac{1}{\Delta_2} (1 - \frac{\partial \rho}{\partial \mu_y} w_f) \]

\[ \frac{\partial w_f}{\partial \sigma} = - \frac{1}{\Delta_2} \left( \frac{\rho}{\sigma} + \frac{\partial \rho}{\partial \sigma_y} w_f \right) \]

\[ \frac{\partial w_f}{\partial w} = - \frac{1}{\Delta_2} (1 + i_d) \frac{\partial \rho}{\partial \mu_y} \]

and

\[ \Delta_2 = \rho \frac{\partial \rho}{\partial \mu_y} + \sigma \frac{\partial \rho}{\partial \sigma_y} > 0 \]

by the second-order condition for a maximum. Now the signs of these expressions depend on those of \( \partial \rho / \partial \mu_y \) and \( \partial \rho / \partial \sigma_y \). Normally, the expected marginal utility of money (\( v_\mu \)) will not decline sharply as \( \mu_y \) rises,
while the expected marginal disutility of risk ($-v_y$) will increase rather rapidly as $\sigma_y$ increases. Therefore, we may expect that $\partial \rho / \partial \mu_y < 0$ and $\partial \rho / \partial \sigma_y > 0$, and hence

$$\frac{\partial w_f}{\partial (i_f + (1+i_f)m)} > 0$$

(2.25) $\frac{\partial w_f}{\partial \sigma} < 0$

$$\frac{\partial w_f}{\partial w} > 0.$$

Moreover, it should be noted that

$$\frac{\partial w_f}{\partial (i_f + (1+i_f)m)} - \frac{\partial w_f}{\partial i_d} = - \frac{1}{\Delta_2} \frac{\partial \rho}{\partial \mu_y} w,$$

(2.26) which will normally be positive. That is, the effects of changes in foreign and domestic rates of return are not symmetric. This is so, because it is only the substitution term which is symmetric ($1/\Delta_2$ in equations (2.23)), while expressions (2.23) contain income terms as well ($-1/\Delta_2)(\partial \rho / \partial \mu_y)w_d$ and $-(1/\Delta_2)(\partial \rho / \partial \mu_y)w_f$). Here the substitution term represents the effect of a change in the rate of return upon the "demand" for foreign investment when the utility level is held constant, whereas the income effect represents the effect of utility re-compensation as in the theory of consumer's demand.6 Therefore, if we assume that the

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6 Replace (2.3) by

(i) $v(\mu_y, \sigma_y) = \bar{v}$

and solve (i), (2.12), (2.13) and (2.20) for $w_f$ to obtain

(ii) $w_f = \tilde{w}_f(i_d, i_t+(1+i_t)m, \sigma, \bar{v})$.

Then, we have, for example,

(iii) $\frac{\partial \tilde{w}_f}{\partial i_d} = -1/\Delta_2$, $\frac{\partial \tilde{w}_f}{\partial i_t} = -(1/\Delta_2)(1/\nu_s)(\partial \rho / \partial \mu_y)$.

Hence

(iv) $\frac{\partial w_f}{\partial i_d} = \frac{\partial \tilde{w}_f}{\partial i_d} / \bar{v} + \frac{\partial \tilde{w}_f}{\partial \nu_s} \frac{\partial \nu_s}{\partial \mu_y} \frac{\partial \mu_y}{\partial i_d} = - \frac{1}{\Delta_2} - \frac{1}{\Delta_2} \frac{\partial \rho}{\partial \mu_y} w_d$.

And similarly for $\frac{\partial w_f}{\partial (i_f + (1+i_f)m)}$.
substitution effect dominates the income effect in the first expression of (2.23), then we will also have

\[ \partial w_I / \partial \alpha < 0. \]

So far we have ignored the risks involved in the purchases of securities in the local market. However, it is not difficult to extend the above model to cover such type of risk. We shall not enter into details, but only mention that we will then obtain

\[ w_f = w_f(i_d, i_f + (1 + i_f)m, \sigma_d, \sigma_f, w) \]

where \( \sigma_d^2 \) and \( \sigma_f^2 \) are the variances of short-term rate of return at home and abroad, respectively. As before, we may normally expect that

\[ \partial w_I / \partial \alpha < 0, \quad \partial w_I / \partial (i_f + (1 + i_f)m) > 0, \]

\[ \partial w_I / \partial \sigma_d > 0, \quad \partial w_I / \partial \sigma_f < 0, \quad \partial w_I / \partial w > 0. \]

Model 3

The final version of the international interest arbitrage theory which we wish to review here extends the foregoing model by introducing an additional complication, i.e., the existence of a domestic riskless asset bearing no interest, say, cash.7

Let \( y_0 \) be the amount of total investible funds initially held, \( c \) the amount to be held in cash, and \( w \) the amount to be invested in risky assets. Then,

\[ y_0 = c + w \]

\[ w = w_d + w_f. \]

After the investment period, the total amount of fund will become

\[ y = c + (1 + i_d + \varepsilon_d) w_d + ((1 + i_f)(1 + m) + \varepsilon_f) w_f \]

7 The model to be developed below is essentially the same as that of Miller and Whitman, who applied their model to the estimation of long-term capital flows. See Norman C. Miller and Marina v. N. Whitman, "A Mean-Variance Analysis of United States Long-Term Portfolio Foreign Investment," Quarterly Journal of Economics, Vol. LXXXIV (May, 1970).
where $\varepsilon_d$ and $\varepsilon_f$ are the normally distributed random variables with the mean zero, the variances $\sigma_d^2$ and $\sigma_f^2$, respectively, and the covariance $r\sigma_d\sigma_f$.

Now define

$$\begin{align*}
(2.33) & \quad x_d = w_d/w, \quad x_f = w_f/w, \\
(2.34) & \quad x = \varepsilon_d x_d + \varepsilon_f x_f, \quad (E(x) = 0),
\end{align*}$$

$$\begin{align*}
(2.35) & \quad \sigma_x^2 = E(x^2) = \sigma_d^2 x_d^2 + \sigma_f^2 x_f^2 + 2r\sigma_d \sigma_f x_d x_f, \\
(2.36) & \quad i = i_d x_d + \{i_f + (1 + i_f)m\} x_f, \\
(2.37) & \quad \mu_y = E(y) = c + (1 + i)w, \\
(2.38) & \quad \sigma_y^2 = E[(y - \mu_y)^2] = \sigma_x^2 w^2.
\end{align*}$$

A representative institution is assumed to maximize the expected utility

$$\begin{align*}
(2.39) & \quad E[u(y)] = \int_{-\infty}^{\infty} u(y) f(y; \mu_y, \sigma_y) dy.
\end{align*}$$

Since

$$\begin{align*}
(2.40) & \quad y = \mu_y + xw,
\end{align*}$$

by defining $z = x/\sigma_x$ we may again write the expected utility function as equation (2.18). The present problem can therefore be summarized as follows: Maximize

$$\begin{align*}
(2.41) & \quad E[u(y)] = v(\mu_y, \sigma_y)
\end{align*}$$

subject to the constraints

$$\begin{align*}
(2.42) & \quad c + w = y_0 \\
& \quad \mu_y = c + (1 + i)w \\
& \quad \sigma_y = \sigma_x^w \\
& \quad x_d + x_f = 1 \\
& \quad \sigma_x^2 = \sigma_d^2 x_d^2 + \sigma_f^2 x_f^2 + 2r\sigma_d \sigma_f x_d x_f \\
& \quad i = i_d x_d + \{i_f + (1 + i_f)m\} x_f.
\end{align*}$$
The first-order conditions are then shown to be

\[(2.43)\quad i = - \frac{\sigma_x \nu_a}{\nu_\mu}\]

and

\[(2.44)\quad i_d - \{i_f + (1 + i_f)m\} = - \frac{\sigma_x \nu_a}{\nu_\mu} \frac{\sigma_d^2 x_d + r\sigma_d \alpha f x_f - \sigma_f^2 x_f - r\sigma_d \alpha f x_d}{\sigma_x^2} .\]

The first condition, (2.43), implies that in equilibrium the marginal rate of return on the risky portfolio, \(i\), is equated to the over-all marginal risk premium, \(-\frac{\sigma_x \nu_a}{\nu_\mu}\), while the second condition, (2.44), requires that the difference between the rate of return and the marginal risk premium of the respective risky asset be equal.

Noting that \(x_d + x_f = 1\), we may solve equations (2.43) and (2.44) for \(x_f\) to obtain

\[(2.45)\quad x_f = \frac{(1 + R)\sigma_d^2 - r\sigma_d \alpha f}{(1 + R)\sigma_d^2 - r\sigma_d \alpha f + \{\sigma_f^2 - (1 + R)r\sigma_d \alpha f\}}\]

where \(R = \{i_f + (1 + i_f)m - i_d\}/i_d\). Since \(1 + R > 0\), it follows that \(0 < x_f < 1\) when \(r \leq 0\). If \(r > 0\), however, it is necessary for \(x_f\) to lie between zero and unity that

\[(2.46)\quad (1 + R)/r > \frac{\alpha_f}{\sigma_d} > (1 + R)r.\]

This condition will normally be satisfied unless \(r\) is close to unity, because as we have explained earlier \(\alpha_f\) is considered to be larger than \(\sigma_d\). We shall henceforth assume that inequalities (2.46) hold. Then, equation (2.45) may be re-written as

\[(2.47)\quad w_f = w_f (R, \sigma_d, \alpha_f, w)\]

where

\[
\frac{\partial w_f}{\partial R} = \frac{w}{\Delta_3} (1 - r^2) > 0, \quad \Delta_3 = \sigma_d^2 - r\sigma_d \alpha f + \{\sigma_f^2 - (1 + R)r\sigma_d \alpha f\} > 0, \quad \frac{\partial w_f}{\partial \sigma_d} = \frac{w}{\Delta_3} \left[\frac{(1 + R)}{r} \sigma_d - \alpha_f\right] r\sigma_f^2 + \{\alpha_f - (1 + R)r\sigma_d\}(1 + R)\sigma_d \alpha_f > 0, \quad \Delta_3 = \sigma_d^2 - r\sigma_d \alpha f + \{\sigma_f^2 - (1 + R)r\sigma_d \alpha f\} > 0. \quad (2.48)
\]
\[
\frac{\partial w}{\partial \sigma_t} = - \frac{w}{\Delta_3} \left[ \left( 1+R \right)^{-\sigma_d} - \sigma_t \right] \sigma_d \left( 1+R \right) \sigma_d + \left[ \sigma_t - \left( 1+R \right) \sigma_d \sigma_t \right] \right]
\]

< 0,

\[
\frac{\partial w}{\partial w} = x_t > 0,
\]

\[
\Delta_3 = \left[ \left( 1+R \right) \sigma_d^2 - \sigma_d \sigma_t \right] + \left[ \sigma_t^2 - \left( 1+R \right) \sigma_d \sigma_t \right]^2 > 0.
\]

Although the above expression is not a final solution in the sense that every endogenous variable is expressed in terms of exogenous variables alone, it is useful in the actual estimation procedure. Ordinarily, the domestic and foreign rates of return are highly correlated so that it is difficult to estimate their separate effects on capital flows. The covered or uncovered interest differential is therefore often used to avoid the problem of multicollinearity. This procedure, however, does not conform to our previous conclusion that the effects of domestic and foreign rates of return are likely to be asymmetric (see equation (2.26)). The above specification can avoid both of these difficulties.

2.1.2. Speculation and Trade Financing

So far we have only been concerned with the pure interest arbitrage unrelated to the speculative activity. Speculation in the foreign exchange market does not directly lead to international capital movements in so far, as it is concentrated in the forward exchange market. It affects the short-term capital flows only indirectly through its effects on the forward margin. However, speculators may sometimes speculate on the spot market. It has been shown by many writers that speculation in the spot exchanges, say, a spot sale of foreign exchanges, is more profitable than the corresponding forward sale when the arbitrage
margin is favorable to the speculator's home country. Such a uncovered spot sale is essentially a combination of a speculative forward sale and an inward arbitrage activity which involves a spot sale and a simultaneous forward purchase. Thus, if a speculator's expectation concerning the future spot rate is revised downward with current interest rates and the forward margin remaining unchanged, the speculator's spot sale of foreign exchanges will be increased. The behavior of such speculator-arbitrager may be formulated by slightly modifying our Model 2.

Model 4

Consider an investor who does not cover his foreign investment by a simultaneous forward transaction. Denoting the ratio of the mean value of the expected future spot rate to its current value by e, we re-write (2.11) as

\[
(2.49) \quad y = (1 + i_d)w_d + (1 + i_f)(e + \varepsilon_f)w_f,
\]

where \( \varepsilon_f \) is a normally distributed random variable with the mean zero and the variance \( \sigma_f^2 \). (For simplicity of exposition we disregard the risk element other than the uncertainty concerning the future spot rate.) Hence (2.12) and (2.13) must be replaced by

\[
(2.50) \quad \mu_y = (1 + i_d)w_d + (1 + i_f)e \sigma_f w_f,
\]

\[
(2.51) \quad \sigma_y = (1 + i_f)\sigma_f w_f.
\]

Other part of the model remains unchanged.

The utility maximization condition (2.20) should now read

\[
(2.52) \quad \frac{1 + i_d}{1 + i_f} - e + \rho = 0
\]

where

\[
(2.53) \quad \rho(\mu_y, \sigma_y, \sigma_f) = - \frac{\sigma_f \nu_{d_f}}{\nu_{\mu_f}}.
\]

And the amount of fund to be invested abroad is determined by

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the \( w_f \) function having the following properties:

\[
\frac{\partial w_f}{\partial i_d} = - \frac{1}{\Delta_4} \left[ \frac{1}{1 + i_f} + \frac{\partial \rho}{\partial \mu_y} w_d \right]
\]

\[
\frac{\partial w_f}{\partial i_f} = \frac{1}{\Delta_4} \left[ \frac{1 + i_d}{(1 + i_f)^2} - \frac{\partial \rho}{\partial \mu_y} e w_f - \frac{\partial \rho}{\partial \sigma_y} \sigma_f w_f \right]
\]

\[
\frac{\partial w_f}{\partial e} = \frac{1}{\Delta_4} \left[ 1 - \frac{\partial \rho}{\partial \mu_y} (1 + i_f) w_f \right]
\]

\[
\frac{\partial w_f}{\partial \sigma_r} = - \frac{1}{\Delta_4} \left[ \frac{\partial \rho}{\partial \sigma_r} + \frac{\partial \rho}{\partial \sigma_y} (1 + i_f) w_f \right]
\]

\[
\frac{\partial w_f}{\partial w} = - \frac{1}{\Delta_4} \left( 1 + i_d \right) \frac{\partial \rho}{\partial \mu_y}
\]

where

\[
\Delta_4 = (1 + i_f)(\rho \frac{\partial \rho}{\partial \mu_y} + \sigma_r \frac{\partial \rho}{\partial \sigma_y}) > 0
\]

by the second-order condition for a maximum. As in Model 2, we may normally expect that

\[
\frac{\partial w_f}{\partial i_d} < 0, \quad \frac{\partial w_f}{\partial i_f} > 0, \quad \frac{\partial w_f}{\partial e} > 0,
\]

\[
\frac{\partial w_f}{\partial \sigma_r} < 0, \quad \frac{\partial w_f}{\partial w} > 0.
\]

Finally, the international capital movements associated with the financing of international trade can easily be incorporated into the previous framework. For instance, if a home country exporter, who expects to be paid in foreign currency in three months' time, always covers the exchange risk, he is acting as a pure interest arbitrager. Or, if he does not cover the exchange risk, he is acting as an arbitrager-speculator. Similar argument applies to a home country importer who must pay in foreign currency in three months' time.
2.1.3. The Speed of Adjustment

The \( w_f \) functions thus far derived explain the equilibrium or desired stock of funds to be invested in the foreign country. Or, alternatively, if we consider a borrower who attempts to maximize his (expected) utility function involving the total cost of borrowing, then these functions determine the equilibrium outstanding debt in foreign currency. The rate of international capital flow per unit of time is therefore given by the first difference of \( w_f(t) \), where \( t \) denotes time period. Take equation (2.47), for example. In a linear form, we may write

\[
\Delta w_f(t) = a_0 + a_1 \Delta R(t) + a_2 \Delta \sigma_d(t) + a_3 \Delta \sigma_f(t) + a_4 \Delta w(t)
\]

or

\[
w_f(t) = a_0 + a_1 \Delta R(t) + a_2 \Delta \sigma_d(t) + a_3 \Delta \sigma_f(t) + a_4 \Delta w(t) + w_f(t-1),
\]

where the \( a_i \)'s denote the partial derivatives of the \( w_f \) function and \( \Delta x(t) = x(t) - x(t-1) \).

The above specification, however, can be used in the actual estimation only when it is clear that the speed of adjustment is sufficiently large relative to the unit period of observation. When there exists some time lag before the desired portfolio is attained, the \( w_f \) functions cannot be directly estimated. Assuming then the partial adjustment process with the adjustment coefficient \( \lambda (0 < \lambda < 1) \), we have

\[
\Delta w_f(t) = \lambda[a_0 + a_1 R(t) + a_2 \sigma_d(t) + a_3 \sigma_f(t) + a_4 w(t) - w_f(t-1)]
\]

or

\[
w_f(t) = b_0 + b_1 R(t) + b_2 \sigma_d(t) + b_3 \sigma_f(t) + b_4 w(t) + (1 - \lambda)w_f(t-1)
\]

where \( b_1 = \lambda a_1 \).
2.2. Long-term Capital Movements

International long-term capital accounts of any country have far the more diverse elements than the short-term capital accounts. Direct investment, investment in long-term bonds and stocks (both outstanding and newly issued), and long-term bank loans associated or unassociated with foreign trade are among others, each of which being governed by different economic factors. The portfolio selection approach we have reviewed in the previous section will find a useful application to some of the long-term investments, although an appropriate choice of explanatory variables will be less obvious. The rate of return variable should reflect not only the current yield but also the expected rate of capital appreciation or depreciation; uncertainty will play a much larger role so that the risk variable must carefully be selected; capital market may be more imperfect; and so on.

Explanatory variables often selected other than the long-term interest rates are: the rate of change, or the rate of growth, of some activity variables such as national income, index of production, private fixed investment, corporate profits, exports and imports, to approximate the long-run profitability, and the deviation from trend of these variables to represent the risk factor of an aggregate portfolio (an upward deviation implying a decrease in risk). An important institutional change that might have affected most country's international capital position is the U.S. foreign investment restraint program. Since there has been a number of revisions of this program, and their impact may not be uniform through time, some special consideration must be given to separate their effects.

As regards the direct investment, however, the situation is less hopeful. Theoretical studies concerning the determinants of direct
investment have just begun to emerge, but there still remains a gap between them and their application to macro-econometric models. For the meantime, we must contend ourselves with some ad hoc specifications.

2.3. Foreign Exchange Rates

An econometric study of the foreign exchange markets is almost indispensable when one is concerned with a system involving a capital accounts sector of the balance of payments, because the spot and forward exchange rates are almost certain to appear as endogenous variables (especially in the short-term capital accounts).

Our model of foreign exchange markets to be presented here is based on the theory of forward exchanges which indicates the simultaneous determination of spot and forward exchange rates.

Let us first consider the forward exchange market. The standard argument in the theory of forward exchange suggests that every transaction in forward exchanges can be functionally classified into three categories: interest arbitrage, commercial covering, and speculation. Let \(E_a(t), E_c(t),\) and \(E_s(t)\) be the excess demand for forward exchanges arising from the above three activities, respectively, at time \(t,\) and \(V(t)\) be the excess supply of forward exchanges by the monetary authorities at time \(t.\) Then, the equilibrium condition in the forward market is given by

\[
E_a(t) + E_c(t) + E_s(t) = V(t).
\]

Now, the three excess demand functions may be written as

\[
E_a(t) = E_a[\Delta m(t), \Delta i_d(t) - \Delta i_f(t), \Delta w(t)]
\]

\[
E_c(t) = E_c[r_f(t), \alpha(t)]
\]

\[
E_s(t) = E_s[r_s^e(t), r_f(t), \sigma_f(t)]
\]

where \(m = \) the forward margin, \(i_d = \) domestic short-term interest rate,

\footnote{See the references cited in footnote 8.}
$i_t$ = foreign short-term interest rate, $w$ = the availability of arbitrage funds, $r_t$ = the forward exchange rate, $r_s^e$ = the mean value of the expected future spot exchange rate, $\alpha$ = factors affecting the basic balance of payments deficit that manifests itself in the forward exchange market, and $\sigma_t$ = the standard deviation of the expected future spot rate.

From the definition of $m(t)$, we have

\begin{equation}
\Delta m(t) = \frac{r_t(t)}{r_s(t)} - \frac{r_t(t-1)}{r_s(t-1)}
\end{equation}

where $r_s$ = the spot exchange rate. No detailed argument will be needed to show that the above excess demand functions have the following properties:

\begin{align}
\partial E_a / \partial (\Delta m(t)) &< 0, \quad \partial E_a / \partial (\Delta i_d(t) - \Delta i_f(t)) > 0, \quad \partial E_a / \partial \Delta w \geq 0, \\
\partial E_c / \partial r_t(t) &\leq 0, \quad \partial E_c / \partial \alpha(t) > 0, \\
\partial E_s / \partial r_s^e(t) &> 0, \quad \partial E_s / \partial r_f(t) < 0,
\end{align}

and

\begin{equation}
\partial E_s / \partial \sigma_t(t) \geq 0 \text{ as } r_s^e(t) \not\leq r_f(t).
\end{equation}

The sign of $\partial E_a / \partial \Delta w$ is uncertain, because a change in $w$ affects both demand and supply in the same direction. And under the fixed exchange rate system, $E_c$ may be considered as independent of the forward rate.

Substitute (2.61) and (2.62) into (2.60), linearize the resulting equation, and solve it for $r_f(t)$. We then have

\begin{equation}
r_f(t) = a_0 + a_1 [\Delta i_d(t) - \Delta i_f(t)] + a_2 \Delta w(t) + a_3 \alpha(t) \\
+ a_4 r_s^e(t) + a_5 \sigma_t(t) + a_6 r_f(t-1) + a_7 r_s(t) \\
+ a_8 r_s(t-1) + a_9 v(t)
\end{equation}

$a_1, a_3, a_4, a_6, a_7 > 0; a_8, a_9 < 0; a_2, a_5 \geq 0$, which gives an equation for the forward rate.

Turning to the spot market, let us define $E_h(t)$ as the excess
demand for spot exchanges arising from the basic balance of payments deficiency that appears in the spot market. It is assumed that \( E_b(t) \) is determined by

\[
E_b(t) = E_b [r_s(t), \beta(t)] ; \quad \partial E_b / \partial r_s(t) \leq 0, \quad \partial E_b / \partial \beta(t) > 0
\]

where \( \beta(t) \) represents the factors affecting the basic balance of payments deficiency that always requires immediate payments. Also define \( G(t) \) as the net purchase of spot exchanges by the monetary authorities, and \( T \) as the maturity period of forward contracts. Since the forward contracts made at \( T \) periods ahead appear in the current spot market, the equilibrium condition of the spot market is given by

\[
E_b(t) + E_a(t-T) + E_c(t-T) + E_l(t-T)
= E_a(t) + G(t) + E_s(t-T) + V(t-T).
\]

In view of (2.60), the above equation can be simplified to

\[
E_b(t) - E_a(t) - E_s(t-T) = G(t).
\]

Substituting (2.61), (2.62) and (2.65) into (2.67) and solving the linearized equation for \( r_s(t) \), we obtain

\[
r_s(t) = b_0 + b_1 [\Delta_i(t) - \Delta_{i'}(t)] + b_2 \Delta w(t) + b_3 \beta(t)
+ b_4 r_s(t-T) + b_5 \sigma_l(t-T) + b_6 r_s(t-1) + b_7 r_l(t)
+ b_8 r_l(t-1) + b_9 G(t)
\]

\[(2.68)\]

\[b_3, b_6, b_7, > 0; b_1, b_4, b_8, b_9, < 0; b_2, b_5 \geq 0,\]

which gives an equation for the spot rate.
3. GENERAL COMMENTS ON THE ESTIMATED EQUATIONS

Based on our foregoing discussions we have estimated the structural equations for the Japanese international capital accounts as well as the reduced form equations for the yen-U.S. dollar exchange rates. The statistical results obtained by the method of ordinary least-squares are summarized in the following section. Needless to say, these equations are of the tentative nature and must be re-estimated by some method of structural estimation when the entire model is constructed. Because of the space limitation, we shall only comment on the general characteristics of our statistical results.

3.1. Short-term Capital Accounts

In the official publication of the Japanese balance of payments statistics, short-term capital transactions are entered in two places: one above the line, and the other below the line. The latter involves the short-term capital transactions by the authorized private foreign exchange banks, while the former contains those by the private non-banking sector. Separate data on net changes in assets and liabilities are given for the banking sector, but only net balance figures are available for the non-banking sector. We have therefore estimated four equations: three for the above categories and one for the total private sector.

In general each equation is estimated according to two different types of specification as were given by equations (2.58) and (2.59). In the latter specification, two alternative interest rate variables were tried: one is the ordinary interest differential and the other the interest differential divided by the domestic interest rate (see Model 3).

All the estimated equations give fairly satisfactory results.
Both the difference type and the stock adjustment type specifications exhibit almost comparable performance, although the former does slightly better (in terms of the standard error of estimate) in the banking-sector asset and the non-banking sector equations whereas the latter is superb a little in the other two equations. In the stock adjustment type specification, however, the normalized interest differential appears to give a substantially better result than the simple differential (see equations (4.2), (4.3) and (4.9), (4.10)).

Our statistical results suggest that the size of our foreign trade and the international interest differential are the two major determinants of the Japanese short-term capital transactions. Trade variables are highly significant in every equation, and similarly for the interest differential variables except one equation, the banking-sector asset equation. The last exception is not surprising, however, because in order to stimulate our exports the Bank of Japan has supplied credit to the foreign exchange banks against the purchase of export usance bill at a relatively low interest rate (4-5 per cent p.a.) until quite recently. Thus, a large part of our exports have been financed by the domestic banks (or, indirectly by the Bank of Japan) irrespective of the level of foreign interest rates.10

Another important factor is the policy adopted by the monetary authorities to regulate the short-term capital flows. In view of the rapid increase in the official foreign exchange reserves since the middle of 1968, the Bank of Japan has relaxed its control over the foreign exchange banks' exchange position and encouraged the so-called "yen-shift," which means a shift of borrowings from foreign to domestic sources.

---

10 In the past several months, however, the picture has become quite different because of the steep decline in the U.S. interest rates.
This has been attained by three steps: first, the exchange position control was relaxed in April, 1969; secondly, in September 1969 the authorities began the buying operation specifically with the foreign exchange banks to supply them the domestic currency funds with which the banks bought foreign exchanges from the Foreign Exchange Fund to repay their foreign short-term debt; and finally, in June, 1970 (the period not included in our sample) the Bank of Japan started to supply credit to support the import usance at terms equal to or more favorable than the U.S. BA rate.

The effects of such a series of institutional changes were dealt with by introducing a dummy variable to the constant term as well as to the coefficient of interest differential variable. It can be seen from our results that our international short-term liabilities have been reduced substantially, and that the interest sensitivity of short-term capital flows has been considerably increased.

Other events such as the U.S. foreign investment restraint program and the devaluation of pound sterling in 1967 also had some significant effects.

3.2. Long-term Capital Accounts

In the Japanese balance-of-payments table, the long-term capital transactions are divided into the following items:

<table>
<thead>
<tr>
<th>Long-term Capital</th>
<th>Long-term Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.1. Direct Investment*</td>
<td>L.1. Direct Investment*</td>
</tr>
<tr>
<td>A.2. Trade Credits*</td>
<td>L.2. Trade Credits</td>
</tr>
<tr>
<td>A.3. Loans*</td>
<td>L.3. Loans*</td>
</tr>
<tr>
<td>A.4. Securities</td>
<td>L.4. Securities*</td>
</tr>
<tr>
<td>A.5. Others</td>
<td>L.5. External Bond</td>
</tr>
<tr>
<td></td>
<td>L.6. Others.</td>
</tr>
</tbody>
</table>
Among these items A.4 is negligibly small due to the exchange control; A.5 consists largely of governmental transactions such as subscriptions and contributions to international organizations; L.2 is also negligibly small in recent several years; and L.6 consists mainly of repayments on GARIOA and EROA loans. We therefore fitted equations to the remaining seven items. However, only equations for six items (those carrying an asterisk in the above table) are reported in the following section, because we failed to obtain a satisfactory result for L.5, which includes government floatation of external bonds.

We first tried to estimate the following type of equation with a suitable choice of explanatory variables for each item. For the long-term asset transactions, for example, we fitted

\[
K = a_0 + a_1 \sum_i w_i^1(i_d - i_f)_{-i} + a_2 \sum_i w_i^2(Y_d/Y_f)_{-i} \\
+ a_3 \sum_i w_i^3(y_d)_{-i} + a_4 \sum_i w_i^4(y_f)_{-i} + a_5 W + a_6 K_{-1},
\]

\[a_1, a_2, a_3 < 0; a_4, a_5 > 0; 0 < a_6 < 1,\]

where \(K\) = outstanding long-term asset, \(i_d, i_f\) = domestic and foreign long-term interest rates, \(Y_d, Y_f\) = domestic and foreign activity variables, \(y_d, y_f\) = deviation from trend of the domestic and foreign activity variables, and \(W\) = a proxy for the wealth variable.

We used the long-term yields on industrial and governmental bonds for the \(i\)'s, the indices of industrial production for the \(Y\)'s, and the domestic fixed capital stock or the outstanding long-term borrowings of major business enterprises for \(W\). This attempt did not succeed, however. The equations reported in the following section are consequently nothing but a collection of ad hoc specifications. It is apparent that much more work is needed, but a general impression of the author is that a good knowledge of institutional arrangements and government policies is particularly important in this field.
3.3. Foreign Exchange Rates

We decided to estimate the exchange rate equations from the monthly data, because we expected that they would provide more accurate information on the lag-structures. In applying the specification described in Section 2.3, we assumed that the expected future spot rate is determined by

\[ r_s(t) = r_s(t), X(t), M(t), \text{qualitative variables} \]

where \( X(t) \) and \( M(t) \) represent the value of exports and imports in the future expected at time \( t \), respectively. The sign of \( \frac{\partial r_s(t)}{\partial r_s(t)} \)

depends on the elasticity of expectation, and

\[ \frac{\partial r_s}{\partial X(t)} < 0, \quad \frac{\partial r_s}{\partial M(t)} > 0. \]

The data on the export letters of credit received were used for \( X(t) \), those on the value of imports licensed for \( M(t) \). Both these data are supposed to indicate fairly well the actual value of exports and imports two or three months later, and the exchange dealers would certainly take them into consideration.

The estimated results are fairly satisfactory, except that the interest differential variable was not statistically significant in the forward rate equation.
4. ESTIMATED EQUATIONS

This section summarizes our statistical results concerning the Japanese short-term capital accounts, long-term capital accounts, and the foreign exchange rates. All equations have been estimated by the ordinary least-squares method. In some equations the Almon-technique of estimating the distributed lag weights is applied.

The sample period generally covers the years 1961 through 1969 and the first quarter of 1970, but it varies from one equation to another due to the data availability. Capital account equations were estimated from the quarterly data, while exchange rate equations were estimated from the monthly data.

In the following equations the variable on the left-hand side of "::" is the explained variable, and those on the right-hand side are explanatory variables. The sign preceding the variable name indicates the theoretically expected sign. The estimated coefficients are given below the variable name, the t-values further below in parentheses (or below the distributed lag weights in the case of Almon-lag estimation). RB2 denotes the coefficient of determination adjusted by the degree of freedom, SE the standard error of estimate, and DW the Durbin-Watson test statistic. The variable names are listed in Section 4.4 in an alphabetic order together with the data source.

The following operator will be used in the presentation below:

\((x)_{-i}\) : variable x lagged i period,
\((x)iD : i\)-period difference of the variable x, i.e.,
\((x)iD = x - (x)_{-i},
DFT(x): deviation from trend of the variable x, i.e.,
DFT(x) = x - \(\hat{x}\), where \(\hat{x} = \text{antilog}(a_0 + a_1Q1 + a_2Q2 + a_3Q3 + a_4t)\). The Q’s denote seasonal dummy variables, and t the time period.
4.1. Short-term Capital Accounts

4.1.1. Private Banking Sector

Liabilities

(4.1a) \( SCFBL: +\text{MBP+TRFP+ISSP})2D, \quad +(\text{RCU-RED1-FM1US})2D, \quad \pm (\text{FXS1US})1D, \)
\[
\begin{align*}
\text{0.92381} & \quad \text{30.481} & \quad -\text{61.424} \\
(8.49) & \quad (3.86) & \quad (3.60)
\end{align*}
\]
\[
-\text{QBJYS}, \quad -\text{QVRPS}, \quad +\text{QDVP}, \quad \pm \text{Q1}, \quad \pm \text{Q2}, \quad \pm \text{Q3}, \quad \text{const.}
\]
\[
-\text{176.8} & \quad -\text{203.2} & \quad 101.0 & \quad -\text{69.6} & \quad -\text{79.6} & \quad -\text{153.8} & \quad 140.6 \\
(3.83) & \quad (6.02) & \quad (2.45) & \quad (2.10) & \quad (1.92) & \quad (4.30)
\]
\[
\text{RB2} = 0.8183, \quad \text{SE} = 68.3, \quad \text{DW} = 2.12 \quad (1961.I-1970.I)
\]

(4.1b) \( SCKBL: +\text{MBP+TRFP+ISSP})2D, \quad +(\text{RCU-RED1-FM1US})2D, \quad \pm (\text{FXS1US})1D, \)
\[
\begin{align*}
\text{0.93157} & \quad \text{31.228} & \quad -\text{60.756} \\
(8.25) & \quad (3.75) & \quad (3.48)
\end{align*}
\]
\[
-\text{QBJYS}, \quad -\text{QVRPS}, \quad +\text{QDVP}, \quad \pm \text{Q1}, \quad \pm \text{Q2}, \quad \pm \text{Q3}, \\
-\text{183.3} & \quad -\text{212.2} & \quad 98.6 & \quad -\text{69.8} & \quad -\text{80.8} & \quad -\text{154.7} \\
(3.62) & \quad (4.90) & \quad (2.32) & \quad (2.07) & \quad (1.91) & \quad (4.24)
\]
\[
+(\text{SCKBL})_{-1}, \quad \text{const.}
\]
\[
\text{1.00657} & \quad \text{125.3} \\
(52.47)
\]
\[
\text{RB2} = 0.9954, \quad \text{SE} = 69.5, \quad \text{DW} = 2.15 \quad (1961.I-1970.I)
\]

(4.2a) \( SCFBL: +\text{MBP+TRFP+ISSP}), \quad +(\text{RCU-RED1}), \quad +(\text{RCU-RED1}) \cdot \text{QBJYS}, \)
\[
\begin{align*}
\text{0.92457} & \quad \text{43.357} & \quad \text{46.061} \\
(9.15) & \quad (5.56) & \quad (2.85)
\end{align*}
\]
\[
-\Sigma_{t=0}^{t} \text{QV}RPS_{t}, \quad \pm \text{Q2}, \quad \pm \text{Q3}, \quad -(\text{SCKBL})_{-1}, \quad \text{const.}
\]
\[
-\text{55.7} & \quad -\text{66.9} & \quad -\text{86.9} & \quad -\text{0.27606} & \quad -\text{763.9} \\
(5.93) & \quad (2.30) & \quad (2.85) & \quad (8.90)
\]
\[
\text{RB2} = 0.8132, \quad \text{SE} = 70.3, \quad \text{DW} = 1.25 \quad (1961.I-1969.IV)
\]

(4.2b) \( SCKBL: +\text{MBP+TRFP+ISSP}), \quad +(\text{RCU-RED1}), \quad +(\text{RCU-RED1}) \cdot \text{QBJYS}, \)
\[
\begin{align*}
\text{0.92457} & \quad \text{43.357} & \quad \text{46.061} \\
(9.15) & \quad (5.56) & \quad (2.85)
\end{align*}
\]
\[
-\Sigma_{t=0}^{t} \text{QV}RPS_{t}, \quad \pm \text{Q2}, \quad \pm \text{Q3}, \quad +(\text{SCKBL})_{-1}, \quad \text{const.}
\]
\[
-\text{55.7} & \quad -\text{66.9} & \quad -\text{86.9} & \quad \text{0.72394} & \quad -\text{763.9} \\
(5.93) & \quad (2.30) & \quad (2.85) & \quad (23.33)
\]
\[
\text{RB2} = 0.9951, \quad \text{SE} = 70.3, \quad \text{DW} = 1.25 \quad (1961.I-1969.IV)
\]
(4.3a) \[ \text{SCFBL: } +(MBP+TRFP+ISSP), +(RCU-RED1)/RCU, +(RCU-RED1) \]
\[
\begin{array}{ccc}
0.90072 & 415.504 & 264.101 \\
10.39 & 6.94 & 2.38 \\
\end{array}
\]
\[/(RCU) \cdot QBJYS, +\sum_{i=0}^{t} QVRPS_i, \ ±Q2, \ ±Q3, -(SCKBL)_{-1}, \]
\[\begin{array}{ccc}
-55.3 & -70.1 & -91.7 & -0.25220 \\
6.71 & 2.75 & 3.46 & 9.37 \\
\end{array}\]
\[\text{const.} \]
\[-794.6\]


(4.3b) \[ \text{SCKBL: } +(MBP+TRFP+ISSP), +(RCU-RED1)/RCU, +(RCU-RED1) \]
\[
\begin{array}{ccc}
0.90072 & 415.504 & 264.101 \\
10.39 & 6.94 & 2.38 \\
\end{array}
\]
\[/(RCU) \cdot QBJYS, +\sum_{i=0}^{t} QVRPS_i, \ ±Q2, \ ±Q3, +(SCKBL)_{-1}, \]
\[\begin{array}{ccc}
-55.3 & -70.1 & -91.7 & 0.74780 \\
6.71 & 2.75 & 3.46 & 27.77 \\
\end{array}\]
\[\text{const.} \]
\[-794.6\]

RB2 = 0.9963, SE = 61.3, DW = 1.41 (1961.I–1969.IV)

\section*{Assets}

(4.4a) \[ \text{SCFBA: } +(XBP+TRFR+ISSR)1D, +(OLBC)1D, +QBJYS, ±Q2, \]
\[
\begin{array}{ccc}
0.40727 & 0.01057 & 267.2 & -129.4 \\
6.74 & 1.18 & 5.42 & 3.62 \\
\end{array}
\]
\[±Q3, \ \text{const.} \]
\[-62.3 & 108.8 \\
1.89 \]

RB2 = 0.7883, SE = 74.4, DW = 1.75 (1961.I–1969.IV)

(4.4b) \[ \text{SCKBA: } +(XBP+TRFR+ISSR)1D, +(OLBC)1D, +QBJYS, ±Q2, \]
\[
\begin{array}{ccc}
0.40527 & 0.00946 & 254.2 & -126.5 \\
6.60 & 1.00 & 4.34 & 3.43 \\
\end{array}
\]
\[±Q3, +(SCKBA)_{-1}, \ \text{const.} \]
\[-60.4 & 1.00663 & 94.5 \\
1.79 & 64.83 \]

RB2 = 0.9957, SE = 75.4, DW = 1.76 (1961.I–1969.IV)
(4.5a) SCFBA: \(+\text{XBP} + \text{FRTR} + \text{ISSR}\), \(+\text{OLBC}, -\text{(SCKBA)}\)\(_{-1}\), const.
\[
\begin{array}{ccc}
0.34866 & 0.09716 & -0.41215 \\
(6.18) & (3.94) & (7.05)
\end{array}
\]
\[\text{RB2} = 0.7595, \text{SE} = 79.3, \text{DW} = 1.57 \ (1961.\text{I} - 1969.\text{IV})\]

(4.5b) SCKBA: \(+\text{XBP} + \text{TRFR} + \text{ISSR}\), \(+\text{OLBC}, +\text{(SCKBA)}\)\(_{-1}\), const.
\[
\begin{array}{ccc}
0.34866 & 0.09716 & 0.58785 \\
(6.18) & (3.94) & (10.06)
\end{array}
\]
\[\text{RB2} = 0.9953, \text{SE} = 79.3, \text{DW} = 1.57 \ (1961.\text{I} - 1969.\text{IV})\]

### 4.1.2. Private Non-Banking Sector

#### Net Liabilities

(4.6a) SCFNN: \(+\text{XCCMNE} + \text{XCCSH})1\text{D}, \ (+\text{MCCCO})2\text{D}, \ (+\text{RAL} - \text{RMUD})2\text{D},\]
\[
\begin{array}{ccc}
0.12515 & 0.62221 & 58.805 \\
(3.31) & (2.82) & (3.88)
\end{array}
\]
\[-\text{QBJYS}, +\text{QDVP}, \text{const.} \\
95.4 & 63.1 & 21.8 \\
(3.32) & (3.35)
\]
\[\text{RB2} = 0.5779, \text{SE} = 38.5, \text{DW} = 1.95 \ (1961.\text{I} - 1969.\text{IV})\]

(4.6b) SCKNN: \(+\text{XCCMNE} + \text{XCCSH})1\text{D}, \ (+\text{MCCCO})2\text{D}, \ (+\text{RAL} - \text{RMUD})2\text{D},\]
\[
\begin{array}{ccc}
0.12673 & 0.60441 & 61.213 \\
(3.28) & (2.63) & (3.64)
\end{array}
\]
\[-\text{QBJYS}, +\text{QDVP}, +\text{(SCKNN)}\)\(_{-1}\), const. \\
90.9 & 59.0 & 1.00988 \\
(2.85) & (2.66) & (36.46)
\]
\[\text{RB2} = 0.9889, \text{SE} = 39.1, \text{DW} = 1.96 \ (1961.\text{I} - 1969.\text{IV})\]

(4.7a) SCFNN: \(+\text{XCCMNE} + \text{XCCSH}), \ +\text{MCCCO}, \ (+\text{RAL} - \text{RMUD}), \ \pm\text{Q3},\]
\[
\begin{array}{ccc}
0.21340 & 1.20928 & 46.852 \\
(3.43) & (3.94) & (3.32)
\end{array}
\]
\[-\text{(SCKNN)}\)\(_{-1}\), \text{const.} \\
-0.23748 & -275.5 \\
(3.15)
\]
\[\text{RB2} = 0.4906, \text{SE} = 42.3, \text{DW} = 1.49 \ (1961.\text{I} - 1969.\text{IV})\]
(4.7b) SCKNN: +(XCCMNE+XCCSH), +MCCCO, +(RAL−RMUD), ±Q3,
\[
\begin{array}{cccc}
0.21340 & 1.20928 & 46.852 & 25.3 \\
(3.43) & (3.94) & (3.32) & (1.36)
\end{array}
\]
\[+(SCKNN)_{-1}, \text{ const.}\]
\[
\begin{array}{cc}
0.76252 & \ -275.5 \\
(10.13) &
\end{array}
\]
RB2 = 0.9870, SE = 42.3, DW = 1.49 (1961.I−1969.IV)

4.1.3. Private Sector Total

Net Liabilities

(4.8a) (SCFBL−SCFBA+SCFNN): −(XBP+TRFR+ISSR)1D, +(MBP+TRFP+ISSP)2D,
\[
\begin{array}{cccc}
-0.38071 & 0.62527 \\
(6.29) & (5.16)
\end{array}
\]
\[+(RCU−RED1)2D, +(RCU−RED1)2D \cdot QBJYS, −QBJYS,\]
\[
\begin{array}{cccc}
46.870 & 44.376 & -200.8 \\
(4.39) & (1.99) & (3.20)
\end{array}
\]
\[−QVRPS, +QDVP, ±Q3, \text{ const.}\]
\[
\begin{array}{cccc}
-129.9 & 112.4 & -111.1 & 75.5 \\
(3.36) & (2.10) & (3.17)
\end{array}
\]
RB2 = 0.8794, SE = 86.9, DW = 2.26 (1961.I−1970.I)

(4.8b) (SCKBL−SCKBA+SCKNN): −(XBP+TRFR+ISSR)1D, +(MBP+TRFP+ISSP)2D,
\[
\begin{array}{cccc}
-0.36730 & 0.58187 \\
(5.98) & (4.59)
\end{array}
\]
\[+(RCU−RED1)2D, +(RCU−RED1)2D \cdot QBJYS, −QBJYS,\]
\[
\begin{array}{cccc}
43.834 & 42.557 & -212.3 \\
(3.99) & (1.91) & (3.38)
\end{array}
\]
\[−QVRPS, +QDVP, ±Q3, +(SCKBL−SCKBA+SCKNN)_{-1}, \text{ const.}\]
\[
\begin{array}{cccc}
-114.9 & 130.5 & -110.3 \ 0.95655 & 133.5 \\
(2.82) & (2.34) & (3.16) & (24.58)
\end{array}
\]
RB2 = 0.9644, SE = 86.5, DW = 2.26 (1961.I−1970.I)
(4.9a) \[(SCFBL-SCFBA+SCFNN): -(XBP+TRFR+ISSR), +(MBP+TRFP+ISSP),\]
\[\begin{array}{ll}
&-0.53891 \\
&0.71296 \\
&676.9 \\
&(3.24) \\
&(4.46)
\end{array}\]
\[+(RCU-RED1), +(RCU-RED1) \cdot QBJYS, \pm OLBC,\]
\[\begin{array}{ll}
&29.014 \\
&181.044 \\
&0.16710 \\
&(2.49) \\
&(6.28)
\end{array}\]
\[-\sum_{i=0}^{t} QRYC_i, -(SCKBL-SCKBA+SCKNN)_{-1}, \text{ const.}\]
\[\begin{array}{ll}
&-61.9 \\
&0.38262 \\
&-676.9 \\
&(3.01) \\
&(7.49)
\end{array}\]

\[RB_2 = 0.8737, SE = 85.7, DW = 1.66 \quad (1961.I-1969.IV)\]

(4.9b) \[(SCFBL-SCFBA+SCFNN): -(XBP+TRFR+ISSR), +(MBP+TRFP+ISSP),\]
\[\begin{array}{ll}
&-0.53891 \\
&0.71296 \\
&676.9 \\
&(3.24) \\
&(4.46)
\end{array}\]
\[+(RCU-RED1), +(RCU-RED1) \cdot QBJYS, \pm OLBC,\]
\[\begin{array}{ll}
&29.014 \\
&181.044 \\
&0.16710 \\
&(2.49) \\
&(6.28)
\end{array}\]
\[-\sum_{i=0}^{t} QRYC_i, -(SCKBL-SCKBA+SCKNN)_{-1}, \text{ const.}\]
\[\begin{array}{ll}
&-61.9 \\
&0.61738 \\
&-676.9 \\
&(3.01) \\
&(12.08)
\end{array}\]

\[RB_2 = 0.9657, SE = 85.7, DW = 1.66 \quad (1961.I-1969.IV)\]

(4.10a) \[(SCFBL-SCFBA+SCFNN): -(XBP+TRFR+ISSR), +(MBP+TRFP+ISSP),\]
\[\begin{array}{ll}
&-0.36956 \\
&0.6235 \\
&72.6 \\
&(3.24) \\
&(7.46)
\end{array}\]
\[+(RCU-RED1)/RCU, +(RCU-RED1)/RCU \cdot QBJYS,\]
\[\begin{array}{ll}
&359.331 \\
&1002.147 \\
&(3.43) \\
&(4.62)
\end{array}\]
\[\pm OLBC, -\sum_{i=0}^{t} QRYC_i, \pm Q1, -(SCKBL-SCKBA+SCKNN)_{-1},\]
\[\begin{array}{ll}
&0.12017 \\
&-72.6 \\
&96.7 \\
&(3.01) \\
&(3.64)
\end{array}\]
\[\begin{array}{ll}
&-0.34022 \\
&262.3 \\
&(2.44) \\
&(7.46)
\end{array}\]
\[\text{const.}\]
\[-682.3\]

\[RB_2 = 0.8935, SE = 78.7, DW = 1.94 \quad (1961.I-1969.IV)\]
\[(4.10b) \quad (SCKBL - SCKBA + SCKNN) = -(XBP + TRFR + ISSR), \quad +(MBP + TRFP + ISSP), \quad -0.36956 \quad 0.62235 \quad (4.08) \quad (8.04) \]
\[\quad +\frac{(RCU - RED1)}{RCU}, \quad +\left(\frac{(RCU - RED1)}{RCU}\right) \cdot QB\text{JYS}, \quad 359.331 \quad 1002.147 \quad (3.43) \quad (4.62) \]
\[\pm \text{OLBC}, \quad -\sum_{i=0}^{t} QRYC_i, \quad \pm Q1, \quad +(SCKBL - SCKBA + SCKNN)_{-1}, \quad 0.12017 \quad -72.6 \quad 96.7 \quad 0.65978 \quad (3.24) \quad (3.64) \quad (2.44) \quad (14.47) \]
const.
\[-682.3 \]
\[\text{RB2} = 0.9711, \quad \text{SE} = 78.7, \quad \text{DW} = 1.94 \quad (1961.I - 1969.IV) \]
4.2. Long-term Capital Accounts

4.2.1. Direct Investment

Liabilities

\[(4.11) \quad \text{LCKDL: } -\sum_{i=3}^{8} w_i \text{DFT(OA5)}_{-i}, +\text{QLR63}, -\text{QFIR1}, +(\text{LCKDL})_{-1}, \text{ Const.} \]

\[
\begin{array}{cccccc}
   & & \text{Coefficients} & \text{S.E.} & \text{D.W.} \\
   i & w_i & 3 & 4 & 5 & 6 \\
   & & (0.065) & (0.127) & (0.180) & (0.214) \\
\end{array} \\
\begin{array}{ccccccc}
   & & \text{Coefficients} & \text{S.E.} & \text{D.W.} \\
   & & (2.1) & (3.4) & (4.2) & (3.3) & (2.5) \\
\end{array} \\
\]

\[\text{RB2 = 0.9985, SE = 6.2, DW = 2.02} \quad (1963.I-1969.IV)\]

Assets

\[(4.12) \quad \text{LCFDA: } -\text{DFT(XCCA3)}, +\text{KP}, +\text{QEFTC}, \pm \text{Q1}, \pm \text{Q2}, \pm \text{Q3}, -89.837 \quad 0.0013030 \quad 62.8 \quad -8.8 \quad -7.4 \quad -11.4 \]

\[
\begin{array}{cccccc}
   & & \text{Coefficients} & \text{S.E.} & \text{D.W.} \\
   i & w_i & 3 & 4 & 5 & 6 \\
   & & (2.26) & (5.76) & (6.51) & (1.64) \\
\end{array} \\
\begin{array}{ccccccc}
   & & \text{Coefficients} & \text{S.E.} & \text{D.W.} \\
   & & (1.38) & (2.11) & (5.68) \\
\end{array} \\
\]

\[\text{RB2 = 0.7709, SE = 11.1, DW = 1.65} \quad (1961.I-1970.I)\]

4.2.2. Long-term Trade Credits

Assets

\[(4.13) \quad \text{LCFTAD: } +(\text{XCCMNE}+\text{XCCSH}), -\text{QXCCSH}, \text{ Const.} \]

\[
\begin{array}{cccc}
   & & \text{Coefficients} & \text{S.E.} \\
   & w_i & 6 & 7 \\
   & & (0.49245) & (32.60) \\
\end{array} \\
\begin{array}{cccc}
   & & \text{Coefficients} & \text{S.E.} \\
   & w_i & 8 & 9 \\
   & & -358.3 & (17.44) \\
\end{array} \\
\]

\[\text{RB2 = 0.9669, SE = 18.4, DW = 1.62} \quad (1961.I-1970.I)\]

\[(4.14) \quad \text{LCFTAC: } +\sum_{i=6}^{24} w_i (\text{LCFTAD})_{-i}, \pm \text{Q2}, \text{ Const.} \]

\[
\begin{array}{cccccccc}
   & & \text{Coefficients} & \text{S.E.} & \text{D.W.} \\
   i & w_i & 6 & 7 & 8 & 9 & 10 & 11 & 12 \\
   & & (0.007) & (0.014) & (0.022) & (0.030) & (0.038) & (0.046) & (0.054) \\
\end{array} \\
\begin{array}{ccccccc}
   & & \text{Coefficients} & \text{S.E.} & \text{D.W.} \\
   i & w_i & 13 & 14 & 15 & 16 & 17 & 18 & 19 \\
   & & (0.060) & (0.066) & (0.071) & (0.075) & (0.047) & (0.078) & (0.076) \\
\end{array} \\
\]

\[
\begin{array}{cccccc}
   & & \text{Coefficients} & \text{S.E.} & \text{D.W.} \\
   & w_i & 18 & 19 & 20 & 21 \\
   & & (4.7) & (3.7) & (3.0) \\
\end{array} \\
\]
4.2.3. Long-term Loans

Liabilities

\[ (4.15) \quad \text{LCKLL: } \sum_{i=1}^{6} w_i^1 DFT(O)_{-i}, \quad -\sum_{i=1}^{8} w_i^2 DFT(OA5)_{-i}, \quad +\text{(LCKLL)}_{-i}, \]
\[ 459.94 \quad -3551.9 \quad 0.98103 \]
\[ \text{const.} \quad 76.7 \]

\[ i \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \]
\[ w_i^1 \quad 0.080 \quad 0.144 \quad 0.189 \quad 0.210 \quad 0.206 \quad 0.171 \]
\[ (0.9) \quad (1.3) \quad (2.2) \quad (3.3) \quad (2.3) \quad (1.5) \]

\[ i \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8 \]
\[ w_i^2 \quad 0.069 \quad 0.118 \quad 0.148 \quad 0.160 \quad 0.158 \quad 0.144 \quad 0.118 \quad 0.085 \]
\[ (4.1) \quad (5.2) \quad (6.9) \quad (8.1) \quad (6.6) \quad (4.5) \quad (3.1) \quad (2.3) \]


Assets

\[ (4.16) \quad \text{LCKLA: } +\text{GNPN}, \quad +\text{GFE1}, \quad \pm Q1, \quad \pm Q2, \quad \pm Q3, \quad \text{const.} \]
\[ 0.08511 \quad 0.19942 \quad 204.9 \quad 195.9 \quad 198.9 \quad -938.9 \]
\[ (15.08) \quad (4.93) \quad (5.79) \quad (5.62) \quad (5.75) \]

RB2 = 0.9672, SE = 72.2, DW = 1.21 (1962.I–1970.I)

\[ (4.17) \quad \text{LCKLA/GNPN: } \sum_{i=0}^{5} w_i (\text{LCKTA/GNPN})_{-i}, \quad +\left\{1/2\right\} \sum_{i=2}^{3} (\text{GFE2})_{-i}, \]
\[ 0.19799 \quad 0.000009400 \]
\[ (3.34) \]

\[ \pm Q1, \quad \pm Q2, \quad \pm Q3, \quad +\text{(LCKLA/GNPN)}_{-4}, \quad \text{const.} \]
\[ 0.004897 \quad 0.003446 \quad 0.003224 \quad 0.71227 \quad -0.03291 \]
\[ (3.56) \quad (2.64) \quad (2.50) \quad (7.34) \]

\[ i \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad 5 \]
\[ w_i \quad 0.156 \quad 0.226 \quad 0.232 \quad 0.193 \quad 0.130 \quad 0.063 \]
\[ (1.5) \quad (2.0) \quad (3.1) \quad (4.4) \quad (1.3) \quad (0.5) \]

RB2 = 0.9907, SE = 0.002302, DW = 1.83 (1962.I–1970.I)
4.2.4. Security Investment

Liabilities

\[
(4.18) \quad \text{LCKSL:} \quad +LTBO, \quad \sum_{i=0}^{18} w_i (QFIR)_{-i}, \quad +\text{LCKSL}_{-1}, \quad \text{const.}
\]

\[
\begin{array}{ccccccc}
0.0012579 & 16.7314 & 0.97322 & -22.8 \\
(0.7) & (13.75) & \\
\end{array}
\]

\[
\begin{array}{ccccccc}
i & 0 & 1 & 2 & 3 & 4 & 5 \\
w_i & -0.044 & -0.072 & -0.086 & -0.088 & -0.079 & -0.061 \\
(2.7) & (2.6) & (2.5) & (2.3) & (2.1) & (1.8) \\
\end{array}
\]

\[
\begin{array}{ccccccc}
i & 6 & 7 & 8 & 9 & 10 & 11 \\
w_i & -0.036 & -0.007 & 0.026 & 0.060 & 0.093 & 0.125 \\
(1.2) & (0.3) & (1.4) & (3.9) & (5.2) & (5.2) \\
\end{array}
\]

\[
\begin{array}{ccccccc}
i & 12 & 13 & 14 & 15 & 16 & 17 \\
w_i & 0.152 & 0.173 & 0.186 & 0.190 & 0.182 & 0.161 \\
(4.9) & (4.7) & (4.5) & (4.3) & (4.2) & (4.1) \\
\end{array}
\]

\[
\begin{array}{ccccccc}
i & 18 \\
w_i & 0.125 \\
(4.1) \\
\end{array}
\]

\[\text{RB2} = 0.9901, \text{ SE} = 30.6, \text{ DW} = 2.39 \quad (1962.1—1970.1)\]

4.3. Foreign Exchange Rates

4.3.1. Forward Exchange Rate

\[
(4.19) \quad \text{FXFUS:} \quad -\sum_{i=0}^{3} w_i^1 (XLC)_{-i}, \quad +\sum_{i=0}^{3} w_i^2 (MIS)_{-i}, \quad +\text{FXSUS},
\]

\[
\begin{array}{cccc}
-0.0012390 & 0.00077761 & 0.45091 \\
(9.59) & \\
\end{array}
\]

\[
\begin{array}{cccc}
-(\text{FXSUS})_{-1}, \quad +(\text{FXFUS})_{-1}, \quad \text{const.} \\
-0.31192 & 0.81974 & 15.15 \\
(5.41) & (16.79) & \\
\end{array}
\]

\[
\begin{array}{cccc}
i & 0 & 1 & 2 \\
w_i^1 & 0.350 & 0.384 & 0.234 \\
(1.1) & (1.8) & (1.4) & (0.1) \\
\end{array}
\]

\[
\begin{array}{cccc}
i & 0 & 1 & 2 \\
w_i^2 & 0.264 & 0.329 & 0.265 \\
(1.4) & (2.0) & (1.9) & (0.6) \\
\end{array}
\]

\[\text{RB2} = 0.9775, \text{ SE} = 0.25, \quad \text{DW} = 1.97 \quad (\text{Jan. 1961—Mar. 1970})\]
4.3.2. Spot Exchange Rate

\[(4.20)\]

\[
FXS1US: -\sum_{i=1}^{4} w_i^1 (XCC)_{-i}, +\sum_{i=1}^{4} w_i^2 (MCC)_{-i}, -\sum_{i=4}^{10} w_i^3
\]

\[
-0.0019884 \quad 0.0021093
\]

\[
\cdot [(RCO)1D - (RBA1)1D]_{-i}, \quad -\sum_{i=4}^{10} w_i^4 [(RCO)1D - (RBA1)1D]
\]

\[
-0.57725 \quad -625.660
\]

\[
\cdot [QBJS]_{-i}, +XF1US, -(FXF1US)_{-i}, -(GFE2)1D,
\]

\[
0.91954 \quad -0.71038 \quad -0.0012152
\]

\[
(8.22) \quad (5.86) \quad (1.89)
\]

\[-QWB, +FXS1US, \text{ Const.}
\]

\[-0.25 \quad 0.69363 \quad 34.93
\]

\[(2.14) \quad (10.82)
\]

\[
i \quad w_i^1  \\
&1 \quad 0.125 \quad 0.240 \quad 0.315 \quad 0.321
\]

\[
(0.9) \quad (1.8) \quad (2.7) \quad (1.8)
\]

\[
i \quad w_i^2  \\
&1 \quad 0.150 \quad 0.256 \quad 0.306 \quad 0.288
\]

\[
(0.6) \quad (1.4) \quad (2.2) \quad (0.9)
\]

\[
i \quad w_i^3  \\
&1 \quad 0.023 \quad 0.066 \quad 0.119 \quad 0.169 \quad 0.207 \quad 0.219 \quad 0.197
\]

\[
(0.5) \quad (1.0) \quad (1.9) \quad (3.1) \quad (3.7) \quad (3.4) \quad (2.9)
\]

\[
i \quad w_i^4  \\
&1 \quad -0.026 \quad 0.006 \quad 0.076 \quad 0.160 \quad 0.235 \quad 0.279 \quad 0.270
\]

\[
(1.4) \quad (0.3) \quad (1.0) \quad (1.1) \quad (1.2) \quad (1.2) \quad (1.2)
\]

\[
RB2 = 0.9524, SE = 0.35, DW = 1.62 \quad \text{(Jan. 1961–Mar. 1970)}
\]
4.4. List of Variables and Sources of Data

The following abbreviations will be used for data sources.

BPM Foreign Department, The Bank of Japan, *Balance of Payments Monthly*

BTW Bank of Tokyo, *Tohgin Shuho* (Bank of Tokyo Weekly)

ESA Statistical Department, The Bank of Japan, *Economic Statistics Annual*

ESM Ditto, *Economic Statistics Monthly*

FESA Ditto, *Gaikoku Keizai Tokei Nempo* (Foreign Economic Statistics Annual)

IFS International Monetary Fund, *International Financial Statistics*

MEI OECD, *Main Economic Indicators*

SRTJ Customs Department, Ministry of Finance, *The Summary Report: Trade of Japan*

FM1US forward margin, U.S. dollar; % p.a.; $\frac{(\text{FXF1US} - \text{FXS1US})}{\text{FXS1US}} \cdot \left(\frac{365}{90}\right) \cdot 100$

FXF1US forward exchange rate, U.S. dollar, 3 months; yen per U.S. dollar: BTW

FXS1US spot exchange rate, U.S. dollar, T.T. selling; yen per U.S. dollar: BTW

GFE1 official gold and foreign exchange reserves including the gold tranche position; million dollars: ESA and IFS

GFE2 the same as above but excluding the gold tranche position


ISSP payments of insurance on international shipments; million dollars: BPM

ISSR receipts of insurance on international shipments; million dollars: BPM

KP gross capital stock of the private sector; billion yen; Division of National Income Statistics, Economic Planning Agency
LCFDA  net increase in foreign long-term assets, direct investment; million dollars; BPM
LCFDL  net increase in foreign long-term liabilities, direct investment; million dollars; BPM
LCFLA  net increase in foreign long-term assets, loans; million dollars; BPM
LCFLL  net increase in foreign long-term liabilities, loans; million dollars; BPM
LCFSL  net increase in foreign long-term liabilities, security investment; million dollars; BPM
LCFTAC net increase in foreign long-term assets, trade credit collected; million dollars; BPM
LCFTAD net increase in foreign long-term assets, trade credit granted; million dollars; BPM
LCKDA  foreign long-term assets outstanding, direct investment; million dollars; = LCFDA + (LCKDA)\(_{-1}\), LCKDA (end of 1967) = 866
LCKDL  foreign long-term liabilities outstanding, direct investment; million dollars; = LCFDL + (LCKDL)\(_{-1}\), LCKDL (end of 1967) = 598
LCKLA  foreign long-term assets outstanding, loans; million dollars; = LCFLA + (LCKLA)\(_{-1}\), LCKLA (end of 1967) = 655
LCKLL  foreign long-term liabilities outstanding, loans; million dollars; = LCFLL + (LCKLL)\(_{-1}\), LCKLL (end of 1967) = 1,925
LCKSL  foreign long-term liabilities outstanding, security investment; million dollars; = LCFSL + (LCKSL)\(_{-1}\), LCKSL (end of 1967) = 275
LTBO  long-term borrowings outstanding by major business enterprises; 100 million yen; ESA
MBP  value of commodity imports, balance of payments basis; million dollars; BPM
MCC  value of commodity imports, customs clearance basis; million dollars; BPM
MCCCO value of imports of crude oil, customs clearance basis; million dollars; SRTJ
MLS  value of imports licensed; million dollars; ESA
O  index of industrial production; 1963 average = 100; MEI
OA5  index of industrial production, simple average of five countries (U.S., U.K., Germany, France, and Netherlands); 1963 average = 100: MEI

OLBC  outstanding loans by city banks (excluding loans to small businesses); 100 million yen: ESA

QBJYS  dummy variable representing the policy of the Bank of Japan to encourage the "yen-shift", i.e., a substitution of domestic debt for the foreign borrowings by the foreign exchange banks: 1 for the quarters 1969.II to date and 0 otherwise.

QDVP  dummy variable representing the lack of confidence in the value of pound sterling before and after the devaluation in 1967; 1 for the quarters 1967.II-1968.II and 0 otherwise.

QEFTC  dummy variable representing an abnormal concentration of direct investment by foreign trading firms to expand the foreign subsidiaries; 1 for the quarter 1968.IV and 0 otherwise.

QFIR  dummy variable representing the U.S. policy to restraint foreign investments; 1 for the quarters 1963.III to date and 0 otherwise.

QFIR1  dummy variable representing the relaxation of inter-regional regulation of direct investment in the U.S. foreign investment restraint program; 1 for the quarter 1969.II and 0 otherwise.

QLR63  dummy variable representing the liberalization of remittance of principal and interests of stock investment by foreigners; 1 for the quarter 1963.II and 0 otherwise.

QRYC  dummy variable representing the regulation of foreign exchange banks' exchange position by the Bank of Japan to control the short-term capital inflow; 1 for the quarters 1968.I to date and 0 otherwise.


QWB  dummy variable representing an expectation of the widening of support points from 0.5 to 0.75 per cent of the parity, which was effected in April, 1963; 1 for the months May, 1961-March, 1963 and 0 otherwise.

QXCCSH  dummy variable representing an abnormal expansion of exports of ships which induced a sharp increase in short-term capital outflow rather than an increase in long-term trade credit; 1 for the quarter 1968.IV and 0 otherwise.
Q1,Q2,Q3 quarterly dummy variables

**RAL** average interest rate on loans of all banks; % p.a.; ESA

**RBA** U.S. bankers' acceptance rate, 90 days; % p.a.; FESA

**RBA1** the same as above, adjusted; = (RBA + 1.5) \cdot 10/9

**RED** Euro-dollar deposit rate, London, 3 months; % p.a.; Paul Einzig, *The Euro-Dollar System* and *Financial Times*

**RED1** the same as above, adjusted; = RED \cdot 10/9

**RCO** call rate, Tokyo, over month; % p.a.; ESA

**RCU** call rate, Tokyo, unconditional; % p.a.; ESA

**RMUD** import usance rate, U.S. dollar; % p.a.; Research Department, The Bank of Japan, *Chosa Geppo* (Monthly Bulletin)

**SCFBA** net increase in foreign short-term assets, banking sector; million dollars; BPM

**SCFBL** net increase in foreign short-term liabilities, banking sector; million dollars; BPM

**SCFNN** net increase in foreign short-term net liabilities, non-banking sector; million dollars; BPM

**SCKBA** foreign short-term assets outstanding, banking sector; million dollars; = SCFBA + (SCKBA)_{-1}, SCKBA(end of 1967) = 3,105

**SCKBL** foreign short-term liabilities outstanding, banking sector; million dollars; = SCFBL + (SCKBL)_{-1}, SCKBL(end of 1967) = 4,133

**SCKNN** net foreign short-term liabilities outstanding, non-banking sector; million dollars; = SCFNN + (SCKNN)_{-1}, SCKNN(end of 1967) = 1,019

**TRFP** payments of freight; million dollars; BPM

**TRFR** receipts of freight; million dollars; BPM

**XBP** value of commodity exports, balance of payments basis; million dollars; BPM

**XCC** value of commodity exports, customs clearance basis; million dollars; BPM

**XCCA3** average of the value of commodity exports (customs clearance basis) to three regions (U.S., South-East Asia, and Central and South America); million dollars; BPM

**XCCMNE** value of exports of non-electric machinery, customs clearance
basis; million dollars; SRTJ

XCCSH  value of exports of ships, customs clearance basis; million dollars; SRTJ

XLC  export letters of credit received; million dollars; ESA
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