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The impact of short-term capital flows and balance of payments fluctuations on monetary policy: an empirical study of Japa

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I. INTRODUCTION

In a world of increasing capital mobility between financial markets of industrial nations, the impact of short-term capital flows on a country's balance of payments is of increasing importance. The growth of the international financial markets in the 1960's helped to improve the global allocation of capital funds and productive resources while at the same time exposing individual nations to massive international short-term capital flows and balance of payments disturbances.

In a number of European countries, particularly Germany, the mobility and movement of international short-term capital has been such as to have considerable offsetting impacts on domestic monetary policy actions. This has adversely affected efforts to pursue an independent monetary policy and reduced the effectiveness of policy actions to achieve economic targets. Alternatively in Japan, the postwar reconstruction era had prompted policymakers to take actions to protect its international financial position and domestic monetary policies. It has been the belief that restraining short-term capital flows through extensive controls would permit Japanese authorities to effectively use monetary policy to attain desired targets. Only during the 1960's have these controls been eased as the Japanese economy has established itself in the world economy.

International short-term capital flows are generated from the movement into and out of a country of financial assets consisting of currency, demand and time deposits with commercial banks, short-term

government securities and similar financial obligations with less than one year maturity. Participants in the market for short-term capital include large commercial banks, industrial corporations, financial institutions, central banks and government agencies. Flows of short-term capital may be the result of speculative forces induced by opportunities for interest arbitrage, related to international trade financing requirements, or the result of central bank activities to achieve internal and external balance in terms of money stock control and balance of payments adjustments.

The basic theoretical approach to explain short-term capital flows has centered around explaining such movements as the result of stock adjustments in a portfolio of international assets. Factors that could impact on a portfolio are foreign and domestic interest rates, the flow of goods and services, i.e. trade balance and GNP, and the domestic monetary policies of the country. Empirical studies have revolved around explaining capital flows from a reduced form equation of an asset portfolio model.

This study attempts to explain international short-term capital flows affecting Japan during the period from 1961 to 1971 when the yen was pegged to the dollar at ¥ 360/$. The experience in a number of industrial countries has shown that capital flows to a large extent offset the intended effects of domestic monetary policy actions. As a result monetary policy becomes ineffective for purposes of domestic stabilization policy. In Japan foreign exchange and trade controls

plus restrictions on capital flows have been used extensively with the intent of affecting all market activities likely to adversely influence the balance of payments or add to the international indebtedness position. In particular, special controls have been directed toward influencing the direction and magnitude of short-term capital flows to offset fluctuations in the basic balance, thereby minimizing disturbances in the overall balance of payments and permitting the authorities to conduct a more independent monetary policy. The 1960's experienced gradual liberalizations of these controls in conjunction with Japan's membership in the Organization for Economic Cooperation and Development (OECD). However, in actuality, it appears the government has simply modified exchange controls to meet the changing needs of Japan's international economic position without really dismantling the controls themselves.

The primary objective of this study is to examine empirically the interrelationship between monetary policy, short-term capital flows, and the basic balance of payments for Japan during the period from 1961 to 1971. Specific objectives are to determine 1) the extent to which short-term capital flows offset monetary policy actions and result in feedback effects; 2) the direction of impact between monetary policy actions and the basic balance of payments and the indirect effect on short-term capital flows; and, 3) the length of the adjustment process of the short-term capital account to exogenous shocks in the system.

To achieve these objectives, this study will employ a portfolio general equilibrium model (Kouri and Porter, 1974) to test empirically

the determinants of capital movements in Japan. The portfolio general equilibrium approach to study international capital flows is a synthesis of the stock equilibrium or adjustment model (Branson, 1968) and the monetary approach to the balance of payments theory (Mundell, 1968 and Johnson, 1972). This framework views capital flows, in the context of the overall balance of payments, as the mechanism through which excess demand for money is removed. The model is constrained to a portfolio of three assets, money, domestic, and foreign bonds, and defines short-term capital flows as the change in domestic holdings of foreign bonds minus the change in foreign holdings of domestic bonds. Solving for a reduced form equation determining short-term capital flows provides important explanatory variables such as: the basic balance, changes in income, changes in the domestic monetary instrument, changes in the foreign interest rate, and changes in the money supply resulting from movements in the money multiplier. This approach is particularly advantageous for policy purposes. It permits direct measurement of the offsetting impact on monetary policy by capital flows and the extent to which the basic balance is offset by the short-term capital account. In addition, to better assess possible feedback effects where short-term capital flows affect monetary policy a basic reaction function is added and the two equations are estimated by a two-stage least squares process. Based on preliminary indications of a close link between monetary policy actions and the basic balance, a test is performed to determine the direction of

causation between the basic balance of payments and the monetary policy instrument.

This framework provides the basis to assess the interrelationship between monetary policy, short-term capital flows and the basic balance of payments. In addition, it will permit a determination of the adequacy of the portfolio balance approach to explain short-term capital flows in a rapidly growing economic environment in which financial market forces are constrained by extensive controls on movements of international financial assets. The basic format of the study is presented as follows. Chapter Two provides a brief survey that will trace the development of the empirical analysis of short-term capital flows. In Chapter Three, the Japanese economy and its institutional framework are discussed to clarify and better establish probable forces affecting Japan's short-term international capital flows. The model and methdology to analyze short-term capital flows are presented in Chapter Four. Finally, the empirical results are represented and interpreted in Chapter Five.

II. LITERATURE REVIEW

There has been significant progress in the theoretical and empirical analysis of short-term capital movements in recent years. Attention has been directed toward the role of short-term capital flows in the balance of payments adjustment process and the impact of capital mobility on the monetary and fiscal policies of industrial countries. This reflects the experience of industrial countries dealing with increased short-term capital mobility and movements. Recent developments in monetary theory and the use of econometric techniques have allowed for a more systematic quantitative analysis of the determinants of short-term capital flows. A brief survey will trace the empirical analysis of short-term capital flows from the classical approach to portfolio selection and the general equilibrium models of portfolio balance.

A. Classical Approach

Early attempts to investigate empirically the determinants of short-term capital flows relate to the question of stock versus flow effects of different (foreign and domestic) interest rates. The concern is whether short-term capital movements respond to absolute interest rate differentials (continuous flow) or to changes in the interest rate differential (stock shift). Studies by Rhomberg (1960, 1964), Kennen (1963) and Black (1968) follow a classical view that arbitrager's activities generate flows of financial assets when the differences in

interest rates exceed the international differences in risk. Implicit in this view is the fact that if monetary authorities could maintain a favorable interest rate differential, short-term capital inflows could be used to finance a continuing deficit in the basic balance of payments. Experiences of speculative capital flows during unsettled periods of the gold exchange standard in the 1920's and severe balance of payments crises resulting from the world depression in the 1930's has led to major concern about whether short-term capital flows could be used as an instrument in the adjustment process.

An alternative view developed by Bell (1962) explains capital movements as resulting from changes in the international interest rate differential. For a given interest rate differential, investors would be willing to hold a stock of domestic and foreign assets and would alter the stock of assets only if the interest rate differential is disturbed. This approach follows the fundamental thinking of the Tobin (1958, 1965) and Markowitz (1959) theory of portfolio selection. Grubel (1966, 1968) and Willett (1967) suggest that the international distribution of assets and resultant flows of capital could be explained by a portfolio selection theory. Essentially a given asset distribution will be determined by a set of interest rates that reflect investors' expected rates of return and risk elements in such a way that their aggregate utility function is maximized. Disturbances in interest rates and the degree of risk will result in international movements of capital until equilibrium is re-established with a new distribution of assets in the world market.

B. Portfolio Selection

The theory of portfolio selection in light of Tobin (1958, 1965) and Markowitz (1959) provides a framework to explain the international movement of capital. Empirical studies using the stock adjustment model first developed by Branson (1968) attempt to explain the allocation of financial wealth between domestic and foreign assets in the U.S. economy. Branson's approach is consistent with the portfolio selection approach in that a stock adjustment model relates a set of independent variables to holdings of short-term foreign assets. The basic model to be tested postulates that the proportion of foreign assets (C) to the stock of wealth (W) is a function of a set of interest rates, foreign and domestic (R^f and R), the flow of exports (X), a risk component (E), and the stock of wealth (W):

$$C = F(R, R^f, X, E, W)W. \tag{1}$$

By taking first differences an equation is derived explaining the flow of foreign capital:

$$\Delta C = F(R, R^f, E, W)\Delta W + F_R W\Delta R + F_R fW\Delta R^f + F_X W\Delta X + F_E W\Delta E + F_W W\Delta W + \mu. \tag{2}$$

The explanatory components in the model reflect the "continuing flow effect" and the "stock shift effect" of portfolio adjustment of foreign assets. The "continuing flow effect" shows the impact on foreign capital flows resulting from portfolio growth, i.e. $F(R, R^f, W, E) \cdot \Delta W$.

In contrast the "stock shift effect" indicates, for a given portfolio stock, the impact on foreign capital flows as portfolios adjust to changes in interest rates, exports, risk and wealth composition (the remaining components of equation 2). However, with the absence of adequate wealth measures, the model is reduced to a stock-adjustment model in terms of changes in interest rates and risk factors:

$$\Delta C = \alpha_0 + \alpha_1 \Delta R + \alpha_2 \Delta R^f + \alpha_3 \Delta X + \alpha_4 \Delta E + \mu. \tag{3}$$

The basic form, with various dummy variables used to reflect risk factors, is used to explain net movements of foreign asset holdings.

In a similar manner, an equation is derived to explain the change in short-term liabilities abroad (ΔL) as a function of changes in foreign and domestic interest rates (ΔR^f, ΔR), change in imports (ΔM) and risk factors (ΔE):

$$\Delta L = \beta_0 + \beta_1 \Delta R + \beta_2 \Delta R^f + \beta_3 \Delta M + \beta_4 \Delta E + \mu. \tag{4}$$

The model tested in the U.S. over the period from 1959 through 1964 provides interesting results. A $100 million increase in the quarterly flow of exports leads to an increase of $94 million in short-term capital outflows (increase in foreign assets) over two quarters. A one percent increase in the domestic interest rate (measured by U.S. bill rate) decreases the holdings of foreign assets by $468 million over two quarters. The increase in foreign interest rates increases foreign asset holdings by $169 million over one quarter attributable

to a one percent increase in the U.K. bill rate and $297 million over two quarters resulting from a percentage increase in the Canadian bill rate. The coefficients are all statistically significant and have the expected sign, yet provide only 58 percent of the explanatory power.

The results for the equation to explain changes in short-term liabilities abroad indicate that a $100 million increase in imports leads to a $72 million increase in liabilities abroad in the subsequent quarter. A one percent increase in the U.S. treasury bill rate results in a $260 million increase in liabilities to foreign entities over two quarters. A similar increase in the Canadian bill rate reduces foreign liability holdings by $230 million in one quarter. All coefficients are statistically significant and have the expected sign. While these variables provide 78 percent of the explanatory power the equation suffers from serial correlation thus suggesting an inappropriate specification of the model.

A number of problems exist in Branson's empirical study. First, the econometric problem of simultaneous-equation bias results when movements of capital affect the domestic interest rate. Second, when domestic and foreign bonds become perfect substitutes, the domestic interest rate identically equals the foreign interest rates. Thus, no changes in relative yields occur to explain capital movements. For the case of near perfect capital markets as well as perfect capital markets, empirical estimation of capital flows will result

in multicollinearity when foreign and domestic interest rates are included as independent variables. A third concern in the Branson analysis relates to the model's inability to analyze a number of macroeconomic issues. The effects of income changes, the influence of domestic monetary policies, and changes in investment and savings can have a substantial impact on capital movements. In addition, by making the domestic interest rate exogenous, it implicitly becomes an instrument of monetary policy that results in complete sterilization of the liquidity effects of capital flows.[1]

Further empirical work in line with portfolio selection is developed by Lee (1969), Bryant and Hendershott (1970, 1972), Branson and Hill (1971), Branson and Willett (1972) and Miller and Whitman (1972). These studies consider the estimation of U.S. short-term capital movements.[2] The major contribution here to Branson's 1968 approach involves the use of wealth as a constraint and scale variable in the regression analysis and the inclusion of lag adjustments. In this framework attempts are made to measure separately the effect of interest rate changes on the stock adjustment and continuing flow

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[1]A net capital inflow could be expected to have a depressing effect on the domestic interest rate. To maintain the level of domestic interest rates, the monetary authorities must be reducing the domestic component of the money supply through the issuance of bonds (thus holding private wealth constant). This has the effect of sterilizing the liquidity effect of capital flows.

[2]Bryant and Hendershott analyze a bilateral flow between the U.S. and Japan.

effect of capital flows.[1] However, the inclusion of a continuing flow effect in a portfolio selection model is shown to be small relative to the stock shift effect.[2] By including a lag adjustment it is possible to allow capital flows to respond over several periods to changes in interest rates. Results show that in general capital flows respond to changes in interest rates over several periods.

It is difficult to compare regression results in these studies because of considerable differences in methodology. However, all results are consistent with Branson's conclusion that capital movements respond more to changes in foreign interest rates than to changes in U.S. interest rates. Branson suggests that because foreign interest rates tend to adjust rapidly to changing U.S. rates, while the reverse is not so, the estimated sensitivity of short-term capital movements to changing U.S. interest rates is reduced.

C. Portfolio Balance

The treatment of capital flows thus far has been in a partial equilibrium context. In both the stock and flow versions, interest rates have been the predominant explanatory factor. More specifically,

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[1] Miller and Whitman (1972), Branson and Willett (1972) and Bryant and Hendershott (1972) include as a wealth variable several variants of total U.S. short-term assets. Branson and Hill (1971) incorporated a proxy for foreign wealth by taking the sum of the gross national product of six major industrial countries other than the U.S.

[2] Branson and Willett (1972, pp. 292-293) show in the case of the general portfolio distribution model that the ratio of the continuing flow effect to stock shift effect is equal to the rate of growth of wealth (scale variable).

domestic interest rates have been assumed exogenous, thus implying no feedback effect of capital movements on the domestic interest rates. Recent developments attempt to incorporate financial flows in a macroeconomic model of an open economy. Work centers around the use of a portfolio balance approach within a Keynesian macroeconomic framework. Capital movements are treated as a stock adjustment phenomenon that responds to financial as well as real variables in the model.

1. Kouri and Porter

The development of a macroeconomic model for the financial sector of a small open economy by Kouri and Porter (1974) is the basis for an empirical analysis of capital flows. The model is constructed in a portfolio equilibrium framework such that the domestic interest rate is endogenous and capital movements, considered in the context of the overall balance of payments, result through adjustments in the financial sector. The model is presented below.

	Demand functions	Supply Relations	
Demand for base money	$M_d = L(Y, W, R, R^f, E)$ (+ + − −)		(5)
Net domestic demand for domestic bonds	$B_d^d = H(Y, W, R, R^f, E)$ (? + + −)		(6)
Net domestic demand for foreign bonds	$B_f^d = J(Y, W, R, R^f, E)$ (? + − +)		(7)

	Demand functions	Supply relations	
Net foreign demand for domestic bonds	$B_d^f = F(Y^f, W^f, R, R^f, E)$		(8)
Total money supply		$M_s = NFA + NDA$	(9)
Domestic component of money supply (open-market operations)		$\Delta NDA = -\Delta B_g$	(10)
Foreign component of money supply (balance of payments)		$\Delta NFA = TC + CAB$	(11)
Wealth constraint		$W = L(\ ) + H(\ ) + J(\ )$	(12)
Money equilibrium		$M_d = M_s$	(13)
Domestic bond equilibrium		$B_d = B_d^d + B_d^f$	(14)
Total net capital inflows		$TC = \Delta B_d^f - \Delta B_f^d$	(15)

Endogenous variables

- M_d - Money demand
- M_s - Money supply
- R - Domestic interest rate
- B_d^d - Domestic demand for domestic bonds
- B_f^d - Domestic demand for foreign bonds

Exogenous variables

- Y, Y^f - Nominal income (domestic and foreign)
- R^f - Foreign interest rate
- W, W^f - Nominal wealth (domestic and foreign)
- E - Vector of risk factors
- B_g - Stock of government bonds held by private sector

Endogenous variables	Exogenous variables
B_d^f - Foreign demand for domestic bonds	NDA - Net domestic assets of central bank
NFA - Net foreign assets of central bank	CAB - Current account balance
TC - Total net capital inflow	

The financial sector comprises domestic demand functions for base money, domestic and foreign assets, plus a foreign demand function for domestic assets (5 through 8 respectively). The supply of base money (9), endogenous to the system, comprises the net foreign assets plus net domestic assets of the Central Bank. Net domestic assets (10), the monetary policy instrument, is assumed to change only through open market operations. Central Bank holdings of foreign assets (11) change through disequilibrium in the current or capital account of the balance of payments. In a portfolio selection framework the allocation of a stock of financial wealth (12) depends on a set of interest rates, domestic and foreign, the stock of wealth, income and other exogenous variables. Equilibrium conditions are specified for the demand for and supply of money (13) plus domestic and foreign bonds (14). Capital flows (15) occur through adjustments in the financial sector and are identically equal to the change in domestic holdings of foreign bonds minus the change of foreign holdings of domestic bonds. It is assumed that changes in income, the stock of wealth and the current account are exogenous to the system. Thus, real variables taken as

exogenous, the domestic component of the monetary base and foreign interest rates, cause portfolio substitution that results in capital movements and changes in the domestic interest rate.

Kouri and Porter solve the model for a reduced form set of equations in capital flows and the domestic interest rate. In the reduced form analysis they assume perfect capital mobility so domestic and foreign interest rates become identical.[1] Thus, only the capital flows equation need be estimated against a set of exogenous variables including the current account balance and changes in income, net domestic assets, and the foreign interest rate.[2]

$$TC = \beta_0 + \overset{(-)}{\beta_1}\Delta NDA + \overset{(-)}{\beta_2}CAB + \overset{(-)}{\beta_3}\Delta R^f + \overset{(+)}{\beta_4}\Delta Y + \overset{(+)}{\beta_5}\Delta W + \overset{(-)}{\beta_6}\Delta Y^f + \overset{(-)}{\beta_7}\Delta W^f + \mu \qquad (16)$$

The signs over the coefficients indicate the a priori qualitative results.

In interpreting the capital flow equation, the foreign interest rate and income variables measure the effect on capital movements of changes in the demand for reserve money. That is, increases (decreases) in foreign interest rates and decreases (increases) in domestic income produce a temporary excess supply (demand) for money

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[1] See Kouri and Porter (1974, pp. 450-54) for mathematical solution.

[2] While the current account balance may respond to income or expenditure it is assumed here to be independent of changes in income.

which can potentially be alleviated through the international outflow (inflow) of capital. The current account balance shows the extent to which capital movements respond to surpluses or deficits. A CAB surplus (deficit) can be expected to increase the outflow (inflow) of capital as foreign (domestic) entities seek domestic (foreign) means to finance the net import of goods and services. Changes in net domestic assets of the Central Bank indicate the offsetting response of capital flows to this measure of monetary policy action. Efforts by the monetary authorities to achieve an expansionary (contractionary) monetary policy result initially in an excess supply (demand) for money that can be alleviated through an outflow (inflow) of capital. In the case of perfect capital mobility, the coefficients of ΔNDA and CAB are minus one, thus resulting in a complete offsetting by capital flows. Owing to inadequate measures for foreign income and domestic and foreign wealth these variables are omitted from the regression analysis. The capital flow equation is tested empirically for Germany, Australia, Italy, and The Netherlands, using quarterly data for the period from 1960 to 1970.

Empirically interesting results are obtained. The impact of changes in income is found to be statistically significant in all four countries tested, thus indicating that changes in income result in changing money demand that is partially satisfied by capital flows. The resultant capital inflow is found to be 11 percent (Germany) and 2 percent (Australia, Italy, and The Netherlands) of the increase

in income over the quarter. The coefficient for the monetary policy instrument, ΔNDA, ranges from -0.72 for Germany to -0.43 for Italy and in all four cases is statistically significant between zero and minus one.[1] Thus, capital flows only partially offset policy induced changes in the monetary base so that sterilization is possible at least in the short run. Again, the offset coefficients for the current account balance are statistically significant between zero and minus one. The offset coefficients are -0.95 for Germany, -0.98 for Italy and The Netherlands and -0.63 for Australia. This indicates that international flows of goods and services are almost completely financed by international capital flows. The impact of the foreign interest rate measured by changes in the London three month Eurodollar rate is statistically insignificant in all four cases. These poor results may imply that the Eurodollar interest rate is not the appropriate foreign interest rate or that forward market and exchange rate expectations have not been appropriately specified.

Kouri and Porter conclude that capital flows result predominantly from fluctuations in the supply and demand for money with changes in income helping to explain shifts in money demand. Changes in monetary

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[1] For Germany the change in reserve requirements ΔRR is also included as a policy instrument. The coefficient on ΔRR is 0.86 and is statistically significant. Thus a DM 1 billion increase in ΔRR results in excess demand for money that is partially accommodated by a DM 860 million inflow of capital. When ΔRR is subtracted from ΔNDA the coefficient on the combined policy instrument is -0.77 and is statistically significant.

policy are partially offset by capital flows, while the current account balance viewed as an exogenous source of changes in base money tends to induce an offsetting capital flow that serves to stabilize the balance of payments.

There are a number of statistical estimation problems in the reduced form equation for capital flows. First, for the limiting case of perfect capital mobility, the domestic interest rate responds immediately and without lag to fluctuations in the foreign rate. This implies that the coefficient of the foreign rate can be used in the regression equation to estimate the interest elasticity of the demand for money. Such an estimation is questionable on several grounds. Discrepancies will occur between domestic and foreign interest rates resulting from exchange rate movements within the intervention band. Second, it is possible that adjustments in the foreign interest rate will occur in response to capital flows which will induce a downward bias in the statistical estimates. This is contingent on the extent to which one country can influence the interest rates in the world.

Another problem relates to the assumption about changes in net domestic assets as a key exogenous variable. It is assumed the government follows a "neutral" monetary policy with respect to the balance of payments. There is no attempt to offset the liquidity effect of foreign exchange flows on the money supply nor is the monetary policy used to achieve equilibrium in the balance of payments.

Subsequent studies by Kouri (1975), Porter (1972) and Argy and Kouri (1975) tend to indicate that the monetary authorities do intervene in the domestic money supply to offset the effects of foreign exchange flows. Thus, specifying ΔNDA as exogenous when in fact it is endogenous will result in biasing the coefficient in the reduced form regression equation.[1]

Subsequent studies presented below have attempted to deal with some of the weaknesses of the Kouri and Porter framework. Particular emphasis is placed on use of lag adjustments and dealing with sterilization policies.

2. Kouri

Kouri (1975), using the portfolio balance approach, examines the relationship between monetary policy and capital flows in Germany for the period 1960 to 1972. The model is an extension of the analysis of Kouri and Porter (1974). Without assuming perfect capital markets,[2] reduced form equations are derived for capital flows and the domestic interest rate. Thus, for the financial market of an open economy

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[1] Kouri and Porter (1974, pp. 453-454) show mathematically the direction of the bias in the model. They argue that this is reduced as discretionary changes in monetary policy dominate automatic changes. Hodjera (1976, p. 606) argues that the assignment of monetary policy to different targets (e.g. balance of payments or capital flows) will affect the direction of the bias.

[2] Kouri argues that foreign and domestic wealth plus foreign income will influence capital flows with less than perfect capital markets. However, when estimating the model these variables are dropped for lack of data.

under fixed exchange rates, short-run equilibrium is obtained through adjustments in the domestic interest rate and capital flows. A reduced form capital flow equation is estimated with particular interest in determining the extent to which different monetary policy measures[1] are offset by capital flows. The empirical results suggest capital flows at least partially offset measures of monetary policy. Changes in reserve requirements and the domestic component of base money ΔNDA are offset approximately 70 to 75 percent by short-term capital flows. In addition, increases (decreases) in the discount rate ΔDISC by one percent results in short-term capital inflows (outflows) of approximately DM 1.3 billion.[2] Kouri concludes that, for an offset coefficient less than one, control of the monetary base is possible by sterilizing the liquidity effects of the balance of payments. The results also suggest that the high offset coefficient for the current account (approximately 93 percent) implies that private short-term capital flows finance in large part the fluctuations in the current account. In addition, the coefficient on income is statistically significant with the result that increases in income of DM 100 million generate short-term capital inflows on the order of DM 49 million. The coefficient

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[1] Kouri considers three separate measures of monetary policy: changes in reserve requirements ΔRR, changes in net domestic assets ΔNDA, and changes in the discount rate ΔDISC.

[2] When the discount rate is included in the regression equation, the offset coefficients for ΔNDA and ΔRR are approximately 54-68 percent.

on the London three month Eurodollar rate is only statistically significant when the discount rate policy instrument is included. In such cases a one percent rise (fall) in the Eurodollar rate produces approximately DM 1.6 billion outflow (inflow) of short-term capital.

While Kouri's results are illuminating regarding the offsetting impact of short-term capital flows from various measures of monetary policy and the current account balance, the approach still suffers the analytical shortcomings of the earlier work done by Kouri and Porter (1974). In particular, the issue of feedback effects on the monetary policy instruments is not considered nor is any allowance made for a lagged adjustment of short-term capital flows to the independent variables.

3. Porter

Porter (1975) examines the effects of monetary policy on capital flows in Germany for the period 1963-1970. He specifies a modified stock adjustment model such that changes in reserve requirements, the primary monetary policy instrument, and changes in the covered interest rate differential are used to explain net short-term capital flows in Germany. The model allows for a lagged adjustment of asset portfolios to changes in the covered interest rate differential. Thus the response of capital flows to changes in the covered interest rate differential extends over several periods.

The major finding of the study, using monthly data, indicates that the effect of changes in reserve requirements on bank liquidity

is substantially offset (80 percent) through the errors and omissions component of the balance of payments. The evidence also indicates considerable sensitivity of recorded short-term capital flows to changes in the interest rate differential; this effect is relatively complete (75 percent) within three months.

The econometric results are subject to simultaneous equation bias in that German interest rates as well as the forward exchange premium could be affected by capital flows. Porter admits that changes in the covered interest rate differential are inadequate in times of speculation to explain speculative flows of capital. To capture these speculative flows would necessitate the inclusion of uncovered interest rate differentials, a forward premium and proxies for the expected change in the exchange rate as independent variables in the capital flows equation.

4. Argy and Kouri

Argy and Kouri (1975), using the basic portfolio balance model to analyze capital flows, address the problem of incorporating a sterilization policy into the analysis. Recent criticism of the basic Kouri and Porter approach directs attention to the assumption of an exogenous monetary policy. It is believed that monetary policy influences the balance of payments and at the same time monetary policy is used to sterilize movements in the balance of payments in general and capital flows in particular. Thus, the measure of monetary policy in the capital flow equation becomes endogenous and can result in

estimation biases when using an ordinary least squares estimation technique.

Argy and Kouri overcome the estimation bias problem by constructing a simultaneous system such that changes in the monetary policy instrument measured by changes in net domestic assets of the Central Bank (ΔNDA) and capital flows are determined in a two-equation model that employs a two-stage least squares estimation procedure as follows:

$$CF = f(\Delta NDA, CAB, \Delta Y, \Delta R^f) \tag{17}$$

$$\Delta NDA = g(CF, CAB, Z). \tag{18}$$

CF - net inflow of capital

ΔNDA - change in the domestic component of the monetary base

CAB - current account balance

ΔY - change in income

ΔRZ - change in foreign interest rate

Z - all other exogenous variables explaining ΔNDA

The reaction function (18) specifies that changes in the domestic component of base money can be explained by various targets of monetary policy plus the current and capital account of the balance of payments. Capital flows (17) are explained by changes in net domestic assets and a set of exogenous components in the model including income, the current account and the foreign interest rate.

The results for three countries (Italy, The Netherlands, and Germany) are similar to those obtained by Kouri and Porter. Capital flows

partially offset the effects of monetary policy (approximately 50 percent for all three countries) and almost completely offset fluctuations in the current account balance (Italy 100 percent, The Netherlands 93 percent, and Germany 87 percent). The foreign interest rate (3-month Eurodollar rate in London) has the expected negative impact but is statistically significant only in Germany where a one percent increase (decrease) in the Eurodollar rate generates a net outflow (inflow) of DM 1.8 billion in short-term capital assets. The results from the sterilization policy equation indicate a partial neutralization of short-term capital flows and the trade balance. In particular the monetary authorities were able to neutralize the liquidity effects of short-term capital flows by 67 percent (statistically insignificant) in Italy, 87 percent in The Netherlands, and 23 percent in Germany. Neutralization of trade balance flows resulted in offset coefficients of 137 percent in Italy, 74 percent in The Netherlands, and 45 percent in Germany.

While the results indicate that partial sterilization policies have been pursued to mitigate payment surpluses or deficits, Argy and Kouri (1975) stress that the sterilization equation represents only a rough approximation of Central Bank behavior and as such results should be interpreted with caution. Unfortunately, Argy and Kouri (1975) provide no basis to determine if the addition of a sterilization policy equation has significantly altered the empirical results of the reduced form equation to explain short-term capital flows. A comparison with

the Kouri (1975) analysis will be inadequate owing to differences in the sample period and specification of the regression equation.[1]

5. Hodjera

Hodjera (1976) provides an empirical investigation into the determinants of short-term capital flows under alternative theoretical approaches using the Branson (1968) portfolio selection approach (partial equilibrium) and the Kouri and Porter (1974) portfolio balance approach (general equilibrium) with and without a reaction function to incorporate endogenous monetary policy responses to short-term capital flows. In addition, he employs a one period lag on all explanatory variables to allow for dynamic adjustment effects in the alternative models. Employing data from France and Austria, Hodjera is able to provide a comparison to determine the degree to which the empirical results of the three approaches conform to some key postulates.

The partial equilibrium approach provides information regarding the response of capital flows to exogenous movements of domestic and foreign interest rates and trade balances. Hodjera finds this approach inadequate in explaining capital flows among industrial countries where there is a high degree of financial integration. When capital is highly mobile a simultaneous relationship can be expected to exist

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[1]Kouri (1975) uses a sample period from 1960-1 to 1972-2 while Argy and Kouri (1975) employ a sample period from 1963-3 to 1970-4. In addition Kouri (1975) incorporates several variables in the capital flow equation to reflect speculative forces and seasonal variation while Argy and Kouri do not.

between domestic and foreign interest rates and capital flows. This introduces the problem of multicollinearity in the regression analysis between the domestic and foreign interest rates. In addition, with less than complete neutralization of the effects of capital flows on the domestic money supply, the domestic and possibly foreign interest rates will respond to movements of capital thus tending to bias the coefficients in the regression results.

In part, Hodjera finds that the empirical results reflect these difficulties. For Austria, the interest rate effects appear internally consistent (they have the right sign), but do not provide very much explanatory power. The coefficient on the domestic interest rate is statistically insignificant for both current and lagged values. The coefficient on the foreign interest rate measured by the three month Euroddollar rate in London is statistically significant with the result that a one percent increase (decrease) in the interest rate generates a capital outflow (inflow) of 1.2 billion shillings. However, the lagged value on the foreign interest rate generates an opposite flow of capital to the previous quarter but of less magnitude. That is, increases (decreases) in the foreign interest rate produce a capital inflow (outflow) in the subsequent quarter of 860 million shilling. The net effect over two periods is a capital outflow (inflow) when foreign interest rates rise (fall). Conceivably lagged values of the foreign interest rate could produce harmonious responses to domestic interest rates thus resulting in reversals of capital flows.

Fluctuations in the trade balance produce offsetting short-term capital flows of more than one hundred percent over two quarters. In general, while these results prove to be interesting they provide only 54 percent of the explanatory power.

The results for France produce incorrect signs for a current and lagged trade balance plus domestic and foreign interest rates. However, the coefficients are statistically insignificant in all cases except for current changes in the domestic interest rates. Such poor results coupled with a 74 percent explanatory power reflect in part the substantial collinear movement of foreign and domestic interest rates.

Hodjera finds the portfolio balance approach a useful alternative, because of its general equilibrium properties that consider the impact of real and financial variables (including a monetary policy variable) on capital flows. In addition, the problem of multicollinearity between domestic and foreign interest rates is eliminated since the domestic interest rate is assumed to be endogenous. However, the results are only marginally adequate and in general have not captured the general equilibrium adjustments implied in the model.

For Austria there is no indication of a statistically significant capital flow response to changes in monetary policy (measured by net domestic assets of the Central Bank) or income for current and one period lagged values. The foreign interest rate impact on capital flows is however statistically significant. In this case a one percent rise (fall) in the foreign interest rate generates a capital outflow

(inflow) of 1.2 billion shilling in the current quarter and a capital inflow (outflow) of 620 million shilling in the subsequent quarter. The results for the current account balance indicate a 100 percent financing of an export surplus (deficit) over two quarters by capital outflows (inflows), thus suggesting the importance of international financing of trade in Austria.

The general equilibrium approach yields better results for France. A statistically significant coefficient is derived for the impact of monetary policy on capital flows. Over two quarters 60 percent of the increase (decrease) in net domestic assets results in an outflow (inflow) in total private capital of which half is in the form of short-term capital flows. Changes in the foreign interest rate and income have no significant impact on short-term capital flows. The results also indicate that total private capital flows finance about 79 percent of the imbalance in the current account of which about 45 percent is in the form of short-term capital movements.

There is considerable interest in attempting to incorporate sterilization policies into the portfolio balance model. Hodjera argues that a serious deficiency in the model is the failure to specify a reaction function that incorporates the simultaneity between changes in the domestic money supply and changes in capital flows. As such, Hodjera incorporates a reaction function by postulating changes in net domestic assets as a function of changes in net foreign assets of the Central Bank (sum of current account balance and total

private capital flows), a time trend and seasonal dummy variables. The empirical results, testing France only, support the contention of a partial sterilization policy. There is a rapid neutralization of foreign exchange flows on the order of 75 percent that is complete in one quarter. However, the inclusion of a reaction function and employing a two-stage least squares estimation process does not affect any of the results in the capital flow equation. This suggests that sterilization policy does not create a simultaneous relationship between changes in the domestic component of the base money and capital flows as a dependent variable. Hodjera indicates that appropriate specification of a reaction function is crucial to incorporate the complexities of sterilization policies.

D. Conclusion and Direction of Study

Considerable gains have been made in the theoretical and empirical analysis of short-term capital movements. The integration of the portfolio selection theory with the monetary approach to the balance of payments theory to derive a general equilibrium macroeconomic model where domestic interest rates are considered endogenous has provided much opportunity for empirical testing. Such empirical work, in attempting to explain short-term capital flows, has considered the effects of different monetary policy measures, the incorporation of sterilization policies, the impact of foreign interest rates and the influence of real sector variables, i.e. income and the current account balance. In addition, there have been some successful attempts to

incorporate the effects of speculative forces through the use of dummy variables and allowance has been made for a lagged adjustment process.

A number of unresolved problems remain in attempting to explain short-term capital flows in the framework of a portfolio general equilibrium model. More consideration needs to be given to the treatment of the impact of the growth of wealth on the balance of payments. Empirical studies to date have been hampered by inadequate measures for wealth. Further empirical work is needed to integrate into the model speculative forces as evidenced through forward exchange market activities. The basic Kouri and Porter model that specifies a money demand function under the presumption of a money multiplier equal to one is overly restrictive. Potentially interesting results could be derived showing the impact on short-term capital flows from fluctuations in the money multiplier. Particularly difficult in the analysis of short-term capital flows has been the appropriate specification of a reaction function for monetary policy. It is necessary to assess monetary policy measures within the realm of instruments oriented toward the various targets of the government's economic policy. Sterilization policies as such will depend on the alternative policy instruments available to the authorities. Also, the extent to which sterilization policies are the results of discretionary policy actions as opposed to automatic responses will impact on the quality of the empirical results. In addition, it would be more appropriate to view a sterilization policy as a response to fluctuations in the overall balance of payments. The

presumption has been that monetary policy responds only to movements of short-term capital and not to fluctuations in the basic balance of payments. It is altogether possible the monetary authorities could be targeting their instruments toward fluctuations in the basic balance of payments with only residual consideration being given to short-term capital flows. As such, it would be interesting to consider the interaction of short-term capital flows with the basic balance of payments and the monetary policy instrument.

The ideal approach for this study would be to deal with all these problems. However, owing to time constraints the focus will be directed to analyzing the potential interaction, within the context of the portfolio equilibrium model, of the balance of payments comprising short-term capital flows and the basic balance of payments, and monetary policy. In addition, a money demand function is specified that allows for movements in the money multiplier.

The empirical analysis will employ Japanese data. Studies of this type have not as yet considered Japan. Presumably this can be attributed to the fact that extensive controls on capital flows would not yield interesting empirical results. However, in an IMF study by Ezekiel and Patel (1967) in which they looked at balance of payments and monetary policy data for Japan from 1959 to 1966, they concluded that policy actions were directed more at fluctuations in the basic balance of payments. The controls on short-term capital flows were such as to offset basic balance of payment positions and thus attenuate what may otherwise be large fluctuations in the overall balance of payments.

Additional interest can be attached to the Japanese data owing to high economic growth during the 1960's. Within the context of the portfolio general equilibrium model income can potentially have a large influence on short-term capital flows through its impact on the demand for money. It should be possible to assess how considerable growth in GNP will impact on short-term capital flows.

Before continuing into the analytical methodology it would be of interest in the next chapter to review the institutional structure and experience of the Japanese economy during the 1960's. This will hopefully be enlightening in establishing economic relationships and interpreting data fluctuations and empirical results.

III. REVIEW OF THE JAPANESE ECONOMY

The objective of this chapter is to describe the workings of the Japanese economy to better establish the probable relationships with Japan's short-term international capital flows (within the broader concept of the balance of payments). The intent is to enable a better assessment of the empirical results derived from employing a portfolio balance model to explain Japanese short-term international capital flows. Particular interest is directed to characterizing the basic structure and cyclical movements of the postwar Japanese economy emphasizing the patterns and reactions to imbalance of payments; identifying monetary policy instruments available and their relationship to the balance of payments; and clarifying the extent of restrictions on and subsequent liberalization of capital movements into and out of Japan.[1]

A. Economic Performance

The main trend in this postwar Japanese economy has been a rapid and sustained growth. Aggregate productive capacity increased dramatically in terms of quantity and quality of the capital stock, labor force and level of technology. At the same time, aggregate demand has been sufficient to maintain high rates of capacity utilization.[2]

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[1] Support for this chapter is derived from Patrick and Rosovsky (1976).

[2] With the possible exception of 1964 expansion of potential output showed no tendency to outpace the growth of demand. Demand created its own supply.

Particularly impressive and instrumental to expansion of aggregate supply and demand has been the growth in the capital stock achieved through high and rising investment rates. From 1952 to 1973 real gross domestic investment, private and public, increased an average of 12.9 percent per annum. Real gross investment, accounting for 20 percent of GNP in the early 1950's, increased its share to 40 percent of GNP by the mid-1960's. An influencing factor in the strong investment performance has been business and managerial optimism about continued economic growth. The structure and framework of industry in Japan is oriented to expansion in size and share of the market with less emphasis on profit. In addition, the rapid investment rate has been supported by a high and rising saving rate.[1] With few exceptions, Japan's domestic investment has been financed through domestic saving. About 85 percent of after tax corporate profits on average are kept for investment.

Because of the strong expansionary trends, recessionary periods have been short and resulted only in less rapid growth of GNP in contrast to absolute contractions in some Western cycles. The main expansionary periods in the 1960's are from: July 1958 to December 1961, November 1962 to October 1964, and November 1965 to August 1970.

The economic cycles can be roughly described in the following way. Upward trends start with increases in final demand, consumption or

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[1]Between 1960 and 1970, total gross saving as a percent of GNP has increased from 35 percent to 40 percent with private saving fluctuating between 14 percent and 20 percent.

exports resulting from easing of monetary restraint.[1] This stimulates production resulting in increased investment in inventory plus plant and equipment which via a multiplier effect leads to a boom in economic activity. In these expansionary periods imports outpace exports and domestic prices increase. Because substantial long-term foreign borrowing or admission of foreign direct investment is not regarded as a desirable means to finance import surpluses, imports threaten to exhaust the limited stock of international reserve assets. Except for the final expansionary period, balance of payments deficits prompt a policy of credit restraint. The deflationary policy produces a slowdown marked by stagnant production, falling corporate earnings and increased bankruptcies. This in turn dampens imports and results in export prices declining thus bringing about an improvement in the balance of payments. With an improved external position, credit restraints ease and the economy is in a position for a new expansionary swing. It can thus be generalized that cyclical movements in Japan's postwar economy prompted by changes in the balance of payments are stabilized through monetary restrictions responding to the deteriorations in international payments position.

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[1] Every expansionary trend has occurred simultaneously with or following a relaxation in policy restraint. There appears to be a natural tendency for the economy to expand rapidly without monetary restraint even in the presence of rather restrictive fiscal policies.

B. Japan's Economy in the World

In the early postwar era, Japan's impact in the world economy was insignificant. By 1953, Japan accounted for 17 percent of world commodity exports, placing it 13th among all trading nations. Japan's balance of payments position was kept in check through extensive restrictions on imports, foreign exchange and capital outflows. The Japanese authorities perceived the country's economy to have minimal impact in the world but to be vulnerable to world economic conditions (particularly the U.S.). During the 1950's and into the 1960's, Japan's balance of payments position became the dominant and immediate constraint on economic growth. Total exports plus dollar earnings from U.S. military-related "special procurement" were barely able to pay for Japanese import essentials of industrial raw materials, foodstuffs and machinery. Efforts to reduce balance of payments constraints on growth became a major objective of Japanese foreign economic policy and economics dominated Japan's foreign policy.

Intertwined with the above factors influencing economic growth has been the priority given to basic development in steel, electric, chemical, and coal industries which help provide the impetus for new industry development--consumer electronics, machinery and later automobiles and computers. Initially this economic activity served as a substitute for imports but later resulted in increased exports which by the mid-1960's put Japan in the position of becoming a large exporter. During the 1960's exports grew at twice the rate of world trade.

Japanese growth can be characterized as export led in the sense that exports grew faster than GNP. Between 1961 and 1970 real GNP grew at an annual rate of 9.5 percent while real exports grew at 14 percent. The secular tendency for Japanese exports to outstrip imports resulted by the late 1960's in considerable trade and current account balance surpluses in the overall balance of payments. The long run trend was strong enough to mask cyclical patterns in growth and trade and the influences of short-run economic policy. During the 1960's, the process was self-perpetuating; strong export performance allowed the balance of payments constraints on growth to ease and provide for more rapid growth and greater foreign trade. The economic performance of Japan in terms of GNP and foreign trade growth has transformed the country into an important position in the world economy.

Japan's share of world export trade has increased from 9th in 1955 to 7th in the early 1960's. There has been concern by Japanese economists[1] that Japan's rapid growth would result in balance of payment deficits and in turn constrained growth. However, it is argued that rapid economic growth could produce balance of payment surpluses through its influence on the competitive power of Japanese exports. Increased Japanese investment in manufacturing equipment relative to other industrial countries has allowed labor productivity to advance faster than in other countries. The result is lower export prices and greater export values. Other studies[2] tended to conclude that

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[1]Kanamori (1966, pp. 79-94) and Fakuoka (1966, pp. 99-103).

[2]Namiki (1970, pp. 475-96) and Tatemoto (1972, pp. 63-71).

balance of trade positions depend not on overall growth but rather on the economic structure and governmental policies.

C. Government Policy

Government economic policy in the 1960's has had a very definite orientation toward growth, investment and exports. The strong economic expansion has been supported by government initiatives of unified policy objectives from the early 1950's to the late 1960's that place growth as the number one objective. In 1961 Prime Minister Ikeda announced a "Doubling National Income Plan" to be accomplished in ten years thus implying a GNP growth rate of 7.2 percent per annum. In actual fact from 1959 to 1970 the economy grew at an average rate of 10.8 percent. Though the emphasis has been on growth, the policy makers have to some extent stressed "stable growth" in the sense of reducing cyclical instability and moderating price increases.[1]

1. Fiscal policy

Fiscal policy, to the extent it is used as a policy tool, has been allocated to the target of preserving a high rate of expansion in the economy. In principle, the government through the mid-1960's has adhered to a balanced budget policy[2] and has in practice been able

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[1] In practice, price stability was of secondary concern to the objective of economic growth. With the economy always near full employment, Japan tolerated moderate inflation rates of 5 to 6 percent.

[2] Adherence to a balanced budget policy was guided by "rules of sound finance." This policy gave way after 1965 to an alternative rule: that government bond issues never exceed the amount spent on construction and that bond issues meet the "test of market acceptance."

to maintain a budgetary surplus.[1] However, the fiscal policy basically restrained by the small budget relative to GNP[2] cannot be considered to have a strong influence on economic performance.

2. Monetary policy

The essential purpose of monetary policy in Japan, as in most countries, is to influence the rate of expansion of business activities mainly through alterations in domestic bank credit availability to the private nonfinancial sector. Such a position does not regard the money stock as unimportant. The view taken by the authorities is that money supply creation should be parallel to the expansion of domestic bank credit, given the relatively small monetary impact of the current balance of payments and exchange controls on international capital flows. Discrepancies as to the extent and the direction of changes in money supply broadly defined (M_2) and domestic bank credit reflect primarily changes in the monetary impact of the balance of payments.

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[1] The general government, comprising central and local governments plus social insurance funds, has typically spent less on current purchases, transfer payments, subsidies and investment than it has received in taxes, social insurance contributions, transfers and property or entrepreneurical income. This government saving has ranged from 1 to 15 percent of government revenues during the 1960's.

[2] A Garin-Painter (1970) study of comparative public expenditure from 1955 to 1965 shows government expenditure in Japan for 1965 to be 21.5 percent of GNP. This is the lowest among OECD countries (compares with 27 percent for U.S. and 40 percent for Sweden) and represents the only case where government expenditure grew less rapidly than GNP.

Monetary policy has had a clear and direct influence on Japanese economic cycles in the 1960's. The monetary authorities pursued a restrictive monetary policy four times over this ten-year period: July 1961 to October 1962; end of 1963 to end of 1964; September 1967 to August 1968; and September 1969 to October 1970. Restrictive monetary policy has been able to curtail business cycle expansions while the easing of monetary policy has resulted in aggregate economic activity expanding rapidly, even with a rather restrictive fiscal policy. Instrumental to monetary policy control on the economy has been the impact of announcement effects involving changes in expectations; Japanese businessmen believing a restraining policy decision will slow the economy will act on the basis of the announcement without waiting for the actual movement in economic activity.

The objective of monetary policy has been to restore domestic equilibrium, principally in terms of wholesale prices, and in the first three restrictive periods, improve the balance of payments. During the beginning stage of the first three restrictive periods, the balance of payments exerted a contractionary impact on the money supply and reinforced the tightening of domestic credit expansion. In periods of expansionary monetary policy when there was a surplus in the basic balance of payments, money expansion was faster than domestic bank credit expansion. However, in the fourth period of restraint between 1969 and 1970 when the monetary policy was moderately restrictive, the balance of payments had an expansionary impact on money immediately.

The effects remain small relative to the total increase in money supply.

Direct management of Japan's monetary policy is conducted independently by the Bank of Japan (BOJ). Its policy actions, however, are consistent with governmental policy as formulated by the Ministry of Finance (MOF). The principal instruments of monetary policy available to the Bank of Japan are:

1) central bank lending policy;

2) open market operations; and

3) reserve requirement charges.

In practice, the Bank of Japan uses these instruments to attain policy objectives through three mechanisms: changes in interest rates; credit rationing; and changes in business expectations. Presented below is a discussion of monetary policy instruments.

a. Central Bank lending The major instrument of Japanese monetary policy is central bank lending (discount rate policy) to the banking system. Loans and discounts are important to Japanese banks not only as a means of bridging temporary gaps in bank reserves but also as a principal long-term source of liquidity for the banking system. The Bank of Japan provides the major source of additional bank liquidity besides the accumulation of foreign exchange reserves.

The standard type of lending to banks is in the form of rediscounting of commercial bills. The cost of reserve money can be adjusted by changing the levels of the discount rate, setting penalty rates on

excess borrowing and/or putting ceilings on the amount of credit to individual banks.

Different bank rates are applicable according to the type of commercial paper offered by the borrowing bank. The Bank of Japan has frequently changed the structure of interest rates and the range of paper eligible for rediscounting in accordance with the objectives of monetary policy. During the 1960's, short-term credit was given preferential treatment for discounting at interest rates below the basic discount rate. In addition, short-term import bills were eligible as collateral for loans until January 1966. Subsequently, Japanese banks have relied mainly on foreign banks to finance their import credits to Japanese importers.

Borrowing from the Bank must be viewed as a privilege and not a right. Individual banks become subject to considerable oversight of their business activities. The Central Bank at times will apply actual ceilings on the amount lent to individual banks. The intention is to limit the amount of credit granted by the commercial banks to their customers.

Changes in the discount rate have great symbolic significance but only slight importance in practice. During the 1960's, the rate on government securities varied between 5.84 percent and 7.67 percent with most of the variation between 6.21 percent and 6.94 percent. In general, deposit rates have not varied with changes in Bank rate.

Bank rate policy has little effect on the portfolio selection of the public. Deposit rates and yields for new subscribers to bond issues are relatively rigid and do not respond to changes in bank rate. Thus changes in the Bank rate do not affect the relative profitability or induce portfolio substitution of various types of financial assets.

Despite the weak cost effect of bank lending policy, the Bank of Japan uses lending policy as a major monetary instrument through discretionary rationing of its credit to banks. Thus, by changing its lending attitude to banks, the Bank of Japan is able to affect lending attitudes of banks vis-a-vis the nonbank sector. In addition, business intentions and expectations about the future course of the economy are considered to be strongly affected by bank rate policy.

b. Securities operations The Bank of Japan can adjust banks' cash reserves through direct securities operations (open market operations) or indirectly through operations with call loan dealers. Since neither banks nor nonbank financial institutions have held sizable amounts of short-term government securities or other short-term bonds, securities operations have been limited mostly to long-term government guaranteed instruments. Long-term government bonds began to be floated in 1966. The small open market operations can be attributed to the lack of a substantially organized capital markets and the low pegging of rates on government securities. The Bank of Japan does not and cannot use securities operations to produce an important direct change in the money supply or portfolio selection of the general public as a result of this rather small bond market.

c. Reserve requirement changes The Bank of Japan is empowered to set and change total reserve requirements against the banks' yen-deposit liabilities to residents and nonresidents. Increases in reserve requirements may provide the incentive for banks to raise interest rates on bank credit in an effort to compensate for the rise in nonprofit earning assets. In addition to this cost effect, reserve ratio changes can create a considerable availability effect by producing a deterioration in the banks' liquidity position and enhance the impact of central bank lending policy. That is banks losing excess reserves and unable to reduce the load of credits and deposits immediately will attempt to increase their demand for central bank credit. Such a position strengthens the central bank's position as creditor of banks and reduces banks' liquidity which may weaken their lending attitude.

Until quite recently the Bank of Japan has not needed to use incremental reserve requirements to offset unwanted fluctuations in banks' reserve base which result from such exogenous effects as swings in the balance of payments. Such offsetting has been relatively small in Japan and could be more effectively and easily offset by varying central bank lending.

In practice, reserve requirements have been changed only seven times between 1960 and 1970. The reserve ratios range from .25 percent to 3.0 percent, depending on the type of financial institution, type of deposit and the volume of yen deposits.

d. Central Bank actions and the money stock The Bank of Japan, while unable to control the money stock directly, is in a position to vary the volume or price at which it extends credit to the banking system. Because of the unwillingness to bear public criticism associated with high credit rates, the Bank of Japan has chosen a nonprice rationing of credit. A penalty rate is applied on top of the discount rate when commercial banks exceed their designated borrowing ceilings.[1] Thus, central bank actions are but measured by the volume of credit extended rather than the price.

The impact of Central Bank credit on the money stock in Japan can be explained by consideration of the link between these variables. This is done by employing the analytical technique developed by Friedman and Schwartz (1964).

The money stock can be defined as:

$$M = C + D \tag{19}$$

Where

M = money stock, M1,

D = designated monetary deposits of the banking system,

and

C = currency in the hand of the public.

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[1]The penalty rate is usually operational for most banks during periods of tight money. However, even penalty rates are always lower than the closest alternative market rate of interest. Interest rates on call money have been as high as 20 percent while the penalty rate has never exceeded 9.5 percent.

High-powered money is defined in terms of its uses and sources. The uses of high-powered money representing liabilities of the Central Bank are:

$$H = C + BR \tag{20}$$

Where

H = high-powered money

and

BR = reserves of the banking system.

The sources of high-powered money representing assets of the Central Bank are:

$$H = NDA + NFA \tag{21}$$

Where

NDA = net domestic assets of Central Bank comprising credit to banking systems and government debt to the Central Bank

NFA = net foreign assets of Central Bank or international reserves.

The money identity can be expressed in terms of high-powered money and the money multiplier written in terms of the deposit-currency ratio, D/C, and the deposit-reserve ratio, D/BR:

$$M = H\left(\frac{D}{BR}\right)\ \left[\frac{1 + D/C}{D/BR + D/C}\right] \tag{22}$$

The Bank of Japan directly controls only NDA.[1] The other components of money stock are determined by other decision-making units. In particular, NFA is influenced by decisions of exporters and importers; deposit-currency ratio D/C, depends on the desired composition of money holdings by the nonbank public; the deposit-reserve ratio, D/BR, depends upon the desire of the banking system for excess reserves. The link between NDA and M can be analyzed in two steps: first the relation between NDA and H, and second, the link between H and M.

The supply of high-powered money is determined directly from the balance sheet of the central bank. High-powered money in the form of currency[2] reaches the nonbank public through its drawdown of deposits with the banking system. The banks in order to maintain working balances of vault cash to meet expected demand must continually acquire additional Central Bank notes. Bank of Japan notes can be acquired in three ways: (1) selling foreign exchange to the Bank of Japan, (2) presenting government drafts to the Bank of Japan, and (3) borrowing from the Bank of Japan. In Japan, Central Bank credit has been extended predominantly through direct increases in the debt of the banking

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[1]It can be argued that the Bank of Japan can only control its credit to the banking system. However, because the Bank of Japan policy is closely coordinated with government policy there is reason to believe the Central Bank has control over the financing of government debt.

[2]Currency represents about 80 percent of the use of high-powered money.

system and the acceptance of government debt.[1] As such, coordination of government policy objectives and the reliance of deposit money banks to Central Bank credit[2] has permitted the Bank of Japan to have almost complete control over high-powered money.

The total money stock in equation (22) is the product of reserve money times the money multiplier. If the deposit-currency ratio, D/C, and deposit-reserve ratio, D/BR, which jointly determine the money multiplier, are known the money stock can be determined for a given level of reserve money, H. However, these components of the money multiplier are only available from the consolidated balance sheet of the banking system once a month with a four-week time delay. If the ratios are not constant, the monetary authorities will be unable to control the money stock directly because of this information lag. A study by Keran (1970) of Japanese monetary developments in the 1950's and 1960's indicates that while the deposit-reserve ratio, D/BR, is relatively stable, the deposit-currency ratio, D/C, is rather volatile. In particular, deviations about a trend for D/C follow closely the cyclical

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[1] In the early 1960's, credit to the banking system dominated central bank lending. From 1960 to 1966, credit to the banking system increased by 1,121 billion yen while financing of government debt increased by only 237 billion yen. However, in the late 1960's, financing of government debt became the dominant source of high-powered money. From 1966 to 1970, financing of government debt increased by 1,739 billion yen while credit to the banking system increased by 489 billion yen.

[2] The willingness of deposit money banks to be in considerable debt to the Bank of Japan is contrary to the experience in the U.S. and in general reflects the fact that appropriate short-term financial markets have not been developed in Japan.

movements of the money stock. Thus with easy (tight) money deposits increase (decrease) substantially relative to currency. As such, fluctuations in the deposit-currency ratio reinforce cyclical movements of high-powered money.

The success of efforts by the Bank of Japan to achieve a money stock target is dependent upon the attainment of a reserve money target and the ability to predict cyclical movements in the deposit to currency ratio.

D. Controls on International Capital Movements

The Bank of Japan, in collaboration with the Ministry of Finance, the Ministry of International Trade and Industry (MITI), and through the authorized foreign exchange banks can regulate the international flow of capital through the use of the Foreign Exchange and Foreign Trade Control Law and the Foreign Investment Law established in 1950. Such controls are designed to prohibit or restrict all transactions likely to influence adversely Japan's balance of payments or add to its international indebtedness. In addition, these controls are intended to permit the monetary authorities to conduct a more independent monetary policy and prevent the loss of foreign exchange.

The operations of the Japanese foreign exchange market are limited by the Foreign Exchange Control Law. This law which forms the basis for Japan's foreign exchange system provides for the concentration of all foreign exchange, precious metals, claims in foreign currency and foreign securities. Foreign exchange can only be kept

by the government (foreign exchange fund), the Bank of Japan, and authorized foreign exchange banks. Residents of Japan are required to sell within ten days any foreign means of payment, foreign claimable assets and foreign securities which they may hold.

Under the Foreign Exchange Control Law, eleven city banks and ten foreign banks possessing branches in Japan are recognized as "authorized foreign exchange banks." All current and capital transactions are handled through the foreign exchange banks which can sell or buy foreign exchange to settle balances arising from transactions with customers in the foreign exchange market. While regulations on the activities of foreign exchange banks can be modified to suit foreign exchange market conditions, there are four controls of importance affecting these banks. The first three relate to ceilings on holdings of net Eurodollars, net foreign currency liability position, and spot and forward foreign exchange holdings. In addition, foreign exchange banks are required to maintain a certain stipulated proportion of their foreign exchange liabilities in highly liquid foreign exchange assets.

The large commercial banks are extremely active in financing foreign trade and related business activities, particularly with regard to developments in the Eurodollar market. In forming foreign branch offices by the Japanese banks, the Ministry of Finance has imposed severe restrictions on the operation of these foreign branches. The primary restrictions, in addition to those already mentioned, relate to ceilings on loans, chiefly to trading companies and foreign

subsidiaries of Japanese enterprises, and guidelines pertaining to the rate of interest payable on Eurocurrency borrowing.

Foreign banks have been permitted to open offices in Japan. Ten foreign banks with offices in Japan have been authorized as foreign exchange banks. These banks are regulated by the type of activities they can engage in. They are permitted to establish free yen accounts for nonresidents. Restrictions on foreign bank activities in Japan relate to ceilings on foreign exchange holdings and free yen deposits, and the extending of loans with maturity greater than one year.

The majority of foreign capital inflows are in the form of foreign loans, sale of Japanese securities and flotation of external bonds (quite small relative to other capital inflows). Impact loans[1] started to play a significant role in the 1960's when rapid economic expansion created a strong demand for funds. The inflow of impact loans have been influenced by a number of factors, particularly the dollar rate, foreign and domestic interest rates, domestic money market conditions and restrictions imposed by the authorities. The emergence of the Eurodollar market has produced significant changes in the pattern of capital inflows.

Japanese interest rates have been considerably higher than foreign rates, particularly because of Japanese market restrictions. It was not until 1969 that Eurocurrency rates rose sharply above Japanese

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[1]This refers typically to loans not tied to World Bank development projects or Export-Import Bank financing the import of American products.

rates. The Ministry of Finance approves all foreign loans and will not approve loans if the interest rate is too unfavorable to Japanese borrowers.

Eurodollar borrowing, which by 1971 amounted to $1.6 billion, is taken up by the London branches of Japanese foreign exchange banks, moved immediately to Japanese headquarters, changed into yen, and used for profitable domestic loans. This is one reason restrictions have been placed on the inflow of impact loans. It is believed such foreign funds are a threat to monetary policy.

Foreign investment in Japanese securities reached a high in 1963 but dropped to less than half in the following year. By the end of 1971, foreign investment in Japanese stock was estimated at $2.5 - $3.1 billion, about 4 percent of the market value of all Japanese stocks. In general, the acquisition of stocks in the stock market are automatically approved only for single foreign holders and if the acquisition remains within specified percentages of the total stock of the corporation.

The timing of payments for current transactions is restricted by the government. Prior approval must be obtained for payments of imports when made in advance or later than four months after delivery. Settlement for the value of export goods must be made by drawing a bill of exchange payable within five months after sight or within six months after shipment. Under the foreign exchange centralization system, export proceeds of foreign denomination are to be surrendered within

ten days from the date of acquisition. Resident trading concerns are permitted to have foreign currency deposits with authorized banks to hold export proceeds for twenty days for which they could be used for approved payments of imports. The payments for invisibles require approval. Generally, such payments are automatically approved by authorized banks without any limitations.

E. Movements Toward Liberalization of Capital Flows in the 1960's

The imposition of severe restrictions on foreign trade and exchange was the result of Japan's effort to deal with the economic difficulties in the postwar era. Japan's membership in the International Monetary Fund in 1952, the Organization for Economic Cooperation and Development in 1964 and adherence to the General Agreement on Tariffs and Trade in 1955 provided the setting for the liberalization of trade and capital. However, efforts to remove such restrictions were not realized until the mid-1960's.

The "liberalization" of capital controls has a different meaning in Japan than what is conceived in Western countries. In Japan, liberalization is taken to mean some increase in freedom to undertake particular foreign exchange transactions. This rarely implies a dismantling of the administrative processes. Thus, the controls which have been liberalized can be reimposed.

During the postwar period until 1968, Japan experienced a chronic shortage of official reserves. Regulations were designed to concentrate

foreign exchange and prevent unnecessary payments to foreigners whether on the current account or the capital account. Since 1968, Japan has experienced large balance of payment surpluses and large increases in foreign exchange reserves. Foreign exchange controls have been liberalized and modified to discourage foreign exchange transactions that would unnecessarily add to Japan's payment surpluses and official reserves. The present set of controls no longer require earned foreign exchange to be turned over to the authorities. Trading concerns, business corporations and individuals can hold foreign exchange indefinitely. By late 1969, through the efforts of MITI, there was a yen shift to increase the share of yen used for the settlement of trade accounts from the previous one percent to six percent.

There has been a gradual dismantling of controls on banking activities of both Japanese and foreign banks. One important measure in the liberalization of current exchange transactions was the introduction of "free yen accounts" in July 1960. Nonresidents can open accounts with Japanese banks licensed to engage in foreign exchange business. The adoption of free yen accounts provides for greater use of yen in the settlement of international transactions. In addition, Japanese foreign exchange banks are permitted to give short-term credits to foreign banks possessing free-yen accounts, plus flexibility in the establishment of foreign exchange accounts.

The restrictions on lending by Japanese banks have been gradually lessened while ceilings on the volume of lending by foreign branches

have been raised as of 1970. In cases where "specific" approval was needed for loans with a maturity exceeding six months, "automatic" approval has been substituted. By August 1970, all restrictions on the amounts which could be lent or guaranteed by overseas branches of foreign exchange banks were abolished. Guidelines were abolished in 1966 pertaining to the rate of interest payable on Eurocurrency borrowing.

Liberalization regarding capital transactions relate to repatriation of profits of foreign corporations, and of interest and dividends on Japanese stocks and bonds owned by nonresidents. There has been little change in restrictions related to the volume or type of capital transactions in Japan and abroad.

The major step in the liberalization of trade financing relates to trading companies having more flexibility to retain portions of their foreign exchange earnings. The restrictions on timing of payments for current transactions have remained intact.

It can be argued that the general trend in the 1960's has been toward liberalization of international transactions involving Japan. However, it appears that in actuality the government has simply rerouted the controls available to meet the needs of Japan in the international economic setting. Thus, with Japan's balance of payments position shifting to large surpluses and excessive accumulations of foreign exchange, the authorities have changed the controls so as to prevent continued accumulation of foreign reserves. The control of short-term

capital movements has been instrumental in the management of international payments.

IV. ECONOMIC MODEL TO EXPLAIN SHORT-TERM CAPITAL FLOWS

A. Introduction and Objectives

This chapter presents the basic methodology to be employed in an attempt to explain movements in the short-term capital account of Japan's balance of payments. The primary objective is to examine empirically the interrelationship between monetary policy, short-term capital flows and the basic balance of payments in Japan for the period from 1961 to 1971.[1] Within the theoretical framework particular interest is directed to determine: (1) the extent to which short-term capital flows offset monetary policy actions and result in feedback effects; (2) the direction of impact between monetary policy actions and the basic balance of payments and the indirect effect of short-term capital flows; and (3) the length of the adjustment process of the short-term account to exogenous shocks in the system.

B. Analytical Approach to Explain Short-Term Capital Flows

1. Theoretical model

To achieve these objectives, this study employs a portfolio general equilibrium model (Kouri and Porter, 1974) to test empirically the determinants of short-term capital movements in Japan. This model

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[1] This time period was selected because short-term capital flow data is only readily available after 1960 and the model's assumptions of fixed exchange rates restricts the study to a period prior to the 1971 breakdown of fixed exchange rates.

views short-term capital flows, in the context of the overall balance of payments, as the mechanism through which excess demand or supply for money is removed. The basic framework specifies a portfolio of three assets to include money plus foreign and domestic assets. The Kouri and Porter approach is modified here to include a broader measure of money, e.g. M1, than the original specification of high-powered money as the money asset. Altering the basic Kouri and Porter model to incorporate a money multiplier allows for a more encompassing assessment of the response of short-term capital flows to disequilibrium conditions in the money market. The model is presented below.

	Demand functions	Supply relations	
Demand for money	$M_d = L(\overset{+}{Y}, \overset{+}{W}, \overset{-}{R}, \overset{-}{R^f})$		(23)
Net domestic demand for domestic bonds	$B_d^d = H(\overset{?}{Y}, \overset{+}{W}, \overset{+}{R}, \overset{-}{R^f})$		(24)
Net domestic demand for foreign bonds	$B_f^d = J(\overset{?}{Y}, \overset{+}{W}, \overset{-}{R}, \overset{+}{R^f})$		(25)
Net foreign demand for domestic bonds	$B_d^f = F(\overset{?}{Y^f}, \overset{?}{W^f}, \overset{+}{R}, \overset{-}{R^f})$		(26)
Total money supply		$M_s = a(NFA + NDA)$	(27)
Domestic component of money supply (Central Bank credit)		$\Delta NDA = -\Delta B_g$	(28)
Foreign component of money supply (balance of payments)		$\Delta NFA = STCF + BB$	(29)
Wealth identity		$W = L(\ ) + H(\ ) + J(\ )$	(30)
Money equilibrium		$M_d = M_s$	(31)

	Demand functions	Supply relations	
Domestic bond equilibrium		$B_g = B_d^d + B_d^f$	(32)
Net short-term capital inflows		$STCF = \Delta B_d^f - \Delta B_f^d$	(33)

Endogenous variables	Exogenous variables
M_d - Money demand	Y, Y^f - Nominal income (domestic and foreign)
M_s - Money supply	R^f - Foreign interest rate
R - Domestic interest rate	W, W^f - Nominal wealth (domestic and foreign)
B_d^d - Net domestic demand for domestic bonds	B_g - Stock of government bonds held by private sector
B_f^d - Net domestic demand for foreign bonds	NDA - Net domestic assets of central bank
B_d^f - Net foreign demand for domestic bonds	BB - Basic balance of payments
NFA - Net foreign assets of central bank	a - Money multiplier
STCF - Net short-term capital inflow	

2. Derivation of reduced form equation

The model can be reduced to a system of two equations with short-term capital flows and changes in the domestic interest rate the endogenous variables. The net domestic demand for domestic bonds (24) can be eliminated from the model by invoking the wealth identity (30). It follows when wealth is assumed exogenous and two of three asset demand

relations are specified in equations (25) and (26) that the demand for the third asset is determined from the wealth constraint. Also, given that the total stock of domestic bonds and the change in this stock generated through credit operations by the monetary authorities are assumed exogenous, equations (28) and (32) add no new information and as such can be dropped. Taking first differences of equations (23) and (27) and with appropriate substitution, the model reduces to the following two equations:

$$\Delta L(Y, W, R, R^f) = a(\Delta NDA + STCF + BB) + \Delta a(NDA + NFA) \tag{34}$$

$$STCF = \Delta F(Y^f, W^f, R^f, R) - \Delta J(Y, W, R, R^f). \tag{35}$$

This system of two equations can be arranged in matrix notation to solve for the two unknowns STCF and ΔR as follows:

$$\begin{bmatrix} -a & L_R \\ 1 & (J_R - F_R) \end{bmatrix} \begin{bmatrix} \overline{STCF} \\ \Delta R \end{bmatrix} = \begin{bmatrix} \overline{a}(\Delta NDA + BB) + \Delta a(NDA + NFA) - L_Y\Delta Y - L_W\Delta W - L_{R^f}\Delta \overline{R^f} \\ F_{Y^f}\Delta Y^f + F_{W^f}\Delta W^f + (F_{R^f} - J_{R^f})\Delta R^f - J_Y\Delta Y - J_W\Delta W \end{bmatrix}. \tag{36}$$

The solution for STCF follows from the use of Cramer's Rule.

$$STCF = \frac{1}{\Delta} \begin{vmatrix} a(\Delta NDA + BB) + \Delta a(NDA + NFA) - L_Y\Delta Y - L_W\Delta W - L_{R^f}\Delta R^f & L_R \\ F_{Y^f}\Delta Y^f + F_{W^f}\Delta W^f + (F_{R^f} - J_{R^f})\Delta R^f - J_Y\Delta Y - J_W\Delta W & J_R - F_R \end{vmatrix} \tag{37}$$

where $\Delta = -a(J_R - F_R) - L_R > 0$.

By multiplying the determinant and arranging terms, the solution for STCF in its reduced form is:

$$STCF = \frac{-1}{\Delta}\,[(J_R - F_R)L_{Rf} + L_R(F_{Rf}J_{Rf})]\Delta R^f + [(J_R - F_R)L_Y - L_R J_Y]\Delta Y$$

$$+ (F_R - J_R)a \cdot BB + (F_R - J_R)[NFA + NDA]\Delta a + (F_R - J_R)a \cdot \Delta NDA$$

$$+ [(J_R - F_R)L_W - J_W L_R]\Delta W + (L_R F_{Yf})\Delta Y^f + (L_R F_{Wf})\Delta W^f. \qquad (38)$$

3. Qualitative results

Without making any assumptions regarding the degree of capital market integration, it is possible to make qualitative statements about the coefficients for ΔR^f, ΔNDA, BB and $\Delta a[NFA + NDA]$. The results are as expected. The coefficient on ΔR^f is negative indicating that an increase (decrease) in foreign interest rates will induce investors to substitute foreign (domestic) bonds for domestic (foreign) bonds thus generating a short-term capital outflow (inflow). In the case of the basic balance BB the coefficient is between zero and minus one which suggests that the current account balance and long-term capital flows are partially financed through short-term capital flows. The coefficients on the changes in the money multiplier Δa and the monetary policy instrument ΔNDA are between zero and minus one. This indicates that the increases (decreases) in credit available through easing (tightening) of monetary policy and increases (decreases) in the money multiplier generate a temporary excess supply (demand) for money that is partially alleviated through short-term capital outflows (inflows).

The coefficient on changes in income is ambiguous only to the extent that the qualitative impact of changes in income on the net

domestic demand for foreign bonds J_Y is not specified. However, noting that the wealth identity constrains income to have only redistribution effects on total asset holdings, i.e. $L_Y + H_Y + J_Y = 0$ with $L_Y > 0$, and assuming that income affects the domestic demand for foreign bonds and the domestic demand for domestic bonds in the same way, i.e. $H_Y = J_Y$, it follows that $J_Y < 0$. Given this assumption, it is possible to conclude unambiguously that the qualitative impact of ΔY on STCF in equation (38) is positive. This implies that increases (decreases) in income produces through the money demand relation an excess demand (supply) for money thus generating short-term capital inflows (outflows).

Only the results for ΔW, ΔW^f and ΔY^f in equation (38) are ambiguous with less than perfect capital market integration. By assuming the limiting case of perfect capital markets such that H_R and J_{Rf} approach positive infinity while H_{Rf} and J_R approach minus infinity, conclusive statements can be made about the impact of these variables on short-term capital flows. The impact of foreign income and wealth becomes small and goes to zero. The coefficient on wealth has the expected positive sign thus indicating that increases (decreases) in wealth have the net effect of producing short-term capital inflows (outflows).

The reduced form equation to explain short-term capital flows can be stated as follows in an estimable form with plus or minus over the β's indicating the expected signs of the coefficients:

$$STCF = \beta_0 + \overset{(-)}{\beta_1} BB + \overset{(-)}{\beta_2}\Delta NDA + \overset{(-)}{\beta_3}\Delta a[NFA + NDA] + \overset{(-)}{\beta_4}\Delta R^f + \overset{(+)}{\beta_5}\Delta Y + \overset{(+)}{\beta_6}\Delta W + \overset{(?)}{\beta_7}\Delta Y^f + \overset{(?)}{\beta_8}\Delta W^f + \mu. \tag{39}$$

4. Data limitations

The availability of statistical data for measures of foreign and domestic wealth (ΔW^f, ΔW) plus foreign income (ΔY^f) is not adequate, and as such these variables are dropped from the equation. There is some question whether this will seriously bias the results of a multiple regression analysis.

Regarding the foreign income and wealth, it is indicated above that when the degree of capital mobility is high, the coefficients on ΔW^f and ΔY^f become very small and approach zero in the limiting case of perfect capital market integration. When the degree of capital mobility is relatively low, the partial derivatives, F_{Y^f} and F_{W^f}, showing the response of net foreign demand for domestic bonds (26) to changes in foreign income and wealth, can be expected to be small. From inspection of equation (38), it is evident the responsiveness of STCF to ΔY^f and ΔW^f will be small and as such exclusion of these variables from the model will not seriously affect the regression results.

The exclusion of domestic wealth from the model could detract from the quality of the results. With perfect capital market integration, i.e. $J_R \to -\infty$ the coefficient on ΔW approaches $\frac{L_W}{a} > 0$. Given the probable situation that the demand for money is responsive to wealth, i.e. $L_W > 0$, a short-term capital flow will result from changes in domestic wealth. However, with less than perfect capital mobility, an argument can be made for justifying the exclusion of ΔW from the model.

The numerator of the coefficient for ΔW in equation (38) could be approximately zero, i.e. $(J_R - F_R)L_W - J_W L_R \simeq 0$. It is quite likely that changes in wealth will elicit a greater response in the demand for money than the demand for foreign bonds on the part of domestic investors, i.e. $L_W > J_W$. Also, changes in the domestic interest rate are likely to affect the demand for money more than the combined impact on domestic demand for foreign bonds and the foreign demand for domestic bonds, i.e. $|L_R| > |J_R - F_R|$. The net effect could be quite small so that changes in wealth will generate little or no net short-term capital flow.

It would be desirable to test the plausibility of the above arguments. However, their very essence is to justify excluding these variables from the reduced form equation. One possible approach to this problem is tied in with the suggestion[1] that GNP could be used as a proxy for changes in wealth. The argument posited suggests that from the point of view of the private sector contributions to net worth are derived from additions to private capital stock, net claims on foreigners plus the government debt. Thus, GNP may be an approximate measure for changes in domestic wealth. However, it is immediately evident that GNP would include not only additions to financial wealth but also real capital growth. From the point of view of the model change in wealth is intended to only include financial wealth and as such GNP would be too encompassing a measure.

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[1] Leamer and Stern (1970, p. 93).

The reduced form equation, derived above to explain short-term capital flows, is stated in its modified form:

$$STCF = \beta_0 + \overset{(-)}{\beta_1}BB + \overset{(-)}{\beta_2}\Delta NDA + \overset{(-)}{\beta_3}\Delta a[NDA + NFA] + \overset{(-)}{\beta_4}\Delta R^f + \overset{(+)}{\beta_5}\Delta Y + \mu. \qquad (40)$$

5. Allowing for lagged adjustment

The formulation of the theoretical model assumes the impact of the explanatory variables on the system is complete within the measured period. This would imply, for example, that changes in the monetary policy instrument resulting in disequilibrium in the demand for money could effect a flow in short-term capital such that equilibrium is restored by the end of the period. In actual fact, the response of short-term capital flows to the monetary policy variable as well as other explanatory variables may be distributed over several periods.

Also, a response of short-term capital flows to the basic balance of payments can arise that is likely to be distributed over several periods. To finance a basic balance surplus (deficit) there will result at least a partial outflow (inflow) of short-term capital in the form of trade credits, etc. Dependent upon the institutional constraints, these credits will mature in subsequent periods and as such result in an opposite flow of these short-term assets and liabilities. The offset of short-term capital flows to the basic balance position in one period will show up in later periods as an accommodating response of short-term capital movements. Thus, it is important that a lagged adjustment process be incorporated to capture these countervailing flows.

The speed of adjustment will depend on a number of factors including institutional constraints and the strength of market forces in the economic process. In order to test for the possibility of a lagged adjustment of short-term capital movements to the explanatory variables, a multi-period lag is introduced for all variables. The determination of the appropriate lag will be an experimental process without explicit a priori information.

6. Assessing the introduction of money multiplier in the model

The model in its reduced form differs from that of Kouri and Porter only to the extent that the money multiplier is not constrained to a value of one. The assumption of a money multiplier greater than one does not change the qualitative results on the coefficients of the explanatory variables. In fact, it is easily shown that the above results collapse to the Kouri and Porter reduced form equation when $a = 1$ and $\Delta a = 0$.

The additional explanatory variable in the model, $\Delta a[NDA + NFA]$ introduced when the money multiplier is allowed to change provides an assessment of the impact on short-term capital flows from a broader measure in money supply and demand, i.e. M1. This point can be clarified further by considering the money supply M in terms of base money and the multiplier.

$$\begin{aligned} M &= a \cdot H \\ &= a[NDA + NFA] \end{aligned} \tag{41}$$

The total change in M results through changes in the multiplier Δa and changes in base money ΔH:

$$\begin{aligned}\Delta M &= H\Delta a + a\Delta H \\ &= H\Delta a + a\Delta NDA + a\Delta NFA \\ &= H\Delta a + a\Delta NDA + aBB + aSTCF \end{aligned} \tag{42}$$

The second and third terms in equation (42) reflect exogenous changes in the domestic and foreign components of base money when the multiplier is held constant. In the Kouri and Porter framework when a=1, only the variables ΔNDA and the exogenous component of ΔNFA, the basic balance BB, are included to explain short-term capital flows, STCF. However, when the money multiplier fluctuates, there will result a change in money supply for a given stock of base money as evidenced by the first term in equation (42). Such changes in the multiplier will produce credit expansions and contractions in the money market. The immediate impact will be a disequilibrium situation in the demand for money that could be alleviated through short-term capital flows. Thus included as explanatory variables in the reduced form equation to explain short-term capital flows are those components causing changes in the money supply that are viewed as exogenous in the model, i.e. BB, ΔNDA and $\Delta a[NDA + NFA]$.

C. Relation of Monetary Policy to Short-Term Capital Flows

1. Exogeneity assumption of the explanatory variables

Implicit in the use of a reduced form equation to estimate short-term capital flows is the presumption that all the explanatory variables

are exogenous within the framework of the model. When such an assumption is violated, the application of an ordinary least squares estimation technique gives rise to the possibility of a bias in the estimated parameters. An appropriate question to ask is whether the degree of exogeneity is sufficient enough for analytical purposes to presume these variables are essentially determined outside the system and thus independent of the simultaneous interaction of the endogenous economic variables within the model.

Even in the simple macroeconomic model presented here to explain short-term capital flows, there is reason to believe a degree of endogeneity is present among all the economic variables in the model. Surely the basic balance of payments position would be altered if financing through short-term capital flows were greatly restricted or not available. Presumably Japanese financial markets could have some impact on foreign interest rates, however slight, even though Japan is assumed to be a price taker on world markets. There is also question whether monetary policy is conducted independent of balance of payment positions in general and short-term capital flows in particular. It is of importance to address the question concerning the appropriateness of the exogeneity assumption on monetary policy actions in the model and the impact on the quality of the results to be derived.

2. Endogenous monetary policy response

Particular concern in this regard for the analysis of short-term capital flows using the portfolio balance approach relates to the

treatment of the monetary policy instrument as an independent variable in the system.[1] Strictly speaking, for the monetary policy instrument, measured by changes in net domestic assets of the Central Bank (ΔNDA), to be exogenous it is crucial that the authorities follow a neutral monetary policy. That is, no effort is made to offset or sterilize the liquidity effects on the money supply for foreign exchange flows nor is an accommodating monetary policy used to attain a targeted or equilibrium position in the balance of payments.

It is argued by Mundell (1968) that an appropriate policy strategy would be to direct the monetary policy instrument to achieve targeted positions in the balance of payments. If government economic policy in general and Japanese economic policy in particular can be described by the Mundell approach, then the monetary authorities would adjust ΔNDA in response to short-term capital flows and/or imbalances in the basic balance of payments.

Two possible responses by the monetary authorities to short-term capital flows are of interest to consider. First, in an effort to pursue an independent monetary policy, the monetary authorities will

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[1] A related question can be directed to the assumption of whether changes in the money multiplier times base money HΔa can be appropriately assumed exogenous. Essentially HΔa reflect actions on the part of the private sector that change the stock of money M1 as a result of economic conditions and/or monetary policies. For Japan, changes in the money multiplier result primarily from changes in the deposit to currency ratio and as such would not be expected to respond to short-term capital flows. Thus, it is felt that HΔa can be assumed exogenous to STCF. See Chapter 2 for a discussion on control of base money and factors influencing the money multiplier.

follow a sterilization policy whereby ΔNDA is adjusted to offset liquidity effects in the money supply from short-term capital flows. In response to changes in net foreign assets of the central bank caused by short-term capital flows, the authorities would initiate an opposite change in ΔNDA in order to leave the monetary base unchanged. Alternatively, it is possible the monetary authorities will assign monetary policy to the balance of payments target. In this case, short-term capital flows will be accommodated by ΔNDA aimed at restoring either the balance of payments equilibrium or a target level of foreign exchange reserves. It should be noted that similar monetary policy responses could be directed to imbalances in the basic balance of payments position or some other measure reflecting a country's international economic position.

If such automatic policy responses do occur, in part, then within the framework of this model the monetary policy instrument, ΔNDA, is to a degree endogenous. However, the degree of endogeneity is dependent on the extent to which automatic sterilization or accommodating policy actions dominate ΔNDA over discretionary changes in monetary policy. For these two cases, the use of ordinary least squares to estimate the reduced form equation to explain short-term capital flows can bias the ΔNDA coefficient toward minus one in the case of a sterilization policy and toward zero under an accommodating policy.[1] The size of the bias is affected largely by automatic responses.

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[1]See Kouri and Porter (1974, pp. 453-4) for a mathematical proof.

To assess the estimation bias problem, a simultaneous system can be constructed with ΔNDA and STCF assumed endogenous. By adding a reaction function to explain monetary policy responses, STCF and ΔNDA can be determined simultaneously in a two-equation model. The model stated in a functional form is:

$$STCF = f(\Delta NDA, BB\ \Delta a[NDA + NFA], \Delta Y, \Delta R^f), \tag{43}$$

$$\Delta NDA = g(STCF, BB\ \Delta a[NDA + NFA], Z), \tag{44}$$

where Z represents all other explanatory variables.

The explanatory variables in the functional form are presumed to include lagged values where necessary. By appropriate specification of the independent variables, the parameters of the model can be identified and estimated with a two-stage least squares estimation procedure.

The addition of a reaction function permits a description of the simultaneous interaction between short-term capital flows and monetary policy. The reaction function shows the response of monetary policy to endogenous movements of short-term capital flows and exogenously determined changes in the money multiplier and basic balance of payments position. The sign on the coefficient for STCF and BB will depend on whether an accommodating or sterilizing policy is pursued. The qualitative results on changes in the money multiplier will reflect the desire of the monetary authorities to control the money supply in its pursuit of policy objectives.

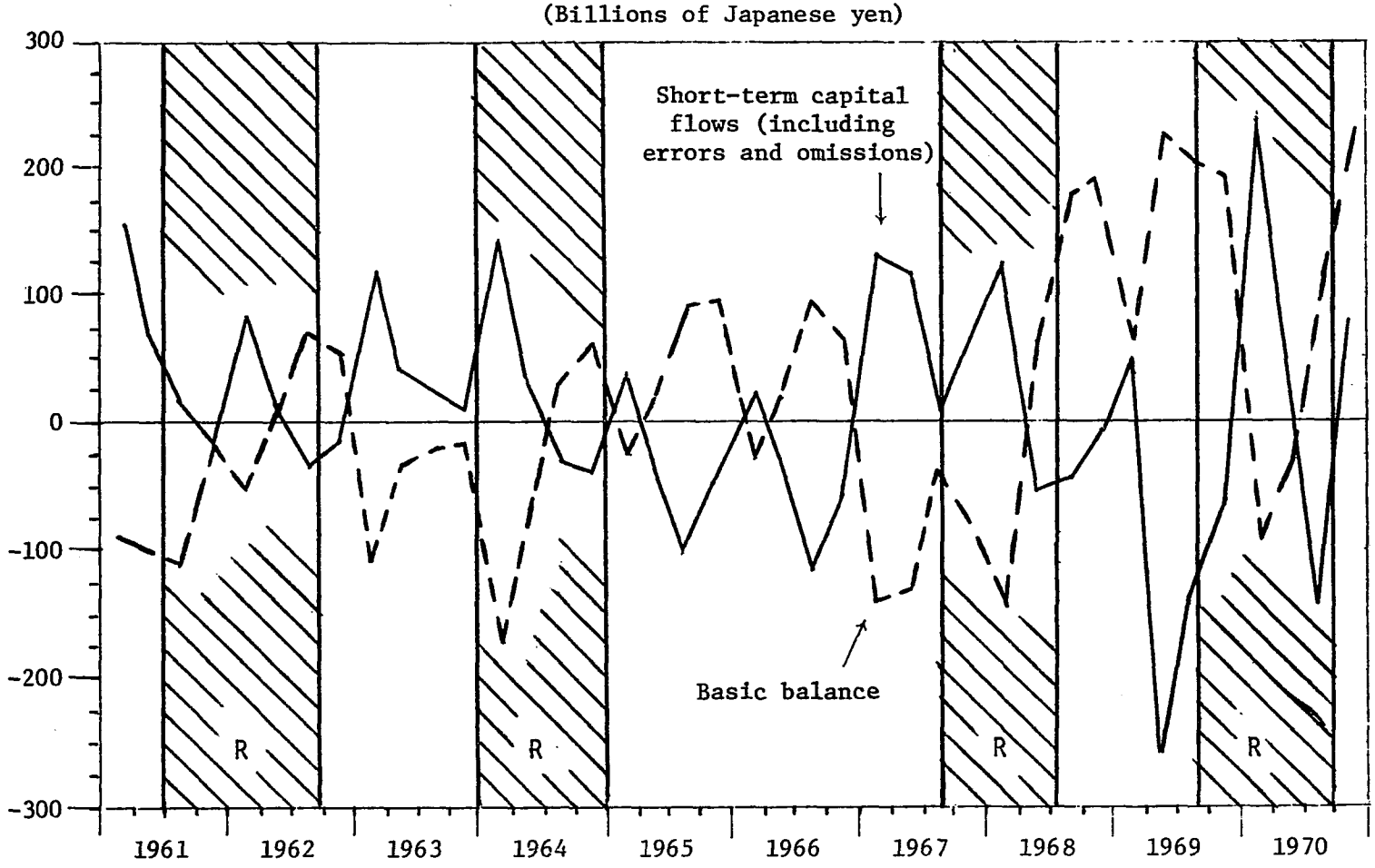
D. Role of Japan's Monetary Policy Within the Framework of the Model

1. Monetary policy and the balance of payments

Monetary developments in Japan during the 1960's indicate that monetary policy actions are geared to the needs of balance of payments adjustment. The evidence shows a definite relationship between changes in monetary policy and fluctuations in the basic balance. This is brought out in Chart 1 showing the basic balance of payments fluctuations, short-term capital flows and periods of monetary ease (unshaded area) and monetary restraint (shaded). While the chart does not show the degree and detailed timing of policy actions, it does suggest that alternating periods of monetary ease and restraint have generally been followed, with a lagged adjustment, by alternating periods of deficit and surplus in the basic balance.

The chart also indicates a definite inverse relation between the basic balance and short-term capital flows. The close link is due in part to trade financing. Japan's exports are generally financed by Japanese banks, while imports receive financing from foreign banks. However, the Japanese authorities through the use of "guidance" and special controls have probably had a more important influence on short-term capital flows than monetary policy actions. The policymakers attuned to the importance of short-term capital flows have instituted special measures to influence these flows in the right direction and of the right magnitude to reinforce the inverse relationship with the

Chart 1. Japan's balance of payments seperated into short-term capital flows and the basic balance and monetary policy[a]



[a]The shaded area with an R refers to periods of restrictive monetary policy.

basic balance. The general intent has been to attenuate fluctuations in the overall balance of payments.

The broad monetary policies adopted to deal with basic balance of payments fluctuations, however, do not appear to be responsive to short-term capital movements. The evidence in Chart 1 indicates in some instances that for a given policy action the flow of short-term capital has operated in the opposite direction expected, with little apparent effect on the inverse relationship with the basic balance. Periods of monetary ease (restraint) should encourage short-term capital outflows (inflows). However, during periods of monetary ease when the basic balance moves from a surplus to deficit, short-term capital movements, while initially a net outflow, turn to a net inflow with a deficit position in the basic balance. This is particularly evident during the period from 1962-4 to 1963-3 and 1965-1 to 1966-4. Similarly, in periods of restrained policy the basic balance deficit position improves while short-term capital flows, at first producing a new inflow, turn to a net outflow when the basic balance moves into a surplus position.

Preliminary conclusions can be drawn from these circumstances. First, monetary policy measures have been directed to influence and reverse cyclical movements in the basic balance of payments. Second, the inverse relation between short-term capital flows and the basic balance stemming from financing patterns has prompted the authorities to reinforce this relationship. Such measures have had a greater

influence on short-term capital movements than monetary policy and have been intended to ameliorate the overall balance of payments position.

2. Appropriateness of a policy reaction function

This assessment of the interrelationship between short-term capital flows, the basic balance of payments and monetary policy actions is not consistent with the specification of a policy reaction function in the model. The basis for introducing a reaction function is to account for monetary policy responses to short-term capital flows and imbalances in the basic balance of payments. The experience of a number of West European countries has indicated the monetary authorities do, in fact, gear policy actions to both these components of the overall balance of payments. In regards to the Japanese monetary policy experience it appears the formulation of such a reaction function would be inappropriate in two ways.

First, the policy reaction function is specifically designed to show the response of ΔNDA to movements of short-term capital. However, the indications are that while monetary policy is directed at Japan's external position it does not consistently produce short-term capital flows. Rather, special policy measures in the form of guidance and controls have responded to short-term capital flows to reinforce the inverse relation with the basic balance. On this basis ΔNDA would not be endogenously determined in the model and specification of a reaction function would be unnecessary. Second, the reaction function

suggests that monetary policy actions respond to the basic balance of payments position. Yet, the preliminary assessment indicates that policy actions work as a causative force to produce responses in the basic balance over several periods. By easing (tightening) the monetary policy instrument there will result over several periods a movement of the basic balance away from a surplus (deficit) position toward an equilibrium balance. However, such a description of the interaction is incomplete. Presumably the monetary authorities were prompted in the first place by imbalances in the external position and thus adjusted the monetary instrument to correct the surplus/deficit position in the basic balance. This suggests a bilateral causation between the monetary policy and the position of the basic balance. In any case, the reaction function is incomplete in the attempt to show the interaction between ΔNDA and BB.

The empirical analysis to explain short-term capital flows with a reduced form equation where ΔNDA is assumed exogenous to STCF would appear appropriate given Japan's monetary developments. It would show the pronounced inverse relation between STCF and BB and the response, however weak, of STCF to ΔNDA. Yet, the analysis does not show the interrelationship between the basic balance and monetary policy. This is not to say the reduced form model is misspecified but rather that ΔNDA and BB are assumed exogenous and not highly correlated. The question of a causal relationship between BB and ΔNDA is not addressed. To the extent that a pronounced causal relationship exists between ΔNDA and BB, we might anticipate a degree of multicollinearity that will tend to obfuscate the separate impacts of ΔNDA and BB on STCF.

3. Direction of causation between monetary policy and the basic balance of payments

Further clarification of the interaction between monetary policy and the basic balance is necessary. A more definitive picture of the probable causal ordering between ΔNDA and BB will help to put into perspective the preliminary indications of the relation of monetary policy to the balance of payments.

A test for the direction of causation between ΔNDA and BB can be performed in light of Granger's (1969) concept of causality.[1] The conceptual argument posits that a stochastic variable ΔNDA causes a response in another stochastic variable BB if the ability to predict BB is improved by incorporating information on ΔNDA. In the same manner BB can be defined to cause ΔNDA.

Operationally a simple test for direction of causation can be performed by the following procedure. A regression of BB on lagged values of itself can be performed to provide a basis in which to predict BB:

$$BB = f(BB_{-1}, BB_{-2}, \ldots, BB_{-n}). \tag{45}$$

A second regression on BB is performed by supplementing lagged values of BB with current and lagged values of the hypothesized causative variable ΔNDA:

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[1] While considerable work has been done also by Sims (1972), DyReyes (1974), DyReyes, et al. (1978) and others that employ involved filtering technique to determine directions of causation between money and income, the analysis here will be kept relatively simple in an attempt to isolate causal orderings between ΔNDA and BB.

$$BB = f(BB_{-1}, BB_{-2}, \ldots, BB_{-n}; \Delta NDA, \Delta NDA_{-1}, \ldots, \Delta NDA_{-n}). \quad (46)$$

If the addition of current and lagged values of ΔNDA adds significant explanatory power to the model then it is suggested that ΔNDA causes BB. This test can be performed by hypothesizing that the coefficients on ΔNDA equal zero and comparing the F statistic derived from the sum of squares of the full and reduced model with appropriate significant levels. Rejection of the null hypothesis provides the basis to conclude that ΔNDA supplies significant explanatory power in attempting to predict BB and as such ΔNDA causes BB.

The same procedure can be performed in reverse to test whether BB causes ΔNDA. If the hypotheses are rejected in both the case of ΔNDA causing BB and BB causing ΔNDA, then it can be concluded that a feedback effect or bidirectional causation exists between ΔNDA and BB.

E. Summary

This chapter presents a basic portfolio general equilibrium model to explain short-term capital flows in Japan. Short-term capital flows are considered in the model as a mechanism through which excess demand or supply for money is removed. The model in its reduced form views the basic balance of payments, monetary policy actions, movements in foreign interest rates and changes in domestic income as important exogenous factors in the explanation of short-term capital movements. In addition by incorporating a broad measure of money, i.e. M1, the model provides the basis to assess the response of short-term capital

flows to changes in a money multiplier. In order to test for the possibility of a lagged adjustment of short-term capital movements to the explanatory variables, a multiperiod lag is introduced into the model.

There is concern with respect to the assumption of a neutral monetary policy. This has prompted the introduction of a reaction function under the presumption monetary policy actions are endogenous to short-term capital flows and the basic balance of payments.

Monetary developments in Japan suggest that policy actions are geared to the needs of balance of payments adjustment. However, preliminary evidence indicates that the monetary authorities are concerned more with correcting the basic balance of payments positions than in attempting to offset the liquidity effects of short-term capital flows. Thus specifying a reaction function to reflect endogenous policy responses to short-term capital flows is inappropriate. Yet a question remains as to the interaction between monetary policy and the basic balance of payments. Do the authorities actively pursue a basic balance target or passively respond to the basic balance position? A causal ordering analysis is performed to assess directions of causation between the measure of monetary policy and the basic balance of payments.

The empirical results presented in the next chapter provide the basis for a more complete assessment of the interaction between short-term capital flows, the basic balance of payments and monetary policy actions. It is hoped the results will clarify some of the suggested complexities in the analysis and provide additional evidence as to the adequacy of the theoretical approach to explain short-term capital flows.

V. EMPIRICAL RESULTS OF MODEL TO EXPLAIN SHORT-TERM CAPITAL FLOWS

The presentation and interpretation of the empirical results from a model to explain short-term capital flows is organized as follows. First, the regression results for the reduced form equation to explain short-term capital flows, equation (40) in Chapter 3, are presented under the assumption of no lagged adjustment. The empirical results include both the case of a variable money multiplier and constant money multiplier equal to one. Second, the empirical results are presented for alternative lagged adjustments in the reduced form equation to explain short-term capital flows under the assumption of (1) a constant and (2) a fluctuating money multiplier. Third, the two-stage least squares regression results are presented to assess the impact on the single equation model when the monetary policy instrument, ΔNDA, is assumed endogenous to movements of short-term capital flows. Finally, the regression results for the test of a direction of causation between the basic balance of payments BB and the monetary policy instrument ΔNDA are presented to clarify the interaction between monetary policy and the basic balance component of the overall balance of payments. These empirical results will provide the basis to assess: (1) the appropriateness of the portfolio balance model to explain short-term capital flows, and (2) the extent to which these results support a priori expectations about the role of short-term capital flows in the balance of payments adjustments and the impact of monetary policy actions on the balance of payments.

A. Single Equation Model to Explain STCF

The reduced form regression equation to explain short-term capital flows under alternative assumptions of a constant and a fluctuating money multiplier and no lagged adjustment of the independent variables provides good explanatory power. The following results are for the period from 1961-1 to 1970-4.

$$\begin{array}{lccccc} STCF = 26.19 & - & 0.60BB & - & 0.15\Delta NDA & - & 37.41\Delta R^f \\ & & (1.56) & & (-6.52) & & (-2.08) & & (-2.56) \end{array}$$

$$\begin{array}{lcc} + 0.02\Delta Y & - & 0.09H\Delta a \\ (0.46) & & (-2.42) \end{array}$$

$$R^2 = 0.73 \qquad D.W. = 2.00 \qquad SE = 52.65$$

$$\begin{array}{lccccccc} STCF = 19.67 & - & 0.59BB & + & 0.01\Delta NDA & - & 48.26\Delta R^f & + & 0.01\Delta Y \\ & & (1.11) & & (-5.99) & & (0.37) & & (-3.25) & & (0.15) \end{array}$$

$$R^2 = 0.69 \qquad D.W. = 1.94 \qquad SE = 56.18$$

The offsetting impact of short-term capital flows on the basic balance of payments is very pronounced and not affected by alternative model specifications. The offset coefficient of -0.60 implies that a surplus (deficit) in the basic balance position is financed in part by an outflow (inflow) of short-term capital. In order to maintain the balance of payments identity changes in international reserve provide the rest of the financing for the basic balance.

The estimated coefficient of ΔNDA is statistically significant only for the case in which the model allows for fluctuations in the money multiplier. The negative 15 percent response indicates that a quarterly increase (decrease) of ¥ 100 billion in net domestic assets

of the Central Bank will generate a ¥ 15 billion outflow (inflow) of short-term capital movements. Compared with the high offset of short-term capital flows on monetary policy actions in European countries (particularly in Germany with 72 percent), the Japanese experience suggests that capital controls may have greatly constrained the expected offsetting response.

The foreign interest rate measured by the rate on three-month Eurodollar deposits in London has the expected negative impact on short-term capital flows. A one percent increase (decrease) from the previous quarter in the foreign interest rate will result in a ¥ 37.4 billion outflow (inflow) of short-term capital. This is strong evidence to suggest that despite Japan's physical distance to U.S. and European financial centers and the controls on capital flows that Japanese financial markets are responsive to movements in world interest rates. In addition, these results are in part reflective of the expected short-term capital movement when domestic interest rates do not respond to changes in foreign rates. During the 1960's, there was a gradual increase in the Eurodollar rate from 3.5 percent in mid-1961 to 11 percent by mid-1969. However, the Japanese interest rate viewed through the official discount rate was generally constrained by the government to a rate between 4.75 and 7.30 percent and as such did not reflect changing economic conditions in financial markets.

Changes in income measured by seasonally adjusted figures of quarterly rates on GNP do not generate a statistically significant short-term capital movement. This is surprising in light of the

positive impact of GNP (3 to 6 percent of ΔGNP measured at quarterly rates) on short-term capital flows experienced by a number of OECD countries in the 1960's (see literature review, Chapter 2). Such a result suggests that Japan's immediate financing needs to sustain a high growth rate can be met from internal sources.

The introduction of a fluctuating money multiplier in the model has the expected impact on short-term capital flows. The effect of movements in the money multiplier is evaluated through its contribution to changes in the money supply M1, for a given level of reserve money. Increases (decreases) in the money multiplier that produce an incremental increase (decrease) in the money supply by ¥ 100 billion generates a ¥ 8 billion short-term capital outflow (inflow). It does not necessarily follow that HΔa and ΔM will move in the same direction over a quarter. Nonetheless, the impact of HΔa on ΔM resulting primarily through changes in the deposit to currency ratio is partially offset by short-term capital movements.

In general, the empirical evidence here supports the basic portfolio balance approach that views short-term capital movements as the means to remove excess demand (supply) for money. The independent variables capture much of the explanatory power (73 percent) on short-term capital flows in the current period. The basic balance of payments, an autonomous source of changes in reserve money, is the dominating factor in explaining short-term capital movements. Changes in the money supply through monetary policy actions and movements in the

money multiplier are partially offset by short-term capital movements. In addition, foreign interest rate movements, which impact on the demand for money, are instrumental in explaining short-term capital flows. Only the income variable is not significant in explaining movements of short-term capital.

B. Single Equation Model to Explain STCF with Lag Adjustment

The multiple regression results in Tables 1 through 4 provide the basis to determine the length of the response of short-term capital flows to the explanatory variables in the model. Separate results are shown under alternative assumptions of a one, two and three quarter adjustment process. In addition to the t test indicating the significance of each estimated coefficient, an F statistic is shown for a test of the null hypothesis that the coefficients on the rth lag of all the explanatory variables are equal to zero.[1] Such a

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[1]The F statistic for the test of the null hypothesis is determined as follows:

$$F^{d}_{n-k-1} = \frac{(SS_{r-1} - SS_{r})/d}{SS_{r/n-k-1}}$$

where

SS_{r-1} = error sum of squares for reduced model with lag r-1,
SS_{r} = error sum of squares for full model with lag r,
d = difference of degrees of freedom between full and reduced model,
n-k-1 = degrees of freedom in full model with lag r.

Table 1. Single equation regression analysis of short-term capital flows (STCF) with one quarter lag on the explanatory variables[a]

Results with variable money multiplier estimated by OLS

Lag	Intercept	BB	ΔNDA	ΔR^f	ΔY	HΔa	
							R^2 = 0.89
							DW = 1.37
0	28.85	-0.65	-0.10	-30.41	-0.03	-0.06	RHO = +0.22
	(1.92)	(-5.87)	(-1.51)	(-2.67)	(-.96)	(-2.17)	(+1.42)
-1		0.28	-0.11	-28.52	0.05	-0.07	SE = 37.43
		(2.71)	(-1.66)	(-2.05)	(1.51)	(-2.67)	F^5_{24} = 7.65

Results with variable money mutliplier estimated by GLS (corrected for first order autocorrelation)

Lag	Intercept	BB	ΔNDA	ΔR^f	ΔY	HΔa	
0	35.15	-0.66	-0.11	-34.25	-0.04	-0.07	R^2 = 0.89
	(2.03)	(-6.07)	(-1.81)	(-3.09)	(-1.37)	(-2.52)	SE = 36.08
-1		0.31	-0.14	-27.99	0.06	-0.08	
		(2.87)	(-2.14)	(-2.11)	(1.73)	(-3.06)	

Results with constant money multiplier estimated by OLS

Lag	Intercept	BB	ΔNDA	ΔR^f	ΔY	
						R^2 = 0.85
						DW = 1.55
0	12.23	-0.65	0.03	-26.89	-0.03	RHO = +0.13
	(0.78)	(-5.37)	(1.21)	(-2.21)	(-0.69)	(+0.83)
-1		0.30	0.06	-41.94	0.04	SE = 41.95
		(2.59)	(1.31)	(-2.84)	(0.96)	F^4_{26} = 7.94

[a]The empirical results and reported statistics are calculated using the Statistical Analysis System, Version 76.5.

Table 2. Single equation regression analysis of short-term capital flows (STCF) with two quarter lag on the explanatory variables

Results with variable money multiplier estimated by OLS

Lag	Intercept	BB	ΔNDA	ΔR^f	ΔY	HΔa	
0	21.60	-0.62	-0.08	-36.48	-0.01	-0.05	R^2 = 0.91
	(1.32)	(-4.03)	(-1.04)	(-2.77)	(-0.32)	(-1.73)	DW = 1.16
-1		0.45	-0.03	-21.83	0.07	-0.04	RHO = +0.33
		(2.32)	(-0.39)	(-1.47)	(1.76)	(-1.44)	(+2.22)
-2		-0.13	0.13	-20.88	-0.06	0.01	SE = 36.51
		(-1.01)	(1.93)	(-1.38)	(-1.04)	(0.43)	F^5_{19} = 1.30

Results with variable money multiplier estimated by GLS (corrected for first order serial correlation)

Lag	Intercept	BB	ΔNDA	ΔR^f	ΔY	HΔa	
0	30.17	-0.55	-0.08	-41.18	-0.03	-0.06	R^2 = 0.92
	(1.55)	(-4.09)	(-1.27)	(-3.47)	(-0.78)	(-2.03)	SE = 33.33
-1		0.42	-0.02	-25.57	0.06	-0.04	
		(2.63)	(-0.24)	(-2.02)	(1.85)	(-1.51)	
-2		-0.08	0.14	-22.75	-0.06	0.02	
		(-0.72)	(2.24)	(-1.68)	(-1.27)	(0.60)	

Table 3. Single equation regression analysis of short-term capital flows (STCF) with two quarter lag on the explanatory variables

Results with constant money multiplier estimated by OLS

Lag	Intercept	BB	ΔNDA	ΔR^f	ΔY	
0	7.47	-0.61	0.03	-37.64	-0.01	R^2 = 0.89
	(0.50)	(-4.14)	(1.28)	(-3.09	(-0.29)	DW = 1.27
-1		0.55	0.09	-30.58	0.06	RHO = +0.28
		(2.91)	(1.77)	(-2.11)	(1.51)	(+1.83)
-2		-0.22	0.14	-19.05	-0.06	SE = 37.50
		(-1.73)	(3.40)	(-1.24)	(-1.02)	F^4_{22} = 2.95

Results with constant money multiplier estimated by GLS (corrected for first order serial correlation)

Lag	Intercept	BB	ΔNDA	ΔR^f	ΔY	
0	15.45	-0.54	0.04	-44.89	-0.02	R^2 = 0.90
	(0.86)	(-3.96)	(1.63)	(-3.99)	(-0.65)	SE = 35.03
-1		0.50	0.10	-33.22	0.05	
		(3.09)	(2.33)	(-2.61)	(1.59)	
-2		-0.16	0.15	-22.99	-0.07	
		(1.35)	(3.83)	(-1.63)	(-1.31)	

Table 4. Single equation regression analysis of short-term capital flows (STCF) with three quarter lag on the explanatory variables

Results with variable money multiplier estimated by OLS

Lag	Intercept	BB	ΔNDA	ΔR^f	ΔY	HΔa	
0	23.48	-0.54	-0.22	-36.71	0.05	-0.06	R^2 = 0.94
	(1.27)	(-3.58)	(-2.30)	(-2.89)	(1.10)	(-1.68)	
							DW = 1.43
-1		0.25	-0.09	-23.09	0.13	-0.03	
		(1.19)	(-0.95)	(-1.52)	(2.78)	(-0.91)	RHO = +0.22
							(+1.45)
-2		-0.11	-0.01	-12.45	-0.06	0.01	
		(-0.53)	(-0.09)	(-0.76)	(-1.09)	(0.22)	SE = 34.74
-3		-0.17	-0.21	10.62	-0.01	-0.04	F^5_{14} = 1.50
		(-1.30)	(-2.01)	(0.65)	(-0.15)	(-1.17)	

Results with constant money multiplier estimated by OLS

Lag	Intercept	BB	ΔNDA	ΔR^f	ΔY	
0	5.69	-0.54	-0.12	-37.30	0.06	R^2 = 0.92
	(0.39)	(-3.79)	(-1.66)	(-3.27)	(1.25)	
						DW = 1.49
-1		0.30	-0.04	-28.47	0.12	
		(1.52)	(-0.60)	(-2.00)	(2.66)	RHO = +0.17
						(+1.08)
-2		-0.17	-0.03	-8.51	-0.05	
		(-0.85)	(-0.38)	(-0.53)	(-0.87)	SE = 34.70
-3		-0.24	-0.15	14.02	-0.001	F^4_{18} = 1.50
		(-1.90)	(-1.70)	(0.89)	(-0.01)	

test is intended to reveal the length of the adjustment process of short-term capital flows to a shock of all explanatory variables in the model.

The regression results in some cases suffer from serial correlation of the residual terms. This is based initially on examination of the Durbin-Watson statistic which falls in the indeterminant range for the one, two and three quarter lagged results. Further evidence of serial correlation is revealed from the regression results for a first order autoregressive representation of the residuals in the OLS estimated reduced form equation. When the RHO coefficient is significant in the first order autoregressive model the data for the multiperiod lag model is corrected for first order serial correlation.

The empirical results clearly indicate the response of short-term capital flows is not complete in the current period. This becomes most evident with the inclusion in the model of a one quarter lagged adjustment of the explanatory variables. The F statistic to test the explanatory power of the first quarter lag is significant at the one percent level under alternative assumptions of a constant and a fluctuating money multiplier. The two and three quarter lagged adjustment response of short-term capital flows is less significant as indicated by the F test. However, the F statistic is susceptible to estimation bias with the presence of serially correlated residual terms. In particular when the D.W. statistic is small implying positive serial correlation, the F statistic will be biased upward

toward rejection of the null hypothesis. This is the case in the regression equation with a two quarter lagged adjustment. Even with positive serial correlation the F statistic is very low thus indicating the second quarter lag does not add significant explanatory power to the model. In general, the results suggest that the response of short-term capital flows is complete within two quarters.

The multiperiod adjustment of STCF to BB shows not only the pronounced offsetting effect in the current period but also a smaller but significant accommodating response in the subsequent quarter. A basic balance surplus (deficit) represents an autonomous source of expansion (contraction) in reserve money and as such is offset in part by a 65 percent outflow (inflow) of short-term capital in the current period. A portion of the offsetting short-term capital flow results from financing of foreign trade. Because of the short-term nature of these trade credits it can be expected they will mature within one to two quarters and thus generate an opposite flow of short-term capital. As such, the accommodating short-term capital flow of 28 to 30 percent in the first quarter lag of the basic balance surplus (deficit) reflects the payment of these credits. The second and third quarter lag on BB in general generates no significant response of STCF. However, including additional lags in the model reduces the initial offsetting impact of BB to 55 percent and increases the subsequent accommodating effect to 41 to 49 percent.

The impact of the monetary policy instrument ΔNDA on short-term capital flows is inconclusive. Conflicting results are produced under

alternative lag adjustments and assumptions of a constant or fluctuating money multiplier. With a one quarter lag adjustment process, there results a significant 25 percent STCF offset to ΔNDA when the model includes a fluctuating money multiplier and is corrected for serial correlation. Constraining the money multiplier to one nullifies the offsetting impact of STCF. Evidently the high correlation between ΔNDA and HΔa of -0.90 in part is influential in identifying any offsetting impact STCF has on ΔNDA. When the model permits a two quarter lag adjustment of short-term capital flows the response of STCF to ΔNDA is of an accommodating nature. With inclusion of a fluctuating money multiplier increases (decreases) in the second quarter lag of ΔNDA generate a 14 percent inflow (outflow) of short-term capital. By constraining the money multiplier to one an accommodating response of STCF amounting to 25 percent of the change in central bank domestic assets is generated over the first and second quarter lag.

The question arises whether the conflicting results can be attributed to estimation problems or can be explained by the inter-relationship of the data over several quarters. The belief is that such conflicting estimates can be interpreted in light of the inter-relationship of several explanatory variables over the three quarter time period.

First, a possible explanation might be found from the indirect influence of lagged ΔNDA on STCF through the impact on BB. In the

discussion to follow on the direction of causation between ΔNDA and BB it is suggested that the first quarter lag on ΔNDA generates an offsetting (25 percent) response from BB. In turn, the analysis here indicates that BB generates a partial offsetting response from STCF. Thus, the multiplicative effect could show up as an accommodating response of STCF from lagged ΔNDA.

Second, a pronounced autoregressive relationship for ΔNDA exists over several quarters such that ΔNDA is negatively correlated with lagged values of ΔNDA with the effect becoming more pronounced in later quarters. With the current quarter STCF offsetting ΔNDA the impact from lagged values of ΔNDA will tend to generate an accommodating STCF.

When HΔa is included in the model, the estimated coefficient on ΔNDA is always reduced (shifts toward minus one) relative to the results with a constant money multiplier. Thus when the money multiplier is excluded and a multiquarter adjustment process is incorporated, the tendency is to show an accommodating response of STCF to ΔNDA distributed over several quarters.

In light of the above complexities, the results suggest the following conclusions for monetary policy actions. Specification of the model to include a fluctuating money multiplier will provide a better representation of the actual economic processes and as such these results will be more reflective of the true response of STCF to ΔNDA. Thus, it is concluded that initially STCF responds to offset changes in the volume of central bank credit. However, this offsetting

response quickly dissipates and shows up in subsequent quarters as an accommodating response primarily due to the indirect influence of monetary policy on the basic balance and the autoregressive nature of monetary policy actions.

The influence of the foreign interest rate on short-term capital flows is very pronounced and complete over three quarters. A one percent increase (decrease) in the foreign interest rate will generate a short-term capital outflow (inflow) of ¥ 30 billion to ¥ 41 billion in the current quarter, ¥ 23 billion to ¥ 28 billion in the first quarter lag and ¥ 22 billion in the second quarter lag. Thus within the constraints of capital controls a change in the foreign interest rate prompts a gradual adjustment of asset portfolios through short-term capital flows that is extended over several quarters. The length of the adjustment process further suggests that domestic interest rates do not respond quickly to conditions in foreign financial markets.

The change in quarterly income generates a positive 6 to 13 percent response in short-term capital movements with a one quarter lag. Thus, increases (decreases) of GNP by ¥ 400 billion at quarterly rates will produce a short-term capital inflow (outflow) of ¥ 24 billion to ¥ 52 billion in the following quarter. While Japan has experienced a higher growth rate in terms of GNP than its European counterparts (particularly Germany and France) there is less sensitivity

of a short-term capital flow to ΔGNP.[1] Again, this reflects the extensive capital controls and the ability of Japan to meet GNP financing needs from internal sources.

The impact of changes in the money multiplier on short-term capital flows is complete over two quarters. The incremental effect of fluctuations in the money multiplier on the money supply generates an offsetting movement of short-term capital of six percent in the current quarter and seven percent in the following quarter.

The general findings indicate that the sensitivity of short-term capital flows to changes in the exogenous components of the model is distributed over several quarters. Permitting a lagged adjustment process in this portfolio balance model increases the explanatory power of STCF to more than 90 percent. While the isolated responses of STCF to each explanatory variable differ in timing, the overall response is complete within two to three quarters. The basic balance of payments position generates a quick offset (65 percent) of short-term capital flows in the current quarter with a smaller accomodating flow (30 percent) in the following quarter as payment is made on the original short-term trade credits. Monetary policy actions ΔNDA and movements of the money multiplier HΔa generate offsetting flows of

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[1]The most pronounced response of STCF to ΔGNP occurred in Germany and amounted to 11 to 12 percent. However, these Kouri and Porter (1974) results measure ΔGNP on an annual basis. When converted to a quarterly rate for ΔGNP the response of STCF increases four-fold to 44 to 48 percent. In France the response of STCF is about 22 percent when ΔGNP is quoted at quarterly rates.

short-term capital in the current and first quarter lag. However, by the second quarter lag ΔNDA produces an accommodating flow due to the indirect influence of policy actions on the basic balance and the autoregressive nature of monetary policy actions. The impact of increases (decreases) in foreign interest rates produces an expected short-term capital outflow (inflow) that is distributed over three quarters. This gradual adjustment suggests in part that domestic interest rates do not respond quickly to conditions in foreign financial markets. The positive short-term capital flow response (6 to 13 percent) with a one quarter lag to changes in GNP is small relative to the European experience and in part reflects the impact of capital controls and Japan's ability to satisfy GNP financing needs from internal sources.

C. Two Equation Model to Explain STCF and ΔNDA

This section presents the empirical results for a two equation model in which a reaction function is specified under the assumption of an endogenous monetary policy response in the equation to explain short-term capital flows. The addition of the reaction function provides the basis to identify empirically if a degree of simultaneity exists between ΔNDA, the monetary policy measure, and STCF. Employing the basic balance BB in addition to STCF as explanatory variables in the reaction function will enable a determination of the response of ΔNDA to the overall balance of payments. The results from the single equation model to explain STCF suggest a small (11 to 15 percent) but

significant offset of STCF on ΔNDA. However, if ΔNDA is endogenous to STCF, it is possible this offset coefficient will be biased toward minus one. Determining STCF and ΔNDA simultaneously in a two-equation model using a two-stage least squares estimation technique should enable an assessment of the estimation bias problem.

The policy reaction function is not intended to reflect a detailed account of Central Bank actions. Rather the desire is to capture, if any, monetary policy responses to components of the balance of payments particularly short-term capital flows. As such, ΔNDA is regressed against current and lagged values of STCF and BB. For the case where the money multiplier is not restricted to a value of one in the model, HΔa is included to assess the response of ΔNDA to movements in the money supply generated through changes in the money multiplier. In addition, a time trend and lagged values of ΔNDA are included as explanatory variables to capture respectively any trend movements and autoregressive responses of monetary policy actions. The empirical results are presented in Tables 5 and 6 below.

The results of a two-equation regression analysis of short-term capital flows do not (in general) support a contention that a high degree of simultaneity exists between STCF and ΔNDA. Rather, at best, the empirical evidence suggests most consistently that ΔNDA responds to the basic balance of payments. However, the regression results are weak and in part reflect the difficulty of specifying a policy reaction function.

Table 5. Two equation regression analysis of short-term capital flows (STCF) with one and two quarter lags on the explanatory variables (results with variable money multiplier estimated by 2-SLS)

Dependent variable: short-term capital flows (STCF)

Lag	Intercept	BB	ΔNDA	ΔR^f	ΔY	HΔa	
0	29.07	-0.64	-0.14	-26.62	-0.03	-0.09	DW = 1.36
	(1.06)	(-4.32)	(-0.56)	(-2.13)	(-0.70)	(-0.77)	
1		0.28	-0.11	-30.69	0.05	-0.07	SE = 38.06
		(2.03)	(-0.81)	(-1.99)	(1.47)	(-2.03	

Dependent variable: change in net domestic assets of the Central Bank (ΔNDA)

Lag	Intercept	STCF	BB	HΔa	ΔNDA	Time	
0	81.74	-0.70	-0.93	-0.44		2.91	DW = 1.86
	(2.01)	(-1.27)	(-1.82)	(-11.56)		(1.44)	
1		-0.39	0.24	-0.14	-0.59		SE = 101.13
		(-0.80)	(0.57)	(-1.74)	(-3.35)		

Dependent variable: short-term capital flows (STCF)

Lag	Intercept	BB	ΔNDA	ΔR^f	ΔY	HΔa	
0	33.38	-0.81	-0.48	-8.92	-0.02	-0.22	DW = 1.51
	(0.98)	(-2.33)	(-1.15)	(-0.29)	(-0.36)	(-1.28)	
1		0.56	-0.17	-24.21	0.05	-0.04	SE = 56.71
		(1.67)	(-0.75)	(-1.02)	(0.76)	(-0.80)	
2		-0.10	0.23	-17.35	0.04	0.09	
		(-0.49)	(1.74)	(-0.71)	(0.29)	(1.11)	

Dependent variable: change in net domestic assets of the Central Bank (ΔNDA)

Lag	Intercept	STCF	BB	HΔa	ΔNDA	Time	
0	58.08	-0.98	-1.07	-0.44		2.39	DW = 1.71
	(1.22)	(-1.84)	(-1.94)	(-11.91)		(1.05)	
1		-0.02	0.50	-0.11	-0.50		SE = 101.54
		(-0.03)	(0.64)	(-1.18)	(-2.17)		
2		0.32	0.18	0.17	0.29		
		(0.59)	(0.31)	(1.91)	(1.31)		

Table 6. Two equation regression analysis of short-term capital flows (STCF) with one and two quarter lags on the explanatory variables (results with constant money multiplier estimated by 2-SLS)

Dependent variable: short-term capital flows (STCF)

Lag	Intercept	BB	ΔNDA	ΔR^f	ΔY	
0	14.38	-0.58	-0.02	-26.28	-0.01	DW = 1.67
	(-.81)	(-4.25)	(-0.41)	(-1.99)	(-0.34)	
-1		0.31	0.04	-48.58	0.03	SE = 44.73
		(2.36)	(0.78)	(-3.02)	(0.71)	

Dependent variable: change in net domestic assets of the Central Bank (ΔNDA)

Lag	Intercept	STCF	BB	ΔNDA	Time	
0	120.20	1.20	0.03		3.57	DW = 2.20
	(1.17)	(0.97)	(0.03)		(0.71)	
-1		-2.91	-0.95	-0.91		SE = 259.25
		(-3.05)	(-0.97)	(-3.74)		

Dependent variable: short-term capital flows (STCF)

Lag	Intercept	BB	ΔNDA	ΔR^f	ΔY	
0	1.53	-0.61	0.003	-32.74	-0.01	DW = 1.49
	(0.10	(-3.64)	(0.08)	(-2.63)	(-0.29)	
-1		0.59	0.08	-39.44	0.05	SE = 37.72
		(2.76)	(1.32)	(-2.58)	(1.24)	
-2		-0.29	0.14	-8.44	-0.03	
		(-2.03)	(3.18)	(-0.50	(-0.47)	

Dependent variable: change in net domestic assets of the Central Bank (ΔNDA)

Lag	Intercept	STCF	BB	ΔNDA	Time	
0	70.45	-0.05	-0.98		8.73	DW = 1.83
	(0.62)	(-0.04)	(-0.66)		(1.48)	
-1		-1.39	0.67	-0.98		SE = 265.29
		(-1.06)	(0.37)	(-3.38)		
-2		-2.34	-2.48	-0.09		
		(-1.73)	(-1.73)	(-0.29)		

For all alternative model specifications, there is no significant offset of STCF to ΔNDA in the current or first quarter lag. Only in the second quarter lag does there result a statistically significant (at the 10 percent level) accommodating response (23 percent) of STCF to ΔNDA. Thus, while the single equation results indicate about an 11 to 15 percent offset of STCF to ΔNDA, when STCF and ΔNDA are explained in a simultaneous system the offsetting impact of STCF is no longer significant. The preliminary conclusion to draw here is that the simultaneous system has eliminated the upward estimation bias of the STCF offset to ΔNDA in the single equation model. However, the fact that the offset coefficient is still about 15 percent but now statistically insignificant suggests that the introduction of a reaction function may have adversely affected the single equation relation between STCF and ΔNDA. It would be expected that if a bias exists then the incorporation of a policy reaction function would serve to eliminate the bias and show a smaller but significant offset of STCF to ΔNDA.

The estimation of the specified reaction function only results in a significant offsetting response of ΔNDA to STCF in one case. With a two quarter lagged adjustment process and incorporation of a fluctuating money multiplier, there is a 98 percent (at 10 percent significance level) offsetting response of the current quarter ΔNDA to STCF. Given the poor results under alternative specifications this result lends only weak support to the proposition that monetary policy automatically adjusts to offset liquidity effects of short-term capital flows.

The results for the reaction function in Table 5, however, more consistently indicate that ΔNDA responds to the basic balance of payments with about a 100 percent offset in the current period. When the money multiplier is held constant, in Table 5, ΔNDA responds with a one and two quarter lag to STCF and two quarter lag to BB. The offsetting response exceeds 200 percent for both STCF and BB in each quarter. The implication here is that monetary policy actions are sensitive to the overall balance of payments position.

The impacts of the other explanatory variables to explain short-term capital movements in this simultaneous system in general follow a priori expectations. The basic balance position generates a 60 to 80 percent offset from short-term capital financing with the expected opposite flow in the following quarter of 30 to 59 percent as these short-term trade credits mature. The foreign interest rate results are less consistent, yet a one percent increase (decrease) generates over the current and first quarter lags a ¥33 billion to ¥75 billion yen short-term capital outflow (inflow). Changes in income do not produce a significant response of short-term capital. The positive STCF response to the first quarter lag change in income of 5 percent is consistent with the single equation result yet is not statistically significant here at the 10 percent level. Changes in the money multiplier impact on STCF in the first quarter lag with a 7 percent offset. Thus assuming ΔNDA to be endogenous in the model and adding a policy reaction function has not adversely affected the results of the other explanatory variables in the STCF equation.

The policy reaction function suffers from lack of detailed accounting of Central Bank actions. Much of the explanatory power for ΔNDA derives from the incremental change in the money supply through movements in the money multiplier, HΔa. The offsetting response of ΔNDA to HΔa is 44 percent in the current quarter and 11 to 14 percent in the subsequent quarter. The implication here is that central bank actions in the form of ΔNDA overwhelmingly adjust to domestic factors HΔa as opposed to foreign factors such as BB and STCF that may adversely affect a targeted money supply, M1. The significant offset of ΔNDA by 50 to 98 percent to the first quarter lag of itself suggests a stable autoregressive movement of the monetary instrument in the pursuit of a policy target. The time variable is insignificant thus implying that ΔNDA does not exhibit any linear trend movement.

It is difficult to draw definitive conclusions from the empirical results about the relation between short-term capital flows and monetary policy actions in the simultaneous system. The evidence suggests no offset of STCF to ΔNDA in the two equation model and at the same time monetary policy responds more consistently to the current basic balance of payments position rather than the movement of short-term capital. To the extent ΔNDA responds to BB and not STCF, a reaction function would be unnecessary for the analysis of short-term capital flows. As such, results from the single equation model better reflect the response of short-term capital flows to the explanatory variables in general and monetary policy actions in particular.

D. Test for Direction of Causation Between Monetary Policy and the Basic Balance

The empirical results for a test of the direction of causation between the measure of monetary policy actions ΔNDA and the basic balance of payments BB are presented here. The intent is to provide a further clarification of the interaction between policy actions and the basic balance position. While it is generally felt monetary policy is directed to attain a desirable balance of payments position it is unclear whether policy actions passively respond to balance of payments disequilibrium or actively pursue a balance of payments target.

The operational test is performed first by regressing the dependent variable on an eight quarter lag of itself. This is referred to as the reduced model. The second regression supplements the first by adding onto the reduced model an eight quarter lag of the hypothesized causative variable. This becomes the full model. An F test is then performed from the hypothesis that the coefficient on the current and lagged causative variable in the full model equals zero. The length of the lag is somewhat arbitrary and as such the selection of an eight quarter lag follows from the work of DyReyes, et. al. (1978). Using this basic test in light of Granger's (1969) concept of causality the problem of serial correlation, present in other causal ordering tests, is for the most part avoided with the inclusion of lagged dependent variables.

The results presented in Table 7 for the test of BB on ΔNDA and ΔNDA on BB include cases both with and without the current value of the causative variable. Also, each regression equation incorporates an intercept and a linear time trend. The sample period runs from 1962-1 to 1970-4.

The empirical evidence suggests a unidirectional causation running from monetary policy ΔNDA to the basic balance of payments BB. The F test is significant at the five percent level for ΔNDA causing BB indicating that current and eight quarter lagged values of ΔNDA add significant explanatory power to the autoregressive model of BB. In reverse the F test for current and lagged BB causing ΔNDA is insignificant at the 10 percent level. When the current value of the causative variable in each test is excluded (it has an insignificant t statistics) the value of the F statistic increases. This results for the test of BB causing ΔNDA, in the F statistic being significant at the 10 percent level. Thus there is weak support that lagged values of BB cause current ΔNDA.

The results of this causal ordering test between ΔNDA and BB suggest that to attain a monetary policy objective in terms of a desirable balance of payments position, the Japanese authorities gear the policy instrument ΔNDA to produce desired movements in the basic balance of payments. Past policy actions on the part of the monetary authorities in terms of the volume of domestic credit extended affect the current basic balance position. In addition, the current monetary policy action is not reflective of current or past positions of the

Table 7. Test for direction of causation between monetary policy (ΔNDA) and the basic balance of payments (BB)

	Test of ΔNDA causing BB					Test of BB causing ΔNDA				
t	BB	BB	ΔNDA	BB	ΔNDA	ΔNDA	ΔNDA	BB	ΔNDA	BB
0			-0.01					-0.03		
-1	0.72***	0.77***	-0.23	0.77***	-0.23	-0.31	-0.45*	-0.07	-0.44*	-0.10
-2	-0.25	-0.54*	-0.15	-0.54	-0.15	-0.21	-0.30	-0.18	-0.30	-0.16
-3	-0.13	0.09	0.17	0.09	0.17	-0.57***	-0.76**	-0.23	-0.77**	-0.24
-4	0.67***	-0.07	0.35*	-0.06	0.35*	0.20	0.01	-0.63	-0.01	-0.62
-5	-0.86***	-0.18	-0.06	-0.19	-0.05	-0.37*	-0.40	1.28**	-0.39	1.28**
-6	0.04	0.13	0.09	0.14	0.10	-0.51***	-0.26	-0.82	-0.26	-0.82
-7	-0.04	0.17	-0.10	0.16	-0.10	-0.12	-0.01	0.41	-0.01	0.41
-8	0.18	-0.95**	-0.19	-0.95**	-0.19	0.23	0.29	0.08	0.30	0.11
INTER	-42.12	-78.07		-79.61*		126.11**	128.29		130.89*	
TREND	3.29*	5.28*		5.19*		5.51**	7.38		7.21	
R^2	.76	0.92		0.92		0.95	0.98		0.98	
SE	63.14	45.20		43.86		85.91	75.02		72.97	
F^d_{n-k-1}		3.64**		4.35***			1.85		2.20*	

*Significance at 0.10 level.
**Significance at 0.05 level.
***Significance at 0.01 level.

basic balance of payments. Thus specifying a reaction function to account for endogenous responses of ΔNDA to BB in addition to a response to STCF would be inappropriate for Japan.

E. Conclusions

This paper has attempted to explain empirically within a portfolio balance model movements in the short-term capital account of Japan's balance of payments. Particular interest has been directed to examining the interrelationship between monetary policy, short-term capital movements and the basic balance of payments in Japan for the period from 1961 to 1971.

The results of this analysis support the use of a portfolio balance approach that views short-term capital flows as a stock adjustment phenomenon and a means to remove excess domestic demand (supply) for money. By allowing for a gradual adjustment of short-term capital flows to a shock of all exogenous variables in the model the indications are that the response is complete within two quarters. The independent variables all affecting equilibrium conditions in the domestic money demand-supply relation capture 73 percent of the explanatory power on short-term capital flows in the current period and 92 percent within three quarters.

The individual responses of the explanatory variables agree with a priori expectations. The basic balance of payments, an autonomous source of changes in reserve money, generates a substantial (65 percent) offset of short-term capital movements in the current quarter. Part

of this response is in the form of trade credits of a three to six month duration which upon maturity in the following quarter will generate an accommodating (30 percent) short-term capital flow. Changes in the money supply brought on by monetary policy actions and fluctuations in the money multiplier are partially offset (15 to 25 percent) by short-term capital movements in the current and first quarter lag. A one percent change in the three month Eurodollar rate, affecting the demand for money, produces a ¥ 75 billion to ¥ 91 billion short-term capital outflow (inflow) over three quarters for increases (decreases) in this foreign interest rate. Changes in quarterly GNP, another factor affecting money demand, generate a small (6 to 13 percent) positive short-term capital flow in the first quarter lag.

There is some question in general if monetary policy actions can be appropriately assumed exogenous to the offsetting response of short-term capital. For Japan, the offset of STCF on ΔNDA is only 11 to 15 percent in the current quarter and as such would probably not prompt a sterilization policy to counteract the liquidity effects in the money supply from short-term capital movements. The results of a two equation model that incorporates a reaction function to show a policy response in ΔNDA to current and lagged components of the balance of payments, STCF and BB, do not suggest consistently that a sterilization policy has been pursued. Rather there is a weak response of ΔNDA to the basic balance position and a very pronounced adjustment to the incremental change in the money supply through movements in the money multiplier,

HΔa. To the extent ΔNDA does not respond to STCF further indicates a reaction function is unnecessary in the analysis of short-term capital flows in Japan.

A test for direction of causation between monetary policy actions ΔNDA and the basic balance of payments BB indicates a unidirectional causation running from ΔNDA to BB. Thus, past policy actions on the part of the monetary authorities in terms of the volume of domestic credit extended affect the current basic balance position.

The conclusions from this analysis indicate that monetary developments in Japan during the 1960s have been geared to balance of payments adjustments. In particular policy measures have been directed to influence cyclical movements in the basic balance. While monetary policy may initially respond to adverse basic balance positions the empirical results suggest that over several quarters the basic balance position is responsive to policy actions.

At the same time that monetary policy is driving the basic balance the monetary authorities have not been severely hampered by the offsetting liquidity effects of short-term capital flows on monetary policy measured through the volume of Central Bank domestic credit extended. Such a situation has not prompted automatic responses in the form of sterilization policies but rather permitted the authorities to conduct a more independent monetary policy. Such favorable circumstances can be attributed to (1) the strong inverse relation between short-term capital flows and the basic balance stemming in part from

trade financing, and (2) the authorities' use of "guidance" and special controls that have had a greater impact on the movement of short-term capital than monetary policy actions. Thus policy makers concerned by the potential volatility of short-term capital movements have instituted controls to influence these flows to reinforce the strong inverse relationship with the basic balance and thus minimize fluctuations in the overall balance of payments.

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VIII. APPENDIX

Presented below is a brief description of the data employed as proxies for the variables in the analysis of short-term capital flows. The study uses quarterly data that is seasonally unadjusted unless explicitly indicated otherwise. All data representing monetary values are expressed in billions of Japanese yen. The balance of payments data are expressed in millions of U.S. dollars by the IMF and have been converted to yen at the fixed par value rate of ¥ 360 per dollar.

The data are derived from various issues of International Monetary Fund publications including the IMF Balance of Payments Yearbook and IMF International Financial Statistics. In addition, the IMF Bureau of Statistics has supplemented these reports with recent revised data from the Fund data bank.

A. Balance of Payments

For analytical purposes, the overall balance of payments with reference to an official settlements balance presentation is subdivided into two major transaction components comprising the basic balance of payments and short-term capital flows plus net errors and omission. On this basis, the study focuses on those transactions resulting in short-term capital movements plus a residual net errors and omission component. The basic balance of payments comprises the other "above the line" transaction items viewed to be of an autonomous nature. These components are further delineated below.

1. Short-term capital flows (STCF)

Short-term capital flows are viewed as a residual category of "other" capital transactions not covered under direct investment, portfolio investment or reserves that have a maturity less than one year. The distinction to be made about short-term capital flows is that they are intended to reflect temporary movements of financial capital likely to be reversed in the short-run. By definition, a short-term capital flow moves in a positive (negative) direction as a result of an increase (decrease) in foreign liabilities or a decrease (increase) in foreign assets for Japan vis-a-vis the world.

The classification of short-term capital movements can be subdivided using the IMF format[1] into three sectors: resident official, deposit money banks and nonmonetary. Each sector is then separated to account for those liabilities that constitute reserves of foreign authorities; and, with the exception of deposit money banks, a differentiation is made between loans (received or extended) and other assets or liabilities.

The resident official sector consolidates Central Bank with general government transactions in cases where such assets and liabilities are not viewed as available reserves of the country. This will include for the most part capital subscriptions to international nonmonetary organizations, i.e. IBRD or IDA, payments agreement balances and loans

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[1]This is in accordance with the IMF Balance of Payments Manual, Fourth Edition (1977).

not resulting from inter-Central Bank arrangements.

Deposit money banks includes all public and private monetary enterprises with the exclusion of the Central Bank. The instruments in general include bank deposits and currency, export-import loans, short-term government securities, commercial paper and bankers acceptance. Some approaches to measure an overall balance of payments would include short-term foreign claims and liabilities of deposit money banks with net reserves assets.[1] This would be appropriate if there is reason to believe deposit money banks automatically supply a substantial portion of the financing to meet the imbalance on transactions of real and financial items. However, with no strong evidence to support deposit money banks' transactions as being of a financing nature, these items will be included above the line as part of short-term capital movements.

The nonmonetary sector refers to those commercial entities of a nonbanking nature such as financial institutions or private firms. Here the change of liquid foreign liabilities and foreign assets consist mostly of trade credits.

The errors and omission component has been consolidated with short-term capital flows for purposes of analysis. The double entry presentation of the balance of payments will in principle produce a zero balance between all credit and debit items. However, in practice, there tends to be a nonzero balance due to errors and inconsistencies in estimation

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[1]This is commonly referred to as the net liquidity balance.

and exclusions from the statement as a result of incomplete information. The errors and omission component serves the purpose of a compensating element for overstatements or understatements of recorded transactions.

The treatment of net errors and omissions for analytical purposes is not clear cut. It represents a residual component consisting most likely of both stable and volatile elements in international transactions. To the extent that net errors and omissions can be attributed to volatile elements that go unrecorded, it has been customary to include net errors and omissions with short-term capital flows rather than with the basic balance in the analysis.

2. Basic balance of payments (BB)

The basic balance is defined to include the current account balance plus long-term capital flows. The current account balance comprises transactions in goods, services, and income plus private and official unrequited transfers. The current account balance is intended to reflect irreversible transactions that add to or subtract from an economy's stock of foreign financial items. In addition, long-term capital movements are included showing changes in ownership of foreign financial assets and liabilities that consist of direct investment, portfolio investment and other financial transactions with an original contractual maturity of one year or more.

The basic balance of payments measure is intended to show longer-term tendencies of transactions in the balance of payments that are not distorted by volatile, easily reversible or speculative factors.

As such, the basic balance is an indicator of the trend in a country's balance of payments positions that must be financed by private short-term capital flows or official reserves of the Central Bank.

3. International reserves (NFA)

The "below the line" financing items that affect the official reserve position comprise monetary gold, foreign exchange assets, the reserve position with Fund, special drawing rights and other claims or liabilities of the Central Bank existing for official financing purposes.

The international reserve position that includes the above assets and liabilities thus represents the foreign asset backing of reserve money by the Central Bank. As such, the change in international reserves that result through financing imbalances in the official settlements balance impact in total on the foreign asset backing of reserve money. That is, changes in reserve money of the central bank that result through changes in foreign assets of the Central Bank should be identically equal to the overall balance of payments.

In the IMF presentation, there is a discrepancy that is directly attributable to the exclusion of specific components of the official reserves from the foreign asset backing of reserve money. In particular, some payments agreement assets and other net liabilities are not included because they are for the most part long-term assets or liabilities held by commercial banks and thus deemed inappropriate for inclusion as part of net foreign assets backing of reserve money. Also, the

counterpart item to the creation of or cancellation of special drawing rights referred to in the double-entry accounting system as "allocation of special drawing rights" is included above the line but separated from the basic balance or short-term capital flows. In order to maintain the balance of payments identity, these components of international reserves will be included as part of the basic balance.

B. Monetary Variables

1. Monetary policy (ΔNDA)

Monetary policy in Japan has generally been conducted through the use of credit rationing rather than relying on the response of the pricing system measured through the Central Bank discount rate. Thus an appropriate measure for monetary policy would be the volume of Central Bank credit extended. Starting from the reserve money stock of the Central Bank composed on the sources side of net foreign assets plus net domestic assets, monetary policy actions will be measured through the changes in net domestic assets.

Net domestic assets comprise Central Bank credit extended to the banking system and financing of government debt minus government deposits and other liabilities in the Central Bank. Using the IMF format net domestic assets are determined by netting out foreign assets from reserve money (line 14 minus line 1).[1]

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[1] In the IMF International Financial Statistics 1973 Supplement international reserves (measured in millions of U.S. dollars, line 1) is converted into yen at the fixed par value rate of 360 yen per dollar and then subtracted from reserve money (measured in billions of yen, line 14).

2. Money multiplier ($H\Delta a$)

The change in money supply, i.e. M1, attributable to changes in the money multiplier is measured by the product of reserve money (line 14) with changes in the money multiplier defined by the ratio of money supply (line 34) to reserve money (line 14).

3. Foreign interest rate (ΔR^f)

The interest rate on three-month Eurodollar deposits in London is used to measure the movement of foreign interest rates. While no one interest rate will accurately measure world financial market conditions, it is believed this Eurodollar rate will be representative of foreign interest rate movements that are unaffected by Japanese economic conditions. The data are quarterly averages on three-month Eurodollar rate of deposits in London and are derived from Interest Rates 1960-1974 OECD Financial Statistics.

C. Gross National Product (ΔY)

Changes in domestic income is measured from the gross national product of Japan's national income accounts. GNP expressed at quarterly rates is available from the IMF in both a seasonally unadjusted and adjusted manner. Given that all other data in the analysis are seasonally unadjusted, it would be appropriate to employ the seasonally unadjusted measure of GNP. However, the Japanese national income accounts show a sudden surge of fourth quarter GNP throughout the 1960's resulting primarily from reporting delays that are finally processed at the end of the year. As such, this will not accurately reflect

actual output in the economy nor would the impact necessarily be felt in terms of short-term capital flows. For this reason alone seasonally adjusted data may be preferred. Yet the smoothing process conceivably could eliminate perturbations in GNP that may generate short-term capital movements. In the analysis both seasonally adjusted and unadjusted data is experimented with to assess the impact of GNP in the model.