Financial Capital Flows
in the Balance of Payments
of the United States:
an Exploratory Empirical Study

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FINANCIAL CAPITAL FLOWS IN THE BALANCE OF PAYMENTS OF THE UNITED STATES: AN EXPLORATORY EMPIRICAL STUDY

I. INTRODUCTION

Despite the growing awareness within the United States of American balance-of-payments difficulties and other related international financial problems, surprisingly little empirical research has been done on the financial capital account in the balance of payments.[1] This state of affairs contrasts sharply with the volume of econometric work that has been or is presently being done on the determination of domestic interest rates, on the linkages between financial markets and expenditures on real goods and services, and even on the impact of prices and real expenditures on the current account in the balance of payments.

An econometric study of international capital movements should, like any econometric study, be composed of three parts. A relevant set of specific economic theories, or postulates, must be selected. The abstract theory must be applied to the particular behavioral units being analyzed, and empirical counterparts to the theoretical constructs must be obtained. Finally, the behavioral relationships themselves must be estimated.

Existing studies of international capital movements are weak in each of these three areas. Most importantly, many studies have been based on very weak theoretical foundations. Posited behavior has in some cases clearly been inconsistent with utility-maximizing behavior. Further, no study has provided a general framework that allows for the impact of governmental restrictions on capital flows, an impact of substantial importance in the last decade or two. Our theoretical framework is presented in Chapter II.

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[1] In this study we use the expression "financial capital account" or "financial capital flows" to connote all parts of the capital account in the balance of payments other than direct investments. The main published empirical work on the financial capital account of which we are aware is that of Arndt [1], Bell [7], Black [8], Branson [9], Hawkins [15], Kenen [20], Prachowny [26], Rhomberg [28] and Stein [29]; see References at the back. We have also seen some unpublished research by Peter Kenen, by Sung Kwack, by Arthur Laffer, by John Patrick, and have recently received a draft of a paper by Miller and Whitman [23]. This last paper, like our theoretical framework in Chapter II, draws on the portfolio approach to the demand for and supply of financial instruments.

The most difficult and possibly most important problem that arises in applying theory to empirical data in the area of international finance is the problem of *sufficiently* taking into account institutional, governmental, and cultural differences among different regions of the world. Differences of negligible importance for this analysis ought, of course, to be ignored, but those that importantly affect the capital flows being studied must be taken into account. Many studies, especially those that have used highly aggregated data, have largely ignored this facet of the problem. The time series of the dependent variables employed have often been taken indiscriminately from the summary table of the balance of payments of the United States or from summary tables on capital flows. Many theoretically relevant independent variables, which were not available at the same level of aggregation, have been excluded altogether. Chapter III contains a brief summary of developments in the financial capital account of the United States in the 1959–68 period, and considers the question of the appropriate type and level of disaggregation in more detail. Chapter III also explains why we have focused our exploratory empirical efforts on capital flows to Japan.

Chapter IV is a detailed discussion of the problems that arise in applying our theoretical framework to Japanese short-term borrowing from the United States.

The difficulties of estimation that arise in econometric studies generally —for example, the problems of estimating simultaneous relationships, nonlinear relationships, and lagged relationships—also exist in econometric studies of international capital movements. The problem of errors in measurement may be, if anything, more severe when working with data on capital movements (see Appendix B). These difficulties, too, have frequently been ignored in international studies.[2] This shortcoming, however, is not as serious as are weaknesses in the theory and its application. One can often obtain adequate estimates without using the most sophisticated estimation techniques if his theory and empirical application are correct, but it is difficult to imagine obtaining adequate estimates with any estimation technique if the theory or application is faulty. Moreover, inadequate theory or inadequate empirical application of theory are more often than not the direct causes of difficulties in estimation.[3] Our

[2] Two important exceptions are Stanley Black's treatment of simultaneous-equations and errors-of-measurement bias [8, especially pp. 51–56] and William Branson's investigation of lagged responses [9].

[3] Simultaneous-equations bias can be attributed in part to inadequate specification, which in turn causes estimation problems (see Appendix A). Inadequate specification is also the most frequent cause of serial correlation of the residuals.

empirical results, which are reported in Chapter V, reflect this ordering of priorities. In particular, we do not attempt in this study to correct for simultaneous-equations bias or to estimate lagged responses. We do, however, obtain nonlinear estimates as required by our theory.

In order not to mislead our readers, we should state at the outset that this study is not intended primarily to be a direct contribution to a detailed empirical analysis of the financial capital account. We have deliberately avoided an objective so ambitious—and at this point so unattainable— as an empirical investigation of the entire financial capital account. Rather our purpose is to outline a sound analytical framework for studying international capital flows and to show in a sample application that this framework can yield promising results.

II. DEMAND AND SUPPLY OF FINANCIAL INSTRUMENTS: THE THEORETICAL FRAMEWORK

Ideally in an approach to a study of international capital flows, one would want to specify both American and foreign demand and supply functions for each financial instrument (or homogeneous group of financial instruments) that is held or issued internationally. In addition, one would want to specify demand and supply functions for all the major financial instruments in the important industrial countries that are not held or issued internationally.[1] Such an approach would make it possible to capture all the simultaneous interactions of financial behavior. If pursued rigorously, however, this ideal approach would obviously lead to a model encompassing the entire balance of payments of the United States and all domestic and international financial markets. Given the level of disaggregation likely to be necessary in such a model, the number of international capital-flow equations, not to mention other equations in the model, would be extremely large.

Short of such an ideal approach, one could specify only the structural foreign demand equations (for financial assets held in the United States) and supply equations (of foreign financial liabilities to the United States) and then attempt to estimate the structural equations, ignoring all or nearly all simultaneous interactions between American and foreign behavior.[2] This is clearly the only possible procedure for an exploratory study such as ours. Only after extensive exploratory research has been successfully completed would one want to pursue the preferred but much more ambitious approach of estimating many simultaneous equations embedded in a multi-region financial model of the world.

We discuss below the arguments and the form of structural demand and supply equations which we feel have general applicability in the analysis of international financial transactions. First, a long-run desired relationship is specified. Then the treatment of some factors that cause discrepancies between desired and actual quantities, such as governmental restrictions on capital flows, is discussed. Finally, we present a short

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[1] It would be necessary to specify all of these "domestic" demand and supply functions, since any shifts in or movements along the functions tend to have significant impacts on the demand or supply of internationally held financial instruments.

[2] A brief discussion of the problem of simultaneous-equations bias is given in Appendix A. See Black [8] for an excellent treatment of simultaneous-equations bias in the context of a model of the spot and forward-exchange markets.

analysis of the estimation of equations by which an initially determined aggregate financial quantity can be subdivided into its components.

A. *Structural Equations for Long-run Desired Quantities*

In the basic microeconomic relationship underlying our approach we express the desired quantity of a financial instrument (or an aggregate of similar financial instruments) as a function of a scale variable S, a vector of expected effective borrowing rates RB, a vector of expected effective lending rates RL, a vector of risks associated with each of the expected interest rates σ, and a vector of noninterest-rate distribution variables X that are also relevant to the desired demand or supply:

$$(2.1) \qquad F^* = f(S, RB, RL, \sigma, X).$$

The intellectual lineage of this formulation goes back at least to the well-known works on portfolio choice by Markowitz [22] and Tobin [32] [33]. In these works the expected return and the "risk" associated with any given asset are taken to be the mean and the standard deviation (or variance) of the subjectively-determined probability distribution associated with investing in that asset.[3] This simplifying assumption allows one to derive strong and usually plausible conclusions about efficient portfolio selection, in particular the conclusion that maximization of expected utility will lead to portfolio diversification.[4]

A scale variable is that variable which, together with the utility function of the economic unit and the other variables in equation (2.1), determines the scale (total size) of the unit's portfolio of assets. Typically the net worth of the unit is assumed to serve this function.[5] If the economic unit has no

[3] The selection of an optimum portfolio of assets also requires explicit consideration of the covariances of the returns on the individual assets. The Markowitz–Tobin "mean-variance" framework is not without its problems. It is consistent with the theory of expected utility maximization only if utility functions can be closely approximated by quadratics, or alternatively, if all the subjective probability distributions are normal. See [22, Chaps. X and XIII]; and [33, pp. 14–21]. Moreover, use of the variance, or standard deviation, as the only measurement of risk implies an equal aversion to all extreme returns, even if they are favorable—obviously an unappealing assumption.

[4] The same analysis can be readily adapted to explain the diversification of liabilities. In this case, disutility is attached both to the expected cost of borrowing and to the risk of the actual cost being greater than the expected cost. Given the size of total liabilities, minimization of disutility will lead in the general case to the issuance of more than one type of liability. For example, one might hedge against possible future increases in borrowing rates by long-term borrowing even if the expected cost of short-term borrowing is less, or against possible future decreases in rates by short-term borrowing, even if the expected cost of long-term borrowing is less.

[5] For households the use of net worth as a scale variable requires that income be predetermined (that is, that it be based on past decisions) and that the saving-con-

liabilities (that is, if expected returns from investing do not exceed the expected costs of borrowing by enough to overcome the risk aversion of the unit), total assets equal net worth. In the more general case where expected asset yields exceed expected liability costs by an amount sufficient to make borrowing desirable, the unit will have a determinate scale if its marginal utility of wealth is nonincreasing and if it has aversion to risk.[6] Given constant net worth, continued proportionate expansion of an economic unit's assets and liabilities implies greater and greater risk of insolvency or actual bankruptcy; a smaller and smaller percentage capital loss on assets is sufficient to eliminate the unit's net worth. The unit will only expand (issue liabilities and purchase assets) on a given net-worth base until the disutility of this increasing risk equals the declining marginal utility of wealth.[7] By reducing the risk associated with a portfolio of given size and composition, increases in net worth will lead to expansion of both assets and liabilities.

Assuming that assets are gross substitutes for each other, the demand for a financial asset is expected to be positively related to the own yield (an element in the vector RL) and negatively related to all other borrowing and lending rates. Similarly, if liabilities are gross substitutes, the supply of a financial liability should be negatively related to the own yield (an element of RB) and positively related to all other borrowing and lending rates. Furthermore, in line with the risk-aversion assumption, asset demand should be negatively related to the risks associated with the own yield and borrowing rates and positively related to those associated with other lending rates; similarly, liability supply should be negatively related to the risks associated with the own borrowing rate and the lending rates and positively related to those associated with other borrowing rates.

We emphasize the expected *effective* rates of return because of the existence of different tax treatments of interest income or expense (including such phenomena as the U.S. Interest Equalization Tax), of various forms of private or governmental credit rationing or interest-rate controls which make some quoted rates meaningless, and of the cost of forward-exchange

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sumption decision be conceptually distinguished from balance-sheet decisions. For firms, it requires that profits be predetermined and that the dividend-retained earnings decision be conceptually distinguished from balance-sheet decisions.

[6] Firms will not have a determinate scale if they operate under constant or increasing returns to scale and if capital markets are perfect. Under such conditions the firm would issue additional equity and expand assets (and possibly liabilities) until either decreasing returns to scale set in or the firm's activities reach such proportions that the price of equity or the return on assets falls.

[7] The borrowing rates relevant to this economic unit will also, of course, be significantly affected by the scale of the unit relative to its net worth.

cover. Risks associated with the lending yields and borrowing costs include exchange-rate risks and risks of changes in asset and liability prices.

An example of a noninterest-rate distribution variable that is relevant to the demand and supply of financial instruments is national income, which serves as a proxy for income-account transactions. Given a basic transactions demand for money, an increase in national income should lead, ceteris paribus, to a substitution of money for other financial assets in asset portfolios and to an increase in total asset portfolios funded by additional liability issues.

We have chosen thus far to modify equation (2.1) by assuming that the desired function is homogeneous of degree one in the scale variable and noninterest-rate distribution variables, that is, that an increase of x per cent in S and X will, ceteris paribus, raise F^* by x per cent:

$$(2.2) \qquad F^* = g\left(RB,\ RL,\ \sigma,\ \frac{X}{S}\right) S.$$

This particular assumption cannot, so far as we know, be directly justified in terms of the Markowitz–Tobin theory, since in general investors' preferences for risk must be expected to vary with the scale variable. A doubling of the scale variable and all noninterest-rate distribution variables, with all returns and risks unchanged, might not therefore lead to a straightforward proportionate doubling of all asset and liability holdings.[8]

[8] In the general case analyzed in the mean-variance framework, with the scale variable being wealth, the amount of any particular asset or liability held will depend on the investor's utility function and its derivatives (and hence on the wealth elasticity of the investor's preferences for risk versus expected return). In the *special* case where there is a riskless asset, Tobin has shown [32] [33] that the proportions in which risky assets (or liabilities) will be held in the portfolio will be independent of the utility function. For this special case, where F_i^* and F_j^* are any two of the risky assets and where there are zero covariances between the returns on the various assets, the result is:

$$\frac{F_i^*}{F_j^*} = \frac{(r_i - r_1)\sigma_j^2}{(r_j - r_1)\sigma_i^2}.$$

In this expression, r_1 is the return on the riskless asset; r_i, r_j, σ_i^2, and σ_j^2 are the expected returns and variances for assets i and j. For this special case, see also Hicks [18, p. 801]. If the ratio F_i^*/F_j^* is invariant to the utility function, it will also clearly be independent of the size of the portfolio. This fact suggests that one might theoretically justify the linear-homogeneity assumption used in the text if he could realistically assume little covariation among returns and if he were to define the scale variable as net worth *minus* the amount of riskless assets held in the portfolio; that is, $S = \sum\limits_{i=2}^{n} F_i^* = NW - F_1^*$, where F_1^* is the desired quantity of riskless assets). We are grateful to Guy Stevens for his helpful discussions of this question with us and for letting us read his as yet unpublished manuscript, "Risk and Return and the Selection of Foreign

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On the other hand, the assumption of linear homogeneity in the scale variable has an important advantage compared with some other specifications (see the next paragraph). We regard (2.2) as a practical modification of (2.1) which, given the present state of our theoretical and empirical knowledge, is as plausible as any other specific modification we might have made.[9]

The function (2.2) has the highly appealing attribute of making the impact of increments in the scale variable on the desired quantity dependent on the levels of the interest rates and the impact of changes in the interest rates dependent on the level of the scale variable. These responses can be shown by taking the first difference of equation (2.2):

$$(2.2)' \quad \Delta F^* = g\left(RB, RL, \sigma, \frac{X}{S}\right)\Delta S + S_{-1}\Delta g\left(RB, RL, \sigma, \frac{X}{S}\right),$$

since $\Delta(AB) = A\Delta B + B_{-1}\Delta A$. Equation (2.2)' implies that in a growing (or declining) economic world—$\Delta S \neq 0$—changes in interest rates or risks bring about both "existing-stock" (the second term) and "continuing-flow" (the first term) impacts on capital flows. Given a "once-for-all" change in interest rates or risks, the existing-stock effect produces capital flows that are also once-for-all in nature (a reallocation of existing portfolios), while the continuing-flow effect persists indefinitely as long as $\Delta S \neq 0$. The continuing-flow effect follows from positing a multiplicative interaction of the interest rates with the scale variable in equation (2.2) rather than simply entering the rates and the scale variable as separate determinants. Both existing-stock and continuing-flow responses are reasonable. They imply that how one distributes an increase in wealth among different assets depends on the yields on the assets, and that how much one adjusts his existing portfolio in response to a given change in yields depends on the size of the portfolio.

In some of the early empirical work on capital flows, a serious theoretical error was made in relating capital *flows* to levels of interest rates.[10] This

Investments," which takes up some of the problems involved in applying the Markowitz–Tobin framework to foreign direct investments.

[9] See de Leeuw [11, pp. 471–72] for a brief discussion of the linear-homogeneity assumption in specifying demand and supply equations for financial instruments. This assumption has also been employed by Brainard and Tobin [6].

[10] Arndt [1], Hawkins [15], Kenen [20], Laffer [21], Powrie [24], Prachowny [26], Rhomberg [28], and Stein [29] have all reported equations containing this incorrect specification. Bell [7, contrast the form of the equations in Appendices II and III] and Black [8, contrast Models I and II] are also unclear on the issue. This stock-flow error has also been prevalent in many of the theoretical contributions to the internal-

"flow-theory" of capital movements has no theoretical justification; it leads to the ridiculous conclusion that desired equilibrium stocks of capital depend on the sum (integral) of the current and all past values of the relevant interest rates and thus that interest-rate elasticities are infinite. An alternative specification sometimes employed has related capital flows to changes in the levels of interest rates.[11] This formulation might approximate what we have termed the existing-stock responses, but it disregards the continuing-flow effects.

B. *Discrepancies between Observed and Long-run Desired Quantities*

If observed holdings of financial instruments always equaled long-run desired holdings, equation (2.2) would illustrate the general form of our structural equations. Equation (2.2) will not be valid, however, if nonprice mechanisms clear markets, and this phenomenon seems to be more the rule than the exception in markets involving international transactions. While the importance of "private" credit rationing (by commercial banks, for example) is unclear, there can be no doubt about the prevalence of "credit rationing" via governmental controls. While the United States is a relatively recent postwar practitioner of this art, other countries have often placed restrictions or regulatory devices on capital flows.[12] The controls can take the form of restricting either capital outflows, such as American efforts to improve its balance of payments, or capital inflows, such as Japanese measures to prevent an inflow of funds from undercutting Japan's efforts to combat domestic inflationary pressures.

If capital controls are strictly binding on all economic units, the desired quantity framework described above becomes quite hypothetical. Capital outflows (or inflows) are what the government allows them to be; changes in economic determinants of capital holdings cannot have any impact on measured flows. But in most cases it is probably correct to assume that not all economic units are rigidly constrained in their behavior by the controls. For example, some American banks in the Voluntary Foreign Credit Restraint Program undoubtedly could and would

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external-imbalance literature, where capital flows are said to depend on the level of interest rates. For an early clarification of the stock-flow controversy generated by the empirical work of Bell [7], Kenen [20], and Stein [29], see Hendershott [16]. For a recent criticism of the incorrect inferences of the "flow theory" for interest-rate policy to correct an external imbalance, see Willett and Forte [34].

[11] See, for example, Branson [9].

[12] For a survey of capital controls in western Europe see Mills [25].

extend more loans to foreigners if the loans were to become relatively more profitable (the "voluntary" nature of the American program makes this particularly likely). In general, tightening and relaxing of controls, respectively, will reduce and increase the response of desired quantities to changes in their economic determinants.

This view of the impact of capital controls can be formalized by expressing the observed quantity of an international financial instrument as a fraction α of the short-run desired quantity F^s[13]

$$(2.3) \qquad\qquad F = \alpha F^s; \quad 0 < \alpha \leq 1,$$

where α equals unity when the controls are absent or not binding at all and is less than unity when the controls keep the observed quantity below the desired quantity.[14] The fraction α itself can be written as a function of variables reflecting the capital controls. Letting C_i denote the ith such variable and β_i its impact on α, we arrive at a linear approximation of a more general function:

$$(2.4) \qquad\qquad \alpha = 1 + \Sigma\beta_i C_i > 0; \quad C_i \geq 0, \beta_i < 0.\text{[15]}$$

The measurement of α in any given application of this theoretical framework will obviously not be simple. First, the variables that are proportional to the impact of the capital controls, the C_i's, must be identified or constructed. Second, the proportionality factors, the β_i's, must be estimated by some method other than simple linear regression, since α interacts with all of the determinants of the desired quantity of the financial instruments. (We discuss the estimation problems in Chapter V.) Despite the difficulties involved, we regard the measurement of α as a necessary part of the investigation of the determinants of many international capital movements. Substantial specification errors will often occur in the estimation of structural equations if capital restrictions are either ignored or inadequately dealt with.[16]

[13] This formula results in the same appealing attribute (and for the same reason) as the assumption employed in (2.2) of linear homogeneity in the scale variable. The impact of changes in control programs on observed holdings depends on the level of desired holdings and the impact of changes in desired holdings depends on the extent to which controls are binding.

[14] If one were dealing with capital controls which government authorities use to stimulate capital outflows, α could conceivably be allowed to take on values greater than 1.

[15] We are grateful to Peter Tinsley for several very helpful discussions on the research described in this paper. In one of the discussions he made the important suggestion that we experiment with this formulation of the impact of capital controls.

[16] A popular method of handling temporary phenomena such as capital controls is to add dummy variables that equal zero when the "ordinary" regime is operating,

There is a second reason for observed and long-run desired holdings not in general being equal. Recent empirical studies of domestic financial behavior suggest that economic units adjust their financial-asset holdings with some lag in response to changes in the determinants of long-run desired holdings. The specific empirical results discussed later in this study do not include tests for lagged responses; we simply assume uniform lag distributions of three months.[17] Accordingly we do not elaborate here on the reasons for these lags and on the problems that arise in trying to estimate them.[18] For the present we merely note that a complete theory would require the specification of a relationship between short- and long-run desired holdings of a financial instrument, where the former is expressed as a function of current and lagged values of the determinants of the latter:

$$(2.5) \quad F^s = h\left(RB, RB_{-1}, \ldots, RL, RL_{-1}, \ldots, \sigma, \sigma_{-1}, \ldots, \frac{X}{S}, \left(\frac{X}{S}\right)_{-1}, \ldots\right) \sum_j w_j S_{-j}; \qquad \sum_j w_j = 1.$$

C. Component Equations

Rather than specifying structural equations for each financial instrument, it has been suggested that the best strategy might be to specify structural equations for aggregative instruments. A practical advantage of this procedure is that it reduces the number of borrowing and lending rates that need enter equations (2.1) to (2.3). For example, if total Japanese borrowing from the United States were the aggregate being considered, it might be sufficient to use only three or four interest rates—an average American lending rate, an average Eurodollar lending rate,

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and unity when "special" forces are in effect. This allows the constant term to differ between the ordinary and special regimes. While this method, which has been employed by many (see, for example, [9], [23] and [26]), is probably superior to doing nothing, it will not yield accurate estimates except in the unlikely event that the impact of the controls is constant over time.

[17] See Chapter IV-D for further discussion.

[18] Such a discussion was contained in an earlier version of this paper presented at the December 1968 Meetings of the Econometric Society in Evanston, Illinois. In "Empirical Analysis of Capital Flows: Some Consequences of Alternative Specifications," a paper presented at a Universities-NBER Conference on International Mobility and Movement of Capital, January 30–February 1, 1970, Washington, D.C., we dealt with the issue of lagged responses in detail. The proceedings of the conference are to be published.

and one or two rates reflecting the costs of borrowing and lending in Japan. However, the composition of the borrowing from the United States could also be interesting.[19] To obtain this information, component equations need to be estimated.

Consider an aggregate asset or liability quantity F that is the sum of n components $F_1, F_2, \ldots, F_n$, each having its own yield $R_1, R_2, \ldots, R_n$. Assume that the division of F into its components depends on a vector of noninterest-rate variables Z as well as the vector of interest rates R. Thus we have the set of equations:

$$F_1 = f(R, Z, F),$$
$$F_2 = g(R, Z, F),$$

(2.6)

$$\cdot$$
$$\cdot$$
$$\cdot$$

$$F_n = z(R, Z, F).$$

Again the assumption of linear homogeneity, this time in F, is an appealing one. The impact of a given interest-rate change on the various components should depend on the size of the total, and the impact of a change in the total should depend on the relationships among the interest rates. Thus we write:

$$F_1 = f(R, Z)F,$$
$$F_2 = g(R, Z)F,$$

(2.6)'

$$\cdot$$
$$\cdot$$
$$\cdot$$

$$F_n = z(R, Z)F.$$

Moreover, given that the components must sum to the total, the following properties must be constrained to hold:

$$\sum_i \frac{\partial \frac{F_i}{F}}{\partial Z_j} = \sum_i \frac{\partial \frac{F_i}{F}}{\partial R_k} = 0 \text{ for all } j \text{ and } k,$$

where Z_j and R_k are elements of the vectors Z and R.[20] That is, if the

[19] For example, it would be interesting to know what proportion of the borrowing was long-term as opposed to short-term if one were attempting to ascertain the impact of international capital flows on the term structure of American interest rates.

[20] These properties will be satisfied empirically if the exact same vectors of explanatory variables R and Z are included in all estimated equations.

proportion of F in any single component rises, the proportion in some other component or group of components must fall by an equal amount. Given this constraint, it is only necessary to estimate $n - 1$ component equations; the nth equation is implied by the others, and the estimates will be independent of which equation is designated as the nth.[21]

[21] See de Leeuw [12] and Brainard and Tobin [6] for discussions of the imposition of balance-sheet constraints on financial behavior.

III. THE FINANCIAL CAPITAL ACCOUNT OF THE UNITED STATES, 1959–68

One of the most important facts about capital flows in the balance of payments of the United States is their diverse nature. Many broad types of lenders and borrowers carry out a significant volume of transactions. Many heterogeneous types of financial instruments are involved. Some of this diversity is suggested by Table 1, which provides annual data, with particular emphasis on capital-account transactions, for the American balance of payments in the last decade.

No single theoretical or empirical approach seems likely to be appropriate for investigating all these diverse capital flows. It is clearly necessary, for example, to treat direct investment quite differently from "portfolio" or "financial" (that is, other than direct investment) flows. Analysis of the former requires both a theory of fixed investment expenditures abroad by American firms and a theory relating financial flows among parents and subsidiaries to these investment expenditures. We have made no attempt to consider direct investments in our research.[1] Even within the aggregates for portfolio flows, moreover, it may be desirable to adopt somewhat different approaches for different types of transactors and financial instruments.

Whatever the most appropriate degree of disaggregation by type of transactor and financial instrument, there are strong reasons for disaggregating capital flows by region or country. If one aggregates over a set of relatively homogeneous individuals, the hope is that an aggregate function which takes the same general form as the individual functions will not introduce an unacceptably high degree of aggregation bias. The more heterogeneous the types of individuals in the group and the more heterogeneous the economic environments in which they operate, however, the less confidently one can hold to such a hope. Some of the greatest disparities among individuals and economic environments are those created by or embodied in national political boundaries. Economic institutions, and probably the preference functions of individual economic units, differ markedly among countries, as do the nature and timing of the economic policies of national governments (for example, policies on restricting capital flows). These considerations suggest that in many

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[1] See Stevens [30] [31] for some excellent pioneering research on America's direct investments abroad.

instances geographical disaggregation of aggregative data on capital flows would yield a substantial payoff.

The case for disaggregation in the analysis of capital flows in the American balance of payments could be pushed too far. There is a limit to the amount of disaggregation that would yield benefits greater than the costs, even if reliable data were available for detailed disaggregative studies (which is far from being the case). It may be possible to construct unweighted or weighted index variables—both for types of capital flows or for regional groupings of countries—that would enable one to estimate a meaningful aggregative description of the underlying microeconomic relationships. It remains to be shown, moreover, just how important the differences are between institutions and behavior in different countries and in different financial markets.

Extensive research on the appropriate type and degree of disaggregation of the capital account will be needed before an intelligent decision on the question can be made. Our approach is, in the meantime, a pragmatic one. Our primary objective is to demonstrate that the theory of domestic financial behavior—suitably modified or supplemented—can be successfully applied to the analysis of international financial transactions. Given this objective, we feel that our initial empirical work will be more illuminating and much less costly in terms of clerical and computational resources[2] if we restrict ourselves to capital flows between the United States and a single major country.

Table 2, which supplies some regional details for a few of the aggregate flows shown in Table 1, brings out several facts about flows of American private capital in the recent past that probably are not widely enough appreciated.[3] If one abstracts from the large volume of direct investments abroad, of which about half has gone to Europe, especially the United Kingdom and the Common Market, it is not true that flows between the United States and Europe account for the major portion of gross flows of private American capital. Both Canada and Japan individually were more important recipients of capital flows other than direct investments in the 1959–64 period than all of Europe taken together. More than one-fourth of the "portfolio" flows went to Canada, while almost another

[2] In principle, a highly aggregative approach requires the construction of indices that will accurately represent variables such as average interest rates in the rest of the world, rest-of-the-world governmental restrictions on capital flows, and the like.

[3] We use the term "flows of American capital" to refer to changes in the claims of residents of the United States on residents of foreign countries. Flows of foreign capital refers to changes in the claims of foreign residents on residents of the United States.

TABLE 1

THE BALANCE OF PAYMENTS OF THE

(*millions*

		1959	1960	1961
(1)	All goods and services transactions, net[1]	2,284	5,898	7,087
(1a)	Exports of goods and services[1]	25,626	29,253	30,235
(1b)	Imports of goods and services	−23,342	−23,355	−23,148
(2)	Unilateral transfers, net[2]	−4,422	−4,025	−3,951
(3)	Changes in assets and liabilities of U.S. government excluding official reserve transactions, net:	−116	−888	−901
(3a)	Assets (excluding reserve assets), net of repayments	−353	−1,104	−926
(3b)	Liabilities (excluding reserve liabilities), net	237	216	25
(4)	Changes in assets and liabilities reported by U.S. corporations and other nonbanks, net:	−1,434	−2,158	−1,930
(4a)	Direct investments abroad[3]	−1,372	−1,674	−1,598
(4b)	Securities sold abroad to finance direct investment	—	—	—
(4c)	Other claims on foreigners (liquid assets, trade credit, etc.)	−97	−394	−558
(4d)	Other liabilities to foreigners (other borrowing, accounts payable, etc.)	35	−90	226
(5)	Foreign direct investments in United States[3]	238	141	73
(6)	Security transactions other than those included elsewhere:	−219	−380	−438
(6a)	American purchases of foreign securities, net	−668	−662	−762
(6b)	Foreign purchases of American securities, net[4]	449	282	324
(7)	Changes in foreign assets reported by American banks, net:	−238	−1,148	−1,261
(7a)	Long-term claims (primarily term loans)	−181	−153	−136
(7b)	Short-term claims (loans, collections, acceptances, deposits held abroad, etc.)	−57	−995	−1,125
(8)	Changes in liabilities to nonofficial foreigners reported by American banks and in foreign nonofficial holdings of marketable U.S. government bonds and notes, net:[5]	1,470	314	1,079
(9)	Errors and omissions, net	260	−1,156	−1,103
(10)	Changes in America's reserve liabilities[6] (increase: +)	1,141	1,258	741
(11)	Changes in America's reserve assets (increase: −)	1,035	2,145	606
A.	BALANCE ON CURRENT ACCOUNT TRANSACTIONS [= 1 + 2]	−2,138	1,873	3,136
B.	CAPITAL ACCOUNT TRANSACTIONS EXCLUDING OFFICIAL RESERVE TRANSACTIONS[7] [= 3 + 4 + 5 + 6 + 7 + 8 + 9]	−38	−5,276	−4,483
C.	BALANCE ON OFFICIAL RESERVE TRANSACTIONS [= −(10 + 11) = A + B]	−2,176	−3,403	−1,347

Note: Increases in foreign assets in the United States (American liabilities) are recorded with a plus sign. Increases in American assets abroad (foreign liabilities to the United States) are recorded with a minus sign.
[1] Including transfers under military grants.
[2] Including military grants of goods and services.
[3] Excludes undistributed profits of subsidiaries.
[4] Excludes sales of securities abroad by American corporations to finance direct investments abroad (see line 4b) and liquidation of securities of the United States other than Treasury issues by United Kingdom residents in 1965–67 period (see line 10). Includes net purchases of American securities by nonmonetary international and regional institutions.

								Annual averages	
1962	1063	1964	1965	1966	1967	1968	1959–61	1962–64	1965–67
6,688	7,546	9,920	8,749	6,281	6,082	3,354	5,090	8,051	7,037
32,045	34,163	38,611	41,027	44,362	47,093	51,432	28,371	34,940	44,160
−25,357	−26,617	−28,691	−32,278	−38,081	−41,011	−48,078	23,282	26,888	37,123
−4,152	−4,277	−4,037	−4,386	−3,835	−3,903	−3,703	−4,133	−4,155	−4,041
−942	−1,226	−1,379	−1,531	−1,422	−2,423	−2,183	−634	−1,182	−1,792
−1,094	−1,661	−1,676	−1,598	−1,534	−2,421	−2,249	−794	−1,477	−1,851
152	435	297	67	112	−2	66	159	295	59
−2,117	−1,854	−3,361	−2,759	−3,012	−2,884	−607	−1,841	−2,444	−2,885
−1,654	−1,976	−2,328	−3,468	−3,639	−3,154	−3,025	−1,548	−1,986	−3,420
—	—	—	191	594	446	2,129	—	—	410
−354	158	−1,108	340	−443	−760	−1,134	−350	−435	−288
−109	−36	75	178	476	584	1,423	57	−23	413
132	−5	−5	57	86	258	319	151	41	134
−835	−823	−761	−787	−65	−243	965	−346	−806	−365
−969	−1,105	−677	−759	−481	−1,266	−1,266	−697	−917	−835
134	282	−84	−28	416	1,023	2,231	352	111	470
−450	−1,536	−2,465	93	253	−475	269	−882	−1,484	−43
−126	−755	−941	−232	337	255	358	−157	−607	120
−324	−781	−1,524	325	−84	−730	−89	−726	−876	−163
219	673	1,642	372	2,572	1,630	3,942	954	845	1,525
−1,246	−509	−1,118	−576	−489	−1,007	−717	−666	−958	−691
1,169	1,634	1,393	−453	−935	2,913	−759	1,047	1,399	508
1,533	377	171	1,222	568	52	−880	1,262	694	614
2,536	3,269	5,883	4,363	2,446	2,179	−349	957	3,896	2,996
−5,238	−5,280	−7,447	−5,132	−2,079	−5,144	1,988	−3,266	−5,988	−4,118
−2,702	−2,011	−1,564	−769	367	−2,965	1,639	−2,309	−2,092	−1,122

[5] Includes changes in long-term liabilities to nonofficial foreigners reported by American banks (although these are relatively small) as well as what the official balance-of-payments articles in the *Survey of Current Business* refer to as "liquid liabilities" to nonofficial foreigners. "Nonofficial" foreigners include nonmonetary international and regional institutions.

[6] Includes changes in both "liquid" and "nonliquid" liabilities to foreign official institutions, and for 1965–67 period, liquidation of American securities other than Treasury issues by residents of the United Kingdom (predominantly the U.K. government).

[7] Including Errors and Omissions (line 9).

SOURCE: *Survey of Current Business* (June 1969) and other earlier issues containing the quarterly balance-of-payments articles.

TABLE 2

REGIONAL COMPOSITION OF OUTFLOWS OF AMERICAN
PRIVATE FINANCIAL CAPITAL, 1959–67

(inflow:—)

	Annual averages, millions of dollars			Percent of average annual outflow		
	1959–61	*1962–64*	*1965–67*	*1959–61*	*1962–64*	*1965–67*
Total flow of American private capital other than direct investment (A + B + C)	1930	2837	1162	100	100	100
Canada	532	748	359	28	26	31
Japan	497	621	42	26	22	4
Europe	326	738	−141	17	26	(12)
Latin America	576²	486	394	30²	17	34
All Other¹		241	507		9	44
A. Transactions in foreign securities³	698	917	835	100	100	100
Canada	293	481	595	42	52	71
Japan	37	95	14	5	10	2
Europe	180	91	−69	26	10	(8)
Latin America	188²	119	61	27²	13	7
All Other¹		132	234		14	28
B. Claims reported by American banks⁴	882	1484	38	100	100	100
Canada	95	56	−125	11	4	
Japan	436	489	—	49	33	
Europe	57	543	−319	7	37	
Latin America	224	298	263	25	20	
All Other¹	70	98	218	8	7	
C. Claims reported by American nonbanks other than direct investments⁵	350	435	283	100	100	100
Canada	143	212	−111	41	49	(39)
Japan	24	37	28	7	8	11
Europe	89	105	247	25	24	87
Latin America	62	69	73	18	16	26
All Other¹	32	12	54	9	3	19

¹ Includes international institutions and unallocated.
² Data not available separately for Latin America and All Other.
³ Line 6a of Table 1.
⁴ Line 7 of Table 1.
⁵ Line 4C of Table 1.

SOURCE: *Survey of Current Business* (June 1968).

fourth went to Japan. Portfolio flows to all of Europe, contrary to the popular impression, were only about 22 per cent of the total in 1959–64; in the three years 1965–67, in part because of selective capital restrictions imposed by the United States, there was a net reflow of American private portfolio capital from Europe.

The importance of Japan as a major borrower from the United States is seen even more clearly if one looks only at the changes in the claims on foreigners reported by American banks (see section B of Table 2). Japan was by far the most important single country to which American banks extended credit in the period 1959–64. Nearly one-half of the entire net increase in American banks' claims on foreigners in 1959–61 represented increased claims on Japan. One-third of the total increase in bank claims was accounted for by Japan in the period 1962–64. Japanese residents repaid debts on balance to American banks in 1965 and 1966 on a large scale, but in 1967 borrowed again, more than $400 million net.

Because of the confidential classification of unpublished data, it is not possible to include a table showing the regional composition of American liquid liabilities to nonofficial foreigners (the most important type of foreign financial claim on the United States). Such a table would also illustrate the importance of Japan in the capital account of the United States. In particular, the liquid liabilities of the United States to private Japanese residents (mainly Japanese banks) grew rapidly in the period 1959–67. Japan ranks second or third in the world in growth of private residents' liquid-asset claims on the United States.[4]

Japan's importance in the capital account of the United States is the major reason why we have selected Japan as the country on which to focus our initial research efforts. We have also been influenced in our choice by the relative completeness and availability of Japanese economic data. One might argue that the prevalence of Japanese government restrictions on international capital flows would be a reason for avoiding an initial concentration of effort on Japan. We have tended to look at the matter more from the other side. Any technique for studying international flows of capital between virtually any two regions in the present-day world will somehow have to come to grips with the analytical problems posed by governmental restrictions. If the intricacies of Japanese (and American) capital controls can be appropriately taken into account, then the problem of restrictions in other countries can very likely be mastered as well.

[4] Other types of Japanese claims on the United States—for example, Japanese holdings of American corporate securities or direct investments in the United States by Japanese companies—are relatively small.

IV. AN APPLICATION OF THE THEORETICAL FRAMEWORK TO JAPANESE BORROWING FROM THE UNITED STATES

A. *Japanese Borrowing*

When studying American–Japanese capital flows we would prefer to have the data on Japanese foreign assets and liabilities collected by the Japanese themselves. If such data were available, both for total Japanese borrowing from abroad and the breakdown by country, we would first attempt to estimate an aggregative equation for total borrowing and then go on to explain borrowing from the United States and from other countries via the technique of component equations described above. Unfortunately, despite the relative completeness of Japanese economic statistics,[1] adequate Japanese data on Japan's foreign assets and liabilities have not been made public.[2] Of necessity, then, we have relied on data collected from American sources.[3]

Table 3 provides a list of the various types of claims of the United States on Japan other than direct investments, and shows data for the end of 1967. From Table 3 it is clear that by far the greatest portion of the total claims consists of short-term claims reported by the banks. Furthermore, more than half of them are dollar acceptances. Although there were significant variations in the relative importance of several components in the total over the 1959–67 period—for example, long-term claims (term loans) reported by American banks reached a peak in 1965 of nearly $500 million, compared with less than $200 million at the end of 1967—the dominance of short-term claims, and especially acceptances, was characteristic of the entire period.

[1] For example, Japan is among the very small group of countries—the other major ones are Canada, the United Kingdom, and the United States—for which quarterly national-income statistics are available for the entire decade of the 1960's.

[2] The best available Japanese data seem to be quite aggregative figures for the "short-term external assets and liabilities of authorized foreign exchange banks." These data, which are published in the Bank of Japan's *Economic Statistics Monthly*, are in a form that shows no country breakdowns and gives little disaggregation by type of financial instrument (for example, see Table 83 on page 117 of the July 1968 issue). The Bank of Japan first published these data in the fall of 1964, with the earliest figures referring to the end of June 1964. Estimated stock figures for these data may be obtained for the period December 1960 to March 1964 by employing published Japanese data for balance-of-payments flows (see the table, "Balance of Monetary Movements," which appears regularly in the Bank of Japan's *Balance of Payments Monthly*) and working backward from June 1964. We are grateful to Robert Emery of the Federal Reserve Board staff for the valuable help he has given us when we required detailed information on Japanese data and economic institutions.

[3] For a description of the American data in general terms, including collection procedures and sample reporting forms, see [27], particularly pp. 69–83.

TABLE 3

TYPES OF PRIVATE FINANCIAL CLAIMS OF THE UNITED STATES
ON JAPAN, DECEMBER 1967

| | End of December 1967 | |
Type of claim	Millions of dollars	Per cent of total
I. Short-term American claims on Japan	3,366	84.0
A. Short-term claims reported by American banks, total	3,154	78.7
1. Short-term dollar loans	507	12.6
2. Dollar collections outstanding for banks' own account or for account of domestic customers	694	17.3
3. Dollar acceptances[1]	1,829	45.6
4. Miscellaneous other claims payable in dollars	85	2.1
5. Claims payable in yen and other foreign currencies	37	0.9
B. Short-term claims reported by American nonbanks	212	5.3
II. Long-term American claims on Japan	643	16.0
A. Long-term claims reported by American banks[2]	180	4.5
B. "Securities" (bonds plus stocks)[3]	450	11.2
C. Long-term claims reported by American nonbanks	13	0.3
III. Total claims excluding direct investment (I + II)	4,009	100.0

[1] Data for dollar acceptances were not reported separately until May 1963. See text.
[2] Primarily term loans denominated in dollars.
[3] Figure is authors' estimate, derived by totaling flows from an assumed benchmark date in the mid-1950s.

There are a number of problems associated with the American data for American claims on Japan, three of which warrant mention here. First, dollar acceptances, the single most important type of claim, were not reported separately until May 1963. Before that date acceptances were merely reported as part of an item called "other claims payable in dollars" (the equivalent of what is now the sum of lines I-A-3 and I-A-4 in Table 3). Since acceptances are believed to have constituted the overwhelming portion of the "all other" category prior to May 1963, we resolve this difficulty by treating the sum of lines I-A-3 and I-A-4 as though it were a series containing only dollar acceptances.[4]

The second important problem with these data arises from discontinuities in the time series, due to changes in reporting coverage, classifica-

[4] In May 1963, when acceptances were first reported separately, they constituted about 97 per cent of the total of lines I-A-3 and I-A-4 (the comparable figure for the end of 1967 was 95.5 per cent). Research by Charles K. Harley in 1965, while he was a summer intern in the Division of International Finance at the Federal Reserve Board, did establish the reasonableness of this procedure directly, in part by Harley's comparing the data on acceptances used in Table 3 with other sources of data on banking acceptances collected for domestic money-market purposes. We have benefited from many aspects of Harley's unpublished research, including some interesting preliminary attempts to explain acceptance claims on Japan with multiple-regression techniques.

tion, or requirements. These changes, which are discussed in Appendix B, have been numerous and often substantial. (The problem is encountered in the empirical analysis of flows of capital between the United States and virtually all foreign countries.) To deal with these discontinuities we have created "revised" capital stocks. Our procedure for doing so is also described in Appendix B.

The third problem arises because of the activities of agencies of Japanese banks located in the United States. These Japanese agency banks are regarded as American banks for statistical purposes, but a substantial proportion of their claims on and liabilities to Japan are subject to special institutional influences that are not present in the case of American banks other than the Japanese agencies. The problems associated with the activities of these Japanese agency banks, which are similar to problems encountered in the analysis of capital flows between the United States and a number of other major countries, are discussed briefly in Appendix C. The principal practical result of our analysis of these problems is that the "collection" claims on Japan reported by Japanese agency banks located in the United States have been excluded from the Japanese borrowing variable that we explain empirically.

One other feature of the data on our dependent variables needs to be mentioned briefly. In the period November 1961 to July 1962 the Japanese government arranged a large credit with several American banks. This credit, which took the form of short-term dollar loans amounting to some $325 million, was subsequently repaid during the remainder of 1962 and in 1963. Formally the American claim on Japan constituted loans to the Bank of Japan. However, some sources, notably Ezekiel and Patel, have argued that the loans "clearly represent flows of private short-term capital which passed from U.S. banks to Japanese commercial banks via the intermediary of the Bank of Japan."[5] The implication of Ezekiel and Patel's analysis is that the loans to the Bank of Japan substituted, at least to some extent, for loans to Japanese commercial banks that would otherwise have been arranged by the commercial banks themselves. In our estimated equations, reported below, we have attempted to determine empirically the extent to which these loans to Japanese official institutions were in fact substituting for other borrowing.[6]

Given that all forms of Japanese borrowing from the United States (and from other countries) are to some extent gross substitutes, what is

[5] [13, p. 430.]
[6] See Chapter V. For other references to these specially arranged loans, see Fuji Bank [14, p. 278] and the *Semi-annual Report* of the Bank of Tokyo, March 1963, p. 33.

the most appropriate method of grouping the available data together for purposes of analysis and estimation? There are three possible alternatives: (1) to explain each disaggregated series separately, (2) to explain total borrowing from the United States in a single aggregative equation, after which the composition of the total is explained via component equations, or (3) to adopt an intermediate solution in which two separate aggregative equations explain short and long-term borrowing from the United States, after which each of the two subtotals are broken down further into detailed components.[7]

The first alternative has the strong disadvantage that substitution effects between types of borrowing from the United States are less likely to be correctly estimated.[8] The second procedure is perhaps the preferred one of the three, for the same reason. Substitution effects between types of borrowing from the United States can in principle be handled by entering an average American interest rate in the aggregative equation (see Part B) and subsequently estimating component equations; substitution effects between Japanese borrowing from the United States and from third countries are estimated explicitly in the aggregative equation itself. The third alternative, explaining short and long-term borrowing from the United States separately in aggregative equations, is a compromise between the first two. In effect, the third alternative assumes that there is little substitution by the Japanese between long-term and short-term borrowing from the United States.

We have experimented with both the second and third alternatives, choosing, after initial work, the third alternative as the more promising for further investigation. Still more specifically, we have concentrated on short-term borrowing from American banks. It is substantially greater than long-term borrowing and short-term borrowing from American nonbanks (see Table 3), and its variation is much greater.[9] Moreover, by con-

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[7] Note again that if data were available, another probably preferable procedure would be to estimate an aggregative equation for total Japanese borrowing from all foreign regions and then to distribute the total to the United States and other foreign regions via component equations.

[8] In principle, by putting all interest rates in every equation estimated, one could still capture all the substitution effects. But since many of the interest rates are highly collinear, such equations are virtually impossible to estimate in practice.

[9] The main variation in long-term Japanese borrowing from the United States over the 1959–67 period can be explained relatively simply. In February 1959 the Bank of Japan floated a bond issue of $30 million in New York. For the next three years there was virtually no change in long-term borrowing. A period of marked activity in security issues began in early 1962, and continued until the U.S. Interest Equalization Tax was proposed in July 1963. The existence of the IET is apparently sufficient explanation for why there has been no significant increase in outstanding Japanese securities

centrating on short-term borrowing (other than the collections of Japanese agencies—see Appendix C), which is initiated almost solely by Japanese foreign-exchange banks, we can apply portfolio analysis directly to the banks. This allows for a considerably more accurate identification of theoretical constructs with empirically observable magnitudes than would the alternative procedures.

The general pattern of variation of short-term Japanese borrowing from American banks, both the total and its two main components, can be seen in Figure 1.

B. *Determinants of Desired Borrowing*

Virtually all Japanese short-term borrowing from the United States has been initiated by Japanese city banks. The principal assets and liabilities of these institutions are listed in the hypothetical consolidated balance sheet shown in Table 4. The assets of the city banks have been divided into five categories: liquid assets held domestically LAd, liquid assets held abroad LAf, all loans and discounts Lld, other security holdings Ls, and "other" assets OA, a balancing item equal to real assets (bank buildings, etc.) plus other miscellaneous minor items. The liabilities of these banks include deposits Dep, borrowing at home Bj (which includes indebtedness to the Bank of Japan and to other Japanese banks), borrowing from banks in the United States Bus, and borrowing from other foreigners $Be\$$ (which is largely borrowing from the Eurodollar market). Net worth NW completes the balance sheet.

TABLE 4

CONSOLIDATED BALANCE SHEET OF JAPANESE CITY BANKS

|			
Liquid assets held domestically	LAd	Deposits	Dep
Liquid assets held abroad	LAf	Borrowing domestically	Bj
Loans and discounts	Lld	Borrowing from American banks	Bus
Other security holdings	Ls	Borrowing from other foreigners	$Be\$$
Other assets	OA	Net worth	NW

Given their net worth and utility functions, the Japanese city banks determine the size of their overall balance sheets and the composition

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since 1963. What did occur on a large scale after July 1963, however, was a switch to borrowing in the form of term loans from American banks. This rapid expansion in long-term lending by American banks was halted in its turn when in early 1965 the IET was applied to long-term bank claims on foreigners. Since 1965 the outstanding stock of term loans has been declining as old loans mature and are not renewed at the higher current loan rate (inclusive of the IET).

FIGURE 1

JAPANESE SHORT-TERM BORROWING FROM AMERICAN BANKS (DEFINED AS EXCLUDING COLLECTION
CLAIMS ON JAPAN OF JAPANESE AGENCY BANKS IN THE UNITED STATES), 1959-67
(billions of dollars, not seasonally adjusted)
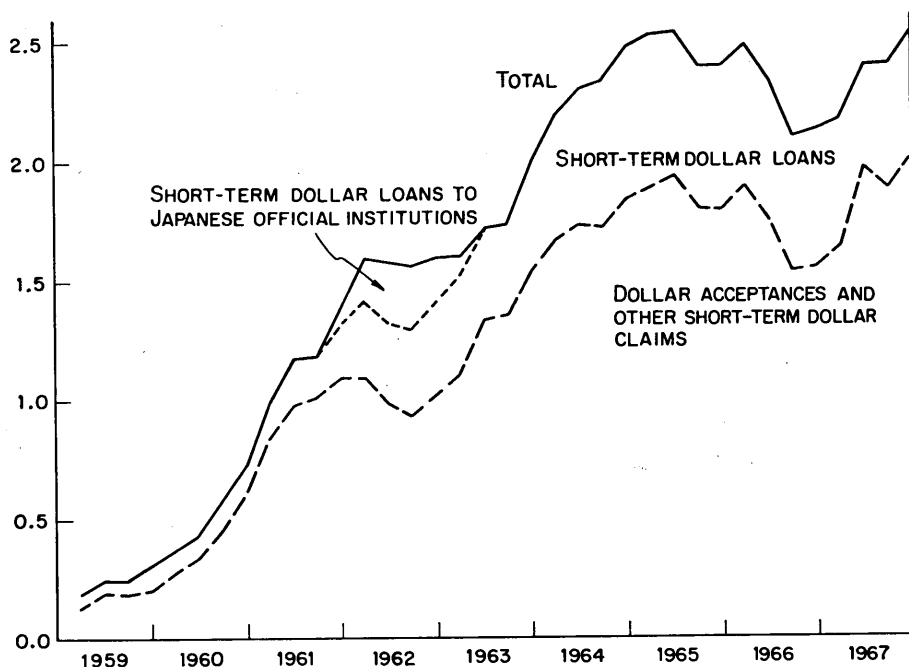
of their lending and borrowing portfolios. This determination will
depend, among other things, on the relevant expected costs and returns.[10]
An increase in borrowing costs other than the cost of borrowing from
American banks, other things being equal, will lead to a substitution of
borrowing from the United States for borrowing from other sources;
it will also lead to a reduction in total borrowing and lending. An increase
in the American borrowing rate, other things being equal, will lead to a

[10] As was noted in Chapter II, banks and other economic units tend to diversify
their liability portfolios in order to minimize the disutility associated with expected
borrowing costs and with the risk of greater actual costs occurring. For example, if
continuous borrowing from American banks is necessary in order to keep lines of credit
open during periods when American monetary conditions are tight, the Japanese
banks might well hedge against the possibility that the United States might be an
attractive source of funds during such periods by continuing to borrow from American
banks even when such borrowing is relatively expensive.

substitution of borrowing from other sources for borrowing from the United States and, again, to a reduction in total borrowing and lending. Finally, an increase in any lending rate, all else being equal, will generate increases in total lending and in all forms of borrowing (as well as a relative shift into the now more lucrative form of lending).

Denoting the expected borrowing and lending rates associated with the balance-sheet instruments by prefixing the quantity symbol with R (and, for the moment, ignoring the risk and noninterest-rate distribution variables), we can write an analogue to equation (2.2) for desired borrowings from the United States by Japanese banks:[11]

$$(4.1) \quad Bus^* = f(\overset{+}{RLAf}, \overset{+}{RLld}, \overset{+}{RLs}, \overset{+?}{RDep}, \overset{+?}{RBj}, \overset{-}{RBus}, \overset{+?}{RBe\$})NW.$$

The expected signs of the partial derivatives of Bus with respect to the interest-rate variables are given above the variables. The signs of the partials with respect to borrowing rates other than the own American borrowing rate are not unambiguous. Increases in these other borrowing rates lead both to substitution effects (more borrowing from the United States relative to other sources) and to what might be termed "income" effects (a reduction in total borrowing). Which of these effects will be dominant is not certain, although we would be surprised if the income effect outweighed the substitution effect.[12] If empirical estimates were to suggest that the income effect was significantly stronger, we would reject the estimates as being probably unreliable (see Chapter V below).

Deposits of the Japanese banks pose special problems. If Japanese banks had a short-run deposit supply function such that they regularly adjusted the deposit rate in order to achieve their desired deposit level, then deposits would be treated like other liability items, and the deposit rate $RDep$ would enter equation (4.1) as we give it. However, since the Bank of Japan imposes rate ceilings that prevent Japanese banks from paying deposit rates as high as they otherwise would be willing to pay [4, p. 104], actual Japanese deposit rates have little significance for our analysis. Under such circumstances it seems more appropriate to substitute the exogenous (to the banks) ratio of deposits to net worth for the deposit rate in our equation (4.1). An increase in this ratio, other things being equal, should lead banks to expand assets and reduce other liabili-

[11] Because the returns on LAd and OA are neither readily available nor likely to be important, they have been omitted.

[12] It is the joint consideration of both the asset and liability sides of the balance sheet that leads to the possibility of substitution effects being partly or wholly offset by "income" effects.

ties, the latter acting to offset the additional risk introduced by the expansion of assets on a given net-worth base. The deposit/net-worth ratio thus acts effectively as a noninterest-rate distribution variable in the equation.[13]

One other noninterest-rate distribution variable reflecting institutional arrangements seems particularly relevant to Japanese borrowing from the United States. As was noted earlier, a large portion of short-term borrowing from the United States is in the form of bank acceptances based on Japanese import-trade bills. American banks appear to have a preference for lending to Japan in this manner, perhaps because of the lower risk associated with lending that uses trade documents as collateral. An increase in the ratio of Japanese imports to net worth, all else being equal, should raise both total borrowing and the portion of the total coming from the United States.[14]

A few more remarks are necessary before we can write an empirical analogue to equation (2.2). We argued above that *expected effective* returns, costs, and risks are the appropriate arguments in structural demand and supply functions. In actual practice, empirical researchers never have adequate information (if they have any at all) about the probability distributions economic units associate with various returns and costs. They seldom have good information on effective costs and returns. We are no exception. As a result, we have not developed proxies for expected rates, for effective rates paid, or for the risks associated with each of the expected costs and returns.[15] The interest rates employed in the empirical

[13] If Japanese banks did not borrow—if their intermediary function were limited to supplying deposits and investing funds so raised—we would add deposits to net worth and use the sum as the scale variable; changes in each would be expected to have similar effects on asset holdings. However, when nondeposit liabilities are included in the analysis, this is not true. Increases in net worth should raise both desired liabilities and desired assets; increases in deposits should *lower* desired liabilities and raise desired assets.

[14] Another effect of rising imports might be to increase LAf by raising the international-transactions demand for money. This, too, should raise total borrowing and thus borrowing from the United States.

[15] If effective rates paid by the Japanese banks were equal to the quoted market rates (for which we do have data) plus a constant premium over this amount, the impact of these constant premia would be adequately reflected in the constant terms of our regression equations. In our brief experiments explaining long-term Japanese borrowing from the United States, we attempted to obtain the effective American interest rates paid by the Japanese by adjusting long-term rates upward (the corporate bond rate after July 1963 and the bank commercial-loan rate after February 1965) by the amount of the Interest Equalization Tax (in per cent per annum), but these adjustments are not relevant to the results for short-term borrowing reported in this study.

equations reported in Chapter V are quarterly averages of observed interest rates.

Two of the interest rates (in addition to the deposit rate) in the set given in equation (4.1) have not been tested. The yield on other securities held by the Japanese city banks RLs is controlled by the Japanese government. Since this rate changed very infrequently and only by small amounts during the period, we did not include it in our estimated equations. In addition, no adequate measure is available for the yield on Japanese liquid assets held abroad ($RLAf$).

Taking these modifications and the noninterest-rate distribution variables into account, our precise empirical analogue to equation (2.2) is:

$$(4.1)' \qquad Bus^* = g\left(\overset{+}{RLld},\ \overset{+?}{RBj},\ \overset{-}{RBus},\ \overset{+?}{RBe\$},\ \overset{-}{\frac{Dep}{NW}},\ \overset{+}{\frac{M}{NW}} \right) NW,$$

where M represents total Japanese imports.

The actual interest rates employed are as follows. The domestic Japanese borrowing rate, RBj, is a weighted average of the basic discount rate of the Bank of Japan (the cost of borrowing from the Bank of Japan) and the unconditional call-money rate (the cost of borrowing from other Japanese banks).[16] The Japanese lending-at-home interest rate, $RLld$, is a weighted average, calculated by the Bank of Japan, of the rates charged by Japanese city banks on all their loans and discounts. For an indicator of the cost of borrowing in the Eurodollar market, $RBe\$$, we use a series for the rate paid by London banks on 90-day Eurodollar deposits.[17] The American interest rate used in aggregative equations,

[16] Since the banking system in Japan borrows extensively from the Bank of Japan on a regular basis, this interest rate has more direct significance for Japanese transactors than the Federal Reserve discount rate has for American transactors.

Ceilings are imposed on call-money rates by the monetary authorities and the Federation of Bankers' Associations of Japan. These ceilings, which are only occasionally effective [3, p. 73], are altered in accordance with changes in the bank rate. (Interbank borrowing is at least as important in Japan as in the United States.)

[17] The Eurodollar rate that is theoretically relevant is the (expected) rate at which the Japanese banking organization as a whole can attract a marginal dollar of deposits. Under normal circumstances the going market rate in London (plus, presumably, a risk premium which hopefully has been relatively constant) might serve as an adequate proxy for this rate. Beginning in July 1962, however, the Bank of Japan set maximum authorized rates payable by Japanese banks on Eurodollar deposits. If the Japanese banking organization (either the head office in Tokyo or a branch in London) were constrained by these ceiling rates in some period so that they could offer only noncompetitive yields on Eurodollar deposits, then the bank would be effectively prohibited from borrowing at all in the Eurodollar market. In such a situation the effective borrowing rate would be undefined. Our information on these maximum

RBus, is a weighted average of the rate on prime 90-day bankers' acceptances in New York (the "own" rate on Japanese borrowing in the form of acceptances) and the rate on short-term bank loans to American businesses in major cities in the United States (the "own" rate on Japanese borrowing in the form of loans). The weights applied to the individual rates in calculating the average rate are the proportions of total American short-term bank lending to Japan in the form of acceptances and loans, respectively.[18] The observed acceptance and loan rates are used in the component equations.

The trade variable, *M*, is total Japanese merchandise imports at a quarterly rate. Data for the net worth and deposits of the Japanese city banks were collected from end-of-quarter balance-sheet data published by the Bank of Japan. None of the variables has been seasonally adjusted.

C. *Capital Restrictions*

As noted in Chapter II, the existence of restrictions on the international mobility of capital makes it unlikely that observed stocks of foreign assets or liabilities are equal to "desired" stocks. This point applies with considerable force to Japanese external borrowing.

In Figure 2 we have plotted our dependent variable, the ratio of Japanese short-term borrowing from American banks (net of loans to official institutions) to net worth, the difference between the two principal interest rates, $RLld - RBus$, and the principal noninterest-rate distribution variable, M/NW. Figure 2 makes it abundantly clear that Japanese short-term borrowing from the United States in the 1959–63 period cannot possibly be explained by changes in the economic determinants of desired borrowing. The import ratio was about the same in late 1960 and 1963 as it was in early 1959. The interest-rate spread was also at about the same level in late 1960 as early 1959, but, due largely to a rise in American rates, it narrowed by more than a full percentage point during
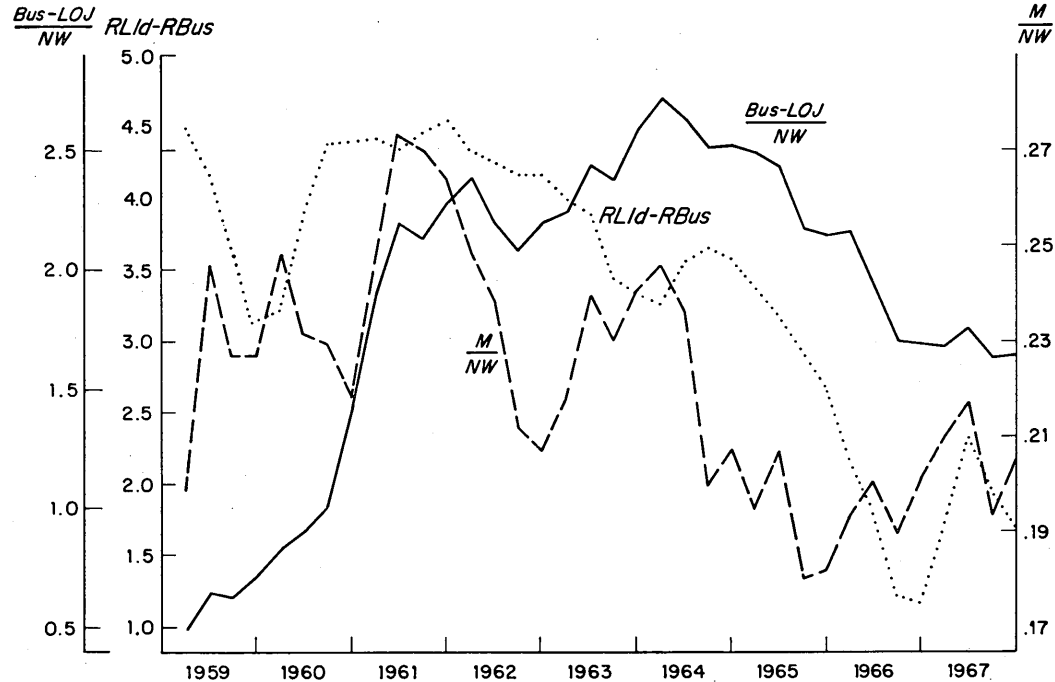
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authorized Eurodollar rates is incomplete, but for a number of quarters in the 1963–66 period we were able to construct a rough approximation to a "quarterly average ceiling rate." In general, the ceiling rate and our series for the "market" rate moved closely together, which implied that the ceiling rates imposed by the Japanese authorities did not bind much, if at all. Further support for this view is provided by official Japanese interpretations of how the ceiling rate system was operated. See, for example, *Nihon Keizai Shimbun* (Japan Economic Journal), International Weekly Edition, issues dated March 17, 1964, pp. 2–5, and July 26, 1966, p. 5.

[18] The weighted average Japanese borrowing rate is calculated in a conceptually similar manner. The weights are variable rather than fixed; that is, they vary from quarter to quarter as the proportions of the components in the total vary.

FIGURE 2

THE BORROWING/NET-WORTH RATIO AND ITS ECONOMIC DETERMINANTS, 1959-67

Note: See text for definition of variables. *Bus, LOJ, and M* are measured in millions of U.S. dollars; interest rates are expressed in percent per annum; *NW* is measured in trillions of yen.

the 1960–63 period. These facts would suggest a relatively similar ratio of borrowing to net worth in late 1960 as in early 1959, and a declining ratio during the 1960–63 period. In contrast, the borrowing ratio more than tripled between early 1959 and late 1960, and continued to rise during 1960 to 1963. Only if one explicitly introduces the widespread relaxation of capital restrictions in 1959–60 and the subsequent gradual response to this relaxation in 1961–63 into the analysis, can he hope to understand the rapid 1959–63 increase in Japanese liabilities to the United States.

We have successfully specified three different types of phenomena as influencing α, the fraction that governs how much of the desired borrowing from the United States is effectively demanded or supplied.[19] These phenomena are discussed below. Appendix D describes in more detail the construction of a variable, representing the impact of the Voluntary Foreign Credit Restraint (VFCR) program on lending of American banks abroad, which could be employed in the study of American bank-lending to any region. Appendix E discusses a fourth capital control phenomenon that, somewhat to our discomfort, we have been unsuccessful in incorporating into our empirical equations.

The Voluntary Foreign Credit Restraint Program of the United States (V)

In addition to imposing the Interest Equalization Tax on long-term foreign bank loans in February 1965, the U.S. government asked each American bank having substantial foreign claims to impose a voluntary ceiling on the size of its foreign assets. The ceiling of each bank was expressed as a percentage of the amount of its outstanding foreign assets as of the end of December 1964. The details of the original program and subsequent modifications in it have been published in the *Federal Reserve Bulletin*.[20]

The VFCR program was drawn up by the Federal Reserve with the expressed hope that banks would give more favorable consideration to foreign claims associated with American exports and foreign claims on the less-developed countries. The restrictive impact of the program was intended to fall mainly on countries in Europe,[21] because of the tendency of Europe as a whole to be in persistent balance-of-payments surplus

[19] See equations (2.3) and (2.4) above.
[20] See *Federal Reserve Bulletin*, for 1965, pp. 371–76 (Feb.), 944–45 (July), 1,693–701 (Dec.); for 1966, pp. 649–51 (May), 1,753–60 (Dec.); for 1967, pp. 1,869–76 (Nov.); and for 1968, pp. 63–71 (Jan.), 257–65 (March).
[21] By 1968 the program was even more specifically formulated with this geographical discrimination in mind. See *Federal Reserve Bulletin* (Jan. 1968), pp. 63–71.

in the 1960s. Insofar as the banks have been free to make their own decisions on how to get their outstanding claims under the ceilings, however, the impact of the program could still have been partly (or conceivably even primarily) on export loans or on loans to countries other than those in Europe.

This last point is relevant to our consideration of a VFCR variable in equations explaining Japanese borrowing from the United States. One might think the VFCR program should not have had much impact on Japan, since the U.S. government was primarily interested in having the banks cut back on claims on Europe. But this inference could clearly be wrong if the banks regarded the Japanese as marginal borrowers. We refer below to a view widely held among American bankers in 1964, that American banks, taken collectively, had somewhat overextended themselves in lending to Japan. The existence of this view might indicate that the Japanese were in fact marginal borrowers in the early months of the VFCR program. Note, too, that American banks were in a position to use the VFCR as an excuse for not lending more to Japan in 1965 even if they might have somewhat curtailed their Japanese lending without the program.

We have constructed a variable to reflect the restrictive impact of the VFCR program from individual bank data on loans to foreigners. As used in the results reported below, the variable is defined as the average ratio during the quarter of foreign claims of banks at or over their ceiling to the aggregate ceiling for all banks reporting in the program. The greater is this ratio $\hat{V}$, the greater is the restrictive impact of the overall VFCR program. The variable is zero prior to the second quarter of 1965, and ranges between 0.01 and 0.40 during the remainder of the period (see Appendix D).

Basic Relaxation of Capital Restrictions (BR)

Between 1958 and 1964 the Japanese government progressively relaxed a number of restrictions imposed on external transactions; the bulk of the relaxation took place in 1959 and 1960.[22] Probably the most important de-restricting measures taken were those affecting the current account in the balance of payments, especially imports. For our purposes, however, we are interested only in changes in controls that have a direct impact on capital flows. Recall from (4.1)′ that we have already specified Japanese imports as an important variable relevant to short-term foreign borrowing. Any indirect effect on Japanese borrowing working through the demand

[22] Some restrictions were still being taken off in 1962 and 1963. Japan did not formally adopt Article VIII status in the IMF until April 1, 1964.

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for import financing should be captured by having imports as an independent variable in our equations.

We have been able to ascertain three types of measures taken during 1959–60 to relax the restrictions bearing directly on capital flows. Broadly speaking, they were (a) expansion between April 1959 and August 1960 of the types of import commodities eligible for usance-bill facilities (borrowing by Japanese importers from the Japanese banks to finance the lag between payment to foreign exporters and domestic sale of the imported merchandise); (b) explicit removal of restrictions on foreign borrowing by the Japanese banks in July–August 1960, including relaxation of the allowable limits on each foreign-exchange bank's "open" position in foreign exchange (the amount by which the larger of foreign-exchange asset or liability holdings can exceed the smaller) and the authorization of nonresident convertible-yen accounts; and (c) extension in November 1960 of the allowable maturity on import-usance facilities from three to four months. The first and third of these easing measures were relevant to borrowing from abroad because, at least initially, it appears that foreign banks were willing to lend to Japanese banks only if the lending were associated with actual transactions in merchandise trade and accompanied by trade documents as collateral (the transactions presumably carrying less risk for the lending banks).

The variable we have constructed to measure the direct effects of these basic relaxations, BR, is based on the detailed timing of the measures and on our subjective weightings of their relative importance. The variable takes on an initial value of one in the fourth quarter of 1958; by the first quarter of 1961 the variable has declined to zero and remains zero thereafter.[23]

Growth of Creditworthiness and Effect of Learning Process (CW)

Once the Japanese government began to relax the many types of restrictions imposed on its external transactions, increased flows of capital between Japan and the United States became possible. But the full adjustment of actual capital flows to the new opportunities presumably did not take place immediately.

Our initial studies of the data on capital flows to Japan and our reading of the government and banking literature convinced us that a "learning process" and the growth of Japanese creditworthiness in international financial markets were important determinants of capital flows between Japan and the United States during the 1961–64 period. As noted above,

[23] The exact values of BR, beginning in 59Q1, are: 1.0, 0.9, 0.9, 0.9, 0.8, 0.7, 0.4, 0.1, and 0.0 in 61Q1 and thereafter.

there is no way that changes in credit conditions and economic activity in Japan and the United States during this period can by themselves explain the rapid increase in Japanese liabilities. The interest rates move the wrong way, while the scale variable and Japanese imports do not grow rapidly enough. In order to take these considerations into account—however crudely—we therefore constructed a trend variable, CW.

There are two sides to the "creditworthiness" and "learning process" phenomena. On the one hand, the Japanese supply of financial liabilities to the United States increased *pari passu* with Japanese acquisition of knowledge of how to tap sources of funds in the United States. So long as restrictive controls disallowed extensive borrowing, Japanese potential borrowers had little incentive to obtain closer banking and financial contacts abroad. But once the restrictions were relaxed, these contacts and the information that went with them were gradually built up. On the other hand, the demand of American banks for assets in Japan (claims on Japanese borrowers) gradually shifted as American banks acquired more reliable and detailed information on lending opportunities and the associated risks in Japan. One specific element in the American banks' more favorable appraisal of the creditworthiness of Japanese banks may have been an increased awareness of an implicit guarantee from the Bank of Japan for the American banks' assets in Japan.

Although we have information about several specific transactions and policy developments which were probably important milestones in the development of this creditworthiness-learning process,[24] we have not found a truly objective criterion to guide us in constructing the CW variable. We feel fairly sure about the date—early in 1961—when such a variable should begin to have an influence. The variable BR, which is zero after the first quarter of 1961, is constructed to describe the direct effects of relaxing the controls in 1959–60, whereas CW should in part serve as a proxy for lagged responses to the basic relaxation. Similarly, we are fairly confident that the period late-1963 to early-1965 brackets the period in which CW should cease to have any further influence.[25]

[24] For example, the Bank of Japan floated a bond issue in New York in 1959, the first Japanese issue in New York in 30 years, in part to break the ice for subsequent Japanese borrowers. The large official loans arranged in 1961–62 by the Bank of Japan are another example.

[25] The Japanese government's adoption of Article VIII status in the International Monetary Fund on April 1, 1964 was a step which in their own view and in the view of international financial markets in general tended to consummate a gradual assimilation of Japan into full-fledged membership in a highly integrated, largely decontrolled world economy. The annual meetings of the IMF and World Bank were held in Tokyo in September 1964, an event that might be interpreted as marking the final stages of a

Thus, while we have some general guidelines as to when a *CW* variable should begin and end its influence, we have little else to go on in constructing such a variable.

In our estimation of equations for Japanese borrowing from the United States, we have conducted limited experiments with several alternative versions of a *CW* variable. Each of the alternative *CW* variables is equal to 1 in and prior to the first quarter of 1961, declines linearly to zero, and remains at zero throughout the rest of the period. The alternative versions are based on the variable becoming zero in the first quarter of 1964, the third quarter of 1964, and the first quarter of 1965.

We conclude our discussion of capital restrictions by writing a specific analogue to equation (2.4):

$$(4.2) \qquad \alpha = 1.0 + \beta_1 BR + \beta_2 CW + \beta_3 \hat{V}, \quad \beta_i \leq 0.$$

More specific constraints on the β's follow from the general constraint that $0 < \alpha \leq 1$ and the precise values of the capital control variables that we have constructed. These constraints are:

$$-1.0 < \beta_1 + \beta_2 < 0 \quad \text{and} \quad -2.13 < \beta_3 < 0.$$

D. *Summary of Equation Specifications*

The counterpart to equation (2.3) is:

$$(4.3) \qquad Bus = \alpha Bus^s + \pi LOJ, \quad 0 < \alpha \leq 1, \text{ and} \qquad 0 < \pi \leq 1,$$

where *Bus* is observed short-term Japanese borrowing from the United States, Bus^s is the short-run desired quantity of borrowing, and *LOJ* is the quantity of loans to official Japanese institutions. The coefficient π is expected to be equal to or somewhat less than 1, depending on the extent to which these loans to official institutions (see the discussion in Part A above) substituted for borrowing that otherwise would have taken place.

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learning process about Japan on the part of foreign bankers and industrialists. Perhaps most important of all, we have frequently heard it stated in our conversations with bankers and officials familiar with the overseas lending activities of American banks, that the banks reappraised their collective asset position vis-à-vis Japan during the course of 1964. A number of individual banks, according to this story, had extended sizable credits to Japan during 1960–63 without paying too much attention to the rapid growth in the claims of other American banks on Japan. Then in 1964, no doubt partly because of the balance-of-payments difficulties experienced by Japan early in the year, American banks became much more collectively aware of their large outstanding claims on Japan (and of the size of Japanese external liabilities in general in relation to their official reserves). Reportedly the general reaction of American banks was to restrain the rapid expansion of credits to Japan which had characterized the 1960–63 period.

On a priori grounds we would not expect lagged responses in an equation explaining *Bus* to be very long. The authorized foreign-exchange banks in Japan now have branches and extensive contacts around the world, and, like sophisticated financial institutions in other countries, probably adjust their short-term portfolios quite rapidly. On the other hand, given considerable evidence of slow responses in domestic financial behavior, we find it equally unsatisfying to go the other extreme and assume that short-term borrowing adjusts instantaneously to changes in its determinants.[26] The compromise that we have chosen in the absence of a detailed investigation of lagged responses is to measure our explanatory variables as average levels (the interest rates, *NW*, and *Dep*) or flows (*M*) during the quarter, but our dependent variable as the end of quarter stock.[27] This measurement—assuming that no other methods of measuring lagged responses are employed—implicitly assumes a uniform lag distribution of three months on the explanatory variables.[28] More formally, we assume

$$(4.4) \qquad\qquad Bus^s = Bus^*,$$

but we define *Bus** in terms of quarterly averages.

Linearizing and substituting our expression for *Bus** (equation [4.1]′) into (4.4) and (4.3), making use of (4.2), and deflating the resulting equation by net worth yields:

$$(4.3)' \quad \frac{Bus}{NW} = \left[1.0 + \beta_1 BR + \beta_2 CW + \beta_3 \hat{V} \right]\left[\theta_0 + \theta_1 RLld + \theta_2 RBj \right.$$

$$\left. + \theta_3 RBe\$ + \theta_4 RBus + \theta_5 \frac{Dep}{NW} + \theta_6 \frac{M}{NW} \right] + \pi \frac{LOJ}{NW}.$$

[26] In particular, one would not be expected to repay short-term borrowing instantaneously in response to increases in the cost of borrowing or to declines in the scale variables. Since the higher borrowing costs only apply to new borrowing, the existing borrowing will simply not be renewed as it matures. In addition, the transactions costs associated with retiring short-term debt early (including the goodwill lost with banks if loans are repaid early) relative to the savings to be gained might tend to make prepayment prohibitive for financial instruments of relatively short maturity.

[27] If one deliberately wished to assume instantaneous adjustment of *Bus* to its determinants, one should either (a) relate stocks at the end of the quarter to interest rates prevailing on the last day (week) of the quarter and to the rate of flow of the scale variables prevailing on the last day (week) of the quarter or, alternatively, (b) relate average stocks during the quarter to average values of the explanatory variables during the quarter.

[28] If the maturity of the debt instruments for short-term borrowing is three months, our uniform lag distribution might be quite appropriate for the cases when borrowers are responding to increases in the cost of borrowing or to declines in the scale variable. Adjustment might be considerably faster to the reverse movements in these variables.

We have strong expectations that $\theta_1 > 0$, $\theta_4 < 0$, $\theta_5 < 0$, and $\theta_6 > 0$; weak expectations that θ_2 and θ_3 are positive; and no a priori expectations regarding θ_0. On the β's, see equation (4.2) and the discussion following it.

Total short-term Japanese borrowing from the United States, as we have defined it (that is, excluding the collection claims of Japanese agencies in the United States), consists of two broad components, short-term dollar loans (SL) and dollar acceptances plus other miscellaneous short-term dollar claims ($A\$$). For the component equations analogous to (2.6)′ we have:

$$(4.5) \qquad SL - LOJ = f(Rcl, Rba, Z)(Bus - LOJ);$$
$$A\$ = g(Rcl, Rba, Z)(Bus - LOJ).$$

$Bus - LOJ$ is the variable that economic units (other than the official Japanese borrowers responsible for the short-term loans represented by LOJ) are allocating between short-term loans and acceptances. The rate Rcl is the own rate for SL, and Rba is the own rate for $A\$$. The lower Rcl is and the higher Rba, the greater will be the proportion of short-term borrowing that takes the form of loans.

We have specified two noninterest-rate distribution z variables that may affect the division of borrowing from the United States between loans and acceptances. Since acceptances tend to be associated primarily with the financing of imports, a relative increase in borrowing to finance imports (reflected in an increase in M/NW) should lead to an increase in the share of borrowing that takes the form of acceptances. Moreover, given the tie between acceptances and imports, the restraint of the VFCR program might possibly be expected to fall more heavily on loans than on acceptances, in which case the loans' share of total borrowing would decline with an increase in $\hat{V}$.

Substituting the noninterest-rate distribution variables, linearizing the functions, and deflating by $Bus - LOJ$ gives the specification of the component equations in the form in which they are estimated:[29]

$$\frac{SL - LOJ}{Bus - LOJ} = \eta_0 + \eta_1 Rcl + \eta_2 Rba + \eta_3 \frac{M}{NW} + \eta_4 \hat{V}$$

$$(4.5)' \quad \frac{A\$}{Bus - LOJ} = (1 - \eta_0) - \eta_1 Rcl - \eta_2 Rba - \eta_3 \frac{M}{NW} - \eta_4 \hat{V},$$

$$\eta_2 > 0; \quad \eta_1, \eta_3, \eta_4 < 0; \quad \eta_0 \gtrless 0.$$

[29] As noted in Chapter II, it is only necessary to estimate one of these equations, since one automatically implies the other and the estimates are independent of which equation is estimated.

V. EMPIRICAL RESULTS

A. *Problems of Estimation*

The equation specified in (4.3)′ is nonlinear in its parameters. It cannot be directly estimated with linear regression techniques.

One possible method of proceeding—the one we employed in early stages of our empirical work—is to estimate (4.3)′ indirectly via the iterative use of a linear regression program. Under this procedure, one must first specify a priori a set of estimates for the capital control coefficients (the β_i's). These parameter estimates, in turn, can be used to derive a time series for α. Given an α determined a priori, one can then generate estimates for the remaining coefficients in (4.3)′ via a linear regression where the regressors are product terms involving α:[1]

$$(4.3)'' \quad \frac{Bus}{NW} = \theta_0 \alpha + \theta_1(\alpha RLld) + \theta_2(\alpha RBj) + \theta_3(\alpha RBe\$) + \theta_4(\alpha RBus)$$

$$+ \theta_5 \left(\alpha \frac{DEP}{NW} \right) + \theta_6 \left(\alpha \frac{M}{NW} \right) + \pi \frac{LOJ}{NW}.$$

This procedure can be repeated in successive iterations that incorporate different theoretically permissible values of the β_i's. Finally, one must select a "best" explanatory equation from the entire set of equations estimated.[2]

This iterative estimation technique, however, is extremely inefficient. The extensive iteration can be very expensive, both in terms of computer time and the research efforts of the investigators. In our case, in order to test thoroughly for only five different values for each β_i (including values for the coefficient on the variable described in Appendix E), three different "end points" for the CW variable, three interest-rate combinations, and three combinations of the noninterest-rate distribution variables,

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[1] Alternatively, and computationally more simply, one can choose $\dfrac{Bus}{\alpha NW}$ as the dependent variable. In this case the regressors do not involve α (except in the case of $\dfrac{1}{\alpha} \dfrac{LOJ}{NW}$). Which of these procedures should be preferred depends in part on properties of the error terms under the two alternatives.

[2] The appropriate criteria for choosing a "best" equation in these circumstances are not clear. In practice we followed the principle of rejecting any equations having coefficients clearly inconsistent with theoretical expectations. The choice between the remaining equations was made on the basis of minimizing the standard error of estimate.

we might have needed to estimate—and worse still, to look at—as many as $(5^4)(3^3) = 16,875$ equations. In practice, even if one selects successive regression equations with care, it may not be realistically possible to test for all major permutations. Yet without such testing, one must inevitably be somewhat uneasy with the parameter estimates actually selected from an allegedly "best" equation.

A much more efficient procedure for estimating (4.3)′ is to employ a computer program written for the purpose of obtaining nonlinear parameter estimates. The estimated coefficients reported in this study were obtained by using such a program.[3] There is no conceptual difference between the first procedure described above and the direct use of a computer program for nonlinear estimation, since the nonlinear estimation program itself is based on an iterative maximization process. But in practical terms the nonlinear computer program can often locate "best" estimates in seconds, estimates that would take many different passes to locate via the iterative use of a linear regression program.

For the single-equation least-squares case, the nonlinear program maximizes an objective function defined as the negative sum of squares of the residuals. It is possible, and we have made extensive use of this provision in the program, to constrain the estimated coefficients to fall within lower and upper bounds that are specified a priori. The program enforces these constraints by adding a penalty function to the objective function being maximized. Within the interior of the admissible region for coefficients, the penalty function takes on values that are not significantly different from zero. If one approaches a boundary of the admissible region for a coefficient during the iterative maximization process, however, the penalty function takes on greater and greater values and thus effectively forces the program to find the local maximum within the admissible region, rather than a global maximum which may lie outside the a priori-specified bounds.[4]

For the total short-term-borrowing equations presented below, we report the nonlinear estimates generated by the program together with their standard errors (below them in parentheses). We also show for each equation the standard error of estimate of the equation, the coefficient of determination adjusted for degrees of freedom R^2, and the Durbin-

[3] A nonlinear estimation program was not available to us initially, but the inefficiencies of our earlier estimation technique ultimately induced us to acquire such a program and to adapt it for our use. See Yonathan Bard [5] for a description of this program and its capabilities.
[4] For details see [5, pp. 24–30].

Watson test statistic for serial correlation in the residuals.[5] Two comments are in order regarding the estimated coefficients and their standard errors. First, the more appropriate test regarding the statistical significance of the coefficients is a one-tailed rather than a two-tailed test. That is, we wish to test whether or not the coefficients are significantly positive (or negative, as the case may be), not whether they are significantly different from zero in either direction.[6] Second, because we have used a nonlinear estimation program, the usual significance tests derived for the case of linear regression coefficients are not strictly applicable.[7] Thus we discard the usual "significance" terminology in our discussion below and simply refer to higher or lower t-ratios.

B. *Total Short-term Borrowing*

Table 5 contains estimates of our theoretical equation (4.3)′ for three possible CW variables. In what follows, equations using the CW variable that first becomes zero in the first quarter of 1964 are denoted by a; those with the CW that first becomes zero in the third quarter of 1964 are denoted by b; and those with the CW that first becomes zero in the first quarter of 1965 are denoted by c.[8] As the theory requires, the own American rate, the deposit ratio, and all the capital-control variables have been constrained to assume nonpositive coefficients. The import ratio and the official-loans variable have been constrained to assume nonnegative coefficients.[9]

In all the equations we have estimated, the penalty function incorporated into the estimation program has been needed to keep the coefficient of Dep/NW within the admissible bounds. In some equations where we relaxed the nonpositive constraint on this coefficient, the coefficient actually assumed positive values two and three times its standard error. This finding has puzzled us, and is perhaps the most disturbing feature of our empirical work. Since we have been unable to come up with a

[5] The Durbin-Watson statistic and the value for R^2 are not supplied by [5], but we have adapted the program to produce these statistics.

[6] In the case of estimates obtained from a linear regression, the usual .05 level test is satisfied, assuming 30 degrees of freedom, if the coefficients are 1.70 times their standard errors rather than 2.04 times (the correct multiple for the customarily used two-tailed test). For the .01 level test, the relevant multiple is 2.46 rather than 2.75.

[7] See Draper and Smith [10, p. 299].

[8] See Chapter IV-C, under "Growth of Creditworthiness," for a discussion of the CW variable.

[9] The nonlinear estimation program was also used to enforce the constraints that the coefficients of BR and CW be greater than -1.0, the coefficient of $\hat{V}$ be greater than -2.13, and that of LOJ/NW not exceed unity.

TABLE 5

ESTIMATES OF EQUATION (4.3)′

(*period of fit: 1959-QI to 1967-QIV*)

Equation	BR	CW	$\hat{V}$	Constant	RLld	RBj	RBe$	RBus	$\dfrac{M}{NW}$	$\dfrac{Dep}{NW}$	$\dfrac{LOJ}{NW}$	R^2	SEE	DW
(5.1a)	−.412	−.411	−.100	−7.209	1.238	−.134	−.076	−.021	.838	0.0	.060	.984	.098	1.53
	(.049)	(.041)	(.112)	(1.610)	(.193)	(.061)	(.149)	(.201)	(.192)	(.103)	(.320)			
(5.1b)	−.368	−.444	−.140	−5.913	1.093	−.121	−.012	−.141	.803	0.0	.014	.983	.103	1.40
	(.050)	(.042)	(.114)	(1.692)	(.197)	(.061)	(.155)	(.211)	(.188)	(.100)	(.330)			
(5.1c)	−.356	−.475	−.259	−7.431	1.306	−.186	−.061	−.131	1.137	0.0	.505	.984	.101	1.68
	(.047)	(.041)	(.111)	(1.697)	(.206)	(.067)	(.164)	(.227)	(.226)	(.106)	(.358)			

NOTE: The dependent variable is Bus/NW. (See text for definitions of variables.) Figures in parentheses are standard errors. *Bus*, *LOJ*, and *M* are measured in billions of U.S. dollars; interest rates are expressed in per cent per annum; *NW* and *Dep* are measured in trillions of yen.

persuasive explanation of why the partial derivative of *Bus* with respect to *Dep* should be positive, we have continued (even though we thereby raise somewhat the standard error of estimate of our equations) to enforce the constraint that the coefficient take on a nonpositive value.

The capital control variables work about as expected. The coefficients of *BR* and *CW* are large, relatively stable, and have t-ratios between 7 and 10. The coefficient of $\hat{V}$ is considerably smaller, relative to its standard error, and more volatile, increasing in size as the effect of the credit-worthiness variable is allowed to extend for a longer period. The import ratio, too, performs as expected, except in variant *c* where the greater-than-unity coefficient seems implausibly large. The large Japanese lending-rate coefficients are also neither surprising nor disappointing. The negative coefficients on the Japanese and Eurodollar borrowing rates, on the other hand, are somewhat surprising, particularly those on the former, which are fairly large and have t-ratios exceeding two. While the "income effect" of an increase in these rates (a reduction in total Japanese borrowing) operates in a direction opposite to that of the "substitution effect" (a relative shift in favor of borrowing from the United States), it seems implausible that the income effect would outweigh the substitution effect by a sizable amount.[10] Further, the American rate coefficient seems much too small, particularly in light of the other coefficients. Even with the negative coefficients on the other two borrowing rates, the equations imply that an increase of 50 basis points in all interest rates would, ceteris paribus and $\alpha = 1$, lead to a substantial (.40 to .50) increase in the borrowing/net-worth ratio.[11] Taken at face value, such an increase seems implausible. In fact, in response to such an all–around increase in interest rates, we might expect banks to economize on domestic and foreign cash balances and slightly *reduce* all forms of borrowing.

One possible explanation for part of the discrepancy in the magnitudes of the interest-rate coefficients in Table 5 is simultaneous-equations bias. As is demonstrated in Appendix A, if American banks' demand for acceptances and short-term loans to Japan is related positively to the yields on these instruments, rather than being independent of them, the estimated coefficient on the American interest rate in the Japanese supply equations will be biased downward in absolute magnitude.

Whatever the reasons for the discrepancies, equations where the sum of the interest-rate coefficients on *RLld*, *RBj*, and *RBe$* are constrained

[10] See the discussion in Chapter IV-B.

[11] At the 1965–67 mean value of net worth (1.257 trillion yen), this would imply a $500–600 million increase in borrowing from the United States.

to be equal with opposite sign to the coefficient on *RBus* (where interest-rate differentials are used as explanatory variables) are probably more meaningful. Table 6 contains estimates of such equations. The coefficient of *Dep/NW* continued to be zero (the a priori constraint was again operative); we have, therefore, not reproduced it in the table.[12] As expected, using interest–rate differentials substantially reduces the coefficient on the Japanese lending rate and raises (in absolute magnitude) the coefficient on the American rate. It also raises the other borrowing-rate coefficients, their sum now being about zero. Other coefficients that change substantially are that on $\hat{V}$, which increases by nearly 0.1; that on *M/NW*, which declines by about 0.35; and that on *LOJ/NW*, which increases by about 0.5. The coefficients on *LOJ/NW* in this table are much closer to unity than those in Table 5; these estimates, as opposed to those in Table 5, suggest that official borrowing from the United States substituted little for private borrowing.

The equations reported in Table 6 have Durbin-Watson statistics between 0.8 and 1.3. These values suggest the existence of positive autocorrelation in the residuals.[13] In an effort to reduce the possible undesirable effects of this phenomenon on our statistical estimates, we have adapted the nonlinear estimation program so as to provide transformed estimates. The procedure we have followed is to assume that the serial correlation follows a first-order, autoregressive scheme:

$$u_t = \rho u_{t-1} + \epsilon_t,$$

where the $u_t = \left(\dfrac{Bus}{NW}\right)_t - \left(\dfrac{\widehat{Bus}}{NW}\right)_t$ are the residuals from the untrans-

formed equation and ϵ_t is an error term that satisfies the customary desired properties. Instead of maximizing the (constrained) negative sum

---

[12] Since the coefficient on *Dep/NW* is essentially zero in equations where the a priori constraints are imposed, one obtains virtually identical estimates for the other coefficients if *Dep/NW* is dropped from the equation altogether.

[13] When autocorrelation of the residuals is present in linear regressions, the sampling variances of the estimated regression coefficients may be seriously underestimated; in any case, the customary significance tests are no longer valid. See Johnston [19, Chap. 7] for a discussion of autocorrelation—its consequences, tests for its presence (for example, the Durbin-Watson statistic), and methods of dealing with it. We do not know of discussions in the literature of the consequences of autocorrelation in the residuals from nonlinear equations, but it would seem likely that similar undesirable consequences may result.

TABLE 6

ESTIMATES OF $(4.3)'$ WITH INTEREST-RATE DIFFERENTIALS

(*period of fit: 1959-QI to 1967-QIV*)

Equation	BR	CW	$\hat{V}$	Constant	RLld-RBus	RBj-RBus	RBe$-RBus	$\dfrac{M}{NW}$	$\dfrac{LOJ}{NW}$	R^2	SEE	DW
(5.2a)	−.371 (.054)	−.421 (.040)	−.196 (.121)	.167 (.423)	.419 (.101)	−.040 (.055)	.097 (.192)	.476 (.171)	.955 (.324)	.969	.137	0.85
(5.2b)	−.337 (.054)	−.452 (.040)	−.228 (.117)	.098 (.413)	.442 (.100)	−.050 (.055)	.112 (.187)	.497 (.167)	.561 (.293)	.970	.133	0.95
(5.2c)	−.336 (.049)	−.475 (.039)	−.354 (.110)	−.552 (.492)	.572 (.111)	−.109 (.059)	.054 (.196)	.762 (.191)	1.000 (.354)	.972	.130	1.27

NOTE: See Table 5 for measurement of variables.

of squares of the untransformed residuals, therefore, the nonlinear estimation program is called on to maximize

$$-\sum_{t=2}^{N} \epsilon_t{}^2 = -\sum_{t=2}^{N} (u_t - \hat{\rho} u_{t-1})^2,$$

where $\hat{\rho}$ is an estimate of ρ and N is the number of observations. In this manner it is possible to obtain an estimate of ρ simultaneously with the nonlinear estimates for the other unknown parameters.

When this adjustment for autocorrelation is made, we obtain the estimates given in Table 7.[14] The principal effect of the autoregressive transformation on our estimates is a substantial reduction in the coefficients on $RLld - RBus$. The transformation also decreases the coefficients on the VFCR variable.

While the autoregressive transformation has a clear impact on the estimates, the measurement of the CW variable does not. It would be difficult to choose the "best" CW variable on the basis of the estimates in Tables 6 and 7. The standard errors of the equations are similar. So also are the regression estimates, particularly those in Table 7. In Table 6 the interest-rate, import, and $\hat{V}$ coefficients are higher for variant c, and the official-loans coefficient is substantially lower for variant b. On the whole, we find it encouraging that the estimates are relatively insensitive to alternative assumptions about the CW variable. Seemingly one can obtain ball-park estimates for the coefficients despite insufficient knowledge of the evolution of the "creditworthiness" of Japanese banks.

At this point it is reasonable to ask now much of the explanatory power of our equations is due to the economic variables rather than the capital-control construct, α. The principal interest rates and the import ratio seem to have an important influence on borrowing, but they are interacted with α, the necessity of which is clear from our theoretical discussion. Figure 3 contains plots of $(Bus - LOJ)/NW$ and α, where $\alpha = 1.0 - .350BR - .400CW - .20\hat{V}$, and the a variant of CW has been employed. The coefficients on BR, CW, and $\hat{V}$ in this instance have been selected by approximately averaging the estimates of equations (5.2a) and (5.3a). A cursory inspection of Figure 3 suggests that α will go a long way toward "explaining" the variation in our dependent variable. Equa-

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[14] For the equations shown in Table 7, the constraint on Dep/NW has been imposed simply by deleting it from the set of regressors.
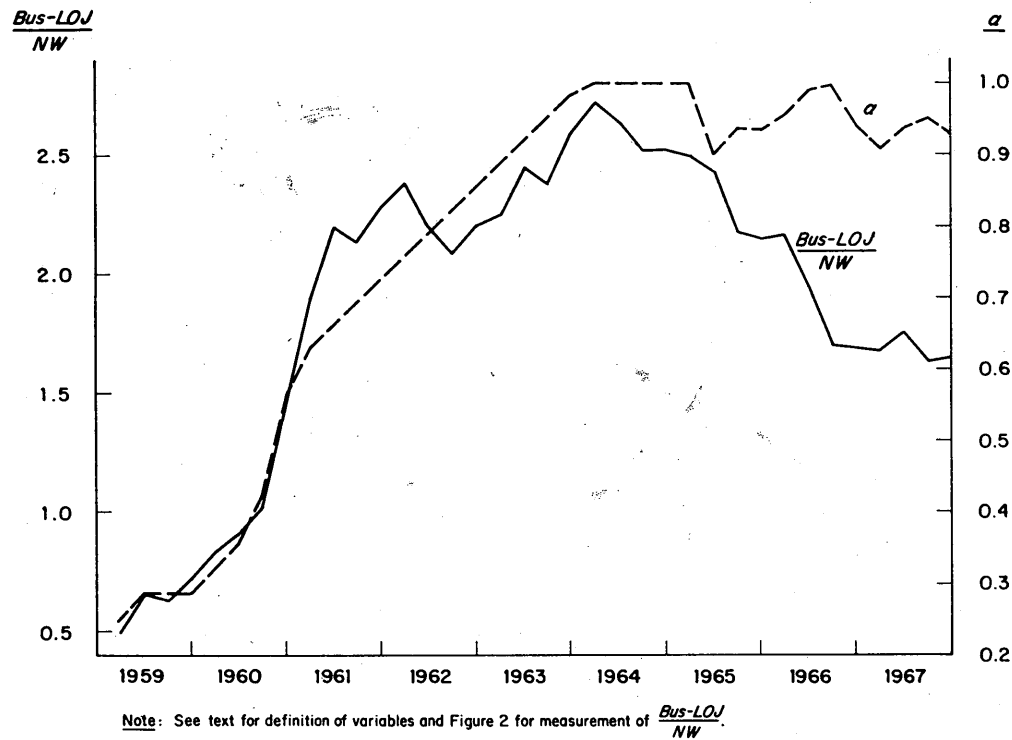
TABLE 7

(*period of fit: 1959-Q2 to 1967-QIV*)

Equation	BR	CW	$\hat{V}$	Con-stant	RLld-RBus	RBj-RBus	RBe$-RBus	$\dfrac{M}{NW}$	$\dfrac{LOJ}{NW}$	R^2	SEE	DW	ρ
(5.3a)	$-.365$ (.145)	$-.373$ (.146)	$-.179$ (.094)	.392 (.546)	.157 (.113)	$-.010$ (.059)	$-.007$ (.101)	.651 (.161)	.950 (.440)	.969	.110	1.89	.920
(5.3b)	$-.371$ (.143)	$-.397$ (.150)	$-.162$ (.094)	.311 (.572)	.155 (.109)	$-.010$ (.057)	$-.002$ (.098)	.672 (.157)	.906 (.401)	.971	.107	1.95	.922
(5.3c)	$-.367$ (.152)	$-.372$ (.179)	$-.197$ (.108)	.358 (.583)	.158 (.120)	$-.015$ (.062)	$-.018$ (.108)	.685 (.185)	.984 (.495)	.968	.113	1.86	.911

NOTE: See Table 5 for measurement of variables.

FIGURE 3

THE BORROWING/NET-WORTH RATIO AND CAPITAL CONTROLS, 1959-67

Note: See text for definition of variables and Figure 2 for measurement of $\frac{Bus\text{-}LOJ}{NW}$.

tion (5.4), which is a regression of our borrowing ratio on the hypothetical α, bears this out.

$$(5.4) \quad \frac{Bus - LOJ}{NW} = \begin{array}{c} .220 + 2.151\alpha \\ (.186) \quad (.229) \end{array} \quad R^2 = .706 \quad \text{S.E.E.} = .344$$

Not surprisingly, α alone accounts for a large part—70 per cent—of the variation in the borrowing ratio. However, it is not true that the economic variables make an unimportant contribution to the explanatory power of the equations in Table 6. The economic variables account for over 90 per cent of the variance unexplained by α; the standard error of estimate is two and a half times as large in equations where α is the only regressor, as it is in equations also containing the economic variables.

It would be interesting at this point, if only for illustrative purposes, to explore some of the implications of our empirical estimates in detail. For the remainder of this paragraph we assume the following values for our coefficients, where the values have been obtained by approximately averaging the estimates in Tables 6 and 7: $\hat{V}$, $-.200$; $RLld$, .300; $RBus$, $-.300$; M/NW, .600. First, the estimated coefficients of LOJ/NW suggest that the Japanese official borrowing from American banks in 1961–62 substituted little, if at all, for borrowing that otherwise would have been arranged by the Japanese commercial banks. Five of the six coefficients are between 0.9 and 1.0, and one of them needs to be constrained in the estimation process in order to keep it from exceeding unity. Second, an increase of $100 million in Japanese imports alone (net worth remaining unchanged) apparently increases Bus by some $60 million at times when capital controls are not binding at all ($\alpha = 1$).[15] Third, the estimates of the equations in Tables 6 and 7 suggest that the elasticities of Bus with respect to the Japanese lending and American borrowing rates have been on the order of 1.1 and -0.8, respectively, in the 1965–67 period—again calculating the effects on the assumption that capital controls are not binding.[16] In terms of changes in basis points, these estimates imply that a 50 basis point increase in our weighted average of American short-term interest rates relative to the Japanese lending rate would generate, at the end-1967 levels of Bus and α, a

[15] Recall that our specification forces the assumption that Japanese borrowing is homogeneous of degree one in Japanese imports and bank net worth. That is, a 5 per cent increase in both imports and net worth is assumed, ceteris paribus, to generate a 5 per cent increase in short-term borrowing from the United States.

[16] These elasticities are computed assuming $\alpha = 1$ and using the formula

$$\eta_R = \frac{\partial (Bus/NW)}{\partial R} \frac{(\overline{R})(\overline{NW})}{\overline{Bus}}$$ where bars over variables denote the 1965–67 means and

reflow of capital to the United States of perhaps \$220 million.[17] Finally, if one calculates the effects of the VFCR program on *Bus*, using a coefficient of $-.20$ for $\hat{V}$, the conclusion is that actual borrowing at the end of 1967 may have been approximately \$160 million below the "desired" level.[18]

C. *Components of Short-term Borrowing*

Equation (5.5) is an estimate of our theoretical equation (4.4)′ for the 1959–67 period:

$$
(5.5) \quad \frac{SL - LOJ}{Bus - LOJ} = \underset{(.126)}{.507} - \underset{(.029)}{.044 Rcl} + \underset{(.018)}{.034 Rba} - \underset{(.035)}{.072} \frac{M}{NW}
$$
$$
- \underset{(.036)}{.146 \hat{V}}; \; SEE = .035 \quad DW = 0.93 \quad R^2 = .300.
$$

All coefficients have the expected sign, and all have *t*-ratios of at least 1.5. Since the equation exhibits substantial positive autocorrelation, a first-order autoregressive transformation is performed using the Cochrane-Orcutt iterative technique.[19] The resulting equation is:

$$
(5.6) \quad \frac{SL - LOJ}{Bus - LOJ} = \underset{(.179)}{.561} - \underset{(.041)}{.065 Rcl} + \underset{(.021)}{.048 Rba} - \underset{(.030)}{.077} \frac{M}{NW} - \underset{(.057)}{.037 \hat{V}};
$$
$$
SEE = .028 \quad DW = 1.90 \quad R^2 = .545 \quad \hat{\rho} = 0.681.
$$

the partial derivatives are the relevant parameter estimates noted at the beginning of the paragraph. The 1965–67 means of *RLld* and *RBus* were 7.17% and 4.98%, respectively; the 1965–67 means of *Bus* and *NW* were \$2.388 billion and 1.257 trillion yen.

[17] The values of *Bus*, *NW*, and α in the fourth quarter of 1967 were \$2.54 billion, 1.56 trillion yen, and .942, respectively. This comparison is potentially misleading, of course, since it is not clear how a 50 basis point relative increase in American interest rates might come about. It has often been noted that foreign interest rates can respond sympathetically to changes in American rates such that the spread between domestic and foreign rates is altered by much less than the absolute change in domestic rates. See Hendershott [17] for an attempt to estimate links between U.S. and Eurodollar interest rates.

[18] The corresponding approximate figures for the end of 1965 and the end of 1966 are \$100 million and \$140 million, respectively. These calculations are made by taking the difference between actual borrowings and desired borrowings for the specified dates, where the latter are computed as actual *Bus* times the ratio $1/\alpha$. (The only reason α was less than unity in 1965–67—the only reason observed borrowing fell short of desired borrowing—was because of the impact of $\hat{V}$.)

[19] In the Cochrane-Orcutt iterative technique, an initial estimate of the first-order autoregressive coefficient $\hat{\rho}$ is obtained from a regression of the residuals from the original linear least-squares equation on their own lagged values. All variables in the estimating equation are then transformed according to the formula $\hat{Z}_t = Z_t - \hat{\rho} Z_{t-1}$ and a regression using these transformed variables is estimated. The same procedure is then repeated until (in the computer program we have used) successive estimates of ρ differ from each other by less than .001.

In this transformed equation the interest-rate coefficients and the coefficient on M/NW are somewhat larger in absolute value and the t-ratios for these coefficients are increased. The coefficient on $\hat{V}$ is sharply reduced, however, and its t-ratio is very low.

The degree of substitutability implied by these equations is not negligible. For example, if the commercial-loan rate were to increase by 50 basis points relative to the bankers-acceptance rate but the average American rate and thus total short-term borrowing from the United States were constant (if, say Rcl rose by 25 basis points and Rba fell by the same amount), the shift from loans to acceptances, at the 1965–67 mean borrowing level, would be approximately \$55–60 million.[20] (The mean value of short-term loans during the 1965–67 period was \$546 million.)

As was expected, increased borrowing from the United States in response to increases in Japanese imports takes the form of acceptances. In fact, the implied partial derivative of loans with respect to imports is, evaluating at 1965–67 means and assuming $\alpha = 1$, effectively zero.[21]

The coefficients on $\hat{V}$ in (5.5) and (5.6) are not large. Nonetheless, they imply that the VFCR program has had a major differential impact on loans as opposed to acceptances. As noted above, at the end of 1967 a value of $\hat{V}$ equal to 0.29 suggested that short-term borrowing may have been some \$160 million below its desired level. Taken literally, a coefficient of $-.05$ on $\hat{V}$ in the loans equation would imply that perhaps \$70 million of this \$160 million gap took the form of loans.[22] This would be nearly twice a proportionate amount of almost \$40 million.

[20] In this calculation we have used coefficients for Rcl and Rba of $-.055$ and $.040$, respectively.

[21] If we write $\dfrac{SL - LOJ}{Bus} = K - .075\,\dfrac{M}{NW}$, where K is independent of M, and $-.075$ is the average of the estimates of equations (5.5) and (5.6), we can deduce: $\dfrac{\partial(SL - LOJ)}{\partial M} = \dfrac{\partial Bus}{\partial M}\left(\dfrac{SL - LOJ}{Bus}\right) - .075\left(\dfrac{Bus}{NW}\right)$. Recall that our preferred estimate of $\dfrac{\partial Bus}{\partial M}$ (the value we assigned to $\dfrac{\partial Bus}{\partial M}$ in earlier calculations) was .600.

[22] If we write $\dfrac{SL}{Bus} = K' - .05\hat{V}$, where K' is independent of $\hat{V}$, we can deduce: $\Delta SL = \left[\dfrac{\partial Bus}{\partial\hat{V}}\dfrac{SL}{Bus} - .05Bus\right]\Delta\hat{V}$. Substituting $-0.20 Bus^*$ for $\dfrac{\partial Bus}{\partial\hat{V}}$ (which can be derived from equation (4.3)' and the results in Part B above), 0.29 for $\Delta\hat{V}$, and using the 1967–Q4 values for SL, Bus, and Bus^* ($Bus^* = Bus + \$160$ million), we obtain the number in the text.

VI. CONCLUDING NOTE

In conclusion it is appropriate to note once again that our objectives in this exploratory study have been limited. We believed at the outset of our research that the careful estimation of behavioral relationships for the entire financial capital account was much too ambitious a task for us or any other researchers to undertake at that time. Even if extensive clerical and computational resources had been at our disposal, we would have been reluctant to invest those resources without first having tried to improve the theoretical framework and empirical methodology employed in earlier studies. This study was, therefore, conceived and carried out as a pilot project in which we would be at least as concerned with theory and problems of methodology as with empirical results.

We believe that the analytical framework we have employed represents a significant improvement over earlier empirical efforts. Our behavioral relationship for long-run desired quantities of financial instruments and our formulation of the impact of capital controls constitute a specification—provided it is suitably implemented in the particular circumstances—that is generally valid for the empirical analysis of all financial capital flows. We feel particularly strongly about the importance of incorporating the impact of capital controls directly into the specification. Previous research has either ignored capital controls or dealt with them in a theoretically unsatisfying manner. Our experience in studying bank lending to Japan clearly demonstrates that ignoring capital controls or dealing with them too crudely can vitiate one's entire analysis. Japan may pose more problems with capital restrictions than other countries, but there are probably few countries where changes in such restrictions have been negligible enough to be ignored.

Putting empirical flesh and blood on the theoretical bones of our specification is not, as will have been amply evident from Chapters IV and V of this study, a straightforward matter of collecting data and running it through a computer. Great care must be taken in the matching of theoretical constructs with available data and in the construction of proxy variables (for example, to reflect the effect of changes in capital restrictions). Even though we feel our empirical work has been done with greater care and more awareness of these difficulties than is evident in earlier studies, we still regard our estimates as being subject to substantial margins of error. If anything, we have become more, rather than less,

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impressed with the difficulties of doing good empirical research on international capital flows.

We conclude this description of our research by pointing out those aspects of it with which we are least satisfied. First, and possibly foremost, we are dissatisfied with our lack of treatment of lagged responses. As noted earlier, we discuss this problem in detail in another publication (see the reference in Chapter II, note 18).
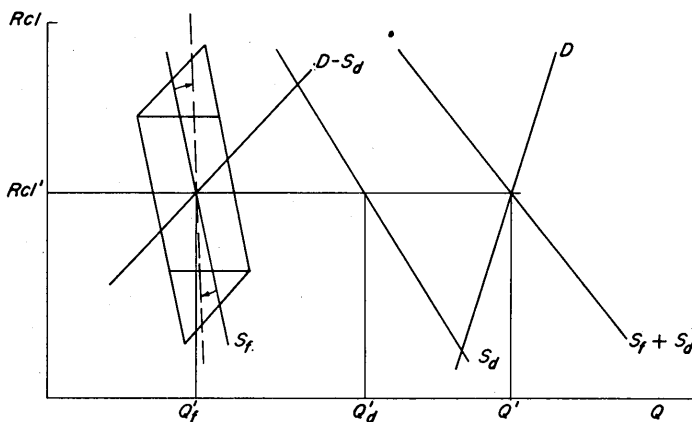
Second, we are uncomfortable about the fact that our theoretical framework calls for the use of expected effective interest rates and for measures of the risks associated with these interest rates, while in practice our empirical variables are series measuring observed interest rates and we have not been able to obtain or construct any variables at all to measure changes in risks. Third, it is disappointing to us that our intensive efforts to construct a variable to capture the effects of changes in one of the allegedly more important types of capital controls (see Appendix E) turned out to be unsuccessful. In both of these respects it proved not to be possible to implement our theoretical specification even approximately. Our study is no worse (indeed, somewhat better) than other studies on these scores, but we take little comfort from that observation.

Finally, we must acknowledge that our pilot study provides less guidance than we would like (and initially intended) on the difficult question of how to carve up the financial capital account in the American balance of payments for future research. Both economists and policymakers would like to get on with the interesting and important job of building a model to describe, albeit roughly, the whole capital account and its interrelationships with American and foreign financial markets. But the most advantageous way to disaggregate (by region and/or by type of financial instrument) and the appropriate level of the disaggregation are questions that have hardly been raised, much less answered. Our study does suggest that the quality of empirical estimates can be improved by careful disaggregation. But that conclusion, which is hardly surprising, does not greatly advance the discussion. International economists have still not progressed far enough with empirical analysis of capital flows, in our opinion, to make strong recommendations about the overall strategy that should be followed in constructing an econometric model of the capital account of the United States.

APPENDIX A: SIMULTANEOUS-EQUATIONS BIAS

An example of the bias generated in regression estimates when the simultaneous determination of financial holdings and financial yields is ignored is illustrated in Figure A1.[1] The American bank-loan rate Rcl

FIGURE A1
THE UNITED STATES BANK-LOAN MARKET

is on the vertical axis, and the quantity of loans Q is on the horizontal axis. S_d and S_f, respectively, are the curves denoting the domestic and foreign supplies of loans to American banks, and D is the total American bank loan demand curve. (The banks have a "demand" for financial assets; borrowers "supply" financial liabilities.) The excess domestic demand at different yields is the difference between the total demand and the domestic supply, $D - S_d$. Since credit rationing is assumed to be absent, equality of total demand and supply determine the interest rate Rcl' and both domestic residents and foreigners supply their desired quantities of loans, Q_d' and Q_f', respectively.

In general, the foreign supply curve can be estimated (is identified) if the excess domestic demand is significantly influenced by factors that

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[1] For simplicity, we assume in this discussion that the bank-loan market of the United States can be analyzed in isolation from other financial markets and that there are no lags in responses on either side of the market. In addition, we abstract in this appendix from all forms of credit rationing, both governmental and private.

have little influence on foreign supply. Such factors are numerous in this example: exogenous monetary-policy instruments, the American scale variables influencing the domestic public's demand for bank deposits (for example, American income and wealth) and the domestic supply of loans (for example, inventories and other components of the capital stock of the United States), and other domestic interest rates that may have little relevance to foreigners. Thus after the foreign supply curve is adjusted for the shift factors that one is able to isolate (variables other than the American bank-loan rate in the regression equation), it will shift little relative to the schedule representing the excess domestic demand; these two schedules will generate combinations of the interest rate and the quantity of loans to foreign residents that fall in the quadrangle shown in Figure A1.

However, given that the excess domestic demand and the bank-loan rate are, in fact, related, the least-squares estimate of the interest sensitivity in the foreign supply of loans to the United States will be biased. Taking the quantity of loans to foreign residents as the dependent variable, application of least-squares regression techniques will yield an estimated regression line such as the dashed line (which minimizes the sum of squares of the *horizontal* deviations) in Figure A1. The interest sensitivity will thus be biased downward in absolute magnitude.[2] Note, however, that the better the supply equation is specified (the smaller are the residuals and thus the narrower is the quadrangle in Figure A1) the smaller is the downward bias in $\dfrac{\partial S_f}{\partial Rcl}$. In the limiting case where the regression equation fits perfectly, the quadrangle in Figure A1 collapses into a line and there is no bias at all.

[2] This clockwise rotation of the estimated line relative to the "true" supply curve is clear from an inspection of the triangles at the ends of the quadrangle. If the excess domestic demand were independent of the loan rate—that is, if $D - S_d$ were a horizontal line—then the combinations of price and loans generated would fall only into that portion of the quadrangle excluding the triangles and a least-squares estimate would yield the "true" supply curve. On the other hand, when this independence does not exist, the observed combinations of loan rate and quantity will fall in the entire quadrangle. The regression estimate will then be biased because the sum of squares of the horizontal residuals in the two triangles are both reduced by a clockwise rotation of the estimated line. (The estimated line will rotate until the gain in reduction of the sum of squares in the triangles is offset by the increase in the sum of squares in the remainder of the quadrangle.)

By the same argument, a least-squares regression of the bank-loan rate on the quantity of loans to foreigners and the same other supply factors will yield high estimates of the interest sensitivity. Possibly an average of the two estimates would be less biased than either of the single estimates.

APPENDIX B: PROCEDURES FOR REVISING DATA ON INTERNATIONAL CAPITAL STOCKS

A serious problem with virtually all capital-flow data arises from discontinuities in time series due to changes in reporting coverage, classification, or requirements. In the Japanese data used in Chapter IV of this study, for example, several banks were included in the reporting network for the first time in 1961. These banks had significant amounts of claims on Japan, not only at the time the banks began to report their claims, but sometime before they began to report. At one time during the period, the reporting "exemption" requirements for American nonbanks' claims on foreigners were changed.[1] Classificatory changes have resulted, for example, when the claims of a bank previously reported as "collections" were reclassified on the basis of better information as "acceptances." The reclassifications could not be carried backward through all earlier data, with the result that the claims of such a bank are not consistently defined throughout the time period being studied.

The single biggest discontinuity in the capital-flow data reported by American banks occurs at the end of 1964. Changes in reporting coverage for these data are largely explained by the introduction of the Voluntary Foreign Credit Restraint (VFCR) program of the United States. When banks learned in February 1965 that their allowable voluntary "ceilings" for foreign assets would be expressed as a percentage of a base taken as their total foreign assets at the end of December 1964, the banks showed somewhat more interest in reporting their foreign assets carefully than they had in the past. Many banks did indeed find that they had been holding foreign assets that had not been reported previously. Total claims on all foreigners were increased by over 8 per cent in the December 1964 revisions. The effect of the December 1964 revisions on American claims *on Japan* was slightly less than 8 per cent.

To deal with these discontinuities we have created "revised" stocks according to the following procedure. Suppose that there is only one discontinuity in the time series and that it occurs at the time t_o. For t_o and dates subsequent to t_o, the actually observed data are used. For

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[1] Before September 1964 nonbanks with foreign claims other than direct investments greater than \$100,000 (on average over the preceding six months) were required to report. This exemption level was raised to \$500,000 in 1964, with the effect that a large number of small reporters dropped out of the series but with small effect on the aggregate data.

dates prior to t_o, a revised stock, designated here as $S_t{}^*$, is calculated according to the following formula as one works backward through time from t_o:

$$S_t{}^* = S_t \left[1.0 + \left(\frac{S_o{}^{REV} - S_o{}^{OLD}}{S_o{}^{OLD}} \right) (\lambda^{t_o-t}) \right], \quad \text{where } 0 < \lambda \leq 1.$$

In words, the value of the revised stock for a given date is equal to the actual reported stock for that date (S_t) plus an adjustment factor which decays as one moves progressively back to earlier periods. The adjustment factor is based on the magnitude of the revision that took place at t_o; $S_o{}^{REV}$ and $S_o{}^{OLD}$ refer to the "revised" and the "old" stock figures, respectively, for t_o. The speed of the decay is governed by the choice of the parameter λ; the value of λ should be chosen on the basis of whatever a priori information is available about the nature of the reporting change. For example, reclassifications of data from one asset category to another might be revised with $\lambda = 1$ (in which case there is no decay of the adjustment factor), while the addition of new-reporting-banks' data might be revised with $\lambda = .75$ (reflecting knowledge that the new reporters had only gotten into the business in recent quarters.)

In cases where there are several discontinuities at different dates in the same series, the procedure for calculating revised stocks is based on the same principle. In effect, the preceding formula is applied to the time series seriatim for each discontinuity, working backward through time from the most recent. The following table illustrates how $S_t{}^*$ would be calculated for a series in which three breaks occur, at times t_a, t_b, and t_c:

TABLE B1

CALCULATION OF REVISED STOCK

Date	Value of final revised stock $S_t{}^*$
$t < t_a$	$S_t \left[1.0 + \left(\frac{S_a{}^{REV} - S_a{}^{OLD}}{S_a{}^{OLD}} \right) (\lambda_a{}^{t_a-t}) \right]$
	$\left[1.0 + \left(\frac{S_b{}^{REV} - S_b{}^{OLD}}{S_b{}^{OLD}} \right) (\lambda_b{}^{t_b-t}) \right] \left[1.0 + \left(\frac{S_c{}^{REV} - S_c{}^{OLD}}{S_c{}^{OLD}} \right) (\lambda_c{}^{t_c-t}) \right]$
$t_a \leq t < t_b$	$S_t \left[1.0 + \left(\frac{S_b{}^{REV} - S_b{}^{OLD}}{S_b{}^{OLD}} \right) (\lambda_b{}^{t_b-t}) \right] \left[1.0 + \left(\frac{S_c{}^{REV} - S_c{}^{OLD}}{S_c{}^{OLD}} \right) (\lambda_c{}^{t_c-t}) \right]$
$t_b \leq t < t_c$	$S_t \left[1.0 + \left(\frac{S_c{}^{REV} - S_c{}^{OLD}}{S_c{}^{OLD}} \right) (\lambda_c{}^{t_c-t}) \right]$
$t_c \leq t$	S_t

APPENDIX C: JAPANESE AGENCY BANKS IN
THE UNITED STATES

Perhaps the most serious data difficulty of all for an analysis of American–Japanese capital flows arises because of the activities of agencies of Japanese banks that are located in the United States. As noted in Chapter IV, Japanese agency banks are "resident" in the United States and for statistical purposes are regarded as American banks.[1] The claims of the agencies on Japan are a significant portion of the total claims on Japan reported by all "U.S. ·banks" (that is, including the Japanese agencies). For example, at the end of 1966 approximately one-fourth of the total claims on Japan reported by banks were claims reported by Japanese agencies.[2] More important, the Japanese agencies grew rapidly in the period covered in this study. Between the end of 1960 and 1967, the claims of the agencies on Japan expanded by well over 800 per cent; this increase in the agencies' claims on Japan represented nearly one-third of the total growth in short-term claims on Japan.

There would be little reason to distinguish between the foreign claims of the Japanese agencies and the foreign claims of American banks other than the agencies if the agencies engaged only in the types of transactions carried out by American banks proper and if their accounting practices were essentially similar. But, in fact, a substantial proportion of the agencies' claims on and liabilities to Japan are claims on and liabilities to their own head offices. There is a strong presumption that the transactions which take place within these large and sophisticated international banking organizations (regarding the Japanese head office and all its affiliates around the world as a single organization) will often reflect quite different phenomena than transactions which take place directly between a banking organization and its "outside" customers. Intraorganizational transactions need not be made primarily with profitability of the indi-

[1] The agencies are located in the 2nd and 12th Federal Reserve districts (New York and the west coast). They are "agencies" rather than "branches" of foreign banks primarily because New York state banking law did not allow foreign banks to establish branches and accept deposits until 1961. Even after 1961 the Japanese banks did not set up branches in New York, perhaps so as not to compete for deposits directly with American banks, on whom they have relied so heavily for financing.

[2] All of the agencies' claims on Japan are "short-term" claims, that is, with an original maturity of one year or less. The agencies are even more important on the other side of the American short-term capital account vis-à-vis Japan. The short-term liabilities of the agencies to Japan at the end of 1966 constituted more than three-fourths of the total short-term liabilities to Japan reported by all American banks.

vidual affiliates in mind, since (subject to some qualifications) it is the net earnings of the entire organization that are the relevant magnitude that is being maximized. Many intraorganizational transactions may have largely an accounting significance.[3]

In particular, we have been concerned about some possible differences in statistical and accounting practices between the Japanese agencies and American banks proper. The bulk of the Japanese agencies' claims on Japan are reported as "collections" (see Table 2 above), and are associated with Japanese imports from the United States and from third countries. The bulk of these collection claims in turn are known to be claims on the agencies' head offices. It has been suggested that the agencies' accounting practices associated with these collection claims may possibly at times have given rise to some "double-counting" or "grossing up" of total American claims on Japan to the extent that the agencies refinance their collection claims with U.S. banks proper.

We have also worried that the "institutional" complications posed by the agencies could disguise the underlying structural relationships we hope to estimate. To an extent we have not been able to determine, the proceeds from Eurodollar borrowing by a Japanese bank (again taking the Tokyo head office, the London branch, and the New York agency of the bank as a single profit-maximizing entity) may be advanced to the bank's American agency, where the funds are held pending disbursement. During the life of the Eurodollar loan, moreover, it may be the case that the American agency carries on its books an associated claim on the Tokyo head office. To the extent that this phenomenon occurs, one observes an increase in American banks' claims on Japan as reported in our data. Other things being equal, and abstracting from the behavior of the Japanese agencies, one would probably expect Japanese borrowing from the United States to be *positively* associated with variations in the Eurodollar borrowing rate. When the cost of borrowing in the Eurodollar market falls, for example, the Japanese will want to borrow less from the United States and more from the Eurodollar market for any given level of total borrowing.[4] But the behavior of the Japanese agencies gives one a

---

[3] It should be noted that the phenomenon of changes in "intraorganization" assets and liabilities significantly affecting reported capital flows in the balance of payments of the United States arises not only with Japanese banking organizations, but with Canadian and European banks as well and, most importantly of all, with American banks themselves. For example, changes in American liquid liabilities to "foreign commercial banks" in Europe are heavily dominated by changes in liabilities of the head offices of the major American banks to their own branches abroad.

[4] This substitution effect could be offset to some extent by what we earlier termed an "income" effect.

possible reason for expecting a negative relationship between the cost of borrowing Eurodollars and the observed statistics of American lending to Japan. The Japanese agencies' transactions, in other words, could possibly weaken or camouflage altogether the underlying positive relationship.

For the above two reasons we decided in this study to report results for Japanese borrowing defined to exclude all claims of the agencies on Japan reported as collections.[5]

APPENDIX D: A VARIABLE REFLECTING
THE VFCR PROGRAM

We construct a proxy variable V for the effects of the VFCR program as follows: Let K represent the number of banks subject to the program, $L_{MAX}(i)$ the quantitative ceiling for the ith individual bank, $L(i)$ the actual amount of outstanding foreign claims for the ith bank, $L_{MAX} = \sum_{i=1}^{K} L_{MAX}(i)$ the aggregate ceiling for all banks in the program, and $\sum_{i=1}^{K} L(i)$ the total amount of outstanding foreign claims for all banks reporting under the program. Consider now the subset of J banks, $J \leq K$, for each of which outstanding credits are greater than some fraction γ of the stipulated ceiling:

$$L(i) > \gamma L_{MAX}(i) \qquad \text{for each bank in the } J \text{ subset,}$$

$$\sum_{i=1}^{J} L(i) > \gamma \sum_{i=1}^{J} L_{MAX}(i) \qquad \text{for all banks in the } J \text{ subset.}$$

If $\gamma = 1$, the J subset of banks includes only those who are actually at or above their ceilings. If γ is set equal to, say, .95, on the other hand, the J subset of banks also includes banks who are getting close to but have not quite reached their specified ceilings.

Given the above definitions, a proxy variable which might capture changes in the pressure on the banks imposed by the VFCR can be calculated as:

$$V\hat{\gamma} = \frac{\sum_{i=1}^{J} L(i)}{L_{MAX}}; \qquad 0 < \hat{\gamma} \leq 1.$$

Of course, when there are no banks in the J subset, then $V\hat{\gamma} = 0$.

The V variable we would have preferred to construct in practice would have used a value for $\hat{\gamma}$ of perhaps .90 or .95. Unfortunately data were not available to allow us to construct such a variable for a number of the quarters during which V would have had a nonzero value (specifically from the second quarter of 1965 through the second quarter of 1966). Therefore, we could only construct our proxy variable assuming a value of $\hat{\gamma}$ equal to 1.0. As finally used, our variable V is thus zero (before 1965)

or equal to the ratio of foreign claims of banks at or over their ceiling to the aggregate ceiling for all banks reporting in the program. We assume, of course, that the greater the ratio V the greater is the restrictive impact of the overall VFCR program.[1]

Note that neither the numerator nor the denominator of V is based exclusively on claims of banks on Japan or on any other single country or region. It is a variable which in principle might be used in equations explaining American banks' claims on any foreign area.[2]

The variable V takes on the values shown in column 6 of Table D1. As actually used in our empirical regressions, the variable is measured as the average during the quarter, $\hat{V}$, as shown in column 7 of Table D1. This measurement is consistent with the measurement of our other variables as quarterly averages (see Chapter IV-D). We made the average value of V in the first quarter of 1965 equal to zero. This assumption is made because the details of the VFCR program were not actually formulated and announced until the quarter was more than half over and because there had been a very large amount of borrowing arranged in the early weeks of 1965 in anticipation of some form of further American restrictions on capital outflows. By February 10 (the date the President announced there would be a program), the banks had thus made large commitments on loans and other credits which were not actually drawn upon until late February or March.

[1] If data on individual banks were available, one might be able to construct a still better proxy variable for the VFCR program. For example, one could weight the claims of each bank in the J subset, giving progressively larger weights to banks closer to (further over) their individual ceilings. If a majority of banks were to ignore their "voluntary" ceilings altogether—if, in other words, the program had little or no restraining effect—it might be argued that the greater was the ratio V the less restrictive would be the impact of the program. In the actual circumstances of 1965–68 this latter interpretation would not be correct.

[2] This statement, however, needs to be qualified if equations are to be estimated using post-1967 data. The added element of geographical discrimination against Europe incorporated in the 1968 VFCR program would need to be taken into account specifically in equations explaining bank claims on Europe.

PROXY VARIABLE, V, FOR IMPACT OF AMERICAN VOLUNTARY FOREIGN CREDIT RESTRAINT PROGRAM[1]

Date	(1) Number of banks reporting in the program: K	(2) Aggregate ceiling for all banks (millions of dollars): $LMAX$	(3) Aggregate foreign claims of all banks: $\sum_{i=1}^{K} L(i)$	(4) Number of banks with claims in excess of ceiling: J	(5) Foreign claims of banks over their ceilings (millions of dollars): $\sum_{i=1}^{J} L(i)$	(6) Proxy variable: $V = 5 \div 2$	(7) Proxy variable as used in regression equations: $\hat{V}_t = \frac{1}{2}(V_t + V_{t-1})$
1959 to 1964	—	—	—	—	—	0	0
1965 Q1	150	9,971	9,896	60	4,890	.490	0[2]
Q2	161	9,981	9,589	56	1,970	.298	.394
Q3	160	9,979	9,503	35	1,879	.188	.243
Q4	161	9,973	9,652	35	3,147	.316	.252
1966 Q1	161	10,076	9,367	22	379	.038	.177
Q2	161	10,179	9,421	24	273	.027	.032
Q3	159	10,290	9,147	13	59	.006	.016
Q4	148	9,641	9,496	51	4,609	.478	.242
1967 Q1	148	9,645	9,278	46	2,275	.236	.357
Q2	148	9,884	9,476	45	2,728	.276	.256
Q3	148	9,893	9,618	41	1,118	.110	.193
Q4	151	10,149	9,865	48	5,216	.471	.291
1968 Q1	153	9,984	9,396	27	2,309	.231	.351
Q2	153	9,886	9,203	21	760	.077	.154
Q3	154	9,785	9,156	24	690	.071	.074
Q4	161	9,729	9,253	38	3,630	.373	.222

[1] See text for general explanation. Values in columns (1)–(6) are measured at the end of the quarter.
[2] $\hat{V} = 0$ for this quarter, for reasons set forth in text.
SOURCE: Federal Reserve Board, Press Releases, various dates.

APPENDIX E: JAPANESE CYCLICAL REGULATION OF CAPITAL FLOWS

In this appendix we briefly describe the cyclical strengthening and relaxation of capital controls by the Japanese monetary authorities in response to cyclical swings in domestic economic activity and the balance-of-payments position of Japan. We also mention here our efforts to construct a variable to measure these changes in Japanese capital controls.

An oversimplified description of the cyclical behavior of the Japanese economy in an upswing might be as follows: As domestic economic activity expands rapidly, imports respond to the expansion; perhaps exports are also dampened a bit from what they would have been with less rapid domestic growth. The current-account balance of payments, which tends to dominate changes in the "basic balance," deteriorates correspondingly. During this time of deteriorating current-account and basic balance, the net short-term capital inflow increases (outflow decreases) and helps to offset the deterioration in the rest of the balance of payments. The close connection between merchandise trade and trade finance[1] is largely responsible for the offsetting movements of short-term capital.

In a later stage of the upswing, the monetary authorities take general restraining action if they think the expansion has gotten out of hand. In addition, selective action may be taken to curtail the inflow of foreign funds that has been helping to fuel the expansion. Domestic interest rates then initially rise further in response to the squeeze (having also risen with economic activity). The expansion then begins to slow down, which in turn will improve the current account with a lag—curtailing imports and, to a lesser extent, improving export performance. As the current account begins to improve, the close link between trade and trade finance causes the short-term capital account to reverse its direction of change. As before, the improvement in the basic balance is to some extent offset by opposite changes in the flow of short-term capital. Any direct interest-rate effects on capital flows—that is, when Japanese rates are rising, Japanese banks and others will, ceteris paribus, want to borrow

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[1] Japanese imports are financed primarily by borrowing from abroad. Exports are financed, at least in part, by Japanese granting of credit to foreigners. Thus in a period of rapid growth in imports and slower growth in exports—a period of deterioration in the trade balance—the net inflow of "trade-associated" capital will increase. When the trade balance is improving, on the other hand, the balance of trade-associated capital tends to worsen.

more from abroad and hold smaller amounts of foreign assets—are apparently more than offset by the "trade-finance effect" plus the efforts of the Japanese authorities to discourage too large a net capital inflow. And, of course, as domestic activity does in fact slow down, Japanese interest rates begin to recede from their cyclical peaks.[2]

The implication of the preceding thumbnail sketch is that the Japanese government has not placed much emphasis on attracting short-term capital inflows as a means of improving its official reserve position during periods of balance-of-payments difficulties.[3] More nearly the reverse has been true: during periods of domestic overexpansion and balance-of-payments weakness the Japanese authorities have sought to reduce the net inflow of capital in order to prevent capital inflows from undercutting their policy of monetary restraint.

Japanese authorities employed at least four selective techniques of control to regulate the net foreign borrowing of Japanese foreign-exchange banks in the 1959–67 period. First, the Bank of Japan varied the allowable limits on the foreign-exchange banks' "open" positions. Second, beginning in June 1962, a reserve requirement system against foreign-exchange liabilities was introduced. Specified types of foreign-exchange assets under this system must be kept at a level equal to or greater than a given proportion of foreign-exchange liabilities. The required reserve ratio under this system was varied several times during the period 1962–67. Third, on at least one occasion during the period (July 1964), quantitative ceilings were imposed on certain types of foreign liabilities. Fourth, the Bank of Japan imposed ceilings on the rates the foreign-exchange banks could pay on Eurodollar deposits.[4]

In addition to the specific measures just described, it appears that the Japanese authorities used a fifth very general technique for regulating capital flows. From the annual reports of the Bank of Japan Policy Board, it seems clear that the monetary authorities frequently "advised" the banks regarding the appropriate amount of foreign borrowing. This

[2] Compare Ezekiel and Patel [13].

[3] Standby credits from the IMF and the 1961–62 special loans from American commercial banks arranged by the Bank of Japan are important qualifications to this statement.

[4] Recall that in our discussion in Chapter IV (note 17) of the Eurodollar-rate series we use, we noted the existence of these officially imposed rate ceilings, and reported our tentative conclusion that in practice the rate ceilings had not been used actively as a device for restraining Eurodollar borrowing. Hence these rate ceilings were apparently a *potential* regulatory device in our period rather than an actual cyclical control.

technique of "earstroking"[5]—a variation on the carrot-and-stick tactic—
was also used regularly by the Bank of Japan in its "window-guidance"
regulation of the domestic activities of Japanese banks.[6] For example, the
annual report of the Policy Board for 1963 includes the following quota-
tion: "Meanwhile, in close cooperation with the Ministry of Finance,
the Bank of Japan constantly extended guidance to authorized foreign
exchange banks, in order to mitigate the direct impact of foreign short-
term fund movements on the foreign exchange market and the domestic
money market. In both the early and the late part of the year, especially,
when fund movements intensified, the Bank endeavored to bring the
interest rates on foreign short-term funds within more reasonable bounds."[7]

In addition to the controls on the banks, the Ministry of Finance
regulated capital flows initiated by Japanese nonbanks. We are not sure
of the details of these additional controls, but it seems to have been the
case that all long-term foreign borrowing by Japanese residents (for
example, term loans or foreign bond issues) of any substantial size had
to be given prior approval by the Foreign Investment Council. It is not
clear to us how automatically approval was given to applications for
foreign borrowing and how much of an attempt was made to use this
control contracyclically.[8]

We have devoted considerable effort on two different occasions to
constructing a variable that would represent the cyclical changes in all
these restrictions. The procedure used was to compile as much information
as possible on changes in the controls and then to weight the changes,
both over time and across different types of controls, by our subjective
evaluation of their relative importance. Unhappily we have to report that
our efforts have not been successful. The variables we constructed have not
improved any of the equations we have estimated, but instead have tended
slightly to worsen the fit.

We do not conclude from our failure to get a cyclical control variable
to work that the cyclical use of controls over capital flows by the Japanese
authorities was ineffective, although this is, of course, a possibility.
Our knowledge of the use made of these controls is limited, and our

[5] See Dennis Robertson, "The Role of Persuasion in Economic Affairs," in *Economic
Commentaries* (London: Staples Press Ltd., 1956).
[6] See [3, pp. 80–84, 92–94].
[7] Bank of Japan Policy Board, *1963 Annual Report*, p. 67.
[8] The international weekly edition of *Nihon Keizai Shimbun* (Japan Economic Journal)
frequently published a list of specific foreign loans to Japanese firms "authorized"
or "approved" by the Foreign Investment Council. See, for example, Japan Economic
Journal (Aug. 18, 1964), p. 6.

attempt to embody the controls' impact on borrowing from the United States in a specially constructed variable is certainly not the last word on the subject. We are simply unable to say either that the cyclical controls did or did not have a significantly binding effect. Perhaps the only conclusion we are safely able to draw is that it is extraordinarily difficult to obtain the factual information that would enable one to construct a variable to measure this type of phenomenon, even in the crudest of quantitative terms.

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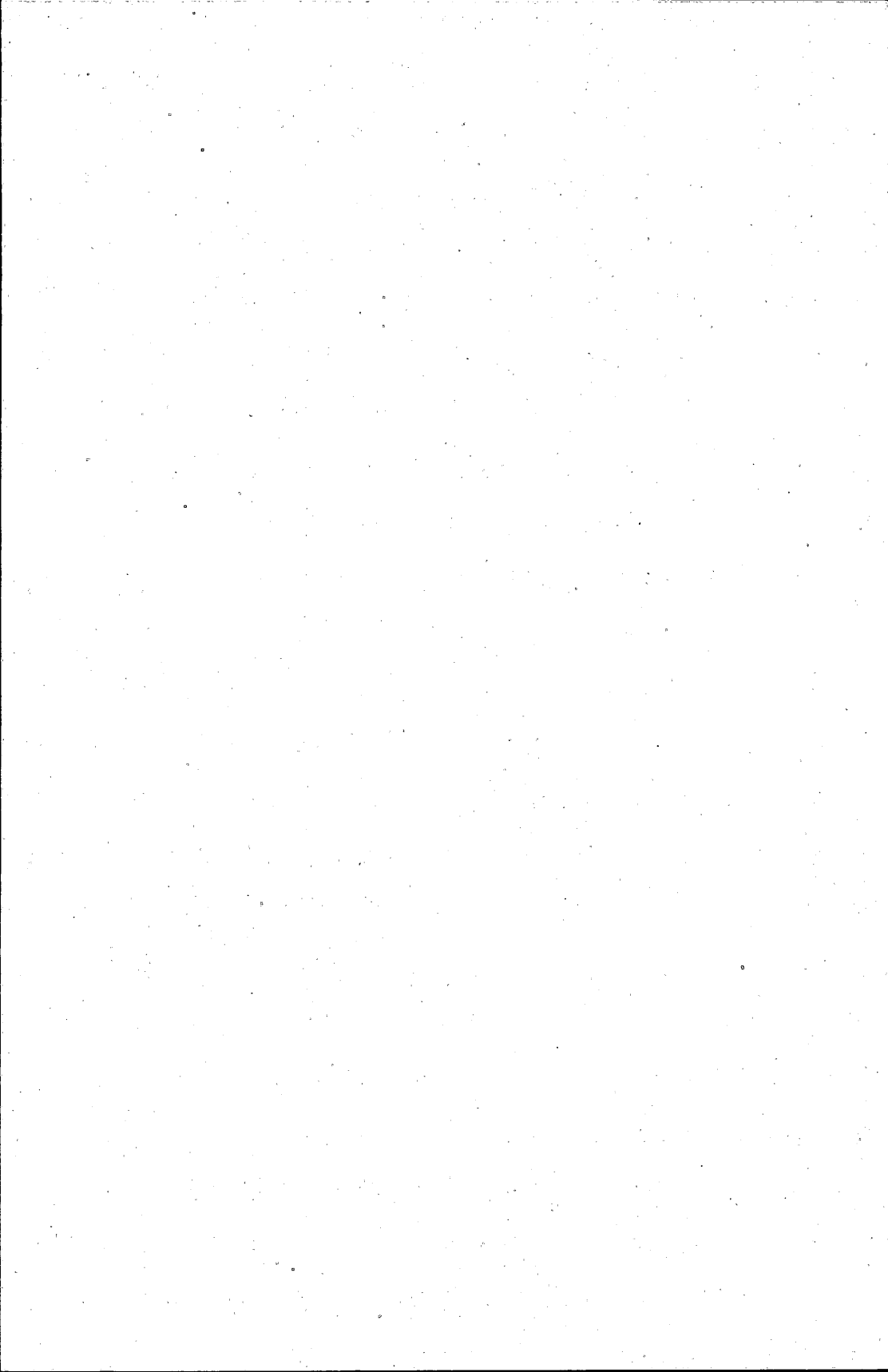

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