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**Macroeconomic effects of restrictions on foreign security
ownership**

Kwon, Jae-Jung, Ph.D.

Rice University, 1993

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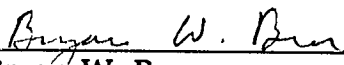
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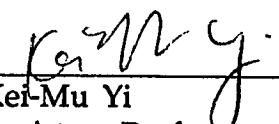
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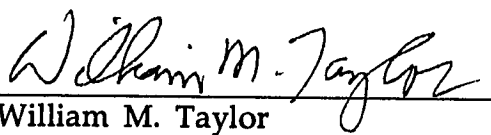
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MACROECONOMIC EFFECTS OF RESTRICTIONS ON FOREIGN SECURITY OWNERSHIP

By

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ABSTRACT

This dissertation consists of two papers on international capital movements. The first part theoretically analyzes the macroeconomic effects of restrictions imposed by official authorities on foreign investment. The main result from the theoretical model is that restrictions on foreign investment by domestic residents can produce a source of cheap investment funds for domestic industries. This in turn would stimulate investment and domestic economic growth and could lead to a favorable judgment on the policy. However, economic welfare as measured by expected utility is reduced despite the high capital accumulation and increased economic growth.

The second part of this dissertation examines the Japanese economy to see how closely its financial market has been connected to the world financial market and how well the theoretical model corresponds to reality. Japan is now well internationalized so far as some measures of internationalization are concerned: the volume of financial transactions, the correlation between domestic saving and domestic investment and covered interest parity. The empirical research also provides some evidence that financial services promote domestic production but an increase in net capital outflows retards its growth. However, it seems not to be clear how policy changes relating to international financial transactions affect physical capital accumulation.

ACKNOWLEDGMENTS

This dissertation has come into being with the support of numerous people. First, I owe a debt of eternal gratitude to my dissertation advisor, Professor Peter R. Hartley. His enthusiasm, his confidence in me and his firm guidance have made of this dissertation a joy. Throughout my course work and research on the levels of both M.A. and Ph.D., his commitment has been the most valuable asset of mine since I took his distinguishing macroeconomic course in my first semester at Rice. Without his encouragement and insightful comments, this dissertation would not be possible. Even during the last one year of his sabbatical leave, he was as great a help as before. He was also so patient in my oral defense that he could sit somewhere in Australia and listen on the phone to us at a conference room. Thanks to modern technology, we had an exciting hour at the unusual seminar.

I would like to express my deep gratitude to Professors Bryan W. Brown and Kei-Mu Yi for their careful reading of the dissertation and for their questions and comments that helped me strengthen weak arguments. I am also grateful to Professor William M. Taylor for serving on my dissertation committee. Besides his valuable comments on my own work, he provided me with quantitative skills and financial support while I was his research assistant on a couple of finance projects.

Over my years at Rice, I have been indebted to many people in the Economics Department. Special thanks go to Professors Peter Mieszkowski, Dagobert Brito, Robin Sickles, Marc Dudey and Suchan Chae; department secretaries Joy Bryant and Patsy Williams; and my officemates Joya

Mukherjee, Shounak Sarkar, Juan Rosellon and Fernando Orozco. I wish to thank also Professor David Papell of Houston for his allowing me to use data.

Education is a costly pursuit. Fellowships from Rice University and the Korean Embassy to the U.S. provided the necessary financial support for my graduate studies and thesis research.

My greatest wealth lies neither in money nor in a diploma, but in people who love and believe in me. Many people have been always there with words of encouragement and suggestions: Hwaja and Nam Sik Chon, Pastor Edward S. Kim, Kyunghee and Hei-Chan Lee, Gilsa and Jae-Joong Hwang, Mihyun Baek, Dong Chul Won, Mun-Jeong Rang, Miran Chung, Song Chin Pak, Hee Chung Kwon, David Kim, and my brother Yong Jung, my sister Jeong Jung and their family. The songs I listened to and sang myself cannot be ignored. Paul Simon, Art Garfunkel, James Taylor, Bob Dylan, Joan Baez, Peter Yarrow, Noel Paul Stookey, Mary Travers, R.E.M. and their songs which are fresh as earth and strong with the perfume of sincerity.

Thank you all!

Last in this list, but first in my heart, I would like to thank my parents for their love which has sustained me at all times. This dissertation is dedicated to them with much love and gratitude.

Jae-Jung Kwon

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CHAPTER I

INTRODUCTION

The world economy has seen an upsurge in gross flows of capital during the last two decades. The integration of international financial markets has been one of the subjects of theoretical and practical interest in the literature of international economics. The breakdown of the Bretton Woods system in 1973, which required that each country protect the value of its currency, obviated the need for controls on the volume and direction of capital transactions. The United States abolished its capital controls in 1974; Germany and Japan gradually lowered their barriers over subsequent years; and the United Kingdom gave up its controls in 1979, leading those OECD countries that had not already done so to abandon controls by the mid-1980s. Together with these official dismantlings of capital controls, technological innovations in communication, transportation, and information gathering have linked international capital markets globally.

Though international financial market integration has been enhanced by those moves toward capital market liberalization, controls on financial transactions are still a pervasive feature of international capital markets. In particular, most developing countries retain extensive restrictions on international capital flows.

The wide spread use of capital controls is not clearly justified in a textbook economy where restrictions on financial transactions are not desirable simply because a global financial network would enlarge the gains from trade of financial securities. In addition, enhanced capital mobility could be expected to aid the trade in goods and services. However, in reality, policy makers might perceive certain benefits from financial regulations: (1)

they help to stabilize domestic interest rates in a regime of managed floating; (2) they avoid speculative attacks against the central bank's foreign exchange reserves; (3) they provide a domestic government with an enhanced ability to impose taxes on foreign investment in the domestic economy; and (4) they help to promote the accumulation of physical capital and hence rapid growth.

This dissertation focuses on higher capital accumulation and faster economic growth as possible motivations for regulations on international capital flows. Stressing the linkage between financial assets and physical capital, we investigate the effects of the regulations of capital movements on real macroeconomic variables such as consumption, the capital stock, and wages.

In order to evaluate capital controls or their liberalization, we need to examine the following questions: How could imposing or removing capital controls affect the risk-return structure characteristics of assets? How would this in turn affect real decisions including savings and portfolio allocations? Are investors in favor of a move toward market integration? Are there any group of economic agents whose interests conflict with those of financial investors? What are the effects on real macroeconomic variables such as consumption, capital stock, and wages of changes in the international financial regimes?

Both the finance and economics literature contain many studies of the effects of financial restrictions on the world capital market. In the field of finance, Eun and Janakiramanan (1986), Jorion and Schwartz (1986), Errunza and Losq (1989), Gultekin et al. (1989), and Hietala (1989) focus on the effects of capital controls on asset pricing. This strand of research has tried to explain how imposing or removing capital controls affects the risk-return characteristics of assets, the market value of the securities, and portfolio

decisions. Another strand of research [for example, Dooley and Isard (1980), Ito (1986) and Browne and McNeils (1990)] investigates the effectiveness of capital controls by testing for a wedge between international interest rates. Also, there have been many efforts to apply an intertemporal equilibrium approach to study capital controls. In this line of research are Obstfeld (1986), Stockman and Hernandez (1988), Bacchetta (1990) and most recently Mendoza (1991). Few efforts, however, seem to have made to study the effects of the regulation of international financial transactions on real economic variables.¹

Popular models in the financial literature take the supply of assets and their return-risk structure as given and analyze portfolio choices under different investment environments. Possible changes in investment decisions, however, cannot be analyzed with a partial equilibrium model. Partial equilibrium analyses cannot be used to analyze the effect of capital transaction barriers on the accumulation of physical capital and the growth of the economy. We need to allow for a production technology which admits capital accumulation or some other potential factors related with growth. By doing so, we can explain how imposing or removing capital controls would affect real decisions as well as portfolio allocations.

The second chapter of this dissertation discusses a theoretical modelling of restrictions on international financial transactions. We use a Samuelson-Diamond type overlapping generations model of the capital market. Many economists such as Onitsuka (1974), Ruffin (1979), Buiters (1981), Dornbusch (1985), Persson (1985) and Ruffin and Yoon (1992) have used the similar types of models to analyze international capital movements. However, none of

¹ Mendoza analyzes the macroeconomic effects of capital controls pursuing the trade balance in a small open economy. However, he finds no significant effects on output, consumption and labor.

these works allow individual savers to make portfolio decisions among different financial assets. They are restricted to a world without uncertainty where portfolio allocations are irrelevant.

We integrate the ideas of financial theory and real growth theory within an overlapping generations framework where uncertainty is taken into consideration. More explicitly, we consider a general equilibrium model with both portfolio decisions by households and investment decisions by firms. By making explicit the relationships between the returns on risky assets and endogenous production with a physical capital stock, the general equilibrium model can help to highlight the effectiveness of financial capital controls.

When young people allocate their savings among different assets, the range of portfolio decisions available to them depends on the international financial regime they are living under. This paper considers three distinct financial market regimes from the view point of the domestic country. While foreign country investors have unlimited access to the domestic country securities:

(1) the capital markets are fully integrated so that investors are not subject to any financial restrictions;

(2) domestic investors can not hold foreign equities, but have access to the world borrowing-lending market; and

(3) domestic investors are completely banned from investing in the foreign country securities. These financial regimes can be compared to a financial autarky regime whose characteristics are identical to the closed economy introduced at the beginning of the analysis.

The main result is that restrictions on foreign investment by domestic residents can produce a source of "cheap" investment funds for domestic industries. This in turn would stimulate investment and domestic economic

growth and could lead to a favorable judgment on the policy. However, economic welfare as measured by expected utility is reduced despite the high capital accumulation and increased economic growth.

Sometimes we see naive economic commentary where GNP, GNP per capita, GNP growth or average wages are used as welfare measures. However, these variables do not correspond to expected utility. In this dissertation, it is shown that restrictions on foreign investment by domestic residents can produce a source of "cheap" investment funds for domestic industries, which in turn might be expected to stimulate investment and domestic economic growth. Nevertheless, economic welfare, which is enhanced by "smoothness" in the intertemporal and state contingent consumption pattern, can be actually reduced despite the high capital accumulation and increased economic growth.

In Chapter III, we investigate the Japanese economy to see how well the findings in Chapter II correspond to reality. This chapter surveys to what extent the internationalization of the Japanese capital market has been enhanced over last two decades. It provides evidence on internationalization of finance in Japan and argues that Japan is now well internationalized so far as some measures of internationalization are concerned. The volume of financial transactions has increased in terms of both absolute magnitude and its share in the world financial market. The correlation between domestic saving and domestic investment has also declined significantly. Even the strictest definition of internationalization, perfect covered interest parity, cannot be strongly rejected for sample periods after 1981.

Chapter III also investigates the connection between financial sector and real sector of the Japanese economy, and examines any possible repercussions of the changes in asset returns on domestic investment and economic

growth. We provide some evidence that financial services promote domestic production but an increase in net capital outflows retards its growth. However, it was not clear how policy changes on international financial transactions affect the physical capital accumulation. This empirical evidence does not capture the linkage from financial transactions through the rate of physical capital investment to economic growth.

CHAPTER II

MACROECONOMIC EFFECTS OF RESTRICTIONS ON FOREIGN SECURITY OWNERSHIP: A THEORETICAL CONSIDERATION

This chapter considers a theoretical model which can relate changes in financial regime governing international capital movement to the real economy. To begin the analysis, in Section 1, we construct a closed economy capital asset pricing model in an overlapping generations context. Some numerical calculations are also carried to see the underlying economic implications of the model. In Section 2, we consider a two-country model to study the effects on macroeconomic variables of changes in policy toward international financial transactions. The accumulation of physical capital and growth of the economy will be the focus of the analysis. The model also permits a welfare analysis of alternative regulatory regimes. The last section contains some concluding remarks.

Jorion and Schwartz (1986) classify segmentation into two categories in order to distinguish the most probable causes of market imperfections. The first category, called 'legal barriers', stems from differential juridical status between domestic and foreign investments, including higher tax rates on income from foreign than from domestic investment and restrictions on ownership of foreign securities. A slightly less obvious form of market segmentation occurs as a result of so called indirect barriers. Foreign investors are substantially hindered by the difficulty of obtaining information about foreign stocks and interpreting information on foreign securities, impediments based on traditional practices such as reluctance to deal with foreigners, or any other cost of doing investment business abroad.

Greenwood and Kimbrough (1985) showed that the intertemporal implications of ownership controls, and taxes on capital flows, are essentially identical. In this work, focus is placed on quantitative restrictions on overseas investment.

1. AN OVERLAPPING GENERATIONS MODEL OF STOCK MARKET

The analysis in this section is a stochastic version of Diamond's model (1965) for the stock market of a closed economy. Overlapping generations models have been used in the literature for studying issues ranging from monetary theory to the effects of fiscal policies and the pricing of capital assets. However, only a few works have used OLG models to analyze stock markets. To examine a stock market, a model should allow for uncertain returns on investments. The source of uncertainty in this paper is a shock appearing in production technology.

We first introduce the assumptions and notation of the model, then describe production, consumption and saving behavior at time t , and finally discuss the competitive equilibrium of the economy.

Assumptions

(i) The economy produces only one kind of commodity which can be either consumed or invested as capital.

(ii) The economy consists of overlapping generations of two-period-lived agents and operates over an infinite discrete time, starting at time $t = 0$.

(iii) At each period $t \geq 0$, N young people are born, said to be of generation t , who are young in period t , old in period $(t+1)$, and dead in period $(t+2)$ and beyond. Since individuals live only two periods and have no bequest motive, they will undertake no investment in the second period.

(iv) There is only one good produced in the economy. The good produced by a representative firm can be used in the first period for either consumption or investment. Output is entirely consumed in the second period.

(v) Each individual inelastically supplies labor in the first period. The firm hires young people and chooses a capital stock so as to maximize profits.

(vi) The young get paid based on the marginal product of labor. The young agents consume out of their labor income and save the rest. Young people allocate their savings between private loans and equities.

Figure 2.1 shows the life spans of several generations. The figure also illustrates how the generations overlap.

Notation

$c_t(t)$: per capita consumption of generation t at time t measured in units of time (t) good

$c_t(t+1)$: per capita consumption of generation t at time $t+1$ measured in units of time $(t+1)$ good

r_{t+1} : rate of return on one-period risk-free loans measured in units of time $t+1$ good per unit of time t good

ρ_{t+1} : gross rate of return on a one-period risky asset measured in units of time $t+1$ good per unit of time t good

k_t : capital stock per capita which the firm acquires at time t measured in units of time t good

s_t : portfolio share of equity of the representative individual born at time t .

w_t : wage which the firm pays for one unit of labor at time t measured in units of time t good

Figure 2.1. Two-period Lived Overlapping Generations

Generation t-1		
<ul style="list-style-type: none"> • Earns: w_{t-1} • Consumes: $c_{t-1}(t-1)$ • Saves: $w_{t-1} - c_{t-1}(t-1)$ 	Generation t	
	<ul style="list-style-type: none"> • Earns: w_t • Consumes: $c_t(t)$ • Saves: $w_t - c_t(t)$ 	Generation t+1
<ul style="list-style-type: none"> • Earns: $(w_{t-1} - c_{t-1}(t-1)) * (s_{t-1}p_t + (1-s_{t-1})(1+r_t))$ • Consumes: $c_{t-1}(t)$ • Saves: none 	<ul style="list-style-type: none"> • Earns: $(w_t - c_t(t)) * (s_t p_{t+1} + (1-s_t)(1+r_{t+1}))$ • Consumes: $c_t(t+1)$ • Saves: none 	<ul style="list-style-type: none"> • Earns: w_{t+1} • Consumes: $c_{t+1}(t+1)$ • Saves: $w_{t+1} - c_{t+1}(t+1)$
		<ul style="list-style-type: none"> • Earns: $(w_{t+1} - c_{t+1}(t+1)) * (s_{t+1}p_{t+2} + (1-s_{t+1})(1+r_{t+2}))$ • Consumes: $c_{t+1}(t+2)$ • Saves: none

We now describe consumption, saving and production behavior at time t and discuss the competitive equilibrium of the economy.

1.1. Production

At time t , the firm invests some amount of capital, I_t , in order to produce a stochastic amount of output, $F(K_{t+1}, L_{t+1}; \theta_{t+1})$ in the next period. Here, K_{t+1} is the capital stock at time $t+1$, which is the sum of investment and previous capital stock, i.e., $I_t + (1-\delta)K_t$, where δ is capital depreciation rate. L_{t+1} is the labor supply and θ_{t+1} is technological shock which is realized at the end of period $t+1$ and therefore is not known in period t when the firm decides how much new capital to invest in. θ_{t+1} is assumed to be normally distributed with a mean of $\bar{\theta}$ and a variance of σ^2 . The firm employs an inelastically supplied labor force each period. Throughout this paper, the production technology is represented by a Cobb-Douglas function, $\theta_t K_t^\alpha L_t^{1-\alpha}$.

For simplicity, we assume a constant population. It is also assumed that capital fully depreciates each period. Under this assumption, since the economy exists in discrete time, investment equals the next period's capital stock, so $I_t = K_{t+1}$.

The firm operating at time t chooses its capital stock and labor force so as to maximize profits. We assume that the firm chooses the capital stock before the production shock is realized and it chooses labor after shock is realized. The problem is postulated as follows:

$$(PF) \quad \max_{K_{t+1}} E_t[\max_{L_{t+1}} \{F(K_{t+1}, L_{t+1}; \theta_{t+1}) - w_{t+1} L_{t+1}\} - \rho_{t+1} K_{t+1}]$$

where ρ_{t+1} is the cost of capital and w_{t+1} the wage rate. This means that each firm maximizes expected profits taking factor payments as given. Note that the payment on the capital stock equals the expected return on the asset the firm issues.

The firm takes w_{t+1} as given but, in equilibrium, we must have $L_{t+1} = \bar{L}$. Therefore equilibrium w_{t+1} is given by

$$w_{t+1}(\theta_{t+1}) = F_L(K_{t+1}, \bar{L}; \theta_{t+1}).$$

Then the firm chooses K_{t+1} taking ρ_{t+1} and w_{t+1} as given. Note that the firm does not take account of the functional dependence of the wage rate on the capital stock when choosing the capital stock. At time t , it is known to the firm that w_{t+1} will be in equilibrium related to K_{t+1} but each firm is not free to vary the wage rate by changing its own capital stock. The first order condition governing the optimal capital stock is:

$$E_t \rho_{t+1} = E_t[F_K(K_{t+1}, \bar{L}; \theta_{t+1})].$$

Since the production technology has constant returns to scale, these first order conditions can be rewritten in per capita terms as follows:

$$(1.1) \quad E_t \rho_{t+1} = E_t f'(k_{t+1}; \theta_{t+1}) = \alpha \bar{\theta}_{t+1} k_{t+1}^{\alpha-1}$$

$$(1.2) \quad w_{t+1} = f(k_{t+1}, \theta_{t+1}) - \rho_{t+1} k_{t+1} = (1-\alpha) \theta_{t+1} k_{t+1}^{\alpha},$$

where $\bar{\theta}_{t+1}$ is the conditional expectation of θ_{t+1} given current information. These first order conditions give us the optimal capital stock to maximize expected profit.

1.2. Consumption and Saving

A representative person of generation t works in period t for a wage, which equals the marginal product of labor, $F_L(K, L)$. He allocates this wage between current and future consumption so as to maximize his utility. Each individual can lend a part of his savings to others at the certain return, r_{t+1} . Alternatively he can purchase equities which entitle him to claim a certain portion of output produced by the firm. The rate of return on the equity, ρ_{t+1} ², depends on the state of nature in the next period.

The asset income the representative consumer collects in the second period is:

$$c_t(t+1) = (w_t - c_t(t))(s_t \rho_{t+1} + (1-s_t)(1+r_{t+1})),$$

² The gross rate of return on the risky asset consists of capital gain and dividend. To distinguish these two components, we can define the rate of return as follows:

$$\rho_{t+1} = \frac{V_{t+1} + D_{t+1}}{V_t},$$

where V_{t+1} is the value of the equity ex dividend at $t+1$ and D_{t+1} is the dividend at $t+1$. Then, following Abel, Mankiw, Summers and Zeckhauser (1989), $D_t = \pi_t - I_t$, where π_t is profits of the firm at time t .

where s_t is the portfolio share of equity at time t . Since returns on risky assets are uncertain, consumption in the second period is also unknown. It should be noted that the consumer takes the profits as given when he chooses his portfolio. In equilibrium, the profits adjust such that the good market clears.

Each individual has an additively separable utility function. Moreover, following Gordon and Varian (1989), we assume a negative exponential utility function.

$$\begin{aligned}
 (1.3) \quad U(c_t(t), c_t(t+1)) &= U(c_t(t)) + \beta E U(c_t(t+1)) \\
 &= -\{\exp\}^{-b C_t(t)} - \beta E \{\exp\}^{-b C_t(t+1)} \\
 &= -\{\exp\}^{-b C_t(t)} - \beta \{\exp\}^{-b (E_t C_t(t+1) - (b/2) \text{var}(C_t(t+1)))}.
 \end{aligned}$$

This specification enables us to derive a simple CAPM equation. Here b is the degree of absolute risk aversion, β is a time discount factor, and E is an expectation operator. The third line of the equation comes from the assumption that $c_t(t+1)$ is normally distributed.

The consumer's problem can thus be expressed as follows:

$$\begin{aligned}
 (PC) \quad & \max_{\{c_t(t), c_t(t+1)\}} U(c_t(t)) + \beta E_t[U(c_t(t+1))] \\
 (1.4) \quad & \text{s.t. } c_t(t+1) = (w_t - c_t(t))(s_t p_{t+1} + (1-s_t)(1+r_{t+1})) \\
 (1.5) \quad & w_t = f(k_t, \theta_t) - f'(k_t, \theta_t) k_t.
 \end{aligned}$$

Equation (1.4) states that the consumer allocates his saving between equities and private lending in the proportions s_t to $(1-s_t)$. Equation (1.5) implies that wage income is the differential between per capita output and the product of marginal product of capital and the per capita capital stock. Note that w_t is determined after θ_t is known.

Substituting the constraints into the problem (PC), the consumer's problem can be converted into the following problem:

$$(PC1) \quad \max_{\{c_t(t), s_t\}} U(c_t(t)) + \beta E_t[U\{(w_t - c_t(t))(s_t \rho_{t+1} + (1-s_t)(1+r_{t+1}))\}].$$

(PC1) states that the consumer chooses values for $c_t(t)$ and s_t , according to the budget constraint, so as to maximize an additively separable two-period utility function.

The first order conditions of the problem give us:

$$(1.6) \quad U'(c_t(t)) = \beta(1+r)EU'(c_t(t+1)),$$

$$(1.7) \quad E_t \rho_{t+1} = (1+r_{t+1}) + \text{bcov}(\rho_{t+1}, c_t(t+1)).$$

The proof is shown in Appendix A and B.

Equation (1.6) is the usual Euler equation which implies that consumers should be indifferent at the margin between consuming today and transferring consumption to tomorrow at the risk-free rate of return. Equation (1.7) is the consumption-based CAPM equation which relates the rate of return on a risky asset to the risk-free rate of return and the systematic risk which is here represented by the covariance between the risky rate and the level of consumption when old.

1.3. Competitive Framework

Partial equilibrium versions of the CAPM assume that the risk premium on an asset depends on the correlation of its return with the return on the market portfolio, i.e., the portfolio of risky securities in the market, with each security weighted by the ratio of the total market value of all its outstanding units to the total market value of all outstanding units of all securities. Since it is assumed that the demand for assets is met by the given supply of assets,

the consumer problem alone is sufficient to solve for the equilibrium returns given parameters. In general equilibrium, however, borrowers would alter the supply of the various risky assets available to savers in response to changes in the rates of return. Therefore, the supply of assets as well as the demand depends on the rate of return. Equilibrium returns have to adjust such that there is no excess supply of or demand for assets because there is no borrowing or lending in our economy of homogeneous agents. This requirement for market equilibrium endogenizes the market portfolio unlike usual CAPM settings.

In short, the clue to a general equilibrium approach lies in the fact that we can identify the marginal efficiency of investment with the supply of equities and then in equilibrium equate them to demand from investors. Moreover, with a one-good model, we can treat excess saving as excess demand for financial assets, including both risky and risk-free assets.

In our model, using the first order conditions from the firm's problem, the covariance term in (2.7) can be rewritten as a product of a constant and the variance of the technological shock which is known to consumers. It can be shown that aggregate consumption is the same as the total output, which depends on the capital stock.

The members of the young generation make up the supply side of the capital market, while the firms make up the demand side. In equilibrium, supply should equal demand. We have to take into account two equilibrium conditions. First, since we assume homogeneous agents within a generation and no borrowing or lending among different generations, there is neither excess lending nor excess borrowing in equilibrium within the same generation. Therefore, we have

$$(1.8) \quad s_t = 1.$$

Second, the supply of equity, that is, the firm's investment, should be met by the demand for the asset by the investor, or consumer saving. Since we assume that the capital stock totally depreciates each period, each period's saving is equal to the capital stock of the next period.

$$(1.9) \quad w_t - c_t(t) = k_{t+1}.$$

Therefore, an equilibrium of the economy is summarized as a horizon T , $0 \leq T \leq \infty$, and a collection of sequences $\{c_t(t), c_t(t+1), s(t)\}$ and $\{k(t)\}$ and prices $\{r(t), \rho(t), w(t)\}$ such that

(i) Given $\{r(t)\}_{t=1}^T$, and $\{\rho(t)\}_{t=0}^T$, the consumption allocation $\{c_t(t), c_t(t+1)\}_{t=0}^T$, and shares $\{s(t)\}_{t=0}^T$ solve the consumer's problem of maximizing utility (PC) subject to the constraints (1.4) and (1.5),

(ii) Given $\{\rho(t)\}_{t=0}^T$, the capital stock path $\{k(t)\}_{t=0}^T$ solves firm's problem of maximizing expected profits,

(iii) The risk-free rate $r(t)$ adjusts so that the loan market clears,

(iv) $\rho(t)$ adjusts so that the investment of each firm equals equity purchases by consumers,

and (v) the wage rate equates the demand for labor by firms to the inelastic supply of labor from households.

We can compute a competitive equilibrium with the above specific assumptions on preferences and the production technology.

Because of the equilibrium conditions (1.1), (1.2) in section 1.1, (1.8) and (1.9) in section 1.2,

$$(1.10) \quad c_t(t+1) = k_{t+1} \rho_{t+1} = \alpha \theta_{t+1} k_{t+1}^\alpha,$$

$$(1.11) \quad E_t(c_t(t+1)) = \alpha \bar{\theta}_{t+1} k_{t+1}^\alpha,$$

$$(1.12) \quad \text{and} \quad \text{Var}_t(c_t(t+1)) = \alpha^2 k_{t+1}^{2\alpha} \text{Var}_t(\theta_{t+1}).$$

Also, under the equilibrium conditions (1.8) and (1.9),

$$\begin{aligned} c_t(t+1) + c_{t+1}(t+1) &= \alpha \theta_{t+1} k_{t+1}^\alpha + w_{t+1} - k_{t+2} \\ &= \alpha \theta_{t+1} k_{t+1}^\alpha + \theta_{t+1} k_{t+1}^\alpha - \alpha \theta_{t+1} k_{t+1}^\alpha - k_{t+2} \\ &= \theta_{t+1} k_{t+1}^\alpha - k_{t+2}. \end{aligned}$$

Thus, the sum of aggregate consumption and investment is equal to total output and the good market clears.

From equations (1.3), (1.6) and (1.10) through (1.12),

$$\begin{aligned} (1.13) \quad (1/b) \ln\{\beta(1+r)\} &= E_t(c_t(t+1)) - (b/2) \text{Var}_t(c_t(t+1)) - c_t(t) \\ &= \alpha \bar{\theta} k_{t+1}^\alpha - (b/2) \alpha^2 k_{t+1}^{2\alpha} \text{Var}_t(\theta_{t+1}) - [(1-\alpha) \theta_t k_t^\alpha - \\ &\quad k_{t+1}]. \end{aligned}$$

Substituting (1.1) and (1.10) into (1.7),

$$\begin{aligned} (1.14) \quad \alpha \theta k_{t+1}^{\alpha-1} &= (1+r_{t+1}) + b \text{Cov}(\rho_{t+1}, k_{t+1} \rho_{t+1}) \\ &= (1+r_{t+1}) + b \alpha^2 k_{t+1}^{2\alpha-1} \text{Var}_t(\theta_{t+1}). \end{aligned}$$

These two equations can be solved for k_{t+1} and r_{t+1} at time $t+1$, when k_t is known. Equation (1.13) includes both the conditional expectation of the future shock $E_t(\theta_{t+1})$ and the realized shock θ_t . Write the solutions for k_{t+1} and r_{t+1} at time t as $k_{t+1} = k_t(k_t, \theta_t)$ and $r_{t+1} = r_t(k_t, \theta_t)$. Next period, taking k_{t+1} as given, generation $t+1$ determines $k_{t+2} = k_{t+1}(k_{t+1}, \theta_{t+1})$ and $r_{t+2} = r_{t+1}(k_{t+1}, \theta_{t+1})$. As the economy evolves over time, capital stocks and risk-free rates of return are determined by the same procedure. The optimal paths of the capital stock and the risk-free rate of return are random variables, since both k_{t+1} and r_{t+1}

depend on the shock θ_t which is stochastic. Each time period, along with capital stock, other variables such as the risky rate of return, wage rate and consumption are also determined.

If the economy has evolved over an infinite period of time, we might be able to find a stationary stochastic process for k and the other endogenous variables. This will not be a linear regular process, however, since the equations determining k and the other endogenous variables are not linear in θ . Since the equations linking the endogenous variables to θ are non-linear, we would not expect the mean values of these endogenous variables to equal the certainty equivalent values.

Certainty equivalent steady state equilibrium

If θ_t is realized as its mean value $\bar{\theta}$ all the time, there exists a steady state equilibrium, in which there is no growth in the capital stock or aggregate consumption. Denote the steady state capital stock by k . Then the equations characterizing the steady state equilibrium are as follows:

$$(CES) \quad (1/b)\ln\{\beta(1+r)\} = \alpha\bar{\theta}k^\alpha - (b/2)\alpha^2k^{2\alpha}\text{Var}(\theta) - [(1-\alpha)\bar{\theta}k^\alpha - k]$$

and

$$\alpha\bar{\theta}k^{\alpha-1} = (1+r) + b\alpha^2k^{2\alpha-1}\text{Var}(\theta).$$

Once the equilibrium values of the capital stock and the risk-free rate have been determined by this pair of equations, the values of other variables can be calculated using the relationships previously discussed.

1.4. Numerical solutions

The nonlinear equation systems discussed above can not be solved analytically. Therefore, to see the effects of any exogenous changes on the economic system and the interactions among the endogenous variables, we present some simulations in this section.

Benchmark case

The parameters b and β define preferences while the parameters α , $\bar{\theta}$ and σ^2 define technology. The parameters are selected so that the model produces the annual risk-free rate of 1%. When we treat one generation as 30 years, a 1% annual rate becomes 35% for one generation. In other words, the young people are willing to give up one unit of consumption good to collect 1.35 units of consumption good, for sure, when old.

To simplify the exposition, we consider the certainty equivalent steady state equilibrium first. The certainty equivalent equilibrium is obtained by solving the equation system (CES) in section 1.3. The equilibrium values for the endogenous variables are reported in Table 2.1.

Comparative Statics

To see the underlying economic implications of the model, we change each parameter value with a variation of 10%. Table 2.1 presents the certainty equilibrium values under different sets of parameter values.

The results based on the assumptions and the specifications of the model seem to be consistent with standard finance models. Higher risk aversion is associated with a higher risk premium. A higher time discount factor results in a lower risk-free rate and higher capital accumulation.

One interesting interpretation of the results concerns the effects of changes in the factors related with production such as the variance of the technological shock -- but not its mean-- and the capital share. The results show that the risk premium becomes larger as the variance of the technological shock increases. An increase in the capital share α also increases the risk premium. The higher the mean of the technological shock, the higher the extent of capital accumulation, but the lower the rates of return on financial assets. We should not conclude from these results, however,

that the introduction of production technology enables us to explain large risk premiums. This is because we have the usual Euler equation (1.6) and the parameters should be set to appropriate numbers so that the model fits the observed data on consumption.

Table 2.1. Comparative Statics

base: $b=0.5, \beta=0.74, \alpha=0.3, \bar{\theta}=4, \sigma^2=0.2$								
	capital stock	risk- free rate	risky rate	risk premium	wage	cons. when young	cons. when old	expected utility
base	1.1921	0.0527	1.0611	0.0084	2.9516	1.7595	1.2650	-0.8090
$b = 0.45$	1.1635	0.0717	1.0793	0.0076	2.9301	1.7666	1.2558	-0.8730
$b = 0.55$	1.2193	0.0353	1.0445	0.0092	2.9716	1.7523	1.2735	-0.7499
$\beta = 0.72$	1.1611	0.0724	1.0809	0.0085	2.9283	1.7672	1.2550	-0.7987
$\beta = 0.76$	1.2530	0.0165	1.0247	0.0082	2.9960	1.7430	1.2840	-0.8298
$\alpha = 0.29$	1.1979	0.0126	1.0204	0.0078	2.9927	1.7948	1.2224	-0.8102
$\alpha = 0.31$	1.1849	0.0940	1.1030	0.0090	2.9090	1.7241	1.3070	-0.8083
$\bar{\theta} = 3.6$	0.9896	0.0789	1.0879	0.0090	2.5121	1.5225	1.0766	-0.9000
$\bar{\theta} = 4.4$	1.4122	0.0288	1.0367	0.0079	3.4160	2.0038	1.4640	-0.7241
$\sigma^2 = 0.18$	1.1928	0.0532	1.0607	0.0075	2.9521	1.7593	1.2652	-0.8098
$\sigma^2 = 0.22$	1.1915	0.0523	1.0615	0.0092	2.9511	1.7596	1.2648	-0.8091

As Mehra and Prescott(1985) argue, the results on risk premiums are unlikely to be improved without introducing additional frictions into the model. One example of such a friction would be the non-existence of the market for some assets resulting from official regulations, which is one of the issues to be explored in this paper.

Dynamic Simulation

For a particular distribution of the technological shock, we can calculate numerical approximations to the distributions of the capital stock, the risk-free rate and other endogenous variables. As mentioned before, when θ_t is

not realized at its mean value $\bar{\theta}$, the endogenous variables in our model are stochastic and so their equilibrium values will be differently distributed depending on the distribution of θ_t .

For a simple experiment, we first chose random values for θ_t over 40 periods given a specification for its distribution (normal distribution with mean of 4 and variance of 0.2) and then solved the following equations for k_1 and r_1 with the starting capital stock of 1.9121 which is its certainty equivalent value. Next period, the equations are used to calculate k_2 and r_2 with the last period's capital stock k_1 as given. Repeatedly, we can calculate the values of k , r and other endogenous variables up to period 40. This calculation can be repeated for other realizations of θ 's.

The results from 300 realizations of θ 's for 40 periods are presented in Table 2.2 and Figure 2.2. The first panel of Table 2.2 shows that the mean values of the endogenous variable are close to their certainty equivalent values, even though not the same, as we predicted above. The next panels (B), (C) and (D) present contemporaneous and once or twice lagged cross-correlation coefficients among the endogenous variables. All of the variables in our model except the expected risky rate and expected consumption of the old are almost perfectly negatively or positively correlated. The reason is found in the structure of the model. From the problem of generation t , the capital stock, k_{t+1} , and the risk-free rate of return, r_{t+1} , are determined by equations (2.13) and (2.14) given an expectation of the technology shock θ_t . As discussed above, the other endogenous variables such as the risky rate of return, the wage rate, and consumption can all be expressed in terms of capital stock. Therefore, the correlations across the endogenous variables can be ascertained by their relationships with capital stock.

(C) First Lagged Cross-correlation Coefficients

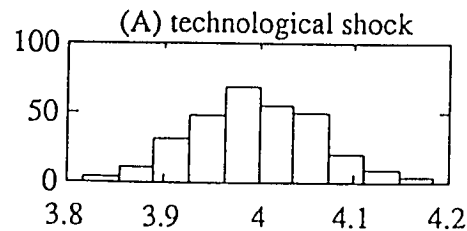
	k_{t+2}	r_{t+2}	ρ_{t+2}	$E_{t+1}\rho_{t+2}$	w_{t+1}	$c_{t+1}(t+1)$	$c_{t+1}(t+2)$	$E_{t+1}c_{t+1}(t+2)$	$E_{t+1}U$
k_{t+1}	-0.0269	0.0285	0.0100	0.0285	-0.0275	-0.0279	-0.0159	-0.0276	-0.0285
r_{t+1}	0.0249	-0.0269	-0.0085	-0.0269	0.0256	0.0260	0.0162	0.0258	0.0268
ρ_{t+1}	0.0131	-0.0136	-0.0208	-0.0136	0.0133	0.0134	-0.0077	0.0133	0.0136
$E_t\rho_{t+1}$	0.0249	-0.0269	-0.0085	-0.0269	0.0256	0.0260	0.0162	0.0258	0.0268
w_t	-0.0263	0.0280	0.0095	0.0280	-0.0269	-0.0273	-0.0160	-0.0271	-0.0280
$c_t(t)$	-0.0259	0.0277	0.0092	0.0277	-0.0265	-0.0269	-0.0161	-0.0267	-0.0276
$c_t(t+1)$	-0.0082	0.0098	-0.0172	0.0098	-0.0087	-0.0091	-0.0267	-0.0089	-0.0098
$E_t c_t(t+1)$	-0.0261	0.0279	0.0094	0.0279	-0.0268	-0.0272	-0.0161	-0.0269	-0.0279
$E_t U$	-0.0250	0.0269	0.0086	0.0269	-0.0256	-0.0261	-0.0162	-0.0258	-0.0269

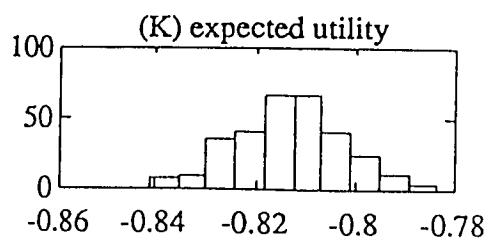
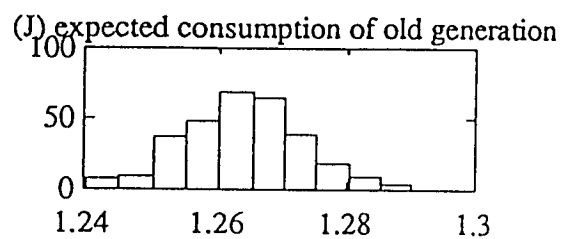
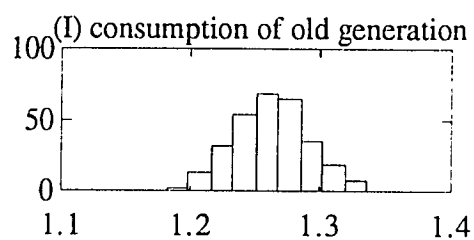
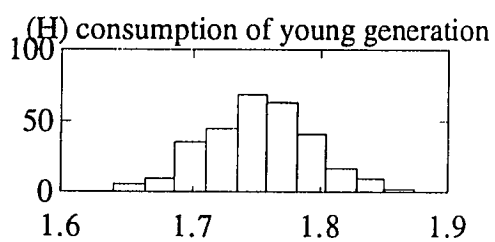
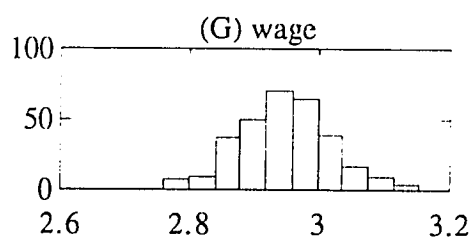
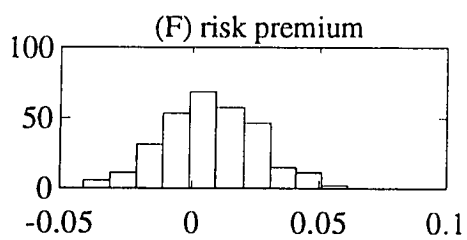
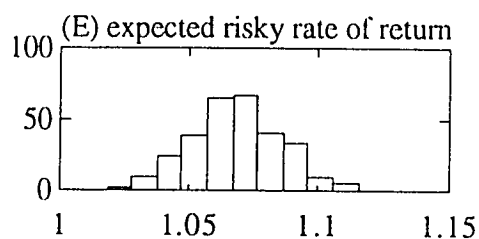
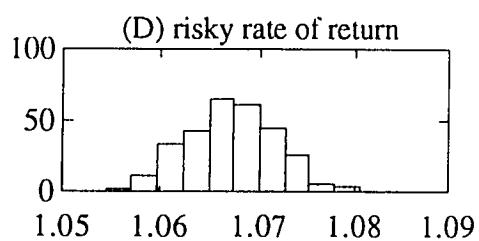
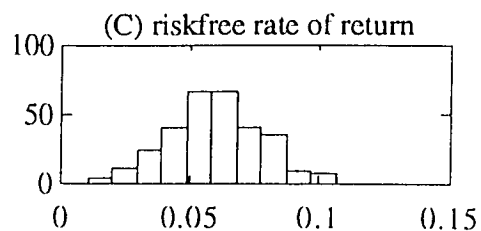
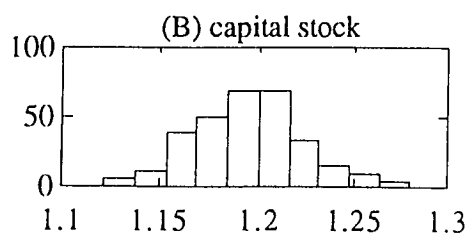
(D) Second Lagged Cross-correlation Coefficients

	k_{t+3}	r_{t+3}	ρ_{t+3}	$E_{t+2}\rho_{t+3}$	w_{t+2}	$c_{t+2}(t+2)$	$c_{t+2}(t+3)$	$E_{t+2}c_{t+2}(t+3)$	$E_{t+2}U$
k_{t+1}	-0.0137	0.0153	0.0045	0.0153	-0.0143	-0.0146	-0.0087	-0.0144	-0.0153
r_{t+1}	0.0145	-0.0165	-0.0028	-0.0165	0.0152	0.0157	0.0119	0.0154	0.0165
ρ_{t+1}	0.0088	-0.0103	-0.0098	-0.0103	0.0093	0.0097	-0.0023	0.0095	0.0103
$E_t\rho_{t+1}$	0.0145	-0.0165	-0.0028	-0.0165	0.0152	0.0157	0.0119	0.0154	0.0165
w_t	-0.0140	0.0158	0.0039	0.0158	-0.0146	-0.015	-0.0098	-0.0147	-0.0157
$c_t(t)$	-0.0142	0.0160	0.0035	0.0160	-0.0148	-0.0152	-0.0105	-0.0150	-0.0160
$c_t(t+1)$	-0.0043	0.0041	-0.0073	0.0041	-0.0042	-0.0042	-0.0134	-0.0042	-0.0041
$E_t c_t(t+1)$	-0.0140	0.0159	0.0038	0.0159	-0.0147	-0.0151	-0.0101	-0.0148	-0.0158
$E_t U$	-0.0145	0.0165	0.0028	0.0165	-0.0152	-0.0156	-0.0119	-0.0154	-0.0165

The distributions of the endogenous variables are illustrated by the histograms presented in Figure 2.2. All the variables appear to be normally distributed like technology shock.

Figure 2.2. Distributions of Variables





2. INTERNATIONAL CAPITAL MOVEMENTS AND THE MACROECONOMY

We now open the economy of the last section to trade in equities and bonds with another economy. Therefore, the world economy consists of two countries, “domestic(d)” and “foreign(f)”. Both countries are populated in the same way as in the last section. These two countries consist of N_d and N_f consumers, respectively, in each period. As long as no population growth is assumed for either of the countries, the difference in populations does not matter in the analysis below, which focuses on the representative agent's economic behavior. Each country has its own firm producing the same good. Each country behaves domestically as it does in the previous section, but now investors also have access to international capital markets and hold foreign assets.

When young people allocate their savings among different assets, the range of portfolio decisions available to them depends on the international economic policy regime they are living under: a financial autarky regime, which is distinguished by a prohibition on the ownership of foreign assets; an asymmetric capital controls regime, in which domestic investors are restricted in holding foreign assets, while foreign investors have unlimited access to domestic securities; or a laissez-faire regime, which is characterized by complete freedom of portfolio choice.

Since in an autarky situation an economy works in the way as described in the previous section, we consider the following three alternative financial regimes. The acronyms are used for them when we interpret simulation results.

FI(Full Integration): The capital markets are fully integrated so that investors are not subject to any financial restrictions.

NE(No foreign Equities purchases by domestic residents): While foreign country investors have unlimited access to the domestic country securities, domestic investors can not hold foreign equities. Domestic investors do, however, have access to the world bonds market.

NEB(No foreign Equities or Bonds purchases by domestic residents): Domestic investors are completely banned from investing in foreign country securities, whereas foreign country investors have unlimited access to the domestic capital markets.³

To provide a benchmark for analysis, we start with the first regime, that is a fully integrated financial system. The world interest rate is determined in the fully integrated world borrowing-lending market. Individuals allocate their savings among domestic and foreign equities and bonds. Subscripts "d" and "f" are added to notations in the previous section to denote 'domestic country' and 'foreign country', respectively, and hence most of the notation is self-explanatory.

2.1. Stock Market Equilibrium in a Two-Country Open Economy

It is assumed that both countries have the same Cobb-Douglas production function so that their products per capita depend only on their own capital-labor ratios and technological shocks. Domestic consumers have the same utility function as foreign consumers although attitudes toward risk and their rate of time preference need not be the same. For our purpose, trade in commodities, including that of investment goods, need not be treated explicitly because of the primarily financial nature of capital movements.⁴

³ In this two-country setting, restrictions on outflows from one country have the same effects as restrictions on inflows to the other country.

⁴ International capital movements should be distinguished from the shifts in real capital or factor movements. Exporting capital goods, or renting them out, is not equivalent to a capital movement because in neither case are sales of securities or borrowing involved.

The basic problems which consumers and firms face are the same as discussed in the previous chapter. Trading securities with the other country enlarges the portfolio choices of investors in both countries.

Consumers

The problem of the domestic representative consumer born at t can be stated as follows:

$$\begin{aligned}
 & \max_{\{c_{dt}(t), c_{dt}(t+1)\}} U(c_{dt}(t)) + \beta E_t[U(c_{dt}(t+1))] \\
 (2.1) \quad & \text{s.t. } c_{dt}(t+1) = (w_{dt} - c_{dt}(t))(s_{dd}(t)\rho_{dt+1} + s_{df}(t)\rho_{ft+1} \\
 & \quad + (1 - s_{dd}(t) - s_{df}(t))(1+r_{t+1})) \\
 (2.2) \quad & w_{dt} = f(k_{dt}, \theta_{dt}) - f'(k_{dt}, \theta_{dt})k_{dt}.
 \end{aligned}$$

where $s_{dd}(t)$ and $s_{df}(t)$ are domestic resident's portfolio shares of domestic equity and foreign equity .

The first order conditions give us:

$$\begin{aligned}
 (2.3) \quad & U'(c_{dt}(t)) = \beta_d(1+r_{t+1})E_t U'(c_{dt}(t+1)), \\
 (2.4) \quad & E_t \rho_{dt+1} = (1+r_{t+1}) + b_d \text{cov}(\rho_{dt+1}, c_{dt}(t+1)), \\
 (2.5) \quad & E_t \rho_{ft+1} = (1+r_{t+1}) + b_d \text{cov}(\rho_{ft+1}, c_{dt}(t+1)).
 \end{aligned}$$

The counterparts for the foreign consumer's problem are:

$$\begin{aligned}
 (2.6) \quad & U'(c_{ft}(t)) = \beta_f(1+r_{t+1})E_t U'(c_{ft}(t+1)), \\
 (2.7) \quad & E_t \rho_{dt+1} = (1+r_{t+1}) + b_f \text{cov}(\rho_{dt+1}, c_{ft}(t+1)), \\
 (2.8) \quad & E_t \rho_{ft+1} = (1+r_{t+1}) + b_f \text{cov}(\rho_{ft+1}, c_{ft}(t+1)).
 \end{aligned}$$

For given rates of return, equations (2.4) and (2.7) yield the demand for the domestic equity by the domestic investor and the foreign investor,

respectively. Similarly, equations (2.5) and (2.8) yield the demand for the foreign equity.

Firms

Firms in the domestic and foreign countries operating at time t choose the capital stock so as to maximize expected profits as before.

$$\max E_t[f(k_{t+1}; \theta_{t+1}) - \rho_{t+1} k_{t+1} - w_{t+1}).$$

The first order conditions for the domestic firms are:

$$(2.9) \quad E_t \rho_{dt+1} = E_t f'(k_{dt+1}; \theta_{dt+1}) = \alpha \bar{\theta}_{dt+1} k_{dt+1}^{\alpha-1},$$

$$(2.10) \quad E_t w_{dt+1} = E_t [f(k_{dt+1}, \theta_{dt+1}) - \rho_{dt+1} k_{dt+1}] = (1-\alpha) \bar{\theta}_{dt+1} k_{dt+1}^{\alpha}.$$

And, for the foreign firm, we have

$$(2.11) \quad E_t \rho_{ft+1} = E_t f'(k_{ft+1}; \theta_{ft+1}) = \alpha \bar{\theta}_{ft+1} k_{ft+1}^{\alpha-1},$$

$$(2.12) \quad E_t w_{ft+1} = E_t [f(k_{ft+1}, \theta_{ft+1}) - \rho_{ft+1} k_{ft+1}] = (1-\alpha) \bar{\theta}_{ft+1} k_{ft+1}^{\alpha}.$$

Competitive Framework

The demand for risky assets is derived from portfolio considerations. The supply of risky assets depends on the technology. In our formulation, the optimal investment level is determined such that the expected rate of return is equal to the marginal product of capital.

In equilibrium, the demand for domestic equity is equal to its supply:

$$(2.13) \quad s_{dd}(t)[w_{dt} - c_{dt}(t)] + s_{fd}(t)[w_{ft} - c_{ft}(t)] = k_{dt+1}.$$

The same holds for foreign equity:

$$(2.14) \quad s_{df}(t)[w_{dt} - c_{dt}(t)] + s_{ff}(t)[w_{ft} - c_{ft}(t)] = k_{ft+1}.$$

In addition, international loans must sum to zero in equilibrium.

$$(2.15) \quad (1 - s_{dd}(t) - s_{df}(t))[w_{dt} - c_{dt}(t)] + (1 - s_{fd}(t) - s_{ff}(t))[w_{ft} - c_{ft}(t)] = 0.$$

All the equations discussed here are listed in Appendix C.

2.2. The Effects of Restrictions on International Capital Transactions

When restrictions are imposed on capital movements between the two countries as discussed above, then both economies will be affected through changes in returns on both risk-free and risky assets. The effects of legal barriers can be captured in the open economy model in the last section.

No Foreign Equities or Bonds Purchases

Suppose domestic investors are not allowed to purchase any foreign financial assets even though foreign investors can purchase domestic securities as much as they want. Risk-free rates in the two countries are different because they are determined independently within each of the countries. Moreover, s_{df} is no longer a choice variable of domestic investors so we lose the CAPM equation which relates the rate of return on foreign equity to domestic systematic risk and the domestic interest rate.

$$s_{dd}(t)[w_{dt} - c_{dt}(t)] + s_{fd}(t)[w_{ft} - c_{ft}(t)] = k_{dt+1}$$

$$s_{ff}(t)[w_{ft} - c_{ft}(t)] = k_{ft+1}$$

$$s_{dd}(t) = 1$$

$$s_{fd}(t) + s_{ff}(t) = 1.$$

No Foreign Equities Purchases

The environment of financial investment abroad is the same as that in 3.1, except that there exists a world borrowing-lending market that domestic

investors also have access to, and hence the world interest rate is determined in this market.

$$\begin{aligned}
 s_{dd}(t)[w_{dt} - c_{dt}(t)] + s_{fd}(t)[w_{ft} - c_{ft}(t)] &= k_{dt+1} \\
 s_{ff}(t)[w_{ft} - c_{ft}(t)] &= k_{ft+1} \\
 (1 - s_{dd}(t))[w_{dt} - c_{dt}(t)] + (1 - s_{fd}(t) - s_{ff}(t))[w_{ft} - c_{ft}(t)] &= 0.
 \end{aligned}$$

3.3. Simulations and Interpretations

The model discussed in the previous sections can be used to quantify the effects on the macroeconomic variables of change in regulation of in the capital markets. Under each financial framework, we calculate certainty equivalent equilibrium values for the endogenous variables. Only the certainty equivalent equilibrium is considered throughout the simulation experiment in this section, since we want to compare the the long-run or average values of macroeconomic variables under different financial regimes. In addition, the closed economy stochastic equilibrium discussed above suggests that the certainty equivalence results should be a close approximation to the likely mean effects under a stochastic simulation. The certainty equivalence simulation results are plotted as a function of various parameters so that we can compare the equilibrium values of the endogenous variables under different financial regimes. The benchmark case is presented as a typical equilibrium pattern in Figures 2.3 through 2.6.

Findings

Basically, the simulation results can be understood from two perspectives. First, we plot the certainty equivalent values relative to the correlation between technology shocks. This enables us to highlight the role of correlations between technology shocks, which represent the risks of the different equities. Alternatively, we can compare the effects of changes in the

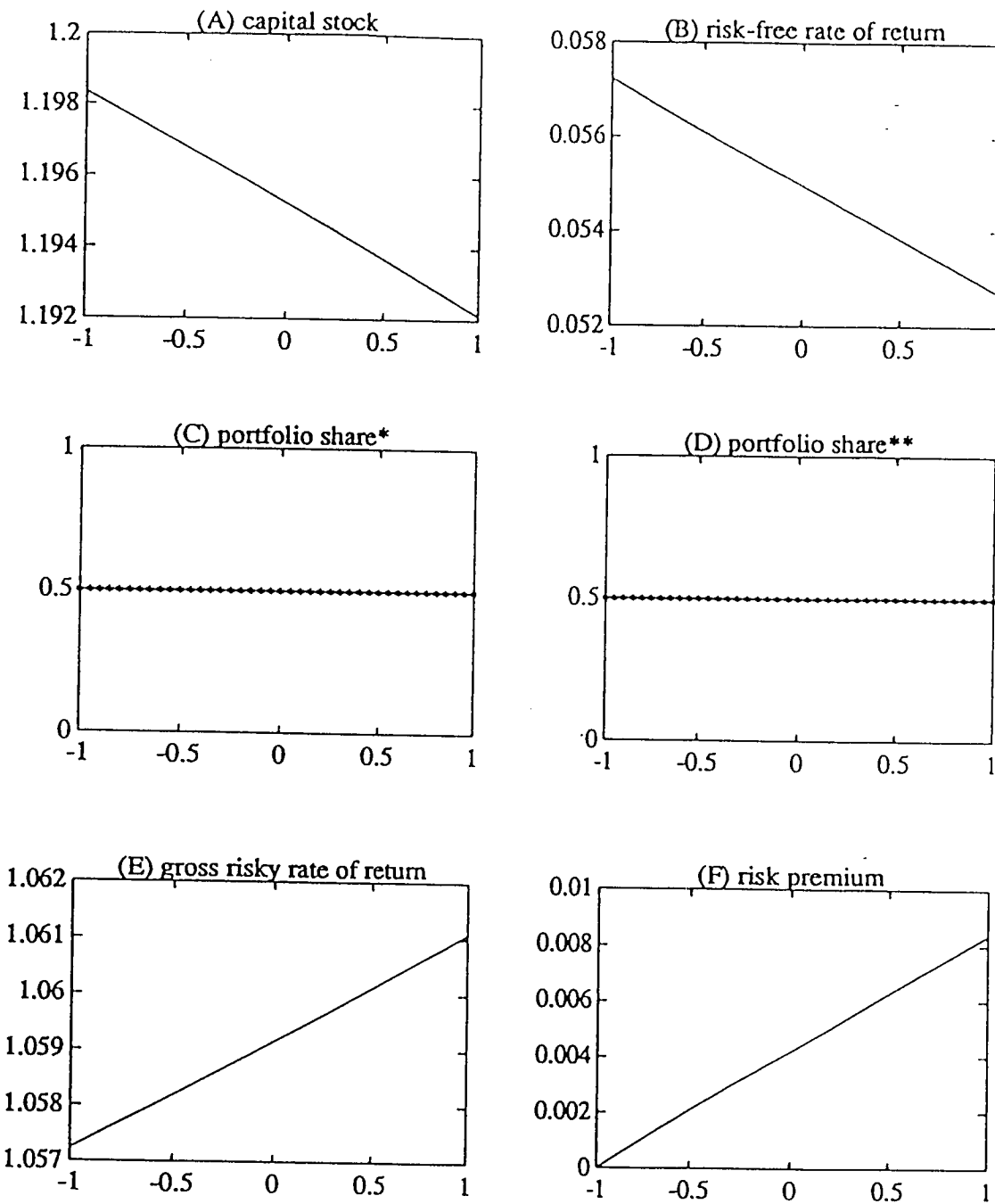
international financial system by plotting the certainty equivalent values under different financial regimes.

Under FI or NEB, each variable responds monotonically in both the domestic and the foreign country to a change in correlation. However, that is not the case for NE where, all the variables, except risk-free rates of return and portfolio shares, increase (or decrease) up to a certain magnitude of technology-correlation, and start to decrease (or increase) beyond that point.

Diagrammatic results for FI are presented in Figure 2.3. The less the technologies of the two countries are correlated, the higher the demand for foreign equities. Foreign equities provides a better hedge for the risk of domestic equity holding when the shocks are less correlated. The increase in equity demand in both countries increases the supply of capital at a given return on equity. Therefore, an integration of the capital markets enhances physical capital accumulation (A).

An integration of capital markets increases the demand for foreign equities and so decreases the demand for risk-free assets. The price of a risk-free asset falls. Therefore, less correlated technological shocks result in a higher risk-free rate of return (B). Since we assume trade between two identical countries, investors in both countries allocate an equal amount out of their savings to the two different equities (C, D). Integration with less correlated technological shocks increases the demand for equities, and this decreases the rate of return on equities (E). By holding foreign equities, domestic investors hedge the risk of holding domestic equities and so do foreign investors. Therefore, less correlation of technological shock leads to lower risk premia in both countries (F). When the shocks are perfectly

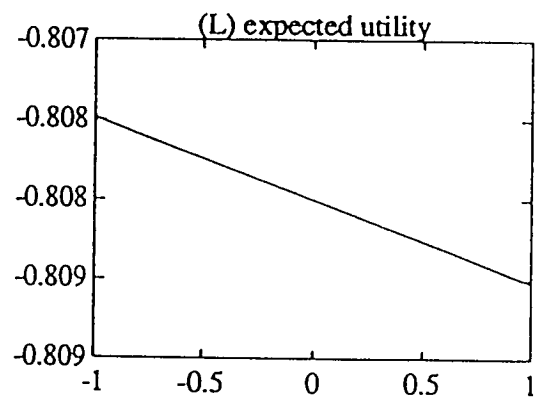
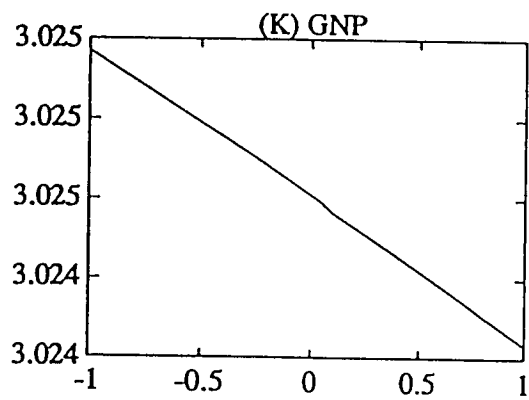
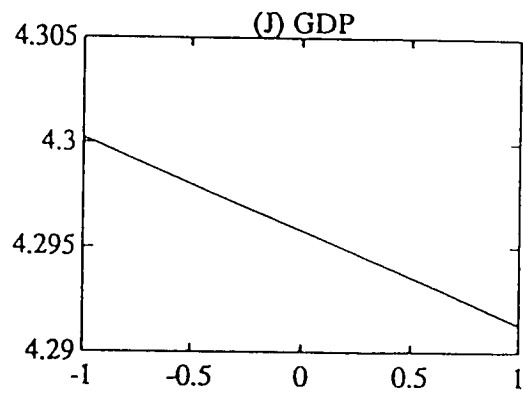
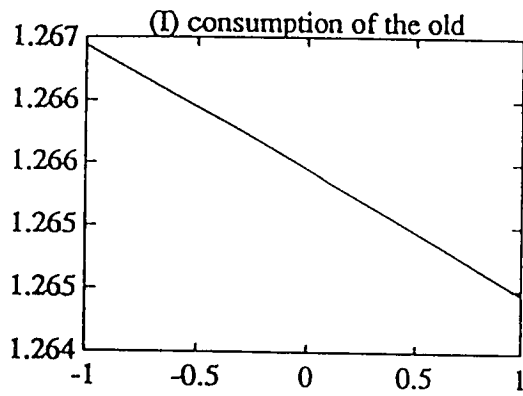
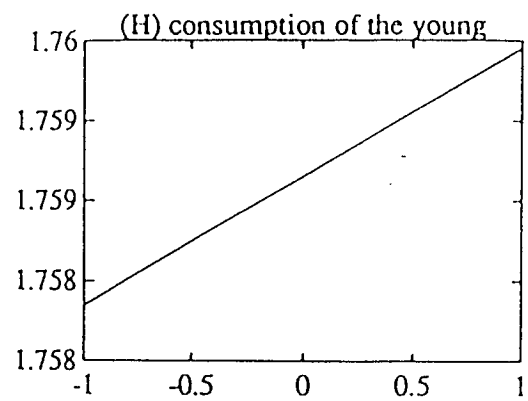
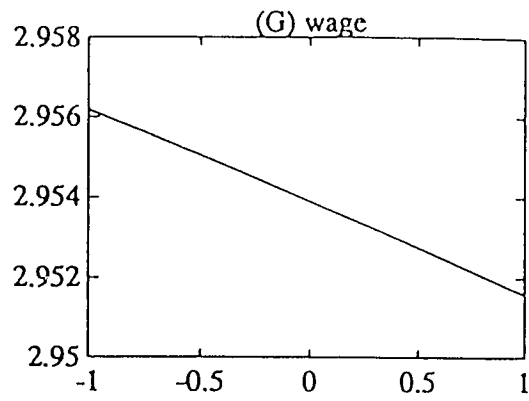
Figure 2.3. Full Integration
(values graphed against correlation coefficient)



(C), (D)

* portfolio share of domestic residents ** portfolio share of foreign residents

— : domestic equities holding *** : foreign equities holding



negatively correlated, it would be possible to construct a perfect hedge⁵. The risk premium falls to zero and the stimulus to investment is maximized.

Higher capital accumulation increases the marginal product of labor and hence wage rates become greater in both countries as the shocks become less correlated (G). Investments abroad smooth the consumption path by reducing the risk of asset holdings. Capital market integration has an ambiguous affect on the allocation of consumption between two periods (young/old) because the allocation depends on the initial consumption levels. For example, if the youth consumption level is lower than the old consumption level in autarky, international trade in assets would increase the former but decrease the latter (H, I).

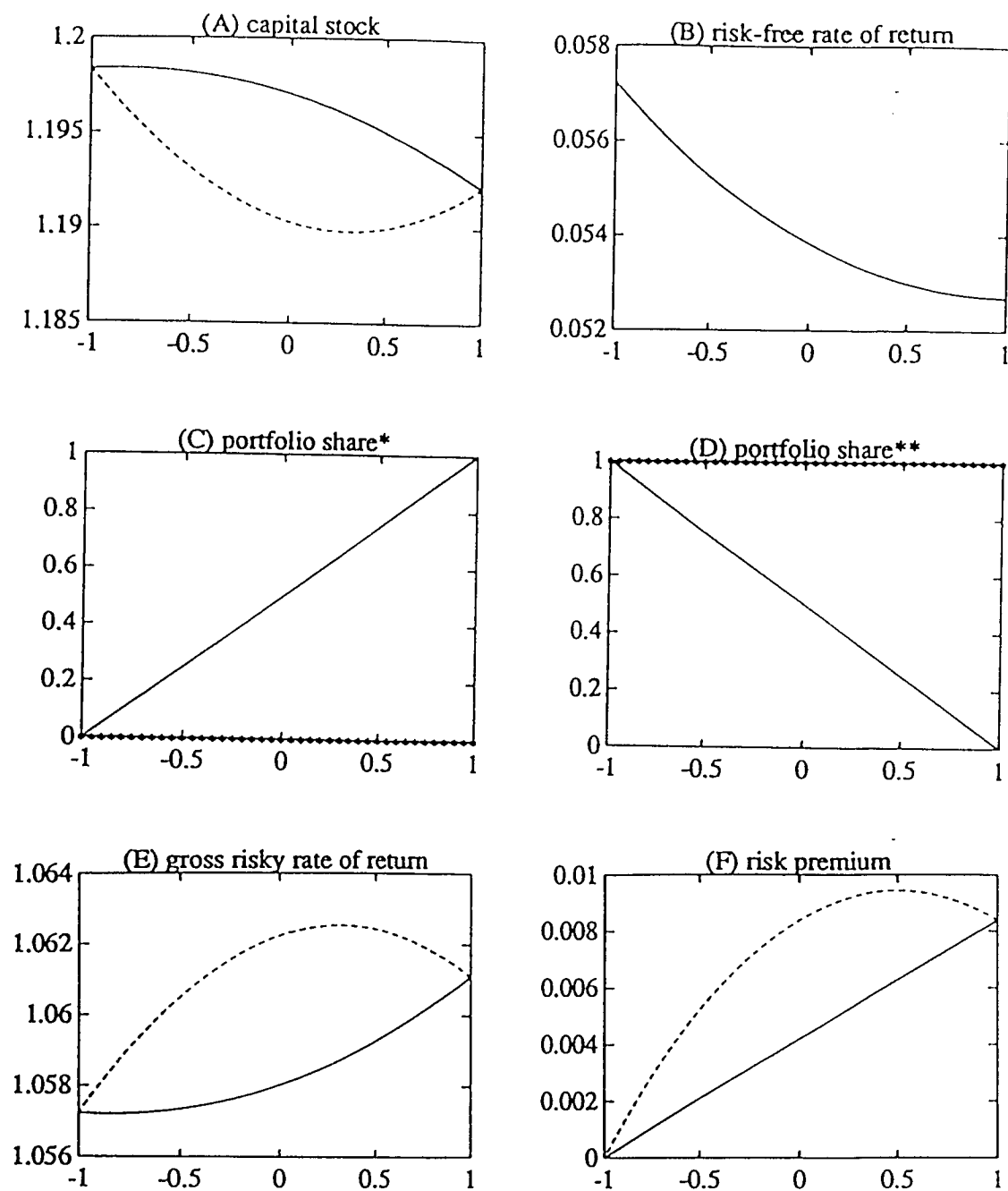
Both countries are better off because of risk diversification in the fully integrated international capital market (L). Integration of capital markets also results in higher level of GDP and GNP in both countries through increased capital accumulation (J, K).

Figure 2.4 presents the patterns of endogenous variables under the regime NE. Foreign investors want to purchase domestic equities in order to reduce the risk of their asset holdings. Therefore, as the technology correlation becomes smaller, the capital stock accumulated in the domestic country increases, while the capital stock in the foreign country decreases (A).

However, this is not the whole story. If the rates of return of the two equities have a highly negative correlation, then the domestic equity is so attractive to foreign investors that they are willing to borrow from domestic residents in order to finance purchasing the domestic equity. Domestic

⁵ When the correlation equals -1 , a portfolio of the two risky assets in equal quantities is risk-free. Hence, the yield on each of the risky assets equals the risk-free rate of return.

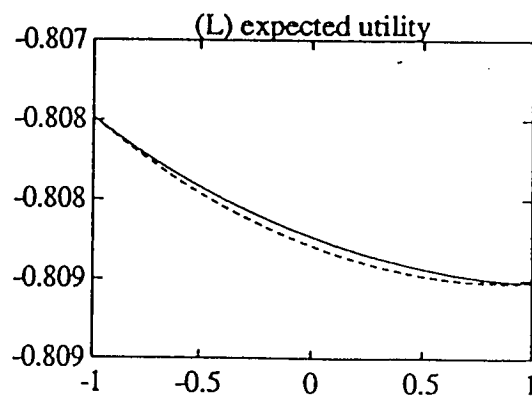
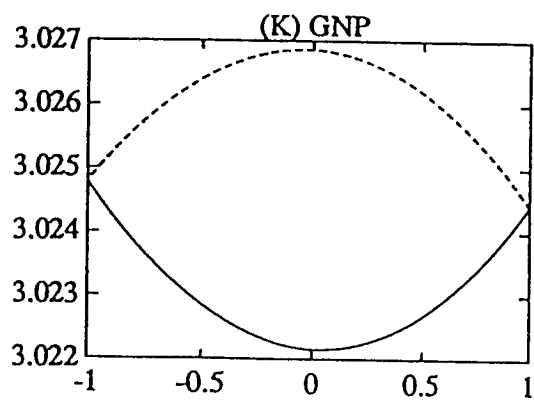
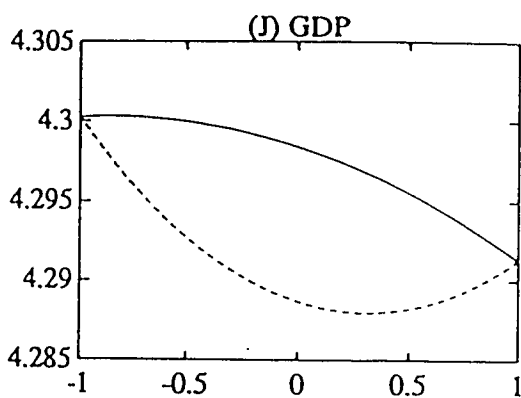
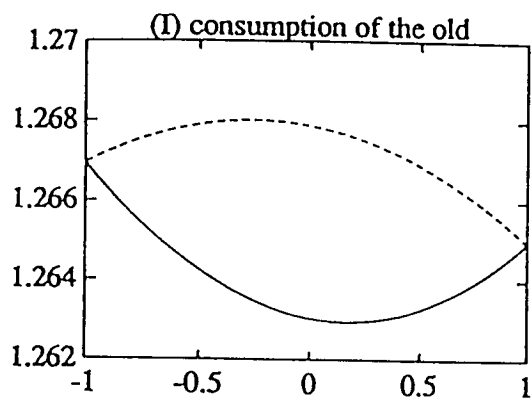
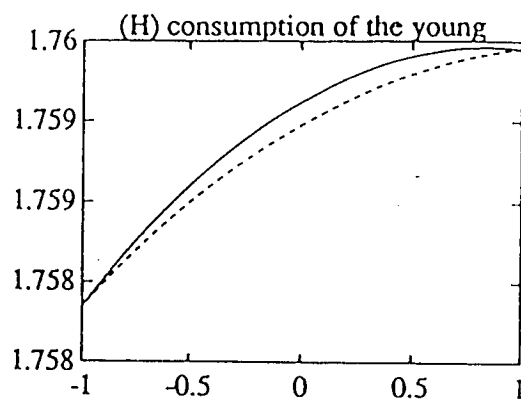
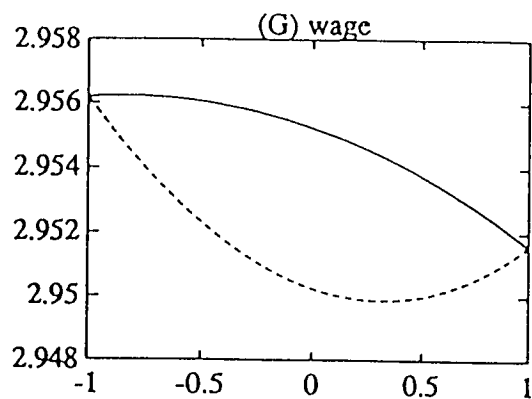
Figure 2.4. No Foreign Equities Purchases by domestic residents
(values graphed against correlation coefficient)



(C), (D)

* portfolio share of domestic residents ** portfolio share of foreign residents

— : domestic equities holding *** : foreign equities holding



(A), (E) - (L)

— : domestic country - - - - : foreign country

residents allocate a certain portion of their savings to the foreign country. The domestic country could eventually become capital-exporting. This tendency for foreign residents to borrow at the risk-free rate and invest in the domestic risky asset as the combined portfolio of risky assets becomes less risky explains the non-monotonic behavior of several variables in the picture.

At the two extreme cases (correlation =1 and correlation = -1), the two countries have the same level of capital stock. When the correlation equals 1, the two equities are the same and there are no gains from diversification.⁶ Therefore, foreign investors are indifferent between the two risky assets. When the correlation is -1, the combined portfolio of risky assets is in fact risk-free. Foreign investors act as an "insurance firm" for domestic residents. The foreign capital stock is more adversely impacted from trade in securities as the correlation declines toward zero. When the two shocks are negatively correlated, the opportunity to diversify the risks associated with investing in the foreign asset makes foreign capital more attractive to foreign residents. Both the foreign and domestic capital stocks increase.

The more negatively the technologies in the two countries are correlated, the greater is the demand for the domestic equity from foreign investors and the lower is the demand for the risk-free asset. Therefore, the risk-free rate becomes higher as the technology correlation becomes more negative (less positive) (B).

⁶ In general, there are still gains to portfolio diversification even when the rates of return on two risky assets are perfectly positively correlated. In our model, where the technological shocks in both countries are assumed to be distributed the same, the two equities are in fact the same and so the restrictions then have no effects.

Domestic residents lend a part of their savings to foreign investors who want to purchase domestic equities. The portfolio share of equity declines as the rates of return on the equities become more negatively (less positively) correlated (C). The demand for domestic equities by foreign residents increases as the correlation gets less positive (more negative) (D). The fact that s_{ff} (the share of foreign equities in the portfolios of foreign investors) is almost one across various correlations implies that the purchase of domestic equity by foreign investors is financed by borrowing from the domestic country.

The rate of return on foreign equities is higher than the rate on domestic equities because the demand for domestic equities, which can be held by residents of either country is greater than the demand for foreign equities (E). This also explains why foreign investors pay a higher premium on the equities issued in their own country (F).⁷

The changes in wages are associated with the changes in capital stocks (G). The wage rate in the domestic country is higher than in the foreign country.

Under the regime NE, the foreign country behaves as a 'financial intermediary' to the domestic country. When domestic residents can lend risk-free to the foreigners, like a 'bank' the foreigners borrow from domestic residents at the risk free rate and lend to risky customers (buy domestic equities). Domestic residents take advantage of this 'banking' service of foreign residents and so are relatively better off in terms of expected utility (L). It is interesting to see that, by restricting foreign investment, the domestic

⁷ This finding is consistent with Eun and Janakiramanan (1986) who showed that, other things equal, the risk premium on equities under restrictions is greater than the risk premium on the same equities under no restrictions.

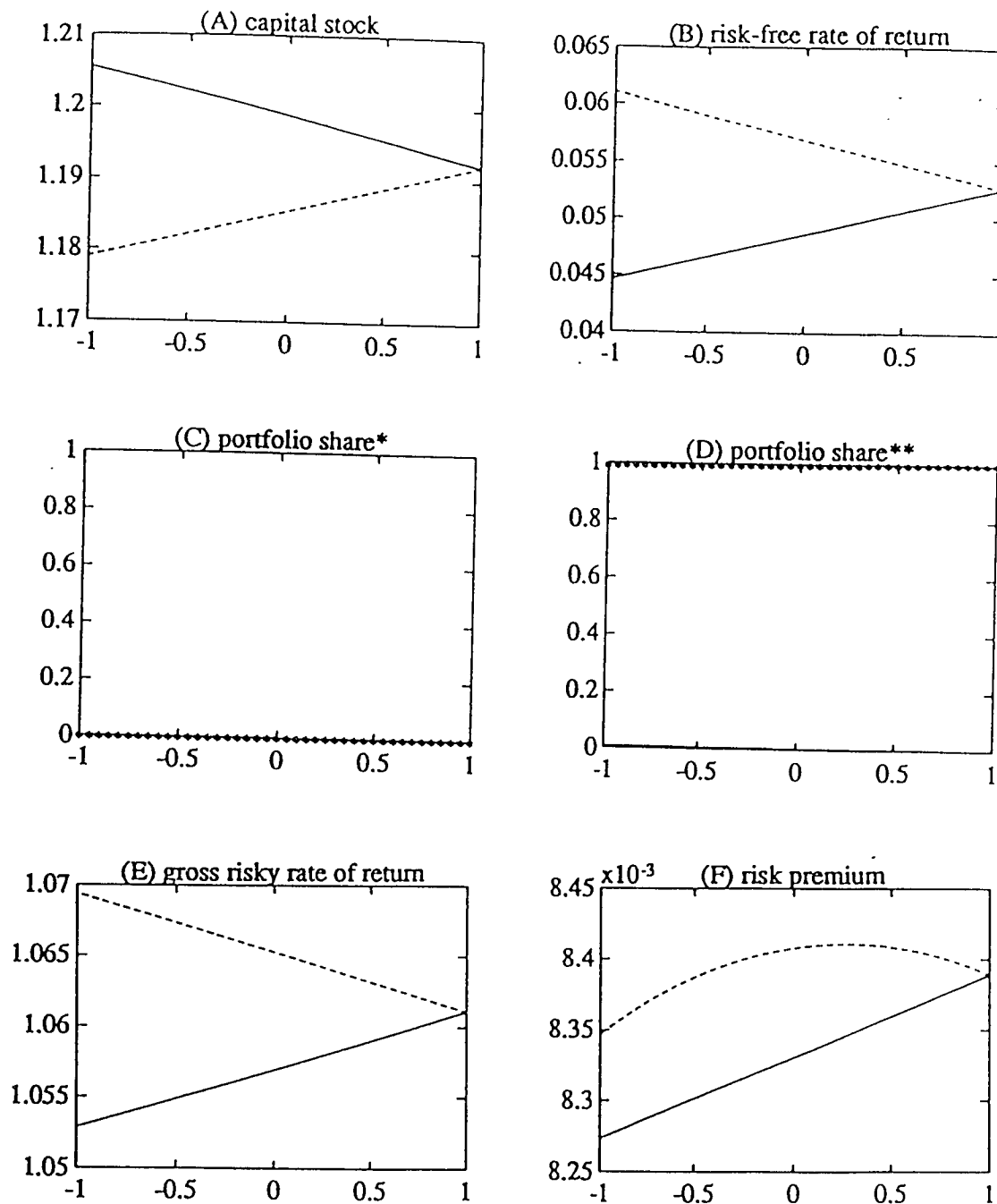
government hurts foreign residents, in terms of expected utility, more than it hurts its own residents, compared to the fully integrated situation. This indicates that international capital flows which equate the return on capital at home to the return on capital abroad do not necessarily mean optimal resource allocations.

Another interesting point about the regime NE is that the domestic country's GDP is greater than that of the foreign country whereas its GNP is lower than that of its partner (J, K).⁸ This is because foreign residents invest in equities in the domestic country as well as the equities in their own country at expense of their consumption when young and so collect higher returns by that diversification than they would in an autarky situation. The consumption pattern of domestic residents is smoother than the pattern of foreign residents (H, I). The expected utility difference mentioned above is related to these consumption patterns.

Figure 2.5 presents the changes in the endogenous variables under the regime NEB. Since domestic residents are not allowed to lend their saving to foreign investors, the purchase of domestic equity by foreign investors is financed by foreign saving. There are no capital outflows from the domestic country whatsoever. Unless domestic equities and foreign equities are perfectly correlated with each other, foreign investors purchase domestic equities to hedge the risk of holding equities issued in their country. When the correlation of returns from those two different equities becomes less, foreign investors find domestic equities more attractive and purchase more of them. Since foreign investors can not borrow from domestic residents to

⁸ GDP of a country is calculated by its production technology given domestic capital stock. By contrast, GNP is measured by the sum of consumptions of the young and the old in the economy.

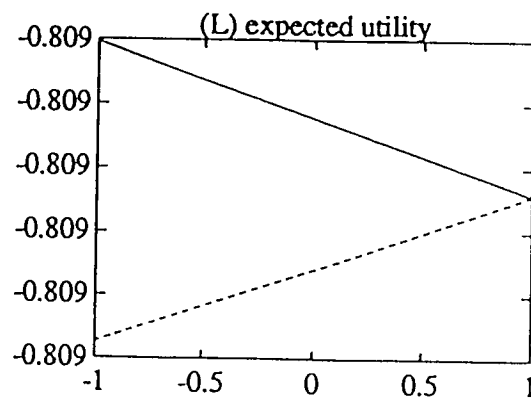
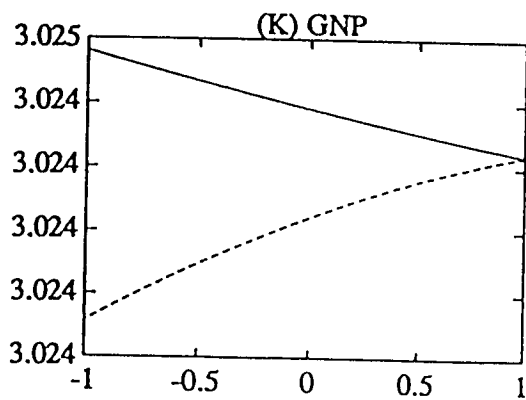
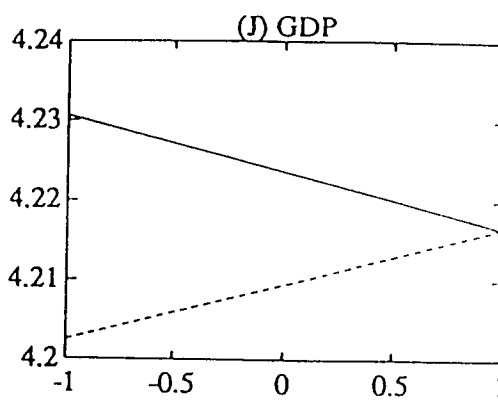
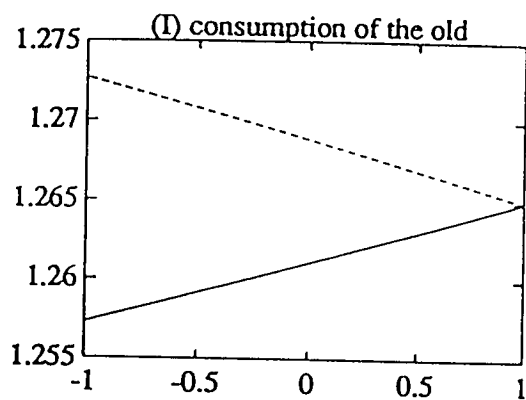
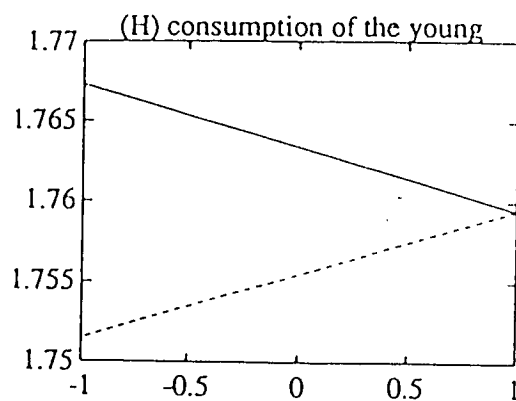
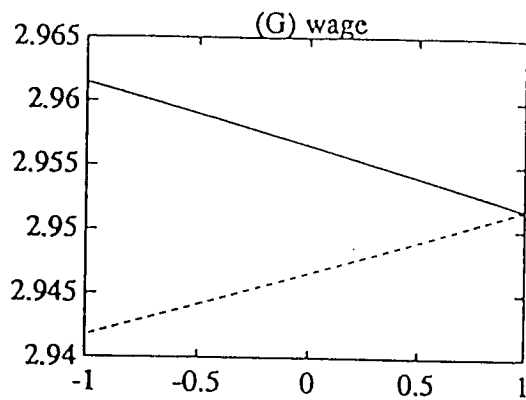
Figure 2.5. No Foreign Equities or Bonds Purchases by domestic residents
(values graphed against correlation coefficient)



(C), (D)

* portfolio share of domestic residents ** portfolio share of foreign residents

— : domestic equities holding *** : foreign equities holding



(A), (E) - (L)

— : domestic country - - - - : foreign country

purchase domestic equities, the physical capital accumulation in the two countries look like in the picture (A).

The demand for domestic equity increases whereas the demand for foreign equity decreases as rates of return become more negatively (less positively) correlated and foreign residents find domestic assets a better hedge (C, D). This also explains the changes in the rates of return on both risk-free and risky assets (B, E). Again, we find that foreign firms should pay a higher premium for the equities issued in their own country than do domestic firms who can sell equities to domestic or foreign residents (F).

Two different effects of financial movements can be considered for the foreign country. One is a risk diversification effect which makes foreign residents better off. The other is an income effect via changes in the foreign capital stock and foreign wage. Trade in financial assets helps foreign residents to diversify risk by holding domestic assets, but the wage rate in the foreign country decreases as capital flows out of the foreign country. The level of savings decrease. On the other hand, trading assets increases asset income per unit of saving. When the negative income effect dominates the risk diversification effect, the foreign country is worse off. In picture (L), the foreign country is worse off for any correlation between shocks even compared to the autarky situation. This indicates that the income effect dominates the risk diversification effect in our simulation experiment.

Under the regime NEB, GNP and GDP in the foreign country are lower than the domestic country, and even lower than in an autarky situation (J, K). This observation is striking because foreign residents hold domestic equities to diversify their risk of equity holding but those asset transactions lower both GNP and GDP in the competitive world capital market.

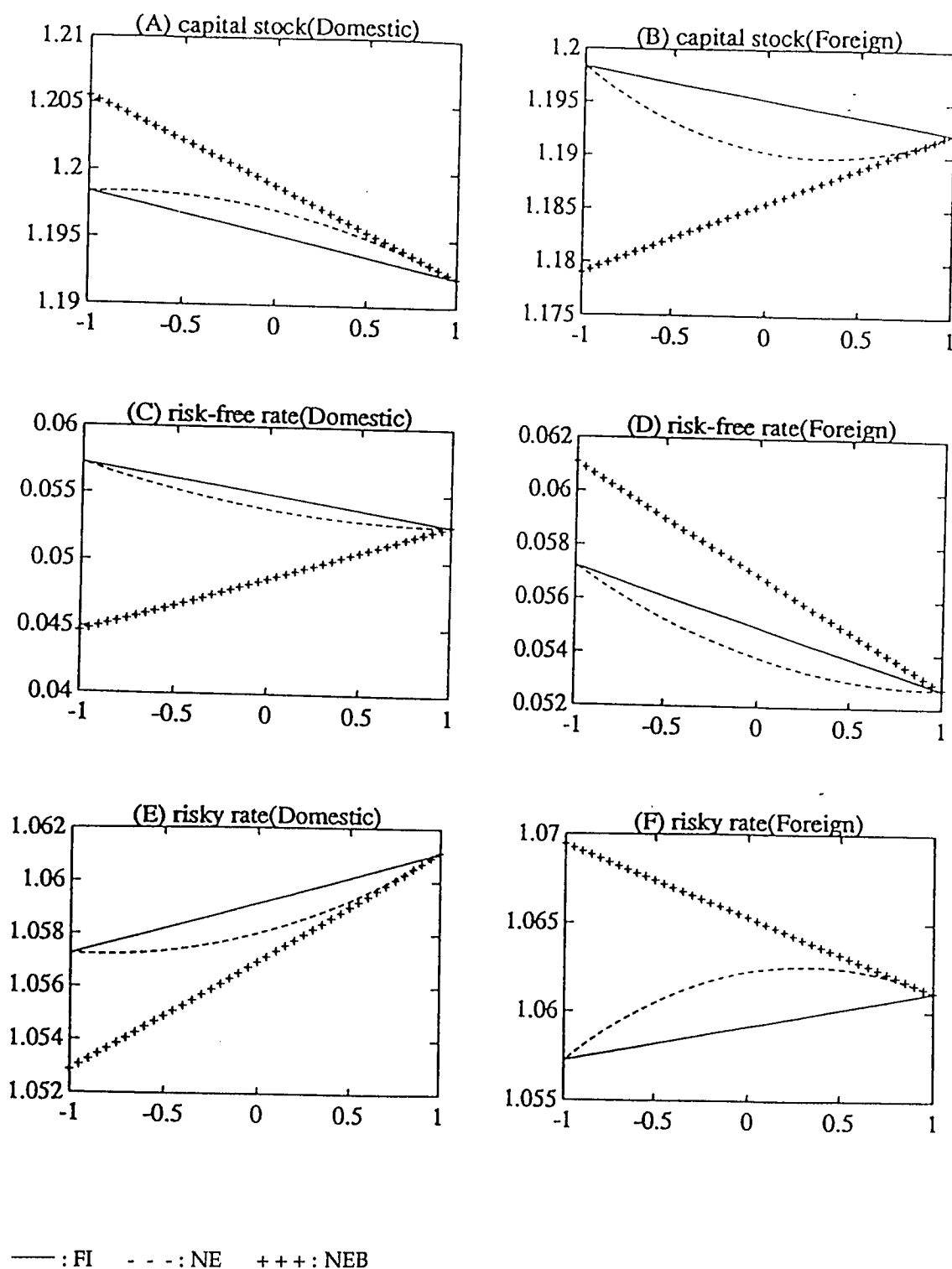
Comparison of financial regimes are exhibited in Figure 2.6.⁹ The capital stock accumulated in the domestic country is greatest under full restrictions on both risk-free and risky foreign investments, since none of the domestic savings are invested abroad while foreign investors are willing to invest in the domestic country in order to diversify their portfolios. The opposite is true for foreign capital accumulation. When the domestic country restricts capital outflows, capital accumulation in the domestic country expands ($FI < NE < NEB$), but accumulation in the foreign country is reduced ($FI > NE > NEB$). Compared to portfolio autarky, the fully integrated capital market would increase the accumulation of capital stock in both countries taken together since portfolio diversification decreases the return rates demanded on both domestic and foreign equities which, in turn, reduces the cost of capital (A, B). When asymmetric barriers to foreign investment are removed, the domestic accumulation of capital decreases. This observation makes the model useful to explain the efforts of some governments, such as those of some Asian countries, to prohibit foreign investment in order to promote domestic capital accumulation.

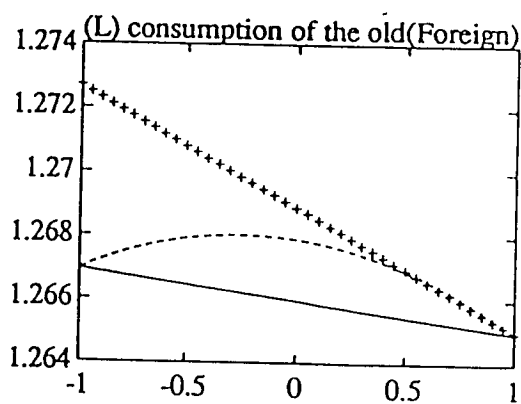
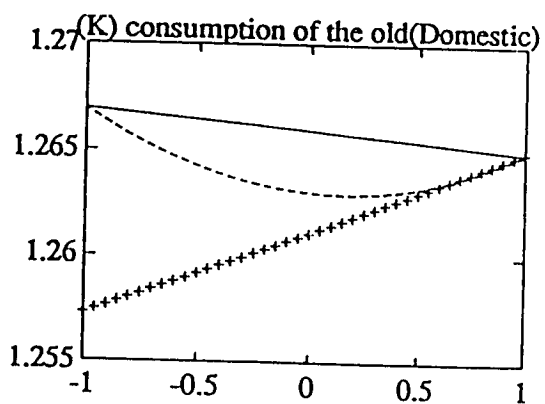
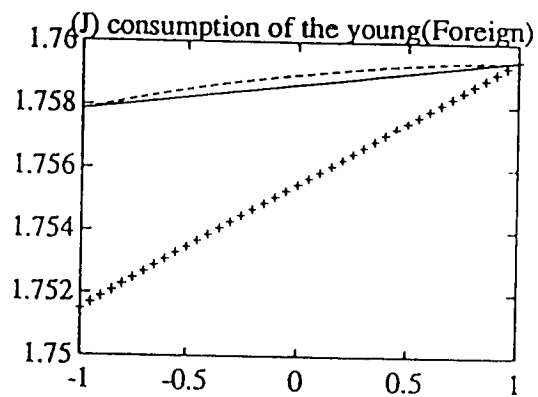
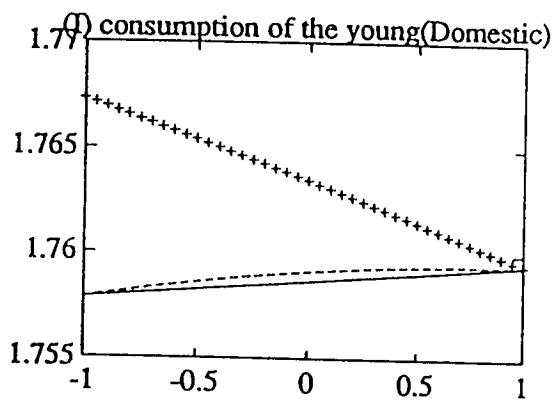
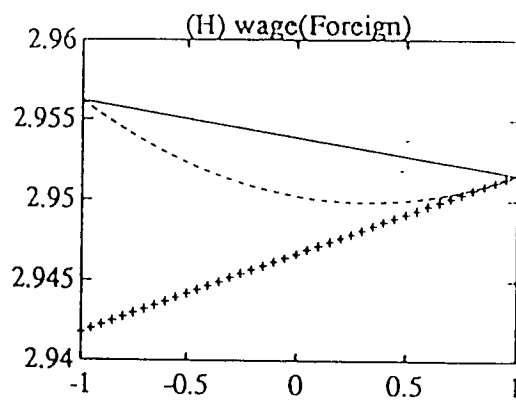
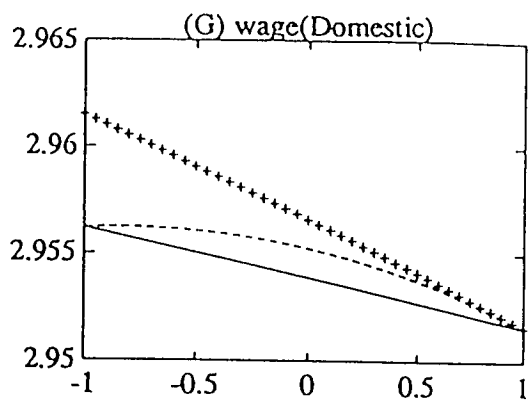
When all capital outflows are prohibited, the risk-free rate becomes lower in the domestic country ($FI > NE > NEB$). In the foreign country, $NEB > FI > NE$. The world risk-free rate is increased as a result of a move toward integration (C, D).

The return demanded by the foreign investors on the risky foreign equity will be higher as restrictions are imposed by the domestic country. On the other hand, the return on domestic risky equity is reduced by restrictions on foreign investment by domestic residents ($FI > NE > NEB$) (E). This is

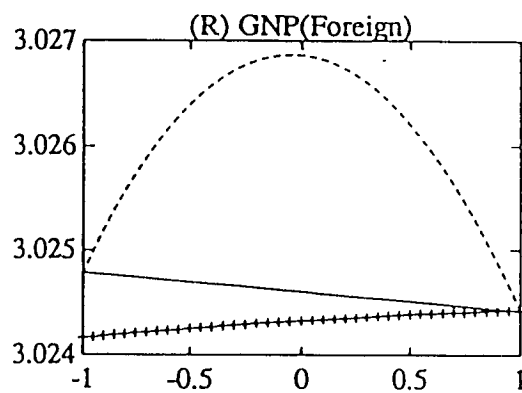
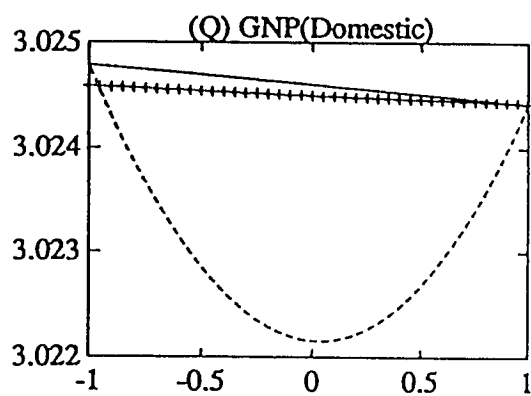
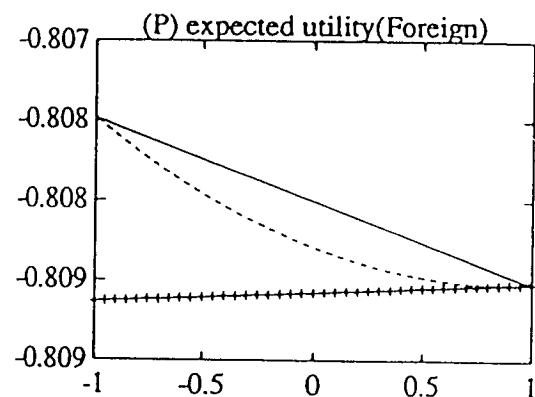
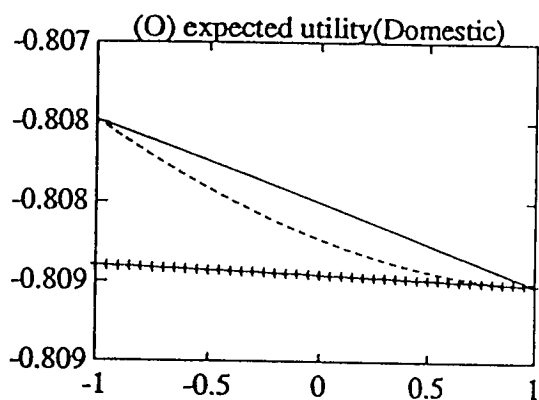
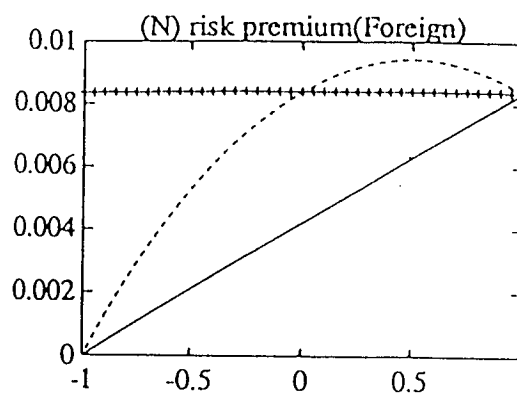
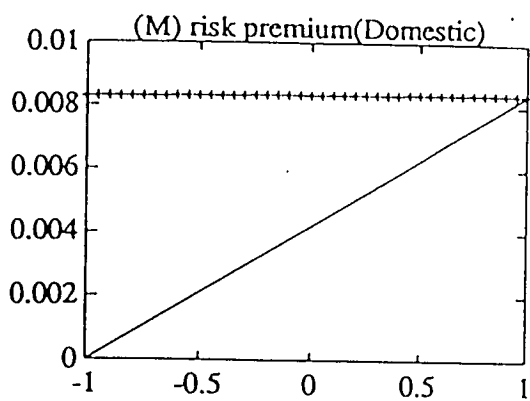
⁹ For each of the graphs in Figure 6, the autarky situation can be illustrated by a horizontal line going through the value at $\text{corr} = 1$.

Figure 2.6. Comparison of Financial Regimes
(values graphed against correlation coefficient)

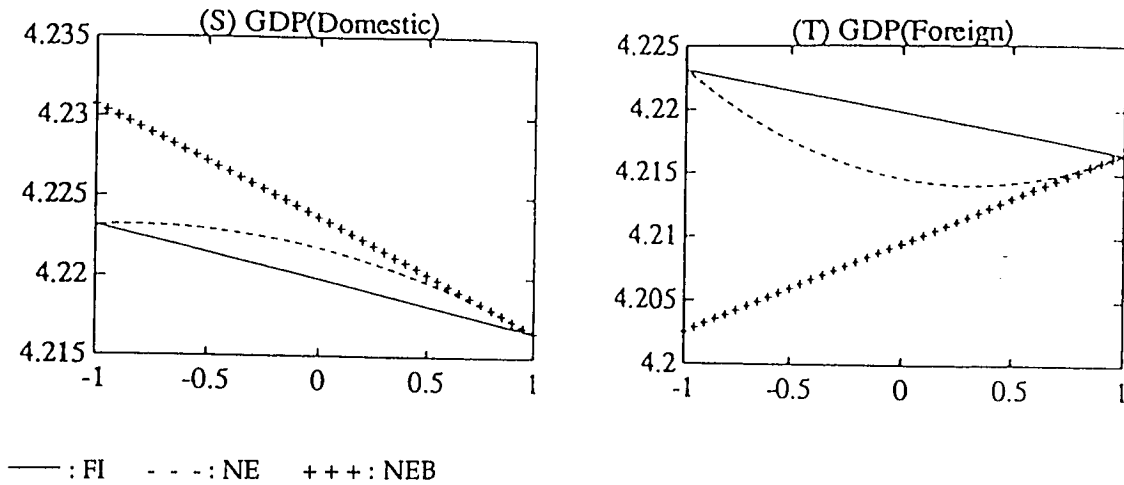




— : FI - - - : NE +++ : NEB



— : FI - - - : NE + + + : NEB



because the risk of foreign equity can not be diversified whereas that of domestic equity is diversified under NE and NEB. The risk premium on the domestic equity becomes larger as compared the premium under no regulations ($FI > NE > NEB$). The ordering is not unambiguous for the premium on the foreign equity (M, N). However, compared to the full integration case, foreign investors should pay a higher risk premium for local equities which are subject to restrictions.¹⁰

The changes in wage are related to the changes in capital accumulation in each country. When asymmetric barriers to foreign investment are removed, the steady-state wage in the foreign country goes up ($FI > NE > NEB$), while the domestic wage declines ($FI < NE < NEB$) (G, H). Workers may be against the removal of asymmetric barriers to foreign investment, because their wage income will be reduced in the long run. Similarly, if the domestic country does have investment restrictions, foreign workers might pressure for investment restrictions in the foreign country too since wages would be higher under autarky.

¹⁰ This observation supports the guess by Mehra and Prescott about the effect of capital market restrictions on risk premium mentioned earlier in this paper.

As long as they are not prohibited, foreign residents hold domestic equities for portfolio diversification. Under any restrictions on foreign investment by domestic residents, the foreign country exports capital and the domestic country imports capital. Therefore, the domestic country obtains a higher physical capital stock in the economy and higher GDP. The picture (S) illustrates this observation. The opposite is the case for the foreign country (T).

Both countries would be better off when investors can hold both domestic and foreign assets, since risk is reduced via international portfolio diversification. All investors would be in favor of a move toward market integration ($FI > NEB > NE$). Under the regimes of NE and NEB, the domestic country, which is capital-importing, is better off compared to autarky equilibrium, whereas the foreign country, which is capital-exporting, is worse off. (O, P)

Thus, we find that the domestic country might be able to obtain higher levels of physical capital accumulation and domestic output by restricting foreign investment by domestic residents. This may give the domestic government a motive to impose restrictions on asset holding by domestic residents. Nevertheless, economic welfare is actually reduced despite the high capital accumulation and increased economic growth. This finding indicates that macroeconomic variables like capital accumulation, GNP per capita, GNP growth or average wages are not welfare measures even though they are often used as if there were. These variables do not correspond to expected utility.

3. CONCLUSION

The main objective of this research was to construct a model capable of analyzing the macroeconomic effects of the regulation of international capital movements. We developed a general equilibrium model of international capital movements where uncertainty is explicitly taken into consideration. The model was used to analyze the effects on macroeconomic variables of changes in the financial regime governing international capital flows. We claimed that financial regulations might significantly affect real economic variables such as physical capital accumulation, consumption, real wages and welfare. The key findings are summarized as follows:

- When no financial regulations exist, capital accumulation in both countries is higher than under autarky, and both countries reach a higher level of welfare.
- The risk premium on equities under restrictions is greater than the risk premium on the same equities under no restrictions.
- When the domestic country imposes financial regulations, but the foreign country does not retaliate, the domestic country would be better off compared to the foreign country.
- Domestic investors would be in favor of a move by the domestic authorities toward market integration, but wage earners would be against the removal of restrictions on foreign security ownership by domestic residents.
- Restrictions on foreign investment by domestic residents can produce a source of “cheap” investment funds for domestic industries, which in turn might be expected to stimulate investment and domestic economic growth.
- Nevertheless, economic welfare is actually reduced despite the high capital accumulation and increased domestic output.

Since it is impossible to analytically solve the relevant equation systems, this paper used numerical calculations to lead to several interesting findings.

Nevertheless, the model has few components and these are easily described. As a result, the simulation findings are highly intuitive and easily understood. This paper has some important implications for policy makers who are willing to impose regulations on the flow of international capitals.

There are several extensions to pursue with the model. First, we could assume two different agents, say investor and wage earner, to highlight the distributional aspect of capital market regulations and deregulations. In the model discussed above assumed a representative agent and it was not clear how differently conflicting interests reacts to shifts in the financial regime.

To capture the growth effects of capital controls, it might be of great interest to introduce increasing returns to scale into production technology and produce an endogenous growth model. In this paper, the long-run growth is taken as given at zero (we assumed zero population growth rate) and changes in the financial regime would not affect the long-run growth rate of the economy. However, with a reasonable model, we will be able to explore some potentially interesting questions concerning the characteristics of capital accumulation and growth. When growth is attributable to external effects such as human capital accumulation and information accumulation, policy changes like the introduction of capital controls or capital market liberalization would increase or reduce each firm's capital accumulation by influencing the rate of technological change. As a result, aggregate capital accumulation and the growth of the economy would be altered.

As for another possible extension, it seems fairly clear that we need to introduce money and nominal assets to analyze the effects of the regulation of international capital movements on exchange rate volatility, which is one of central questions in the literature of international finance. More precisely, we can study how different financial regimes governing international capital

movements determine the risk characteristics of nominal assets, how these characteristics determine international portfolio diversification, and how the equilibrium exchange rate would be affected.

CHAPTER III

EMPIRICAL EVIDENCE ON THE INTERNATIONALIZATION OF THE JAPANESE CAPITAL MARKET

The main objective of this chapter is to investigate the Japanese economy to see how closely its financial market has been connected to the world financial market and how well the theoretical model of this dissertation corresponds reality. One of the most notable developments in international financial markets has been the emergence of Japanese financial institutions as a major source of international risk sharing and maturity transformation, borrowing short in the world interbank market in order to lend long through the purchase of bonds and equity, as well as through foreign direct investment. By examining the Japanese data, we can draw some conclusions on the internationalization of capital markets and its effects on macroeconomies.

The primary reason for choosing Japan for this empirical research is that the model of the previous chapter concerns large economies and so the experiences of small countries are unlikely to be explained by the model. Another reason for choosing Japan is its importance in the world capital market as it has emerged as the largest net exporter of capital in the world. According to *International Financial Statistics*, the liabilities of Japanese residents to foreign banks in 1991 amounted 831 billion dollars which was about 15% of the world's total. In the same year, the claims by Japanese residents to foreign banks were 14% of the world's total with 751 billion dollars. According to *OECD Financial Statistics* on funds raised on the international markets, Japan's 71 billion dollars as of the end of 1992 are equivalent to about 16.7 % of the world's total.

As presented in Table 3.1, the increase of Japan's share in both the bond markets and the equity markets has been outstanding among the four countries: the United States, the United Kingdom, Germany and Japan, the capitalized values of the markets in which accounted for roughly 81 percent of the world equity market and 78 percent of the world bond market.

Table 3.1. Equity and Bond Market Shares of Four-Country Aggregates: 1975-1990

	1975	1980	1985	1990
<u>Equity Markets</u>				
United States	72.1	65.4	58.1	41.3
Japan	14.5	19.4	26.9	41.5
Germany	5.7	4.6	5.3	5.2
United Kingdom	7.7	10.6	9.7	12.0
<u>Bond Markets</u>				
United States	63.5	53.7	64.1	59.2
Japan	13.9	22.1	22.0	24.6
Germany	15.7	17.2	10.4	13.6
United Kingdom	6.9	7.0	3.5	2.6
<u>Financial Markets (Equities plus Bonds)</u>				
United States	67.0	58.0	63.2	51.3
Japan	14.2	21.0	22.8	32.0
Germany	11.6	12.7	9.6	10.0
United Kingdom	7.2	8.3	4.4	6.7

•Sources: Recalculated from Tesar and Werner (1992)

This chapter begins with an institutional history of capital account regulation and deregulation in Japan. The first section traces the process whereby the Japanese financial market has become highly integrated into the world market over the last two decades. The next section examines the extent

to which the capital markets have been internationalized. We attempt to determine whether the changes in financial regulatory policies in Japan have been associated with a greater degree of internationalization of its capital market. Unfortunately, existing literature does not provide a conclusive definition of internationalization of capital markets. Therefore, a variety of measurements of capital mobility are surveyed and their empirical evidence leads to a new tentative judgment. Three alternative approaches to defining internationalization are followed.

In section 3, we investigate whether the findings in the previous chapter have in fact occurred in the Japanese economy. This section looks for adjustments on the asset supply side while section 2 focuses on changes in rates of return on assets. Section 4 includes the concluding remarks.

1. A BRIEF HISTORY OF THE INTERNATIONALIZATION OF THE JAPANESE CAPITAL MARKET

The experience of internationalization of the Japanese capital market falls into three distinct periods. The first is the period to 1973 when the world economy was suffering from the First Oil Crisis and the Brettonwood System collapsed. The Japanese financial system was highly regulated during the 1950s and 1960s. In 1974, the high growth of the Japanese economy halted and there was a consequent accumulation of government debt that changed the structure of the flow of funds. During this period, most short-term capital flows in and out of Japan were in general subject to restrictions. The second period extends from the late 1974 to 1980. This is the period during which the financial scene changed quite dramatically, with some liberalization occurring on the domestic and external fronts. The third period is from 1980 onwards when Japan's capital market became progressively more open to the rest of

the world. In the following, we review the brief history of the foreign exchange market, the foreign bonds market¹¹ and the foreign stock market in Japan.

1.1. Before 1974

In this period, no Japanese security companies could purchase foreign securities, and no foreign companies could purchase Japanese securities. Opportunities from arbitrage were exploited by leads and lags, but not by capital flows.

Samurai bonds market

The yen-denominated foreign bonds market was established by the issue of Asian Development Bank bonds in December 1970. Issues by international institutions such as World Bank and the Commonwealth of Australia followed. Due to restrictive management of the market, the number of yen-denominated publicly offered bonds issues stayed at three to five a year.

Equity market

Equity investment has been the easiest way for nonresidents to invest in Japan in the postwar years.

After October 1972 each securities dealer in Japan was required, until November 1973, to avoid net sales of Japanese securities to nonresidents. Any given nonresident customer could acquire Japanese equities but only if another nonresident were willing to sell. This regulation continued well past

¹¹ Foreign bonds that are issued (1) in the Japanese market, (2) by non-residents, and (3) with yen denomination are commonly called "Samurai bonds." If (1) is altered to being issued in the Euro-market, then they would be Euroyen bonds; if (2) is altered to being issued by residents, then they would be domestic bonds; and if (3) is altered to be denominated in foreign currencies, then they would be called "Shogun bonds." Up to around 1984, a slightly negative policy had been placed on the Euroyen bond issue which was aimed at the balanced development of its market with that of the yen denominated foreign bond.

the advent of a floating exchange rate in February 1973; it was rescinded only when the yen began to weaken after the first oil crisis.

As far as foreign equity purchase was concerned, residents were treated far more strictly than nonresidents. Equities were subject to the declaration and liquidation-at-request requirement of the old foreign exchange law, and each equity investment required approval, even until 1971. In general only investment trusts were allowed to purchase foreign equities, and this only on a case-by-case basis. But official attitudes changed in mid-1971 as the exchange crisis approached. After July 1971 all residents except mutual funds were permitted to purchase foreign equities in any amount. This treatment changed abruptly with the oil crisis; case-by-case approval was required after November 1973.

1.2. 1974 - 1980

During this period, the regulatory structure of the Japanese capital market appeared to reflect concerns about the exchange rate.¹² The motive was concern over monetary independence. Japan, like Germany and Switzerland, had a reputation for maintaining a strong currency, and potential demand for yen assets by international investors was growing. When the yen was depreciating quickly, deregulation to encourage inflows of capital took place; and when the yen was rapidly appreciating, deregulation to encourage outflows of capital was introduced. For example, in the wake of yen depreciation, short-term government securities became available to non-residents in August 1974, although their interest rate was fixed at a level lower than the market rate. In an attempt to stop a long process of yen appreciation in 1977, Japanese security firms and others were allowed to

¹² See Otani (1983) for details.

acquire foreign securities. After hitting an all-time high in late 1978, the yen depreciated rapidly in 1979.

In 1979, several steps were taken to encourage capital inflows to prevent rapid yen depreciations: Foreign companies were allowed to purchase any Japanese securities in February and to trade repurchase agreements (Gensaki) in May. It should be noted, however, that there was a short spell of capital control tightening between 1977 and 1979. This is one of a few occasions when controls were tightened, only to be deregulated shortly thereafter. The marginal reserve requirement for "free" yen accounts by nonresidents was increased to 50% in November 1977 and to 100% in March 1978, and then reversed to 50% in January 1979 and 0% in February 1979. Nonresidents were prohibited from purchasing any Japanese securities with maturities less than five years and one month after March 1978 to February 1979.

Samurai bonds market

The Samurai bonds market was closed between 1974 and mid-1975 as the trade balance of Japan worsened due to the first oil crisis and rising interest rates world-wide. A sharp drop in domestic interest rates, coupled with a rise in world-wide demand to transfer Japan's huge trade surplus, and a less regulated market place led the bond market to take off in 1977, when 22 issues were made with a total issue amount of ¥454. In 1978, the size of the Japanese domestic issuing market became the world's third largest after Switzerland and the United States.

Equity market

Since 1973 regulation of nonresident purchases in the equities market has been progressively eased to the point of virtual elimination. With the change in the direct investment law in 1973, the 25%/15% limits on portfolio acquisitions were eliminated, and after 1976 stock purchases were given

automatic approval. Moreover equities retained an advantage over other securities since proceeds of liquidation of equities could go directly into the foreign exchange market, while proceeds of liquidations of other securities had to be deposited in bank accounts before conversion to foreign exchange. Under the new foreign exchange law nonresident acquisition of Japanese equities requires notification (usually by the securities firm handling the transaction) but no wait as long as the acquisition is not in the nature of direct investment.

The Ministry of Finance issued a directive to securities dealers not to encourage residents to buy foreign equities (or other securities); this directive was not revoked until June 1975. After that, however, foreign equity purchase by residents became fully free. Under the new foreign exchange law it is fully free if executed through a designated dealer and requires notice, but no wait, if executed through a non designated dealer.

The timing of regulatory changes on equity purchase, particularly around the times of the wide swings in the current account in the 1970-1977 period, demonstrates clearly how the regulatory structure reacted to market forces. But this regulatory reaction, at least with respect to equities purchase, has ceased since the late 1970s, and the stable environment has made equities one of the faster-growing vehicles for cross-border investment in Japan.

1.3. After 1980

In December 1980, the new Foreign Exchange and Foreign Trade Control Law became effective allowing free flows of capital in and out of Japan with a few exceptions. The law specifies various conditions under which controls can be reimposed: a dangerously unstable Yen: a threat to domestic capital markets, monetary policy, or balance of payments; a substantial threat to a

domestic industry; or the inability of Japan to meet international agreements.

Major outcomes of this law are summarized by Ito (1986):

Japanese companies and individuals are now allowed to invest in foreign securities without security firm's intermediation; foreign loans by Japanese no longer need permits, but reporting only; non-residents can purchase and sell Japanese securities without any licensing; non-residents can issue bonds in Japan with prior reporting only; and Japanese residents can open deposit accounts denominated in foreign currencies with market-determined interest rates.

Samurai bonds market

The Samurai bonds market weakened in 1979 and 1980 because of the rise in domestic interest rates and generally weak yen in the foreign exchange market. In 1984, however, due to an increase in the number of new issuers following relaxation of issuing qualifications and an increase in the maximum issuing amount per issue, the bond issues picked up and hit a historical record amount in 1985.

However, in 1986, the yen denominated foreign bonds market became extremely slow due to the liberalization of the Euro bonds market, which competed with the Samurai market. Only 18 issues with an issue amount of ¥440 billion were realized that year. However, with deregulation, together with the revaluation of relatively low yen interest rates and a stable yen in the foreign exchange market, and the increase in number of issuance with swap arrangements, pushed issues in 1989 to 43 worth a total ¥1,000.5 billion.

Euroyen market

The Euroyen bond issues and Euroyen loans increased substantially due to the gradual deregulation measures taken after the Joint Japan-US Ad Hoc

Group on yen/dollar Exchange Rate, Financial and Capital Market Issues in May 1984. Table 3.2 shows the liberalization of Euroyen bond market after 1981. Reflecting the advance of liberalization, Euroyen bonds have shown steady issuing results. The issuing rules of non-resident Euroyen bonds, which accounts for the majority of the actual issues of Euroyen bond were substantially deregulated in June 1990. From the view of further promotional deregulation, international restrictions were removed and bond issues with a term shorter than four years were admitted.

Table 3.2. Comparison of Euroyen Bond and Yen Denominated Foreign Bond Issues

Year	Euroyen Bond				Yen Denominated Foreign Bond			
	Non-Resident Issue		Resident Issue		Samurai Bond		Private Issue	
	Number	Amount	Number	Amount	Number	Amount	Number	Amount
1981	5	800			27	4,950	13	1,175
1982	6	950			37	6,630	30	1,930
1983	4	700			41	7,200	32	1,9301
1984	13	2,270			37	9,150	34	1,790
1985	66	14,457	7	1,400	35	11,150	24	1,995
1986	141	25,515	21	4,170	21	5,900	21	1,575
1987	151	29,939	16	5,200	15	4,200	10	1,950
1988	224	22,130			22	6,350	19	1,622
1989	395	35,570	1	120	41	9,255	10	735

•Sources: FAIR FACT SERIES II *Japan's Financial Markets* (1991)

2. INTERNATIONALIZATION OF THE JAPANESE CAPITAL MARKET

In the first part of this section, we consider the definitions of essential concepts in examining the internationalization of capital markets. Later in the section, we examine the trends in internationalization of the Japanese capital market.

2.1. Terminology

A variety of terms are commonly used to capture the trend toward interconnectedness of national financial markets: capital mobility, capital substitutability, capital market integration, and internationalization of the capital market. From the viewpoint of individual countries' financial markets, the trend is "internationalization" or "globalization." From the viewpoint of the world economy, it is called "integration," the opposite of "segmentation."

Integration of international capital markets has been possible by "liberalization" and "deregulation" on the part of national governments (the removal of controls, regulations, and taxes) and "innovation" on the part of the private sector (the development of new financial instruments and new ways of issuing and trading them). Innovation includes "securitization": securities such as stocks and bonds are now increasingly sold directly to investors, often without the participation of banks ("disintermediation").

The extent of internationalization is often called "capital mobility" or "capital substitutability". Capital mobility refers to the ease with which funds may be shifted from one financial market to another in response to changes in expected relative returns. Perfect mobility implies zero transaction costs and the absence of a domestic bias in portfolio preferences.

Capital substitutability refers to the willingness of investors, in response to changes in expected relative returns, to shift among assets that differ only by currency of denomination and that are not covered against exchange rate movement. This definition therefore focuses on the cross-partial derivatives of asset demands or liability supplies in the investing and wealth-allocating behavior of individual investors. Perfect substitutability implies an infinite cross-price elasticity of demand between domestic and foreign assets.

Perfect substitutability, together with the absence of transactions costs, implies equalization of expected yields on foreign and domestic assets. An alternative and weaker definition of perfect capital mobility does not require perfect substitutability, but merely the absence of home-asset preference, i.e., investors are risk-averse but asset demand functions are not country-specific.

2.2. Tests of the Internationalization of the Japanese Capital Market

There has been considerable debate in the literature of international finance on the extent of internationalization of capital markets. A different criterion for internationalization may lead one to a different interpretation of reality. Therefore, it is important to be clear about distinct criteria for measuring the extent of internationalization before seeing how each criterion fits the real economy. Such clarification is essential for correctly interpreting the results obtained below. The following three different approaches are considered in this section.

(1) Quantitative measures

Internationalization of an economy may be gauged by reviewing flows of transactions.

(2) The correlation between domestic saving and domestic investment

Under this notion of internationalization, a country wishing to invest more than it saves should be able to do so by borrowing abroad. Statistically, such independence of investment from the level of domestic savings should be manifested in a low level of correlation between the two variables

(3) Interest parity

We can also judge the internationalization of the Japanese capital market by defining internationalization in terms of an optimality condition, i.e., the degree of price or yield dispersion within some area for the same financial instrument.

2.2.1. Quantitative Measures

It is natural to consider the volume of international capital flows even though it seems too naive to draw any conclusive judgment on the internationalization of financial markets based on examining such flows.

(1) Volume of Trade in the Foreign Exchange Market

The growth of foreign exchange trading gives the most aggregate indicator of the heightened degree of integration of Japan's financial markets with those of the rest of the world. As Japan has risen to the position of the world's largest creditor country, Tokyo has now become one of the three premier centers of the world together with London and New York. According to Bank for International Settlements' data, the yen's share of the world's foreign-currency reserves increased from 0.5 percent in 1975 to 10.4 percent in 1991 while the US dollar dropped its share from 79.4 percent to 55.6 percent during the same period.

The volume of foreign exchange trading is not sufficient to capture the full flavor of what has happened. In addition to the depth of internationalization illustrated by the foreign exchange transaction growth, there was substantial growth in the breadth of internationalization. This can be illustrated by consideration of what this foreign exchange was used to buy.

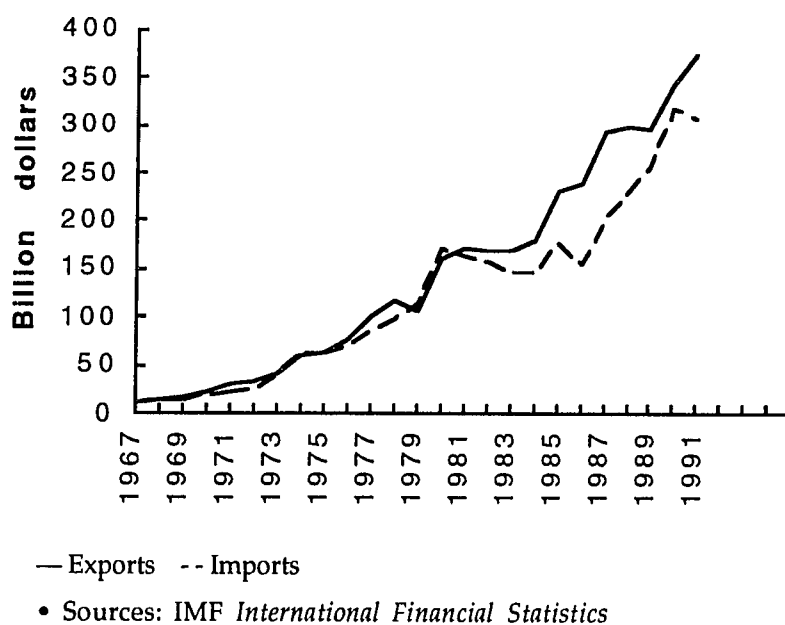
(A) Current Account Behavior

As the international competitiveness of Japanese firms has risen and provided the basis for a steady expansion of the national economy, exports and imports have increased steadily as shown in Figure 3.1. For instance, exports increased from the \$162 billion level in 1980 to 373.9 billion in 1991. Over the same period, imports also grew from \$ 172.6 billion to \$307.7 billion.

One of the reasons for the growth of Japanese foreign trade was that the yen/ dollar exchange rate changed drastically from 362 to 125 and bloated

dollar equivalents. A stronger yen reduced import prices dramatically, touched off structural reform in Japanese industries, changed the Japanese economy into one led primarily by domestic demand, leading ultimately to the spectacular increases in imports.

Figure 3.1. Japanese Exports and Imports: 1967-1991



Meanwhile, Japan's share of the world trade has been increasing up to 10.9 % of exports and 8.7 % of imports as of 1991. Trade between Japan and the rest of the world is now also increasingly denominated in yen. The ratio of Japan's imports settled in yen reached a record high of 10.6 % in 1987. The ratio of Japan's exports settled in yen has been around 30%.

(B) Capital Transactions

Rather than treating capital flows in general, we focus on the two types of capital flows, i.e. direct investment and portfolio investment by residents, which are large in sum and have a significant bearing on currency trading in

the Tokyo foreign exchange market. The global pattern of direct and portfolio investment is presented in Table 3.3.

(a) Direct Investment

Japanese foreign direct investment, existing since the 1970s, underwent a major change in the 1980s. Direct investment in the 1970s was concentrated geographically on developing countries in Asia and Latin America, mainly for manufacturing industries and natural resources development.

The situation changed drastically in the beginning of the 1980s. The motivation was the appreciation of the yen and an accompanying rapid surge of current surplus. However, overseas investment by Japanese manufacturing industries gained momentum spurred not only by intensified trade friction but also as a positive response to the European Community integration and industrial restructuring. The medium-term trend for a stronger yen since 1986 forced Japanese industries to opt for relocating their production facilities.

(b) Portfolio Investment

Foreign ownership of Japanese equities has been insignificant at least until the early 1970s (see Table 3.3). However, the regulatory environment changes that accompanied the new foreign exchange law beginning in 1980, particularly the shift of reporting burden from purchasers to dealers, generated a significant reduction in transactions costs due to economies of scale in reporting. Foreign ownership has risen since then. The jump in foreign ownership is also attributable to habitat shift based on expectations. The relatively strong recovery of Japan after the first oil shock gave the world's investors confidence that Japan would weather the second oil crisis equally well.

The acquisition of foreign currency securities by Japanese residents rose sharply after the revision of the Foreign Exchange and Foreign Trade Control Law in 1980, and reached the \$100 billion level in 1986.

Table 3.3. Pattern of Direct and Portfolio Investment in Industrial Countries

	1975-79	1980-84	1985-89	1990	1991
Total Outward Direct Investment	35.3	42.4	134.9	222.4	177.3
United States	15.9	9.6	22.8	33.4	29.5
Japan	2.1	4.3	23.8	48.0	30.7
European Community	14.2	20.9	59.4	97.5	80.5
Total Inward Direct Investment	26.9	52.6	117.6	179.6	157.9
United States	6.1	18.6	48.2	37.2	22.2
Japan	0.1	0.3	0.1	1.8	1.4
European Community	11.4	14.2	38.4	85.9	67.7
Total Outward Portfolio Investment	12.4	41.8	176.8	151.6	277.6
United States	5.8	5.8	9.5	28.5	46.2
Japan	2.6	13.8	89.9	39.7	74.3
European Community	3.8	18.9	62.6	79.8	144.0
Total Inward Portfolio Investment	25.0	57.8	186.0	159.1	388.7
United States	4.6	16.7	59.2	2.9	52.3
Japan	3.0	11.9	23.3	34.7	115.3
European Community	8.5	17.7	70.4	94.4	173.7

• Sources: Bank for International Settlements, Annual Report (1992)

(2) Gross Capital Flows

Net capital flows have little connection to the foreign exchange market's day-to-day pressures, to which authorities reacted in regulatory changes. Rather, gross capital flows on an asset-by-asset basis are a more reliable indicator of pressures in the system.

The basic idea behind this notion is that when capital is highly mobile, *gross* or *two-way* capital flows are likely to be large even when net flows are

small. A lot of authors have believed that two-way international capital flows are large despite of documents on small net flows. For instance, Feldstein (1983) notes the puzzling fact that substantial gross capital flows produce only relative small net capital flows. Capiro and Howard (1984) mention 'massive gross capital flow' and Obstfeld (1986) asserts that 'gross capital flows have been large.' Earlier than these authors, several theoretical papers suggest the coexistence of large gross capital flows with small net flows. Krugman (1981) shows that a large volume of two-way trade in financial assets occurs in a world of differentiated financial assets because intra-industry trade in the goods market is large under conditions of low transactions costs and differentiated products. Golub (1992) presents gross flows as a better criterion of capital mobility to show that they are small compared to gross asset creation for OECD countries, although the degree of capital mobility by this measure has been increasing.

Table 3.4 shows the cumulative flow supplies of domestic financial assets, private domestic holdings of foreign financial assets (assets) and private foreign holdings of domestic financial assets (liabilities). These figures provide suggestive evidence that the openness of the Japanese financial system did not change much in the early and late-1970s, but increased significantly thereafter. Note, for example, that the relative ratio of net foreign assets to domestic assets increased from 1.2 over the period 1967-1979 to 3.4 over the period 1981 to 1990. This change seems not to be large enough to argue that there has been significant trends of the integration of the Japanese financial market into the world financial system. However, the relative ratio of foreign assets to domestic assets increased from 3.5 to 11.3 over the same sample periods. The relative ratio of foreign liabilities to domestic assets also increased from 2.4 to 7.8.

Table 3.4. Foreign Assets and Liabilities as a Ratio of Domestic Asset Supply (billion yen)

Year	(a)Assets	(b)Liabilities	(c)Domestic Asset Supply	$\frac{(a)}{(c)}$	$\frac{(b)}{(c)}$	$\frac{(a)-(b)}{(c)}$
1967	458	527	25,560	1.8	2.1	-0.3
1968	979	602	25,404	3.9	2.4	1.5
1969	1,296	534	36,544	3.5	1.5	2.1
1970	1,758	1,049	42,861	4.1	2.4	1.7
1971	4,218	2,217	49,417	8.5	4.5	4.0
1972	3,340	1,300	74,401	4.5	1.7	2.7
1973	961	993	87,519	1.1	1.1	0.0
1974	2,407	3,736	70,343	3.4	5.3	-1.9
1975	753	9,54	100,413	0.8	1.0	-0.2
1976	2,877	1,799	99,346	2.9	1.8	1.1
1977	2,958	142	87,967	3.4	0.2	3.2
1978	6,694	3,209	113,879	5.9	2.8	3.1
1979	2,537	4,506	115,807	2.2	3.9	-1.7
1980	6,940	9,517	120,415	5.8	7.9	-2.1
1981	8,901	7,754	129,292	6.9	6.0	0.9
1982	5,762	3,987	123,031	4.7	3.2	1.4
1983	10,944	5,984	144,257	7.6	4.1	3.4
1984	15,511	7,160	148,593	10.4	4.8	5.6
1985	24,672	13,154	154,951	15.9	8.5	7.4
1986	37,799	23,620	190,880	19.8	12.4	7.4
1987	41,205	28,664	255,897	16.1	11.2	4.9
1988	40,442	30,250	252,772	16.0	12.0	4.0
1989	42,493	34,640	326,771	13.0	10.6	2.4
1990	17,548	12,346	219,902	8.0	5.6	2.4

•Sources: OECD Financial Statistics *Financial Account*

Empirical evidence on the quantity measures above exhibits increased openness of the Japanese financial market. Internationalization, defined as large increases in quantities of foreign exchange and cross-border investment

transactions, was already occurring at a rapid pace in the 1970s but accelerated after implementation of the new foreign exchange law of 1980. Internationalization unleashed forces that have raised the overall efficiency of funds use in Japan and in the rest of the world.

It is not straightforward, however, to choose the best measurement of the quantities. Neither is it straightforward to determine which securities are more important as indicators of internationalization. These are problems both because of the difficulty of summarizing large amounts of information in single indicators and because of the inability of quantity measures alone to have clear implications for resource allocation.

Quantity data examined above provide only indications of improved efficiency but efficiency is defined not by movements of quantities. Indeed, even small quantities of trade can ensure equalization of prices and hence efficient resource allocation. Thus increases in traded quantities indicate only movements toward efficiency, not full achievement of it. The quantity approach, although informative, is therefore not wholly adequate.

2.2.2. Correlation between Saving and Investment

Internationalization can also be approached from the viewpoint of the correlation between domestic saving and domestic investment. The rationale underling this criterion for internationalization is that if domestic saving were added to a world saving pool and domestic investment competed for funds in the same world saving pool, countries with a high level of investment need not rely on an equally high level of domestic saving. In such an environment, the gap between domestic investment and saving would always be financed by foreign saving via a current account deficit and thus there would be no correlation between a nation's saving rate and its rate of investment.

This criterion of the degree of internationalization stems from a paper by Feldstein and Horioka (1980). They questioned the view that the world economy had been characterized by high and rising capital mobility in the post-war period by showing that domestic saving and international investment flows were highly correlated in a cross-section sample of 17 OECD countries. Subsequent papers conducted regression tests which confirmed that domestic investment moves closely with domestic savings. The interpretation of the initial Feldstein and Horioka results as evidence on the immobility of capital has been challenged by a number of critics.

The skeptic researchers have criticized at least two aspects of the Feldstein and Horioka study. First, even if financial capital moves freely, there are a number of other plausible macroeconomic reasons which cause the observed co-movements in saving and investment. Saving and investment may be correlated because of their similar response to certain types of exogenous shocks such as population growth, technological shocks and imperfect integration of goods markets (see Frankel (1986) and Krugman (1989)). For example, in the presence of constraints to the mobility of labor and physical capital, an unanticipated productivity increase would boost both domestic saving and investment. Similarly, if an autonomous rise in private saving is associated with a decline in demand for consumer goods the production of which is relatively labor intensive, then one would expect a rise in the marginal product of capital and hence a concomitant rise in domestic investment.¹³

The second explanation is that governments may have responded endogenously to shifts in the net balance of private saving and investment

¹³ For a further exposition of these issues, see Artis and Bayoumi (1989) and Tesar (1988)

through altering public sector saving. In other words, fiscal policy in the 1960s and 1970s may to some extent be adjusted to national saving rates in order to dampen fluctuations of the current account balances. Although this hypothesis is difficult to test, there is some evidence to support it indirectly. Notably, correlations between private saving and investment tend to be less close than those between total national saving and total domestic investment. Although there are other possible explanations, this finding is consistent with the hypothesis that policy-induced changes in government saving have offset shifts in the private saving-investment balance.

More recent studies suggest that the close correlation between investment and saving that had prevailed during the 1960s and 1970s began to break down in the early 1980s - see Frankel (1991) and Feldstein and Bacchetta (1991). This breakdown may be attributable to coincidental events. One is that the pace of financial reform was intensified in the industrial countries in the 1980s, particularly in the high-saving countries such as Japan and Germany. As a result, a substantial source of saving was made available in the international capital markets. At the same time, a widening of budget deficits in a number of low-saving countries, particularly the United States, created excess demand for saving and attracted foreign saving through higher interest rates. These stylized facts help explain the large current account imbalances between the United States, on the one side, and Japan and Germany, on the other.

Despite of the criticisms mentioned above, the Feldstein and Horioka study still has many implications for the internationalization of financial markets. In this section, I update the data Feldstein and Horioka used in their study so as to include the experience after the early 1980s. Starting with their

original regression, we reconsider the criticisms outlined above using the same data.

The analysis of Feldstein and Horioka is based on the regression equation

$$(1) \quad \frac{I_t}{Y_t} = \alpha_0 + \alpha_1 \frac{S_t}{Y_t},$$

where I_t is gross investment, Y_t is gross product domestic product, and S_t is gross saving.¹⁴ The "savings retention coefficient", α_1 , indicates the proportion of the incremental savings that is invested domestically. We carried out the regression with updated data for the period 1970-1991. To verify that the 1980s experience is indeed the source of the precipitous fall in the saving-investment coefficient, the sample period is split at 1980 when the new Foreign Exchange and Foreign Trade Control Law became effective.

The results are summarized in Table 3.5. In panel (A), the Ordinary Least Squares (OLS) regression results for the first subperiod are very similar to the original results of Feldstein and Horioka, in that the savings retention coefficient is significantly different from zero and close to unity, indicating that most of an increment to saving spilled over into investment. The coefficient falls in the next decade¹⁵. Taken at face value, these regressions support the presumption that capital mobility has increased since 1980, but also suggest that it remains far from perfect. It is worthwhile to note that the R^2 is lowered in the second subperiod regression. This is due to the increased

¹⁴ The data source is *International Financial Statistics* from the International Monetary Fund. Saving is defined as Gross National Product plus net unilateral transfers minus government and private consumption. Investment is gross fixed capital formation plus change in stock.

¹⁵ The F statistics for the Chow test is 42.03 and so the null hypothesis that there were no significant changes in the coefficients is rejected.

current account imbalances Japan has had since the early 1980s as shown in Figure 3.2.

Table 3.5. Feldstein-Horioka Type Regression

(A) Ordinary Least Squares

Period	α_0	α_1	R^2	SSE	Serial Corr.*	Heterosced.**
Whole period:	-0.022	1.015	0.7152	0.02751	$\chi^2 (4) = 79.55$	$\chi^2 (1) = 1.21$
1970-1991	(0.023)	(0.069)			(0.000) [°]	(0.272) [°]
Subperiod I:	0.041	0.866	0.8111	0.00749	$\chi^2 (4) = 36.46$	$\chi^2 (1) = 0.55$
1970-1980	(1.794)	(13.429)			(0.000) [°]	(0.459) [°]
Subperiod II:	0.058	0.735	0.5084	0.00335	$\chi^2 (4) = 31.71$	$\chi^2 (1) = 0.05$
1981-1991	(0.974)	(4.203)			(0.000) [°]	(0.449) [°]

(t-ratios in parentheses)

* Lagrange multiplier test of residual serial correlation

** Lagrange multiplier test of heteroscedasticity based on the regression of squared residuals on squared fitted values

[°] p-value

(B) Exact Maximum Likelihood Method

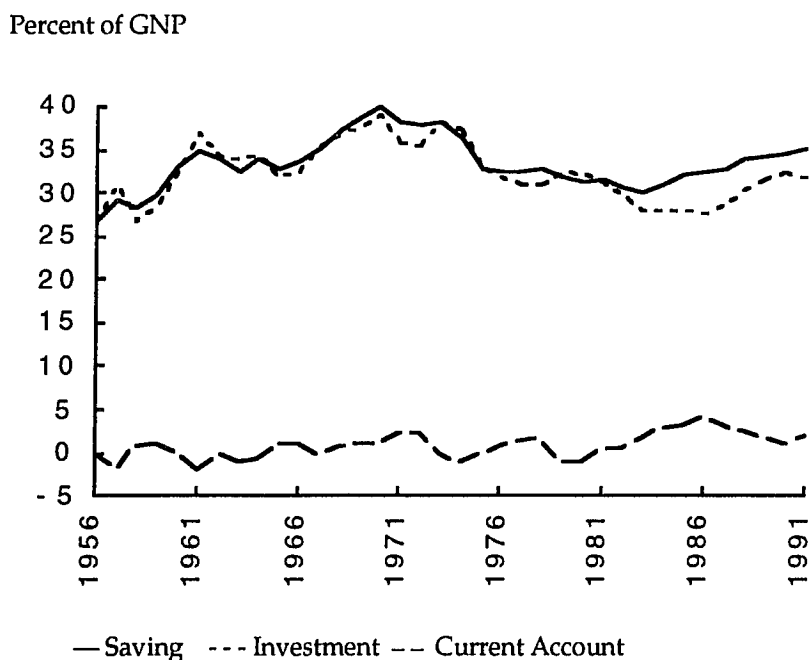
Period	α_0	α_1	R^2	AR(1)	AR(2)	SSE
Whole period:	0.041	0.827	0.9739	1.214	-0.274	0.00251
1970-1991	(1.254)	(8.989)		(11.839)	(-2.670)	
Subperiod I:	-0.017	1.030	0.9683	1.302	-0.454	0.00125
1970-1980	(-0.476)	(10.200)		(9.693)	(-3.383)	
Subperiod II:	0.248	0.166	0.9687	1.522	-0.576	0.00047
1981-1991	(8.190)	(1.905)		(12.409)	(-4.67)	

(t-ratios in parentheses)

The estimates in panel (A) may not be valid since there exists significant serial correlation in all the three regressions. The strong existence of serial correlation implies that lagged values of saving ratio should be in the original regression. Lagrange multiplier tests for serial correlation indicate the coefficients on the first and second order autoregressive terms are significant. We computed exact maximum likelihood estimators of the original

regression with a AR(2)-error specification and the results are presented in panel (B). The change in the savings retention coefficient becomes more dramatic compared to the change in panel (A). The estimate of α_2 is not significantly different from unity in the first subperiod but it is close to zero in the second subperiod. The adjustments of serial correlation result in much lower estimate of the savings retention coefficient for the period of free capital flows, which indicates that the Japanese capital market has been highly internationalized since 1980.

Figure 3. 2. Domestic Saving, Investment, and Current Account



We have also examined the possibility that integration to the world financial market reduces the correlation between domestic saving and domestic investment.

$$(2) \quad \frac{I_t}{Y_t} = \alpha_0 + (\beta_0 + \beta_1 X_t) \frac{S_t}{Y_t},$$

where X_t represents a measure of the openness of the national financial market. The estimates of β_1 are expected to be negative.

We consider three different measures for the openness of the national financial market: (a) current account surplus, (b) gross capital flows and (c) net capital flows. Because of lack of data for measure (b), we take yearly data rather than quarterly data. The sample period covers from 1967 to 1991. Table 3.6 presents the results of the regression (2) along with the results of the regression (1) by using yearly data.

Table 3.6. The Impact of Openness of Financial Markets on Domestic Investment

(A) Ordinary Least Squares

Openness Measures	α_0	β_0	β_1	R^2	Serial Corr.*	Heterosced.**
(Export-Import)/ GDP	-0.005 (-0.385)	1.007 (29.442)	-568.30 (-16.68)	0.9825	$\chi^2(4) = 6.71$ (0.010) [°]	$\chi^2(1) = 1.86$ (0.172) [°]
Gross Capital Flows/GDP	-0.004 (-0.138)	1.008 (11.255)	-0.597 (-4.697)	0.8810	$\chi^2(4) = 6.58$ (0.010) [°]	$\chi^2(1) = 0.27$ (0.602) [°]
Net Capital Flows/GDP	-0.021 (-2.631)	1.061 (45.387)	-3.390 (-24.823)	0.9918	$\chi^2(4) = 12.65$ (0.000) [°]	$\chi^2(1) = 0.61$ (0.433) [°]

(t-ratios in parentheses)

* Lagrange multiplier test of residual serial correlation

** Lagrange multiplier test of heteroscedasticity based on the regression of squared residuals on squared fitted values

[°] p-value

(B) Exact Maximum Likelihood Method

Openness Measures	α_0	β_0	β_1	R^2	AR(1)	AR(2)
(Export-Import)/ GDP	-0.012 (-0.910)	1.027 (27.151)	-540.669 (-15.399)	0.9911	0.825 (4.907)	-0.542 (-3.224)
Gross Capital Flows/GDP	-0.014 (-0.443)	1.035 (11.733)	-0.597 (-5.046)	0.9451	0.871 (5.7487)	-0.653 (-4.313)
Net Capital Flows/GDP	-0.003 (-0.279)	0.996 (37.542)	-2.889 (-34.617)	0.9986	1.222 (6.337)	-0.266 (-1.381)

(t-ratios in parentheses)

Using the same sample, we got 1.055 for the estimate of the savings retention coefficient. When we used capital flow variables for the measure of the openness, we got the estimates of their coefficients whose signs were as expected.

Summers (1988) suggests an alternative possible explanation for the observed relation between investment and savings rates. Governments might adjust their budget deficits to offset the gap between investment and private saving. His idea can be applied to test the hypothesis that the high correlation of saving and investment may be due to capital controls.

As evidence of this possibility, Summers presents a regression of the ratio of the budget deficit to GDP on the difference between the private savings ratio and the investment-GDP ratio:

$$(3) \quad \frac{GDF_t}{Y_t} = \gamma_0 + \gamma_1 \frac{(PS_t - I_t)}{Y_t},$$

where GDF is the general government budget deficit, PS is private saving and I and Y are investment and GDP.

Table 3.7 presents the regression result of (3). We did the similar diagnostic tests as we did for the Feldstein-Horioka regression to find out that heteroscedasticity is not significant but serial correlation is. The estimates of coefficients did not change a lot when we calculated exact maximum likelihood estimators. In panel (A), for a sample for the period from 1976¹⁶ to 1990, The estimate of γ_1 would imply that each yen of the private saving - investment gap induces the government to increase their budget deficit by 0.97 yen. When serial correlation is adjusted with a AR(2)-error specification,

¹⁶ Budget deficit data of the Japanese government are obtained from OECD *Quarterly National Accounts*, but available only from the year of 1976.

the estimate changes to 1.006. The estimates in the two different methods are not significantly different from unity.

Table 3.7. The Impact on Government Budget Deficit of the Difference between Private Savings and Investment

(A) Ordinary Least Squares

γ_0	γ_1	R^2	Serial Corr.*	Heterosced.**
-0.021	0.970	0.9169	$\chi^2 (4) = 58.83$	$\chi^2 (1) = 0.04$
(-8.523)	(25.294)		(0.000) [°]	(0.846) [°]

(t-ratios in parentheses)

* Lagrange multiplier test of residual serial correlation

** Lagrange multiplier test of heteroscedasticity based on the regression of squared residuals on squared fitted values

[°] p-value

(B) Exact Maximum Likelihood Method

γ_0	γ_1	R^2	AR(1)	AR(2)
-0.017	1.006	0.9935	1.087	-0.140
(-1.693)	(172.286)		(8.503)	(-1.094)

(t-ratios in parentheses)

Although it explains short-term stabilization policy, equation (3) is implausible as an explanation of why long-term differences in budget deficit ratios persist among countries. As Feldstein and Bacchetta (1991) point out, a more likely explanation of the correlation between budget deficits and net saving ratios is that budget deficit ratios are exogenous reflecting political and historical characteristics and that high deficit ratios crowd out private investment in the traditional way. Similarly, countries with budget surpluses may crowd in more private investment.

To assess the plausibility of this alternative specification, we rewrite the equation (3) and estimate the equation:

$$(4) \quad \frac{I_t}{Y_t} = \delta_0 + \delta_1 \frac{GDF_t}{Y_t} + \delta_2 \frac{PS_t}{Y_t}.$$

The original Feldstein and Horioka model implies that the coefficients δ_1 and δ_2 are equal in absolute value but opposite in sign with private saving having a positive effect and the budget deficit a negative effect.

The results presented in Table 3.8 are consistent with this generalization of the original basic model. The coefficient of private saving is 0.533 while that of the budget deficit is -0.510. In other words, each yen of gross private saving adds 0.53 yen to gross investment while each yen of the budget deficit crowds out 0.51 yen of investment.

Table 3.8. The Impact of Government Budget Deficit and Private Savings on Investment

(A) Ordinary Least Squares

δ_0	δ_1	δ_2	R^2	Serial Corr.*	Heterosced.**
0.132	-0.510	0.533	0.1638	$\chi^2 (4) = 55.77$	$\chi^2 (1) = 2.53$
(2.561)	(-3.317)	(3.320)		(0.000) [°]	(0.112) [°]

(t-ratios in parentheses)

* Lagrange multiplier test of residual serial correlation

** Lagrange multiplier test of heteroscedasticity based on the regression of squared residuals on squared fitted values

[°] p-value

(B) Exact Maximum Likelihood Method

δ_0	δ_1	δ_2	R^2	AR(1)	AR(2)
0.213	-0.298	0.303	0.9518	1.246	-0.284
(5.198)	(-2.491)	(2.525)		(10.070)	(-2.298)

(t-ratios in parentheses)

From the results above, we find that the degree of saving retention (in the Feldstein-Horioka terminology, perfect capital mobility) has not dropped to zero. However, it is likely that capital market liberalization in Japan has resulted in a higher degree of capital mobility and thereby facilitated capital flows out of Japan in the 1980s.

2.2.3. Extent of convergence of yields

The two criteria of internationalization discussed above do not judge the optimality of resource allocation. To discuss optimality, we need to define internationalization in terms of an *efficiency* condition. If a market operates efficiently so that the price of the good fully reflects all the available information and there are no unexploited opportunities for profit, arbitrage goes a long way to eliminate price differentials and hence the law of one price holds. For international capital markets the form of this law is the interest parity condition.

If we consider the typical investor faced with the choice between two financial assets denominated in two different currencies, what will concern him or her will be the difference between interest rates prevailing in the two different countries, after allowing for any expected change in the exchange rate over the period of holding the assets. A number of authors have investigated the relationships among assets denominated in different currencies and among assets issued in different financial markets by directly comparing measures of returns or borrowing costs. Some researchers have examined nominal interest rates; others have looked at real rates. Some have tried to study expected returns (and hence have had to make decisions about alternative ways of inferring measurements of expectations); others have simply examined observed returns. Virtually all the work has involved tests of some *parity condition*. The various parity conditions will hold identically only for the cases of complete market integration and perfect asset substitutability. The literature has attempted to correlate the deviations from interest parity with other variables, such as the cumulated current account. Such approaches can be interpreted as decomposing the deviation from interest parity into components.

There have been three alternative parity conditions examined in the literature: (i) real interest parity - capital flows equalize real interest rates; (ii) uncovered interest parity - capital flows equalize expected rates of return on assets after allowing for any change in the exchange rate over the period of maturity; and (iii) covered interest parity - capital flows equalize interest rates across countries when contracted in a common currency. In the following, it is argued that only covered interest parity is an unambiguous criterion for capital mobility in the sense of the degree of financial integration across national borders. Empirical evidence on covered interest parity is examined using Japanese data.

Real Interest Parity

Perfect capital mobility implies equal ex ante real interest rates only for time periods for which the expected change in the exchange rate equals the difference in the expected inflation rates. However, no empirical work has suggested that this condition holds. As Frankel (1991) stresses, since ex ante purchasing power parity may not hold even for periods as long as a decade, the existence of perfect capital markets does not imply a continuing equality of expected real interest rates. An increase in saving in one country that gives rise to an equal increase in its investment need not violate the nominal interest arbitrage condition even though it causes a decline in the real interest rate.

The Feldstein and Horioka criterion of internationalization of capital markets focuses on the ability of a country to freely engage in intertemporal trade. It requires not only a zero correlation between the saving ratio and the disturbance term but also the equalization of real interest rates rather than nominal interest rates.¹⁷ Under the Feldstein and Horioka notion, the

¹⁷ Let the investment ratio be given by

country's real interest rate is tied to the world interest rate. However, as Frankel (1991) points out, the interest arbitrage condition of integrated capital markets refers to nominal interest rates only.

Uncovered Interest Parity

Perfect substitutability requires uncovered or open interest parity, i.e., equalization of expected yieldson domestic and foreign assets without forward cover. However, since it is inherently difficult to measure exchange rate expectations, tests of uncovered interest parity face a fundamental obstacle. The tests are inevitably joint tests of some proposed measure of exchange rate expectations and the absence of exchange risk. Conclusive evidence on uncovered interest parity is therefore not likely to be forthcoming unless one is willing to accept specific assumptions about investor behavior, e.g., rational expectations, which is assumed in papers such as Cumby and Obstfeld (1981), Hodrick and Srivastava (1984) an many others, or mean-variance optimization (Frankel, 1986).

Covered Interest Rate Parity

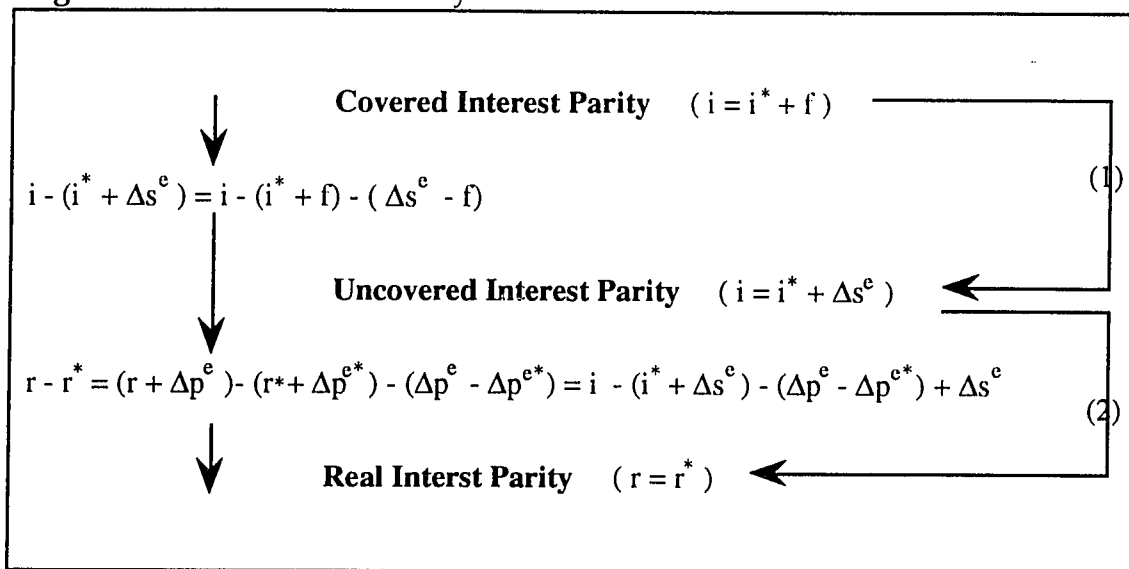
The differences in nominal interest rates of comparable assets, after adjusting for exchange risk through cover in the forward exchange market, are small. The first thing to note is that the interest parity condition does not require any assumptions about optimality, expectations formation or attitudes

$$\frac{I_t}{Y_t} = a_0 + a_1 r_t + v_t,$$

where r_t is the domestic real interest rate and v represents all other factors, whether quantifiable or not, that determine the rate of investment. To get the zero coefficient in the FH regression (1) requires not only real interest parity: $r_t = r^*$ (with the world real interest rate r^* exogenous) but also a zero correlation between v_t and $\frac{S_t}{Y_t}$.

to risk. The condition relies on very few assumptions about the behavior or tastes of the agents operating in the market.

Figure 3.3. Interest Rates Parity



(1): $\Delta s^e = f$ (unbiasedness)

(2): $\Delta p^e - \Delta p^{e*} = \Delta s^e$ (ex ante relative purchasing parity)

Figure 3.3 summarizes the relationships among these alternative definitions of interest parity. In the table, i and r denote nominal and real interest rates, respectively. Exchange rate, s , is the price of foreign currency in terms of domestic currency. Forward premium (discount), f , is the proportion by which the forward exchange rate exceeds (falls below) the spot rate. Price is denoted by p . Superscripts $*$ and e denote foreign country and expected value, respectively.

It should be noted that there is an order of specificity among them. Even when covered interest parity holds, the forward rate is required to equal the market consensus view of the future spot rate (unbiasedness) if uncovered interest parity is to hold. For unbiasedness, the following conditions should apply: (a) there are an adequate number of well-funded and

well-informed agents in the currency markets, with broadly similar views about likely future developments; (b) there are no barriers to trade in the markets (that is, no exchange controls) and no cost to dealing (no transactions costs); and (c) investors are risk neutral.

When uncovered interest parity holds, *ex ante* relative purchasing power parity is required for real interest parity to hold. If goods markets are perfectly integrated so that domestic and foreign goods are perfect substitutes in consumers' utility functions, then purchasing power parity holds.

As shown above, covered interest parity is the most reliable method available for quantifying impediments to capital movements. It is not so easy however to establish covered interest parity empirically. A number of authors have emphasized various aspects of the parity condition. Frenkel and Levich (1975, 1977, 1981) measured transactions costs by triangular arbitrage between different currencies. McComick (1979) emphasized the importance of simultaneous observations. Frankel (1982) focused on the Franc with an emphasis on political risks and Otani and Tiwari (1981) demonstrated deviations from parity involving the Yen caused by capital controls for 1978-1982. Dooley and Isard (1980) explained deviations in foreign and domestic Mark-based interest rates by variables associated with political risks.

The literature on international finance attributes deviations from parity to some sort of imperfection: habitat preference, risk aversion, transaction costs, or cross-border tax differences. Deviations from the parity can be decomposed into the following components: (1) transactions costs associated with information gathering and processing, brokerage fees and commissions, and taxes on transactions; (2) differences in the income tax treatment of yields from assets in different currency denominations; (3) capital controls on the

movement of short-term investments; and (4) observation errors including errors in obtaining contemporaneous quotes.

Since none of the above mentioned components can be denied a priori, the residual can be interpreted as an aggregate indicator of imperfection. A decrease in the deviation over time thus implies a diminution in the aggregate level of imperfections and a rise in internationalization of the underlying market. It is not easy to single out the portion of deviations from the parity that is caused by a certain component.

Covered interest differential, the deviation from the equation in Figure 3.3, beyond nominal transaction costs, would signal the existence of capital controls. Hence, a violation of covered interest parity implies that a country's capital market is not integrated into the world capital market. In this sense, covered interest parity is a test of capital controls, or a test of capital market integration.

Figure 3.4 presents diagrams of deviations from covered parity between various pairs of comparable assets denominated in the US dollar and the Japanese yen. The first pair are the Eurodollar deposit rate and the Euroyen deposit rate. Covered interest parity holds so perfectly because both assets are issued in the same Euromarket. Parity of these rates does not make a good test of the capital controls, since both rates are quoted "offshore." The certificate of deposit (CD) rates and treasury-bill (TB) in the United States and Japan are comparable. However, the TB market in Japan has not yet fully developed.

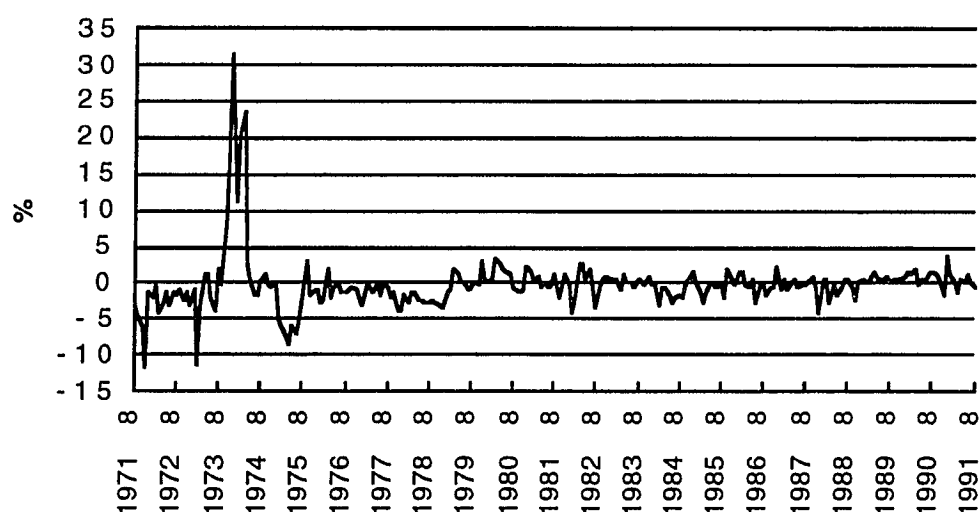
For the purpose of testing capital controls, the three-month U.S. dollar deposit rate and the three-month *gensaki* rate¹⁸ are used for rates of return

¹⁸ There are two main types of market rates of interest. One is interbank interest rates such as call rates and bill rates. The other kind is open market

on assets ; and the spot rate and three-month forward rate are used for the exchange rates.

Under the null hypothesis that internationalization was perfect, the deviations should be random errors. Hence, under the null, the ratio is distributed $t(n-1)$, where n is the number of observations in the test statistic.

Figure 3.4. Covered Interest Differentials (Aug 1971 - Aug 1991)



As presented in Table 3.9, the period before 1981 has a high t -value and so the hypothesis of perfect internationalization is rejected. In contrast, the period afterwards has a low value and the null cannot be rejected.

interest rates such as the negotiable certificate of deposit rate (NCD), gensaki rate (bond trading with repurchase agreement), commercial paper rate (CP), interest rates for foreign currency deposits, bond yields. The first group of interest rates are not totally determined by the private market as the policies of the Bank of Japan have a strong influence. In contrast, the second group of markets are open to non-financial institutions and interest rates are decided solely by market forces. This characteristic led this research to the choice of gensaki market which was created as a short-term money market among securities firms and non-financial businesses.

Table 3.9. Covered Interest Differentials

Period	Number of Observations	Mean	Standard Error	t-value
Aug1971 - Dec 1980	113	-0.4069	0.0488	-8.338
Jan 1981 - Aug 1991	128	-0.0107	0.0104	-1.103

Interpreting these results, one must also bear in mind that the test for zero means of interest parity deviations is extremely strict; any continuous imperfection, habit preference, tax difference, risk premium, and so forth, could lead to a rejection of the null hypothesis over the earlier period. Thus the fact of rejection is not quite as important as the confidence with which one rejects.

This section has provided evidence about internationalization of the Japanese financial market: the volume of financial transactions has increased in terms of both absolute magnitude and its share in the world financial market; the correlation between domestic saving and domestic investment has declined significantly; and even the strictest definition of internationalization, perfect covered interest parity, cannot be strongly rejected for sample periods after 1981. All three approaches to internationalization indicate significant changes in the Japanese financial market. It is interesting to note that this is very close to the same time that the new foreign exchange law was implemented and that swap transactions saw a major jump in their share of foreign currency trading. Unfortunately the tests cannot indicate what imperfections caused failure before 1981. But whatever the reasons were, they were gone after 1981.

No single method of gauging trends may be taken in isolation since all three are intimately related. But the weight of the evidence from all three

approaches, and particularly the results with respect to interest rate parity, suggests that the Japanese financial market has become highly internationalized since 1981 using all definitions.

3. THE MACROECONOMIC EFFECTS OF INTERNATIONALIZATION

The previous section showed that the rates of return on domestic assets have adjusted to match returns on foreign assets of comparable risk after domestic governments relaxed their restrictions on capital flows. The main proposition of the theoretical model in the previous chapter was that we expect this adjustment in rates of return to be associated with changes in investment, output and growth in those countries (i.e. the supply side of financial assets). Thus, in this section, we investigate whether the findings in the previous chapter have in fact occurred in the Japanese economy.

The theoretical key point from the previous chapter was that restrictions on foreign investment by domestic residents can produce a source of cheap investment funds for domestic industries, which would stimulate investment and domestic economic growth. However, restrictions on foreign investment can bring about an adverse effect on welfare measured in terms of expected utility which depends on the "smoothness" of the consumption pattern across time and states of the world in addition to the level of consumption. It is natural that the first and concern of this section should be the change in the cost of capital in Japan over the last two decades. Then we shall issues we explore are changes in investment demand, production, wage and consumption behavior (the smoothness of the consumption pattern).

3.1. The Cost of Capital

Conventional wisdom holds that Japanese firms have access to "cheaper money" compared to U.S. firms. The low cost of capital has been believed to

be the primary engine that gave Japanese firms a competitive advantage in world markets.

To see this, we need to investigate the effect on corporate finance of changes in the financial regime and the role financial restrictions have played in the growth of the Japanese economy. Contributions such as Ando and Auerbach (1985, 1988), Baldwin (1986), Friend and Tokutsu (1987), Hatsopoulos and Brooks (1986), Hodder (1988), Luehrman and Kester (1988) and Meerscham (1991) have all looked at the cost of capital to explain differences in corporate performance between the United States and Japan.

Based on a weighted average of the cost of capital (WACC), we take a brief look at the differential of the cost of capital between Japan and the United States. The weighted average of the cost of borrowing and the cost of capital is a traditional measure of the cost of capital:

$$(5) \quad R = wR_b + (1 - w)R_e,$$

where R_b is the cost of borrowing, R_e is the cost of equity capital, and w ¹⁹ is the relative weight of debt in total financing. There are three avenues to the claim that the cost of capital in Japan has been lower: the cost of borrowing is lower in Japan, (b) the cost of equity is lower in Japan, or (c) the weight on debt financing is higher in Japan.

3.1.1. The Cost of Debt

¹⁹ Weight should be distinguished from leverage, which is the ratio of debt financing relative to equity financing. The weight w is calculated by $\frac{B}{B + E}$, where B and E is the amount of debt and equity financing, respectively. When leverage is denoted by lv , then the weight w is expressed by $w = \frac{lv}{1 + lv}$. Therefore, a higher leverage results in a higher weight.

The first component of the three-way breakdown is the cost of borrowing, i.e., interest rate payments. Nominal interest rates in Japan have been lower than those in the United States during most of the postwar period, and continuously since 1977. The real interest rates which matters for investment should take into account inflation rates.

Figure 3.5. Long-term Interest Rates: 10-year Bond Yields

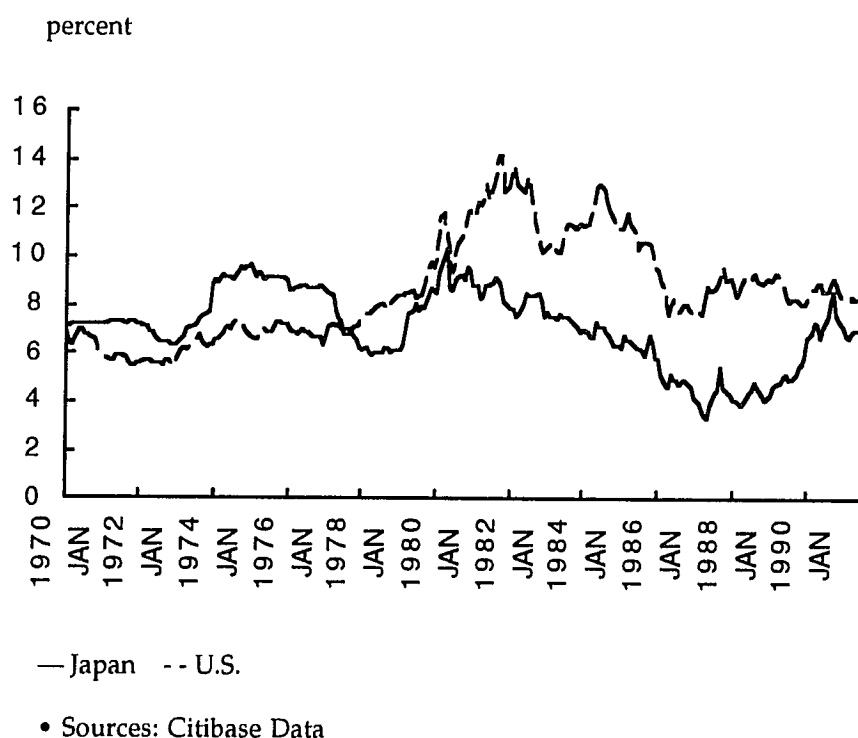


Figure 3.5 shows the paths of the nominal rates of return on 10-year government bonds in Japan and the United States. Bernheim and Shoven (1986) estimate that the Japanese real interest rate, on average, lay below the U.S. real rate during the period 1971-1982, although the difference was quite small for the long-term rates: 0.23, 0.30, or 0.93, depending whether expected inflation is estimated by, respectively, the inflation rate over the preceding year, the average ex post rate, or a simple ARIMA model.

In the period 1982-84, the U.S. long-term real interest rate rose substantially above that in Japan and other G-7 countries. This differential is widely considered to have been the result of a U.S. fiscal expansion, counterpoised to fiscal contraction in Japan and some major European countries. Bernheim and Shoven put the U.S. - Japan long-term real interest differential, on average for the period 1983-85, at 2.20.

Since the real interest differential is thought to be small, with the exception of the early 1980s, those who argue that the cost of capital is low in Japan and that this has presented a problem for the competitiveness of U.S. industry ever since 1973 tend not to emphasize the real interest rate. They, choose, rather, to emphasize the cost of equity financing and the relative weight of debt versus equity in corporate financing.

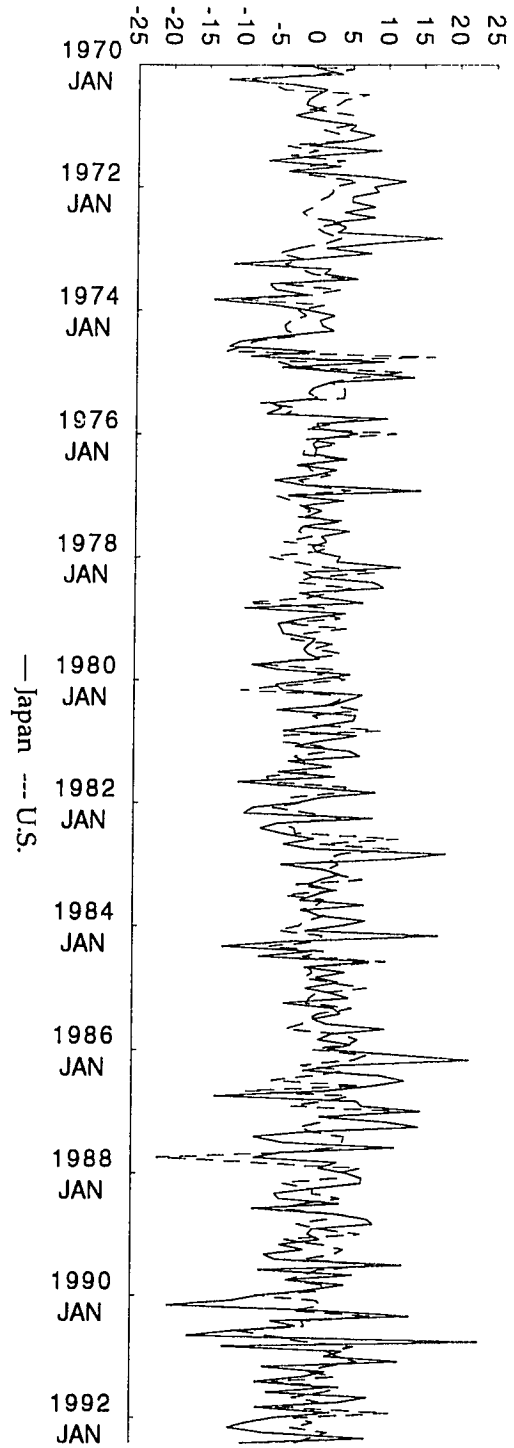
3.1.2. The Cost of Equity

It is not straightforward to measure the cost of equity capital. The cost of equity is the change in the return to equity holders with respect to the change in their investment. A traditional measure has been the realized market rate of return on equity, that is, capital gain plus dividend.

Using monthly data on equity indices²⁰, we can compute real returns on equity. Figure 3.6 contains a plot of real stock return and Table 3.10 presents summary statistics. Using a fairly small sample of firms for the period 1966-81, Ando and Auerbach (1985) also find that the market rate of return to equity was much higher in Japan (13.6% for the median of their sample of firms, vs. 2.2% for the U.S. firms). From these, one could conclude that the cost of equity in Japan has been lower than that in the United States. This

²⁰ A sample for the period January 1970 - June 1992 are obtained from Morgan-Stanley Capital International (MSCI). The combined market value of the companies included in the indices equals approximately 60% of the total market capitalization of all the countries contained in the MSCI data set.

Figure 3.6. Real Monthly Returns on Equity



judgment is, however, ignoring the fact that stockholder's realized rate of return on equity is a very noisy indicator of their ex ante expectations.

Table 3.10. Statistics Summary of Real Monthly Equity Returns (%)

Period	Statistics	Japan	U.S.
1970-1992	mean	1.01	0.47
	standard deviation	6.66	4.69
	median	0.75	0.29
	skewness	0.16	-0.22
	kurtosis	0.73	1.97
	maximum	23.52	16.79
	minimum	-19.82	-21.43
1970-1980	mean	0.95	0.02
	standard deviation	5.64	4.69
	median	0.58	-0.21
	skewness	0.01	0.14
	kurtosis	0.51	1.09
	maximum	17.56	16.79
	minimum	-14.34	-12.54
1981-1992	mean	1.06	0.89
	standard deviation	7.53	4.67
	median	1.14	0.81
	skewness	0.21	-0.58
	kurtosis	0.47	3.29
	maximum	23.52	12.60
	minimum	-19.82	-21.43

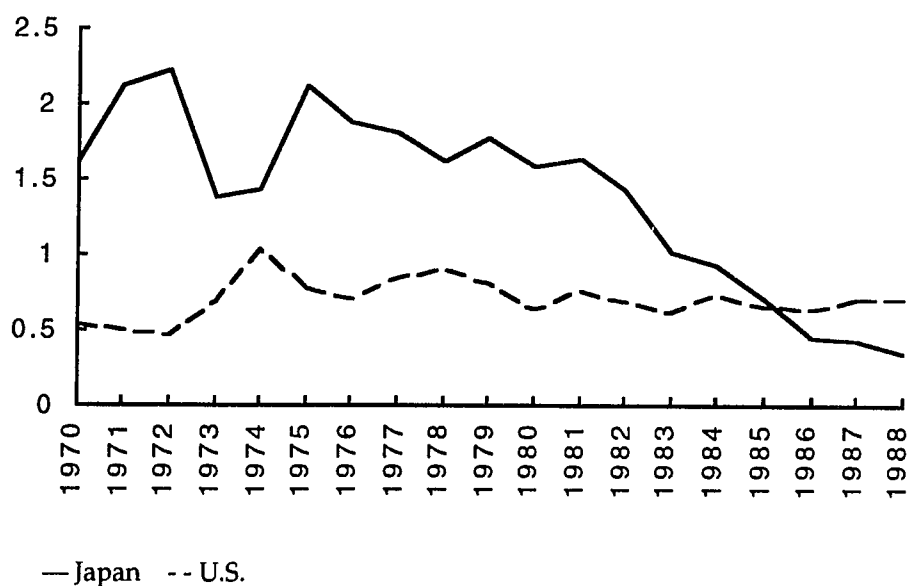
Friend and Tokutsu (1987) point out that a reverse answer would be possible if the dividend/price ratio is added to the rate of growth of dividends per share, rather than to the rate of growth of prices. Furthermore, looking at the problem from the viewpoint of the investor rather than the firm might give the wrong answer if the stockholders' return to capital differs from what managers perceive as their required rate of return. Hatsopoulos and Brooks

(1989) and Hodder (1988) approach the matter of the cost of equity on these grounds.

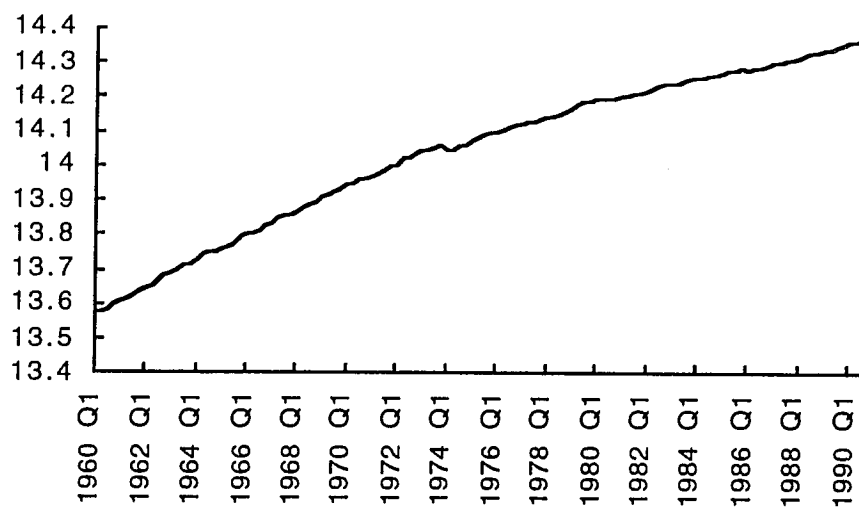
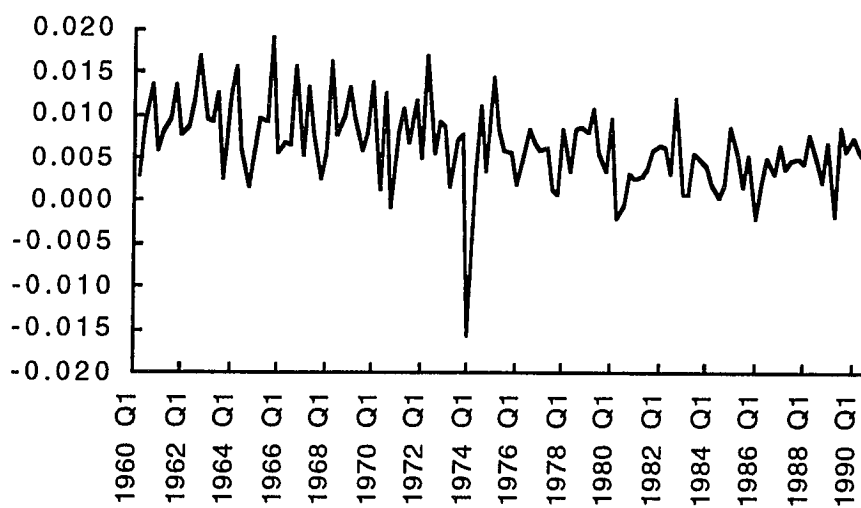
3.1.3. The Weight on Debt Financing

Japanese firms are believed to have been much more highly leveraged than U.S. firms. In period 1970-72, for example, debt/equity ratios in Japan were four times as high as in the U.S. The debt/equity ratio in Japan has fallen throughout most of the 1970s and 1980s, and a reversal took place in 1985, when the ratio in Japan fell below the ratio in the U.S., as shown in Figure 3.7. The primary reason for this reversal is the decline in Japan, which is in turn due to the soaring value of Japanese equities and decreased reliance on the main bank system as well as reduced need for external financing of any sort after 1973.

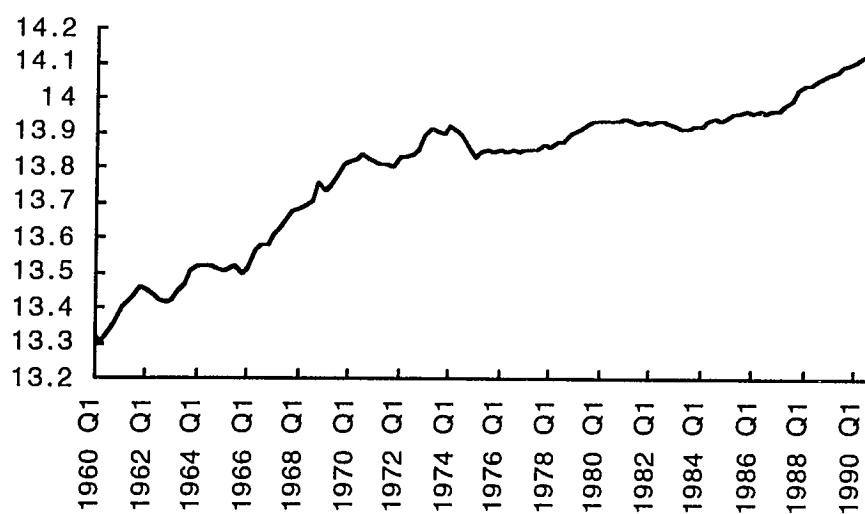
Figure 3.7. Debt/Equity Ratios: 1970-88



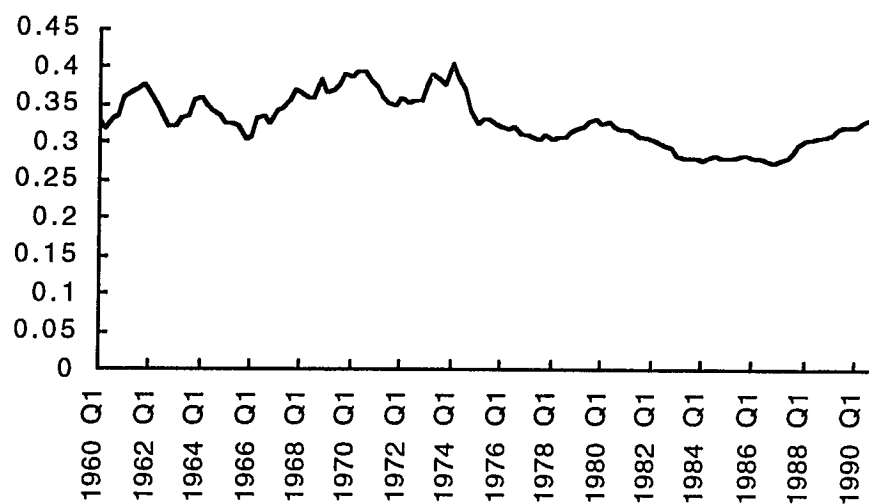
Source: French and Poterba (1991)

Figure 3.8. Historical Paths of Macro Variables**(A) Consumption****(B) Consumption Growth**

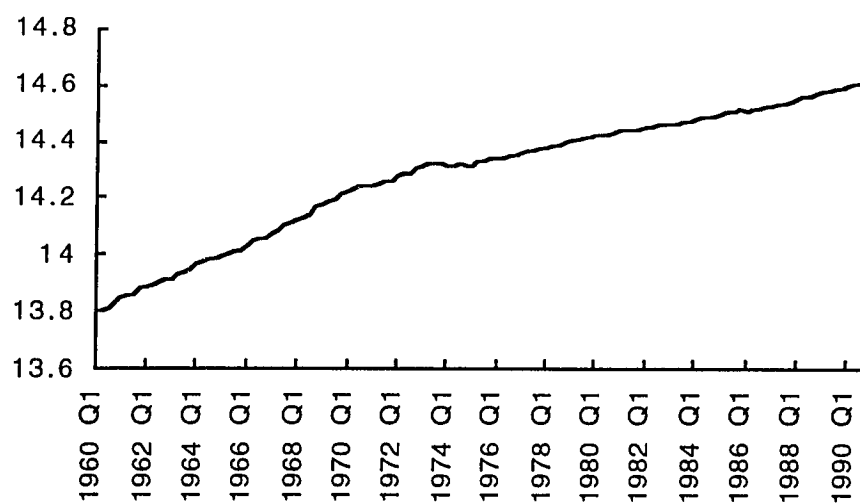
(C) Investment



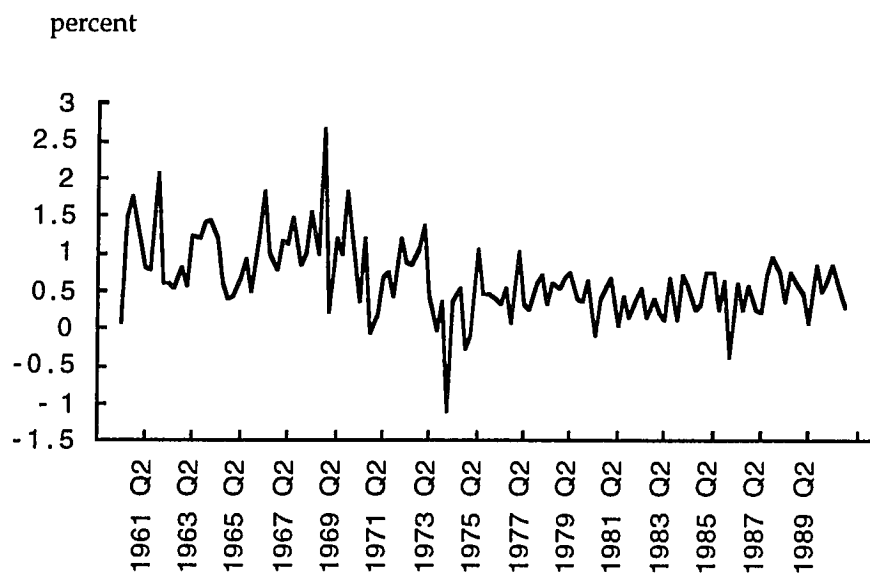
(D) investment share of Gross Domestic Production



(E) Gross Domestic Production



(F) Gross Domestic Production Growth



3.2. Changes in Macroeconomic Variables

In this section, we consider the connection between the financial sector and the real sector of the Japanese economy. Figure 3.8 shows movements of consumption, investment, the investment share of GDP, GDP and its growth rate over the period from the first quarter of 1960 to the fourth quarter of 1991. We also provide means and standard deviations of the macroeconomic variables over different periods to see if there were any significant changes.

Table 3.11. Means and Standard Deviations of Key Variables

Period	Consumption	Change in Consumption	Investment	Investment Share	GDP	Growth Rate
1960 - 1969	13.7537 (0.1095)	0.0092 (0.0042)	13.5347 (0.1324)	0.3439 (0.0216)	13.9966 (0.1194)	1.0578 (0.5321)
1970 - 1979	14.0703 (0.0704)	0.0064 (0.0053)	13.8610 (0.0361)	0.3449 (0.0311)	14.3251 (0.0543)	0.5092 (0.4605)
1980 - 1990	14.2753 (0.0526)	0.0040 (0.0032)	13.9819 (0.0679)	0.2991 (0.0186)	14.5070 (0.0566)	0.4401 (0.2751)

(standard errors in parentheses)

The statistics presented in Table 3.11 support the findings of the theoretical model. The decreasing standard deviation of consumption implies that the consumption path has been smoother as does the reduced mean and standard deviation of the change in consumption. Investment share during the 1980s was lower compared to the previous two decades. The growth rate of GDP has been decreasing over the three decades, which is consistent with the finding of the theoretical model that removal of financial market restrictions lowers the growth rate.

Chow Test

To see if changes in the financial regime affected production and economic behavior such as consumption and investment, we can specify

regression models for the underlying variables and then identify any significant change in the set of coefficients. To test for structural changes in the regression models, we adapt the Chow test.

3.2.1. Consumption Behavior

Consumption is assumed to depend on both income and the previous consumption level. This implies that the effects on consumption of changes in income persist for many periods.

$$(6) \quad C_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 C_{t-1},$$

where C is consumption and Y is gross domestic production.

The coefficient on C_{t-1} is expected to become larger after capital market liberalization, since consumers can smooth out their consumption pattern by diversifying their portfolio in the world capital market.

Table 3.12. Shifts in Consumption Behavior

Period	α_0	α_1	α_2	SSE	Serial Corr.*	Heterosced.**
Whole period:	0.058	0.184	0.812	0.00630	$\chi^2 (4) = 21.72$	$\chi^2 (1) = 16.33$
1970-1991	(0.493)	(0.5.075)	(24.145)		(0.000) [°]	(0.000) [°]
Subperiod I:	-1.481	0.493	0.545	0.00236	$\chi^2 (4) = 7.66$	$\chi^2 (1) = 0.81$
1970-1980	(-5.7279)	(7.956)	(9.792)		(0.105) [°]	(0.368) [°]
Subperiod II:	0.503	0.211	0.770	0.00124	$\chi^2 (4) = 0.86$	$\chi^2 (1) = 0.05$
1981-1991	(2.539)	(3.517)	(11.928)		(0.930) [°]	(0.825) [°]

(standard errors in parentheses)

* Lagrange multiplier test of residual serial correlation

** Lagrange multiplier test of heteroscedasticity based on the regression of squared residuals on squared fitted values

[°] p-value

Lagrange multiplier tests for serial correlation and heteroscedasticity indicate that neither of those problems are present for the regressions with the two subperiod data sets. Therefore, we carried out Ordinary Least Squares

regression and Table 3.12 presents the results. The F statistic for testing that the coefficients over the two subperiods are the same is 20.5. Therefore, we would reject the hypothesis that there were no significant changes in the coefficients. As expected, the coefficient on C_{t-1} increased in the second subperiod: post-1980 period. This result indicates that the consumption pattern has been more smooth than before since 1980.

It is worthwhile to note that both serial correlation and heteroscedasticity are significant in the regression with the whole data set. The estimate of β_1 is greater than any of the two estimates from the subperiod regressions. This estimate, however, is not valid because of the problems with the residuals. Serial correlation and heteroscedasticity have some relevance if there are essentially two regimes for the error variances with a break at the time of financial deregulation. Trying to force a single relation to fit over the whole period when there has been a structural break leads to serial correlation and heteroscedasticity in the residuals. The "wrong coefficients" produce "systematic errors" that are autocorrelated while the variances of the errors (the influence of factors other than Y_t and C_{t-1}) also changed over the two subperiods. In addition to the greatly reduced serial correlation and heteroscedasticity in the two sub-samples, note the much lower sum of squared errors (SSE) of the regression. All of these features along with the change in parameter estimates indicate the sample should be split at 1980.

However, the Chow test does not seem appropriate, because we cannot highlight the influence of a specific factor (financial asset flows, in this work) using this test. Indeed, it is not clear from a Chow test whether changes in the financial regime play a significant role.

Extreme Bounds Analysis (EBA)

To highlight the role of changes in the financial regime, we consider a sensitivity analysis following Levine and Renelt (1992). They examine how robust or fragile the correlations are between economic variables correlated by using EBA as discussed in Leamer (1983, 1985) and Leamer and Leonard (1983). To estimate the coefficients of variables of interest, they first identify a general family of models and then undertake a sensitivity analysis, in which the coefficient of the key variables are estimated using all combinations of included or excluded "doubtful" variables.

The sensitivity analysis is summarized by Levine and Renelt as follows. EBA uses a equation form:

$$(7) \quad Y = \beta_i I + \beta_m M + \beta_z Z + u,$$

where Y is dependent variable, I is a set of variables always included in the regression, M is the variable of interest, and Z is a subset of variables chosen from a pool of variables identified as potentially important or "doubtful" explanatory variables. The EBA involves varying the subset of Z -variables included in the regression to find the widest range of coefficient estimates on the variable of interest M , that standard hypothesis tests do not reject. In particular, we first choose a variable that has been the focus of past empirical studies, M , and run a base regression that includes only the I -variables and the variable of interest. Then the regression results are computed for all possible linear combinations of up to three Z -variables and the highest and lowest values for the coefficient on the variable of interest, β_m , that cannot be rejected at the 0.05 significance level are identified. Thus, the extreme upper bound is defined by the group of Z -variables that produces the maximum value of β_m , plus two standard deviations. The degree of confidence that one

can have in the partial correlation between the Y and M variables can be inferred from the extreme bounds on the coefficient $\beta_{m\cdot}$. If $\beta_{m\cdot}$ remains significant and of the same sign at the extreme bounds, then one can maintain a fair amount of confidence in that partial correlation. In such a case, we refer to the result as "robust." If the coefficient does not remain significant or if the coefficient changes sign, then one might feel less confident in the relationship between the M and Y variables, because alterations in the conditioning information set change the statistical inferences that one draws regarding the M - Y relationship. In this case, we refer to the result as "fragile."

It is likely that this method can be applied to examine the correlations between investment and financial changes or between economic growth and financial changes. The changes in the policy regime governing international capital transactions are captured by the M -variable. In our analysis, the M -variable would be the change in net foreign assets (BFNET) or the change in foreign assets held by the monetary authorities and the deposit banks (BFASST). The former captures net flows of portfolio capital and the latter only their outflows.

3.2.2. Investment

This part examines the empirical relationship between the rate of physical capital investment and indicators of the change in policy regime concerning international financial transactions. Based on economic theory, I used five variables as the I -variables which were included in all the regressions: per capita GNP, its lagged value, the lending rate, exports and imports. As potentially significant variables (Z -variables), government expenditure, the money supply and the inflation rate were considered. The variable codes are listed in Table 3.13.

Table 3.13. Variables in Investment Equation

dependent variable:

(1) INVSH: investment share (investment/GNP)

(2) INV: investment

I-variables

GNP: per capita GNP

BGNP: lagged per capita GNP

LEND: lending rate

EXPT: per capita export

IMPT: per capita import

Z-variables

EXGVT: per capita government expenditure

MON: money supply

INF: inflation

The results in Table 3.14 do not support the conjecture that changes in foreign asset holding would affect the physical capital accumulation. Neither BFNET or BFASST is significantly related to the rate of the physical capital investment. We can not find any robust correlation between the financial policy indicators and the investment share of GDP. This empirical evidence does not support the conjecture in the previous chapter which argues that relaxation of controls on capital outflows would decrease physical capital investment or its share of GDP.

The simplicity of the theoretical model discussed in the previous chapter seems to be one reason for the failure of finding supporting results for the conjecture that physical investment would be hurt by moves toward

market integration. The model may exclude some important factors explaining the physical capital accumulation. For instance, as shown in Table 3.14, the inclusion of EXGVT changes the magnitude or the sign of t -ratio significantly. This implies that the crowding-out effects of government spending should be taken into consideration for the analysis of physical investment.

Table 3.14. International Financial Transactions and Investment

(A) Dependent Variable: INV

M	β_m	standard error	t	R ²	Z	robust/fragile
BFNET	high: 0.1653	0.0561	2.946	0.9988	EXGVT, INF	fragile
	base: -0.1140	0.0555	-2.055	0.9980		
	low: -0.1225	0.0563	-2.175	0.9980	INF	
BFASST	high: 0.1166	0.0238	4.895	0.9984	MON, INF	fragile
	base: 0.1008	0.0191	5.288	0.9983		
	low: 0.0225	0.0224	1.005	0.9987	EXGVT	

(B) Dependent Variable: INVSH

M	β_m	standard error	t	R ²	Z	robust/fragile
BFNET	high: 2.60E-7	8.0E-8	3.214	0.8188	EXGVT, MON	fragile
	base: -1.56E-7	7.0E-8	-2.228	0.6997		
	low: -1.92E-7	7.0E-8	-2.802	0.7256	INF	
BFASST	high: 1.05E-7	2.0E-8	4.190	0.7477	INF	fragile
	base: 8.72E-8	3.0E-8	3.373	0.7164		
	low: -5.54E-8	3.0E-8	-1.783	0.8065	EXGVT, MON	

3.2.3. Domestic Production

Table 3.15. Variables in Production Function

<i>dependent variable:</i>
PGDP: per capita real GDP
<i>I-variables:</i>
PINV: per capita real investment
POP: population
EXPT: per capita export
<i>Z-variables:</i>
INVSH: investment share of GDP
EXGVT: per capita government expenditure
INF: inflation rate
MON: money supply

Table 3.16. International Financial Transactions and Domestic Output
Dependent Variable: PGDP

M	β_m	standard error	t	R ²	Z	robust/ fragile
BFNET	high: -1.2639	0.1168	-10.817	0.9993	All	robust
	base: -2.1211	0.2312	-9.174	0.9965		
	low: -1.7023	0.1624	-10.482	0.9984	MON	
BFASST	high: 0.5772	0.0819	7.045	0.9977	MON	robust
	base: 0.6893	0.1174	5.868	0.9952		
	low: 0.4107	0.0777	5.289	0.9987	INF, MON	

3.2.3. Domestic Production

To investigate the correlation between financial policy indicators and domestic output, we included three variables as I-variables: per capita real investment, population and exports. The conditioning set includes INVSH:

investment share of GDP, per capita government expenditure, the inflation rate and the money supply. Their abbreviations are listed in Table 3.15.

The results in Table 3.16 indicate robust partial correlation with PGDP, that is, the correlation does not depend on a diverse set of variables chosen for the conditioning set. Both BFNET and BFASST are significantly related to domestic output after controlling for other factors that may also affect domestic production but the two different measures of financial transactions affect domestic production in different directions. An increase in net foreign asset holding, i.e. an increase in net capital outflows lowers domestic production. This implies that relaxation of the controls on capital outflows would decrease domestic production. The positive correlation between BFASST and PGDP suggests that an increase in the "financial size" enhances production.²¹

4. CONCLUSION

This chapter examined the internationalization of the Japanese financial market and presented a simple model in which international financial transactions affect the key variables such as consumption, investment and production. In this chapter we investigated the connection between the financial sector and the real sector of the Japanese economy, and examined any possible repercussions of the changes in asset returns on domestic investment and key macroeconomic variables.

In section 2 and 3, we traced the historical steps whereby the Japanese financial market has become integrated to the world market and then

²¹ A correct measure for financial size would be gross asset flow, which is the sum of assets and liabilities by domestic residents. *International Financial Statistics*, which is the data source for this part, does not report liabilities data for Japan.

considered the extent of internationalization the Japanese capital market has achieved over last two decades. We argued that Japan is now well internationalized so far as some measures of internationalization are concerned. The volume of financial transactions has increased in terms of both absolute magnitude and its share in the world financial market. The correlation between domestic saving and domestic investment has also declined significantly. Even the strictest definition of internationalization, perfect covered interest parity, cannot be strongly rejected for sample periods after 1981.

In the last section, we provided some evidence that financial services promote domestic production but an increase in net capital outflows retards its growth. However, it was not clear how policy changes relating to international financial transactions affected physical capital accumulation. This empirical evidence does not capture the linkage from financial transactions through the rate of physical capital investment to economic growth. Future empirical work will need to disentangle the interactions between financial transactions and physical capital accumulation.

More work should be done as well to construct better measures of the changes in the policy regime governing international capital movements. The two indicators employed in this research may not capture very well the changes in the policy regime governing international capital transactions. We should also take into account changes in the preferences of investors or their attitudes toward risk as factors affecting foreign asset holding in addition to policy changes.

APPENDIX

A. Intertemporal allocation between consumption and saving at period t

Substituting the constraints into the objective, we can formulate the objective for the consumer's problem as follows:

$$L = U(c_t(t) + \beta E[U\{(w_t - c_t(t))\} s_t(t) \rho_{t+1} + (1 - s_t(t))(1+r_{t+1})])$$

The first order conditions are obtained by differentiating L with respect to $c_t(t)$ and $s_t(t)$.

$$(1) \quad \frac{\partial L}{\partial c_t(t)} = U'(c_t(t)) - \beta E[U'(c_t(t+1))\{s_t(t) \rho_{t+1} + (1 - s_t(t))(1+r_{t+1})\}] = 0$$

$$(2) \quad \frac{\partial L}{\partial s_t(t)} = \beta E[U'(c_t(t+1))(w_t - c_t(t))(\rho_{t+1} - (1+r_{t+1}))] = 0$$

Equation (1) can be written as:

$$(1') \quad U'(c_t(t)) = \beta(1 - s_t(t))(1+r_{t+1})E[U'(c_t(t+1))] + \beta E[U'(c_t(t+1))s_t(t) \rho_{t+1}]$$

Also, from Equation(2),

$$(2') \quad (1+r)E[U'(c_t(t+1))] = E[U'(c_t(t+1))\rho_{t+1}]$$

Substitute (2') into (1') to get

$$U'(c_t(t)) = \beta(1+r) E[U'(c_t(t+1))] \quad \text{or} \quad e^{-b} C_t(t) = \beta(1+r) E e^{-b} C_t(t+1).$$

B. Derivation of CAPM Equation

Rewriting the equation (2') in the previous proof,

$$\begin{aligned} (1+r_{t+1}) &= \frac{E[\rho_{t+1} U'(c_t(t+1))]}{E(U'(c_t(t+1)))} \\ &= \frac{E(\rho_{t+1})E[U'(c_t(t+1))] + \text{Cov}(\rho_{t+1}, U'(c_t(t+1)))}{E(U'(c_t(t+1)))} \\ &= E(\rho_{t+1}) + \frac{\text{Cov}(\rho_{t+1}, U'(c_t(t+1)))}{E(U'(c_t(t+1)))}. \end{aligned}$$

Since $c_t(t+1)$ is normally distributed if θ_{t+1} has a normal distribution, we can use the following theorem:

$$\text{Cov}(x, g(y)) = E(g'(y))\text{Cov}(x, y).$$

$$\text{Since } U(c_t(t+1)) = \{\exp\}^{-bC_t(t+1)}, U'(c_t(t+1)) = -b\{\exp\}^{-bC_t(t+1)} = -bU'(c_t(t+1)).$$

Therefore, (1) becomes:

$$E(\rho_{t+1}) = (1+r_{t+1}) + b\text{Cov}(\rho_{t+1}, c_t(t+1)).$$

C. Equilibrium of Full Integration

The equation system for generation t in the two countries with capital markets fully integrated is summarized as follows:

$$\begin{aligned} \frac{1}{b_d} \ln\{\beta_d(1+r_{t+1})\} &= [w_{dt} - c_{dt}(t)][(s_{dd}(t)E_t\rho_{dt+1} + s_{df}(t)E_t\rho_{ft+1} + (1 - s_{dd}(t) - \\ &s_{df}(t))(1+r_{t+1})) - \frac{b_d}{2}[w_{dt} - c_{dt}(t)][s_{dd}^2(t)\alpha_d^2\text{var}(\theta_d)k_{dt+1}^{2\alpha_d-2} + 2s_{dd}s_{df}\alpha_d\alpha_f\text{COV}(\theta_d, \theta_f)k_{dt+1}^{\alpha_d-} \\ &_{1,dt+1})k_{ft+1}^{\alpha_f-1} + s_{df}^2(t)\alpha_f^2\text{var}(\theta_f)k_{ft+1}^{2\alpha_f-2}] - c_{dt}(t) \end{aligned}$$

$$\begin{aligned} \frac{1}{b_f} \ln\{\beta_f(1+r_{t+1})\} &= [w_{ft} - c_{ft}(t)][(s_{fd}(t)E_t\rho_{dt+1} + s_{ff}(t)E_t\rho_{ft+1} + (1 - s_{fd}(t) - \\ &- s_{ff}(t))(1+r_{t+1})) - \frac{b_f}{2}[w_{ft} - c_{ft}(t)][s_{fd}^2(t)\alpha_d^2\text{var}(\theta_d)k_{dt+1}^{2\alpha_d-2} + 2s_{fd}s_{ff}\alpha_d\alpha_f\text{COV}(\theta_d, \theta_f)k_{dt+1}^{\alpha_d-} \\ &_{1,dt+1})k_{ft+1}^{\alpha_f-1} + s_{ff}^2(t)\alpha_f^2\text{var}(\theta_f)k_{ft+1}^{2\alpha_f-2}] - c_{ft}(t) \end{aligned}$$

$$\begin{aligned} E_t\rho_{dt+1} &= (1+r_{t+1}) + b_d\text{COV}(\rho_{dt+1}, c_{dt}(t+1)) \\ &= (1+r_{t+1}) + b_d[w_{dt} - c_{dt}(t)][s_{dd}^2(t)\alpha_d^2\text{var}(\theta_d)k_{dt+1}^{2\alpha_d-2} + s_{df}\alpha_d\alpha_f\text{COV}(\theta_d, \theta_f)k_{dt+1}^{\alpha_d-1}k_{ft+1}^{\alpha_f-1}] \end{aligned}$$

$$\begin{aligned} E_t\rho_{ft+1} &= (1+r_{t+1}) + b_d\text{COV}(\rho_{ft+1}, c_{dt}(t+1)) \\ &= (1+r_{t+1}) + b_d[w_{dt} - c_{dt}(t)][s_{dd}\alpha_d\alpha_f\text{COV}(\theta_d, \theta_f)k_{dt+1}^{\alpha_d-1}k_{ft+1}^{\alpha_f-1} + s_{df}(t)\alpha_f^2\text{var}(\theta_f)k_{ft+1}^{2\alpha_f-2}] \end{aligned}$$

$$\begin{aligned} E_t\rho_{dt+1} &= (1+r_{t+1}) + b_f\text{COV}(\rho_{dt+1}, c_{ft}(t+1)) \\ &= (1+r_{t+1}) + b_f[w_{ft} - c_{ft}(t)][s_{fd}^2(t)\alpha_d^2\text{var}(\theta_d)k_{dt+1}^{2\alpha_d-2} + s_{ff}\alpha_d\alpha_f\text{COV}(\theta_d, \theta_f)k_{dt+1}^{\alpha_d-1}k_{ft+1}^{\alpha_f-1}] \end{aligned}$$

$$\begin{aligned} E_t\rho_{ft+1} &= (1+r_{t+1}) + b_f\text{COV}(\rho_{ft+1}, c_{ft}(t+1)) \\ &= (1+r_{t+1}) + b_f[w_{ft} - c_{ft}(t)][s_{fd}\alpha_d\alpha_f\text{COV}(\theta_d, \theta_f)k_{dt+1}^{\alpha_d-1}k_{ft+1}^{\alpha_f-1} + s_{ff}(t)\alpha_f^2\text{var}(\theta_f)k_{ft+1}^{2\alpha_f-2}] \end{aligned}$$

$$E_t \rho_{dt+1} = \alpha_d \bar{\theta}_d k_{dt+1}^{\alpha_d-1}$$

$$E_t \rho_{ft+1} = \alpha_f \bar{\theta}_f k_{ft+1}^{\alpha_f-1}$$

$$w_{dt} = (1-\alpha_d) \theta_d k_{dt}^{\alpha_d}$$

$$w_{ft} = (1-\alpha_f) \theta_f k_{ft}^{\alpha_f}$$

$$s_{dd}(t)[w_{dt} - c_{dt}(t)] + s_{fd}(t)[w_{ft} - c_{ft}(t)] = k_{dt+1}$$

$$s_{df}(t)[w_{dt} - c_{dt}(t)] + s_{ff}(t)[w_{ft} - c_{ft}(t)] = k_{ft+1}$$

$$(1 - s_{dd}(t) - s_{df}(t))[w_{dt} - c_{dt}(t)] + (1 - s_{fd}(t) - s_{ff}(t))[w_{ft} - c_{ft}(t)] = 0.$$

REFERENCES

- Abel, Andrew B, A. Gregory Mankiw, Lawrence H. Summers and Richard J. Zeckhauser (1989), Assessing dynamics efficiency: theory and evidence, *Review of Economics Studies*, 1-19.
- Ando, Albert and Alan Auerbach (1985), The corporate cost of capital in the U.S. and Japan: a comparison, *NBER Working Paper* No. 1762.
- _____ (1988), The cost of capital in the U.S. and Japan: a comparison, *Journal of the Japanese and International Economies* 2, 134-158.
- Baldwin, Carliss (1986), The capital factor: competing for capital in a global environment, in *Competition in global industries*, ed. Michael Porter, 185-223. Boston: Harvard Business School Press.
- Bacchetta, Philippe (1990), Temporary capital controls in a balance-of-payments crisis, *Journal of International Money and Finance* 9, 246-257.
- Bayoumi, Tamim (1990), Saving-Investment correlations: immobile capital, government policy, or endogenous behavior?, *IMF Staff Paper* 37, 360-387.
- Bernheim, B. Douglas and John Shoven (1986), Taxation and the cost of capital: an international comparison, in *The consumption tax: a better alternative?*, ed. C. E. Walker and M. A. Bloomfield, 61-85. Cambridge: Ballinger.
- Brennan, M. J. and B. Solnik (1989), International risk sharing and capital mobility, *Journal of International Money and Finance* 8, 359 -373
- Browne, Francis X. and Paul D. McNeils (1990), Exchange controls and interest rate determination with traded and non-traded assets: the Irish - United Kingdom experience, *Journal of International Money and Finance* 9, 41-59.

- Bryant, Ralph C. (1987), *International financial intermediation*. Washington D.C.: The Brookings Institution,
- Buiter, Willem H. (1981), Time preference and international lending and borrowing in an overlapping-generations model, *Journal of Political Economy* 89, 769-797.
- Diamond, Peter A. (1965), National debt in a Neoclassical Growth Model, *American Economic Review* 55, 1126-50.
- Dooley, Michael P. and Peter Isard (1980), Capital controls, political risk, and deviations from interest-rates parity, *Journal of Political Economy* 88, 370-384.
- Dornbusch, Rudiger (1985), Intergenerational and International Trade, *Journal of International Economics* 18, 123-139.
- Errunza, Vihang and Etienne Losq (1989), Capital flow controls, international asset pricing, and investor's welfare: a multi-country framework, *Journal of Finance* 44, 1025-1037.
- Eun, Cheol and S. Janakiraman (1986), A model of international asset pricing on the foreign equity ownership, *Journal of Finance* 41, 897-914.
- Foundations for Advanced Information and Research (1991), *Japan's financial markets*. Tokyo, Japan.
- Feldman, Robert A. (1986), *Japanese financial market*. Cambridge: MIT Press.
- Feldstein, Martin and Philippe Bacchetta (1991), National saving and international investment, in *National saving and economic performance*, ed. B. Douglas Bernheim and John B. Shoven, 227-260. Chicago and London: University of Chicago Press.
- Frankel, Jeffrey A. (1986), International capital mobility and crowding out in the U.S. economy: imperfect integration of financial markets or goods

markets?, in R.W. Hafer ed., *How open is the U.S. economy?* Lexington Mass.: Lexington Books.

Frankel, Jeffrey A. (1991), Quantifying international capital mobility in the 1980s, in *National saving and economic performance*, ed. B. Douglas Bernheim and John B. Shoven, 227-260. Chicago and London: University of Chicago Press.

French, Kenneth R. and James M. Poterba (1991), Were Japanese stock prices too high?, *Journal of Financial Economics* 29, 337-363.

Friend, Irwin and Ichiro Tokutsu (1987), The cost of capital to corporation in Japan and the U.S.A., *Journal of Banking and Finance* 11, 313-327.

Golub, Stephen S. (1990), International capital mobility: net versus gross stocks and flows, *Journal of International Money and Finance* 9, 424-439.

Gordon, Roger H. and Hal R. Varian, (1989), Taxation of asset income in the presence of a world securities market, *Journal of International Economics* 26, 205-226.

Greenwood, Jeremy and Kent P. Kimbrough (1985), Capital controls and fiscal policy in the world economy, *Canadian Journal of Economics* 18, 743-765.

Greenwood, Jeremy and Kent P. Kimbrough (1987), An investigation in the theory of foreign exchange controls, *Canadian Journal of Economics* 18, 271-288.

Gultekin, Mustafa N., N. B. Gultekin, and A. Penati (1989), Capital controls and international capital market segmentation: The evidence from the Japanese and American stock markets, *Journal of Finance* 44, 849-869.

Hatsopoulos, George and Stephen Brooks (1986), The gap in the cost of capital: causes, effects, and remedies. in *Technology and Economic Policy*, ed. Ralph Landau and Dale Jorgenson, 221-280. Cambridge: Ballinger.

- Hietala, P. T. (1989), Asset pricing in partially segmented markets: evidence from the Finnish market, *Journal of Finance* 44, 697-718.
- Hodder, James (1988), Corporate capital structure in the United States and Japan: financial intermediation and implication of financial deregulation, in *Government policy towards industry in USA and Japan*, ed. J. Shoven, 241-263. Cambridge: Cambridge University Press.
- Ito, Takatoshi (1986), Capital controls and covered interest rate parity between the yen and the dollar, *Economic Studies Quarterly* 37, 223-241.
- Ito, Takatoshi (1992), *The Japanese economy*. Cambridge: MIT Press.
- Jorion, Phillippe and Eduardo Schwartz (1986), Integration vs. segmentation in the Canadian stock market, *Journal of Finance* 41, 603-616.
- Krugman, Paul R. (1981), Intraindustry specialization and the gains from trade, *Journal of Political Economy* 89, 959-973.
- Krugman, Paul R. (1989), Comments, *European Economic Review* 33, 1083-1085.
- Luehrman, T. and W. C. Kester (1989), Real interest rates and the cost of capital: a comparison of the United States and Japan, *Japan and the World Economy* 1, 1-23.
- Mehra, R. and E. C. Prescott (1985), The equity premium: a puzzle, *Journal of Monetary Economics* 15, 145-161.
- Mendoza, Enrique G. (1991), Capital controls and the gains from trade in a business cycle model of a small open economy, *International Monetary Fund Staff Papers* 38, 480-505.
- Obstfeld, Maurice (1986), Capital controls, the dual exchange rate and devaluation, *Journal of International Economics* 20, 1-20.
- Onitsuka, Yusuke (1974), International capital movements and the patterns of economic growth, *American Economic Review* 64, 24-36.

- Otani, Ichiro (1983), Exchange rate instability and capital controls: the Japanese experience, 1978-1981, in *Exchange rate and trade instability: causes, consequences, and remedies*, ed. David Bigman and Teizo Taya, 311-337. Cambridge: Ballinger.
- Persson, Torsten (1985), Deficits and intergenerational welfare in open economies, *Journal of International Economics* 19, 67-84.
- Ruffin, Roy J. (1979), Growth and the long-run theory of international capital movements, *American Economic Review* 69, 832-842.
- Ruffin, Roy J. and Young Deak Yoon (1992), International capital movements in the Solow and overlapping generations growth models, mimeo.
- Stockman, Alan and Alejandro Hernandez D. (1988), Exchange controls, capital controls, and international financial markets, *American Economic Review* 78, 362-373.
- Summers, Laurence (1988), Tax policy and international competitiveness, in *International aspects of fiscal policies*, ed. Jacob Frenkel. Chicago: University of Chicago: University of Chicago Press.
- Tesar, Linda L. and Ingrid M. Werner (1992), Home bias and the globalization of securities markets, manuscript.