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A STUDY OF ENDOGENIZING REGULATED INTEREST RATES AND CAPITAL FLOWS UNDER FINANCIAL DEREGULATION

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The purpose of this paper is to develop a model that shows how partial regulation affects interest rates and capital flows under financial deregulation. The suggestion from the model is that regulated interest rates and capital flows should be endogenously specified as reflecting different stages of financial deregulation. Different degrees of financial deregulation make economic agents accessible to different combinations of asset choices, which is mainly caused by changes in unofficial loan markets and foreign capital markets under the process of financial deregulation.

I. INTRODUCTION

In an unregulated econmy, interest rates and capital flows are completely determined by market interactions. In contrast, in a regulated economy where governments impose heavy financial regulations, interest rates and capital flows are mainly determined by the policies of the regulators.

However, as regulations are relaxed, market forces reassert themselves more strongly and government policies respond to the relevant market pressures. As a result, interest rates and capital flows are determined by a combination of market forces which affect the supply and demand for loanable funds and by the decisions of monetary and financial policies of regulators. The purpose of this paper is to develop a model that shows how partial regulation affects interest rates and capital flows.

This paper analyzes two aspects of the regulation process-one concerns regulatory policies in domestic financial markets, and the other concerns regulation in foreign markets. For domestic markets, this paper introduces the relationship between the regulated ceiling deposit rate and the equilibrium curb loan rate, which is deter-

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mined by the demand and supply of total loanable funds. The model shows that as financial regulatory policies are relaxed, the gap between the regulated ceiling deposit rate and the curb loan rate is reduced by the interaction of government-induced changes in money supply and regulatory policies. On the other hand, in analyzing changes in foreign capital regulations, the model combines elements of the closed-economy and open-economy model, and thus is able to incorporate the influences of foreign interest rate, expected changes in exchange rates, and monetary developments on domestic interest rates.

Several questions analyzed and explored from the model are: First, How can we endogenize regulated interest rates and capital flows under financial deregulation? Second, which factors are more important in determining regulated interest rates and capital flows-government reactions (changes in money supply), or market forces (expected rate of inflation, and changes in income etc.). Third, is the change in money supply an important factor to determine the new regulated interest rates?

II. BASE MODEL

In a setting of a small economy, there are, for simplicity, three sets of private agents-the households, commercial banks, and firms. The households can hold currency(CUh), bank deposits(BDh) which include demand deposits(DD), time deposits(TD), and foreign bonds(eFh). The household is also assumed to hold a collection of assets such as precious objects, and land and real eatate, which we call "inflation hedges" (IH). The household supplies the curb market loans (Lc or unorgainzed market loans). Firms borrow working capital mainly from commercial banks(bank loans: Lb), and from the curb loan market(curb loans: Lc) and from foreign markets(foreign bonds:eFf). As assets, firms hold currency(CUf), bank deposits(BDf), and productive physical capital(pK). Commercial banks hold bank deposits as liabilities, and bank loans(Lb) and required reserves(vDD) as assets.

Thus, the balance sheets of the three agents are following:

CBs	Firms	Households
Lb DD	CUf Lb	Cuh
vDD TD	BDF Lc	Lc
	pK eFf	eFh
		BDh
		IH

Total loans equal the sum of curb loans, bank loans, and foreign loans to achieve equilibrium in the domestic financial sector. Commercial banks do not hold any excess reserves and are assumed not to hold foreign bonds. Thus, bank loans are strictly determined by bank deposits and the required reserve ratio.

(2.1) $TL = Lc + Lb + eF$

(2.2) $Lb = (1\text{-}v)\ DD + TD$

where, v : required reserve ratio

To analyze the determination of interest rates in this financial situation, the model introduces a simple loanable funds model. In addition, the economy is sufficiently small so as not to affect foreign interest rate. This implies that the foreign interest rate is exogenously determined.

In a simple loanable fund framework, the total demand for loanable funds for each period, DL, consists of investment(I), capital outflows(CO), and changes in real money demand(Δmd). The demand for loanable funds is assumed to arise from firms's borrowing for working capital and fixed capital goods, from foreign investment by home residents, and from the demand for loans from those who wish to build up their stock of money balances. The total supply of loanable funds, SL, is domestic saving(S), capital inflows(CI), and changes in domestically determined real money(Δms). I,S, capital flows, and changes in money demand are assumed to be functions of market determined interest rates.

The model here modifies the monetary loanable funds model developed within Wicksell(1936), Ohlin(1937) which incorporates changes in the money demand and supply into the simple saving-investment framework based on the flow demand for and supply of loanable funds. Furthermore, to reflect the recent deregulatory policies in capital policies in capital markets, the model includes capital flows into the model.

The base model is as follows:

(2.3) Investment $(I) = I(y, Rc) = p0 + p1y - p2Rc,\ pi>0$

(2.4) Saving$(S) = S(y, Rc) = q0 + q1y + q2Rc,\ qi>0$

(2.5) Change in real money demand$(\Delta md) = md(\Delta y, rc\ rrd, rf, II^e)$
$= a0 + a1\Delta y - a2rc + a3rrd - a4rf - a5II^e,\ ai>0$

(2.6) Change in real money supply $(\Delta ms) = \Delta(CU + BD)/P$

(2.7) Net capital inflows$(CF) = CF(y, yf, Rc, Rf)$
$= t0 + t1y - t2yf + t3Rc - t4rf,\ ti>0$

(2.8) Fisher's equation: $rc = Rc + II^e$
$rf = Rf + II^e$
$rrd = Rrd + II^e$

(2.9) Interest arbitrage condition, $rc = rf + e^e$

At equilibrium in loanable funds requires that excess demand for loans is zero, and it follows:

(2.10) $I + \Delta md = S + CF + \Delta ms$

where, Rc: real curb loan rate, Rf: real foreign rate, Rrd: real deposit rate, P: price level, rc: nominal curb loan rate, rrd: nominal deposit rate, rf: moninal foreign rate, Δms: change in real money supply, Δmd: change in real money demand, CU: currency, DD: demand deposits, y: real domestic income, yf: real foreign income, e^e: expected rate of change in exchange rate.

Using a simple loanable funds model(Conard(1959), Harris(1981)), saving and investment are functions of the market determined interest rate. The government has set the interest rate that may be paid on deposits(rrd), and charged for bank loans(rrl) below the market clearing rates; consequently an informal, curb loan market charging high real rates of interest has risen to give savers an alternative, albeit risker, real return. This model assumes that rrd and rrl are initially exogenous. The relevant interest rate for saving function is the curb loan rate. Also, as it is borrowing costs at the margin the matters, the relevant interest rate for investment is the curb loan rate alone.

S and CI are positive functions of market determined interest rates, and I, CO, and Δmd are negatively related to market determined interest rates. Δms is independent of market determined interest rates, the nominal foreign interest rate, and the expected rate of inflation. The inclusion of the curb loan, deposit, the foreign bond interest rate, and the nonbank public's expected rate of inflation is based on an individual's asset composition decision. To determine the optimal mix of domestic and foreign assets, individuals should compare the various returns of assets-curb loan interest rate(rc), bank deposit(rrd), holding of capitals(or goods for inflation hedges)(Π^e) and foreign bonds(rf), taking due account of relative risks and conveniences.

Captial flows are defined as net capital flows(difference between capital inflows and capital outflows). Since most developing countries have mainly capital inflows(Fry(1988)), this model assumes that capital flows are mainly composed of capital inflows, or indebtedeness that the country wishes to incur, give the foreign interest rate. Equation (2.8) shows the Fisher effect, which relates the nominal rate with the real rate through the expected rate of inflation. To relate the nominal curb loan rate to the exogenous foreign interest rate, this model adopts the uncovered interest arbitrage condition as(2.9). In a small open economy without any capital controls, capital can move freely with respect to interest rate differentials between domestic markets and foreign markets. In this case of perfect capital mobility and the assumptions of no transaction costs and risk neutrality, the domestic interest rate is closely related to world interst rate through the expected rate of change in the exchange rate.

When eqation(2.10) is satisfied, the equilibrium curb loan rate can be derived, since the curb loan rate can be assumed to represent the market rate determined freely by the demand and supply of loanable funds. Solving (2.10) based on the specificaton (2.3)-(2.9) yields the reduced form equation for the curb loan rate:

(2.11) $rc = ((v0\text{-}v1a0)/(1\text{-}v1a2) + (v1/(1\text{-}v1a2))\Delta ms\text{-}(v1a1/(1\text{-}v1a2)\Delta y\text{-}(v1a3/(1\text{-}v1a2))rrd + (v4/(1\text{-}v1a2))rf + (1\text{-}v4 + v1a5)II^e + (v2/(1\text{-}v1a2)y + (v2/(1\text{-}v1a2))yf$, where, $v0 = (t0 + q0\text{-}p0)/(\text{-}t3\text{-}p2\text{-}q2)$, $v1 = 1/(\text{-}t3\text{-}p2\text{-}q2)$, $v2 = (q1\text{-}p1 + t1)/(\text{-}t3\text{-}p2\text{-}q2)$, $v3 = t2/(t3 + p2 + q2)$, $v4 = t4/(t3 + p2 + q2)$.

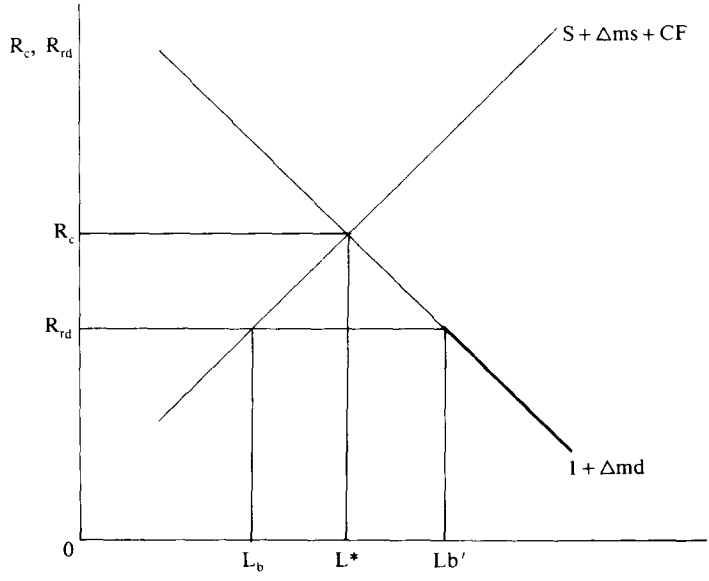
On the other hand, the reduced form equation for capital flows is derived by substituting the endogenous curb loan rate (2.11) and the Fisher's Equation

(2.8) into capital flows equation(2.7).

(2.12) $CF = t0 + t3(v0\text{-}v1a0)/(1\text{-}v1a2)) + t3(v1/(1\text{-}v1a2)\Delta ms\text{-}t3(v1a1/(1\text{-}v1a2)\Delta y\text{-}t3(v1\ a3/(1\text{-}v1a2)rrd + (t3v4/(1\text{-}v1a2)\text{-}t4)rf + (t3(\text{-}v4 + v1a5) + t4)II^e + (t1\text{-}t3v2/(1\text{-}v1a2)y + (t3v2/(1\text{-}v1a2)\text{-}t2)yf$

where, vi are defined as same as in equation(2.11).

In this base model, the model assumes that government imposes a fixed ceiling deposit rate(Rrd) that holds Rrd below the equilibrium curb loan rate(Rc). As shown in Figure 1, there is an excess demand for the loanable fund at the regulated ceiling rate. The initial loanable fund available to the banking sector is Lb. Credit flowing into the curb loan market is L*-Lb. At Rrd, excess demand for loanable funds is(Lb'-Lb*). Credit rationing is common in most developing countries. However, a kind of credit rationing is also possible even in an unregulated bank-



[**Figure 1**] Exogenous Interest Rate Regulation in Domestic Markets

ing system of developed countries. Stiglitz and Weiss(1981) show how in credit markets with imperfect information, the profit maximizing interest rate set by banks may not be the market clearing rate of interest rate(i.e. there may exist an excess demand for loans at the bank determined interest rate). The reason that the interest rate is not allowed to rise to clear the market for bank loans in accord with the principle of supply and demand is because banks are unable to differentiate between risky and safer borrowers. Problems of adverse selection arise in that the most risky borrowers will self-select into the pool of those desiring credit at a high rate of interest rate, while safer borrowers may not be able to make a profit at the higher rate even if the project undertaken has its best possible outcome. Thus, if bank cannot assess perfectly the credit worthiness of potential borrowers, raising loan rates of interest will not necessarily increase bank profits even if there is excess demand for loans at the existing loan rate. However, in this model, credit rationing is assumed to be caused mainly by government regulations in addition to asymmetric information problems in bank loan markets.

A. Case 1: Endogenous Domestic Interest Rate Regulation

To introduce endogenous regulation of the deposit rate into the base model, the model formulates the relationship between curb loan rates, regulated ceiling rates and bank loan rates under domestic financial regulation. This model assumes that the deposit rate is initially set as a ceiling rate and that the curb loan rate is determined freely by the supply and demand of loanable funds. The bank loan rate is part of the posted rate of structure and can be modelled as the deposit rate plus markup.

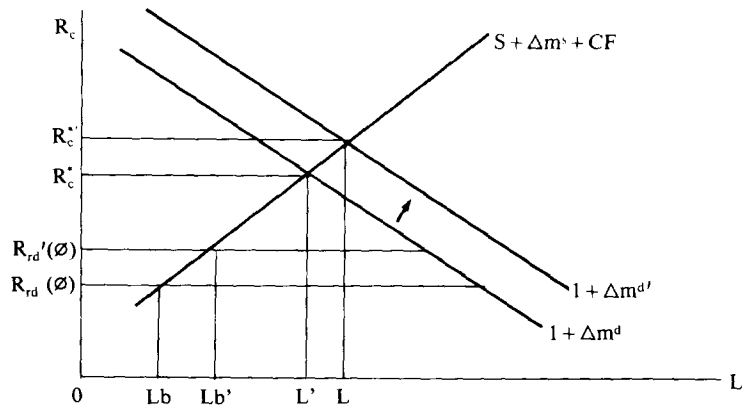
(2.13) $Rrl = Rrd + mu$

where, mu:markup, Rrl, Rrd:real ceiling loan and deposit rate.

The relationship between the curb loan rate and deposit rate under the process of financial deregulation can be explored in a loanable funds framework. The relationship between the curb loan rate and the ceiling deposit rate is important, especially since as an economy becomes less regulated, the gap between the two interest rates is reduced, following the typical definition of both McKinnon-Shaw(McKinnon(1973, Shaw(1973)) and the neo-Structuralists (van Wijenbergen(1983), Taylor(1983)) about tools of financial deregulation. As the ceiling deposit rates approach to the higher curb loan rates, which are determined freely by supply and demand of loanable funds, financially repressed economies are moving towards less regulated ones where less severe regulatory policies are imposed on domestic financial markets. Thus, the size of the gap between the two interest rates can be represented by a measure or index of domestic financial regulatory policies. The index of domestic financial policies($0<\phi$) indicates the ex-

tent of the domestic regulation in the financial markets other than the level of interest rate ceilings. It includes the degree of denationalization of commercial banks, the lowering of barriers to entry into financial markets, reductions of reserve requirements, elimination of bank portfolio restrictions, and the introduction of new financial instruments, etc. Since regulatory policies are largely unmeasurable, cannot be directly derived. As we shall see below, however, its size can be inferred from a structural model of the financial sectors of various economies. These financial regulation policies have been implemented as a mixture of regulatory "banking policies" and "monetary policies". Drawing on a slightly modified version of a distinction made by Goodfreind and King(1988), "monetary policies" include reduction of reserve requirements, since changes in reserve requirements can affect the degree of utilization of the high powered money. On the other hand, denationalizing commercial banks, removing bank portfolio controls, lowering barriers to financial markets, and introducing new financial instruments belong to "banking policies", as these policies include changes in regulatory and supervisory rules or actions of the central banks.

The degree of domestic financial regulation affects the gap through the following mechanism. As the financial markets become less regulated, the ceiling rate increases toward the market determined interest rate. The government may raise the ceiling deposit rate to help the banking sector compete with new instruments and other lenders after the introduction of new financial innovations, or the lowering of barriers to competition in financial markets. As shown in Figure 2, the government is under pressure to increase the ceiling deposit rate as domestic financial regulation policies are relaxed. The initial volume of loanable funds available to the banking sector is increased from Lb to Lb' (to the curb market is decreased from L*-Lb to L*'-Lb) by an increase in the ceiling deposit rate. Thus, financial deregulation policies reduce the gap between the two interest rates (from Rc*-Rrd



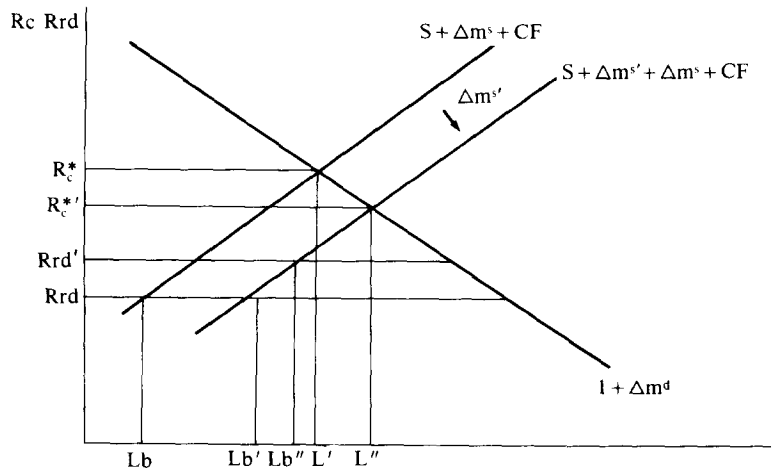
[**Figure 2**] Effect of Financial Regulation Policies on the Gap between the Curb Loan Rate and the Ceiling Rate

to Rc*'-Rrd').

In most developing countries, monetary policy is complicated by the need for governments to finance their deficits. As government bond markets are not well developed, deficits are ordinarily financed by central banks with newly created high-powered money. This is the major reason why inflation is endemic in such countries and why traditional monetary policies, which operate through controlling the money supply, cannot be used. As a substitute, authorities must use increases in the deposit rate as a tool for moderating the inflation rate. The larger the growth rate of the money supply, the more likely it is that they will raise the deposit rate (eg. from Rrd to Rrd' in Figures 3).

An increase in the growth rate of the money supply also increases the general supply of loanable funds made available through the banking system (eg. from Lb to Lb' in Figure 3). Given the demand for loanable funds, the excess demand for loanable funds in the economy is reduced, and the curb loan rate also falls. Thus, an acceleration of the growth rate of money supply reduces the gap between the two interest rates by stimulation the authorities to raise the regulated deposit rate and encouraging lenders in the curb markets to lower the curb market loan rate.

To sum up, the gap between the curb loan rate of interest and deposit rate reflects investment spending and other factors affecting the demand for loanable funds, the severity of financial regulation, the rate of growth of the money supply, and the influence of monetary policy as it is designed to mitigate the inflationary effects of monetary growth. The authorities will raise the nominal deposit rate in response to an acceleration of inflation in order to prevent an erosion of the real deposit rate (an unplanned increase in the severity of regulation) and in order to



[**Figure 3**] Effect of a Change in the Growth Rate of the Real Money Supply on the Gap between the Curb Loan Rate and the Ceiling Deposit Rate

slow inflation by strengthening the demand for money. If the authorities wish to liberalize, they will do so by further raising the deposit rate along with relaxing other controls on bank assets. In Figure 3, if there is an increase in the growth in the money supply ($\Delta ms'$), it provides additional real loanable funds to curb and bank loan markets. The initial gap between the two interest rates (Rc*-Rrd) is reduced to (Rc*'-Rrd) by an increase in the growth rate of the real money supply ($\Delta ms'$). In this cas, the government increases the regulated ceiling rate to mitigate the inflationary momentum caused by an increase in deposit rate (Rrd to Rrd') as a reaction policy. Additionally, the government increases the regulated ceiling rate to induce more loanable funds (which are increased by an increase in the growth rate of the money supply) into official commercial banks. Thus, an increase in the growth rate of the real money supply can be assumed to reduce the gap between the two rates (Rc*-Rrd to Rc*'-Rrd') by affecting both the curb loan rate and the regulated deposit rate.

Based on above explanations, the model can make the gap of the two interest rates a more specific equation. The degree of regulatory policies ($\varnothing$) can be specified as a parameter of the change in the real money supply variables. The effect of the growth rate of money supply on the gap becomes larger as an economy is more regulated. That is, more severe regulatroy policies in domestic financial markets are registered by a a larger $\varnothing$. Based on

(2.14), the endogenous regulated ceiling rate is derived as (2.15).

(2.14) $Rc\text{-}Rrd = rc\text{-}rrd = \alpha\text{-}\varnothing\Delta ms + u(t)$

(2.15) $rrd = rc\text{-}\alpha + \varnothing\Delta ms + u(t)$

where, Rc: real curb loan rate, Rrd: real ceiling deposit rate, rc: nominal curb loan interest rate, rrd: nomial ceiling deposit rate, Δms: change in the real money supply, $0<\alpha$, $0<\varnothing$: the degree of domestic financial regulation, u(t): random variable.

To specify the endogenous regulated deposit rate, this model adds two types of regulation in addition to $\varnothing$. Another degree (α) of regulation reflects other systematic sources which cause the ceiling deposit rate to deviate from the market determined rate. It includes financial customs such as usury laws, government selective credit policies, etc. Especially, in most developing countries, to stimulate investment in priority activities and frequently to redistribute income and wealth, government channels credit to certain sectors at subsidized rates of interest (far below the market determined rate). Thus, apart from financial regulation policies, α represents policies which use interest rate ceilings to direct investible funds through a nonprice rationing systems. The third is u (t), which represents nonsystematic sources of regulation which are not constant. The regulated interest rate is now endogenously determined by equation (2.16) and the model derives the reduced form equation of rrd based on (2.15) and (2.11).

(2.16) $rrd = 10 + 11\Delta ms + 12\Delta y + 13rf + 14II^e + 15y + 16yf + w(t)$

where, I_o-(v0-v1a0 + α)/D, I1 = (-v1a3$\emptyset$/D + $\emptyset$), I2 = -v1a1/D, I3 = v4/D, I4 = (1-v1a2) (1-v4 + v5)/D, I5 = v2/D, I6 = v3/D, D = 1-v1a2 + v1a3, vi are defined as same as (2.11)

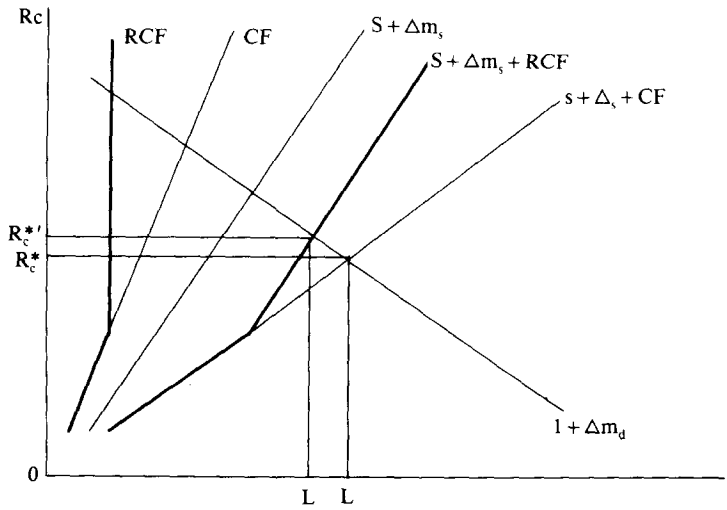
The reduced form equation of capital flows in this case can be derived by substituting (2.16) into (2.12)

(2.17) $CF = m0 + m1\Delta ms + m2\Delta y + m3rf + m4II^e + m5y + m6yf$

where, m0 = t0 + t3((1-v1a2) (v0-v1a2-α)/B + α), m1 = (t3v1/(1-v1a2)) (1-a3(-v1a3)/B), m2 = -t3v1a1/B, m3 = (v4t3)/B + t1), m4 = (t3(1-v1a2) (1-v4 + v5)/B + t4), m5 = (t3v2/B + t1), m6 = (t3v3/B-t2), B = 1-v1a2 + v1a3, vi are defined as same as before.

B. Case 2 : Exogenous Foregien Capital Controls

In this case, the model introduces complete foreign capital controls into the base model. With complete foreign capital controls, capital flows are set at a fixed level by government regulations. As shown in Figure 4, the equation of capital flows without any foreign capital controls can be derived from the positively sloped CF (equation (2.7)). With complete capital controls in foreign markets, however, the actual transacted capital flows are given as RCF. With the regulated capital flows, the equilibrium curb loan rate (Rc*') is higher than the equilibrium rate (Rc*) without any capital controls. As a result of capital controls in foreign markets, loanable funds from abroad are reduced by (CF-RCF), the equilibrium rate is high,



[**Figure 4**] Captial Control in Foreign Markets

and the equilibrium level of loanable funds is reduced (L*-L*'). In this case, the model can derive the nominal curb loan rate from the market interest rate without any capital controls in foreign markets-by setting ti = 0 (i = 1-4).

(2.18) $rc = b0 + b1\Delta y + b2y + b3\Delta ms + b4rrd + b5\Pi^e$

where, $b0 = (\beta + \mu 1a0)/(1 + \mu 1a2)$, $b1 = \mu 1a1/(1 + \mu 1a2)$, $b2 = -\mu 2/(1 + \mu 1a2)$, $b3 = -\mu 1/(1 + \mu 1a2)$, $b4 = \mu 1a3/(1 + \mu 1a2)$, $b5(1-\mu 1a5)/(1 + \mu 1a2)$, $\beta = (q0-p0)/(-p2-q2)$, $\mu 1 = 1/(p2 + q2)$, $\mu 2 = (p1-q1)/(p2 + q2)$

Using (2.15) and (2.18), the model can derive a final reduced form with complete foreign capital controls and without any domestic capital controls (when$\varnothing = 0$).

(2.19) $rc = bo' + b1'\Delta y + b2'y + b3' \Delta ms + b4'\Pi^e$

where $b0'(\beta + \mu 1ao-\mu 1a3\alpha)/(1 + \mu 1a2-\mu 1a3)$, $b1' = \mu 1a1/(1 + \mu 1a2-\mu 1a3)$, $b2' = -\mu 2/(1 + \mu 1a2-\mu 1a3)$, $b3' = -\mu 1/(1 + \mu 1a2-\mu 1a3)$, $b4' = (1-\mu 1a5)/(1 + \mu 1a2-\mu 1a3)$

On the other hand, the regulated capital flows with complete capital controls is derived from the equation (2.12)-capital flows without any capital controls in foreign markets-by setting ti = 0 (i = 1-4).

(2.20) $CF = RCF = t0$

C. Case 3: Partial Exogenous Foreign Capital Controls (Base Model + Case 2)

It is more plausible to assume that most developing countries do not completely abandon capital controls. By restricting payments for current and capital transactions, such as imposing advanced import deposits or limiting residents' holding of foreign currency deposits etc., developing countries seek to achieve balance of payment objectives to insulate domestic financial markets from external shocks, and to curb abrupt capital flows.

In this case, interest rates and capital flows are affected by partial regulation in foreign markets. The partially regulated capital flows are located between RCF and CF, and the market determined curb loan rate belongs to the range between Rc*' and Rc* in Figure 4. In this case, the partially regulated capital flows are determined both by market forces and government regulations. In an economy with partial foreign capital controls, domestic interest rates and capital flows are determined by both the domestic and foreign market sectros as conditioned by the degree of financial controls in foreign markets. It is expected that domestic interest rates become determined by world interest rates and the expected rate of change in the exchange rate if a country eliminates regulations over capital flows. Thus the model can derive the determinants of interest rates in this regime by modifying the two extreme cases-completely regulated and completely unregulated

economic in foreign markets-with the degree of financial openness (or degree of foreign market regulation) of a country.

The nominal curb loan interest rate in an economy with partial capital controls in foreign markets is hypothesized to be the following equation.

(2.21) $rc = (1-\Omega)\, rcc + \Omega rcwc$

where, $0<\Omega<1$: the degree of financial openness of a country, rcc: nominal curb loan rate under complete foreign capital controls (rc in case 2), rcwc: nominal curb loan rate under complete foreign capital deregulation (rc in the base model).

The degree of financial openness (Ω) is an "index" representing the severity of foreign capital controls, such as limitations on foreign currency deposits by residents, requirement of prior approval for foreign direct investment flows, and so forth. As Ω approaches 1, the domestic interest rate approaches foreign interest rates as modified by the uncovered interest arbitrage condition of equation (2.9). As Ω approaches to 0, the domestic interest rate is determined in the perfectly regulated economy in foreign markets by the equation (2.19). The degree of financial openness relates to the degree of substitutability of goods across borders and the efficiency advantage to be reaped from reducing intervention in the free flow of real trade. Financial openness has to do with the substitutability of foreign and domestic financial assets and the extent of interference with free capital mobility. From equation (2.18),

(2.22) $rcc = b0' + b1'\Delta y + b2'y + b3'\Delta ms + b5'\Pi^e$

Using interest arbitrage condition as equation (2.9),

(2.23) $rcwc = rf + e^e$

Substituting (2.22) and (2.23) into (2.21), the curb loan rate is determined as:

(2.24) $rc = d0 + d1\Delta y + d2y + d3\Delta ms + d4\Pi^e + d5(rf + e^e)$

where, $d0 = (1-\Omega)(\beta + \mu 1a0 - \mu 1a3)/(1 + \mu 1a2 - \mu 1a3)$, $d1 = (1-\Omega)\mu 1a1/(1+\mu 1a2-\mu 1a3)$, $d2 = -(1-\Omega)\, 2/(1+\mu 1a2-\mu 1a3)$, $d3 = -(1-\Omega)1/(1+\mu 1a2-\mu 1a3)$, $d4 = (1-\Omega)(1-\mu 1a5)/(1+\mu 1a2-\mu 1a3)$, $a5 = \Omega$, $\beta = (p0-q0)/(-p2-q2)$, $1 = 1/(p2+q2)$, $2 = (p1-q1)/(p2+q2)$

with partial financial controls in the foreign capital markets, capital flows can be derived by substituting rc into capital flows equation (2.7).

By using (2.24) and (2.8),

(2.25) $RCF = e0 + e1\Delta y + e2y + e3yf + e4ms + e5\Pi^e + e6(rf + e^e)$

where, $e0 = t0 + t3(1-\Omega)d0$, $e1 = (1-\Omega)t3d1$, $e2 = t3(1-\Omega)d2$, $e3 = -t2$, $e4 = t3(1-\Omega)d3$, $e5 = t3(1-\Omega)d4-t3+t4$, $e6 = -t3\Omega-t4$.

D. Case 4: Semi – regulated Both in Domestic and Foreign Markets
(Endogenous Domestic Interest Rate Regulation and Partial Exogenous Foreign Capital Control: Case 1 + Case 3)

This case describes the situatin where partial capital controls both in domestic and foreign markets exist. Regulated interest rates and capital flows are affected by capital controls in both markets. Thus, to derive a reduced form of regulated interest rates and capital flows in this regime, the model combines two partially regulated cases-case 1 and case 3. The interesting feature is that two parameters ($\varnothing$ and Ω) play a role of connecting interst rates in each regime. In domestic partial regulation, $\varnothing$ relates the ceiling deposit rate to the curb loan rate, and in foreign partial regulation, Ω relates the curb loan rate to the given foreign rate. In this regime, the initial exogenous regulated deposit rate and capital flows are endogenously determined by government reactions and market forces through intereactions of $\varnothing$ and Ω. Under partial domestic regulation,

(2.15-1) $rrd = rc\text{-}\alpha + \Delta ms + u(t)$
Under partial foreign regulation,
(2.21-1) $rc = (1\text{-}\Omega)\, rcc + \Omega rcwc$
By substituting (2.21-1 or 2.24) into (2.15-1), a reduced form of the regulated interest rate is determined as:

(2.26) $rrd = c0 + c1\Delta y + c2y + c3II^e + c4\Delta ms + c5(rf + e^e) + w$
where, $co = ((1\text{-}\Omega)(\beta + \mu 1a0\text{-}\mu 1a3\alpha)/(1 + \mu 1(a2\text{-}a3))\text{-}\alpha$, $c1 = \mu 1(1\text{-}\Omega)a1/(1 + \mu 1(a2\text{-}a3))$, $c2 = \text{-}(1\text{-}\Omega)\mu 2/(1 + \mu 1(a2\text{-}a3))$, $c3 = (1\text{-}\Omega)(1\text{-}\mu 1a5)/(1 + \mu 1(a2\text{-}a3))$, $c4 = (\text{-}\mu 1(1\text{-}\Omega) + (1 + \mu 1a2\text{-}\mu 1a3)\varnothing)/(1 + \mu 1(a2\text{-}a3)$, $c5 = \Omega$

Here, the regulated deposit rate is determined both by the market forces (Δy, y, II, rf, and e^e) and by the government's monetary policy (Δms). The effect of the governmet's monetary policies on the regulated interest rate depends upon the degree of both domestic ($\varnothing$) and foreign (Ω) financial regulation.

Given the semi-regulated economy framework, capital flows necessarily occur as long as the domestic interest rates deviate from the world interest rates. By substituting (2.24) into (2.7), and using (2.8), a reduced form of the regulated capital flows is derived as:

(2.27) $RCF = g0 + g1yf + g2y + g3\Delta y + g4\Delta ms + g5II^e + g6(rf + e^e)$
where, $g0 = t0 + t3(1\text{-}\Omega)(\beta + \mu 1a0\text{-}\mu 1a3\alpha)/K$, $g1 = \text{-}t2$, $g2 = t3(1\text{-}\Omega)(\text{-}\mu 2)/K$, $g3 = t3(1\text{-}\Omega)\mu 1a1/K$, $g4 = \text{-}t3(1\text{-}\Omega)\mu 1/K$, $g5 = \text{-}t3(1\text{-}\Omega)(1\text{-}\mu 1a5)/K + t4$, $g6 = \text{-}t3\Omega\text{-}t4$, $K = 1 + \mu 1(a2\text{-}a3)$.

The regulated capital flows, here again, are determined partly by market forces

(y, yf, Π^e, $rf + e^e$) and partly by government's monetary policy (Δms). However, all the coefficients are mainly influenced by the degree of financial openness (Ω).

III. EMPIRICAL RESULTS

1. Derivation of $\varnothing$ and Ω from Estimation Results

The value of Ω can be directly derived from the estimation results of the equation (2.26) (the coefficient on $rf + e^e$). The value of $\varnothing$, however, cannot be directly derived from the equation (2.26). The best way to estimate $\varnothing$ would be to simultaneously estimate the complete set of the structural equations with the regulated interest rate. However, the full model is underidentified, and furthermore, it is not possible to get all the data necessary for such a study (especially, aggregate saving, investment and the curb loan rate). Thus, we will impose a reasonable restriction that permits estimation of the parameter $\varnothing$.

To derive $\varnothing$ directly from the equation (2.26), we shall assume that $a1 = 1$. This assumption indicates that the partial derivative of the change in the money demand function with respect to the change in income is equal to one ($\partial \Delta m / \partial \Delta y = 1$). It is equivalent to assuming that the long-run income elasticity of money demand is equal to one. It has long been a common practice to assume unitary income elasticity of demand for money functions, as for example, in regressions which estimate velocity as a linear function of interest rates (Boughton (1979)). In addition, table 1 shows that estimates of the long-run income elasticity of money demand are close to unity.

Based on the assumption that $a1 = 1$, we can get the values of α and Ω from the estimates of equation (2.26) (1).

(3.1) $\alpha = c1 + c4$, $\Omega = c5$

2. Data

The data used for the estimations are drawn from the annual data in the IMF's International Financial Statistics (IFS) and from publications from several central banks (details are in table 2). For most of the sample countries, the annual

[**Table 1**] Income Elasticity of Money Demand Function

	Canada	France	Germany	Japan	United Kingdom
Boughton (1979)	0.79	0.90	1.08	1.07	1.32
Adekundel (1968)	0.87	1.29	1.16		
Coutiere (1976)		1.10	0.95	1.27	0.57
Kaufman and Latta (1966)	0.81	1.16		1.21	0.35

(1) Sources: Boughton (1979), Mandell (1975)

[**Table 2**] Variables and Data for Estimation

rrd_t (IFS line 601): bank deposit interest rate per year (except Chile, Urguay: bank lending rate before 1975).
Δrrd: $rrd_t - rrd_{t-1}$
y (IFS line 99bp): real income[gross domestic output (1980 prices)].
Δy: change in real income$[y_t - y_{t-1}]$
M(IFS line 34): nominal money supply (M1).
ΔM: change in nominal money supply $(M_t - M_{t-1})$.
ΔM: one-time previous ΔM.
Δms: change in real money supply $(\Delta(MO/PR))$
$(rf + e^w)$: foreign interest rate plus expected change in exchange rate (foreign interest rate (IFS line U.S. 60c): treasury bill rate per year, $e^e = \Delta \log$ (exchange rate against dollar) (IFS line ag).
$(rf + e^e)_{t-1}$: on time previous $(rf + e^e)$
P(IFS line 64): domestic price level (consumer price index (1980 = 100)).
$\pi^e = \Delta \log P$: inflation rate = expected rate of inflation ($\pi^e = \pi = \Delta \log P$).
rcf(IFS line 77dd): regulated capital flows (short-term one-year capital flows).
RCF: real regulated capital flows (rcf/P)

(1) From the equation (2.26), $c1 = \mu 1(1-\Omega)a1/\{1 + \mu 1(a2-a3)\}$ and $c4 = \{-\mu 1\ (1-\Omega) + (\ 1 + \mu 1a2 - \mu 1a3)\varnothing\}/\{1 + \mu 1(a2-a3)\}$. By assuming $a1 = 1$, and substituting c1 into c4, $c4 = -c1 + \varnothing^*$

data period is 1957-1986, but there are less than 30 observations for Uruguay (1960-1986).

3. Estimation Results of Regulated Interest Rates

This section reports the empirical results for regulated deposit interest rates (2.26). Before testing the validity of the equation, it explains the procedure of examining whether the equation is specified correctly. Then it discusses the estimation results, especially for the two indices of financial regulations.

Parameteres of (2.26) are initially estimated with ordinary least squares (OLS). For reasons discussed below, OLS estimation results are reported only for the Philippines. Table 3, however, reports the three test statistics of serial autocorrelation, normality, and homoskedasticity derived from OLS. These tests are important in that we want to see if the regulated interest rate equation for each country is specified correctly, especially because the two indices of regulation are derived from the estimation results of the regulated interest rates.

First, DW statistics indicate the degree of serial correlation. Time series are known for possessing a relatively high degree of serial correlation which, if not taken into account in estimation, could result in a serious loss in efficiency and invalid statistical inferences. According to DW statistics, the hypothesis of no autocorrelation cannot be rejected only in the case of the Philippines. Other countries show various degrees of serial correlation. Korea and Australia appear to have particularly serious positive first-order serial correlation.

Second, in nearly all econometric analyses, the hypothesis of normality and homoskedasticity are generally taken for granted, since the classical properties for the error term are assumed to hold. But here we try to test the two properties, especially because rapid changes of the error structure under different financial regulation policies might violate the assumption of the same variance and normality of error term. The normality test is performed using the Jarque-Bera (JB) statistic (Jarque and Bera (1980)). This statistic indicates the difference between the skewness and kurtosis of the distribution of estimated residuals, e_t, and the skewness and kurtosis of the normal distribution. The JB statistic is computed as:

$$(3.2) \quad JB = T[\mu_3^2/(6\mu_2^3) + (1/24)/(\mu_4/\mu_2^{2-3})^2]$$

where, T = sample size, $\mu_i = \Sigma\mu_t^i/T$: the ith moment of the error distribution. The first term of the JB statistic represents the skewness of the distribution of e: the second measures departures of the estimated kurtossis from the kurtosis associated with from the normal distribution. Jarque and Bera (1980) argued that the asymptotic properties of the test are still same if μ_t is replaced by the OLS residuals et. So here, the JB statistic can be directly calculated and compared to the χ^2 statistics. According to the test results, the normality of error distribution can be easily assumed in the sample of countries.

The test of homoskedasticity is based on the work of Engle (1982) on disturbances with autoregressive conditional heteroskedasticity(ARCH). The test relies simply on the autocorrelation of the squares of the OLS residuals. The statistic can be calculated by regressing the squared residuals on a constant and one lag of squared residuals, which provides TR^2 as a χ^2 distribution. More simply, the null hypothesis of homoskedasticity cannot be rejected if the parameter of one lag squared residual is insignificant. Following the Engle model,

$$(3.3) \quad E(e^2/e_{t-1}) = \beta 0 + \beta 1 \; e_{t-1},$$

the test cannot reject the null hypothesis of homoskedasticity if the t-stastistic of $\beta 1$ is insignificant. In the test results, Chile and Korea show relatively high t-statistics, but the null hypothesis of homoskedasticity cannot be rejected at the 5% significance level. For other countries, homoskedasticity can be easily assumed for error distribution.

Considering the problems from the three tests, especially the most serious problem of positive serial correlation of error terms, we estimate the equations with generalized least squares (GLS). Only in the case of the Philippines, can the OLS results pass all the three tests. As a Generalized Least Square method, we use Yule-Walker estimation instead of using the Cochrane-Orcutt method, which is commonly used to correct the first order autocorrelation. In small samples, it is important to use full transformations, but Cochrane-Orcutt method loses the first

[**Table 3**] Estimation Results of Regulated Interest Rates (2.26)

	Expected Signs	Au (GLS)	Ch (GLS)	Ja (GLS)	Ko (GLS)	Ph (OLS)	Ur (GLS)
constant	?	1.07	2.07	1.47	2.26	1.32	2.23
		(5.36)	(3.71)	(8.65)	(5.75)	(4.93)	(7.58)
Δy	+	−0.04	−0.01	−0.01	−0.01	−0.02	−0.01
		(−2.63)	(−0.43)	(−0.89)	(−0.38)	(−1.35)	(−0.78)
y	−	−0.01	−0.01	−0.01	0.01	0.01	0.01
		(−0.34)	(−0.68)	(0.89)	(−1.35)	(1.23)	(0.57)
π_e	?	0.39	0.10	0.48	−1.03	1.73	0.66
		(0.75)	(0.59)	(0.78)	(−1.62)	(1.43)	(2.43)
Δms	?	0.58	0.17	0.18	0.34	0.63	0.14
		(2.07)	(1.24)	(1.87)	(0.34)	(1.33)	(2.15)
$(rf + e^e)$	+	0.49	0.53	0.20	0.17	0.32	0.61
		(4.67)	(1.90)	(0.32)	(5.23)	(2.01)	(3.68)
R^2		0.93	0.43	0.64	0.79	0.48	0.84
DW[1]		0.52	1.48	0.96	0.33	1.87	0.94
Normality[2]		1.23	3.18	4.40	1.79	1.42	1.51
Homoskedasticity[3]		0.65	1.43	1.27	1.52	1.12	0.65

(1) DWs are from OLS. If 1.821<DW-est<2, the null hypothesis of no positive first-order autocorrelation cannot be rejected.

(2) χ^2 statistics based on the equation (3.2). If χ^2-cal. is larger than χ^2 r, α, the null hypothesis of normality can be rejected at the α level.

($\chi^2_{2,\,0.05} = 5.99$, $\chi^2_{2,\,0.01} = 9.21$)

(3) t-statistics based on the equation (3.3) If t-est. is larger than t, α, the null hypothesis of homoskedasticity can be rejected at the α level ($t_{24,\,0.05} = 1.71$, $t_{24,\,0.01} = 2.49$)

observation.

Table 3 reports the estimation results of the regulated interest rate (2.26). The degree of foreign market regulation (Ω), which is represented by the coefficient of $(rf + e^e)$, is consistent with our initial hypothesis, even though in the case of Japan, the coefficient is not statistically significant. The cases of Chile and Uruguay, which are expected to have higher degrees of financial openness, show relatively higher Ωs. According to this estimated value of Ω, a 10 percentage point increase in the world interest rate, for example, implies an increase of the regulated domestic deposit rate of 5.3 percentage (Chile) and 6.2 percentage (Uruguay). The estimation of Chile gives some especially interesting results. Except for the coefficient on $(rf + e^e)$ and the constant term, all the other coefficients are insignificant. The changes in the real money supply as a government reaction have no direct effect on the deposit rate, although it is possible that they still could indirectly through their effect on the constant term. This indicates that the deposit rate in Chile is dominated by the interest arbitrage condition.

The East Asian countries, which still maintain most capital controls in foreign markets (limiting foreign currency deposit held by residents and restricting foreign

direct investment), have relatively small values of Ω compared to the Latin American countries, Among the Asian countries, Ω of Australia is 0.49, which indicates that the Australian financial sector has, in practice, been more integrated to the world than one might be led to believe after analyzing the nature and extent of capital controls during this period.

Under the assumption that a1 = 1, we can evaluate indices of domestic financial regulation in our sample from the estimated coefficients of the change in real money supply and the change in income (c1 + c4 in the equation (2.26)). The Latin American countries have relatively lower degrees of domestic market regulation (lower ∅). In the case of the more regulated countries in domestic markets as Australia, Japan, Korea, and the Philippines, and increase in the growth rate of money supply induces an increase in the regulated interest rate as a governemnt reaction to attract more loanable funds competing with the large curb loan markets. The countries such as Japan and Korea, which still impose interest rates ceilings and credit rationing, have relatively smaller degrees of domestic market financial regulation than Australia and the Philippines. This may be caused by prevalent selective credit policies which are not included in ∅ but still furnish to strong effect of maintaing the regulated deposit rate below the market determined rate.

On the contrary, with less regulated domestic and foreign financial markets, Chile and Uruguay show smaller positive ∅, reflecting government reactions to maintain the regulated deposit rate where they can compete with the foreign interest rate under the rapid inflation in those countries.

Even though the magnitude and direction of the two indices are generally consistent with the initial hypothesis, some indices show statistical insignificance. Furthermore, we excluded three countries (Indonesia, Mexico and Thailand) whose ∅ or Ω do not belong to the range predicted in the model. There might be several reasons to explain some of these unexpected results. First, the dynamic processes of financial deregulation policies were not included in the model. The static specification of constant degrees might no well represent-as it does not in Australia-the changing situations of financial deregulation in some countries. Second, as

[**Table 4**] Degrees of Domestic and Foreign Market Regulation

	Au	Ch	Ja	Ko	Ph	Ur
Demostic market(∅)	0.54 (1.47)	0.16 (0.78)	0.17 (2.21)*	0.33 (0.43)	0.61 (1.62)	0.13 (1.96)*
Foreign market(Ω)	0.49 (4.78)**	0.53 (1.90)*	0.20 (0.32)	0.17 (2.23)*	0.32 (2.01)*	0.61 (3.68)**

(1) Includes t-statistics. * denotes statistical significance at the 0.05 level. ** indicates statistical significance at the 0.01 level.

(2) T-statistics of ∅ is calculated by using variance-covariance matrix of estimation results.
Var(c1 + cr) = Var(c1) + Var(c4) + 2Cov(c1, c4),
$t(\varnothing) = (c1 + c4)/(\text{Sta. Dev.}(c1 + c4))$

initially given in the equation (3.1), the degrees of domestic financial regulation (Ø) are affected by all the coefficients of structural variables. In some cases, biased coefficients from the absence of those variables may cause unpredictable magnitude of Ø, even though it is almost impossible to separate the effect of biased coefficients from the calculated values. Third, here we use yearly data. More recent monthly or quarterly data may affect the estimation results. In this case, it is expected that both degrees will change by substantial margin, reflecting more recent ongoing implementation of financial deregulation policies in these selected countries.

Most of the domestic market factors (income, change in real income and expected rate of inflation) do not significantly affect the regulated deposit rate. This indicates that the regulated deposit rate is mainly determined by changes in money supply and by the foreign sector.

4. Estimation Results of Regulated Capital Flows

This part reports the estimation result of the regulated capital flows (2.27). For estimating the equation (2.27) of four countries (Japan, Korea, the Philippines, and Uruguay), we use the GLS to correct serial correlation problems caused by using the OLS. For Australia and Chile, we use the simple OLS. Estimation results are reported in table 5. Since the equation of the regulated capital flows cannot directly reveal the degrees of financial regulation, we take an indirect way to examine whether the regulated capital flows equation is specified correctly.

If a country has complete capital controls in the foreign market, the equation (2.27) is reduced to the equation (2.20). In this case, the regulated capital flows are determined completely by government regulatory policies in the foreign market. Empirically, it implies that all the coefficients of the equation (2.27) except the constant term should be statistically zero. For any selected countries, estimation results (table 5) do not accept the hypothesis that a country has complete capital controls in the foreign market. Instead, we test how the deregulatory policies affect the capital mobility based on estimation results. The best way in the given framework of the model is to see how the foreign sector ($rf + e^e$) affects the regulated capital flows. If a country is less regulated in the foreign market, the coefficient of the foreign sector becomes negatively larger since the negative effect of an increase in the foreign interest rate on capital inflows becomes larger. As given in (2.27), the coefficients of the foreign sector is $-\Omega t3 - t4$. The derived coefficients from the model implies that when a country is less regulated (larger Ω, t3, and t4), it has a larger negative coefficient ($t3 = \partial CF/\partial Rc$, $t4 = \partial CF/\partial Rf$, t3, t4>0). We expect that Chile and Uruguay, which have relaxed regulations in foreign markets relatively earlier than the East Asian countries, will have a larger negative coefficients of the foreign sector.

Among the estimation results, the coefficients of foreign income (y) show

[**Table 5**] Estimation Results of Regulated Capital Flows(2.27)

	Expected Signs	Au (OLS)	Ch (OLS)	Ja (GLS)	Ko (GLS)	Ph (GLS)	Ur (GLS)
Constant	?	−54.9	29.7	68.1	18.9	59.4	−67.3
		(−1.20)	(1.42)	(4.67)	(0.54)	(2.44)	(−1.67)
Δy	+	−5.52	0.16	4.86	−1.87	5.64	−5.45
		(−0.76)	(0.27)	(2.59)	(−0.79)	(2.28)	(−0.73)
y	−	−0.66	−0.02	0.75	−7.57	2.25	14.3
		(−0.06)	(0.05)	(0.18)	(−0.99)	(0.52)	(2.56)
yf	−	11.57	−3.52	−16.2	−0.43	−11.34	−11.7
		(1.16)	(−1.11)	(−3.69)	(−0.06)	(−3.05)	(−2.74)
Δms	−	−0.83	−1.02	−3.10	0.58	3.20	−0.45
		(−2.11)	(−2.33)	(−1.20)	(0.23)	(1.03)	(−0.30)
π^e	?	−2.94	−1.65	−1.77	0.10	−0.37	0.73
		(−0.51)	(−0.71)	(−0.42)	(0.02)	(−0.09)	(0.96)
$(rf + e^e)$	−	−0.71	−2.03	−0.55	0.29	−0.36	−1.71
		(−0.55)	(−2.64)	(−2.73)	(2.04)	(−2.08)	(−2.33)
R^2		0.43	0.59	0.57	0.25	0.40	0.51
DW^2		1.84	2.07	1.27	1.20	2,67	2.34

(1) DW statistics are from OLS results. If 2>DW-est>1.821, the null hypothesis of no positive first-order autocorrelation cannot be rejected. If 2<DW-est <2.189, the null hypothesis of no negative first-order autocorrelation cannot be rejected.

significantly negative as expected in most selected countries and the two significant positive signs of change in income (Δy) are consistent with the expected signs. In addition, the coefficient signs of the expected rate of the inflation rate (π^e) are indeterminate as expected by assuming a2 = a3.

The effect of the change in money supply(Δms) provides interesting implications for capital controls. The initial expected coefficient sign of Δms is negative by assuming symmetry between the two interest rates(a2 = a3). Four of the coefficients are negative, as expected, and two of these are significant. However, if a2 is larger than a3 by substantial amount, the expected coefficient sign of Δms can be positive. Among the selected countries, Korea and the Philippines show positive coefficient signs. In this case, the symmetry assumption between the two interest rates may not be appropriate. In these countries, since a2 may be larger than a3 by substantial margin, the, coefficient signs of Δms are positive. A larger a2 indicates that the curb loan market is flourishing and the domestic market is severely regulated. Since these two countries are relatively regulated in both markets, an increase in money supply mainly raises the size of curb market loans and reduceds real cost of borrowing, but with almost strict capital controls in foreign markets, it does not reduce capital inflows immediately, In the meantime, government may have an incentive to induce more capital inflows and to relax capital controls both in domestic and foreign markets, since it needs more official sources

of loanable funds. In this case, capital flows are not much affected by the gap between the domestic market interest rate and foreign interest rate. Instead, government regulation policies are major factor to determine capital flows. Thus, the effect of money supply on capital flows can be positive in the short-run.

IV. SUMMARY AND CONCLUSION

Using a loanable fund model of a small economy, this paper examined the determination of interest rates and capital flows under different degrees of financial controls. In a framework of an unregulated fianancial model, two restrictions representing capital controls in domestic and foreign markets were imposed. However, under the process of financial deregulation, two restrictions in the model-interest rate ceilings in bank loan markets and quantitative controls of capital flows-are relaxed to reflect changes in regulatory policies. Based on the relaxation of these restrictions, we derived endogenous regulated interest rates and capital flows. Endogenous deposit interest rates and capital flows are associated with different degrees of financial regulations, located between two extremes case- i.e. between economies with complete capital controls and economies without any capital controls both in domestic and foreign markets.

One interesting feature was to introduce two indices of regulation in financial markets designed to reflect different financial policies of developing countreis. One index reflects the degree of financial regulation in domestic markets, which represents the degree of denationalization of commercial banks, the lowering of barriers to financial markets, reductions of reserve requirements and the introduction of new financial instruments. This degree affects the size of gap between market determined curb loan rates and ceiling deposit rates. The other index indicates the degree of foreign market regulation, including limitations on foreign currency deposits, and requirements for prior approval of foreign direct investment etc. It represents financial openness in foreign capital markets. Inclusion of these two indices enables the model to be applicable to a variety of developing countries that differ widely in terms of the extent to which they are financially regulated in both domestic and foreign market.

Another notable aspect of the model is the inclusion of the curb loan markets(unofficial loan market, which are commonly observable in most developing countries, but which have been neglected in the previous models. Adding a curb loan market makes it possible to analyze effects of policy variables in a loanable fund model, since the equilibrium interest rate in curb loan markets can be assumed to be freely determined market interest rates. The inclusion of the curb loan market recognizes the proposition of Neo-Structuralists(van Wijenbergen(1983), Taylor(1983)) that most developing conuntries have unofficial markets which weaken financial reformists(McKinnon (1973) and Shaw(1973)). However, in this research, the two indices of financial regulation imply results intermediate to the

two conflicting positions. For example, as a country becomes financially less regluated in foreign markets, the negative effect of domestic financial deregulation policies is weakened, since an increase in capital flows may offset the contradictory effect on total loanable funds caused by the substituting demand deposits for curb loans as the ceiling deposit interest rate is increased.

For illustrative purpose, the model was applied to the 6 selected countries. From the estimation results of regulated interest rates and capital flows, measures of the two indices of financial regulation were obtained for these countries. As hypothesized, the estimation results of regulated interest rates showed that degrees of financial regulation vary among the countries, especially between the Latin American countries, which adopted financial regulation policies at relatively early stages, and the East Asian countreis, which still control most of thier financial markets. The Latin American countries had less severe financial regulations both in domestic and foreign markets than do most of the East Asian countries in the sample.

Two suggestions emerge from the model and the empirical results of determining interest rates and capital flows under various financial regulation. First, when regulated interest rates and capital flows are determined, not only market forces but also government reactions should be considered. As economies have evolved from financial repression to less regulated economies, interest rates and capital flows become apparent intermediaries in the transmission mechanism of economic impacts. This changing role of regulated interest rates and capital flows under financial deregulation process would lead to different sets of market forces and government reactions.

Second, different degrees of financial regulation play important roles to determine regulated interest rates and capital flows and should be considered in the modelling regulated interest rates and capital flows. Different degrees make economic agents accessible to different combinations of asset choices, which is mainly caused by changes in unofficial loan markets(curb loan markets) and foreign capital markets under the process of financial deregulation. The changes in asset choices affect interest rates and capital flows, reflecting different interactions between market forces and government reactions. Thus, interest rates and capital flows should be considered to be endogenously specified as reflecting different stages of financial regulation.

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