Chapter 2

Theoretical Framework and Review of Literature

2.1 Theoretical Framework

The effects of the deregulation of interest rate ceilings can be illustrated by the McKinnon (1973) and Shaw (1973) model of finance in economic development. Ever since the pioneering contributions of Goldsmith (1969), McKinnon, and Shaw, the relationship between financial development and economic growth has remained an important issue of debate. Numerous studies have dealt with different aspects of this relationship at both the theoretical and empirical levels. McKinnon and Shaw extended the earlier argument by noting that financial deepening implies not only higher volume of investment. Unlike Goldsmith, where growth and financial intermediation are both thought of as endogenous, the focus of McKinnon and Shaw is on the effects of public policy regarding financial markets on savings and investment. In particular, McKinnon and Shaw argue that policies that lead to financial repression, for example, controls which result in negative real interest rates; reduce the incentives to save. Lower savings, in turn, result in lower investment and growth.

The McKinnon and Shaw hypothesis suggests that the level of financial intermediation should be closely related to the prevailing level of the real interest rate, the reason being that the level of the real interest rate indicates the extent of financial repression. According to this view, a positive real interest rate stimulates financial savings and financial intermediation, thereby increasing the supply of credit to the private sector. This, in turn, stimulates investment and growth. While the main channel of transmission emphasized by the McKinnon and Shaw hypothesis is the effect of real interest rates on the volume of savings, it is also recognized that positive real interest rates make the allocation of invisible funds more efficient, thus providing an additional positive effect on economic growth.[7]

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[7] Jose De Gregorio and Pablo E. Guidotti, "Financial Development and Economic Growth", IMF Working Paper, International Monetary Fund, WP/92/101, December 1992.

Moreover, Maxwell J. Fry, gives us the effects of having deposit rate ceiling are as follows[8]

(1) Low interest rates produce a bias in favor of current consumption and against future consumption. Therefore, they may reduce savings below the socially optimum level. Savings also decline in situations where inflation prevail because of the decline in real interest rates. In this situations, savers will tend to reduce deposits at commercial banks and prefer to hold non-depreciating assets such as land.

(2) Potential lenders may engage in relatively low yielding direct investment instead of lending by way of depositing money in banks. Ceilings on deposit interest rates may lead to financial disintermediation as savers and investors sought alternative outlets outside the formal financial system. Consequently, accumulation of deposits in commercial banks will decline.

(3) The deposit rate ceilings force commercial banks to play a greater role in capital intensive projects and non price competition.

However, in most financially repressed economics there are loan and deposit rate ceilings. Ceilings on lending rate have the following effects:

1) If the market interest rate is higher than the loan rate ceiling, there will be an excess demand for loanable funds at the level of lending rate ceiling. Therefore, commercial banks may require compensating balances from lenders. Commercial banks will then lend this deposit out to other investors.

2) Credit is allocated not according to the expected productivity of investment projects but according to the transaction costs and the perceived risk of default. This allocation of credit may be influenced by quality of collateral, political pressures, loan size, and covert benefits to the responsible loan officers. Loan rate ceilings discourage risk taking on the part of financial institutions. Risk premium cannot be changed when ceilings are effective. Indeed, there will be a preference for low yielding investments because they appear safest and simplest to finance. Thus, a large

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[8] Pornpen Sodsrichai, An Economic Impact of Financial Liberalization in Thailand, Thesis, Master of Economics, Thammasat University, May 1993, refers to "Maxwell J. Fry, "Money, Interest and Banking in Economic Development", (Baltimore and London: The John Hopskins University Press, 1988), p.135-144.".

proportion of potentially high yielding investment may be rationed out.

Kellison commences his treatise on "the Theory of Interest" determinants of the level of interest rates[9] as conventionally outline in basic economic theory. This proposes that rates of interest, like other prices, are established by supply and demand. If the demand for funds is strong in relation to the availability of funds, interest rates will rise. Conversely, if the demand for funds is weak in relation to the availability of funds, interest rates will fall. This sounds simple, but in practice there are a large number of factors that come together in complex ways to determine rates of interest.

Moreover, his treatise has a list of major factors which have an influence on the level of the rate of interest. The list is not exhaustive, but it does include most of the major determinants.

1. *The underlying "pure" rate of interest*

   Most economic and financial theories believe that there is an underlying "pure" rate of interest rate as a base which is related to long-term productivity growth in the economy. This rate would prevail on the risk-free investment if there were no inflation. This rate has proven to be relatively stable over many decades.

2. *Inflation*

   Experience has shown that inflation has a significant effect on the rate of interest.

3. *Risk and uncertainly*

   Experience has also shown that risk and uncertainly have a significant effect of the rate of interest.

4. *Length of investment*

   There will normally be differences in the market between the rates of interest on short-term and long-term loans and investments, all other things being equal.

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[9] Stephen G.Kellison, "The Theory of Interest", (second edition, 1991), p.296-298

5. *Quality of information*

   In finance theory "efficient" markets are defined as those in which all buyers and seller (in this context borrowers and lenders) possess the same information. Aberrations in the rate of interest rate are more likely to exist in "inefficient" markets. In the modern computer-information age, markets tend to be more efficient than in the past. However, certain market rigidities remain which can effect the rate of interest.

6. *Legal restrictions*

   Some rates of interest are regulated by the government. In the United States there has been a trend toward deregulation is recent, so that this has become a less significant factor than in the past. Nevertheless some rates of interest still are subject to some degree of regulation.

7. *Government policy*

   The government has a major influence, even control, on the overall level of interest rates through its monetary and fiscal policy. The primary control is the ability of the government to adjust the supply of money in the economy. Also the level of government deficit or surplus affects the demand side of the credit market significantly.

8. *Random fluctuation*

   In addition to all the above, the movement of interest rates over time also shows random fluctuations.

2.2 Review of Literature

Much of the existing development literature follows McKinnon and Shaw in claiming that higher time deposit rates, and lower inflation in the short run increase growth via their favorable impact on savings rates. However, this section attempts to organized these factors in sections which examine the effects of financial liberalization.

Interest rates and savings[10]

One of the most contentious issues in financial policy is the effect of interest rates on savings. There can be little doubt that short-term, temporary swings in interest rates have little effect on private savings behavior since this behavior is largely governed by expectations and plans regarding current and future incomes and expenditures: they alter the level of savings primary by affecting the levels of investment and income. However, when there is a rise in interest rates that is expected to be permanent (for instance, because it is the result of a change in the underlying philosophy in the determination of interest rates), will consumer behavior remain the same, or will the propensity to save rise? The orthodox theory expects the latter to occur, and thus argues that removing "financial repression" will have a strong, positive effect on savings (Shaw, 1973)

Empirical studies of savings behavior typically do not distinguish permanent from temporary changes in interest rates. Recent evidence on savings behavior in a number of developing countries that changed their interest rate policy regimes shows no simple relation between interest rates and private savings.[11]

Financial liberalization and deepending

It is generally agreed that financial liberalization raises financial activity relative to the production of goods and non-financial services. However, there is much less consensus on the causes and effects of this "financial deepening". According to the financial repression theory (McKinnon, 1973; Shaw, 1973) financial deepening represents increased intermediation between savers and investors because higher interest rates raise savings and shift them from unproductive assets towards financial assets, thereby raising the volume of productive investment.

While it is true that financial liberalization can shift existing savings toward financial assets, reallocation is not the only and even the most important reason for financial deepening. Financial liberalization can also lead to deepending by redistributing savings and investment among various sectors,

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[10] Yilmaz Akyuz, "Financial Liberalization: The Key Issues", United Nations Conference on Trade and Development, Discussion Papers, No. 56, March 1993.

[11] This is true for a wide range of countries in Asia and the Middle East (Indonesia, Malaysia, Philippines, Sri Lanka, Republic of Korea and Turkey-Cho and Khatkhate, 1989; Amsden and Euh. 1990; Lim, 1991; Akyuz, 1990). Africa (Ghana, Kenya, Malawi, Tanzania and Zambia-Nissanke, 1990), and Latin America (Massad and Eyzaguirre, 1990) that undertook financial liberalization, albeit to different degrees and different circumstances.

and by creating greater opportunities for speculation. Since these can worsen the use of savings, financial deepending is not necessarily a positive development.

The prime role of the financial system in the saving/investment process is to intermediate between deficit and surplus sectors rather than to transfer aggregate savings into aggregate investment. Deficit sector[12] save as well as invest, while surplus sectors (households) invest as well as save. Thus, redistribution of savings and investment among sectors can occur, by changing structural savings and investment for instance, when higher interest rates redistribute income and savings from debtors to creditors. Even when this does not alter the volume of aggregate saving, it increases deficits and surpluses and, hence, the amount of financial intermediation. Indeed, financial intermediation can increase while aggregate savings and investment fall (Akyuz, 1991). This can happen even under the orthodox assumptions that savings rates are positively related the interest rate and that investment determine savings and growth (Molho, 1986),

Financial liberalization often raises holdings of both financial assets and liabilities by firms and individuals at any given level of income, investment and savings. This tendency to borrow in order to purchase assets is driven by the increased scope for capital gains generated by financial liberalization. Liberalization increases the instability of interest rates and asset prices, thereby raising prospects for quick profits through speculation on changes in the market valuation of financial assets. It also allows greater freedom for banks and other financial institutions to lend to finance activities unrelated to production and investment, and to firms and individuals to issue debt in order to finance speculation. These can generate considerable financial activity unrelated to the real economy, and lead to financial deepending as in the United States in recent years through leverage takeovers, mergers, acquisition and so on (UNCTAD, 1992).

Deepending can also result from the impact of changes in interest rates on the form in which savings are held. Indeed, one of the main reasons why savings do not in practice strongly respond to increases in real interest rate is the existence of a range of assets with different degrees of protection against inflation: for, returns on such assets also influence savings decisions. The greater the influence of interest rates on the allocation of savings among alternative assets, the smaller the influence on the volume of savings.

Freeing interest rates in the formal sector can trigger a shift away from informal markets. However, the scope of such shifts may be limited since the

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[12] Typically the corporate sector and the government

reason for informal markets is not always interest rate controls and credit rationing. They often provide services to small and medium producers who do not have access to bank credits. Since financial liberalization does not always improve their access to banks, informal markets continue to operate after the deregulation of interest rates. As savings placed in the informal sector assure these producers of some access to credit, they are not always willing to shift to banks.

The financial deepening brought about by liberalization is not necessarily associated with a higher level and/or better use of savings. Indeed, the empirical evidence does not support the claim that financial deepening is associated with faster growth (Dornbusch and Reynoso, 1989). The degree of financial deepening is therefore not a good measure of the contribution of finance to growth and development.

Measuring efficiency

Financial liberalization normally reduces or eliminates credits on preferential terms and hence diminishes variations in the cost of capital across sectors. Therefore, measuring the effect of financial liberalization on allocative efficiency in terms of reduced variations in cost of capital is tautological. On the other hand, a successful industrial policy could reduce variance in borrowing cost by diminishing the number of industries requiring special treatment. For instance, it has been argued that the decline in the inter-industry variance of borrowing costs in the Republic of Korea in the 1980s compared to the 1970s reflects the success not of financial liberalization as suggested by some authors (e.g., Cho, 1988), but of industrialization policies (Amsden and Euh, 1990).

The search for greater allocative efficiency through financial liberalization can greatly reduce the productive efficiency of the financial system by giving rise to increased financial instability and raising the cost of finance to investors. This is a systemic influence, quite independent of any rise in interest rates that may result from elimination of ceilings. Indeed, the financial instability and bank failures stemming from financial liberalization in the major industrial countries, especially the United States, in the 1980s played a major role in considerably raising long-term interest rates and reducing their sensitivity to changes in short-term rates (Akyuz, 1992).

The Keynesian notions of lender's and borrower's risks provide an appropriate framework for discussing the determinants of cost of finance and the effects of financial liberalization on productive efficiency (Keynes, 1936). An important determinant of the lender's interest rate is the risk due to the

possibility of default by the borrower, i.e., the lender's risk. Firstly, there is the risk of voluntary default, or what Keynes calls the moral risk: the lender must make an allowance for the possibility of dishonesty of the borrower. Secondly, involuntary default arising from imperfect foresight, i.e., from uncertainties over factors outside the control of the borrower which affect profitability. This risk, called the borrower's risk or the pure risk, is inherent in all investment decisions and cannot be eliminated. However, it can be reduced by the borrower having access to better information and stable economic conditions. The pure risk is closely related to allocative efficiency. When finance is not allocated efficiently, the probability of involuntary default increases. This raises the lender's risk and the cost of finance: allocative inefficiency thus aggravates cost inefficiency.

The role of the banking system

In mid 1980s, Izak Atiyas (1989) examined the restructuring and deregulation of the Turkish financial sector, including the removal of interest rates restrictions and the encouragement of financial transactions through the introduction of new types of financial institutions and instruments. The important objectives of financial liberalization were an expected increase in the interest rates and the competition into the banking sector.

The results of Atiyas' investigations showed that the objectives of an increase in deposit and financial savings were successful; however, the response of the financial sector and firms were worse than expected.

The first unexpected response related to the banking system's reaction to deregulation. It was argued that the complete absence of a regulatory framework allowed insolvent banks to avoid bankruptcy by offering high rates to deposits, and then using collected funds to finance their obligations and refinance non performing loans.

Second, the response of the corporate sector was also in contrast to the expectations of the authorities. The firms who had losses would continue to increase their debt to asset ratio. Therefore, the ability of firms to finance current expenditure would be reduced when there was a drop in their earnings. The asset provided the difficulties to the firms for selling assets. The thinness of equity markets and/or owners' unwillingness to share or loose control of corporations limited the extent to which financing can be secured through outside equity.

Hence, the Turkish experience suggests that the financial liberalization might not generate desired response. In fact, it might adversely affect the commercial banks' profitability and caused financial distress in the corporate and the banking sectors.

Experience in others countries

Kumihara Shigehara (1991) investigated financial liberalization in Japan. The policies were managed using a step by step approach concerning the issuance of instruments, the removal of interest rates, and so on.

Shigehara concluded that the financial liberalization increased the role of market expectations in determining interest rates. Moreover, the Bank of Japan emphasized on open market operations, the authorities preferring short-run adjustment of bank reserves to be conducted solely through buying and selling operations in open and well-developed markets for short government papers.

In addition, an important consequence of financial liberalization was greater competition among financial institutions which has led to a narrower profit margin because there has been an increase in return on savings and a reduction in the cost of borrowings. The benefits of financial liberalization have also accrued to corporate borrowers and wealthy savers.

In another study of financial liberalization in Japan, Akio Kuroda[13] explained that the market for deposits with large denomination is closely related to the short-term money market and the development of the certificate of deposits market in Japan, which was established in May 1979, has led to a series of deregulation measures in the market for deposits (Kuroda, 1988; Takagi, 1988).

The liberalization of the Japanese deposits market, however, has not greatly benefited individuals, since the minimum denomination of free market instrument is still large: even the denomination of MMCs, whose return is set at a fixed percentage below CD rate, was set at 10 million yen at the end of 1988. This exclusion of individuals was designed to protect the smaller financial institutions that were dependent almost entirely on low-cost, fixed-rate deposits by individuals for funding. The authorities, however, recognize that the liberalization of interest rates on small denomination deposits is inevitable and desirable from the viewpoint of individuals.

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[13] Senior Economist, Institute for Monetary and Economic Studies, Bank of Japan

Along with the development of the market for deposits with market interest rate, the fund-raising costs of banks become more flexible, and thus the banks, at least to the extent that raised short-term funds and lent long-term funds, began to bear a much greater risk of interest rate fluctuations (Suzuki, ed., 1987). In order to reduce the risks, the banks have had to seek more flexibility in the interest rates that they earned on the asset side of their balance sheets. Loan rates have also more influenced by international factors because of increased competition from foreign funds in the market for bank loans.

Financial sector policy in Thailand has been studied by William Easterly and Patrick Honohan (1990). The domestic interest rate will not be affected by private sector excess demand or fiscal deficits but will be determined solely by international interest rates (plus expected devaluation of the domestic currency). Changes in the fiscal deficit or autonomous private demand will pass through into the current account deficit of the balance of payments rather than increasing domestic interest rates.

Wanda Tseng and Robert Corker (1991) attempted to focus on the relationship between financial liberalization, money demand, and monetary policy in a number of Asian countries including Indonesia, Korea, Malaysia, Myanmar, Philippines, Nepal, Singapore, Sri Lanka, and Thailand.

Prior to the financial liberalization, the financial system in these countries shared the same characteristics such as interest rate restrictions, high reserve requirements, the restrictions limiting competition in the financial system, and international capital flow controls.

The interest rates controls were designed to provide low-cost funds to encourage investment. However, these restrictions led to financial disintermediation i.e., savers and investors sought alternative choices outside the formal financial system. It caused an accelerated growth in unregulated financial markets and non-bank institutions.

In addition, the high reserve requirements with no interest paid on reserves served as an implicit tax on commercial banks and acted to raise the cost of financial intermediation. The regulations on the entry of new institutions was aimed at improving the financial intermediation and developing the new services and instruments. Furthermore, the controls of international capital flows were intended to protect the fluctuation of domestic interest rates and monetary conditions from abroad.

The financial liberalization in the Asian countries has been a gradual and continuing process. The objectives of the financial reform were to expand the reliance on market forces, in order to improve the efficiency and the effectiveness of monetary policy.

The empirical results showed that the important effects of interest rate liberalization were to promote savings and efficient investments. Moreover, the positive real interest rates contributed to economic growth by promoting financial deepening and the investment productivity. The financial depth, which was measured by M2 to GDP ratio, rose in the most of these countries.

Moreover, a number of Asian countries undertook measures to increase competition by allowing greater freedom of entry, to expand the scope of business activities for difference types of financial institutions, to relax the restrictions on foreign banks activities, and to encourage the creation and development of money markets. They not only increased competition in the financial system but also provided flexible means for managing liquidity through open market operations.

In addition, the authors investigated the implications of financial liberalization for money demand. The financial reform would make the instability of money demand because the interest rate deregulation could prompt the portfolio shift. However, it depended on which level of interest rates changed. If interest rates on time deposits increased after liberalization, the demand for broad money might rise while the demand for narrow money might decline.

The financial liberalization might results in the inability of money demand function to predict short run monetary aggregate development since the new influences might become important determinants of money demand after liberalization. The precision of the predicted monetary development might be changed.

Regarding the effects of financial reforms on the transmission channels of monetary policy, the authors showed that interest rates played an important role in transmitting monetary effects to all sectors of the economy. Many of the countries examined placed a greater emphasis on market-based monetary instruments rather than on direct controls on interest rates and credit. The market determined interest rates have become more important in determining the flow of credit. The liberalization of interest rates has also contributed to improve resource allocation, the mobilization of savings, and the efficiency of investment.

Empirical studies

A fundamental determinant of the macroeconomic properties of an economy is its degree of financial integration with the outside world.[14]

Peter J. Montiel, gives macroeconomic implications of strong financial integration are especially important. One of them state on interest rate policy in repressed economies, in which domestic interest rates are subject to binding legal restrictions, is affected by the implications of financial openness. The pursuit of positive real interest rates in a closed economy in which the domestic marginal product of capital is the relevant opportunity cost of funds may easily be frustrated by capital inflows if the economy is sufficiently open.

Sequencing of Macroeconomic and Financial Policies

Policy	Country initial conditions			
Sequencing	UM/IS	UM/AS	SM/IS	SM/AS
Step 1	Stabilize economy and strengthen supervision while; regulating interest rates.	Stabilize economy and maintain supervision; begin gradual interest rate liberalization.	Maintain economic stability and boost supervision; while enhancing supervision, temporarily regulate interest rates.	Maintain economic stability and supervision; can liberalize interest rate simultaneously.
Step 2	Liberalize interest rates.	Liberalize interest rates.	Liberalize interest rates.	

Source: International Monetary Fund Staff Papers 37(September 1990): 522.
Note: UM denotes unstable macroeconomy; SM denotes stable macroeconomy; IS denotes inadequate bank supervision; and AS denotes adequate bank supervision.

[14] Peter J. Montiel, "Capital Mobility in Developing Countries: Some Measurement Issues and Empirical Estimates", The World Bank Economic Review, volume 8, September 1994, No. 3.

Moreover, in the study of Sebastian Edwards (1988) on the financial liberalization in Korea which has characterized as follows:

(1) new financial instruments were created.

(2) both domestic and foreign commercial banks seem to increase competition among banks.

(3) banks were permitted to raise the scope of their business under inter mediating time deposits,

(4) the liberalization of financial system in Korea was attempted to encourage overall competition in financial sector by giving a more important role to non-bank financial institutions, to decrease the government intervention in the credit allocation, and to raise the degree of flexibility in terms of interest rates which banks could charge on their loans.

In addition, Christopher Chamley and Qaizar Hussian (1988)[15] concentrated on the "linchpin" theory of economic development or the removal of financial repression policy, especially the abolition of interest rates ceilings, in the three Southeast Asia countries; Thailand ,Indonesia and the Philippines.

Chamley and Hussian's hypothesis that domestic interest rates are increasingly determined by foreign rates after liberalization policy was tested by ordinary-least squares method. The model was:

$$r_D=f(r_F, GDP/M, n, r_D(-1))$$

Where r_D and r_F are domestic and foreign interest rate ,*GDP/M* is the ratio of nominal GDP to money supply and n is the inflation rate, respectively. The empirical results of the analysis showed that there was a positive correlation between domestic and foreign interest rates.

The empirical results also suggested that the liberalization measure including the removal of interest rate ceilings and other regulations on credit led to an increase in M2 to GDP ratio in both Thailand and Indonesia. In the Philippines, there was a significant relationship between real deposit rate and

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[15] Pornpen Sodsrichai, "An Economic Impact of Financial Liberalization in Thailand", Thesis, Master of Economics, Thammasat University, May 1993, refers to "Christopher Chamley and Qaizar Hussian, "The Effects of Financial Liberalization in Thailand, Indonesia and the Philippines", World Bank Working Paper WPS 125, October 1988.

growth of deposits; however, the result differed from Thailand and Indonesia cases. The interest rate liberalization failed to generate an increase in the bank deposit, because the positive effect of financial liberalization was offset by the interaction of inflation and taxes on financial institutions. Accordingly, the ratio of M2 to GDP did not change after the interest rate liberalization.

Pornpen Sodsrichai[16] investigated the degree of openness of the financial sector in Thailand by examining the extent to which domestic interest rates are influenced by foreign interest rates. The analysis was conducted using two models:

Model I "uncovered foreign borrowing:"

$$R^d_t = a + bR^f_t + c(L/D)_t + u_t, \qquad \text{and}$$

Model II "was covered foreign borrowing:"

$$R^d_t = a' + b'(R^f + F)_t + c'(L/D)_t + u'_t,$$

where R^d is the Thailand interbank rate, R^f is the one-month Singapore interbank offer rate, F is the one-month forward premium rate, L/D is the loan to deposit ratio, and u and u' are the disturbance terms.

The results of this study suggested that the domestic interest rates were increasingly influenced by foreign interest rates after the period of financial liberalization. The result of the first model was

$$R^d_t = \underset{(-1.15)}{-30.62} + \underset{(3.67)}{1.59}R^f_t + \underset{(1.23)}{0.30}(L/D)_t$$

$$R^2 = 0.73 \qquad DW. = 1.68$$

Accordingly, the openness of financial sector has increased after the relaxation of capital control.

In the second model,

$$R^d_t = \underset{(1.47)}{16.92} + \underset{(9.47)}{0.89}(R^f + F)_t - \underset{(-1.46)}{0.16}(L/D)_t$$

$$R^2 = 0.89 \qquad DW. = 2.00$$

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[16] Pornpen Sodsrichai, An Economic Impact of Financial Liberalization in Thailand, Thesis, Master of Economics, Thammasat University, May 1993.

The significance of the forward premium rate reflects the greater degree of openness of financial sector. However, this study did not give the level of degree of openness of the financial sector.

The last study to be presented here is the paper of David Robinson, Yangho Byeon, and Ranjit Teja with Wanda Tseng[17]. This study assessed the openness of the capital account in Thailand, using a method first put forward by Edwards and Khan (1985), and drew some conclusions on the likely effectiveness of monetary policy.

They used the Edwards and Khan approach which attempts to measure the openness of the capital account directly by viewing the observed domestic interest rate at time t, i_t, as a weighted average of the interest rate i^o_t, that would obtain if the economy was completely open and interest rate i^c_t that would exist if the economy was completely closed. The approach was measured for developing countries where mixed between closed and open economy.

The basic approach for a closed economy is

$$i^c_t = d_0 + d_1 \log y_t + d_2 \log m_{t-1} + d_3 \pi^e_t + E_t$$

where
- i^c_t = domestic interest rate
- d_i = parameters
- y_t = Real GDP
- m_{t-1} = lagged money supply
- π^e_t = expected inflation rate
- E_t = error term

and the approach for an open economy is

$$i^o_t = \Theta (i^*_t + e_t) + (1- \Theta) i_{t-1}, \ (0 \leq \Theta \leq 1)$$

where
- i^o_t = domestic interest rate
- i^* = foreign interest rate
- e_t = expected foreign exchange rate
- Θ = speed of adjustment to foreign interest rates

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[17] David Robinson, Yangho Byeon, and Ranjit Teja with Wanda Tseng, "Thailand: Adjusting to Success Current Policy Issues", International Monetary Fund, Occasional Paper 85, August 1991, p.39-42

Thus, they derive the basic approaches for a developing country as the following equation:

$$i_t = \psi i^*_t + (1- \psi) i^c_t$$

The parameter ψ measures the degree of openness of the economy in the long term: if $\psi = 1$, the economy is fully open. In practice, even in a fully open economy, domestic interest rates may only adjust to foreign interest rates with a lag. The model is extended so that in an open economy the interest rate adjusts to foreign interest rates with a speed of adjustment Θ (if $\Theta = 1$, then adjustment is instantaneous), allowing a distinction between the openness coefficient in the short run ($\Theta \psi$) and in the long term (ψ).

The degree of monetary disequilibrium, which determines the real interest rate in developing countries, can be proxied in equation below:

$$i_t = d_0 + d_1 i^*_t + d_2 log\ y_t + d_3 log\ m_{t-1} + d_4 \pi^e_t + d_5 i_{t-1} + E_t$$

where the d_i are parameters. A detailed derivation of this equation, and expressions for the d_i in terms of the underlying parameters of the system, can be found in Edwards and Khan. It is enough to note here that the openness coefficient ψ is the sum of the parameters d_1 and d_5, which d_1 as $\Theta\psi$ and d_5 as $\psi(1- \Theta)$, while the speed of adjustment can be derived by dividing d_1 by $(d_1 + d_5)$.

The estimates of the openness coefficient, showed the long-run openness coefficient ψ is 0.97, which very close to unity in the case. However, adjustment was not instantaneous, with only 0.54 of the difference between domestic and foreign interest rates eliminated in each quarter, suggesting that information lags and other sources of friction in the system are important in the short term.