# Chapter 1

# Strategies for Financial Reforms*

During the past two decades,[1] many developing countries have implemented financial liberalization aimed at eliminating credit controls and achieving positive real interest rates on bank deposits and loans. The general objective of this policy was to mobilize domestic savings, attract foreign capital, and improve efficiency in the use of financial resources. Initial economic and financial conditions across countries varied significantly and affected subsequent performance. Nonetheless, certain characteristics were common to the relatively successful cases of financial liberalization. These patterns included the establishment of a stable macroeconomic environment, prudential supervision of the banking system, and the sequencing of stabilization, banking regulations, and interest rate policies. Specifically, those economies that largely avoided the adverse consequences from large-scale financial liberalization — sharp increases in interest rates, bankruptcies of financial institutions, and loss of monetary control — were characterized by stable macroeconomic conditions, a strong and effective system of bank supervision, and a gradual removal of controls on interest rates. How stabilization, prudential supervision, and pace of liberalization affect financial reforms is the focus of this chapter.

The particular mechanism for attaining positive real interest rates has tended to depend on individual country circumstances. In some cases there was an outright liberalization or deregulation of interest rates in a short period, whereas in other cases it involved gradual liberalization over the medium run in which frequent adjustments in regulated interest rates were made. Taiwan Province of China, Singapore, and the Republic of

* Written with Abbas Mirakhor and reprinted from *International Monetary Fund Staff Papers* 37, 509–536, by the permission of the International Monetary Fund. Copyright for the year 1990 was obtained by the International Monetary Fund.

[1] 1970–1990.

Korea (and to some extent, Sri Lanka) engaged in a gradual and flexible management of interest rates that resulted in positive real levels. Chile, Argentina, Uruguay, the Philippines, Malaysia, and Turkey liberalized interest rates within a relatively short period (generally three years or less). Of these, only Malaysia appeared to have avoided any adverse consequences from the liberalization, such as a sharp run-up in real interest rates. In the others in this group, output declined owing to bankruptcies of firms (banks and nonfinancial firms), inflation worsened, and external imbalances widened. These contrasting experiences between the two groups would suggest that, other things being equal, a gradual approach to interest rate reforms is more likely to be successful.

In the past, conventional wisdom was that credit rationing and low interest rates were solely the result of government intervention, and that removal of controls would lead to a more healthy, dynamic, and efficient financial system. Recent literature, however, has significantly increased our understanding of how commercial bank credit markets actually operate, in particular how asymmetric information between lenders and borrowers may lead to efficient credit rationing and optimal interest rates that are below market-clearing levels, even in a competitive, multibank structure, and in the absence of interest rate ceilings. We now have a theoretical rationale for why the interaction of macroeconomic instability and inadequate bank supervision (the decision of banks to undertake risky lending in the presence of deposit insurance, sometimes referred to as *moral hazard*) often results in an immediate increase in real interest rates to risky levels. Progress has also been made involving the application of implicit contract theory to bank credit markets, demonstrating the critical importance of stable economic conditions in the smooth functioning of such markets, and showing that bank lending rates in a stable macroeconomic environment tend to be fairly rigid in relation to the (opportunity) costs of loanable funds, such as interest rates on treasury bills, deposits, interbank lending, and so on. Although such analytical breakthroughs have been developed in the context of commercial bank credit markets in the advanced countries (for example, the United States), little effort has been made to apply this analysis to financial reforms in developing countries.

The experiences of developing countries over the last two decades and recent advances in the theoretical analysis of bank credit markets raise the following major questions. What are the respective roles of imperfect information, risk-sharing, macroeconomic instability, and moral hazard in the determination of bank lending interest rates? And what is the appropriate sequencing of interest rate liberalization, macroeconomic stabilization, and

financial regulatory policies? This chapter is an attempt to address these questions, leading to a reassessment of interest rate policy and financial liberalization strategies.

Section 1.1 is in two parts. The first part reviews the recent theoretical literature relevant to interest rate and other financial sector policies. The second part details key policy considerations in the design and sequencing of such policies. Section 1.2 reexamines the historical experiences in the Southern Cone countries of Latin America (Argentina, Chile, and Uruguay), several Asian countries and Turkey, in the light of the theoretical policy discussion. The final section summarizes the analysis and provides some concluding observations.

## 1.1. Financial Liberalization: A Review of Major Issues

This section reviews the key issues in the renewed debate on the benefits and pitfalls of interest rate and financial liberalization policies. The literature on this topic is extensive, and only two major issues will be taken up in this brief survey: the role of imperfect information and risk-sharing in the allocation of credit and the determination of interest rates; and the implications of the interaction between macroeconomic instability and moral hazard in the banking system for the sequencing of interest rate liberalization, macroeconomic stabilization, and prudential supervision. Before discussing these issues in detail, it is useful to summarize the standard thinking on the need for interest rate and financial liberalization policies in countries undergoing structural economic adjustment.

"Financial repression" is a phrase popularized by McKinnon (1973) and Shaw (1973) to describe the policies that distort domestic capital markets through a variety of measures — for example, ceilings on interest rates, high reserve requirements, and overall and selective credit ceilings. In a financially repressed economy, real deposit and lending rates are often negative, with adverse consequences for the development of the financial system and for saving and investment generally. As a remedy, the standard approach suggests establishing positive real rates of interest on deposits and loans by, among other measures, eliminating interest rate ceilings and direct credit allocations and pursuing price stabilization through appropriate macroeconomic and structural policies. Savers and investors could then see the true scarcity price of capital, leading to a reduced dispersion in profit rates among different economic sectors, improved allocative efficiency, and higher output growth.

Although the adoption of the above standard measures produced positive results in Malaysia in the 1980s (Cho and Khatkhate, 1989), the outcome was far less satisfactory when tried in Chile, Argentina, and Uruguay during the 1970s (Corbo and de Melo, 1985), and during the 1980s in the Philippines, Indonesia (Cho and Khatkhate, 1989), and Turkey (Atiyas, 1989). In fairness, inappropriate exchange rate and domestic financial policies in these countries and the significant weakening of government supervision of bank lending when the profitability of the business sector was particularly adverse all contributed to the failure of interest rate and financial sector liberalization.[2] Special mention must also be made of the political turmoil and external debt crisis in the Philippines. Nonetheless, some economists have begun to question the traditional approach to interest rate policy and financial liberalization.

### 1.1.1. *Theoretical Developments*

Ronald McKinnon (1986, 1988), an original contributor to the standard approach to financial liberalization, recently analyzed its failure in the Latin American experiments. On the basis of an analysis of credit markets that incorporates imperfect information and moral hazard, he modified his earlier position, suggesting that "the government should probably impose a ceiling on standard loan (and deposit) rates of interest" to overcome the bank's moral hazard — the tendency to provide risky loans at high rates in the expectation that large losses will be covered by deposit insurance, explicitly or implicitly provided by the government; see McKinnon (1988, p. 408). The very cause of financial repression — an immature bank-based capital market — imposes limits on the levels to which interest rates can be raised without incurring undue "adverse risk selection" among borrowers (Stiglitz and Weiss, 1981). McKinnon (1988, p. 388) then demonstrates that "macroeconomic instability reduces the socially desirable level of real interest rates in the banking sector, and makes financial liberalization more difficult."[3]

[2]Dornbusch and Reynoso (1989) emphasize the importance of macroeconomic stability, in particular price stability. Given large fiscal imbalances and unrealistic exchange rates, these authors have argued that financial liberalization could lead to higher inflation. They then present empirical evidence that high inflation, in turn, retards growth through its adverse effects on net investment and efficiency of resource use. On the latter, see Chapter 7.

[3]This issue is taken up in Subsection 1.1.1.3.

#### 1.1.1.1. *An Overview of the Theory*

The market for bank credit, whether in an industrial or developing economy, is very different from any spot market for a commodity (such as coffee or sugar) or any other financial asset (such as foreign exchange or government bonds). In spot markets, the supplier of the commodity or foreign exchange, or the investor in government bonds, receives a rate of return exactly equal to the price (net of any taxes) of the commodity or foreign exchange, or the interest rate on government bonds transacted in the relevant markets. In the market for bank credit, however, the interest rate charged on the loan differs from the expected return to the bank, which is equal to the product of the interest rate and the repayment probability of borrowers. This probability is always less than 100 percent because of imperfect or asymmetric information between banks and their borrowers, defined as a situation in which borrowers have greater information about their own default risks than do banks.

The probability of repayment itself is negatively related to the interest rate charged; that is, as the interest rate on the loan increases, the probability of repayment would tend to decline. Beyond a certain interest rate level, the repayment probability would fall by more than the increase in the interest rate, and the expected return to the bank may actually decline with further increases in the interest rate. The bank closes the loan window for some borrowers even if they are willing to pay higher interest rates. This feature of the bank credit market shows the limits to which interest rates can be raised. Thus, it can be observed that when faced with an excess demand for loans, properly regulated banks (with adequate provisions for loan losses) even in competitive banking markets limit lending to borrowers and charge an interest rate below the level that would clear the market. In this situation, the market-clearing rate is neither optimal nor efficient for the bank, because at this rate the bank's expected profit is less than that at the credit-rationing level, and borrowers with high repayment probabilities tend to drop out and are replaced by those with high default risks. The credit-rationing rate, however, is both optimal and efficient, because bank profits are at a maximum level and risky borrowers are rationed out. This credit-rationing feature of the bank credit market is characteristic of any market where imperfect or asymmetric information is inherently present.

What is the effect of macroeconomic instability on the market for bank credit? Macroeconomic instability can be defined as a situation where large

changes in the prices of goods and factors of production lead to increased variance and positive covariance in returns on investment projects; that is, many or all investment projects would be affected adversely (favorably) by poor (good) macroeconomic performance. Assume (and this is critical) that any potential moral hazard in the bank itself that may be induced by economic instability is effectively contained by strict official supervision and prudential regulation requiring sufficient reserves against loan losses, and that deposit insurance, explicit or implicit, is either absent or appropriately priced. The bank therefore behaves as if it were risk averse. The higher reserves against defaults required by the regulatory authorities in response to macroeconomic instability would lower the expected profit function of the bank at given levels of the loan interest rate. The response of the bank is to lower interest rates on loans further and to ration credit more severely. This is why low and stable bank lending rates can be observed in countries where bank supervision and prudential regulation are strong and effective (such as in Malaysia).

What is the effect of weak bank supervision and regulation systems? Assume (realistically) that the regulatory authority stands ready to prevent a collapse of the banking system at little or no cost to the banks themselves (for example, provision of free deposit insurance, whether explicit or implicit). Suppose that the system of prudential regulation is weak either in design or enforcement or both, such that levels of bank capital (in relation to risk assets) and provisions for loan losses are grossly inadequate. Unsound banking practices go unabated. Where penalties exist, they are neither made explicit nor enforced. Consequently, banks have an incentive to provide high-interest rate, and high-risk loans. Why? Because the bank is the beneficiary of an unfair bet against the government — the bank can keep extraordinary profits in good times without having to pay the full cost of large losses in bad times.

#### 1.1.1.2. *Imperfect Information and Credit Rationing*

Research by Stiglitz and Weiss (1981) showed that the limits to which interest rates can be raised are a direct consequence of imperfect or asymmetric information between lenders and borrowers. The basic intuition of Stiglitz and Weiss is that, whereas moderate increases in the lending interest rate would normally elicit a higher volume of lending, further rate increases beyond a certain level would prompt a lower level of lending activity by changing adversely the quality of the pool of borrowers in favor of those in

the high-risk category. Thus, when faced with an excess demand for loans, the optimal response of a properly regulated bank (with adequate provisions for loan losses) is to limit lending to potential borrowers and to charge an interest rate level that maximizes the bank's expected profits (net of defaults). The reason is that raising the interest rate beyond this level would lower the bank's overall return by triggering two effects.

First, safe — that is, more creditworthy — borrowers would be discouraged and would likely be dropped out of the market (the adverse selection effect). Second, other borrowers would be induced to choose projects with a higher probability of default, because riskier projects are associated with higher expected profits (the adverse incentive effect). Therefore, there would always be an interest rate for the bank beyond which its expected return declines. Although at this rate there may exist an excess demand for credit, a bank would generally not raise the interest rate to eliminate it.[4]

The above results can be described with the help of Fig. 1.1.[5] Quadrant I shows the demand for $L^D$ and supply of $L^S$ loanable funds as functions of the loan interest rate $r$. As normally assumed, the demand for credit is a negative function of the loan interest rate. The supply of loanable funds is a positive function of the loan interest rate up to a certain interest rate level $r^*$. Increases in the interest rate beyond $r^*$ trigger adverse selection and adverse incentive effects, which, by reducing the expected rate of return to the bank, would lead to decreasing amounts of credit offered to borrowers. Thus, the relationship between the interest rate and the supply of loanable funds turns negative, and the value of $L^S$ in quadrant I decreases to the right of $r^*$. A similar line of reasoning produces the nonmonotonic relationship between the expected rate of return to the bank $\rho$ and the rate of interest as shown in quadrant II. The expected rate of return to the bank is the product of the interest rate and the repayment probability. Owing to the adverse selection and adverse incentive effects of a rise in the interest rate, the repayment probability declines by more than the increase in the interest rate beyond a certain interest rate level $r^*$. Quadrant III displays the positive relationship between $\rho$ and the supply of loanable funds, since a higher expected rate of return would elicit a greater amount of bank lending. Quadrant IV shows a 45° line mapping of the equilibrium loan amount

[4]Similar results are reported by Mankiw (1986). For a formal summary of the Stiglitz–Weiss model, see Appendix 1.A.

[5]Taken from Stiglitz and Weiss (1981, Figure 4, p. 397), with permission from authors and publisher.

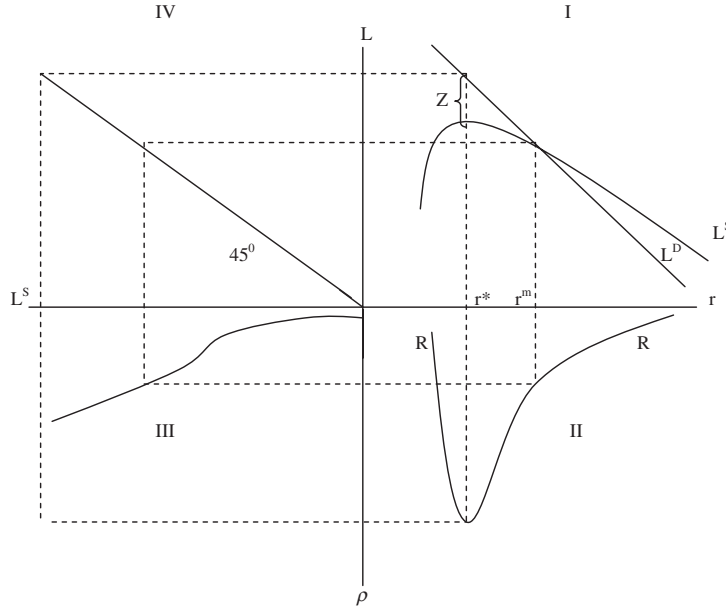


Fig. 1.1. Determination of bank equilibrium interest rate.

$L$ and $L^S$. The credit-rationing equilibrium occurs at the interest rate $r^*$, where the expected return $R$ to the bank is at its maximum level. At this interest rate, however, there is an excess demand for loans of amount $Z$. The market-clearing equilibrium interest rate is $r^m$. This rate, however, is not optimal for the bank, because at $r^m$ bank profits are less than at $r^*$. It is also inefficient, because borrowers with high repayment probabilities are dropped out and are replaced by those with high default risks. The nonmarket-clearing interest rate $r^*$ is both optimal and efficient, because bank profits are at a maximum level and risky borrowers are rationed out.

### 1.1.1.3. *Risk-Sharing and Macroeconomic Stability*

The preceding discussion has shown that under imperfect information, lending rates at below market-clearing levels can be observed even in competitive banking markets, so long as banks are properly regulated. And such nonmarket-clearing lending rates reflect an efficient response to profit opportunities.

The analysis so far has assumed a stable economic environment, that is, a situation in which macroeconomic conditions such as moderate changes

in goods and factor prices are presumed not to affect the constant variance and zero covariance in the returns from borrowers' projects. A failure of one project does not lead to a generalized system-wide crisis. If the number of borrowers in each risk class is large, such that there is a predictable number of defaults, expected bank profits per dollar lent can be determined. Banks simply select an interest rate that maximizes expected profits (such as $r^*$ in Fig. 1.1), and then ration credit; the Stiglitz–Weiss results hold.

If there is macroeconomic instability — a situation in which large changes in prices of goods and factors of production lead to increased variance and positive covariance in project returns — all projects would be affected adversely (favorably) by poor (good) macroeconomic performance. Let us assume that any potential moral hazard in the bank itself that may be induced by economic instability is effectively contained by strict official supervision and prudential regulation requiring sufficient reserves against loan losses; and that deposit insurance (explicit or implicit) is either absent or appropriately priced.[6] The bank therefore behaves as if it were risk averse. In this case, the higher reserves against defaults required by the government in response to macroeconomic instability would lower the expected profit function of the bank at any given loan interest rate (in quadrant II of Fig. 1.1, the $RR$ curve shifts upward toward the r-axis and to the left). Owing to higher variance in project returns, increased adverse risk selection lowers the optimal loan interest rate, leading banks to become more risk averse; the Stiglitz–Weiss results are reinforced. In this case banks further lower interest rates on loans — in Fig. 1.1, $r^*$ moves to the left — and ration credit more severely.

Therefore, where macroeconomic instability is a problem, the socially desirable equilibrium-lending rate is reduced further. In this case, low real lending interest rates may well be (and indeed have been) observed. Where macroeconomic instability interacts with ineffective bank supervision in the presence of moral hazard,[7] banks may well set interest rates at higher and riskier levels (as has been observed in several developing countries in Latin America and Asia). Yet, the real benefit from macroeconomic stability is its favorable impact on risk-sharing relationships between banks and their borrowers.[8] Such relationships tend to be preserved in a stable economic environment characterized by moderate fluctuations in the opportunity costs of

[6]For one method of appropriate pricing of deposit insurance, see Le Fort (1989).
[7]This issue is taken up in the next subsection.
[8]For a derivation of these relationships as optimal responses of a bank and its borrowers under uncertainty, see Appendix 1.A.

money.[9] What makes macroeconomic stability so essential is its predictable effects on the cost and availability of bank credit. In addition, stable economic conditions ensure that under risk-sharing contracts, the bank-lending rate is more rigid than the opportunity cost of loanable funds, as long as the bank is less risk averse than its borrowers.[10] This explains why lending rates, even for medium-term loans, may be fairly low and stable in comparison with other market interest rates.

These points can be elaborated. Greater possibilities for diversifying portfolios and the existence of deposit insurance allow a bank to be less risk averse than its borrowers. This systematic difference in risk aversion leads to financial arrangements (implicit contracts) through which banks absorb risks that would otherwise by borne by borrowers. Implicit contracts assure greater profit stability for both borrowers and banks than does the spot market.[11] Borrowers benefit from stable interest rates, and because the rates are known with certainty, long-term investment plans can proceed smoothly. Banks gain because they economize on information costs through knowledge of the borrower accumulated over time. The result is often speedy approval of loan proposals, benefiting the borrower while increasing the number of loans banks can safely make.

Credit markets dominated by implicit contracts can be extremely sensitive to changes in the attitude of banks and borrowers toward risks, administrative costs of banks, returns to investments made by firms for which funds were borrowed, and variations in the total loan size (Appendix 1.A). Any shock to the financial system that affects these factors will change the variability of profits accruing to banks and their borrowers. The larger (smaller) is the risk aversion of the bank in relation to that of the borrower, the less (more) stable are the profit levels of either party or the lending rate, and therefore the less (more) is the incentive for risk sharing. That is, the more (less) conservative is a bank, the higher (lower) is the probability of loan turndowns for some borrowers at fixed lending rates.

Floating rate loans are certainly possible (and do exist), where the risk from future changes in interest rates is borne fully by the borrower. In this case fluctuations in the market interest rate are reflected completely in fluctuations in the lending interest rate, thus contributing to the vulnerability of profits and uncertainty of investment decisions of borrowers. Since

[9] See Appendix 1.A, Eq. (8.A).
[10] See Appendix 1.A for proof, in particular Eq. (20.A).
[11] See Appendix 1.A for proof, especially Eqs. (18.A) and (19.A).

the fortunes of banks and borrowers are intertwined, the soundness of the banking system may be in jeopardy in the long run, and the outlook for long-term business investments could turn bleak. In addition, for banks to enter into and maintain implicit contracts with their borrowers, they must have some degree of certainty about the range of future opportunity costs of funds.[12] Any factor, foreign or domestic, that creates uncertainty about the future costs of funds would introduce instability into the system (Smith, 1984) and undermine the willingness of banks to enter into or maintain implicit contracts with long-time customers. Examples include generalized domestic macroeconomic instability — which may result in large changes in interest rates on government securities, deposits, and interbank lending — and fluctuations transmitted by interest rate developments abroad.

#### 1.1.1.4. *The Problem of Moral Hazard*

The preceding analysis has assumed that prudential supervision of bank lending is effective and that deposit insurance (explicit or implicit) is either absent or appropriately priced. Let us now relax these two assumptions. Suppose that the system of prudential regulations is weak either in design or enforcement or both, such that the levels of bank capital (in relation to risk assets) and provisions for loan losses are inadequate. In addition, assume that the government provides free deposit insurance. Combined with these policy elements, an unstable macroeconomic environment would intensify and strengthen the problem of moral hazard in the banking system. This appears to be what happened in Argentina, Chile, and Uruguay (Le Fort, 1989), the Philippines, Indonesia (Cho and Khatkhate, 1989), and Turkey (Atiyas, 1989). Banks observed that in good times they kept all their profits and in bad times walked away from large losses, the bulk of which was covered by the government.[13] In addition, in a majority of these countries unsound banking practices went unabated. Where penalties existed, they were neither made explicit nor enforced. Consequently, banks had an incentive to provide risky loans at high interest rates. In Fig. 1.1, the

[12]See Eq. (8.A) in Appendix 1.A.

[13]If the economy were stable, such moral hazard problems would not affect bank behavior, because the default rates of a large number of borrowers are uncorrelated. Moreover, so long as regulation is fairly stringent, banks would be prevented from concentrating loans on a few large borrowers.

variable $\rho$ now represents the expected return per amount lent net of anticipated bank losses to be covered ex post by deposit insurance. The bank now behaves as if it were a risk taker; its expected profits are uniformly higher than those of a risk-averse bank that is properly regulated. The $RR$ curve shifts downward away from the $r$-axis and to the right. McKinnon (1988, p. 407) has aptly described the bank in this situation as beneficiary of an unfair bet against the government. The bank can keep extraordinary profits without having to pay the full cost of large losses from bad loans.

It is now apparent that the most crucial argument in McKinnon's anatomy of liberalization failure relates to the inadequate prudential regulation of the banking system in the presence of moral hazard, and not macroeconomic instability in itself. Moral hazard in the banking system is a consequence of the presence of full and costless deposit insurance, implicit or explicit, and asymmetric information. The removal or a significant relaxation of prudential regulations makes it easier for banks to exploit the existence of moral hazard, and may lead to financial breakdown, even in a stable macroeconomic environment.[14] It is likely, however, that macroeconomic instability increases the system's susceptibility to shocks, leading to an increased probability of default and an accelerated financial collapse.

When moral hazard is present and bank supervision is loose, macroeconomic instability increases *distress* borrowing at higher interest rates from firms needing to roll over maturing debt as well as from those near bankruptcy. Deposit insurance creates an expectation among banks and their borrowers that either higher interest rates will hold for only a short period, or the government will rescue everyone (Diaz-Alejandro, 1985). The result may be a perverse situation in which a sharp increase in interest rates would actually cause the demand for credit to be inelastic, with an increasing number of firms unable to service debt obligations and therefore forced to capitalize interest at higher rates. As this process continues, many firms would exhaust their capacity to borrow and nonperforming loans carried by banks would begin to grow rapidly. Excessive risk-taking, which would be unchecked because of poor government supervision, would be undertaken by banks in the expectation that failure would pose no problem because the government would bail them out, while success would mean substantial profits to their shareholders.

[14]The United States during the mid-1980s and, more recently, the case of the failed Lincoln Savings and Loan (a California thrift institution), provide examples of this possibility.

### 1.1.2. *Policy Strategies*

Although the analytical results from the recent studies mentioned above focused on mature banking systems, mainly those in the United States, they are applicable with even greater force to the bank-based capital markets of developing countries. The critical elements — asymmetric information, macroeconomic instability, moral hazard, implicit contracts — are far more common in developing countries. In these countries equity markets are generally shallow or nonexistent, making virtually all financial contracts bank-based debt instruments. The costs of collecting information to screen and monitor debtors are extremely high, and in some cases prohibitive. By the time information is collected, both banks and borrowers have already invested heavily in *informational capital*.

Examining the policy sequencing issues in the light of modern financial theory, four theoretical policy strategies may be identified, depending on whether the initial macroeconomic environment is stable (SM) or unstable (UM), and whether bank supervision is adequate (AS) or inadequate (IS)[15]: (1) UM/IS strategy, where macroeconomic instability interacts with weak bank supervision; (2) UM/AS strategy, where the potential interaction between economic instability and moral hazard is largely offset by effective bank supervision; (3) SM/IS strategy, where the economy is stable but moral hazard in banks presents a potential problem because of inadequate supervision; and (4) SM/AS strategy, where the economy is stable and the banking system is adequately supervised (Table 1.1). The actual policy experiences in several developing countries corresponding to each of these strategies are examined in detail in the next subsection.

In all four situations, macroeconomic stabilization and stringent bank supervision must occur before complete interest rate liberalization. In only one situation — where the economy is stable and the banking system is already effectively supervised — is full and simultaneous interest rate liberalization likely to be successful. In the remaining three cases, regulated but flexibly managed interest rates should be the rule in anticipation of

[15]For purposes of Table 1.1, effective bank supervision should be taken to cover the following policies, among others: adequate reserves against loan losses; adequate bank capitalization; limits on bank exposure to shareholders, personnel, and large borrowers; limits on foreign exchange exposure; a deposit insurance scheme with appropriate costs that reflect the riskiness of the individual bank's loan portfolio; adequate number and skills of bank examiners and supervisors; and the absence or minimization of political and other interference with the enforcement of bank supervisory and regulatory controls. For details, see Dooley and Mathieson (1987) and Snoek (1989).

Table 1.1. Suggested sequencing of macroeconomic and financial sector policies.

| Policy sequencing | Country initial conditions | | | |
|---|---|---|---|---|
| | 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 rates simultaneously. |
| Step 2 | Liberalize interest rates. | Liberalize interest rates. | Liberalize interest rates. | |

*Note*: UM denotes unstable macro economy; SM denotes stable macro economy; IS denotes inadequate bank supervision; and AS denotes adequate bank supervision.

the full benefits from either economic stabilization or improved bank supervision or both. However, where bank supervision is adequate and effective, some initial steps toward interest rate liberalization might be tried at the same time as stabilization measures. Where the rate of inflation is particularly high and variable, a strong and credible stabilization program and an equally strong set of prudential regulations offer the best policy package, and postponing the removal of interest rate regulations may be appropriate until the monetary situation has been stabilized and banking supervision strengthened. Under these circumstances, adjustments in the regulated interest rates must be preannounced so that banks and borrowers alike know the new interest rate with certainty.[16]

[16] Appendix 1.A shows that an economically efficient interest rate policy generally establishes a bank lending interest rate greater than a representative risk-free interest rate. Thus, for example, taking the market-determined treasury bill rate $\rho$ as the risk-free interest rate, the monetary authority would set an upper limit to the bank lending interest rate $r$ equal to $\alpha + \rho$. To provide greater incentives for bank lending, $\alpha$ could be raised to a new level. This action, however, should be preannounced so that existing implicit contracts can be renegotiated between banks and their borrowers.

## 1.2. Experiences with Different Liberalization Strategies

Two post-liberalization episodes are reexamined in this section. The first is the strategy of complete interest rate liberalization implemented in a very short period. The experiences of Chile, Argentina, Uruguay, the Philippines, Malaysia, and Turkey fit in this category. The second strategy is a gradual liberalization, where even though interest rate regulations were removed or administered, rates were set at high levels, and the process was spread out over a longer period. The experiences of Indonesia, Sri Lanka, and Korea are illustrative of this strategy.

### 1.2.1. *Rapid Interest Rate Liberalization*

The experiences of Chile, Argentina, and Uruguay are well documented (Corbo and de Melo, 1985). In all three countries, severe macroeconomic imbalances existed when interest rate reform and financial liberalization policies were implemented. Rates of growth of output, saving, and investment were all low; inflation rates were high; and the external current account deficits were large in relation to national income.

The liberalization strategy followed by these Latin American countries involved completely and abruptly removing interest rate ceilings and credit controls and relaxing government supervision over the banking system. These measures were accompanied by virtually free deposit insurance, explicit or implicit.[17] In these countries the interaction between loose banking supervision and an unstable macroeconomic environment intensified moral hazard in the banking system. Such a strategy led to an immediate run up in real interest rates on deposits and loans and increased uncertainty about future costs of funds; that is, increased variability of interest rates. Banks raised lending interest rates to higher and riskier levels in the expectation that deposit insurance would (and did) cover any unusual losses.

Excessively high interest rates forced many low-risk firms to drop out of the market, and the quality of bank loans thus suffered. High-risk firms took up the slack and undertook high-interest rate loans (Velasco, 1988).

[17]Inasmuch as the existence of nearly free deposit insurance was partly responsible for the distorted financial behavior of banks and firms in these countries, a case can be made for an imposition of a variable bankruptcy penalty on banking activity or an actuarially fair insurance premium adjusting to changes in the riskiness of the individual bank's loan portfolio. See Le Fort (1989) for an elaboration of this point.

Riskier projects were associated with higher expected returns, which were expected to cover higher levels of interest payments. Under greater macroeconomic uncertainty and given deposit insurance and inadequate supervision, banks took excessive risks and provided credits to firms with high default probabilities. In Argentina the provision of full and free deposit insurance and the accompanying lack of supervision on the quality of loans created incentives for destabilizing behavior (Corbo and de Melo, 1985, p. 864). Nonperforming loans rapidly developed and many firms were forced into bankruptcy. In Chile the number of bankruptcies rose from two corporate enterprises in 1978 to 75 in 1982, and from 75 general establishments in 1974 to 810 by 1982. Loans to the financial and manufacturing conglomerates (*grupos*), which represented about one-fifth of the banking system's portfolio, reflected the dominance of these groups and the lack of adequate supervision of bank lending (Luders, 1985; Hanna, 1987; Velasco, 1988). Most of the bankruptcies occurred among these *grupos*. These bankruptcies adversely affected bank incomes, cash flows, and financial positions. Loan defaults in the financial system (commercial banks plus finance companies) represented nearly 19 percent of loan portfolios by 1983, compared with only 2 percent in 1981 (Behrens, 1985; Luders, 1985). In Argentina bad and doubtful debt as a ratio of total bank loans rose from less than 2 percent in 1975 to over 9 percent in 1980. The trend was similar in Uruguay (Cho and Khatkhate, 1989).

Besides not insulating borrowers from the risk arising from future increases in interest rates, banks also insisted on shorter maturities on new loans. Both these developments reflected the derailment of implicit contracts. By 1980–1982, on average, 64 percent of Chilean peso loans had maturities of less than one year (Arellano, 1983).

As noted earlier, firms tend to step up distress borrowing at high interest rates as macroeconomic instability unfolds and moral hazard is present and unchecked by government regulatory policies. In all three countries, business firms increased their leverage during the financial liberalization period. Increasing indebtedness at first did not pose any problem; many firms generated sufficient operating earnings to cover real interest rates of up to 25 percent and still showed positive profits. When real interest rates soared to the 40 percent range, however, rising indebtedness reflected distress borrowing just to pay interest, and many firms eventually went under (Corbo and de Melo, 1985). The severity of moral hazard and the ultimate breakdown of implicit contracts were manifested in the willingness of banks to extend more loans to shaky firms at high interest rates

that reflected a complete pass-through of the high opportunity costs of money. By 1982, the rollover of bad loans and capitalization of interest in Chile were estimated to be about 72 percent of outstanding peso loans (Velasco, 1988).

Much the same pattern of events — macroeconomic instability interacting with severe moral hazard — occurred in the Philippines and Turkey as documented, respectively, by Cho and Khatkhate (1989), and Atiyas (1989).[18] According to these studies, the deterioration in the quality of bank portfolios in these countries could be traced to the high levels of real lending interest rates in relation to the marginal productivity of capital, combined with relatively high gearing ratios of the corporate sector. In both countries interest rate liberalization was carried out in a period when the business sector's financial position was fragile. The further decline in profitability of the private sector and the banking system following financial liberalization was particularly sharp in these countries. Also, as in Chile, serious moral hazard problems in the Philippines and Turkey reflected the existence of interlocking firms in which banks had close interest. This phenomenon was facilitated by *universal* banking in the Philippines and in Turkey by the establishment of private banks by industrial groups controlled by individual families.[19] In the case of Turkey, Atiyas (1989, p. 30) concludes that an inadequate regulatory framework allowed insolvent banks to avoid bankruptcy by offering high rates to depositors, using mobilized funds to refinance nonperforming loans. At the same time, firms that made losses increased their leverage, even though the cost of borrowing had gone up.

The story is entirely different in the case of Malaysia. Here, long periods of economic stability and a strong tradition of banking supervision enabled the government to liberalize interest rates fully in less than three years without the adverse consequence of an immediate increase in interest rates.[20] Cho and Khatkhate (1989, p. x) observe a modest impact of financial liberalization on domestic interest rates in Malaysia because market forces prior to liberalization already had a strong influence on interest rate levels. Positive real levels were achieved that were consistent

[18]Interest rate ceilings were lifted in July 1980 in Turkey and in mid-1984 in the Philippines.

[19]One exception is Turkiye Is Bankasi, which is the country's largest private bank.

[20]In October 1978, commercial banks were allowed to set their own interest rates on deposits and loans, except the prime rate, which was controlled by the monetary authority. Late in 1981, commercial banks were allowed to determine their own lending rates on the basis of their own cost of funds, signaling the virtual disappearance of controlled lending rates.

with both enhanced credit flows to the borrowing sector at stable interest rates and a generally sound loan portfolio of the banking system. Nonperforming loans never posed a serious problem, and the corporate sector was never exposed to the shocks of high interest rates (Cho and Khatkhate, 1989, p. xiii).

In sum, Chile, Argentina, Uruguay, the Philippines, and Turkey, although appropriately placed in the UM/IS policy category in Table 1.1 at the beginning of the adjustment program, followed exactly the opposite sequencing of policies. In liberalizing interest rates completely and in a relatively short period, these countries failed to begin financial reforms with effective stabilization of their domestic economies, improvements in the private sector's profitability, and a strengthened system of prudential regulations over the banking sector. By contrast, Malaysia's interest rate and financial liberalization succeeded by strictly adhering to the SM/AS sequencing strategy.

### 1.2.2. *Gradual Liberalization of Interest Rates*

The experiences of Korea, Sri Lanka, and Indonesia have been studied in detail by Cho and Khatkhate (1989).[21] All these countries suffered macroeconomic imbalances in varying degrees on the eve of financial liberalization. Financial reforms were undertaken in the context of overall economic liberalization and generally strong adjustment programs. In addition, the system of bank examination and supervision either remained intact or was considerably strengthened.

The sequence of liberalization followed by these countries involved policy strategies described in the first three columns of Table 1.1. In these countries, especially Korea and Sri Lanka, and to a lesser extent, Indonesia, positive real interest rates were achieved and maintained mainly through credible macroeconomic policies that successfully reduced inflation to low

[21] See also World Bank (1989). Korea began its liberalization in 1981 when the government divested its shares in commercial banks. From 1982 onwards, interest rates became positive in real terms owing to stabilized inflation. To date, interest rate ceilings, albeit flexibly managed, are still maintained except in the markets for interbank transactions, unguaranteed commercial bills, and corporate bonds. Sri Lanka's liberalization, which began in 1977 when regulated interest rates were sharply adjusted upwards, was basically similar to Korea's in its accent on price stabilization. By contrast, Indonesia's interest rate reform, which started in 1983, lifted the ceilings on nearly all bank deposits and loans before stabilization and effective bank supervision were fully achieved.

levels. While stabilizing the economy and boosting effective bank supervision, these countries also made incremental adjustments in regulated nominal interest rates to maintain a positive real level. Positive real interest rates stimulated bank deposits, thereby increasing the amount of credit available to productive firms.

Cho and Khatkhate (1989) describe the Korean approach to the deregulation of interest rates as pragmatic, noting that lending interest rates were quickly adjusted downward when the financial position of the corporate sector turned out to be affected adversely. Such concern for the financial vulnerability of the corporate sector may be interpreted as a policy of *not* undermining implicit contracts between banks and their corporate borrowers. At the same time, a strengthened system of examination and supervision ensured that banks did not take excessive risks and that bankruptcy would be costly. Only later, when macroeconomic stability was firmly established and a permanently effective system of prudential regulations was in place and enforced, did the government fully liberalize interest rates in financial markets. By this time, the interest rate liberalization introduced no shock, as evidenced by lower inflation rates, stable interest rates, and firmly established implicit contracts.

In Sri Lanka, the treasury bill rate was used as a benchmark for adjusting interest rates (Cho and Khatkhate, 1989). In the course of a gradual liberalization of interest rates, the interbank market also played a key role in the operation of the market for commercial bank loans. Later, domestic interest rates generally moved with foreign interest rates adjusted for actual exchange rate changes. As in Malaysia, because of strong prudential regulations and timely official policy actions, nonperforming loans remained manageable. All these favorable developments were also influenced by the economic stability achieved during the adjustment process.

The stability of lending interest rates in Korea and Sri Lanka meant that adverse selection and adverse incentive effects were largely avoided through the preservation of implicit contracts. Greater certainty of interest rates and enhanced supervision enabled banks to continue to engage in risk-sharing with the corporate sector. As prices, interest rates, and wages stabilized and credit availability increased, the environment for domestic investment improved and sharp swings in resource allocation were largely avoided. Output growth remained high in these countries.

Although Indonesia's liberalization strategy was more gradual than that of the Philippines and Turkey, the results were generally similar in all

three countries. Indonesia's initial situation could be appropriately characterized as unstable but adequately supervised (UM/AS in Table 1.1), and Indonesia did take the first step in the liberalization sequence indicated by that strategy. Measures were implemented to stabilize the economy and, under continuing bank supervision, interest rates were gradually liberalized. The problem was with the second step in the policy sequence. Despite its failure to achieve macroeconomic stability, the government liberalized interest rates completely. Inflationary pressures and destabilizing capital flows, combined with expectations of devaluation, resulted in high and volatile domestic interest rates that often exceeded the rates of return to domestic fixed investments, as happened in the Philippines and Turkey, leading, as in Chile, Argentina, and Uruguay, to destabilizing behavior of the banking system. The deterioration in the financial position of the business sector followed, and the volume of bad and doubtful debts grew.

## 1.3. Summary and Conclusions

This chapter has reviewed some major issues in interest rate reform and financial liberalization, with particular reference to developing countries. The relevance of recent theories to the operation of the bank-based capital market in such countries was discussed and the liberalization experiences and strategies of several countries reexamined. Modern financial analysis suggests that a reassessment of interest rate policies and financial reforms in the context of economic adjustment programs appears warranted. Several conclusions can be drawn with respect to the sequencing and modality of such policy reforms.

First, the approach to interest rate policy and financial sector liberalization generally should take into account the initial state of the economy, in particular the financial position of the private sector and the quality of prudential regulations over the financial system. If the macroeconomic environment is unstable (adversely affecting the private sector's profitability) and bank supervision is ineffective, interest rate liberalization should be gradual, to avoid possible disruptions to long standing financial contracts that can emerge from a sudden removal of interest rate regulations. At the same time that strong macroeconomic policies to stabilize the economy and reinvigorate the private sector are being pursued, strict supervision of the banking system must be maintained or strengthened, to minimize moral hazard in the banking system. The importance of strong banking

regulatory and supervisory policies needs to be underscored, not only because they ensure the viability and health of the banking industry, which is their traditional microeconomic justification, but also because interest rate liberalization would be ineffectual without them. Strengthening can be accomplished in several ways. Besides the standard provisions for capital adequacy and reserves against loan losses, one way to reform deposit insurance schemes is to impose a bankruptcy penalty on bank activity or an actuarially fair insurance premium on bank liabilities, in direct proportion to the riskiness of a bank's loan portfolio, as suggested by Le Fort (1989).

Second, institutional changes should be in the forefront of financial sector reforms in developing countries. These should include a strong supporting infrastructure that will provide for adequate information flow, credit appraisal and rating, and internationally accepted legal and accounting systems, and the development of equity markets. Such institutional reforms will help reduce the dependence of firms on bank credit and help orient them toward equity financing. Firms' vulnerability to interest rate shocks would then be reduced, allowing more room for interest rate liberalization.

Third, in terms of the specific interest rate strategy, two types of situations may be considered: where inflation is low and where it is unacceptably high. A gradual program of interest rate liberalization that maintains positive real rates can proceed in the low-inflation countries, provided that banking supervision is strong and effectively enforced and that demand management and other policies are appropriate to maintain economic stability. Within this group, countries with relatively long periods of price stability achieved largely through sound and credible macroeconomic policies are good candidates for full interest rate liberalization, subject to a strengthened system of prudential regulations over the banking system. For a low inflation country that has already liberalized interest rates, the appropriate policies are to maintain economic stability and continually improve bank supervision.

In high inflation countries, a strong and credible stabilization program and an equally strong set of prudential regulations are generally the best initial policy measures. Postponing the removal of interest rate regulations may be appropriate until the monetary situation has been stabilized and banking supervision strengthened. The empirical evidence suggests that successful countries have combined price stability with flexible, even if regulated, nominal interest rates. When interest rates are raised, they must be

pre-announced, so that banks and borrowers alike know the new interest rate with certainty.

For a high inflation country that has already deregulated interest rates, the appropriate policies are to implement a strong and credible stabilization program that will stimulate the private sector, and to strengthen the system of prudential controls over the banking sector. Failure to integrate and effectively implement such policies in programs of financial liberalization could lead to financial instability, as the experiences of three Latin American countries discussed here and the Philippines, Indonesia, and Turkey have shown. Financial instability, in turn, could exacerbate macroeconomic instability. In the interim, if interest rates appear to get out of control (which may reflect increasingly severe moral hazard problems unchecked by existing prudential regulations), it may be necessary to go back to regulating nominal interest rates and maintaining them at positive real levels. Once confidence in the banking system is restored (here, an appropriate set of prudential regulations will play a key role), a firm basis for the resumption of implicit contracts is installed, policies aimed at price stabilization begin to bear fruit, and the financial position of the business sector is improved, the regulations on lending rates can then be safely removed and full financial liberalization and integration vigorously implemented.

## Appendix 1.A

### *Models of Credit Rationing and Implicit Contracts*

The purposes of this appendix are to describe more formally the Stiglitz–Weiss, Fried–Howitt, and Mankiw models, provide formal proofs of the basic propositions used in the text, and derive optimal rules in setting lending interest rates under asymmetric information.

#### 1.A.1. *Stiglitz–Weiss (1981) Model*

Assume each project requiring funding has a distribution of gross payoffs $F(R, \theta)$, where $R$ is the project return and $\theta$ is some measure of riskiness of the project, such that a larger value of $\theta$ represents greater risk, in the sense of mean preserving spreads (Rothschild and Stiglitz, 1970). The borrower receives a fixed amount of loan ($L$) at interest rate ($r$) and defaults on the loan if the project returns ($R$) plus collateral ($C$) are insufficient to repay

the loan. The bank receives either the full contracted amount $(L(1+r))$ or the maximum possible $(R+C)$. The return to the bank $(\Pi_1)$ is given by

$$(\Pi_1) = \min[(R+C);(1+r)L]. \tag{1.A}$$

Stiglitz and Weiss show that for a given interest rate, $r$, there is a critical value of $\theta$, say $\theta^*$, such that a firm will borrow if, and only if, $\theta > \theta^*$; that is, the interest rate serves as a screening device. The value of $\theta^*$ for which expected borrower profits $(\Pi_2)$ are zero satisfies

$$\Pi_2(r,\theta^*) = \int_0^\infty \max[R-(1+r)L;-C]dF(R,\theta^*) = 0. \tag{2.A}$$

An increase in interest rate triggers the adverse selection effect by increasing the riskiness of the mix of applicants:

$$\partial\theta^*/\partial r = \frac{L\int_{(1+r)L-C}^{\infty} dF(R,\theta^*)}{\partial\Pi_2/\partial\theta^*} > 0, \tag{3.A}$$

which indicates that the critical value of $\theta$ increases as the rate of interest increases. An increase in $r$ has an adverse selection effect, because less risky borrowers opt out of the market, leaving only the riskier borrowers with higher expected returns on their projects. This has a negative effect on the lender's expected profit, which may dominate the positive effect of an increase in the interest rate.[22] Thus, the rate of returns to the bank may not be a monotonic function of $r$ as shown in Fig. 1.1.

### 1.A.2. *Fried–Howitt (1980) Model*

Let us assume that the bank and the borrower have utility functions with constant absolute risk aversion[23]:

$$U_1[\pi_1(\rho)] = -e^{-\alpha\pi_1^{(\rho)}} \tag{4.A}$$

$$U_2[\pi_2(\rho)] = -e^{-\beta\pi_2^{(\rho)}}, \tag{5.A}$$

where $U_1$ and $U_2$ are the utility functions, $\pi_1$ and $\pi_2$ are the profits of the bank and the borrower, respectively, and $\alpha$ and $\beta$ are, respectively, the bank's and the borrower's degrees of absolute risk aversion. It is assumed

[22]The bank's expected profit may also decline if, for a fixed rate of interest, the collateral is increased (Stiglitz and Weiss, 1981; 1983; Wette, 1983).

[23]This model is a modified version of the original Fried–Howitt model (1980) and is taken from Osano and Tsutsui (1985).

that $\beta > \alpha > 0$, to reflect the greater risk aversion of the borrower. The opportunity cost of lending per unit is represented by $\rho$ with a density function $q(\rho)$, defined on the interval $I = [\underline{\rho}, \bar{\rho}]$.

The bank enters into an ex ante arrangement with the borrower before the realization of $\rho$, which must be observed even after $\rho$ is realized. The contract must permit the borrower at least to attain a market-determined utility level $\lambda$. The bank incurs administrative costs, which are assumed to be a convex increasing function of its total lending amount, $n[C = C(n)]$, where $n$ is a function of $\rho[n = n(\rho)]$. That is, for any $n \geq 0$, $C(0) = 0$, $C'(n) > 0$ and $C''(n) > 0$. It is assumed that $C''$ is constant. The profits of the bank for a given $\rho$, $\pi_1$, are expressed as

$$\pi_1(\rho) = n(\rho)[r(\rho) - \rho] - C[n(\rho)], \tag{6.A}$$

where $n(\rho)$ represents the loan size and $r(\rho)$ is the loan interest rate when the opportunity cost of lending per unit is equal to $\rho$. The profits of the borrower, $\pi_2(\rho)$, are

$$\pi_2(\rho) = R[n(\rho)] - n(\rho)[1 + r(\rho)], \tag{7.A}$$

where $R$, as before, is the project return, such that for any $n \geq 0$, $R' > 0$, and $R'' < 0$. It is assumed that $R(0) = 0$ and $R''$ is constant.

The optimal contract, whose terms are $[r(\rho), n(\rho)]$, is derived by solving the following problem:

$$\max_{[r(\rho), n(\rho)]} \int_{\underline{\rho}}^{\bar{\rho}} U_1[n(\rho)(r(\rho) - \rho) - C(n(\rho))]q(\rho)d\rho \tag{8.A}$$

subject to

$$\int_{\underline{\rho}}^{\bar{\rho}} U_2[R(n(\rho)) - n(\rho)(1 + r(\rho))]q(\rho)d\rho \geq \lambda \tag{9.A}$$

Equation (8.A) represents the expected utility of the bank; inequality (9.A) reflects the constraint on the bank of having to assure its current and potential borrowers that it will attain at least an expected utility level $\lambda$.

The first-order optimality conditions are

$$\alpha e^{-\alpha\pi_1} - \phi\beta e^{-\beta\pi_1} = 0, \tag{10.A}$$

$$(r - \rho - C')\alpha e^{-\alpha\pi_2} + \phi(R' - 1 - r)\beta e^{-\beta\pi_2} = 0, \tag{11.A}$$

where $\phi$ is the constraint multiplier. Substitution of (10.A) into (11.A) yields

$$(r - \rho - C' + R' - 1 - r)\alpha e^{-\alpha\pi_1} = 0. \tag{12.A}$$

Since the term $\alpha e^{-\alpha\pi_1} \neq 0$, for (12.A) to be satisfied, the optimality condition can be rewritten as

$$R' - 1 = C' + \rho, \tag{13.A}$$

which implies that the marginal revenue of the loan for the borrower is equal to the marginal cost of the loan for the bank. The bank can use the interest rate $r$ as a risk-sharing device to dampen the variations in the borrower's profits.

To show that risk-sharing can be used to stabilize the borrower's profits, it can be demonstrated that variations (as measured by the standard deviation) in the profits of the bank and the borrower are influenced by the degree of their absolute risk aversion. Recalling the definition of the profit functions of the bank and the borrower, and taking logarithms of both sides of (12.A) yields

$$\alpha[(r - \rho)n - C(n)] - \beta[R(n) - (1 + r)n] = \log(\alpha) - \log(\beta) - \log(\phi),$$

which, when rearranged, becomes

$$nr = [1/(\alpha + \beta)][\alpha(n\rho + C(n)) + \beta(R(n) - n) + \log(\alpha) - \log(\beta) - \log(\phi)]. \tag{14.A}$$

A Taylor series expansion of the administrative cost function $C(n)$ and the revenue function $R(n)$ yields the following approximations:

$$C(n) \approx nC'(n) - (1/2)n^2C'' \tag{15.A}$$

and

$$R(n) \approx nR'(n) - (1/2)n^2R''. \tag{16.A}$$

The profits of the bank are

$$\pi_1(\rho) = (r - \rho)n - C.$$

Using Eqs. (13.A)–(16.A) in the above equation and simplifying yields

$$\begin{aligned}\pi_1(\rho) = {} & [\beta/(\alpha + \beta)](n^2/2)(C'' - R'') \\ & + [(1/(\alpha + \beta)][\log(\alpha) - \log(\beta) - \log(\phi)].\end{aligned} \tag{17.A}$$

From Eq. (17.A) the standard deviation of the bank's profits is derived as

$$\sigma(\pi_1) = \left[\int_{\underline{\rho}}^{\bar{\rho}} [\pi_1(\rho) - E\pi_1(\rho)]^2 q(\rho) d\rho\right]^{(1/2)}$$
$$= (1/2)[\beta/(\alpha+\beta)](C'' - R'')\sigma(n^2), \tag{18.A}$$

where $E$ denotes mathematical expectation. Using a similar procedure [from Eqs. (14.A), (15.A), and (16.A)], an equation is derived for the standard deviation of the profit function of the borrower[24]:

$$\sigma(\pi_2) = (1/2)[\alpha/(\alpha+\beta)](C'' - R'')\sigma(n^2). \tag{19.A}$$

Equations (18.A) and (19.A) imply that the variations in the profits of both the bank and the borrower are functions of their attitude toward risk, the variations in the size of the loan, and the parameters of the cost function of the bank and the revenue function of the borrower. First, the more conservative (that is, the more risk averse and the larger $\alpha$) is a bank, the more stable would be its profits. At one extreme, a bank that is infinitely risk averse would show no variability of profits simply because it would make no loans. Analogous statements apply to borrowers. Second, the variability of profits accruing to banks and borrowers is positively related to the administrative costs of the bank and negatively to the project returns to the borrower. Third, the more variable is the total loan size, the more variable are the profits of both the bank and the borrower.

To prove the proposition that under implicit contracts the loan interest rate is more rigid than the opportunity cost of lending, let us assume that the loan size is independent of $\rho$ and compute the standard deviation of the loan interest rate from Eq. (14.A):

$$\sigma(r) = \left[\int_{\underline{\rho}}^{\bar{\rho}} [r(\rho) - Er(\rho)]^2 q(\rho) d\rho\right]^{(1/2)}$$
$$= [\alpha/(\alpha+\beta)]\left[\int_{\underline{\rho}}^{\bar{\rho}} [(\rho - E\rho)]^2 q(\rho) d\rho\right]^{(1/2)}$$
$$= [\alpha/(\alpha+\beta)]\sigma(\rho), \tag{20.A}$$

where $\sigma(\rho)$ is the standard deviation of the opportunity cost of lending. Since the borrower is assumed to have risk-averse preferences, $\beta > 0$,

[24]For details, see Osano and Tsutsui (1985).

we conclude that $\sigma^2(r) < \sigma^2(\rho)$. That is, the lending interest rate is more rigid than the opportunity cost of funds.

### 1.A.3. *Mankiw (1986) Model*

The Mankiw model can be used to derive general principles in setting the optimal lending interest rate under asymmetric information. The two equilibrium conditions of the model are given by

$$\Pi r = \rho \tag{21.A}$$

$$\Pi(r) = E[P; R > \Pr]. \tag{22.A}$$

Here, $R$ is the expected return on a project, and $P$ is repayment probability, with a given density $f(P, R)$; neither $R$ nor $P$ can be observed by the bank or the government; $\Pi$ is the average probability of repayment — that is, the average of $P$ for those firms that actually borrow at an interest rate $r$. The expected payment to the bank is, therefore, $\Pi r$, which must be equal to the risk-free interest rate $\rho$ (such as the interest rate on treasury bills) if the bank is to make any business loans (Eq. (21.A); $\rho$ is exogenous to the model). The investment condition, Eq. (22.A), states that investors decide to invest and borrow as long as $R$ exceeds the cost of capital Pr. For any density $f(P, R)$, the function $\Pi(r)$ is a well-defined conditional expectation.

Two general principles for the optimal interest rate $r^*$, can be derived. First, $r^*$ is never less than the risk-free return $\rho$. A value of $r^*$ below $\rho$ would induce inefficient investments. Second, $r^*$ is always greater than $\rho$. To establish this proposition, social surplus (SS) is defined as,

$$SS = \int_0^1 \int_{\Pr}^{\infty} (R - \rho) f(P, R) dR dP.$$

Taking the derivative of social surplus with respect to the interest rate $r$, and evaluating the derivative at $r = \rho$,

$$d\mathrm{SS}/dr = \int_0^1 -P(\Pr - \rho) f(P, \Pr) dP > 0,$$

as long as $f(P, R)$ is nonzero everywhere. Thus, an economically efficient interest rate policy generally establishes a lending interest rate greater than the risk-free interest rate.

## References

Arellano, J (1983). De la liberalización a la intervención: el mercado de capitales en Chile 1974–83. *Colección Estudios CIEPLAN*, 11, 5–49.

Atiyas, I (1989). The private sector's response to financial liberalization in Turkey: 1980–82. *PPR Working Paper WPS147*. Washington, DC: World Bank.

Behrens, R (1985). Los bancos e instituciones financieras en la historia económica de Chile. *Master's Thesis*. Santiago, Chile: Catholic University of Chile.

Cho, YJ and D Khatkhate (1989). Lessons of financial liberalization in Asia: A comparative study. *Discussion Paper No. 50*. Washington, DC: World Bank.

Corbo, V and J de Melo (1985). Overview and summary. *World Development*, 13, 863–866.

Diaz-Alejandro, CF (1985). Good-bye financial repression, hello financial crash. *Journal of Development Economics*, 18, 1–24.

Dooley, M and D Mathieson (1987). Financial liberalization in developing countries. *Finance and Development*, 24, 31–34.

Dornbusch, R and A Reynoso (1989). Financial factors in economic development. *American Economic Review*, 79, 204–209.

Fried, J and P Howitt (1980). Credit rationing and implicit contract theory. *Journal of Money, Credit, and Banking*, 12, 471–489.

Hanna, D (1987). Heads I win: Tales of the Chilean financial system. *Doctoral Dissertation*. Cambridge, MA: Harvard University.

Le Fort, G (1989). Financial crisis in developing countries and structural weaknesses of the financial system. *IMF Working Paper 89/33*. Washington, DC: International Monetary Fund.

Luders, R (1985). Lessons from two financial liberalization episodes: Argentina and Chile. *Manuscript*. Washington, DC: World Bank.

Mankiw, NG (1986). The allocation of credit and financial collapse. *Quarterly Journal of Economics*, 101, 455–470.

McKinnon, RI (1973). *Money and Capital in Economic Development*. Washington, DC: The Brookings Institution.

McKinnon, RI (1986). Domestic interest rates and foreign capital flows in a liberalizing economy. *Paper presented at the Annual Meeting of the American Economic Association*. New Orleans, LA.

McKinnon, RI (1988). Financial liberalization in retrospect: Interest rate policies in LDCs. In *The State of Development Economics: Progress and Perspectives*, G Ranis and TP Schultz (ed.). New York, NY: Basil Blackwell Inc.

Osano, H and Y Tsutsui (1985). Implicit contracts in the Japanese bank loan market. *Journal of Financial and Quantitative Analysis*, 20, 211–229.

Rothschild, M and J Stiglitz (1970). Increasing risk: I. a definition. *Journal of Economic Theory*, 2, 225–243.

Shaw, ES (1973). *Financial Deepening in Economic Development*. New York, NY: Oxford University Press.

Smith, BD (1984). Private information, deposit interest rates, and the "stability" of the banking system. *Journal of Monetary Economics*, 14, 293–317.

Snoek, H (1989). Problems of bank supervision in LDCs. *Finance and Development*, 26, 14–16.

Stiglitz, JE and A Weiss (1981). Credit rationing in markets with imperfect information. *American Economic Review*, 71, 393–410.

Stiglitz, JE and A Weiss (1983). Incentive effects of termination: Applications to the credit and labor markets. *American Economic Review*, 73, 912–927.

Velasco, A (1988). Liberalization, crisis, intervention: The Chilean financial system, 1975–1985. *IMF Working Paper 88/22*. Washington, DC: International Monetary Fund.

Wette, HC (1983). Collateral in credit rationing in markets with imperfect information: Note. *American Economic Review*, 73, 442–445.

World Bank (1989). *World Development Report 1989*. New York, NY: Oxford University Press.