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Bank-by-Bank Credit Ceilings: Issues and Experiences

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Abstract

Many central banks have abandoned credit ceilings in favor of monetary control frameworks based on indirect instruments. In the long run, ceilings limited competition, hampered the development of a money market, and caused disintermediation. Despite the many distortions associated with the use of credit ceilings, some countries continue to employ them, particularly during the transitional period before full reliance on indirect monetary instruments. The paper argues that the careful attention to design can help reduce distortions typically associated with the use of credit ceilings. It identifies a series of principles that may be followed in designing a system that can minimize those distortions.

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Summary

A number of countries have used direct methods of monetary control and bank-specific credit ceilings, in particular, to control monetary and credit aggregates by allocating credit directly amongst financial intermediaries. These ceilings are usually cast as instructions telling each bank the maximum amount of loans it is allowed to have in its portfolio. Countries resorted to such ceilings either as a temporary instrument of monetary policy to contain demand shocks in the short run or as a permanent tool to control aggregate credit. 1/

Typically, credit ceilings were imposed on credit of commercial banks, excluding capital. In calculating the weights allocated to each covered institution, each period, the authorities permitted a maximum percentage increase of bank advances in relation to a certain period. Credit ceilings were only effective if the authorities established and preannounced stiff penalties for noncompliance. In general, these penalties depended on the amount of excess credit extended and on market interest rates to reduce the profitability of exceeding individual credit ceilings for the noncompliant bank.

Over time, in most of the 19 countries reviewed, the imposition of credit ceilings, often combined with other administrative controls, left the banking industry highly uncompetitive, inhibited growth of banking financial intermediaries, distorted the flow of funds to the most profitable projects, and led to circumvention by covered banks.

In certain cases where monetary relationships are unstable, ceilings can temporarily be used to target net domestic assets of the banking system. However, the features of the instrument have to be carefully designed to minimize its many drawbacks and enhance its flexibility. In particular, the allocation rule has to reflect as closely as possible the banks' competitive evolution of market shares. Additionally, monitoring of the compliance and the design of penalties on overshooting of credit ceiling are crucial elements of the system. Finally, trading of the unused credit margins will help introduce a market mechanism in the operation of the credit ceilings.

1/ Hereafter, bank-specific credit ceilings will simply be referred to as credit ceilings.

I. Introduction

A number of countries have used direct methods of monetary control and bank-specific credit ceilings, in particular, to control monetary and credit aggregates by allocating credit directly amongst financial intermediaries. These ceilings are usually cast as instructions telling each bank the maximum amount of loans it is allowed to have in its portfolio. Countries resorted to such ceilings either as a temporary instrument of monetary policy to contain demand shocks in the short run or as a permanent tool to control aggregate credit.

This paper discusses the experience of a sample of these countries by focusing attention on the effectiveness of the instrument in achieving the assigned objectives. The analysis is conducted against the background of the historical shift from direct methods of monetary control to indirect methods. 1/ The sample comprises industrial and developing countries, as well as economies in transition. 2/ Countries were chosen according to the availability of data and the diversity of experiences they encountered, particularly as regards to the design of the credit ceilings.

Section II of the paper discusses experiences in the use of credit ceilings. It describes the reasons for adopting credit ceilings, their various design features such as allocation rules, administration of the system and penalties. Section III points to a number of problems that were associated with the use of credit ceilings including significant distortions and loss of effectiveness over time. In the long run, with credit rationed through quantitative controls and interest rates often administratively set below market clearing levels, ceilings discouraged mobilization of financial savings and distorted the flow of funds to the most profitable lending. As a result, in a number of countries, regulated institutions circumvented the ceilings and informal financial intermediaries gained importance, which weakened monetary control. 3/

1/ In the broadest sense, indirect methods seek to achieve monetary control (either of a quantity or a price target) through full use of market prices.

2/ Countries surveyed includes Albania, Belgium, Bulgaria, Czech Republic, Denmark, Egypt, France, Guyana, Italy, Jamaica, Kenya, Former Yugoslav Republic of Macedonia, Madagascar, the Netherlands, Norway, Poland, Portugal, Romania, United Kingdom.

3/ Empirical discussion on the effectiveness of credit ceilings is difficult since, in most cases, ceilings were used in combination with other forms of direct monetary control, including inter alia, administratively set interest rates and liquidity ratios. This made it difficult to isolate the effects of the credit ceilings on the economy from those of other instruments of direct control. Also, in a majority of cases, the authorities exempted many categories of credit from the ceilings, typically to combine controls of aggregate credit ceilings with attempts at directing credit to priority sectors. Such an approach further complicates the task of identifying and assessing the effectiveness and efficiency of credit ceilings by its own merit. Therefore, the problems associated with the use of credit ceilings may be broadly viewed as representative of problems associated with repressed financial systems.

By the early 1980s, due to the significant distortionary effects of credit ceilings, most OECD countries sought to abandon credit ceilings. A similar process took place in many developing countries. 1/ However, under conditions of financial market liberalization, initial macroeconomic imbalances, worldwide market integration, or more region-specific structural changes in financial systems, the shift to indirect instruments often was accompanied with large increases in interest rates. At times, such swings in the rates led a number of central banks to reinstate temporarily direct controls. Controls were also reinstated in few countries when their balance of payments deteriorated due to large liquidity overhangs. Moreover, to prevent loss of monetary control, many central banks retained credit ceilings as a backstop during the transition toward indirect instruments, while they developed the techniques of monetary control through indirect instruments. 2/ As of end-1994, 16 countries used credit ceilings. 3/

In certain circumstances, such as when monetary relationships are highly unstable (e.g., during the transition to a framework of indirect control), credit ceilings can be a practical way to directly target net domestic assets of the banking system. The practicality of the instrument may of course be offset by administrative costs, disintermediation and inefficiency. Therefore, section IV identifies a series of principles that may be followed in designing a system that can minimize the drawbacks associated with credit ceilings. In particular, trading of unused credit margins helps to introduce a market mechanism in the operation of credit ceilings. Section V presents the conclusions. The appendix provides an accounting and monitoring framework and a numerical simulation of allocation rules.

II. Experiences in the Use of Credit Ceilings

Country experiences with the use of credit ceilings varied greatly in terms of the objectives for adopting credit ceilings and the specific design of the instrument.

1/ For instance, nearly all Asian countries including Indonesia, Korea, Malaysia, Nepal, the Philippines, and Sri Lanka reduced or eliminated direct control on bank lending. In June 1995, however, Thailand introduced controls on credits extended in foreign currency. The experience of African countries in removing credit ceilings has been more mixed.

2/ This is referred to as a "belts and braces" approach in Alexander, Baliño, and Enoch (1995).

3/ Albania, China, Ethiopia, Guinea-Bissau, Jordan, Lesotho, Madagascar, Mauritania, Mongolia, Mozambique, Pakistan, Sao Tome and Principe, Slovak Republic, Tanzania, Vietnam, and Former Yugoslav Republic of Macedonia. Furthermore, Cambodia and the People's Democratic Republic of Lao introduced credit ceilings in 1995. The majority of these countries implemented these ceilings while carrying out programs supported by use of Fund resources.

1. Reasons for adopting credit ceilings

The sample countries adopted credit ceilings because they (a) appeared easy to implement; (b) were perceived to deliver monetary and credit targets with accuracy; (c) were observed to be the most effective monetary instruments given the underdeveloped financial markets and/or limited technical capabilities of the monetary authorities; and (d) were seen as the best instrument through which resources could be diverted to the most "favored" sectors such as the agricultural sector.

Notwithstanding the varying degrees of development and sophistication of financial markets in countries using credit ceilings, a closer look reveals some common features, including highly regulated financial markets (except in the United Kingdom), noncompetitive banking structures, underdeveloped markets for government securities, low propensity of the private sector to hold financial assets due to interest rate controls, high transaction costs, and restrictions on capital outflows.

The noncompetitive banking system was characterized by high intermediation costs and large interest rate spreads, which hampered the efficient transmittal of monetary policy to the real economy. They also impeded the efficient functioning of open market operations. Moreover, in countries with a small number of commercial banks, the oligopolistic nature of the financial system prevented the running of efficient auctions of government or central bank bills by limiting the number of market participants. 1/

In addition to the above reasons, in the 1960s and 1970s, a number of OECD countries employed credit ceilings on other grounds (see Table 2). Some OECD countries used credit ceilings essentially as an emergency instrument, to be adopted only during periods of overheating such as those which presented large and growing balance of payments deficits, and to be immediately suspended afterwards (Belgium, Denmark, the Netherlands).

Other countries such as France (1969-1987), Italy (1970s and early 1980s), Portugal (1977-1989) and the United Kingdom (1960s and early 1970s) adopted credit ceilings as one of their main instrument of monetary policy for longer periods of time. In France (1969-1987), adjusting interest rates was viewed as ineffective for managing monetary conditions due to the perceived inelasticity of credit demand to short-term interest rates. Italy and Portugal used credit ceilings both as a quasi-fiscal means of channeling resources to priority sectors or to finance the external current account deficit. Italy placed ceilings on credit extended in domestic currency to encourage foreign borrowing. This was especially important in the early 1980s when the balance of payments had deteriorated considerably. By the early 1960s, the authorities in the United Kingdom introduced credit

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1/ See Alexander, Baliño and Enoch (1995).

ceilings in response to a deteriorating external balances. Ceilings were also used to channel credit to export sectors, state enterprises and government debt.

A number of developing countries utilized credit ceilings to allocate credit to "favored" sectors at subsidized interest rates (Egypt during the early 1980s). Others used credit ceilings to meet targets set on the net domestic assets of the banking system in the context of programs supported by use of Fund resources. In these cases, controls were instated to address particularly severe monetary disturbances and adverse macroeconomic developments (Jamaica, during the 1980s). Some countries with a rudimentary financial system opted for credit ceilings as the only feasible instrument until the legal and institutional framework for market-oriented instruments were developed (Kenya (1987-1990), Guyana (1988-1991) and Madagascar, (1985-1995)).

In the 1990s, some economies in transition, mostly in Eastern Europe, used credit ceilings to control monetary and credit aggregates during the transitional stage from centrally-planned to market-based systems (Albania, Bulgaria, Czechoslovakia, Poland, Romania, and the Former Yugoslav Republic of Macedonia (FYRM)). In these economies, ceilings were often seen as an alternative to the immediate shift to more market-oriented instruments of monetary policy and reliance on reserve money management. Making such a shift at that time posed high risk of loss of control because the transmission mechanisms were largely unknown. In particular, money multipliers were showing signs of erratic behavior due to structural breakdowns. Also, frequent changes in reserve requirements (one of the few immediately available instruments) would have meant undesirable large adjustments in bank reserves. Finally, large liquidity overhangs limited the effectiveness of monetary control based on reserve money management. Credit ceilings allowed credit and monetary expansion to keep at a pace consistent with macroeconomic stabilization, until they could be replaced with market-based instruments of monetary control.

Nevertheless, most of these countries adopted credit ceilings in combination with a number of other indirect instruments. For example, Albania employed reserve and liquidity requirement ratios. The authorities in the Czech Republic relied on auctions of refinance credit along with reserve requirements while utilizing credit ceilings as a backstop. The National Bank of Poland used credit refinancing facilities and limited auctions of central bank bills, followed by treasury bills; at the same time, it imposed temporary credit ceilings on the state banks. In Bulgaria, the system of monetary control consisted of credit ceilings, nonremunerated reserve requirements, central bank refinance, and limited open market operations.

2. Rules of allocation

Notwithstanding the initial reasons for employing credit ceilings, the rules of credit allocation varied among countries, depending on the specific priorities and the institutional environment of the country. In general,

the central banks set periodic ceilings on net domestic assets of the banking system--with a subceiling on credit to government, consistent with ultimate policy objectives for balance of payments, inflation and economic growth. A global ceiling on credits to the economy was then derived as a residual. The base used for credit ceilings and the weights allocated to each covered institutions were, however, more country specific.

Typically, in calculating the weights allocated to each covered institution, each period, the authorities permitted a maximum percentage increase of bank advances in relation to a certain base period. Initially, in some cases, banks that granted preferential credit to certain sectors were given a higher share of the global credit ceilings (Portugal), but over time, most countries treated all banks and types of credit equally to minimize distortions.

Tables 2-4 provide an overview of the various allocation rules in different countries. While some countries based credit ceilings on gross credit, others used only the credit financed with monetary liabilities (the so-called net credit ceilings) as the base for credit ceilings (France and the Netherlands). 1/ Portugal introduced modifications to the base as new financial instruments, including treasury bills and certificate of deposits, were introduced in the market. It also included in the base loans extended in foreign currency and borrowing from abroad. France and the United Kingdom exempted loans to sectors that the authorities wished to support such as the export sector.

Between 1973-1984, the Bank of France (BOF) excluded long-term resources for bank lending from credit growth. Thus, banks could expand their lending activities beyond the ceilings, provided that these credits were financed with new capital funds or through the issuance of long-term bonds. The rationale for such an arrangement was that at times when the ceilings were binding because of excess demand for credit, banks could fund additional lending by issuing bonds. This would raise interest rates, leading to a reduction in demand for credit and restoration of the equilibrium (Quintyn, 1991).

Between 1973-1984, the BOF set an annual growth target on the stock of credit. In 1973 and 1974, the annual growth rate was based on the credit portfolio of the previous year, using a moving base. Monthly growth rates were then derived from this annual growth rate. As of 1975, the targets were calculated with respect to an index 100, corresponding to the credit stock at the end of 1994. 2/

By the mid-1980s, however, these direct credit controls were no longer binding in the aggregate since some banks had accumulated a large amount of unused credit limits that could be carried over. Difficulties in

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1/ Net credit aggregate includes total credit, including non-performing loans, less capital, provisions and non-monetary liabilities.

2/ See Quintyn (1991).

forecasting these accumulated credit margins contributed to the abandonment of the system. By end-1986, the authorities completely removed quantitative credit controls and began managing monetary policy through the indirect control of short-term market interest rates.

In the 1960s, the Netherlands also adopted a system of "net credit ceilings." Under this system, no limits were set on the bank's total lending as long as the proportion of lending not matched by long-term funding did not exceed an envisaged growth rate. Accordingly, only credits financed with short-term bank deposits were subject to direct restrictions. As in France, the advantage was that banks could finance their credit by issuing long-term paper or mobilizing long-term savings deposits. Such a system aimed at encouraging the development and deepening of the market for long-term financial instruments. Except for brief interruptions, direct credit restrictions were in force from June 1961 until March 1972, and from May 1977 until early 1982. In early 1986, the Netherlands again imposed the ceilings through an informal agreement, under which the banking system was to limit the two-year growth of its net money-creating operations to 11-12 percent.

Faced with an increase in net lending by banks and pressures on the exchange rate peg, in 1989, the Dutch authorities introduced a new instrument, the "monetary cash reserve arrangement." This instrument superseded the credit ceilings and sought to remedy the latter's shortcomings, which stemmed from its nonmarket-oriented nature. Like credit ceilings, the monetary cash reserve arrangement sought to curb the banks' net money creating operations. In cases where credit growth exceeded a certain permitted target, banks had to pay an interest equal to the interest that would have been lost if a compulsory reserve requirements were in place (the so-called "cash reserve percentage"). This way, a price was paid for lending in excess of permitted volume.

Such a system had several advantages over the previous system of credit ceilings. First, unlike the latter, it was market oriented, since it acted not on the volume of lending financed from short-term funds but on its price. It raised the price of excessive lending financed from short-term funds. Second, it did not curtail interbank competition. Each bank could expand its lending to any desired level, provided that a price was paid. Third, it encouraged the development of the interbank market, since banks could trade unused margins of credit ceilings with one another (see section II.4). 1/ 2/

1/ An unused margin was the difference between the ceiling and a bank's actual growth of net lending.

2/ The monetary cash reserve arrangement was approved in July 1989, for a period of one year. In June 1990, the authorities renewed the arrangement in a slightly modified form by allowing the cash reserve percentage to remain zero. This was motivated by the decline in the growth of banks' money creation. This arrangement has not been reactivated since then but remains an instrument that can be used at any time.

In a number of developing countries, the allocation of credit ceilings amongst banks was based on each bank's outstanding credit at the end of the previous period (Guyana, Egypt, Kenya, and Jamaica). However, at times, such an allocation rule gave banks an incentive to breach the ceilings even at the cost of severe penalties in order to obtain higher credits next period. Also, such an allocation rule often limited bank competition by discouraging banks from mobilizing deposits. Thus, some countries changed the base of the allocation rule as they gained experience with the implementation of ceilings. For example, in Madagascar, the authorities used to allocate quarterly global credit ceilings to individual banks based on banks' credit and deposit market shares over the preceding three-year period and their projections for the forthcoming year. In November 1990, the authorities changed the base to one where credit ceilings were set based on the increase in deposit share of each bank (and for new banks on their expected deposit share). In addition, they adjusted ceilings to take into account the evaluation of each bank's needs. Further, in 1994, they began to base the ceilings on the volume of each bank's capital, reserves and increases in deposits. Albania changed the original allocation rule from one where ceilings were based on share of bank's deposits to one that combined bank's share of credits outstanding, new lending and repayment and increases in a bank's deposits. Bulgaria initially set quarterly credit ceilings based on bank's share of outstanding credit. However, significant lags in reporting and slippage on the part of the commercial banks led to changes in the allocation rules. The new rules took into account variations in banks' share of deposits, size of banks' capital, and a qualitative assessment of relative liquidity and riskiness of banks' portfolios. The new ceilings were set monthly.

3. Administration of credit ceilings

a. Monitoring and circumvention

Central banks had to remain vigilant for signs of circumvention of the ceilings by measuring compliance frequently. A number of countries shifted from end-of-quarter to monthly monitoring to better observe deviations from the targets (Albania and Egypt). At times, however, monitoring of the ceilings was complicated because of the long lags in reporting from the commercial banks to the central banks (Albania).

In some countries, the authorities determined compliance with ceilings by comparing the ceiling with the outcome on a particular date (Portugal). However, such a practice allowed banks to engage in "window dressing" to comply with the ceilings. 1/ At times, banks hid credit extended in off-balance sheet accounts just before the reporting date and used various accounting ploys to conceal the true volume of credit outstanding on that particular date.

1/ This term refers to banks adjusting their balance sheets to meet the credit ceilings only on the test dates.

In almost all cases, prolonged use of credit ceilings led to evasion and circumvention. In those countries where borrowing in foreign currency was exempted from the base, banks circumvented ceilings by increasing foreign currency credits in total loans. In Jamaica, banks circumvented credit ceilings by developing new ways to extend credit, which included classifying certain credit items as contingent liabilities to avoid an expansion in the assets shown on their balance sheets. Often, having reached their credit limits, many banks charged brokerage fees to match depositors with borrowers directly. Also, banks shifted loans and deposits to nonbank affiliates, often stimulated in addition by differential reserve and capital requirements on nonbanks. 1/ In Bulgaria, banks that sold government securities to nonbanks were allowed to increase credits by an identical amount. Often, however, banks circumvented the ceilings by selling government securities just before the test date and buying them back later.

In many cases, circumvention of ceilings and/or overall loss of competitive advantage by banks, forced the authorities to extend the ceilings to instruments or institutions that previously were exempted (Egypt, Portugal, United Kingdom). For example, in the United Kingdom, larger borrowers who were denied credit at their commercial banks were able to discount their commercial bills through brokered channels or turn to the capital markets or finance houses instead. As a result, finance houses grew rapidly at the expense of deposit banks who were subject to these restrictions. To deal with this problem, the Bank of England extended the ceilings to include all financial intermediaries as well as the capital market (by imposing controls on the issuance of securities) to prevent further deterioration of banks' market shares. Eventually, all important channels for lending and borrowing activities of credit institutions were put under the supervision and control of the authorities. In Belgium, exchange controls, a two-tier foreign exchange market and regulations imposed on the net foreign position of commercial banks helped reduce evasion of credit ceilings via foreign capital markets. In Italy, the credit supply of nonbank financial institutions was brought under control as the authorities imposed an upper limit on the securities' yields issued by these institutions.

b. Enforcement

In most countries, credit ceilings were only effective if the authorities established and preannounced stiff penalties for noncompliance. Typically, these penalties depended on the amount of excess credit extended and on market interest rates to reduce the profitability of exceeding individual credit ceilings for the noncompliant bank.

1/ See Marston (1995).

Penalties varied from one country to another, ranging from purely monetary fines equivalent to the excess of ceilings (Egypt), to a less biting form that included a reduction in the bank's rediscount quota at the central bank by an amount at least equal to the excess credit growth (Belgium and Bulgaria). 1/

Generally, penalties took two forms, depending on the degree of monetary control that was to be achieved through credit ceilings. They were prohibitive, discouraging overshooting altogether with a view to adhere as closely as possible to the overall monetary targets. High penalties were particularly useful if the central bank wished to contain bank lending to residents during episodes of capital inflows and to nonresidents during episodes of speculative attacks.

Alternatively, penalties could be progressive which allowed greater flexibility in the volume of credit, as some loans could be profitable enough to offset the cost of the penalty. Because progressive penalties did not aim at discouraging overshooting altogether, they also introduced flexibility in the enforcement of credit ceilings on particular banks. Since 1973, France, used a progressive reserve requirements ratio that was applied to the nonobservant bank's total outstanding amount of lending to the private sector. 2/ Noncompliant banks were required to deposit these noninterest-bearing "supplementary reserves" in a special account with the central bank. The Dutch "monetary cash reserve arrangement" used a system of progressive penalties by levying fines that consisted of the imputed cost of the reserve requirements, that is, lending in excess of ceiling times a penalty interest rate. The penalty was calculated each month, with undershooting months allowed to offset overshooting months over a 12-month period. At the end of the 12-month period, the penalty was levied if it exceeded a preannounced small amount. The preannounced amount aimed at sheltering the smaller banks from the penalties, and thus encouraged competition in the banking sector.

In Madagascar, to ensure that the overall limit was not broken, the central bank allocated less than the overall ceilings. At times, however, such a strategy led to unnecessary credit constraints, without, at other times, preventing the overall limit from being exceeded. Penalties for exceeding the ceilings were related to the frequency of violations. First time offenders were given a warning for the first violation, whereas repeat offenders were required to make a noninterest-bearing deposit with the central bank equivalent to 50 percent of the excess credit for the second infraction until the next test date.

1/ As of November 1989, the authorities in Egypt changed the penalty for noncompliance to include 1/6 of 1 percent per day on balances in excess of limits.

2/ The system was highly progressive, since the ratio was a quadratic function of the increase in excess of the set standard. See Quintyn (1991)

Alternatively, some countries used moral suasion to enforce credit ceilings. The sole use of moral suasion, however, was unsuccessful in containing aggregate demand since some banks increased their credit above the targeted limits (Kenya). Thus, a number of countries combined moral suasion with penalties. In France, for example, moral suasion was backed by the "supplementary reserve requirements."

4. Trading of credit ceilings

A number of countries allowed banks to trade credit rights among themselves to minimize distortions created by the administrative allocation of credits. Banks that wanted more credit than permitted under the ceilings acquired credit rights from elsewhere in the industry. The trading of credit rights after the initial allocation allowed for the outcome of banks' market shares at the end of the period to be closer to the one that would prevail under pure market conditions.

In the Netherlands, for example, under the monetary cash reserve system, a fast-growing bank could buy an unused margin from a bank whose net lending growth remained below the allowed ceiling. The development of a market for unused quotas helped reduce the circumvention of ceilings. Moreover, the incentive to extend lending to the economy was affected by the price of unused margin in the market for credit. That mitigated the constraints that the initial allocation put on banks that could profitably expand their share of the credit market faster than the ceiling. However, it did not eliminate the windfall profit to banks whose ceiling implied a market share higher than they would have achieved under pure market conditions.

In July 1992, Bulgaria began to allow interbank trading of up to 50 percent of the unused portion of a bank's credit limit. However, overtime, some banks appeared to be always sellers and others buyers. Also, since ceilings were monitored monthly, the selling banks waited until the end of the month to carry out trades, leaving the buyers uncertain about the status of their portfolio.

In France, banks with unutilized room under the ceiling began trading credits with other banks that were in danger of exceeding their credits. Banks could also trade, up to six months, unused past credit.

III. Effectiveness of Credit Ceilings

In all countries reviewed, monetary control via the imposition of ceilings--often combined with other administrative controls--left the banking industry highly uncompetitive, inhibited growth of bank financial intermediaries, and led to a large build up of excess reserves, often caused by the monetary financing of the budget deficit. The problem was further complicated in countries where ceilings had to be applied to a large number of financial institutions. Such a task often led to significant administrative difficulties.

In general, while credit ceilings were effective in containing credit aggregates in the short run, they became less effective in the longer run as borrowers substituted away to unregulated channels of credit financing. In most cases, since banks had to limit their credit expansion according to some arbitrary allocation rule, the most expansive banks were progressively put at a disadvantage as changes in the bank's market share for credit were in effect frozen. In fact, in almost all countries where credit ceilings were put in place for prolonged periods, the demand for credit tended to develop alternative channels of financing. The main advantages and disadvantages of credit ceilings are summarized in Table 1.

In the United Kingdom, for example, under binding credit ceilings, banks invested their excess liquidity in government papers or lent mainly to those sectors excluded from the ceilings. As a result, in some cases, the quality of projects financed progressively weakened due to the dissociation between lending rates and the quality of borrowers to the point where real returns became negative on some investments. By the early 1970s, dissatisfaction with the deadweight efficiency losses resulting from a directly controlled financial system grew and disintermediation rendered the direct controls ineffective. Thus, in 1971, the authorities dismantled all credit controls. 1/

In most countries, the number of exemptions introduced in the system complicated administrative control. Several methods were generally used in this respect: partial or total exemptions from the ceilings, the fixing of higher ceilings for specific credit categories and the upward adjustment of the individual ceiling to include credits already granted. In Bulgaria, the number of loopholes and exemptions led to the abandonment of the credit ceilings altogether in 1994. The primary difficulty was that credits extended in foreign currency were not included. With the growth in foreign currency deposits, there was a parallel growth in foreign exchange credits. Also, agricultural credit as well as credit extended by newly established banks were exempted from credit ceilings.

1/ Faced with a rapid growth of monetary aggregates in the following periods, in 1973, the authorities were compelled to reintroduce the credit controls in the form of Supplementary Special Deposit scheme, or "corset." Under this system, the Bank of England (BOE) established limits for the growth of interest bearing liabilities of banks for a specific period of time relative to a defined base period. Any bank which exceeded the specified rate of expansion in its interest bearing liabilities was required to place a certain amount of non-interest deposits with the BOE. The volume of such penalty deposits required of a bank rose progressively as the rate of expansion of the banks interest bearing liability exceeded the stipulated limit. By adjusting this penalty rate, the BOE could increase the effective cost of new funds to deter banks from aggressive competition for funds and to encourage banks to increase their lending rates. By end-1980, the BOE removed all quantitative restrictions including the "corset." While the option to call special deposits has remained in place, it has never been exercised since then.

Table 1. Credit Ceilings: Advantages and Disadvantages

Advantages	Disadvantages
Perceived to be reliable in controlling credit aggregates	Cannot be used for fine tuning short-term liquidity management and are only effective as long as they are binding
May be the only feasible monetary instrument available in countries with severe market failures or with very thin financial markets	Tend to perpetuate credit market shares, independent of a bank's competitiveness
Relatively easy to implement when the number of banks is limited	Cause disintermediation from regulated financial sector to unregulated domestic markets or foreign markets (transfer of savings overseas)
Relatively easy to link to a monetary programming format	Limit competition among banks and hamper the development of a money market
Unaffected by the exchange rate regime	May lead to overhang of liquidity if monetary policy is loose
	Cause micromanagement of credit allocation by the central bank
	Difficult to monitor since credit may be extended in forms not covered by ceilings
	May lead to multiplication of direct controls and financial repression
	Difficult to enforce and create administrative difficulties in countries with a large banking system.

In France, insufficient coverage of financial institutions, combined with a significant number of exemptions and complexities based on the categories and types of lenders and borrowers, seriously jeopardized the effectiveness of credit ceilings. In addition to the growing number of exemptions, smaller and newly established banks were allocated looser ceilings, while in general, ceilings became tighter for larger banks. The proportion of the amount of credit exempt from the ceilings rose from 1.7 percent of the total bank lending in 1973 to 7 percent in 1978 and nearly 11 percent in 1983. These measures increasingly led individual banks to request special waivers when they experienced difficulties, introducing additional arbitrariness into the system. As mentioned above, the carry over of unused credits also undermined the credit ceiling's effectiveness.

Indeed, to add flexibility to the system, banks were allowed to carry forward, up to a maximum of six months, unused credit ceilings. Eventually, however, difficulties in forecasting the utilization of accumulated credit margins contributed to the abandonment of the system altogether.

Exemptions also complicated monetary programming, since it was necessary to project the path of the exemptions in order to derive the credit subjected to ceilings as a residual. The result was a reduction in the usefulness of credit ceilings as an operational target for monetary policy. 1/

IV. Design Features of a More Efficient System of Credit Ceilings

Despite the fact that credit ceilings tend to be cumbersome and a fairly blunt monetary instrument, a number of central banks still use them. To prevent loss of monetary control, some countries use the ceilings during their transition from a centrally planned to a market economy until the financial markets are sufficiently developed for full reliance on indirect monetary instruments. Others use credit ceilings as a backstop during the transition from direct to indirect instruments, while the authorities develop the techniques of monetary control through indirect means. Still, other countries keep the ceilings in reserve in case of difficulties.

In certain circumstances such as when monetary relationships are highly unstable, which makes the demand for money too volatile for monetary management through indirect instruments, the ceilings can temporarily be used as a pragmatic way to target net domestic assets of the banking system directly. However, credit ceilings need to be carefully designed to minimize the many distortions discussed above.

Appropriately tight reserve money is a prerequisite for the effectiveness of credit ceilings if and when they are used: the looser the central banks' reserve money, the greater the liquidity of the banking system, and the greater the incentives for all banks to circumvent credit ceilings, no matter how the instrument is designed. This being said, there may nevertheless be incentives for particular banks to circumvent the system, if the methods of apportioning credit lead over time to allocations at odds with the competitive evolution of banks' market shares. In these cases, the imposition of an overall credit target will tend to affect certain banks relatively more than others. Therefore, the former will be inclined to circumvent their ceilings, whereas the latter will enjoy rents.

To make credit ceilings more effective, monetary control has to be market oriented. Thus, the ceilings should incorporate features that enhance flexibility of credit allocation. Allocation methods can be designed to minimize distortions of the credit ceilings. To this end, the Netherlands approach to the setting of rules of allocation may be useful;

1/ See Quintyn (1991).

the base can be a net domestic credit aggregate; the weighing rule can be a flow method, which would allocate the change in net domestic credit of the banking system. The flow method reflects as closely as possible the banks' competitive evolution of market shares; competition is enhanced through uniformity of treatment and transparency of rules. 1/ The flow approach introduces some flexibility by encouraging banks to compete for deposits and accumulate capital. 2/ Finally, to preserve the integrity of the credit ceiling as an instrument of monetary control, financial support for "priority" sectors that the authorities wish to support should explicitly flow through the budget.

The design of penalties on overshooting of credit ceiling is a crucial element. In particular, progressive penalties introduce a useful element of flexibility in the enforcement of the ceilings. In effect, such penalties allow for a range of outcomes; the upper limit of the range corresponds to the desired outcome, at which point prohibitive penalties would be assessed. The central bank can also modulate the progress of the penalties from period to period to signal monetary policy intentions.

A progressive penalty may consist of a reserve requirement proportional to credit extended above the ceiling. However, such a constantly changing reserve requirement may complicate monetary management, especially as it interferes with the money market. A simpler system of progressive penalties would levy fines that consist of the imputed cost of the reserve requirement, that is, lending in excess over ceiling times a penalty interest rate. In monetary control frameworks relying on indirect instruments, if those instruments coexist with (nonbinding) credit ceilings, penalties should become prohibitive in order to block credit expansion in those episodes where the indirect instruments fail.

Alternatively, in certain cases where a bank repeatedly overshoots its credit ceiling by large amounts, penalties may be imposed on management or in an extreme case, the bank license may be withdrawn. These actions would tend to ensure compliance with the central bank's guidelines.

In the simplest possible framework, compliance with ceilings is determined by comparing them with the outcome on a prescribed test date. However, verification of compliance on a particular day may sometimes cause certain banks to manipulate the outcome, i.e., reduce their declared outstanding credit through accounting gimmicks. Credit extended just before the test date may be temporarily hidden in a suspense account, or banks may ask clients to "repay" credits with deposits on the test date, the operation being reversed thereafter. If these practices tend to be widespread and cannot be readily deterred through the threat of penalties, some form of averaging of outstanding credit subject to ceilings may be needed to ensure

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1/ However, all allocation rules will involve an element of arbitrariness as the weights are not chosen through a market mechanism.

2/ See Appendix for a technical discussion of the stock and flow methods.

better implementation of the instrument. In periods, of high inflation, it may be necessary to take the average of the series, e.g., during the last month of the quarter, if quarterly test dates are used.

The averaging method used in the Netherlands' monetary cash reserve arrangement goes one step further, in that it assesses compliance against a moving average of outcomes. A series of averages of net lending is computed for the most recent six months; the year-on year growth rates of these averages are compared to the desired growth rate of net lending--the ceiling. An excess in a particular month is assessed a penalty; otherwise, a negative penalty is assessed. Finally, these monthly penalties are cumulated over 12 months, giving the net penalty. The advantage of this system is to provide flexibility to banks in the month-to-month management of their credit activity, and therefore to minimize the impact of credit ceilings on the banks' business. However, the cost of this flexibility is relatively looser control by the central bank over credit conditions.

The treatment of credit rights is an important dimension of market-based monetary control under a system of credit ceilings. Banks that want to grant more credit than permitted under the ceilings may acquire credit rights from elsewhere in the industry. This mitigates the constraints that the initial allocation puts on banks that can profitably expand their share of the credit market faster than the ceiling. As explained above, trading does not however eliminate the windfall profit to banks that obtain a ceiling higher than the one they would have achieved under pure market conditions. Banks would need to register the transfer of unused credit quotas with the central bank. This is particularly important for the flow method, as the treatment of base drift needs to take trading of ceilings into account (see Appendix).

It is possible to allow banks with unused credit margins to increase their ceilings by the amount of the margin during a given number of periods, after which the margins still unused are lost. However, a system that allows unused credit rights to be accumulated or traded for use outside the current period would require projection of these unused margins. Therefore, for administrative simplicity, it is preferable to allow for the use and trading of credit ceilings within the current program period only.

Complete market determination of credit ceilings could in principle be achieved if in addition to post-allocation trading of ceilings, the initial rule-based allocation is replaced by an auction of credit rights. Such an auction is conceptually identical to auctions of pollution rights or telecommunications frequencies. Banks would bid cash amounts for the right to expand credit by tranches of, say, 100 during the period (month or quarter). The more efficient banks would have the lowest costs and would tend to make the highest bids. Clearly, prudential safeguards need to be put in place to minimize distress bidding, but such safeguards are in principle similar to the one used in the operation of other monetary

instruments, such as central bank credit auctions. 1/ Thus, flexibility can in principle be achieved if the credit ceilings are allocated through a periodic auction of credit rights, supplemented by post-auction trading of unused margins, thereby resulting in a system of credit ceilings that is fully market-determined. The auction system would in principle eliminate all rents arising from administrative allocation methods.

V. Conclusions

The country experiences provided an overview of the range of practices and various designs that have characterized credit ceilings. While the instrument is inherently a crude and inflexible method of monetary control, its specific design and enforcement has, in many cases, led to its ineffectiveness. Suboptimal specification of rules of allocation tended to ossify the distribution of credit by perpetuating market shares and limiting the incentives for banks whose ceilings were binding to finance profitable projects. Additionally, inadequate monitoring and enforcement of penalties by the authorities often led to circumvention and ineffectiveness of the instrument. Insofar as credit ceilings were effective, they led to financial repression and disintermediation.

Credit ceilings may serve a useful purpose in certain circumstances, such as when monetary relationships are highly unstable or during the transitional period until the financial markets are sufficiently developed for full reliance on indirect monetary instruments.

In those circumstances, the proper design of credit ceilings tends to reduce the distortions they usually entail, albeit without eliminating them completely. Over time, as the market orientation of monetary control is established, the country can rely increasingly on indirect instruments (such as credit or deposit auctions, operations with government securities, standing facilities) to achieve its monetary and inflation targets. At such a stage of development of market-based monetary control, the role of credit ceilings should be substantially diminished. However, the instrument could conceivably be maintained in the central bank's arsenal as a fall-back tool, to be used only in those episodes where indirect methods falter because of uncertainties in monetary relations or where indirect methods need to be temporarily supplemented in order to contain the impact on credit of surges in capital flows.

1/ For a discussion of ways to design credit auctions under adverse selection see Saal and Zamalloa (1995).

Table 2. Bank-Specific Credit Ceilings in Selected OECD Countries

Country (period in use)	Rules of Allocation	Institutions Subject to Credit Ceilings	Penalty in Case of Noncompliance	Trading of Unused Margins	Other Monetary Instruments in Use
Belgium (1964-5) (1966-7) (1969-71) (1974-75) (1978)	Ceilings established on maximum rates of expansion with allowance made for certain priority categories	Banks, savings institutions, public credit institutions, life insurance companies	Reduction of banks' rediscount quota at CBB by an amount at least equal to the excess over the limit	No	Minimum required monetary and security reserves, maximum lending rate of interest
Denmark (1970-80)	Limits on banks' gross credit, using deposit and credit shares	Commercial, savings and cooperative banks	NA	No	Reserve requirements, Rediscount operations
France (1969-87)	Limits set on short term credit not matched by increase in long-term liabilities	Deposit banks	Progressive special reserve requirements	Yes	Rediscount policy, cash reserve ratio
Italy (1973-75) (1976-83) (1985-87)	Separate ceilings on growth rate of short- and long-term credits	Deposit banks	NA	No	Interest rate ceilings
Netherlands (1961-67) (1969-72) (1977-81) (1989-93)	Net credit ceilings; Monetary cash reserve arrangement.	Deposit banks	Progressive penalty that consisted of the imputed cost of excess lending.	As of 1990	Open market operations, reserve requirements, rediscount window
Norway (1955-1958) (1961-1965)	Applied in terms of a maximum percentage increase in credit allowed relative to the same month in the pervious year; ceilings also applied to foreign credits extended in foreign currency.	Commercial banks; life insurance companies	NA	No	Open market operations
Portugal (1977-89)	Applied initially to domestic credit but was later extended to include external credit and borrowing in foreign currency. Calculated based on the structure of bank's liabilities with capital and long-term liabilities having higher weights; over time, preferential credit, sight deposits and time deposits with maturities of less than six months were excluded; also, purchases of T-bills were given relatively high weighing so as to favor the development of this instrument.	All banks	NA	No	Rediscount facilities, reserve requirements
United Kingdom (1964-71) Corset (1973-79)	Limits set on growth of credit to low priority sectors; many exemptions applied Limits set on growth of deposit liabilities	All banks; gradually broadened to include finance companies	Deposits placed at the Central Bank equal to the excess of lending	No	Open market operations, reserve requirements, ceilings on short- term interest rates

Table 3. Bank-Specific Credit Ceiling in Selected Developing Countries

Country (period in use)	Rules of Allocation	Institutions Subject to Credit Ceilings	Penalty in Case of Noncompliance	Trading of Unused Margins	Other Monetary Instruments in Use
Egypt (1981-87) (1987-88)	A ceiling of 3 percent per quarter on the growth of credit in Egyptian pounds to the private sector for commercial purposes; a ceiling of 2.5 percent per quarter on credit in Egyptian pounds to households. Applied to both domestic and foreign currency lending.	Commercial bank. All financial institutions including investment and specialized banks.	NA Included holding of excess reserves with Central bank of an equivalent amount and period	None	Loan to deposit ratio amounting to 65 percent of Egyptian pounds deposits, interest rate ceilings, reserve requirements, selective credit ceilings
Guyana May 1988-Sept. 1988) Sept. 1988-1991)	Banks' outstanding credit at the end of previous period plus allowed percentage growth	Two deposit banks. Later changed to four indigenous banks.	No	None	Interest rate ceilings, reserve requirements
Jamaica (End 1981-85) (1989-91)	Banks' outstanding credit at the end of previous quarter plus allowed percentage growth Required increase in banks' credit was kept at no more than 5 percent of outstanding amount in each 90 days	Commercial banks All financial institutions, many exemptions applied	No Penalty of 1/6 of 1 percent per day on balances in excess of limits	None	Cash and liquid asset reserve requirements, refinance windows, selective credit ceilings, saving deposit floor rate, open market-type operations (after 1985)
Kenya (1987-90)	Bank's outstanding credit at the end of previous quarter plus allowed percentage growth	Commercial banks	As of 1990, penalty included placement of a noninterest-bearing deposit at the CBK equivalent to 20 percent of excess credit extended.	None	Maximum lending rate and minimum savings deposit rate
Madagascar (1985-Dec. 1995)	Up to 1990, ceilings were set quarterly based on banks' performance in terms of sources and uses of funds over the preceding three years and projections for the coming year; as of 1990, ceilings were based on banks' increase in deposit share; in 1994, allocation rule was changed so that base would include volume of bank's capital, reserves and increases in deposits.	Commercial banks	Since 1987	As of March 1993	Credit authorization, reserve requirements, rediscounting

Table 4. Bank-Specific Credit Ceilings in Selected Eastern European Countries

Country (Period in use)	Rules of Allocation	Institutions Subject to Credit Ceilings	Penalty in Case of Noncompliance	Trading of Unused Margins	Other Monetary Instruments in Use
Albania (1992-)	Ceilings are set based on the share of credit outstanding, new lending and repayment, nonperforming loans and increase in deposits.	Commercial banks	Banks required to pay fine on excess lending equal to one period's interest on spread between maximum lending rate and minimum deposit rate, adjusted for reserve requirements, plus 0.5 percent of the excess	Yes	Reserve and liquidity requirement, refinancing window
Bulgaria (1990-July 1994)	As of 1993, ceilings set monthly based on changes in relative share of deposits, size of bank's capital, relative liquidity of bank and riskiness of portfolio.	Commercial banks	banks required to deposit amount equivalent to excess credit in a noninterest bearing account with BNB.	50 percent of unused margins are allowed to be traded	Reserve requirements, open market type operations, refinance credit facilities
Czech Republic (1990-1992)	Ceilings set on quarterly basis.	Commercial banks	No	No	Auction of refinance credit, reserve requirements, open market operations
Republic of Macedonia (1991-)	Ceilings are set monthly based on the relative growth in bank's deposit, paid-in capital and general reserves, share of credits outstanding, and riskiness of portfolio.	Commercial banks	Based on discount rate.	No	Reserve requirements, refinancing facilities, special liquidity credits, auction of deposits and NBRM bills
Poland (1989-92)	Ceilings were set based on bank's outstanding share of credit at the end of previous period.	Commercial banks	No	No	Reserve requirements, weekly auctions of T-bills, credit refinancing facilities
Romania (1990-91)	Ceilings set quarterly based on bank's outstanding share of credit at the end of previous period.	Commercial banks	No	No	Maximum spread of 3 percent allowed between deposits and lending rates, refinance policy

Illustrative Accounting Framework and Choice of System Parameters

As discussed in the main body of the paper, in cases where monetary relationships are highly unstable (e.g., during the transition to a framework of indirect control over broad money), credit ceilings can be a practical instrument to directly target net domestic assets of the banking system on a temporary basis. In those cases, certain design features of the instrument can minimize the distortions associated with its use. The purpose of this appendix is to describe an accounting method and administrative procedures that would make credit ceilings more effective.

1. Choice of the base

For effective targeting, the base used for credit ceilings should be an aggregate as close as possible to the operational target which we assume is net domestic assets of the banking system. This principle implies that a net credit aggregate should be used, such as total credit (including nonperforming loans) minus capital and provisions. The use of this net aggregate gives banks the possibility of extending more credit than allowed under a gross ceiling if such credit is matched by shareholder funds.

2. Choice of the weighing rule

In addition to the choice of a base in a reference period, a weighing rule (weights for each covered institution) needs to be determined. The weighing rule needs to be designed carefully, because of the sensitivity (and arbitrariness) of individual bank credit allocations associated with particular weighing rules. The stock and flow weighing rules are defined below and their outcomes compared. It turns out that the stock method results in less stable outcomes when underlying parameters shift. The stock method also imposes constraints on the choice of system parameters in order to avoid outcomes that would require loan recalls for certain banks. These issues are illustrated by means of a numerical example. The example also shows how to recalculate the base when the trading of credit ceilings is allowed and how to calculate the penalties.

a. Stock method

Let the base be measured in period t as:

C_t = gross credits - capital - provisions (1)

PC_{t+1} is the projected level in period t+1 of overall net domestic credit of the banking system as defined above. 1/ Then, g_t is the targeted growth rate of credit from t to t+1; $C_{i,t}$, outstanding net credit of bank i at the end of the base period; and $PC_{i,t+1}$, next period's ceiling on net credits of bank i. A stock method would allocate the stock PC_{t+1} according to:

$$PC_{i,t+1} = C_{i,t}(1 + g_t) \qquad (2)$$

This is equivalent to allocating PC_{t+1} according to each bank's share of the credit market:

$$PC_{i,t+1} = (C_{i,t}/C_t)PC_{t+1} \qquad (3)$$

A shortcoming often found with this method is that it does not provide rewards to banks that perform comparatively better in the deposit market. C excludes capital and provisions. Let us therefore consider allocating PC_{t+1} according to a mix of the banks' gross credit (GC), deposit, and capital shares (stock method):

$$PC_{i,t+1} = PC_{t+1}(\alpha_1 GC_{i,t}/GC_t + \alpha_2 D_{i,t}/D_t + (1-\alpha_1-\alpha_2)K_{i,t}/K_t) \qquad (4)$$

Denmark used such a mixed system of credit ceilings in the early 1980s. More precisely,

$$PC_{i,t+1} = C_{i,t}[1 + g_t + \tfrac{1}{2}(D_{i,t}/D_{i,t-1} - D_t/D_{t-1})] \qquad (5)$$

Under this scheme, credit weights were supplemented by deposit weights; however, the National Bank of Denmark scaled down the bank-specific deposit growth to counteract what it assessed as being too fierce competition for deposits. 2/

1/ PC_{t+1} is consistent with an overall broad money program which typically puts a separate ceiling on net credit to government and a floor on net foreign assets. Using standard notations, NC = M + OIN - NFA - NCG, where OIN are defined to exclude capital and provisions. M, NFA, NCG, and OIN are projected; NC is a residual.

2/ Moreover, it was found that banks with low loan-to-deposit ratios compared to the industry average were often too constrained in expanding credit; for these banks, the credit ceiling was increased toward the average. These higher-than-normal credit ceilings were then offset by allocating lower-than-normal ceilings to banks with relatively low increases in deposits, irrespective of the banks' actual deposit mobilization. See National Bank of Denmark, Yearly Report, 1994.

The case of Denmark is in fact illustrative of a general shortcoming of the stock method or variations thereof, in that the choice of the α_i may lead to a decrease of allowed credit for particular banks, even though overall PC_{t+1} increases. To see this, compute the individual credit increase:

$$PC_{i,t+1} - C_{i,t} = (\alpha_1 g_t - 1)C_{i,t} + PC_{t+1}(\alpha_2 D_{i,t}/D_t + (1-\alpha_1-\alpha_2)K_{i,t}/K_t) \quad (6)$$

It is possible to develop examples of banking systems where this expression can be negative under normal circumstances if $\alpha_1 g_t$ is too small. One such example is presented in the attachment. It implies that α_1 has to be set rather high and the other coefficients correspondingly lower in order to avoid situations in which a particular bank would have to recall loans. 1/ The trading of credit ceilings would alleviate the problem, but even so, particular banks would be penalized simply because the stock method was chosen as the weighing rule.

b. The flow method

One may instead consider a weighting rule in which instead of allocating PC_{t+1}, one allocates ΔPC_{t+1}--the flow envisaged in the monetary program during period t. The expression for the ceiling of bank i becomes (flow method):

$$PC_{i,t+1} = C_{i,t} + \Delta PC_{t+1}(\alpha_1 C_{i,t}/C_t + \alpha_2 D_{i,t}/D_t + (1-\alpha_1-\alpha_2)K_{i,t}/K_t) \quad (7)$$

Here, individual ceilings automatically increase as long as overall credit increases. Comparing $PC_{i,t+1} - C_{i,t}$ under the stock method to the same expression under the flow method, one sees that the stock method almost always imposes larger adjustments than the flow method, and therefore may appear to be more arbitrary. The limiting case when the two methods converge is for α_1 equal to 1.

If applied mechanically, the stock and flow methods have different implications on the treatment of unused credit margins, due to base drift. The stock method automatically allows some proportion of unused margins to be used in the periods ahead. The proportion depends on the definition and evolution of the weights and on the extent to which the overall credit target will be revised next period. But all else equal, the entire unused credit of period t is available in period t+1, since the target for overall credit in the next period, PC_{t+2}, is in principle not affected by the nonutilization of a particular $PC_{i,t+1}$. On the contrary, the flow

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1/ Some central banks (e.g., Jordan, Italy) used to compute credit ceilings according to a variant of method 2 and then adjust outcomes based on a review of the particular circumstances of the banks. However, this approach introduces the type of discretion which may ultimately undermine the integrity of the instrument by granting too many exemptions.

allocation automatically penalizes those banks that undershoot their ceilings (all else equal, it rewards banks that overshoot). This is so because the nonutilization of $PC_{i,t+1}$ lowers the base $C_{i,t+1}$ to which the flow $\Delta PC_{i,t+2}$ is applied. These problems are somewhat circumscribed if there is the possibility of trading credit ceilings, because banks may then directly determine the outcome, $C_{i,t+1}$. Given the above, in the implementation of the flow method, one needs to take base drift into account, as shown in the numerical example presented in the attachment. The example also shows how to adapt the treatment of base drift when the trading of credit ceilings is allowed in the case of flow method.

It is easy to see from (7) that the implementation of the flow method is not constrained by particular values of the parameters α_i, whereas in the case of the stock method, α_1 cannot be set too low in order to avoid loan recalls for certain banks. This property makes it therefore possible to emphasize the role of capital in the mix of weights, i.e., it is possible to set $\alpha_1 = \alpha_2 = 0$ and $\alpha_3 = 1$ (flow method 2 in the attachment), or even to introduce capital adequacy in the computation of weights (flow method 3 in the attachment). Under those circumstances, banks would have an additional incentive to increase their shareholder funds if they want to develop their credit business. However, the numerical example shows that the effect of this property is marginal and that the choice of the base as credit net of shareholder funds already provides a strong incentive to increase those funds.

ANNEX

Numerical Example of Bank-by-Bank Credit Ceilings

The following example assumes a banking industry composed of three banks: bank L whose may activity is lending to the economy, funded by interbank funds and deposits; bank S, a savings bank; and bank N, a new bank.

I. Initial Conditions

	L	S	N	total
Assets	1100	1050	100	2250
Credit to nonbanks	850	600	30	1480
Other assets	250	450	70	770
Liabilities	1100	1050	100	2250
Own funds & provisions	80	73	7	160
Deposits	840	970	90	1900
Other liabilities	180	7	3	190

II. Individual Bank Weights

Shares at t	L	S	N	total	
Credits	57%	41%	2%	100%	α_1=0.6
Deposits	44%	51%	5%	100%	α_2=0.3
Own funds & provisions	50%	46%	4%	100%	α_3=0.1
Capital/asset ($CA_{i,t}$)	8.2%	8.8%	10.8%		

Weights 1 are computed using the formula: (α_i are discretionary) =

$$\alpha_1 C_{i,t}/C_t + \alpha_2 D_{i,t}/D_t + (1-\alpha_1-\alpha_2)K_{i,t}/K_t$$

Weights 1	0.53	0.44	0.03	1.0

Weights 2 computed using same formula as above, but $\alpha_1 = \alpha_2 = 0$

Weights 2	0.50	0.46	0.04	1.0

Weights 3 are $K_{i,t}/K_t * CA_{i,t}$, normalized to one.

Weights 3	0.48	0.47	0.05	1.0

III. Aggregate Banking System Target and Individual Bank Ceilings

Overall banking system target for t+1:	1400
Overall change in target for t, t+1:	80

		L	S	N	total
Initial conditions		770	527	23	1320
Computation of individual ceilings					
Stock method (weights 1) 1/		738	619	43	1400
Flow method 1 (weights 1)		812	562	25	1400
Flow method 2 (weights 2)		810	564	27	1400
Flow method 3 (weights 3)	a	808	565	27	1400

IV. Outcomes at t+1 (based on flow method 3)

		L	S	N	total
Net credits to nonbanks	b	820	550	38	1408
Own funds & provisions		95	80	7	
Deviation from allocation	b-a	12	-15	11	
of which traded	c	8	-11	3	
Penalty base		4	-4	8	
New credit base	a+c	816	554	30	1400
New weights $K_{i,t+1}/K_{t+1} * CA_{i,t+1}$			etc.		

1/ Using the coefficients (0.6, 0.3, 0.1), the outcome of the stock method would require bank L to reduce its lending, possibly by recalling loans. To avoid this, α_1 would need to be greater than 0.8, with corresponding reductions in α_2 and α_3.

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