

# **The implementation of monetary policy through the zero-average reserve requirement system: the Mexican case**

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## **Introduction**

In December 1994 the Mexican peso was allowed to float. The abandonment of the fixed exchange rate regime compelled the Bank of Mexico to look for new intermediate objectives with which to anchor and conduct its monetary policy. The Bank decided to set quantitative targets consistent with its inflation objective for the annual growth of the monetary base and use the observed behaviour of the monetary base as a guideline for its actions in the money market. It also decided to establish limits on the expansion of domestic credit.

The 1994 crisis brought a nominal depreciation of the exchange rate of more than 100%, high and variable inflation and a plunging real economy. In such a context it was considered unrealistic to use interest rates as an operating target, since it would have been impossible to find adequate levels. Thus, to conduct its daily operations, the Bank of Mexico uses, as its primary operational target, the average level of settlement balances on banks' accounts, and leaves the market free to determine equilibrium interest rates. To be able to send signals to the market without setting any specific level for interest rates, the Bank adopted an operational system commonly known as "reserve averaging around zero" or the "zero-average reserve requirement system".

This paper describes how the central bank implements its monetary policy using the zero-average reserve requirement system, as well as the manner in which it operates in the money market.

## **1. The monetary policy objectives of the Bank of Mexico**

The Mexican experience, like that of many other countries, has

confirmed the notion that the best possible way monetary policy can contribute to the sustained growth of employment and economic activity is through the pursuit of stability of the general price level. Hence, the Mexican Constitution states that the Bank of Mexico's priority is to seek stability in the purchasing power of the national currency.

To implement its policy, the Bank of Mexico monitors the behaviour of the monetary base and several economic indicators, such as the exchange rate, differences between observed and projected inflation, the results of surveys on the public's and specialists' inflation expectations, revisions of collective employment contracts, producer prices, and the balances on the current and capital accounts. Special importance is attached to the monetary base as an intermediate target because the public can follow it very easily. However, the central bank does not always react to deviations of the monetary base from its expected path: those that are considered non-inflationary do not call for intervention.<sup>1</sup>

## **2. The zero-average reserve requirement system**

The system works within 28-calendar-day maintenance periods in which each bank strives to manage the balances on its current account at the central bank so that, at the end of each period, its daily balances sum to zero. The incentive for doing so lies in the fact that if the accumulated balance is negative, the bank in question would have to pay high interest rates on it, whereas if it is positive, the bank forgoes any return it might have earned by investing the funds elsewhere. Table 1 exemplifies how accumulated balances are computed for a hypothetical credit institution.

This reserve requirement system is designed to induce credit institutions to avoid, on an average basis, overdrafts or positive balances on their current accounts, and offset any excess or lack of resources they might have by lending to other banks or borrowing from them at market interest rates. It is for this reason that, during maintenance periods, the Bank of Mexico does not pay interest on positive balances or charge interest on overdrafts posted at the end of each day, as long as both are kept within certain pre-established limits.

<sup>1</sup> As an example, during 1997 the monetary base grew more than anticipated owing to a larger-than-expected drop in interest rates and a faster recovery of economic activity.

Table 1  
**Computation of the accumulated daily balances of a  
hypothetical credit institution's current account**

Day	Balance at the end of each day	Accumulated balance	Day	Balance at the end of each day	Accumulated balance
1	10	10	15	0	40
2	10	20	16	0	40
3	10	30	17	0	40
4	10	40	18	0	40
5	0	40	19	0	40
6	0	40	20	0	40
7	-100	- 60	21	0	40
8	-100	-160	22	- 10	30
9	100	- 60	23	- 10	20
10	100	40	24	- 10	10
11	100	140	25	- 10	0
12	0	140	26	0	0
13	-140	0	27	-100	-100
14	40	40	28	100	0

Notes: the accumulated balance equals the sum of both positive and negative balances (overdrafts) reported at the close of each day on each credit institution's current account at the central bank (including non-business days). The shaded areas indicate non-business days.

However, at the end of the maintenance period the central bank charges interest at twice the 28-day CETES<sup>2</sup> rate on all negative accumulated balances. In this manner, the costs incurred by commercial banks that post positive accumulated balances at the end of any given period are similar to those incurred by banks which do not offset their accumulated overdrafts. These costs are similar because banks with positive accumulated balances incur an opportunity cost for not having invested those resources at market rates. Banks with negative accumulated balances have to pay interest equivalent to twice a market-determined rate on those balances; on the other hand, they benefit from returns earned on resources obtained through overdrafts. Thus, the net cost in either case is similar to the market rate.

<sup>2</sup> CETES are zero coupon government securities.

(i) *Monetary policy signals*

The central bank intervenes in the money market, offering credit, deposits or repurchase agreements, or carrying out direct purchases or sales of government securities, all through auctions. It determines the amounts to be auctioned so that the sum of all banks' balances may close the day at a pre-determined level. In order to help the participants in the financial markets understand its monetary policy intentions, the Bank publishes the information contained in Table 2 every day at noon.

Table 2  
**Information for the market**

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Bills and coins in circulation.

Net balance of banks' accounts at the central bank, at the close of the previous day.

Sum of accumulated balances.

Projected pre-intervention cash position of the banks' current accounts resulting from the expected injections and withdrawals of liquidity caused by the autonomous items.

Central bank intervention in the money market.

**Target for the accumulated balance.**

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The last item of information is the Bank's target for the accumulated balance<sup>3</sup> for the opening of the next business day. A zero accumulated balance target would indicate the central bank's intention to meet, at market interest rates, the full demand for bills and coins. Thus, the central bank provides the necessary funds so that no commercial bank will be forced to incur overdrafts or post unwanted positive balances at the end of the maintenance period.

A negative accumulated balance target would signal the central bank's intention not to provide commercial banks with sufficient resources at market interest rates. This would force at least one credit institution to obtain part of the needed resources by means of an overdraft on its current account. Other things being equal, this could give rise to increases in market interest rates, for banks would try to avoid paying high rates on overdrafts by obtaining the required resources in the money market.

<sup>3</sup> The accumulated balance is the sum of the accumulated balances of all current accounts held by credit institutions at the Bank of Mexico.

Table 3  
**Sum of the accumulated daily balances of  
two hypothetical banks**

Day	Bank A Accumulated daily balances	Bank B Accumulated daily balances	Sum of accumulated daily balances of banks A and B
1	10	– 10	0
2	20	– 20	0
3	30	– 30	0
4	20	– 10	10
5	40	–100	–60

When a negative total accumulated balance target is announced, the central bank exerts some upward influence on interest rates or, conversely, downward pressure if the target is positive. This influence is, more than for any other reason, the result of the signal sent by the central bank to the market because the amounts of credit granted through overdrafts represent a minimal part of the total credit granted to the banking system at market interest rates. In fact, modifications to the accumulated balance target seem to exert a greater influence on interest rates than the existence of a negative or positive accumulated balance itself.

The total accumulated balance plays a significant role as operational target for the Bank. The choice of operational target was made considering the difficulties and political pressures that any central bank would face in setting an equilibrium interest rate. Before the 1994 crisis the Bank did not explicitly use interest rates as an operational target. However, it very often sent policy signals through the use of rate caps and floors in its daily interventions in the money market with very mixed results. After the floating of the exchange rate and the interest and exchange rate volatility that came with that, the need for a quantitative target was clear. Any attempt to set an “official rate” in such an environment would have been not only technically impossible but also politically untenable.<sup>4</sup>

<sup>4</sup> Annex 2 presents a brief summary of the main changes to the Bank of Mexico’s monetary policy implementation in recent years.

*(ii) Positive and negative limits*

In order to prevent fluctuations in commercial banks' current account balances at the central bank from translating into upward pressures on interest rates in the last few days of maintenance periods, limits have been established on the amount of each individual institution's positive daily balances. These limits preclude banks with considerable negative balances from offsetting them at the end of each period. Limits on positive daily balances also imply ceilings on the negative accumulated balances that banks can offset, based on the number of days remaining to the end of any given maintenance period.

There are also limits on the amounts of daily overdrafts that can be offset. These limits have been established in order to prevent commercial banks from incurring excessive overdrafts at the start of a maintenance period, a practice that could result in undue downward pressures on interest rates. When an overdraft is beyond its limit for any given day, the excess is not offset and the bank in question must pay a penalty equivalent to twice a market-determined rate on the excess amount. This amount is not taken into consideration later for the computation of the bank's accumulated balance, and therefore does not need to be compensated for with positive balances. Both positive and negative limits are determined on a case-by-case basis, according to the capital and liabilities of each credit institution.

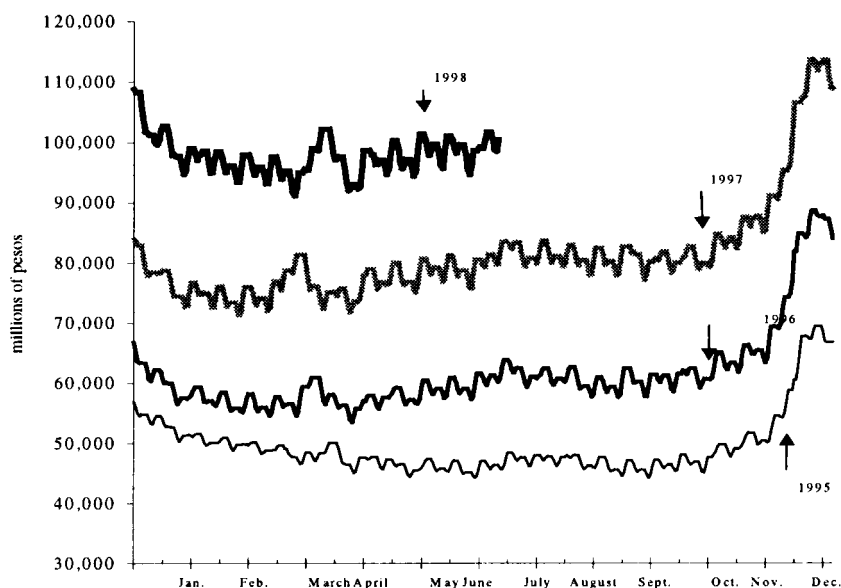
It must be stressed that the Bank of Mexico's monetary policy signals must be inferred from the total accumulated balance target announced, and not from observed total accumulated balances. The former signals the central bank's intentions, whereas the latter may indeed differ from the stated target for the following reasons: (i) differences between the projected and observed demand for bills and coins in circulation; (ii) balances on some banks' current accounts that are not taken into consideration for the computation of their individual accumulated balances as a result of having exceeded the corresponding positive or negative limits; and (iii) adjustments made to the sum of accumulated balances when a credit institution is not able to achieve a zero accumulated balance because of the positive or negative limits imposed and the days remaining to the end of any given maintenance period.<sup>5</sup>

<sup>5</sup> A detailed explanation of the source of differences between the total accumulated balance targets and the total observed accumulated balances can be found in Annex 1.

### 3. The operational framework

The Bank of Mexico, like most other central banks, meets the daily fluctuations in the public's demand for bills and coins by "creating" or "destroying" monetary base through operations in the money market. The Bank requires the Government to announce 24 hours in advance any deposit or withdrawal from its accounts at the central bank. Consequently, the Bank has prior information on all operations affecting the balances on commercial and development banks' current accounts, except for cash deposits or withdrawals of currency by credit institutions. On the other hand, the Bank credits (or debits) banks' current accounts on the same day when, without prior notice, banks deposit bills received from the public at (or withdraw cash from) the central bank. Therefore, every day the Bank has only to forecast changes in the demand for bills and coins in order to offset such changes by means of its intervention in the money market.

Graph 1  
**Bills and coins in circulation**  
1995-98



*(i) The demand for monetary base*

The demand for bills and coins is highly calendar-dependent. It increases on Thursdays and Fridays and decreases on Mondays and Tuesdays. It also grows on pay days (every 15 days), during Holy Week and around Christmas. For this reason it is very easy to forecast.

Commercial banks in Mexico do not maintain on average sizable balances on their cash accounts at the central bank. Banks normally need such balances to protect themselves against deposit withdrawals by their customers or to settle operations in the payment systems. However, the Bank of Mexico provides facilities to enable credit institutions to cope with unforeseen liquidity needs, such as daylight and overnight facilities which enable them to overdraw their current accounts and access to a pre-settlement market. It also intervenes daily in the money market to compensate for any creation or destruction of liquidity caused by the “autonomous items” such as its own interventions in the foreign exchange market, movements in the Treasury’s account and changes in the demand for bills and coins. It should also be stressed that there is no obligation to maintain positive balances and that such balances do not accrue interest.

*(ii) Intervention in the money market*

The Bank of Mexico intervenes in the money market through repos and reverse repos on government securities, and credit or deposit auctions. The Bank also intervenes through auctions to directly buy or sell government securities. In all these operations, it fixes the amounts of credit or securities to be sold or bought, and the market freely determines the corresponding interest rates.

*(iii) The pre-settlement market*

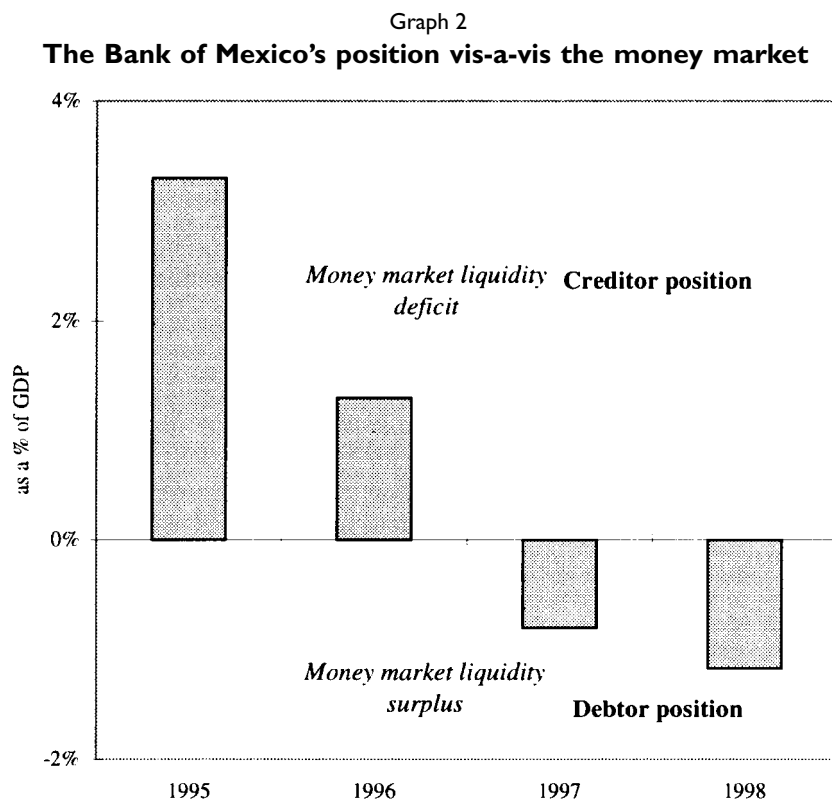
Every day at 6:30 p.m., after the cheques, securities and electronic clearing processes have liquidated the corresponding debits or credits to commercial banks’ current accounts, the Bank of Mexico opens its system for one hour so that banks can carry out transactions among themselves. When this market opens, the Bank may auction credits or deposits in order to offset significant errors in the estimation of the demand for bills and coins. If the central bank decides to intervene, it can



establish a minimum or maximum interest rate, although at levels similar to those observed in the money market during that particular day. These interventions are necessary only when fluctuations in the demand for money differ significantly from expectations forcing several banks to exceed the limits on their accounts at the central bank, and on the last day of the maintenance period described in the following section.

#### *(iv) Operating procedures*

The operating procedures have evolved in accordance with the Bank of Mexico's structural position vis-à-vis the money market (Graph 2). In that respect, during 1995 and 1996 the Bank had to modify its operations

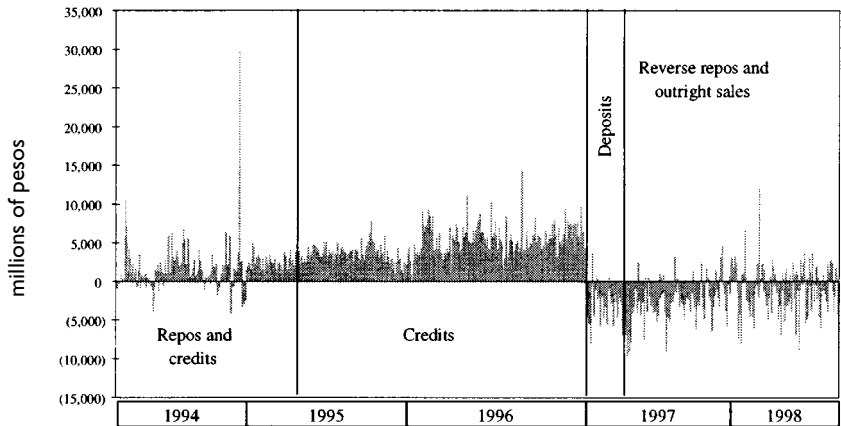


to cope first with a lack of government securities to be used as collateral, and later to extend the maturity profile of its debtor position.

At the beginning of 1995 the Bank of Mexico had a sizable creditor position against the market. Its net creditor position grew so much that eventually the government securities in circulation were insufficient to satisfy the collateral requirements of the repo auctions held by the central bank to provide liquidity to the market. As a result, the Bank switched to auctioning credits collateralised by government and commercial and development bank securities.

The accumulation of foreign reserves by the central bank reduced its creditor position during 1995 and 1996 until it finally reversed that position at the beginning of 1997. The Bank of Mexico started to drain liquidity through the auction of deposits. However, smaller banks find it easier to fund their participation in the auctions through the sale or repurchase of government securities than by obtaining credit in the interbank market. Hence, the central bank moved to subtract liquidity through reverse repos and outright sales of government securities.

Graph 3  
**The Bank of Mexico's daily intervention in the money market**  
(1994–98)



#### 4. Final remarks

The conduct of monetary policy in Mexico relies heavily on the policy signals sent to the market by the central bank. These policy signals are announced every day through the publication of the Bank of Mexico's target for the accumulated balances on banks' accounts at the central bank. The market reacts to these signals with movements in the overnight rate, which in turn affect the market's expectations with regard to the exchange rate and the rate of inflation. The Bank does not provide the market with any information about desired levels of exchange rates or interest rates, nor does it intervene in the money or foreign exchange markets when those rates react to changes in market expectations. Graph 4 shows the recent behaviour of the overnight rate (at which banks lend to each other) and the exchange rate, in response to modifications by the central bank of its target for the accumulated balance during 1996, 1997 and the first half of 1998. Table 4 shows the reaction of the exchange rate, equity prices and interest rates in several

Graph 4  
**Overnight rate, exchange rate and central bank objective  
for accumulated balances**  
(1996–98)

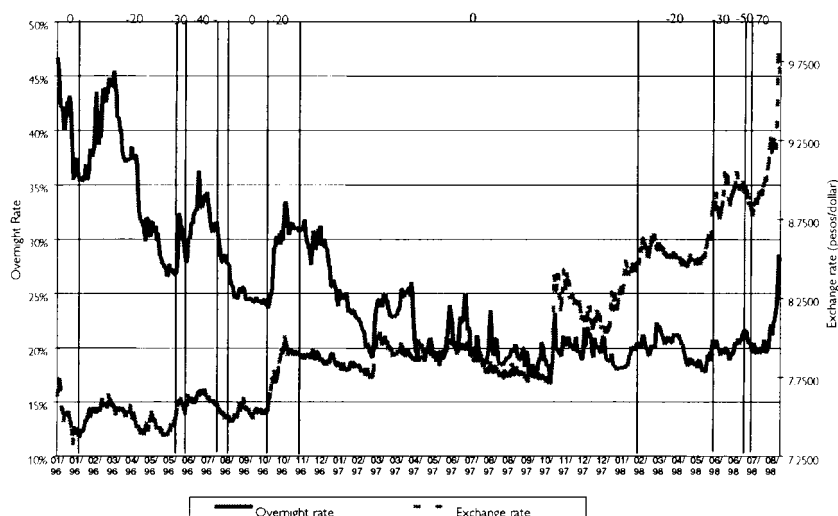


Table 4

**Behaviour of the exchange rate, equity prices and interest rates in selected countries between July 1997 and July 1998**

	Exchange rate <sup>1</sup>	Equity prices <sup>2</sup>	Interest rates <sup>3</sup>
Argentina	0.00%	-26.89%	75
Brazil	8.30%	-25.99%	- 95
Chile	9.78%	-39.33%	38
Colombia	25.89%	-28.59%	1,351
<b>Mexico</b>	<b>12.52%</b>	<b>-14.38%</b>	<b>- 73</b>
Venezuela	15.18%	-53.91%	3,409
China	-0.13%	-69.84%	- 11
Hong Kong	0.01%	-47.85%	241
Indonesia	462.09%	-88.24%	5,684%
Japan	22.77%	-34.94%	0
Korea	38.54%	-68.07%	20
Malaysia	63.55%	-77.11%	368
Philippines	58.44%	-63.52%	- 519
Singapore	19.76%	-55.32%	-63%
Thailand	68.24%	-69.93%	- 475
Russia	7.92%	-66.91%	4,143

<sup>1</sup> Units of domestic currency per US dollar. A positive figure indicates a depreciation. <sup>2</sup> In US dollars. <sup>3</sup> Change in basis points in the domestic markets, except for China (dollar bond yields).

Source: Bloomberg.

emerging economies during 1997. As can be seen, the reaction of Mexico's financial markets was remarkable.

## **Annex 1**

### **Differences between the central bank's accumulated balance targets and the total observed accumulated balance**

#### *Differences between projected and observed demand for bills and coins*

The sum of commercial banks' current account balances, and therefore the total accumulated balance, observed on any given day may differ from the accumulated balance target set by the Bank as a result of differences between the expected and observed demand for bills and coins. When this happens, the sum of banks' current account balances at the close of that day will be different from the amount needed to bring the total accumulated balance to its target.

Throughout the maintenance period, the Bank takes these differences into consideration in order to assess its intervention in the money market the following day. In other words, these deviations are corrected by the central bank with a one-day lag.

On the last day of each maintenance period, and on some occasions when the difference between the projected and observed demand is substantial, the Bank offsets deviations by auctioning credits or deposits in the pre-settlement market that same day.

For example, on a particular day, the central bank may estimate that the public's demand for bills and coins will increase by 500 million pesos, and thus inject liquidity in an equivalent amount. If the aforementioned demand increases by 450 million pesos only, the banking system will close the day with a 50 million pesos unwanted positive balance. Likewise, the total observed accumulated balance will be 50 million pesos above its target. The next day, the Bank will have to offset the positive balances by injecting a lower amount of liquidity into the market, forcing banks to incur overdrafts for a total of 50 million pesos.

Similarly, should the demand for bills and coins be greater than that expected by the Bank, commercial banks will be forced to overdraw their accounts in order to meet the public's demand for cash, and the total observed accumulated balance will be below the target. The next day, the Bank will have to provide the banking system with more resources so that banks may offset the overdrafts with deposits at the central bank, and thus bring the total accumulated balance to its target.

### *Balances exceeding their positive or negative limits*

The total accumulated balance may also differ from its target when the current accounts of one or more commercial banks post positive balances or overdrafts exceeding their respective positive or negative limits. The amounts exceeding these limits are not taken into consideration for the computation of the accumulated balances of the banks in question, and therefore are not considered in the total accumulated balance either.

For example, if a bank incurs a 150 million pesos overdraft while subject to a 100 million pesos negative limit, on the following day it will have to pay a penalty equivalent to twice the CETES rate on the 50 million pesos by which it exceeded its limit. Nonetheless, in the future the bank will have to offset a 100 million pesos overdraft only, for the 50 million pesos excess overdraft will not be considered in the computation of the bank's accumulated balance or in the system's total accumulated balance. The latter item will then surpass the target announced by the Bank for that day by 50 million pesos. In its intervention in the money market the following day, the central bank will have to reduce the amount of resources provided to the market by 50 million pesos, so as to bring the total accumulated balance to its target.

By the same token, should a bank report a 150 million pesos positive balance in its current account while its positive limit is 100 million, the bank will have the right to overdraw, without cost, up to 100 million pesos on its account during the days remaining to the end of the maintenance period. The 50 million pesos in excess will not be considered in the bank's accumulated balance or in the system's total accumulated balance. Therefore, the latter will be 50 million pesos below the amount announced by the central bank for that day. On the following day, the Bank will have to increase the amount of resources provided to the market by 50 million pesos, so as to bring the total accumulated balance to target.

### *Adjustments to the total accumulated balance*

There are some cases where one or more credit institutions cannot close a given maintenance period with zero accumulated balances because, given their respective positive or negative limits, the positive or

negative balances they have accumulated throughout the period cannot be offset in the days remaining to the end of the period.

For example, a hypothetical bank has a 500 million peso positive accumulated balance and a 100 million peso negative limit per day with four days to go to the end of the maintenance period. In this case, the bank will only be able to accumulate 400 million pesos' worth of overdrafts in the days remaining (100 million times four days). Therefore, its positive accumulated balance cannot be eliminated by the end of the maintenance period. In turn, the Bank of Mexico will not take the 100 million pesos that cannot be offset into the calculation of the system's total accumulated balance; hence, the total accumulated balance will be 100 million pesos below the target for that day. On the following day, the Bank will have to increase the amount of its intervention in the market by an equivalent amount in order to bring the total accumulated balance to target.

Likewise, if a bank has a 500 million peso accumulated overdraft while its positive limit is 100 million pesos per day and only four days remain to the end of the period, the bank will only be able to offset 400 million pesos. At the close of the maintenance period, the bank will have to pay the predetermined penalty on the 100 million overdraft, and the total observed accumulated balance will exceed the announced target by 100 million. This amount will be deducted from the Bank of Mexico's intervention on the following day.

## **Annex 2**

### **Main changes in the implementation of monetary policy in Mexico during the past three decades**

The Bank of Mexico has over the years introduced several changes to the procedures used to implement its monetary policy. These changes have moved the central bank away from setting liquidity coefficients, interest rates and even ceilings for different types of bank credit to the sole use of market-oriented instruments. This annex briefly describes the main changes that have taken place in the last three decades.

During the 1970s two key developments enabled the Bank of Mexico to adopt new procedures to carry out its monetary policy. The first was the introduction of the Securities Market Law in 1975 and the second the issuance for the first time in 1978 of zero coupon government bonds known as CETES. These bonds are issued at a discount and registered in book-entry form at the central bank, thus facilitating trading in them. The enactment of the Securities Market Law allowed the establishment of some brokerage houses and invested the National Securities Commission with greater powers for regulating financial intermediaries and stock markets. All these changes opened up the possibility for the Bank to implement its monetary policy through open market operations with government securities. The establishment in 1978 of a national securities deposit agency (INDEVAL) also contributed to the development of a market for private securities.

The oil crisis of 1982 and the nationalisation of the commercial banks at the end of that year forced the central bank to temporarily abandon its market-oriented operations and return to its traditional policies of setting interest rates. However, by 1987 it was again using open market operations to supply or withdraw liquidity to/from the commercial banks. At the end of 1990, another important change took place with the abandonment of positive reserve requirements or liquidity coefficients. During that year, the Bank of Mexico started facing increasing difficulties in implementing its monetary policy. The fiscal surplus run by the Government as a result of the privatisation of very important sectors of the economy and some cuts in government spending led to a sharp decrease in the supply of government securities. Liquidity coefficients had to be invested in government securities; hence, the



growth of bank deposits observed during those years combined with the relative decrease in the supply of securities generated major distortions in the behaviour of interest rates. This situation led to the removal of both the reserve requirement and the liquidity coefficient, leaving open market operations as the main policy tool used by the central bank to implement its monetary policy.

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