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# Table of contents

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# The transmission mechanism of monetary policy in emerging market economies: an overview

Steven Kamin, Philip Turner and Jozef Van 't dack*

## Introduction

Economists do not agree about how monetary policy affects the economy. Different observers weigh in different ways the various specific channels through which monetary policy works. Views diverge even about the monetary transmission process in individual industrialised nations, the subject of decades of theoretical and empirical research; the process in developing countries is still more uncertain.

Yet an understanding of the transmission process is essential to the appropriate design and implementation of monetary policy. Because changes in the structure of the economy – including changes in balance-sheet positions, in financial sector technology and institutions, or in expectations concerning future policy – tend to alter the economic effects of a given monetary policy measure, central banks need to be alert to the impact of structural change. They need to be able to continuously reinterpret the channels of transmission of monetary policy.

These important questions were discussed by a small group of senior central bankers at the BIS in January 1997. Two days of very lively debate revealed not only much common ground but also important differences. Much depended on the specific context in which monetary policy was framed: the historical record of inflation; the nature and depth of the financial system; the international financial background; and so on. The country papers that follow highlight the main experiences of specific countries. This paper provides an overview of some of these issues and tries, where possible, to delineate the differences between countries.

* This overview has benefited greatly from the co-operation and the statistical input of the central banks which participated in the meeting. Special thanks also go to Zenta Nakajima who commented on parts of the paper, to Ib Madsen who was responsible for most of the statistical work and to Stephan Arthur for preparing the graphs and overseeing the publication. Nigel Hulbert, Judith Hunter and Alison Spurway provided much valued editorial assistance and Christine Mapes typed various drafts most efficiently.

The paper begins by reviewing some of the arguments associated with the choice of ultimate objectives of monetary policy. The following section briefly summarises the main channels of transmission of monetary policy that have been identified, drawing chiefly on research into the experiences of industrialised economies. The factors that may alter these transmission channels, or affect their relative importance, are then discussed. The focus is on differences in the monetary transmission process between industrialised and developing nations, comparing data provided in response to a questionnaire prepared for this meeting with analogous data for key industrialised countries. The final section of the paper reviews topical, and unresolved, issues involving the monetary policy transmission process.

## The objectives of monetary policy

In recent years, many have argued that central banks should emphasise price stability as a single objective of monetary policy and eschew consideration of other goals such as growth or employment. The desire to limit the objectives of monetary policy in this way is based on the near-unanimity among economists and policy-makers that monetary policy cannot affect the long-term growth of the economy. In this view, efforts to stimulate growth above its potential rate merely lead to higher inflation: accordingly, monetary policy can at most only moderate short-run fluctuations in output. Many analysts even doubt that discretionary monetary policy can effectively dampen economic fluctuations. Lags in recognising turns in the business cycle, and subsequent lags in the response of the economy to changes in monetary policy, make it difficult to time policy actions accurately enough to moderate business cycles. Moreover, while many central banks may in practice continue to attempt to stabilise output, they find it useful for their public mandate to be restricted to price stability alone, since this reduces their vulnerability to political pressure for expansionary policy.

How should a number be placed on the price stability objective? Figures of 2 to 3% have often surfaced in discussions in industrial countries with a small but positive rate of inflation (rather than zero) taking account of (i) difficulties of statistical measurement and (ii) relative price

adjustments reflecting differential productivity trends in various sectors. In rapidly developing countries, some argue, inflation targets need to be somewhat higher. One reason is that relative price adjustments will be more significant in economies where productivity gains in the tradable sectors are large. In addition, price liberalisation will also increase measured inflation in situations where there is downward rigidity of nominal prices: this has been a particularly important consideration in the transition economies.

In developing countries, there are additional arguments both for and against restricting the objectives of monetary policy solely to price stability. On the one hand, the case for an activist monetary policy rests on the difficulties faced by developing economies. The concentration of output in a smaller range of products, combined with more limited development of financial markets that could diversify risk, may make developing countries more vulnerable to destabilising shocks, both internal and external, creating a greater need for countercyclical monetary policy. The limited and uncertain access to international capital markets faced by many developing countries may lead central banks to give a larger weight to balance-of-payments equilibrium in their monetary policy objectives. Finally, where financial systems remain particularly rudimentary, the authorities may seek to use monetary policy to direct credit to sectors regarded as central to the nation's development strategy.

On the other hand, monetary policy in developing countries may be less able than in industrialised countries to achieve goals other than price stability. In industrialised countries, monetary expansion is generally believed to affect output in the short run, even if such actions merely lead to changes in the price level over longer periods of time. In many developing countries, however, monetary expansion may lead immediately to higher prices with little even transitional impact on the level of activity. This situation arises when inflationary psychology, usually reflecting a prior history of high inflation, combines with a lack of central bank credibility, so that monetary policy actions generate immediate changes in inflation expectations and, in turn, actual prices. The presence of shallow and volatile financial markets may further undermine the ability of monetary policy to influence output in a predictable manner. Under such circumstances monetary policy may be required to concentrate exclusively on the goal of price stability.

Yet if the ultimate objective of monetary policy is price stability alone, it may not be possible to ignore the implications of monetary policy for output and employment. In particular, the output costs of reducing high levels of inflation may need to be taken into account in determining the extent and pace of disinflation. Various features of high-inflation developing economies, including a lack of credibility, the indexation of contracts and wages and structural rigidities in labour and goods markets, may impart a high degree of inflation inertia and thereby exacerbate the output costs of disinflation. While the use of the exchange rate as a nominal anchor can sharply reduce output costs at the outset of stabilisation programmes, this strategy may lead to overvaluation, a large external deficit and, possibly, an eventual collapse in the exchange rate. This might result in a rebound of inflation. For such reasons, central banks may opt for a more gradual disinflation policy (relying on purely domestic channels of disinflation) because the inflation reduction thus achieved will be more sustainable.

The debate on the objectives of monetary policy is still very much alive in many emerging market economies and views continue to differ, sometimes widely. In the Indonesian paper reference is made to the multiple objectives of monetary policy to be achieved "primarily through control of monetary aggregates at levels adequate to support the targeted rate of economic growth without giving rise to internal and external macroeconomic equilibrium". In a similar vein, the objective in Thailand is described as "to achieve sustainable economic growth, with a reasonable level of internal and external stability", while it consists in India of ensuring an adequate provision of credit for the productive sectors of the economy without jeopardising price stability. The Central Bank of Peru's paper describes how the previous central bank charter, which assigned to the central bank three objectives which could be mutually inconsistent, was replaced by one that defines the central bank's objective much more narrowly, emphasising that "price stability is the sole objective of the central bank".

## The channels of transmission of monetary policy

Four channels of transmission of monetary policy have been identified in modern financial systems. The first is through the direct interest rate

effects – which affect not only the cost of credit but also the cash flows of debtors and creditors. Changes in interest rates alter the *marginal* cost of borrowing, leading to changes in investment and saving and thus in aggregate demand. Changes in *average* interest rates will also have cash-flow effects on borrowers and lenders.

The second channel is through the impact of monetary policy on domestic asset prices – including bond, stock market and real estate prices. The third channel is through the exchange rate. Credit availability is the fourth major channel. In countries with either poorly developed or tightly controlled financial systems, interest rates may not move to clear the market. Aggregate demand is often influenced by the *quantity* of credit rather than its *price*. Even in liberalised, highly developed markets, credit changes operating in addition to interest rate changes have been identified as important factors influencing economic activity. An increasing body of research has found that the financial condition of households, firms and financial institutions can play a key role in the propagation of monetary policy actions.

How these channels function in a given economy depends on its financial structure and the macroeconomic environment. A major purpose of this meeting was to explore the important links between financial structure and the transmission mechanism of monetary policy. Several central bank papers in this volume analyse how the financial structure of their economies has evolved under the twin influences of liberalisation and internationalisation. The Brazilian paper focuses on the macroeconomic environment explaining how chronic inflation produced many adaptations in economic life that tended to reduce the power of all the main channels of monetary policy transmission. To a large extent, then, stabilisation has to do with restoring the effectiveness of monetary policy.

*Direct interest rate effects: cost of credit and cash flow*

In the most conventional model of monetary transmission, a shift in policy leads to a change in the money supply that, for a given money demand, leads to a change in money-market interest rates. Changes in policy and interbank rates lead, in turn, to changes in bank loan rates for borrowers, which may affect investment decisions, and in deposit rates, which may affect the choice between consuming now and later.

A key issue in this channel of transmission is the extent to which a policy-induced change in the interest rate most directly under the central

bank's control (usually an overnight interbank rate) affects all short-term money market interest rates, and in turn spreads to the entire spectrum of interest rates, in particular the long-term interest rates most relevant to investment (including housing) or to purchases of durable goods. The propagation of monetary policy actions along the term structure of interest rates depends upon various factors, including the organisation of financial markets and the state of expectations (see below).

In this model, the present value of durable goods is inversely related to the real interest rate. A lower rate of interest increases the present value of such goods and thus increases demand. In this framework, interest-rate-sensitive spending is affected by changes in the *marginal* cost of borrowing. Changes in interest rates also lead to changes in *average* rates on outstanding contracts, and these changes increase over time as old contracts come up for renegotiation. Similarly, marginal adjustments in deposit rates will over time change the average deposit rate. These changes in average interest rates will affect the income and cash flow of borrowers and lenders. Policy-induced movements in average interest rates could thus lead to cash-flow-induced changes in spending (akin to income effects) that could be as important as – or more so than – the substitution effects associated with changes in marginal interest rates. In particular, balance-sheet positions would determine the relative importance of marginal versus average interest rate effects.

In differentiating between the effects of marginal and average interest rates, the distinction between real and nominal rates is important. The real interest rate affects the marginal cost of borrowing that determines spending and saving decisions. While a rise in nominal interest rates that reflects higher inflation expectations – so that the real rate remains constant – will not change the perceived marginal cost of borrowing, it will alter the cash-flow and balance-sheet positions of borrowers as it changes the average rate of interest. It does this because the portion of interest payments associated with the inflation premium represents a prepayment of the real part of the debt, so that changes in inflation alter the effective maturity of loans. These cash-flow effects could have a large impact on aggregate demand.

*Indirect effects via other asset prices*

Policy-induced interest rate changes also affect the level of asset prices – principally those of bonds, equities and real estate – in the

economy. In Israel, for instance, interest rates have been a significant factor behind cycles in equity and housing markets in the 1990s, with the stock market peaking in late 1993 and housing prices surging in 1993–94 when interest rates reached a trough. In Colombia, too, a positive (though temporary) response of asset prices to monetary policy easing has been observed in recent years.

Where long-term fixed interest bond markets are important, higher short-term interest rates may lead to a decline in bond prices. As such markets develop, this channel of transmission may be strengthened. (However, the nature of this link is complicated and is discussed further in the final section of this paper.)

Another means by which asset price changes triggered by monetary policy actions can affect aggregate demand is described by the so-called *q* theory of investment pioneered by James Tobin. With an easier monetary policy stance, equity prices may rise, increasing the market price of firms relative to the replacement cost of their capital. This will lower the effective cost of capital, as newly issued equity can command a higher price relative to the cost of real plant and equipment. Hence, even if bank loan rates react little to the policy easing, monetary policy can still affect the cost of capital and hence investment spending. Policy-induced changes in asset prices may also affect demand by altering the net worth of households and enterprises. Such changes may trigger a revision in income expectations and cause households to adjust consumption. Similarly, policy-induced changes in the value of assets held by firms will alter the amount of resources available to finance investment.

A decline in asset prices may have particularly strong effects on spending when the resultant change in debt-to-asset ratios prevents households and firms from meeting debt repayment obligations; it can have similar effects if it raises fears about the ability to service debts in the future. A substantial fall in stock and bond prices for instance, may reduce the value of liquid assets available to repay loans. As households and firms thus become more vulnerable to financial distress, they may attempt to rebuild their balance-sheet positions by cutting spending and borrowing.

The effects of monetary policy actions on aggregate demand, working through asset prices and balance sheets, may become amplified as the pace of economic activity begins to respond. For example, increases in interest rates that depress asset prices and weaken balance sheets may lead to an initial decline in output and income. This initial decline in

economic activity, in turn, reduces the cash flow of households and firms, further heightening their vulnerability to financial distress, and leading to a second round of expenditure reduction. In this way, changes in monetary conditions may lead to prolonged swings in economic activity, even if the initial monetary policy action is reversed soon afterwards. The severe recession in Malaysia in 1985–86 exemplified this effect. A steep drop in the prices of commodities, shares and real estate accompanied weak foreign and domestic demand. The result was a marked contraction of the cash flow of many enterprises, caught by falling income, collapsing asset values and rising debt servicing costs.

*Exchange rate effects*

One particularly significant price monetary policy can affect is the exchange rate. Indeed, in many developing countries – particularly those with only rudimentary markets for bonds, equities and real estate – the exchange rate is probably the most important asset price affected by monetary policy. When the exchange rate is floating, a tightening of monetary policy increases interest rates, raises the demand for domestic assets, and hence leads to an appreciation of the nominal and – at least initially – the real exchange rate.

This appreciation can feed through to spending in two distinct ways. The first is the relative price effect: it tends to reduce the demand for domestic goods, which become more expensive relative to foreign goods, and thus aggregate demand. Secondly, changes in the exchange rate also may exert significant balance-sheet effects. In many countries, households and firms hold foreign currency debt, either contracted abroad or intermediated through the domestic banking system. Unless such debts are fully offset by foreign currency assets, changes in the exchange rate may significantly affect net worth and debt-to-asset ratios, leading to important adjustments to spending and borrowing. Where domestic residents are net debtors to the rest of world, as in many emerging market countries, a large appreciation of the exchange rate may lead to an improved balance-sheet position that may give rise to a marked expansion of domestic demand. Thus this balance-sheet effect tends to offset – and in some cases may even dominate – the relative price effect.

In small open economies with flexible exchange rates, the exchange rate channel is likely to be particularly important because, in contrast to the other channels described above, it affects not only aggregate demand

but also aggregate supply. A loosening of monetary policy, for example, may lead to a depreciation of the exchange rate, an increase in domestic currency import costs, and hence induce firms to raise their domestic producer prices even in the absence of any expansion of aggregate demand. Because exchange rate changes are viewed as a signal of future price movements in many countries, particularly those with a history of high and variable inflation, wages and prices may change even before movements in import costs have worked their way through the cost structure. This issue will be addressed again at the end of this paper.

When the exchange rate is fixed or heavily managed, the effectiveness of monetary policy is reduced but not entirely eliminated. Often (as in Israel) relatively wide margins exist within which the exchange rate can fluctuate. Moreover, if domestic and foreign assets are only imperfectly substitutable, there is some scope for domestic interest rates to deviate from international levels. Therefore, even if the nominal exchange rate is fixed, monetary policy may be able to affect the real exchange rate by acting on the price level. In this manner, monetary policy retains its ability to affect net exports, albeit to a much lesser degree and with much longer lags. However, where domestic and financial assets are close to perfect substitutes, as they may be under currency board arrangements (e.g. in Argentina and Hong Kong) or where there is a long tradition of dollarisation (e.g. in Argentina and Peru), the scope for monetary policy is severely limited.

*Credit availability effects*

In countries where private markets for credit either are poorly developed or are prevented by government regulation from operating freely, monetary policy is likely to affect aggregate demand more by altering the quantity or availability of credit than through the direct or indirect effects of changes in the price of credit. This will be true especially when binding controls or guidelines on the quantity of credit itself are present, as is the case in several major developing countries (see below). In addition, binding ceilings on interest rates (or statutory rates as in China) will force banks to use non-price means of rationing loans and thus enhance the importance of credit availability effects. Finally, direct government involvement in the loan market, either through official development banks or through fiscal subsidies of commercial bank loans, will have a similar effect.

The liberalisation of financial markets does not necessarily eliminate credit availability effects. Recent financial market research has emphasised the importance of imperfect information and contract enforcement problems that alter the means by which credit markets clear. When monetary conditions tighten, for example, banks may wish not to rely exclusively on raising interest rates in order to ration available credit, since this would not only encourage riskier investment behaviour on the part of borrowers but also attract riskier borrowers as customers. Hence, in response to increases in the cost of credit, banks are likely both to raise loan interest rates *and* to tighten creditworthiness standards, leading to declines in the supply of credit along with increases in its price. Even borrowers whose creditworthiness has not been affected will face less favourable terms for their loans during periods of recession and at times of financial distress, because banks may be unable to distinguish fully between borrowers who have been adversely affected and those who have not.

Partly in response to the special role credit can play even in liberalised systems, several central banks (e.g. in India, Indonesia, Israel, Malaysia, Peru, Thailand and Venezuela) explicitly monitor credit growth in evaluating the stance of monetary policy. The Korean paper argues that "in formulating policy, the central bank should monitor an alternative indicator, such as the volume of bank loans, which has shown a close link to aggregate spending".

Credit rationing is likely to hit smaller borrowers particularly hard because of the high cost of gathering information about them. The Colombian paper shows that during past periods of monetary contraction the implicit cost of external funds for smaller firms rose significantly relative to that for larger firms, and the growth of their financial liabilities was significantly lower. Especially where financing sources other than bank lending are scarce (or access to them is limited to a few borrowers), the credit rationing effects may amplify the conventional interest rate effects of restrictive monetary policy.

The availability of credit also may be affected by shifts in loanable resources from one market to another. At the core of the view that a "bank lending channel" exists in addition to an "interest rate channel" is the proposition that when monetary policy tightens, banks lose some of cheaper sources of loanable funds. According to some analysts, this logic would apply particularly to smaller banks that depend primarily on

deposits for funding and cannot tap as easily as larger banks other sources of funds (e.g. international capital market). The Korean paper presents econometric evidence that a tightening of monetary policy leads to a greater cutback in lending by small banks than by large banks, thereby supporting the existence of a credit channel for monetary policy. To the extent that certain firms depend heavily or exclusively upon bank financing, shifts in loanable resources from banks to other markets may exert an impact on aggregate demand that goes beyond the effects of increased interest rates alone.

Finally, monetary policy may affect the availability of credit more directly through effects on the value of assets of both borrowers and lenders. As changes in monetary conditions lead to changes in asset prices, the value of collateral for bank loans may be affected and changes in the access of borrowers to credit could be induced. For instance, residential housing loans in Singapore are not to exceed 80% of the cost or valuation of the house, whichever is lower. In addition, where a large proportion of bank assets is invested in equities or real estate, declines in asset prices, by lowering capital/asset ratios, could force banks to tighten the supply of credit.

Changes in the creditworthiness of bank customers and in the financial condition of banks themselves will induce changes in credit rationing only if the banks perceive themselves to be facing hard budget constraints. The Colombian paper suggests that, in the early 1980s, the perception that the Government would bail out ailing banks caused banks to tighten credit insufficiently in the face of monetary contraction: "A monetary contraction in the context of systems endowed with high levels of government involvement in the marketplace, and thus high degrees of moral hazard, might not lead bankers to implement the same type of behavioural adjustments (i.e. credit rationing) as would be the case in a more liberal environment. A banking crisis could well emerge as a consequence of bankers lacking incentives, failing to perceive and respond to policy decisions."

### Factors influencing the transmission of monetary policy

Two aspects are important in evaluating how fast monetary policy affects the real economy. The first is the transmission from the instruments

directly under the central bank's controls – e.g., short-term interest rates or reserve requirements – to those variables that most directly affect conditions in the non-financial sector – loan rates, deposit rates, asset prices and the exchange rate. This linkage is determined primarily by the structure of the financial system. The second aspect of the monetary transmission process is the link between financial conditions and the spending decisions of households and firms. In this regard, the initial financial position of households, firms and banks is likely to play a key role, including the extent of leveraging, the composition and currency denomination of assets and liabilities, and the degree of dependence upon external financing sources, in particular bank financing.

Both aspects of the monetary transmission channel are likely to have been affected by the process of financial liberalisation in many countries in the past decade. The reduced role of the government in the financial system has lessened the importance of the credit availability channel of monetary policy compared with the interest rate channel (and related effects). But the increased fragility of the financial sector in the wake of financial liberalisation may have accentuated other aspects of the credit availability channel – particularly perhaps in the aftermath of crises. At the same time, the opening and deepening of financial systems in emerging market countries has caused both the assets and the liabilities sides of the private non-financial sector's balance sheet to become more diversified, thereby enhancing the role of asset prices, in particular the exchange rate, in the monetary transmission process.

*Official intervention*

Government intervention in financial markets may influence the monetary transmission process in three ways: by imposing interest rate controls or other limits on financial market prices; by imposing direct limits on bank lending; or by providing government-financed credit to selected areas.

In the past decade, the trend almost everywhere has been towards liberalisation. Direct controls on the quantity and allocation of credit have given way in practically all cases to greater reliance on indirect mechanisms of monetary control such as open market operations. Table 1 compares the primary instruments of monetary policy used by various countries. Compared with the beginning of the 1980s, when the use of credit ceilings and changes in reserve requirements was pervasive, the table indicates greater reliance on open market operations and on central

Table 1

**Primary instruments of monetary policy**

| | Credit ceilings | Reserve/ Liquid asset require-ments | Discount rate | Open market opera-tions | FX market opera-tions | Moral suasion |
|---|---|---|---|---|---|---|
| China | ✓ | | | | | |
| India | | ✓ | ✓ | ✓ | ✓ | ✓ |
| East Asia | | | | | | |
| Hong Kong | | | ✓ | ✓ | ✓ | ✓ |
| Indonesia | | ✓ | ✓ | ✓ | | ✓ |
| Korea | | | (✓) | ✓ | | (✓) |
| Malaysia | (✓)[1] | ✓ | | ✓ | | ✓ |
| Singapore | | | | ✓ | ✓ | |
| Thailand | | | | ✓ | | ✓ |
| Latin America | | | | | | |
| Argentina | | | | | | |
| Brazil | | | ✓ | ✓ | | |
| Chile | | | ✓ | ✓ | | |
| Colombia | | | | ✓ | ✓ | |
| Mexico | | | | ✓ | | |
| Peru | | | ✓ | ✓ | ✓ | |
| Venezuela | | | | ✓ | | |
| Hungary | | ✓ | ✓ | ✓ | ✓ | (✓) |
| Israel | | | ✓ | | ✓ | |
| Russia | | ✓ | ✓ | ✓ | | |
| Saudi Arabia | | ✓ | ✓[2] | ✓ | ✓ | ✓ |
| *Memorandum*: | | | | | | |
| United States | | ✓ | ✓ | ✓ | | |
| Japan | (✓) | ✓ | ✓ | ✓ | | |
| Germany | (✓) | ✓ | ✓ | ✓ | | |
| United Kingdom | | ✓ | ✓ | ✓ | | |

[1] Lending guidelines for development purposes and occasional recourse to selective credit controls to reduce undue demand pressures. [2] Overnight repo rate.

bank credit and deposit facilities in the 1990s. Some central banks (such as those of Brazil, Chile, Hong Kong and Israel) rely in the first instance on their own loan and deposit facilities to implement monetary policy; in the first three countries this practice leads to the setting of an interest rate corridor for money market interest rates. Other central banks (such as

Table 2

**Reserve and liquid asset requirements**

In percentages

| | Reserve requirement ratio | | | Liquid asset ratio |
|---|---|---|---|---|
| | 1980 | Latest | Remuneration | |
| China | .. | .. | Yes | .. |
| India | 6.0–10.0 | 10.0 | Yes | 25.0 |
| East Asia | | | | |
| Hong Kong | None | None | .. | 25.0 |
| Indonesia | 15.0 | 3.0–5.0 | No | .. |
| Korea | 18.5 | 3.1 | No | 30.0 |
| Malaysia | 5.0 | 13.5 | No | 17.0 |
| Singapore | 6.0 | 6.0 | No | 18.0 |
| Thailand | 7.0 | None | .. | 6.0 |
| Latin America | | | | |
| Argentina | .. | .. | .. | 17.0 |
| Brazil | 14.0 | 78.0 | No | .. |
| Chile | 10.0 | 9.0 | No | .. |
| Colombia | 45.0 | 31.0 | .. | 11.8 |
| Mexico | .. | 0 | .. | 0 |
| Peru | 6.0–64.0 | 7.0 | No | .. |
| Venezuela | 15.0 | 17.0 | Yes | .. |
| Hungary | .. | 12.0 | Yes | .. |
| Israel | 64.0 | 8.0 | No | 12.8 |
| Russia | .. | 8.0–14.0 | No | .. |
| Saudi Arabia | 7.0 | 7.0 | No | 20.0 |

those of Colombia, Indonesia, Korea, Malaysia, Peru, Russia, Saudi Arabia, Singapore, Thailand and Venezuela) aim to change liquidity conditions mainly by auctioning Treasury or their own paper, by performing foreign exchange swaps or by operating in the open markets.

Although the use of reserve requirements has declined significantly (see Table 2), they are still high in Brazil and Colombia and are relatively important in several other countries. Reserve requirements are often imposed in a differentiated way. Chile and Peru maintain a higher reserve requirement on foreign-currency-denominated deposits in order to limit the impact of capital inflows on the exchange rate. Several central banks (e.g. in Chile and Argentina) impose higher reserve requirements on more short-term instruments.

Table 2 (cont.)

## Reserve and liquid asset requirements

In percentages

| | Reserve requirement ratio | | | Liquid asset ratio |
|---|---|---|---|---|
| | 1980 | Latest | Remuneration | |
| *Memorandum*: | | | | |
| United States . . . . . | 3.0–12.0[1] | 3.0–10.0 | No | .. |
| Japan . . . . . | 0.125–2.5[1] | 0.05–1.3 | No | .. |
| Germany . . . . . | 4.15–12.1[2] | 1.5–2.0 | No | .. |
| United Kingdom . . . | 0.45 | 0.35 | No | .. |

Notes: *Argentina*: Liquidity requirements apply to almost all banks' liabilities except central bank borrowing, interbank loans and trade financing. The rate declines from 17% for liabilities with a maturity of less than one month to zero for those with a maturity of over one year. *Brazil*: Ratios shown apply to demand deposits; lower ratios apply to other deposits; required reserves on time and saving deposits are remunerated. *Chile*: Ratios shown apply to domestic currency demand deposits; reserve requirements on longer-term and foreign currency deposits are 3.6% and 30% respectively. These reserves are not remunerated. Reserve requirement on the "reserva técnica" is 100%, is applied to short-term deposits in excess of 2.5 times the bank's capital and is remunerated on the basis of the Unidad de Fomento. *Colombia*: Latest (1996) ratio applies to demand deposits; lower ratios apply to other deposits. *India*: 1980 ratio applies to outstandings at 6% and to increments at 10%. *Indonesia*: Statutory reserve ratio of 5% for banks' liabilities in rupiah and 3% for banks' liabilities in foreign currency. *Israel*: 1980 ratio applies to domestic currency deposits. *Korea*: 1980 ratio applies to demand deposits; lower ratios apply to other deposits. *Malaysia*: 1980 ratio applies to commercial banks only. *Peru*: Ratios shown apply to domestic currency deposits. A marginal reserve ratio of 45% is applied to foreign currency deposits (remunerated at LIBOR less 1 ⅛%). *Russia*: Ratios shown apply to rouble deposits of various maturities with the ratio set higher for shorter maturities; the ratio for foreign currency deposits is 9%. *Saudi Arabia*: Ratios shown apply to demand deposits; the ratio for time and savings deposits is 2%. *Venezuela*: 1980 ratio applies to demand deposits at commercial banks only (10% savings deposits; 8% term deposits). Since August 1997 a uniform rate is applied to all financial institutions (commercial banks, universal banks, mortgage banks, investment banks and leasing companies).

[1] 1990. [2] 1991.

*Interest rate controls*

Very few countries still impose limits on loan or deposit interest rates. Only in China are a significant number of loan and deposit rates non-market-determined. In Brazil, the authorities continue to exert some direct control over interest rates: the so-called "Reference rate" which guides several deposit and loan rates deviates from the freely determined rates in the interbank market by a fixed margin exogenously set by the central bank. In Chile, the interest rate on short-term demand deposits is regulated. In India, limits are imposed on interest paid on savings deposit

accounts and on interest charged for a selected number of types of credit (mainly export credits and small value loans). A ceiling on lending rates (which, however, permits competitive pricing) exists in Malaysia. Below-market interest rates are charged on agricultural loans in Venezuela.

*Limits on bank lending*

Not only does the monetary authority (either government or central bank) impose direct targets or limits on bank lending, but it may also exert influence through moral suasion and the use of prudential regulations. In China, credit controls remain the most important instrument of monetary policy. Brazil, India and Venezuela retain credit allocation prescriptions. Moreover, Brazil imposed credit ceilings in 1995 to stem the rapid growth of credit triggered by the Real Plan; taxes on credit operations continue to be levied. In Malaysia, lending guidelines to priority sectors and selective, short-term credit controls (mainly on loans for automobile purchases, credit cards and real estate) are applied; cyclical conditions have on occasion led to the discretionary adjustment of such guidelines. In Korea, Russia and Thailand, credit controls are not used at present, but recourse to some form of credit ceilings is possible. In Thailand, financial institutions are required to submit credit plans for the next half-year, allowing the central bank to better monitor lending growth. Annual credit plans had to be submitted by Indonesian banks in 1996; this practice was continued in 1997. In several Asian economies (such as Hong Kong, India, Indonesia, Malaysia, Thailand and, to a lesser extent, Korea) the central bank at times uses moral suasion to steer credit (growth) in the right direction. In Singapore, the Monetary Authority can make recommendations to banks concerning credits and investments. In Israel and Peru, the last controls on credit were lifted as recently as the early 1990s. Controls on private sector credit were one of the main instruments of monetary policy in Venezuela before 1990.

In some countries it is recognised that prudential regulations could also play a supporting role in the conduct of monetary policy (see Table 3). There are of course major objections – both of principle and of practicality – to gearing prudential regulations to the (often cyclical) demands of monetary policy. However, rules about bank loan exposures to particular spending categories, about loan-to-value ratios, or about collateral valuations (e.g. preventing assets being valued at an overpriced peak) can limit the risk of swings in bank lending fuelling boom-and-bust

Table 3

**Use of prudential guidelines for monetary policy purposes**

| | |
|---|---|
| China | Not used |
| India | Occasionally monetary policy considerations may play a role in determining bank exposure limits |
| Hong Kong | Not used; however, rates on saving deposits and on time deposits of less than 7 days are subject to the "Interest Rate Rules" of the Hong Kong Association of Banks |
| Indonesia | Some prudential guidelines have been applied to help reach monetary policy objectives |
| Korea | Not used |
| Malaysia | Tightening of prudential guidelines may coincidentally serve monetary policy needs |
| Singapore | Tightening of prudential guidelines may coincidentally serve monetary policy needs |
| Thailand | Move towards market-based system of monetary control supported by a systematic tightening of prudential regulations. Changes may have desirable monetary policy implications |
| Argentina | Choice of monetary policy regime (currency board) meant that prudential regulations for banks had to become stricter |
| Brazil | Not used |
| Chile | Not used |
| Colombia | Not used |
| Mexico | Not used |
| Peru | Not used |
| Venezuela | Not used |
| Hungary | Not used |
| Israel | Not used |
| Russia | Not used in normal circumstances |
| Saudi Arabia | Occasionally used |

cycles. In addition, a change of monetary regime may require a change in prudential standards. Moving from ceilings on bank credit to interest-rate-based mechanisms of control will require tighter prudential controls. In a fixed exchange rate regime which limits the scope for independent monetary policy, prudential rules may need to be stiffened.

*Government-provided finance*

Finally, the government may itself provide much of the non-financial private sector's total credit, either directly through official development institutions or indirectly through subsidisation of certain credits extended by commercial banks. Special development institutions receiving and lending funds at preferential rates or conditions can still be found in Brazil, India and, to a lesser extent, Israel (special mortgage banks). Development institutions in Malaysia receive substantial long-term funding from the central bank and the Federal and State Governments, usually in the form of equity participations and low interest loans. Special credit institutions in Venezuela grant subsidised loans to small enterprises, funded from the national budget. In Russia, up to one-fifth of enterprises' capital investments are still financed from federal and local government budgets, to a large extent on favourable terms. Another significant share comes from extra-budgetary investment funds. In all these cases, the role of credit availability in the transmission of monetary policy is likely to be strengthened relative to other channels, particularly interest rate effects.

Although the role of the government as a source of credit also has diminished substantially over time, a high proportion of the banking sector was still owned by the government in several countries (for example, Argentina, Brazil, India and Indonesia) at end-1994 (the year of comparison shown in Table 4). In the last couple of years, however, several institutions in Argentina and Brazil have been privatised and further privatisations are in course.

Overall trends in the relative importance of different sources of financing for the private non-financial sector are summarised in Table 5. The share of financing provided by commercial banks has remained very large in most of the emerging economies for which data can be found (Table 5). In industrial countries, the share of alternative sources of financing tends to be much more pronounced.

*Competitiveness, depth and diversity of financial markets*

In a liberalised financial environment, a key feature of the monetary transmission process is the responsiveness of the interest rates faced by borrowers and savers to the short-term money market rate most directly influenced by the central bank. Several factors have an important influence on this: the degree of competition within the banking sector;

Table 4

**Indicators of the structure of the banking industry**

| | Five largest banks | Foreign banks | State-owned banks | *Memorandum: Share of bank assets in total financial sector assets* |
|---|---|---|---|---|
| | assets as a percentage of total bank assets, at end-1994[1] | | | |
| India | 45.0 | 8.3 | 83 | *80* |
| East Asia | | | | |
| Hong Kong | 30.7 | 72.0 | 0 | .. |
| Indonesia | | 3.7 | 48 | *91* |
| Korea | 31.8 | 4.2 | 13 | *39* |
| Malaysia | 49.0 | 21.0 | 9 | *78* |
| Singapore | 39.0 | 80.0 | 0 | *71* |
| Thailand | 60.9 | 6.4 | 7 | *75* |
| Latin America | | | | |
| Argentina | 37.5 | 21.7 | 36 | *98* |
| Brazil | 49.4 | 2.8 | 48 | *97* |
| Chile | 46.7 | 21.4 | 14 | *62* |
| Colombia | 24.5 | 3.6 | 23 | *86* |
| Mexico | 61.9 | 1.2 | 28 | *87* |
| Peru | 71.2[2] | 19.2[2] | 0[2] | *91* |
| Venezuela | 56.1 | 44.7 | 8 | *90* |
| Hungary | 57.0 | .. | .. | *91* |
| Israel | 85–90 | 0.0 | Large | *65* |
| Russia | 38.5 | 2.7 | .. | .. |
| Saudi Arabia | 65.9 | .. | .. | *61* |
| *Memorandum*: | | | | |
| United States | 12.8 | 22.0 | 0 | *23* |
| Japan | 27.3 | 1.8 | 0 | *79* |
| Germany | 16.7 | 3.9 | 50 | *77* |
| United Kingdom | 57.0 | .. | .. | *46* |

[1] Or more recent. [2] Excludes Banco Central de Reserva and Banco de la Nación.

access to alternative financing sources; and the depth of the various financial markets.

The greater and more rapid the response of loan and deposit rates to changes in money market rates, the more rapid and effective will be the transmission of monetary policy measures to the real economy. Tables 6 and 7 show to what extent loan and deposit rates are linked to policy or

Table 5

**Sources of financing for the private non-financial sector**

Percentage of total financing received

| | Commercial banks | | Other institutions | | Foreign sources | | Other | |
|---|---|---|---|---|---|---|---|---|
| | 1983 | 1993 | 1983 | 1993 | 1983 | 1993 | 1983 | 1993 |
| India | 26.4 | 21.7 | 16.4 | 34.4 | 0.8 | 4.6 | 56.5 | 39.3 |
| East Asia | | | | | | | | |
| Korea | 30.7 | 24.5 | 21.9 | 35.0 | 13.0 | 3.7 | 34.4 | 36.8 |
| Malaysia | 76.8 | 54.9 | 23.2 | 45.1 | .. | .. | .. | .. |
| Singapore | 86.5 | 87.2 | 13.5 | 12.8 | .. | .. | .. | .. |
| Thailand | .. | 84.1 | .. | .. | .. | 7.5 | .. | 1.0 |
| Latin America | | | | | | | | |
| Brazil | 60.3 | 80.1 | 39.7 | 19.9 | .. | .. | .. | .. |
| Mexico | 80.6 | 91.5 | 19.4 | 8.5 | .. | .. | .. | .. |
| Hungary | .. | 22.5 | .. | 0.3 | .. | 49.2 | .. | 28.0 |
| Israel | .. | 51.6 | .. | .. | .. | 6.6 | .. | 41.8 |
| Saudi Arabia | 29.3 | 45.9 | 70.7 | 54.1 | .. | .. | .. | .. |
| *Memorandum*: | | | | | | | | |
| United States | 20.4 | 16.6 | 23.6 | 20.9 | 0.6 | 0.1 | 55.3 | 62.4 |
| Japan | 46.6 | 42.7 | 21.0 | 23.5 | .. | .. | 32.3 | 33.8 |
| Germany | 57.9 | 64.9 | .. | .. | 7.8 | 6.7 | 34.3 | 28.4 |
| United Kingdom | 38.2 | 42.3 | .. | .. | 10.9 | 6.2 | 50.9 | 51.6 |

Notes: For *Brazil, Malaysia, Mexico, Saudi Arabia, Singapore* and *Thailand,* total financing is taken to be the sum of the data shown. Other institutions are defined as other financial institutions and official development banks.

*Hungary*: Data are for 1996 and cover the non-financial corporate sector. *Korea*: Respective data for 1996 are: 24.1, 35.5, 5.0 and 35.4. *Malaysia*: Other institutions refer to finance companies, merchant banks and non-bank financial intermediaries. Data for 1996 are commercial banks (51.3); other institutions (48.7). *Saudi Arabia*: Data for 1996 are: commercial banks (47.9); other institutions (52.1). *Thailand*: Data are for 1995.

money market rates. The rates most subject to central bank control or intervention are identified in Table 8. A key determinant of this responsiveness is the degree of competition within the banking sector. When there are several banking institutions (a development that could be promoted by lowering barriers to new entrants, in particular to foreign banks) and market conditions are competitive, changes in the cost of funds are likely to rapidly affect loan and deposit rates. Conversely, in a highly concentrated banking sector, oligopolistic pricing may be possible,

Table 6
**Determinants of bank deposit rates**

| | Linked to policy rate | Linked to interbank rate | Agreed within bank association | Negotiated with customers | Subject to regulation |
|---|---|---|---|---|---|
| China | | | | | Yes |
| India | No | No | No | No | No |
| East Asia | | | | | |
| Hong Kong | No | Yes | (No) | Yes | No |
| Indonesia | No | Yes | No | Yes | No |
| Korea | No | No | No | No | No |
| Malaysia | No | No | No | Yes | No |
| Singapore | | Yes | | Yes | No |
| Thailand | | Yes | No | Yes | No |
| Latin America | | | | | |
| Brazil | | Yes | | | Yes |
| Chile | No | (Yes) | No | Yes | No |
| Colombia | (Yes) | (Yes) | (Yes) | (Yes) | No |
| Mexico | No | Yes | No | Yes | No |
| Peru | | | No | | No |
| Venezuela | No | No | No | Yes | No |
| Israel | Yes | | | Yes | No |
| Russia | | | No | Yes | No |
| Saudi Arabia | No | Yes | No | Yes | No |
| *Memorandum*: | | | | | |
| United States | No | Yes | No | (No) | No |
| Japan | No | Yes | No | (Yes) | (Yes) |
| Germany | (No) | Yes | (No) | Yes | No |
| United Kingdom | Yes | Yes | No | (No) | No |

Notes: The link to the interbank rate may also be a link to another money market rate or a long-term bond rate.

*Hong Kong*: Rates on saving deposits and on time deposits of less than 7 days are subject to the "Interest Rate Rules" of the Hong Kong Association of Banks. *India*: Bank deposit rates are not subject to regulation except for savings deposits.

making the response of loan and deposit rates to changes in money market rates sluggish and asymmetric. In addition, the presence of state-owned or state-subsidised banks under little pressure to maximise profits could diminish the responsiveness of loan and deposit rates to monetary policy. (A number of measures of competition in emerging country banking sectors were shown in Table 4 above.)

Table 7
**Determinants of bank loan rates**

| | Linked to policy rate | Linked to interbank rate | Agreed within bank association | Negotiated with customers | Subject to regulation |
|---|---|---|---|---|---|
| China | | | | | Yes |
| India | No | No | No | Yes | No |
| East Asia | | | | | |
| Hong Kong | No | (Yes) | No | Yes | No |
| Indonesia | No | Yes | No | Yes | No |
| Korea | (Yes) | (Yes) | No | Yes | No |
| Malaysia | Yes | Yes | No | Yes | Yes |
| Singapore | | Yes | | Yes | No |
| Thailand | | Yes | No | Yes | No |
| Latin America | | | | | |
| Brazil | | (Yes) | | | |
| Chile | No | | No | Yes | Yes |
| Colombia | (Yes) | (Yes) | (Yes) | (Yes) | No |
| Mexico | No | Yes | No | Yes | No |
| Peru | | | No | | No |
| Venezuela | No | No | No | Yes | No |
| Israel | Yes | | | | No |
| Russia | | | No | Yes | No |
| Saudi Arabia | No | Yes | No | Yes | No |
| *Memorandum*: | | | | | |
| United States | (No) | Yes | No | Yes | No |
| Japan | No | Yes | No | (Yes) | No |
| Germany | (No) | Yes | (No) | Yes | No |
| United Kingdom | Yes | Yes | No | No | No |

Notes: The link to the interbank rate may also be a link to another money market rate or a long-term bond rate.

*India*: Bank loan rates are not subject to regulation except for export credits and credits for amounts of less than Rs. 200,000 (about US$ 5,500).

The impact of banking sector competitiveness on the responsiveness of deposit and loan rates can be illustrated by a number of country experiences. In Colombia, competition among banks in the deposit market is much greater than in the loan market (partly because Colombia is still rather underbanked). The Colombian loan market is much more concentrated as many banks belong to conglomerates: interest rates charged to

Table 8

**Interest rates under central bank control/intervention**

| | |
|---|---|
| China | Central bank lending rate; financial institutions' loan and deposit rates |
| India | Central bank (lending) rate (Bank rate); reverse repo rates; general refinance and export refinance rates; rate on line of credit to two specialised banks (for housing and agriculture); selected lending rates and deposit rates on savings bank accounts |
| Hong Kong | Bid and offer rate on the "Liquid Adjustment Facility" at the HKMA |
| Indonesia | Discount rate |
| Korea | Discount rate; overnight interbank rate |
| Malaysia | Overnight, one-month and three-month interbank rates |
| Singapore | Interbank rate |
| Thailand | Loan window central bank rate; repo rate |
| Argentina | Repo and reverse repo rates |
| Brazil | Overnight repo rate ("SELIC" rate); two rediscount rates |
| Chile | Daily interbank rate |
| Colombia | Rate on one-day borrowing (for liquidity absorption) and rate on reverse repos (for liquidity supply) |
| Mexico | Central bank auctioned loan rate; repo rate |
| Peru | Discount rate |
| Venezuela | Interest rate on central bank stabilisation bonds (TEMCs) (the central bank stopped auctioning TEMCs in October 1997) |
| Hungary | One-month reverse repo rate |
| Israel | Commercial banks' prime rate and short-term deposit rate |
| Russia | Rate on Bank Refinancing Facility |
| Saudi Arabia | Overnight repo rate |

preferred customers within these conglomerates tend to be adjusted only sluggishly to changing market conditions. In Indonesia and Thailand, too, commercial banks tend to adjust lending rates less frequently than deposit rates. Sometimes adjustment throughout the banking sector depends on the initiative of the most important banks in the deposit and/or loan segment of the market. In Hong Kong, smaller banks usually follow the

best lending rate charged by the bigger banks. In Indonesia there is evidence of price leadership by the largest state banks.

The interest rates on deposits and loans set by the domestic banking system may also depend on the access of households and firms to *alternative domestic funding sources*, including securities markets and/or informal "curb" markets. Table 9 shows the reliance of enterprises in emerging economies on various sources of financing, including securities markets. Moreover, in several countries (e.g. Israel and Thailand) access to foreign sources of funds has increased widely, an issue addressed separately below. The key determinants of the impact of these alternative sources of financing on the efficacy of monetary policy are their degree of integration with the domestic banking market and their state of development.

In principle, the presence of *domestic securities markets* should accelerate the transmission of monetary policy shocks. Well-developed and competitive capital markets often tend to respond more flexibly to changes in policy rates than do bank-administered loan and deposit rates. The Israeli paper notes the importance of institutional investors and recent financial deregulation in the transmission of monetary policy. Since the portfolios of such investors contain various maturities of government bonds, including short-term notes (which are an important monetary policy instrument), a change in the central bank's policy rate can quickly spread throughout domestic securities markets. Some of the rates in these markets may be more relevant for spending decisions than those on short-term bank deposits or loans.

Moreover, if the banking sector and the securities markets are well integrated, banks may be forced to enhance the responsiveness of the interest rates under their control. The Israeli case is also illustrative in this regard. As institutional investors also hold bank deposits, they represent an important element of the linkage between individual financial market segments, ensuring that a change in the policy-controlled rate reverberates through the entire spectrum of interest rates.

Restrictions on the financial sector have led in many countries to the emergence of *informal "curb" markets for credit*. In some countries, these curb markets have become large enough for the monetary authorities to actively monitor them. For example, developments in the curb market remain even today an indicator for guiding the policies of the Bank of Korea. To the extent that the formal banking sector and curb markets are highly segregated (e.g. if each market has its own small group of distinct

Table 9

## Gross flow of financial liabilities of the non-financial corporate sector

In percentages

| | Annual flow of gross financial liabilities as a % of GDP | | Composition of gross financial liabilities | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Bank loans | | Commercial paper and bonds | | Equities | |
| | 1982–84 | 1992–94 | 1982–84 | 1992–94 | 1982–84 | 1992–94 | 1982–84 | 1992–94 |
| India | 3.9 | 6.8 | 27.0 | 16.8 | 8.1 | 8.9 | 6.2 | 21.9 |
| East Asia | | | | | | | | |
| Korea | 21.8 | 25.4 | 54.3 | 48.8 | 19.6 | 29.3 | 26.1 | 21.9 |
| Malaysia | .. | 11.2 | .. | 54.9 | .. | 26.9 | .. | 18.2 |
| Singapore | 9.6 | 3.8 | 68.8 | 31.5 | 5.3 | 26.8 | 25.9 | 41.7 |
| Thailand | .. | 73.1 | .. | 45.7 | .. | 32.4 | .. | 22.0 |
| Latin America | | | | | | | | |
| Chile | 11.6 | 45.4 | 71.9 | 20.0 | 2.8 | 3.7 | 25.3 | 76.3 |
| Colombia | 10.7 | 16.6 | 20.7 | 31.9 | 13.2 | 4.7 | 66.1 | 63.4 |
| Mexico | .. | 23.5 | .. | .. | .. | .. | .. | .. |
| Venezuela | 4.8 | 7.2 | 5.6 | 36.2 | −0.2 | −3.3 | 27.9 | 67.1 |
| Hungary | .. | 17.9 | .. | 41.1 | .. | 1.9 | .. | 57.0 |
| *Memorandum*: | | | | | | | | |
| United States | 4.7 | 1.9 | 127.5 | −51.5 | 44.3 | 133.1 | −71.9 | 18.4 |
| Japan | 10.2 | 2.5 | 84.4 | 76.3 | 7.5 | 18.6 | 8.1 | 5.1 |
| Germany | 4.5 | 7.1 | 89.4 | 56.1 | 2.8 | 36.1 | 7.9 | 7.8 |
| United Kingdom | 3.5 | 3.9 | 61.6 | 20.9 | 10.8 | 17.1 | 27.7 | 61.9 |

Notes: *Hungary*: Data are for 1996. Bank loans include loans from resident banks and foreign sources. *India*: Non-bank borrowing constitutes the main other financial liability of the corporate sector. *Korea*: Respective data for 1992–96 are: 27.5, 43.3, 39.4 and 17.3. *Thailand*: 1990–93. *Venezuela*: The earlier period is for 1984–86. Bank loans include loans of the personal sector.

depositors and borrowers), the impact of monetary policy will be diminished. Contractionary monetary policy, for example, will raise interest rates and reduce credit availability in the formal sector, but may have little impact on conditions in the curb market.

The transmission of monetary policy is more complex when formal and curb markets are integrated to some degree. Tighter monetary policy which raises bank deposit rates may cause households to shift their savings from the curb market to formal bank deposits. Because borrowers in the curb market are likely to lack access to formal bank lending, this shift in loanable resources may cause disruptive declines in credit and spending in those sectors served by the curb market. The uneven nature of the incidence of monetary policy in a partially segregated market suggests that its effects may be harder to predict than in a more unified one.

The *depth of money and capital markets* can also have an important bearing on how policy-controlled rates affect other rates and ultimately spending behaviour. A thin or uncompetitive financial market can cause major volatility of money market interest rates. Insofar as it is costly to adjust loan and deposit interest rates, both for administrative reasons and for reasons of customer relations, banks may not adjust these rates in response to movements in money market rates if these rates are highly variable and expected to reverse their movements quickly. (On the other hand, greater money market volatility may lead banks to develop mechanisms to link administered loan and deposit rates more closely to money market rates.)

Similarly, the response of interest rates in thin capital markets to changes in policy rates may be more-than-usually unpredictable. Although they have grown over time, bond markets in many developing countries indeed remain shallow and volatile. In the early stages of capital market development, therefore, the transmission of monetary policy measures may be particularly uncertain.

In sum, various factors, including the degree of competition within the banking sector, the availability of alternative sources of financing, and the depth and volatility of domestic financial markets, are likely to condition the extent and rapidity of the adjustment of bank deposit and loan rates to monetary policy actions.

There is some statistical evidence that the response of bank rates to monetary policy measures has been slower in some emerging market

economies than in the larger industrialised countries, perhaps reflecting the more limited competitiveness, depth and flexibility of financial markets in emerging market economies. This difference is least apparent in the response of three-month money market rates to changes in overnight rates; possibly, it is easiest to ensure competitive conditions in the interbank market. On the other hand, the response of bank deposit and loan rates to same-month changes in three-month money market rates clearly has been slower in the emerging market countries than in the industrialised nations. The average long-run response of bank rates to money market rates also is smaller in the emerging market economies, though less markedly so.

*Terms of financial contracts*

As noted earlier, an important means by which monetary policy affects economic activity is by altering the cash-flow position of borrowers. This depends not only on the extent to which changes in the policy interest rate lead to changes in new short-term deposit and loan rates, but also on how quickly changes in these *new* rates lead to changes in *average* rates. One of the most important determining factors is the maturity of financial contracts. The shorter the maturity, the more frequently will loans and deposits be rolled over at new interest rates, and hence the more quickly will changes in policy rates lead to changes in average interest rates earned by depositors and paid by borrowers.

Table 10 shows that the share of loans with maturities exceeding one year in the major emerging market countries is considerably lower than in several industrialised countries. Loans in Latin America are typically of an even shorter maturity (but comprehensive data are not available). This reflects the greater degree of uncertainty over future inflation and interest rates in those markets. For instance, in Brazil, most enterprise loans have a maturity of less than three months and bonds of less than one year. No long-term instruments existed in Peru until the early 1990s. Monetary policy might therefore be expected to produce a more rapid impact on cash-flow positions in developing countries than in industrialised countries, and hence on aggregate demand as well.

A second factor determining the impact of policy rates on average interest rates is the extent to which interest rates on loans and deposits can be adjusted prior to maturity. The more frequently contractual interest rates are adjusted, and the more fully adjustments reflect changes

Table 10

**Structural characteristics of bank loans (1996)**

| | Maturity structure of loans | Share of loans with adjustable interest rates | |
|---|---|---|---|
| | Percentage with original maturity greater than one year | Home mortgages | Long-term business loans |
| | | percentage of loan category | |
| East Asia | | | |
| Hong Kong | 40.1 | 96.0 | .. |
| Korea | 26.7 | .. | .. |
| Malaysia | 88.2 | .. | .. |
| Singapore | 59.1 | 100.0 | .. |
| Thailand | 53.7 | 100.0 | 100.0 |
| Latin America | | | |
| Brazil | .. | 100.0 | 100.0 |
| Chile | .. | 0.0 | .. |
| Colombia | .. | 100.0 | .. |
| Mexico | .. | 100.0 | .. |
| Peru | 19.0 | .. | .. |
| Venezuela | .. | 100.0 | 100.0 |
| Hungary | 42.6 | 100.0 | 100.0 |
| Israel | 33.5 | 19.0 | .. |
| Russia | 2.2 | .. | .. |
| Saudi Arabia | 21.5 | .. | .. |
| *Memorandum*: | | | |
| United States | 83.0 | 15.0 | 19.0 |
| Japan | 68.0 | 60.0 | 38.0 |
| Germany | 84.0 | 90.0 | 24.0 |
| United Kingdom | 62.0 | 90.0 | 48.0 |

Notes: *Hong Kong*: Percentage of loan category: 1994; maturity structure of loans based on remaining maturity in 1997. *Korea, Malaysia* and *Saudi Arabia*: Maturity structure of loans: 1995. *United States, Japan, Germany* and the *United Kingdom*: 1993 data; maturity structure includes loans from other financial institutions; share of loans with adjustable interest rates includes short-term loans for Japan and the United Kingdom; long-term business loans include securities.

in money market rates, the more rapid will be the impact of changes in policy rates on average loan and deposit rates. Table 10 indicates the share of loans with adjustable interest rates in emerging and industrialised countries: as a general rule, most loans carry adjustable interest rates.

A third feature of financial contracts that should be highlighted is the indexation of principal to some nominal variable, usually the price level or the exchange rate. In countries such as Chile and Israel with a history of high inflation, the majority of longer-term contracts are indexed; by contrast, indexation is insignificant in Hong Kong, Korea, Malaysia, Singapore and Thailand (see Table 11). The presence of indexed loans and deposits introduces several considerations. First, the interest rate on such contracts may be interpreted as a real interest rate, depending upon the specific manner of indexation. This may help clarify the signal that a

Table 11
**Indexation of principal of debt instruments**

| | |
|---|---|
| India | No indexation |
| Hong Kong | Mostly non-indexed |
| Indonesia | No indexation |
| Korea | No indexation |
| Malaysia | No indexation |
| Singapore | No indexation |
| Thailand | No indexation |
| Brazil | Indexation to a price index is possible when debt instrument has a maturity of more than one year; in special cases (including some government bonds) US$-linked indexation is possible |
| Chile | Two-thirds of bank loans and almost all public securities are indexed to prices |
| Colombia | Indexation to the CPI is applied to 20% of the financial system's loans, to 14% of the financial system's liabilities and to 20% of public debt |
| Mexico | Mechanism to index some bank loans to the CPI introduced after the 1994 crisis. Some index-linked bonds |
| Peru | Some bonds are indexed to the CPI |
| Venezuela | No indexation |
| Hungary | Issuance of an indexed bond is planned for 1998 |
| Israel | Most financial assets and liabilities are indexed; longer-term instruments usually indexed to the CPI; shorter-term instruments (as well as some government bonds) to the US dollar |
| Saudi Arabia | No indexation |

central bank sends to financial markets through its monetary policy action; it may also help the central bank interpret movements in free market interest rates on indexed debt instruments. Secondly, when deposits and loans are properly indexed, swings in expected inflation and/or exchange rate depreciation will not lead to swings in deposit and loan interest rates, and hence will not affect cash flow as such developments will in non-indexed financial systems. In Mexico in 1995, for example, the Government encouraged the re-contracting of loan rates on a price-adjusted basis so as to eliminate the high inflation-risk premium built into nominal interest rates and thereby reduce the impact of debt service on borrowers' cash flows.

*External finance and dollarisation*

A particularly important form of access to resources outside the domestic financial system is foreign finance. In contrast to many other aspects of the monetary transmission process in developing countries, there has been considerable research into the role of capital mobility in conditioning the effects of monetary policy. The textbook analysis of the implications of external capital flows for monetary policy transmission suggests several important conclusions. Two related phenomena – offshore borrowing by enterprises and dollarisation – require particular analysis.

*Capital flows and monetary policy*

In the absence of capital controls, the efficacy of domestic monetary policy is in theory determined by the exchange rate regime and the degree of substitutability between domestic and foreign financial assets. Under a floating exchange rate, monetary policy works through two channels. First, since the money supply is exogenously controlled by the central bank, monetary policy can work through conventional interest rate and liquidity effects. Secondly, monetary policy influences aggregate demand and prices through its impact on the exchange rate. The greater the substitutability between domestic and foreign assets, the greater the response of the exchange rate to policy-induced changes in interest rates, and hence the larger the impact of monetary policy through that channel.

In a fixed exchange rate regime, the influence of asset substitutability on the impact of monetary policy is reversed. When domestic and foreign

assets are perfect substitutes, any monetary policy action is immediately offset through capital flows, so that monetary conditions remain unchanged. The lesser the degree of substitutability, the more scope the monetary authorities will have to move domestic interest rates independently of foreign rates. As will be discussed in greater detail below, the evidence suggests that asset substitutability is less than perfect, indicating that governments fixing their exchange rate have some scope, albeit limited, for pursuing independent monetary policy.

*Offshore borrowing*

An important feature of increased capital mobility has been the growing ability of many firms in emerging market economies to get finance abroad. For instance, international capital markets have become the main source of capital raised by Israeli firms. The Singapore economy is dominated by multinational corporations with access to financing from abroad. External financing of Thai enterprises grew from 16% of GDP in 1989 to 27% in 1995. Offshore borrowing effectively reduces these firms' exposure to domestic credit-market conditions, and acts to limit the impact of monetary policy on aggregate demand. A monetary tightening that raises domestic loan rates will cause firms to switch to foreign borrowing, thereby limiting the incidence of the monetary tightening and constraining the ability of domestic banks to raise loan rates. To the extent that a change in the differential between the domestic and foreign rate is not offset by an equivalent expected change in the exchange rate, the impact of monetary policy on spending (other than the important effect operating through the exchange rate change itself) may thus be constrained in a floating exchange rate regime.

In practice, only a small number of large firms – often those with foreign currency revenue streams – are able to tap international credit markets directly. Some central banks restrict enterprise access to offshore finance or subject it to reserve requirements (e.g. in Chile and Thailand). The aggregate impact of monetary policy on aggregate demand will not be much affected. Instead, the incidence of monetary policy will fall primarily on smaller firms and households. Whether or not this is desired, it may make the transmission of monetary policy more uncertain, since the firms that are most affected might be those with the weakest balance-sheet positions and most vulnerable to credit rationing.

*Dollarisation*

Many countries having experienced high inflation – particularly in Russia and Latin America – have seen a substantial rise in the use of foreign currency. The term "dollarisation" has been employed somewhat indiscriminately to refer to the use of dollars as a unit of account, a store of value, a means of transactions, or all three. This paper focuses on the provision of dollar-denominated loans and deposits by the domestic banking system, an activity which embraces both the store-of-value and, to a lesser extent, the transactions function of money. Table 12 compares the shares of bank assets and liabilities denominated in foreign currencies

Table 12
**Currency denomination of bank balance sheets**
Percentage denominated in foreign currency

| | Assets | | Liabilities | |
|---|---|---|---|---|
| | 1983 | 1993 | 1983 | 1993 |
| East Asia | | | | |
| Hong Kong | 68.1 | 74.5 | 69.4 | 75.5 |
| Indonesia | .. | 35.1 | .. | 36.4 |
| Korea | 5.1 | 4.1 | 12.6 | 3.9 |
| Latin America | | | | |
| Chile | 41.6 | 19.7 | 46.7 | 20.6 |
| Colombia | .. | 13.0 | .. | 11.1 |
| Mexico | 41.7 | 26.7 | 47.2 | 28.2 |
| Peru | 54.0 | .. | 56.4 | .. |
| Venezuela | 7.0 | 12.2 | 9.3 | 3.5 |
| Hungary | .. | 28.8 | .. | 30.9 |
| Israel | .. | 36.1 | .. | 36.9 |
| Russia | .. | 29.0 | .. | 25.1 |
| Saudi Arabia | 12.3 | 25.6 | 21.5 | 29.1 |
| *Memorandum*: | | | | |
| United States | 0.4 | 1.6 | 0.3 | 2.1 |
| Japan | 14.4 | 12.0 | 14.4 | 12.8 |
| Germany | 2.1 | 5.1 | 2.2 | 4.1 |
| United Kingdom | 90.6 | 69.7 | 93.2 | 70.7 |

Notes: Data for 1996 respectively: Korea (6.3, 9.2); Mexico (31.9, 33.4); Peru (74.1, 73.0); Russia (24.6, 23.2); Saudi Arabia (20.6, 22.4).

*Hungary*: 1996. *Russia*: 1995. *United States*: Only positions against non-residents.

among various emerging market countries. Foreign-currency-denominated shares in some of these economies are much higher than in the industrialised countries shown in the table and, given the legacy of unsettled macroeconomic conditions over the past decade, have risen since the early 1980s.

Assets can be denominated in foreign currency ("dollars") or in the domestic currency ("pesos"); the other dimension is that assets can be local or foreign. The transmission of monetary policy in a dollarised system will depend not only on the substitutability between domestic peso and dollar assets, but also on the substitutability between domestic dollar assets and foreign dollar assets. Because of the presence of default and convertibility risk, domestic and foreign dollar-denominated assets are likely to be regarded as less than perfect substitutes. As evidence of this, dollar interest rates in dollarised financial systems have generally exceeded international levels.

Consideration of the case where the markets regard domestic peso and dollar assets as close substitutes but view domestic and foreign assets as being not substitutable serves to illustrate the importance of asset substitutability. Assuming limited exchange rate changes, policy-induced increases in peso interest rates will induce borrowers to switch to domestic dollar loans and savers to shift their assets into peso deposits, leading to increases in domestic dollar deposit and loan rates as well. Therefore, monetary policy is effective in this case. Conversely, where domestic and foreign dollar assets are highly substitutable, the monetary transmission channel will more closely resemble that in a non-dollarised system with perfect capital mobility, except that access to dollar loans might be more widespread in a dollarised system than in a non-dollarised one.

There is considerable evidence that relative holdings of peso and dollar deposits respond to changes in relative rates of return. However, little research has focused on the degree of substitutability between domestic and foreign dollar-denominated assets. The conduct and transmission of monetary policy in a partially dollarised financial system remains a relatively unexplored topic.

*The role of initial financial conditions*

The initial financial position of households, firms and banks is likely to interact with monetary policy in three important ways. First, the impact

of monetary policy on consumption and investment will depend upon the extent to which these expenditures are financed through the financial system. Secondly, changes in asset prices resulting from monetary policy action will have different effects on net worth depending on the composition of financial portfolios. Finally, the initial strength or weakness of balance-sheet positions will influence how monetary policy action will induce changes in borrowing and spending aimed at achieving a sustainable or acceptable balance-sheet position.

*Sources of financing*

In economies where financial intermediation is underdeveloped and investment (both housing and corporate) usually is financed from internal sources (such as personal savings and retained earnings), the impact of monetary policy actions on aggregate demand may be relatively modest. Limited reliance on external financing sources could be a reason why enterprise investment in India is only slightly affected by interest rate changes.

As economies develop, the availability of intermediated savings tends to rise, and a greater share of investment and, in some cases, consumption expenditures is financed by bank lending. In the past decade, this long-term evolution has been amplified by the process of financial liberalisation, which has improved the financial sector's efficiency and ability to channel savings – both foreign and domestic – to borrowers. Often, too, fiscal adjustment has released resources for private sector use that previously had financed government budget deficits. These developments are likely to have increased the sensitivity of aggregate demand to monetary policy.

Tables 13 and 9 (p. 29) display flow-of-funds data on the personal and the non-financial corporate sector's liabilities to the financial sector, respectively. The rather incomplete data are consistent with the view that dependence upon intermediated savings has risen in emerging market countries in the past decade. For instance, two-thirds of investment by enterprises in Thailand was financed by external funds in 1991–96, compared with only one-third in the period 1980–90.

The pattern of financing of household and enterprise expenditures also plays an important role in the sectoral impact of monetary policy. In industrialised countries, the construction sector is especially sensitive to interest rates, since buildings and real estate are too large and "lumpy" to

Table 13

**Gross flow of financial liabilities of the personal sector**

In percentages

| | Annual flow of gross financial liabilities as a % of GDP | | Composition of gross financial liabilities | | | |
|---|---|---|---|---|---|---|
| | | | Mortgage debt | | Other debt | |
| | 1982–84 | 1992–94 | 1982–84 | 1992–94 | 1982–84 | 1992–94 |
| East Asia | | | | | | |
| Korea | 6.2 | 8.9 | .. | .. | .. | .. |
| Malaysia | 2.5 | 5.6 | 58.2 | 37.7 | 41.8 | 62.3 |
| Singapore | 2.1 | 4.4 | 30.0 | 75.3 | 70.0 | 24.7 |
| Thailand | .. | 10.8 | .. | 20.9 | .. | 79.1 |
| Latin America | | | | | | |
| Colombia | 4.0 | 7.6 | 55.9 | 63.2 | 44.1 | 36.8 |
| Mexico | .. | 17.3 | .. | 37.0 | .. | 63.0 |
| Hungary | .. | –0.4 | .. | 70.0 | .. | 30.0 |
| *Memorandum*: | | | | | | |
| United States | 4.6 | 4.4 | 55.1 | 61.9 | 44.9 | 38.1 |
| Japan | 4.7 | 1.1 | 5.6 | 21.6 | 94.4 | 78.4 |
| Germany | 3.8 | 4.3 | 83.1 | 85.9 | 16.9 | 14.1 |
| United Kingdom | 6.4 | 2.9 | 78.8 | 101.6 | 21.2 | –1.6 |

Notes: *Hungary*: 1996. *Korea*: Annual flow of gross financial liabilities (% of GDP) in 1992–96: 9.1. *Thailand*: 1990–93.

be financed in ways other than by borrowing; for much the same reason, consumer durable expenditures are also quite interest-sensitive. Similarly, sectors in which requirements for fixed capital or working capital (because of the cyclical behaviour of demand or supply) are high are likely to be heavily dependent on bank credit and sensitive to bank interest rate changes. There has been less research on the sectoral response of demand to monetary policy shocks in developing countries; but there is some evidence that in such countries construction and consumer durables expenditures are also especially sensitive to monetary conditions. Colombian studies also suggest high sensitivity in certain other sectors, such as agriculture and manufacturing.

In several emerging market countries, financial liberalisation and capital inflows have given rise to particularly marked growth in mortgage lending and consumer credit, including credit cards. In Argentina, for

instance, consumer loans have led credit growth in recent years. As indicated in Table 14, the share of consumer credit and mortgage lending in total bank loans has grown considerably in the past decade, although it still remains below levels in industrialised countries. Given the interest

Table 14
**Composition of bank loans**
In percentages

| | Home mortgages | | Consumer credit | | Enterprises | | Government | |
|---|---|---|---|---|---|---|---|---|
| | 1983 | 1993 | 1983 | 1993 | 1983 | 1993 | 1983 | 1993 |
| India | .. | .. | .. | .. | 59.2 | 56.5 | 40.8 | 43.5 |
| East Asia | | | | | | | | |
| Hong Kong | 6.4 | 9.4 | 5.4 | 3.6 | 88.2 | 87.0 | .. | .. |
| Indonesia | .. | 4.1 | 1.0 | 6.9 | .. | 70.7 | .. | 2.2 |
| Korea | .. | 12.7 | .. | 11.7 | .. | 74.5 | .. | 1.1 |
| Malaysia | 11.3 | 13.9 | 1.0 | 11.2 | 20.1 | 30.1 | .. | 0.5 |
| Singapore | 1.8 | 14.9 | .. | .. | .. | .. | 0.0 | 0.0 |
| Thailand | .. | 8.3 | .. | 4.1 | .. | 58.8 | .. | 0.7 |
| Latin America | | | | | | | | |
| Brazil | .. | 22.1 | .. | 3.4 | .. | 65.3 | .. | 9.2 |
| Chile | 7.8 | 11.2 | 1.2 | 4.0 | 36.7 | 44.5 | .. | .. |
| Mexico | 2.5 | 13.0 | 0.8 | 7.2 | 16.8 | 36.3 | 29.2 | 9.5 |
| Venezuela | .. | .. | .. | .. | .. | .. | 3.2 | 0.7 |
| Hungary | .. | 6.2 | .. | 3.5 | .. | 52.4 | .. | 37.9 |
| Israel | .. | .. | .. | .. | .. | .. | .. | 19.1 |
| Russia | .. | .. | .. | 1.7 | .. | 74.6 | .. | .. |
| Saudi Arabia | .. | .. | .. | .. | .. | .. | .. | 18.8 |
| *Memorandum*: | | | | | | | | |
| United States | 20.8 | 29.8 | 13.4 | 12.6 | 28.6 | 20.7 | 11.3 | 10.1 |
| Japan | 7.5 | 8.7 | 0.4 | 3.8 | 73.7 | 70.4 | 13.5 | 9.0 |
| Germany | 16.9 | 15.6 | 8.2 | 8.5 | 45.3 | 44.9 | 19.4 | 13.9 |
| United Kingdom | 48.8 | 56.0 | 8.7 | 8.3 | 25.3 | 21.0 | 10.8 | 2.8 |

Notes: *Brazil*: Total bank loans exclude inflation correction component. *Chile*: 1985 data (instead of 1983). *Hungary*:1996 data. *India*: Bank loans include bank credit to the commercial sector (i.e. households, non-bank, non-financial private and public sector enterprises) and net bank credit to the government; data for 1993 are at end-March 1997. *Korea*: Data for 1996 are: home mortgages (2.6), consumer credit (20.2), enterprises (75.1) and government (1.1). *Malaysia*: Bank loans include loans extended by commercial banks, finance companies and merchant banks. Data for 1996: home mortgages (11.9), consumer credit (12.0), enterprises (33.4) and government (0.3). *Russia*: 1995. *Venezuela*: Commercial banks only.

sensitivity of residential investment and consumer durables purchases, this promises to further strengthen the effects of monetary policy in developing countries, as well as to accentuate its uneven incidence across different sectors. In Mexico, heavy consumer lending in the years prior to the peso's 1994 devaluation was followed by a near-elimination of new credit availability thereafter, making the subsequent contraction even deeper than it otherwise would have been.

*Composition of financial portfolios*

As monetary policy can change the valuation of assets and liabilities, the impact on aggregate demand depends crucially upon the initial composition of portfolios. In economies in the early and middle stages of financial development, most savings are intermediated through the domestic banking system, and relatively small proportions of household and corporate portfolios are invested in securities whose value varies with market conditions. More important may be the share of foreign currency assets and liabilities.

As financial markets develop, the diversity of portfolios and their sensitivity to policy actions affecting asset values may be expected to grow. Table 15 compares movements in the share of securities in the total assets of banks. Unfortunately, very few data for the household and the non-financial corporate sector are available, making it difficult to discern to what extent this share has grown and come closer to the levels observed in selected industrialised countries.

Holdings of foreign currency assets and liabilities may represent a particularly important source of balance-sheet exposure to asset prices – in this case, exchange rate changes. Data on the foreign currency exposure of households and firms are not readily available. The data on the foreign currency exposure of the banking system are shown in Table 12, but they must be interpreted carefully. In most countries, regulations restrict the size of net foreign currency exposure by banks. However, insofar as bank borrowers may hold open positions in foreign currency, the quality of bank portfolios and banks' ability and willingness to provide credits may be affected by changes in exchange rates. In Mexico, for example, foreign exchange exposure was limited as a share of capital (and foreign liabilities as a share of total liabilities), but the 1994 devaluation seriously eroded the financial situation of many domestic customers with dollar-denominated debts, contributing to a rise in non-performing loans

Table 15

**Share of securities in total assets of the consolidated banking sector**

In percentages

| | 1983 | 1993 |
|---|---|---|
| India | 32.5 | 40.0 |
| East Asia | | |
| Hong Kong | 3.8 | 5.5 |
| Indonesia | .. | 4.1 |
| Korea | 8.1 | 10.3 |
| Malaysia | 11.9 | 7.0 |
| Singapore | 7.8 | 10.6 |
| Thailand | .. | 5.4 |
| Latin America | | |
| Brazil | .. | 4.8 |
| Chile | 7.5 | 18.2 |
| Colombia | .. | 8.9 |
| Mexico | 2.4 | 1.1 |
| Peru | 2.4 | .. |
| Venezuela | 6.8 | 15.4 |
| Hungary | .. | 22.8 |
| Israel | 7.0 | 12.6 |
| Russia | .. | 16.1 |
| Saudi Arabia | 5.7 | 21.1 |
| *Memorandum*: | | |
| United States | 25.5 | 27.2 |
| Japan | 16.4 | 16.9 |
| Germany | 11.2 | 14.5 |
| United Kingdom | 5.3 | 14.1 |

Notes: Holdings of commercial paper, corporate and government bonds and equities where available. For *Chile, Colombia, Indonesia, Israel, Malaysia, Saudi Arabia, Singapore, Thailand* and *Venezuela*, holdings of all securities.

Data for 1996: India (October 1997: 40.9), Korea (12.4), Malaysia (6.9), Saudi Arabia (23.9), Peru (6.9), Venezuela (39.7; June 1997: 29.1).

*Chile*: 1980 data (instead of 1983). *Hong Kong*: 1983 excluding equities. *Hungary*: 1996. *India*: Includes government securities and other securities approved for statutory liquidity ratio. *Israel*: 1987 data (instead of 1983). *Malaysia*: Securities refer to Malaysian Government, foreign and corporate securities. *Mexico*: Government bonds and equities. *Russia*: 1995. *Saudi Arabia*: Saudi commercial banks only as the information for specialised government institutions is not available.

that has seriously damaged bank balance sheets. Banks, in turn, have responded by tightening lending, which may have further reinforced

contractionary tendencies. The depreciation of a number of Asian currencies since mid-1997 may have similar effects, especially where there has been large foreign-currency-denominated borrowing to finance the acquisition of domestic assets.

*Leveraging and net worth*

As already noted, the strength of balance-sheet positions is likely to be an important determinant of borrowing and spending, insofar as it affects both permanent income and financial vulnerability. The relationship between balance-sheet strength and financial vulnerability, and therefore between balance-sheet strength and expenditures, is likely to be non-linear. When initial balance-sheet positions are strong – that is, assets far exceed debt repayment obligations – the probability of future financial distress may remain low even after a marked reduction in the value of asset holdings, and therefore expenditures may be little affected. But if balance-sheet positions are weak, the same reduction in asset values may significantly boost the probability of insolvency or illiquidity, and therefore lead to a sharp and sudden adjustment to borrowing and spending.

The initial financial condition of households and firms thus represents a key determinant of the impact of monetary policy. The stronger the initial position of balance sheets, the weaker will be the contribution of this channel to the impact of monetary policy on consumption and investment. In addition, the smaller the share of *net* debt (interest-bearing liabilities minus interest-bearing assets) in household and firm portfolios, the smaller will be the cash-flow effects of a given change in monetary conditions.

Various indicators could capture the vulnerability of the non-financial sector to different means by which balance-sheet changes affect spending. Unfortunately, very few countries (industrial as well as developing) collect the necessary statistics to allow the derivation of such ratios. One important measure is *net worth*, the ratio of net assets to income, which through standard neoclassical effects is expected to influence expenditures, even in the absence of concerns over debt repayment and financial distress. Another is the ratio of debt to assets which measures *leveraging* and may be better correlated with the probability that households or firms will have difficulty meeting scheduled debt service obligations. Insofar as interest payments on debt are likely to move more closely with changes in policy interest rates than returns on assets, the degree of leveraging

also indicates the prospective size of the cash-flow effect resulting from monetary policy measures. However, the latter effect would be more precisely captured by a third indicator, the ratio of net interest payments to income.

As a result of financial liberalisation, the private non-financial sector has had more access to credit as public sector use of bank credit has fallen and capital inflows have risen: this implies that, as in the industrialised countries, various measures of balance-sheet vulnerability to monetary policy actions are likely to have increased in emerging market countries in the past decade.

*Balance-sheet heterogeneity*

One implication of the non-linear relationship between balance-sheet positions and expenditures is that the effects of monetary policy will depend not only on the *aggregate* balance-sheet position of the non-financial sector, but also on its *distribution* among households and firms. If the financial condition of enterprises in an economy is very dispersed (some strong, others weak) the non-linearities between balance-sheet strength and spending will make the effects of monetary policy much more unpredictable than where most firms have rather similar balance-sheet positions. Aggregate measures of financial positions may therefore be misleading.

*The financial condition of the banking system*

The financial condition of the banking system is an important determinant of the cost and availability of bank loans. Declines in risk-adjusted capital/asset ratios can lead banks to limit lending by raising both interest rates and loan-qualification standards. As in the case of firms and households, the weaker their financial position, the more likely banks are to reduce loan supply as monetary policy tightens. When bank capital is high relative to assets, reductions in asset value (due to declines in securities prices or increases in non-performing loans) may still leave capital/asset ratios at comfortable levels. When initial capital/asset ratios are low, however, policy-induced increases in the cost of funds, declines in asset prices and deterioration in loan performance may force banks to sharply restrict loan availability, inducing a credit crunch that reinforces the effect of monetary policy in raising the cost of borrowing to households and firms.

Various developments over the past decade have accentuated the vulnerability of banks in emerging market economies to financial distress, and hence increased the sensitivity of bank lending to monetary policy. Macroeconomic misalignments and their delayed correction have been a major source of disturbance. Secondly, the reduced dependence of the banking system on government support, both through privatisation and the reduction of subsidies, has made capital/asset ratios for banks more binding than in the past. Thirdly, financial liberalisation and reduced fiscal deficits have encouraged a marked shift in bank lending from the public sector to the private sector. Because banks in many emerging market countries had limited experience in private loan assessment and monitoring, and because prudential oversight mechanisms were not sufficiently strengthened, loan quality deteriorated. Finally, this tendency has been reinforced by large-scale capital inflows, which caused the supply of loanable resources to increase faster than banks could properly allocate. Two summary measures of banking sector financial strength (the ratio of non-performing to total loans and the capital/asset ratio) are shown in Table 16.

Discerning whether there has been a credit crunch or not depends on distinguishing between declines in loan supply and declines in loan demand as explanatory factors for the reductions in lending that typically have accompanied recessions. Attempts to identify significant effects of a credit crunch in both the weak 1990–91 recovery in the United States and the Japanese recession of the 1990s have met with only mixed success. The decline of bank lending in Mexico in 1995 has been subject to less formal analysis, but again there is disagreement as to how far the huge drop in real credit outstanding reflected the response of bank loan supply to widespread financial fragility in the economy in general, and the banking sector in particular, and how far the response of bank loan demand to high interest rates, economic recession and weak balance sheets. Similar observations could be made for Russia, where the sizable share of idle assets in banks' balance sheets could be due to both the financial problems of enterprises and the extensive bad loan portfolios of banks. The distinguishing line between the fragility of banks and that of borrowers as the primary cause of tighter credit availability is also difficult to draw in the cases of Brazil and Thailand.

One difficulty in identifying significant contractionary pressures from a credit crunch – that is, a tightening of loan supply induced by a weakening

Table 16

**Balance-sheet position of the banking system**

In percentages

| | Non-performing loan ratio | | | Risk-weighted capital ratio | |
|---|---|---|---|---|---|
| | 1983 | 1993 | 1996 | 1983 | 1993 |
| China | .. | 19.5 | .. | .. | 9.5 |
| India | .. | .. | 9.2 | .. | .. |
| East Asia | | | | | |
| Hong Kong | .. | 2.9 | 2.7 | 15.1 | 17.5 |
| Indonesia | 4.5 | 10.4 | 8.8 | .. | 11.9 |
| Korea | .. | 1.8 | 0.8 | .. | 11.0 |
| Malaysia | 20.6 | 6.1 | 3.9 | 10.4 | 11.3 |
| Singapore | .. | .. | .. | .. | 18.7 |
| Thailand | 9.7 | 7.7 | 8.2 | 8.6 | 9.3 |
| Latin America | | | | | |
| Argentina | 16.0 | 12.3 | 9.4 | .. | 18.5 |
| Brazil | 4.7 | 7.9 | 5.8 | .. | 12.9 |
| Chile | 11.4 | 1.0 | 1.0 | .. | 8.2 |
| Colombia | 2.2 | 2.7 | 4.6 | .. | 13.5 |
| Mexico | 9.9 | 7.6 | 21.4 | 9.3 | 11.3 |
| Peru | .. | 9.3 | 5.1 | .. | 10.5 |
| Venezuela | 7.6 | 7.8 | 4.4 | .. | 10.5 |
| Hungary | .. | .. | 4.0 | .. | 15.7 |
| Israel | .. | 4.8 | .. | 11.3 | 10.5 |
| Russia | .. | .. | .. | .. | 8.7 |
| Saudi Arabia | .. | 4.8 | 6.6 | 59.7 | 42.2 |
| *Memorandum*: | | | | | |
| United States | 3.3 | 1.3 | 1.1 | 8.6 | 12.8 |
| Japan | .. | 3.4 | .. | 9.1 | 9.1 |
| United Kingdom | .. | .. | .. | 8.4 | 8.1 |

Notes: For *Russia, Saudi Arabia* and the *United Kingdom* the capital ratio is measured as net assets/total assets.

Data for the 1996 risk-weighted capital ratio: Korea (9.1), Saudi Arabia (39.8), Venezuela (17.9).

*Chile*: Equity plus reserves/total assets (excluding fixed assets, contingency loans and other assets). *Hungary*: 1996. *India*: Public sector banks; end-March 1997. *Malaysia*: End-October 1997 data: non-performing loan ratio (4.3%); risk-weighted capital ratio (10.8%). *Saudi Arabia*: Non-performing loan ratio for 1993 is 1995. *Venezuela*: Non-performing loan ratio in June 1997 is 3.7%.

of bank balance sheets – is that even healthy banks will react to a tightening of monetary policy and a subsequent slowing of economic activity

by raising loan rates and loan standards. This in practice blurs the distinction between loan supply and loan demand. However, emerging market economies may be more exposed to a credit crunch than industrial countries because they are more dependent on bank financing.

## Unresolved issues in the monetary transmission process

There are four important aspects of the monetary transmission process where uncertainties and/or disagreements are especially deep, namely (i) the transmission of monetary policy actions to long-term interest rates and asset prices, (ii) gauging the tightness of monetary conditions, (iii) the scope for monetary policy under fixed exchange rates and financial fragility, and (iv) the effects of monetary policy in high-inflation economies. In all cases, the state of expectations very largely conditions the impact of monetary policy, and it is this which gives rise to the uncertainties.

*Long-term interest rates and asset markets*

As noted earlier, an important facet of the monetary transmission process is the impact of policy-induced changes in short-term interest rates on long-term interest rates and asset prices. According to the expectations theory of the term structure, long-term interest rates represent the average of future expected short rates plus a risk premium, while equity prices could be interpreted as reflecting the discounted present value of expected future enterprise earnings and real estate prices that of expected future rents. According to the principle of uncovered interest parity, exchange rates are determined by changes in international interest rate differentials. Therefore, changes in the short-term interest rate will influence long rates and asset prices, depending upon how monetary policy affects the path of expected future short-term rates, earnings or rents.

In practice, the response of long rates and asset prices to policy-induced changes in short rates has been difficult to predict, even in industrialised countries. First, it depends on how the expected future path of short-term interest rates is affected by a policy step. Much depends on how the action alters market expectations of the need for further measures. For example, the Federal Reserve's raising of short rates in February 1994 might have been expected to lower long rates on

Table 17

**Volatility of exchange rates, interest rates and equity markets**

| | Exchange rates | | Interest rates | | | | Equity markets | |
|---|---|---|---|---|---|---|---|---|
| | | | Overnight | | Three-month | | | |
| | 1986–90 | 1991–95 | 1986–90 | 1991–95 | 1986–90 | 1991–95 | 1986–90 | 1991–95 |
| China | 3.4 | 4.3 | .. | .. | 0.5 | 0.3 | .. | 21.6 |
| India | 1.3 | 3.2 | 2.6 | 5.7 | .. | .. | 8.9 | 10.4 |
| East Asia | | | | | | | | |
| Hong Kong | 0.1 | 0.2 | 2.4 | 1.4 | 0.8 | 0.5 | 8.8 | 7.6 |
| Indonesia | 3.9 | 0.2 | 2.2 | 2.0 | 1.6 | 0.6 | 10.8 | 8.6 |
| Korea | 0.8 | 0.6 | 0.9 | 1.3 | 0.0 | 0.2 | 8.9 | 7.7 |
| Malaysia | 1.0 | 1.4 | 1.2 | 0.3 | 0.4 | 0.3 | 8.6 | 7.0 |
| Singapore | 1.2 | 1.0 | 2.5 | 1.1 | 0.5 | 0.5 | 7.3 | 4.1 |
| Thailand | 0.6 | 0.5 | 1.2 | 1.9 | 0.5 | 0.7 | 9.3 | 8.8 |
| Latin America | | | | | | | | |
| Argentina | 18.8 | 5.3 | ∞ | 26.9 | ∞ | 23.1 | 31.7 | 17.6 |
| Brazil | 10.5 | 11.2 | ∞ | ∞ | .. | .. | 22.9 | 16.2 |
| Chile | 1.3 | 1.8 | .. | .. | 0.6 | 0.2 | 8.3 | 8.1 |
| Colombia | 0.3 | 2.2 | .. | .. | 0.9 | 1.8 | 6.4 | 11.5 |
| Mexico | 3.7 | 5.8 | .. | .. | 12.2 | 5.9 | 15.9 | 10.8 |
| Peru | 18.9 | 4.6 | .. | .. | 944.1 | 25.1 | 32.6 | 16.4 |
| Venezuela | 10.0 | 7.1 | .. | .. | 2.9 | 5.1 | 13.7 | 13.3 |
| Hungary | 3.0 | 2.9 | .. | .. | 5.7 | 1.6 | .. | 10.8 |
| Israel | 2.2 | 2.1 | .. | 0.7 | .. | 1.2 | 5.0 | 7.7 |
| Russia | .. | 13.1 | .. | 182.9 | .. | 14.8 | .. | 34.7 |
| Saudi Arabia | 0.0 | 0.0 | .. | 0.3 | 0.6 | 0.4 | 3.0 | 7.9 |

Table 17 (cont.)

## Volatility of exchange rates, interest rates and equity markets

| | Exchange rates | | Interest rates | | | | Equity markets | |
|---|---|---|---|---|---|---|---|---|
| | | | Overnight | | Three-month | | | |
| | 1986–90 | 1991–95 | 1986–90 | 1991–95 | 1986–90 | 1991–95 | 1986–90 | 1991–95 |
| *Memorandum*: | | | | | | | | |
| United States . . . . . | 1.4 | 1.5 | 0.3 | 0.2 | 0.2 | 0.2 | 3.9 | 2.2 |
| Japan . . . . . | 3.9 | 3.1 | 0.3 | 0.2 | 0.2 | 0.2 | 6.4 | 6.0 |
| Germany . . . . . | 3.4 | 3.5 | 0.3 | 0.2 | 0.3 | 0.2 | 5.9 | 3.6 |
| United Kingdom . . . . | 3.4 | 3.5 | 0.6 | 0.4 | 0.6 | 0.4 | 5.5 | 3.4 |

Notes: Volatility as measured by the standard deviation of monthly changes. Exchange rates vis-à-vis the US dollar. For the United States, the nominal effective exchange rate. ∞ denotes exceeds 1,000. Equity markets in US dollar terms.

*Chile*: Interest rate: the real interest rate as officially defined. *China*: Interest rate: one-year deposit rate. *Peru*: Interest rate: up-to-six-months deposit rate. *Russia*: Exchange rate: starting in mid-1992. *Saudi Arabia*: Exchange rate: starting in July 1996.

the grounds that it was pre-emptive (i.e. aiming to contain inflation even before it had started to rise). Instead, long rates rose as the market (correctly) foresaw further interest rate adjustments in the immediate period afterwards.

Secondly, asset prices are also determined by expectations of future macroeconomic performance which affect both future short-term interest rates and future earnings and rents. The difficulties of predicting future macroeconomic variables (not least after a significant monetary policy measure has been taken) make the response of long-term interest rates and asset prices to a change in short-term rates particularly uncertain. This is especially the case as the causality between asset prices and macroeconomic performance runs in both directions.

A final complication is that asset market behaviour frequently appears to deviate from the basic expectations model. Many movements in asset prices appear to reflect changing risk premia, speculative bubbles or other factors not obviously related to expected future returns. Asset market responses to monetary policy are likely to be particularly uncertain in emerging market countries, where asset markets tend to be shallower and less competitive. Often small groups of players can move the market. Swings in asset market prices may well be amplified by the greater availability of credit or other financing in the wake of financial reform. Market participants also may have less experience in pricing assets, and less access to timely and accurate information on the financial condition of firms seeking to raise funds. Furthermore, many of these firms may be new and therefore without an extensive track record, making them inherently more difficult to price. All of these considerations contribute to uncertainties about the appropriate level of asset prices and the prospective response of asset prices to monetary policy actions.

The unpredictability of asset market responses in many emerging market economies is likely to be magnified by the greater volatility of macroeconomic performance – including output and inflation – compared with industrialised countries (see Tables 17 and 18). This widens the range of possible responses to a given change in short-term interest rates.

One feature of many highly volatile economies, particularly in Latin America, is that this volatility takes the form of alternating high and low-inflation periods, which are usually associated with alternating fixed and flexible exchange rate regimes. In such countries, market expectations may focus narrowly on the probability of a future switch in regime, placing

Table 18

**The volatility of macroeconomic indicators and banking aggregates over the period 1980–95**

| | GDP | Inflation | Bank deposits | Bank credit to private sector |
|---|---|---|---|---|
| China | 3.5 | 7.7 | 7.5 | 6.1 |
| India | 2.2 | 3.6 | 2.3 | 3.5 |
| East Asia | | | | |
| Hong Kong | 3.4 | 3.5 | 7.9 | 6.9 |
| Indonesia | 2.0 | 3.1 | 7.8 | 20.1 |
| Korea | 3.5 | 7.2 | 5.3 | 5.6 |
| Malaysia | 6.9 | 3.7 | 8.8 | 8.4 |
| Singapore | 3.3 | 2.6 | 5.7 | 4.6 |
| Thailand | 2.7 | 4.6 | 6.6 | 6.5 |
| Latin America | | | | |
| Argentina | 5.5 | 860.0 | 23.5 | 34.4 |
| Brazil | 3.7 | 767.6 | 20.7 | 32.8 |
| Chile | 5.8 | 7.5 | 20.9 | 21.8 |
| Colombia | 1.5 | 3.9 | 9.0 | 9.1 |
| Mexico | 4.2 | 39.4 | 16.4 | 22.1 |
| Peru | 7.6 | 1,964.5 | 15.1 | 19.5 |
| Venezuela | 4.9 | 21.9 | 12.7 | 16.0 |
| Hungary | 3.8 | 9.1 | 12.0 | 7.9 |
| Israel | 2.0 | 111.0 | 15.0 | 10.7 |
| Russia | 4.5 | 363.3 | 7.6 | 24.9 |
| Saudi Arabia | 5.4 | 2.5 | 19.6 | 16.8 |
| *Memorandum*: | | | | |
| United States | 2.1 | 3.1 | 4.4 | 3.4 |
| Japan | 1.8 | 2.0 | 2.5 | 2.5 |
| Germany | 1.8 | 1.9 | 5.4 | 3.1 |
| United Kingdom | 2.4 | 4.1 | 4.4 | 6.1 |

Notes: Volatility as measured by the standard deviation of annual percentage changes. Bank deposits and bank credit to private sector as a percentage of nominal GDP.

*India*: Financial year data. *Russia*: 1993–95. *United Kingdom*: 1987–95.

less weight on prospective marginal changes in fundamentals that may occur within regimes. Accordingly, monetary policy affects long-term interest rates and asset prices mainly by influencing market expectations of a future regime shift or, more broadly, market assessments of the credibility of monetary policy. In Venezuela, for instance, prices of real

estate have tended to be determined in the first instance by the prospects of significant exchange rate adjustments (as property was viewed as a good store of value to protect against exchange rate depreciation), rather than by changes in domestic interest rates.

In a volatile environment, even a limited change in monetary policy might have large and not necessarily intentional effects on asset markets and aggregate demand. A loosening of monetary policy, if it prompts concerns of a new surge in inflation, may lead to sharp increases in all but the very short-term interest rates and to sharp declines in equity prices and the exchange rate; the net effect of these movements may be contractionary, not expansionary. Conversely, in the context of high and rising inflation, a sharp tightening of monetary policy may instil confidence, lower longer-term rates, and encourage a recovery of financial markets and economic activity. Of course, asset markets may move in ways that offset the direct effect of a monetary policy action in more stable industrialised countries as well, but experience suggests that the degree of offset is much less than in more volatile economies. Hence, the monetary authorities' room to manoeuvre probably is more limited in developing than in industrialised nations.

To the extent that asset market responses to monetary policy in emerging market countries are particularly uncertain and volatile, the question arises as to whether this volatility may be destabilising for economic activity in general. In principle, when asset markets are highly volatile, the informational content of particular movements in asset prices is reduced. This should cause investors to discount asset price movements to some extent, thereby reducing the impact of asset price fluctuations on consumption and investment decisions, and hence on economic activity.

In practice, asset market volatility has been closely associated with macroeconomic volatility (although as noted above, this certainly reflects some causality running from the latter to the former). Probably, a certain amount of myopia among investors and consumers contributes to a failure to discount asset market fluctuations sufficiently. Moreover, swings in asset market prices may well be correlated, for reasons discussed earlier, with the availability of credit or other financing. If certain classes of households and firms are excluded from credit market access during financial downswings, it may make sense for them to borrow as much as possible during the upswings. This will be particularly true if a poorly

developed legal system makes it difficult for creditors to recover their loans, thereby reducing risks associated with over-borrowing during periods of credit availability.

*Gauging the tightness of monetary conditions*

When monetary conditions are extreme, the direction in which to adjust monetary policy may be obvious: inflation calls for a tightening of monetary policy, while severe recession and/or price deflation would make monetary loosening appropriate. In more intermediate circumstances, it may be less obvious whether current monetary conditions are too tight or too loose, and therefore the direction in which to adjust monetary policy may be uncertain.

Unfortunately, there are no clear or unambiguous grounds for gauging the tightness of monetary conditions. Central banks have relied upon various statistical indicators of monetary conditions, but none of them has proved entirely reliable in providing an indication of future movements in aggregate demand and inflationary pressures. A common shortcoming of statistical indicators of monetary stance is that their relation to the ultimate objectives of monetary policy – aggregate demand and prices – will shift as the channels of transmission of monetary policy evolve.

The monetary authorities in many industrialised countries have largely abandoned monetary targeting, since changes in the demand for money have caused the relationship between the monetary aggregates, aggregate demand and prices to shift over time. This movement away from targeting has been less pronounced in several emerging economies (see Table 19). Both Brazil and Korea still formulate monetary targets, although they are only indicative and rather broadly defined given the volatility of money demand in recent years. M3 is an indirect intermediate target in Malaysia. By contrast, in China and Russia, where financial market reform has not yet progressed very far, the usefulness of monetary targeting does not appear to have been eroded much. Despite extensive liberalisation in recent years, Indonesia and Peru also continue to use a monetary aggregate target (respectively, the monetary base and base money) at least as a starting-point (while closely monitoring interest rate movements). In Venezuela, an IMF-supervised economic programme includes a target for M2. In India the money demand function appears to have remained stable over a long period as well as in the recent past, notwithstanding institutional changes and financial market development. However, because the

Table 19

**Principal intermediate/operating target for monetary policy**

| | |
|---|---|
| China | M1 and M2 |
| India | M3 (Broad money) |
| Hong Kong | Exchange rate against the US dollar |
| Indonesia | Monthly target range for the monetary base; target range for the real effective exchange rate |
| Korea | M2 and MCT (M2 + CDs + Money in trust) |
| Malaysia | Interbank interest rate, M3 is indirect target |
| Singapore | Exchange rate against a basket of currencies |
| Thailand | Money market liquidity; interbank lending rate; exchange rate |
| Argentina | Exchange rate against the US dollar |
| Brazil | Four monetary aggregates: the monetary base, M1 and two broader aggregates |
| Chile | Short-term interest rate (consistent with an annual inflation target) |
| Colombia | Annual target range for the exchange rate against the US dollar; interest rate range |
| Mexico | Net domestic credit; monetary base |
| Peru | Base money (consistent with an annual inflation target) |
| Venezuela | M2 |
| Hungary | Pre-announced crawling peg supported by interest rate objective |
| Israel | Short-term interest rate |
| Russia | Money supply and money base (including upper ceilings on net domestic assets of the monetary authorities and minimum floors on net foreign assets); exchange rate band |
| Saudi Arabia | Exchange rate against the US dollar |

interest rate has a significant, albeit still small, impact on money demand, the Reserve Bank monitors a host of indicators, quantities as well as prices, belonging to both the financial and the real sector.

Some central banks attach importance to the real rate of interest. However, the issue of what definition of inflation should be taken to define the real rate of interest is far from trivial. A particularly thorny

question is the weight to be attached to asset prices compared with goods prices – rapid changes within the financial system have often caused these two indicators to diverge. For example, some analysts speculate that in Japan during the 1980s changes in the structure of financial markets caused looser monetary policy to lead to higher asset prices rather than inflation of goods prices. According to this view, because goods prices were stable and the yen was strong, policy-makers failed to interpret surging asset prices as a signal of loose monetary policy until dangerous imbalances in the Japanese economy had already developed. The linkage between monetary expansion and asset prices also is believed to have assumed some importance in other East Asian economies such as Korea and Taiwan during the 1980s. In Indonesia, stock market prices have become an indicator used in guiding monetary policy. Unsustainable property price booms both fuelled, and were fuelled by, an excessively rapid expansion of bank credit in several Asian countries in the first half of the 1990s, contributing to the financial crises that erupted recently.

In emerging market economies, uncertainties about the channels of transmission of monetary policy, combined with rapid structural change in these channels, make the interpretation of indicators of monetary stance especially difficult. Moreover, even if the channels of monetary transmission are stable and well-understood, the greater volatility of financial markets and macroeconomic performance may loosen the linkage between indicators of monetary conditions and future economic outcomes. Also, if inflation expectations are high and volatile, it may be very difficult to identify which part of the interest rate reflects the real interest rate and which part the inflation risk premium. As the Brazilian paper puts it, the relevant real interest rate is the nominal interest rate minus the certainty equivalent of inflation, which will exceed its expected value by a "volatility" premium. Hence a high real interest rate is not necessarily synonymous with tight monetary policy if the "volatility" premium is similarly high. The Brazilian paper argues that the interest rate channel is strengthened when stabilisation policies have produced less volatile inflation. To avoid such problems, some central banks (e.g. in Chile) set monetary policy in terms of a real interest rate.

In some cases, different indicators simultaneously may point to very different monetary conditions. In the aftermath of inflation stabilisation, for example, certain emerging market economies have experienced simultaneous increases in real interest rates (pointing to monetary tightness)

and rapid credit growth (pointing to monetary ease). This was the case in Mexico after it stabilised the peso in 1988 and in Brazil following the implementation of the Real Plan in mid-1994. These developments could stem from a recovery of bank deposits and of access to international lending, which allows a loosening of credit rationing by banks, combined with continued concerns about future inflation and exchange rate depreciation, which cause nominal interest rates to decline less quickly than actual inflation. In general, whenever both price- and quantity-rationing are used to clear the market, opposite movements of prices and quantities may occur, making the determination of the monetary stance particularly uncertain.

*Monetary policy under fixed exchange rates and financial fragility*

Many countries have relied on the exchange rate as the nominal anchor. This largely reflects the fact that fixed exchange rates historically have provided the fastest and, at least initially, least costly way to reduce high rates of inflation.

A major drawback of this policy choice is that independent monetary action is constrained. In theory, a fixed exchange rate can force a central bank to accept the international level of interest rates, thus preventing it from increasing rates as much as needed to contain excessive credit and demand growth. Equally, a fixed exchange rate that becomes overvalued can lead to very large current account deficits. The automatic adjustment mechanisms associated with fixed exchange rates can be too disruptive. Downward rigidities in domestic prices mean that current account deficits, for example, must be adjusted through monetary outflows and demand compression, not through real exchange rate depreciation: this could severely test both the strength of the banking system and the political viability of the monetary authority.

In practice, however, there may be scope for a *somewhat* independent monetary policy even with a fixed exchange rate. This exists as long as domestic and foreign assets are not perfect substitutes, even when capital flows are entirely unregulated. The evidence is that domestic and foreign assets in developing economies are indeed less than perfect substitutes: statistical research indicates that rates of return on assets are neither equalised nor perfectly synchronised. In addition, the effects of monetary policy measures are not usually fully reversed by offsetting capital flows. Finally, the historical experience of countries which have had fixed

exchange rates and sterilised capital inflows suggests that these policies usually did succeed in raising domestic interest rates (or limiting their decline), at least temporarily. However, such effects are unlikely to be permanent and a country may have to cope with a sudden reversal after a period of prolonged capital inflow.

The lack of perfect substitutability between domestic and foreign assets, and hence the failure of exchange-rate-adjusted rates of return to converge, may in part reflect institutional factors. To the extent that financial markets are highly segmented and clear through non-price rationing mechanisms, market participants may fail to arbitrage deviations of domestic rates of return from international norms. For example, the domestic money market might be well integrated with international capital markets, but changes in money market rates might not lead to immediate, corresponding movements in deposit or loan rates. Market segmentation has been cited as a factor in maintaining a degree of monetary independence in East Asian countries that had fixed or quasi-fixed exchange rates before July 1997.

Another factor is that divergent risk premia for exchange rate changes may prevent the equalisation of returns across countries. Depending upon individual assessments of the sustainability of a fixed exchange rate regime, a given domestic interest rate may be viewed as highly attractive by some participants and too low by others. This may give the monetary authority a certain amount of leeway in targeting interest rates, although the more these rates deviate from international levels, the greater is the risk of triggering offsetting capital flows.

In practice, using the scope for some degree of policy independence often has taken the form of sterilising capital inflows or outflows. Unfortunately, sterilisation poses significant risks. Sterilising capital inflows can be costly, because it requires issuing domestic currency liabilities that generally pay higher rates of return than the foreign currency assets being acquired in exchange. If capital inflows rise more than expected in response to sterilisation, the fiscal costs of sterilising can become unacceptable. Another price, as pointed out in the Israeli paper, is that sterilisation reduces the exchange rate risk in the eyes of the typical domestic borrower.

Another issue that recently has attracted a good deal of interest is the scope for monetary policy – in particular in defence of pegged exchange rates – under conditions of financial fragility. In certain conditions of

financial fragility, the central bank may feel constrained from allowing the exchange rate to fall. This is particularly the case when there has been heavy foreign currency borrowing by domestic investors. The monetary authority may also feel constrained from raising interest rates sufficiently to defend a pegged exchange rate if banks already are in poor financial condition. Market participants usually realise when the central bank is confronted with a dilemma and this can cause great difficulties.

The constraint posed by financial fragility on monetary policy does not disappear once exchange rates are floated. Under normal circumstances, a depreciated currency tends to ease the problem of financial fragility by stimulating economic growth. However, heavy foreign currency indebtedness of residents can undermine this effect because an exchange rate depreciation increases the domestic currency burden of debt. Several currency crises in both industrial and emerging market countries have been preceded by heavy foreign currency borrowing to finance investment in local real estate. Exchange market crises have often struck when local real estate markets are depressed – so that a depreciation increases the local currency value of debtors' liabilities at the same time as the value of the assets falls. This double effect increases the risk of bankruptcy and poses severe problems for the local banking system. Awareness of this predicament has often tempted the authorities to delay for too long a needed exchange rate adjustment, thus distorting monetary policy.

These considerations underscore the need for structural measures to strengthen the banking system, so that monetary policy is free to concentrate on macroeconomic stability. This need, perhaps particularly evident in fixed exchange rate regimes, is also important under more flexible exchange rate arrangements.

*Monetary policy in highly inflationary economies*

The effects of monetary policy in highly inflationary economies are likely to differ from those in more stable economies in two respects: (i) the impact of monetary policy on aggregate demand; and (ii) the translation of changes in aggregate demand, in turn, into changes in output and changes in prices. Turning to the first of these aspects, various considerations outlined in the Brazilian paper suggest that in a highly inflationary environment monetary policy will have a smaller impact on aggregate demand than would be the case with low inflation. First, as noted above, when inflation is high and variable, the level of the real interest rate becomes

very uncertain, diminishing the importance of the interest rate channel in the monetary transmission mechanism. Secondly, in a highly inflationary environment, the maturity of financial instruments shrinks and long-term, non-indexed assets disappear. In this context, wealth and asset price effects of changes in monetary policy become much less important. Thirdly, in high inflation economies, both a reduction in bank deposits and a desire by banks to match the maturities of assets and liabilities severely restrict the role of bank intermediation in financing consumption and investment. Because the dependence of aggregate expenditures on bank loans already is low, they may be little affected by marginal changes in monetary policy.

Inflationary economies are distinctive not only in the linkage between monetary policy and the level of aggregate demand, but also in the impact of changes in aggregate demand on output and inflation. Among low-inflation industrialised countries, changes in monetary policy are believed to affect inflation initially by altering levels of aggregate demand and employment, which subsequently lead to changes in wages, costs and ultimately consumer prices. Conversely, in many emerging market economies with recent histories of high inflation, there is little prima facie evidence of a positive link between economic activity and inflation. In Argentina, Mexico and Peru, peaks in inflation rates were associated with sharp economic contractions, while disinflation programmes were linked to recoveries in output. This suggests that in certain cases the short-term Phillips curve may be vertical or even slope the wrong way – that is, higher levels of inflation may lead economic activity to contract. The verticality of the Phillips curve in such circumstances arises from the hyper-sensitivity of inflation expectations and price determination to changes in the monetary stance. This hypersensitivity, in turn, probably reflects memories of recent episodes of high inflation and monetary instability.

Because it is the most visible and frequently revised proxy for the aggregate price level, the exchange rate typically dominates expectations formation and price setting during high-inflation episodes. Shopkeepers in high-inflation economies know that depreciation of the exchange rate is soon followed by higher prices, and this leads them, in turn, to link their own prices to the exchange rate. One heritage of the very high inflation experienced in the 1980s is that the prices of many goods, in particular housing, are quoted in terms of US dollars in Israel and in many Latin

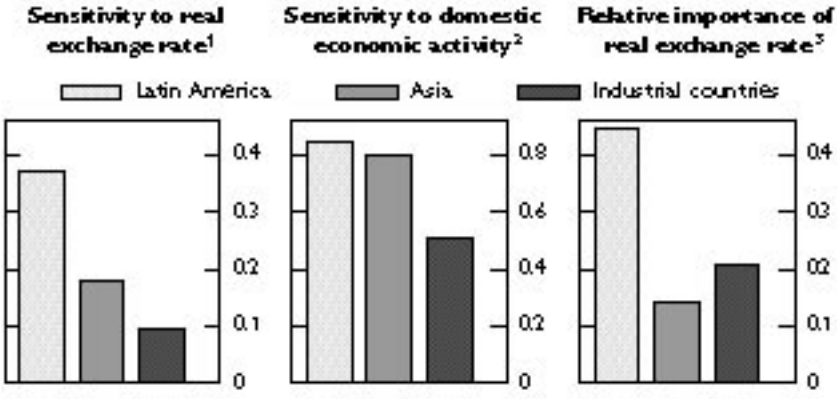
American economies. Hence, the proximate causes of inflationary upswings, even if induced initially by monetary expansions, have been mutually-reinforcing surges in inflation expectations and exchange rate depreciation, *not* an overheated economy following increases in aggregate demand. Virtually all successful disinflation programmes in recent decades therefore have centred on a stabilisation of the exchange rate, not a contraction in aggregate demand and in output.

There is statistical evidence (summarised in Graph 1) that inflation on average has been more sensitive in the short term to the level of the real exchange rate (relative to the sensitivity to domestic economic activity) in Latin America than in either Asia or in industrial countries. Inflation history appears to play a big part in this relationship: the scatter diagram shown in Graph 2 suggests that the estimated sensitivity of inflation to the real exchange rate is directly related to the country's inflation history.

This evidence suggests that in countries where memories of high inflation are fresh, monetary policy may affect prices primarily through its effects on the exchange rate. Moreover, in such countries, monetary

Graph 1

**Estimated sensitivity of inflation in major world regions**

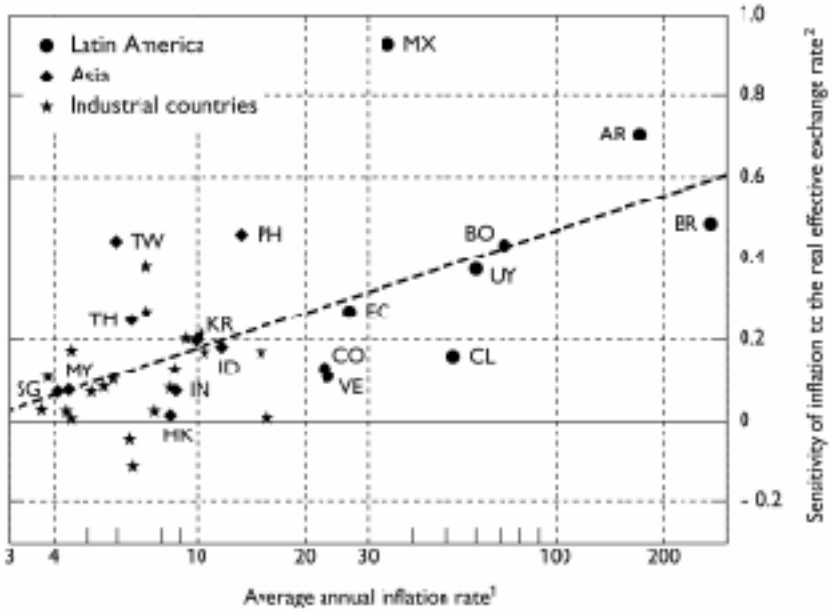



Notes: Sensitivities were estimated for nine Latin American countries, nine Asian countries and 20 industrial countries (see Graph 2 for a list of the first two groups). Regression equations also controlled for lagged inflation, the domestic currency value of foreign inflation and long-term trends.

[1] Average percentage point increase in inflation in response to a 1 percentage point depreciation of the real effective exchange rate. [2] Average percentage point increase in inflation in response to a 1 percentage point increase in the output gap. [3] Median ratio of exchange rate sensitivity to economic activity sensitivity.

Graph 2

**Inflation sensitivity and inflation history**




AR = Argentina; BO = Bolivia; BR = Brazil; CL = Chile; CO = Colombia; EC = Ecuador; MX = Mexico; UY = Uruguay; VE = Venezuela; HK = Hong Kong; ID = Indonesia; IN = India; KR = Korea; MY = Malaysia; PH = Philippines; SG = Singapore; TH = Thailand; TW = Taiwan.

[1] Percentage change in consumer prices between 1970 and 1996, subject to data availability (logarithmic scale). [2] Estimated increase in inflation in response to a 1 percentage point depreciation of the real effective exchange rate.

policy may be relatively powerless to affect aggregate demand, except insofar as it affects inflation expectations and the credibility of the monetary authority. Monetary loosening may frighten financial markets, causing a decline in asset values and a collapse in aggregate demand, while contractionary monetary policy that lowers inflation expectations may boost asset prices and encourage economic activity.

At what point do inflation expectations become sufficiently quiescent so that the monetary authority in countries with a history of high inflation has sufficient credibility to engage successfully in conventional aggregate demand management? The experiences of several countries that have implemented disinflation programmes present mixed evidence on this point. In Chile and Israel, which successfully reduced inflation from

triple-digit levels to rates close to international averages in recent years, monetary policy appears to have been implemented nowadays in a standard, countercyclical manner without reigniting inflation expectations. By contrast, in Mexico, the 1994 devaluation led very quickly to changes in prices, suggesting that even after several years of relatively low inflation, inflation expectations remained highly sensitive to changes in the monetary and financial environment.

## Concluding observations

The channels through which monetary policy work are complex. They also change over time, sometimes radically especially when new instruments emerge and financial markets are rapidly evolving or are becoming more international. It is therefore hardly surprising that the meeting produced no simple unifying philosophy behind the practical working of monetary policy.

The transformation in macroeconomic background that has taken place during the last fifteen or twenty years in many of the countries represented at this meeting deserves emphasis. Some suffered from chronic inflation, even hyperinflation, which rendered the normal channels of monetary policy transmission inoperative. In many countries, interest rates were not market determined, there were quantitative ceilings on credit and the State often influenced the allocation of credits. Moreover, capital controls meant that the exchange rate was not very sensitive to interest rates.

As these conditions have changed, so too have the transmission mechanisms. At the risk of oversimplification, discussion on transmission has often turned on two basic dimensions. The first is the relative importance of internal, closed-economy channels (such as domestic interest rates, money supply etc.) and external channels (notably the exchange rate). The second is the very old question in the theory of monetary policy – whether prices (interest rates) or quantities (monetary aggregates) give a better indication of the thrust of monetary policy.

For those developing countries going through major liberalisation and internationalisation in recent years, the exchange rate became, at least for a time, the main anchor of monetary policy. Similarly, for the authorities of a country gripped by hyperinflation, a fixed exchange rate can often

provide the only feasible way to rapidly disinflate. Precise modalities differed from country to country in the degree of commitment to a precise target: currency board; virtual fixing but without public announcement; or cases where the exchange rate dominated the central bank's policy moves.

However, with the exception of currency board regimes, the exchange rate has not in the majority of cases provided a *permanent* anchor. On the contrary, an exchange rate kept fixed too long has, in many cases, accentuated boom-bust cycles. A fixed exchange rate has often served to further stimulate already heavy capital inflows; despite attempts at sterilisation, few countries have managed to prevent a significant subsequent expansion of bank credit. In many cases, several years of widening current account deficits have eventually led to a very sharp drop in the exchange rate, sometimes causing great disruption. This experience, repeated in several countries in recent years, has led perhaps to a greater sense of realism about the authorities' ability to fix exchange rates in a world of ever-increasing capital market integration. This has prompted closer attention to the domestic channels by which monetary policy works.

Recent experience has also prompted some further reflection about the key role played by the quantity of bank credit and about the importance of balance-sheet adjustments as a channel of monetary transmission. Major recent financial crises in both industrial and emerging market countries have been preceded by periods of a very rapid growth in bank credit. Relatively high real interest rates often served to reassure central banks and others that monetary policy was sufficiently tight, but did not effectively curtail excessive credit expansion. One explanation for the co-existence of relatively high real interest rates with very rapid credit growth can be found in changes affecting balance sheets. Financial liberalisation and innovation gave firms and households greater freedom to borrow – in other words, to expand the liabilities side of their balance sheets. Banks often reacted to lower margins induced by deregulation by accepting more risk (e.g. by extending credit for the purchase of equities and real estate). In almost all countries that liberalised their financial markets, these developments triggered an asset price boom. For a time, rising asset prices created the illusion of strengthening balance sheets, thus permitting further borrowing. In such circumstances, a speculative bubble in property and equities becomes almost inevitable: when it bursts, the balance sheet positions of both banks and their customers

rapidly deteriorate sometimes leading banks to ration credit and often forcing the sudden adjustment of spending plans. These developments have led many central banks to take greater account of rates of bank credit expansion than they did in the past – both in upswings and downswings. More attention has been focused on how swings in asset prices affect the balance sheet positions of firms, households and banks.

Yet it was clear from this meeting that any dogmatism about how monetary policy works would be misplaced. The channels of transmission continue to evolve, often in unexpected ways. Policy-makers need to keep alert to these changes; they cannot escape the weighing of many complex factors in reaching decisions about monetary policy.

# The transmission mechanism of monetary policy in a stabilising economy: notes on the case of Brazil[1]

Francisco L. Lopes

Recent research has shown that understanding the transmission mechanism of monetary policy is a difficult and still largely incomplete task.[2] Understanding that mechanism in the context of a stabilising economy is an even more daunting challenge because stabilisation produces important structural and behavioural changes in the economy. During stabilisation the nature of the transmission mechanism is modified; indeed to a large extent stabilisation has to do with restoring the effectiveness of monetary policy.

A country that has lived under chronic high inflation for a long time produces a series of adaptations in its economic life that tend to reduce the power of monetary policy. As inflation recedes, these adaptations become superfluous and have to be replaced by normal stable price conditions. Hence as stabilisation progresses, important parts of the transmission mechanism have to be reconstructed so that the effectiveness of monetary policy can be gradually restored.

Among these adaptations to high inflation conditions, in the case of Brazil three are particularly relevant to our discussion. First, a crawling peg was adopted. The exchange rate became linked to a general price index, which amounted to freezing the real exchange rate.

Secondly, there was widespread currency substitution through the development of sophisticated financial indexation mechanisms.[3] As a result, long-term debt dominated in non-indexed domestic currency disappeared. The market overnight rate on federal debt repos – the so-called SELIC rate – became the leading interest rate and almost all debt, whether private or public, became linked to that rate. This meant that the

[1] The author is grateful to Marcio Garcia for a helpful suggestion in connection with the wealth channel.

[2] See for example Mishkin (1995) and the related symposium papers on the monetary transmission mechanism.

[3] See Dias Carneiro and Garcia (1993) and Garcia (1996) for details on the Brazilian experience.

duration[4] of all debt instruments, including credit operations, converged to zero.

And thirdly, the banking system became "float-dependent". Even though non-remunerated deposits shrank over time, banks were still able to amass a considerable amount of revenue from the high levels of inflation. They made large profits not only from demand deposits but also through (usually implicit) "administrative fees" on remunerated deposits whenever these were used as substitutes for demand deposits. These "fees" were paid by their clients because their only available alternatives were cash, demand deposits or foreign currency. Of these only the last offered a hedge against inflation, but it forced transactions out of the formal banking system (hence no cheques or other banking services). This transaction cost made remunerated deposits that offered an inflation hedge a clearly superior alternative to holding foreign currency. But that also meant that banks could charge a fee on these deposits (that is, could pay less than the rate of inflation) provided that the indifference threshold was not reached. This float-dependent banking system was characterised by low leverage. Credit was not an important source of revenue. Since both assets and liabilities were equally short-term (and of almost zero duration) balance-sheet risk was small.

In what follows we look at the main changes occurring in the transmission mechanism of monetary policy during stabilisation and some related issues for the case of Brazil.

## 1. The interest rate channel

The interest rate channel of transmission of monetary policy was clearly defined in Keynes's General Theory. The present value of capital and durable consumption goods is negatively related to the real interest rate (the marginal efficiency of capital function). A lower real rate of interest implies a higher present value of existing durable (capital and consumption) goods and an increase in the ratio between the prices of existing stocks and the prices of newly-produced goods (*Tobin's q*). Hence a

[4] Duration is defined as a weighted average of the components of a stream of cash flows, in which the time of receipt of each payment is weighted by the present value of that payment. It can be seen as a measure of the approximate change in the value of an asset or liability for a 100 basis point change in interest rates.

stimulus is given to the current production of durable goods and, through the multiplier, to aggregate demand.

In a high-inflation economy, the interest rate channel loses strength because the relevant concept of the real rate of interest must be modified to take into account the high volatility of inflation. The relevant cost of capital concept must take into account the nominal interest rate minus the certainty equivalent of inflation. If inflation is very volatile, its certainty equivalent will exceed its expected value by a "volatility" premium. Therefore a high real interest rate is not necessarily synonymous with tight monetary policy if the volatility premium is similarly high.

When inflation goes down the interest rate channel is strengthened because low inflation usually also implies less volatile inflation. Hence the volatility premium decreases. A given real interest rate will produce much more monetary restraint when inflation is low and less volatile than when inflation is high and more volatile.

## 2. The wealth channel

The transmission of monetary policy through wealth effects has been analysed in the Pigou-Metzler-Patinkin tradition. Here we want to focus on the public debt component of wealth.

In a high-inflation economy there is no long-term debt. In such an environment, since the duration of all public debt is very close to zero, changes in interest rates produce little impact on its present value. A simple way to model this is to assume that all public debt is in the form of perpetuities linked to the current (short-term) interest rate. Hence the stock of public debt has a present value of $B$ paying every period total interest of $i.B$, where $i$ is the interest rate for the period (which of course may change over time). Notice that although debt has infinite maturity it is really short-term because its duration is just one period.[5]

Under this assumption the public debt component of wealth is insensitive to the interest rate. Financial wealth can be defined as $W = m + B$, where $m$ is the real value of money. Assume aggregate demand is given by:

[5] In Brazil before the Real Plan, most of the public debt was in the form of LFTs (Letras Financeiras do Tesouro – Treasury Financial Notes), which could have maturities of up to one year but, since they were linked to the overnight interest rate (SELIC), had a duration close to zero (more exactly, of one day!).

$$Y = D(i, Y_d, W) + G$$

where private demand is negatively related to the interest rate and positively related to disposable income and financial wealth ($D_i<0$, $D_{Yd}$ and $D_W>0$) and public demand is given by non-financial expenditures $G$. Disposable income is given by GDP, $Y$, plus interest charges on government debt, that is, $Y_d = Y + i.B$. Assume a normal inverse relationship exists between real money and the interest rate. Hence an increase in the interest rate reduces demand both directly and through its effect on wealth (because $m$ and $W$ fall as $i$ increases) but at the same time increases demand through its effect on disposable income. The net effect on aggregate demand is clearly ambiguous.

This result is modified when we move to a low-inflation economy where long-term debt has been reconstructed. To see it most clearly, take the extreme assumption that all public debt is in the form of fixed rate perpetuities (like the British consols). In this case, the stock of public debt has a present value of $B/i$ paying every period total interest of $B$. Financial wealth is defined as $W = m + B/i$, and disposable income is given by $Y_d = Y + B$. In this case, an increase in the interest rate reduces aggregate demand through its effects on wealth while leaving disposable income unaffected.[6] There is no doubt that the net effect of an interest rate increase is unambiguously restrictive.

This analysis of the extreme cases of zero and infinite duration allow us to conclude that, as stabilisation consolidates and the duration of public debt increases, monetary policy becomes more powerful as a result of its transmission through the wealth channel.

## 3. The credit channel

It has been recognised in the literature that monetary policy affects not only the interest rate but also the "external finance premium", defined as the difference between the corporation's or household's cost of funds raised externally (by imperfectly collateralising borrowing, for example) and the opportunity cost of internal funds. This premium is very similar to the spread charged by banks between borrowing and lending rates and

[6] Observe that in this case interest rate changes are transmitted to aggregate demand through the effect on financial wealth of resulting changes in the present value of public debt.

it is an important determinant of investment and spending decisions. As emphasised by Bernanke and Gertler (1995), the credit channel is not really an independent alternative to the traditional interest rate mechanism but rather an amplifying mechanism.

Two mechanisms have been considered in the literature on the credit channel: the balance-sheet (or net worth) mechanism and the bank lending mechanism. The balance-sheet mechanism is based on the well-documented fact that a borrower with a stronger financial position pays a lower external finance premium. We also know that present value is more sensitive to a given interest rate change when the stream of payments is longer. In other words, the interest elasticity of an asset price is higher when the stream of payments derived from that asset has a longer duration. To the extent that corporations and households have balance sheets in which the duration of assets exceeds the duration of liabilities, their net worth becomes inversely linked to the interest rate. This may be the case, for example, if a large part of borrowing is in the form of short-term or floating-rate debt. Also, if a rising interest rate causes declining asset prices, the value of loan collateral will shrink. The result is that a higher interest rate worsens the financial position of most firms and households, increasing their external finance premium and depressing spending.

In a high-inflation economy, this balance-sheet mechanism loses strength because long-term debt disappears. In an environment where the duration of all debt instruments, including credit operations, is very close to zero, changes in the interest rate produce little impact on the relative prices of financial assets and on the relative valuation of capital assets; hence their effect on net worth is negligible. On the other hand, in a stabilising economy, as long-term debt is gradually recreated, the balance-sheet channel comes back into operation.

The other mechanism of the credit channel, the bank lending mechanism, works through the conditions of supply of bank loans. A tightening of monetary policy reduces the supply of loans for small or medium-sized bank-dependent businesses, which are forced to search for new lenders and to construct new credit relationships. These costly activities are likely to increase their external finance premium and hence to affect their spending decisions.

In a high-inflation economy, where banks are float-dependent and assume minimum credit risks, this mechanism cannot be very powerful.

With the fall of inflation, float revenues disappear and the banking system finds itself oversized. Reducing costs to match the now reduced level of revenues is a slow, painful process. Moreover, an obvious "prisoner dilemma" exists: any bank that avoids reducing costs early, for example by not closing unprofitable branches, may end up gaining market share. Hence there is a profit in not being the first to adjust by reducing costs, the typical non-cooperative solution to the non-zero-sum game.

In order to maintain profitability in this new low-inflation environment, banks try to create new sources of revenue rather than cut costs dramatically. They are bound to take more risks, by increasing leverage and turning credit operations into an important source of revenue. In this process they are also likely to increase their currency risk exposure if borrowing abroad offers a low-cost alternative to domestic funding. As a result, the bank lending mechanism becomes more powerful and there is also an increased risk of bank distress.

## 4. The exchange rate channel

In a high-inflation economy where a crawling peg is in operation, which is the most typical case, the exchange rate channel becomes powerless. Inflation stabilisation usually proceeds either through a currency board, as in Argentina, or through a floating exchange rate coupled with very high interest rates, as in Brazil. In the first case there is a self-imposed restriction on the use of monetary policy: the domestic interest rate is determined by the interest rate on the currency to which the domestic currency is pegged. The exchange rate channel is clearly shut off.

In Brazil the Real Plan, launched in July 1994, maintained a floating exchange rate coupled with a real interest rate of 27% (annual rate) in its first six months. The nominal exchange rate (R$/US$) appreciated by 16% and the trade balance moved from a surplus of US$ 12.9 billion in the 12 months ending in June 1994 to a deficit of US$ 600 million in the 12 months ending in June 1995, and of around US$ 5 billion in 1996. The recessionary nature of this movement in the trade account cannot be seen in the GDP statistics because output growth proceeded at a rapid pace fuelled by the consumption boom that typically follows stabilisation. But GDP growth rates of 5.8% in 1994 and 4.3% in 1995 would certainly have been much higher without this contractionary shift in the trade

balance (judging from the Argentine experience, perhaps some 2 to 3 percentage points higher each year). There is no doubt that the exchange rate channel was fully operative here.

Starting in 1995, the central bank used a policy of intervening in the exchange market in order to avoid further currency appreciation, thereby reducing somewhat the contractionary impulse through the exchange rate channel and avoiding (ceteris paribus!) a further deterioration in the trade balance. A formal band was adopted in the first half of 1995 (with a width of around 8%) and a "very dirty" float has been used since the second half of 1995, with almost weekly interventions using very small informal "mini-bands" (with a width of no more than 0.5% between buying and selling points). But the vast majority of interventions was aimed at avoiding exchange rate appreciation, which real interest rates of 33% in 1995 and 17% in 1996 promoted. Most of the time, the central bank was on the buying side of the market with the balance of payments showing surpluses of US$ 13 billion in 1995 and US$ 10 billion in 1996.

The exchange rate channel has probably been the key transmission mechanism of monetary policy in the recent Brazilian experience. This stabilisation process cannot be adequately described as an exchange-rate-based one. The combination of large foreign reserve accumulation (from US$ 42.9 billion in June 1994 to US$ 60.5 billion in November 1996) with extremely high interest rates leaves no room for doubt that this has so far been a monetary-policy-based stabilisation process. As stabilisation proceeds and other channels of transmission of monetary policy are gradually restored, one may expect that the need for very high interest rates will be somewhat reduced. A tight monetary policy stance in a floating exchange rate regime will become possible with interest rates comparable to those used by stable advanced countries. Only at that point will stabilisation be truly consolidated in Brazil.

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# Monetary policy transmission: the Chilean case

Nicolás Eyzaguirre

## Introduction

In order to understand the workings of monetary policy in Chile it is important to bear in mind the special characteristics of its financial system. Chile has a quite free and developed financial system compared with most other developing countries. Credit markets operate without any ceilings, either on quantities or on interest rates, which are determined by the interplay of supply and demand. Reserve requirements are relatively low (9% on liquid assets and 3.6% on time deposits); they are not used for monetary policy purposes and have remained almost unchanged for the last two decades.

Financial markets are relatively deep and long-term-oriented. Financial savings amount to 75% of GDP, and stock market capitalisation is close to 100% of GDP. There is also an important sector of institutional investors, consisting mainly of insurance companies and private pension funds (AFPs), which have a long-term horizon. Pension funds alone manage funds in the order of 35% of GDP, representing approximately one-quarter of financial liabilities and stock market capitalisation. These characteristics allow the central bank to conduct open market operations at both short and long term, targeting market interest rates and liquidity.

There are two other basic factors that have conditioned the development of monetary policy as well as exchange rate policy during the 1990s. A first factor has been the ending of restrictions on foreign currency holdings and the alleviation of the foreign exchange scarcity, so notorious during the previous decade. A second factor is the high degree of indexation that was so favoured and is still prevalent in the Chilean economy despite the considerable progress made in reducing inflation.

The massive inflow of foreign capital that began in 1990 dramatically changed the environment for monetary policy. It was also a tremendous obstacle to maintaining a high and stable real exchange rate, which had

been the basic aim of economic policy throughout the second half of the 1980s. As could be expected, when foreign capital began to flow freely again, this aim frequently clashed with the attempt to use monetary policy to rein in domestic expenditure. In order to alleviate this situation as far as possible, an unremunerated reserve requirement on foreign loans and deposits was adopted in 1992, designed mainly to curb short-term capital inflows. The intervention band for the exchange rate was widened from 5 to 10%, and more recently was further increased to 12.5% in order to permit greater exchange rate flexibility.

At the same time, the Chilean economy has been subject to a high degree of indexation that has prevented a more rapid drop in inflation. Consequently, a policy of gradual reduction of inflation has been adopted rather than an abrupt or radical decline to the levels of industrial countries. Indexation has been operated in the labour market and in the financial sector as well as being applied in the tax system. The main instrument of indexation has been the *Unidad de Fomento (UF)*, whose value rises on the basis of the past month's increase in the consumer price index. Indexation practices have so strongly conditioned Chilean economic policy that monetary policy uses the real interest rate as its instrument (instruments are denominated in the UF), and the exchange rate band is indexed to the consumer price index.

## 1. Monetary policy in Chile

From the creation of the Central Bank of Chile in 1925 until 1974 monetary policy was mostly subordinated to fiscal deficit financing. Credits to the Treasury were the first source of basic money creation in the country. Initially, the central bank financed any fiscal deficit virtually automatically, but from the 1940s it also extended credit for the development of a number of productive sectors. Money grew at an unsustainable rate, bringing annual inflation to a permanent two-digit level. In spite of many efforts made to bring discipline to monetary policy, the situation deteriorated progessively, culminating in an inflation rate of over 100% in the early 1970s.

In the mid-1970s the situation changed abruptly. Radical economic reforms were implemented in order to modernise the economy and finally curb inflation. The fiscal deficit was cut sharply and the Chilean

peso was pegged to the US dollar, accompanied by major capital account liberalisation. At first the exchange rate was fixed against the dollar with periodic mini-devaluations, but in 1979 a completely fixed exchange rate was introduced. Monetary policy was once again passive, dictated by balance-of-payments considerations and the need to maintain the fixed exchange rate. This economic policy collapsed in 1982, with the worst economic crisis in Chile since the Great Depression of the 1930s. From 1982 to 1985 monetary policy was oriented towards recovery from the economic depression and the collapse of the financial sector.

In 1985 the central bank adopted an entirely new approach, which is still followed today. With a capital account less open than in the second half of the 1970s and an exchange rate band, the monetary authorities could influence market interest rates and at the same time maintain a narrow foreign exchange intervention band. Since then, monetary policy has focused on keeping the growth rate of aggregate spending in line with that of the economy, and in turn curbing inflation. Nevertheless, in the second half of the 1980s the economy was still depressed, facing severe external restrictions, and a high and stable real exchange rate (depreciated domestic currency) was needed in order to promote exports. Faced with a trade-off between inflation control and maintaining a competitive real exchange rate, the monetary authorities gave priority to this second goal, indexing exchange rate policy.

In 1990 the Banco Central de Chile was granted a new Charter establishing the autonomy of its Board from the political authority. The Charter also explicitly defined the Bank's objective as being "to ensure the stability of the currency system and the due payment of both domestic and foreign debts". Inflation stabilisation became the main target of monetary policy, albeit within the context of a gradual process, serving to minimise the costs in terms of employment and competitiveness. The Bank has since searched for the most efficient ways to fulfil this objective, taking into account the particular characteristics of the Chilean economy.

Since 1991 the Bank has operated with explicit annual inflation targets. These targets have been met every year. In implementing its policy, the Bank aims to achieve a level of interest rates, expenditure and output consistent with the stated inflation targets.

Market interest rates are freely determined by demand and supply conditions. The Bank influences market rates indirectly through its policy instruments. Until May 1995 monetary policy was implemented through

open market operations using 90-day real instruments (indexed to the UF). More recently it has shifted towards shorter-term instruments which have proved to be more efficient and flexible, with special focus on the overnight interest rate. Today the Bank offers a liquidity credit line at a discount rate and a liquidity deposit account, which together establish a ceiling and a floor for the overnight market interest rate. The fine-tuning of monetary policy is carried out through short-term repo and reversed repo operations within this market.

The Bank has medium-term debt instruments of 30 and 90 days (PDBCs and PRBCs respectively) and longer-term bonds ranging from 8 to 20 years (PRCs). All are auctioned twice a week in fixed amounts, so the market determines the yield curve. In view of the particular circumstances prevailing in Chile, all central bank debt is indexed to the consumer price index through the UF. It is important to note that in Chile all public debt is issued by the central bank and none by the Government.

## 2. Monetary policy transmission channels

Among the different monetary policy transmission channels, Chilean policy is mainly focused on the traditional interest rates/aggregate demand mechanism. In fact, the current policy pursues stabilisation of the growth rate of aggregate demand around the growth rate of potential output as an intermediate objective. Theoretically, this objective, together with a real exchange rate (RER) target, permits both control of the inflation rate and a sustainable external deficit, which are the final objectives of policy.

A key element in understanding why monetary policy has focused on aggregate demand is the extent and level of indexation of the economy. As mentioned above, most financial instruments, including those issued by the central bank, are indexed to the UF which is a unit of account that is adjusted on a daily basis taking into account one-month lagged inflation. This allows the monetary authorities to control the development of the real interest rate quite closely, giving a powerful policy instrument to control aggregate demand. The Bank offers an open window for overnight borrowing at a given UF interest rate. This rate, in turn, affects longer-term UF interest rates through the term structure, with the latter rates

approximating real interest rates.[1] It should also be mentioned that another benefit of using UF instead of simple nominal interest rates for conducting monetary policy is the clarity of the policy signal. While rises in UF rates are seen as an unambiguous indication of a contractionary policy, increases in nominal rates in a policy framework based on nominal variables may simply reflect a validation of a higher inflation rate.

The exchange rate transmission channel of monetary policy has been a central part of the Chilean monetary policy debate. While inflation decreased from an annual rate of 27.3% in 1990 to 6.6% in 1996, the real exchange rate appreciated by some 24.4%, implying that traded goods made an important contribution to the fall in inflation. Although, at first sight, it might appear that the authorities have used this channel to control inflation, the current account deficit objective places a major constraint on the trend of the real exchange rate. Thus, rather than being a pure contractionary monetary policy phenomenon, the observed appreciation has been the natural response of a growing economy and the result of the large exogenous capital flows that the emerging economies have received. Moreover, the authorities have tried to control capital inflows – and gain room for monetary manoeuvre without sacrificing real exchange rate objectives – by imposing an unremunerated reserve requirement on all capital inflows, with the exception of foreign direct investment, and by following an active sterilisation policy. Between 1991 and 1996 net reserves increased from US$ 6.6 billion to US$ 15.5 billion.

In its purest form, this unremunerated reserve requirement imposes a tax of the same nominal amount on all capital inflows, regardless of maturity. Thus, short-term capital pays a higher rate of tax than longer-term flows. Although it is still a controversial issue, this tax has allowed a positive (and significant) interest rate differential to be maintained vis-à-vis the developed world without inducing massive inflows. The covered interest rate differential was around 3% during 1996. New evidence shows that this tax has directly depreciated the real exchange rate by 3% and curbed capital inflows by US$ 700 million.

The other monetary policy channels – credit aggregates and other asset prices – have received less emphasis and have been less explored in the Chilean policy debate, although they are potentially important. As for

[1] The short-term UF interest rate is not as closely related to the real interest rate because of the delay in the calculation of the UF. This delay means that the UF is an imperfect indexation mechanism.

credit and other monetary aggregates, there is the problem of the high instability of nominal interest rates that results from the use of UF rates in monetary policy. Arbitrage and the way the UF is calculated imply that a three-month nominal operation has the following interest rate:[2]

$$i_{90} = r_{UF} + \pi_{t-1} + \pi_t$$

where $r_{UF}$ is the UF rate (very stable in the short run) and $\pi_t$ is inflation in month $t$. In this set-up $i_{90}$ is highly variable because monthly inflation is extremely volatile. This complicates the task of disentangling and taking into account monetary aggregates in the transmission of monetary policy. As for other asset prices, it is worth mentioning that stock market changes probably have some impact on aggregate demand through wealth effects, especially in view of the fact that the private pension system significantly increases the extent to which changes in stock prices affect agents' wealth.

Empirically, the transmission of monetary policy in Chile starts with the overnight UF rates affecting the medium-term UF market rates. A simple correlation between market and overnight rates is 0.92, showing that the initial policy in fact translates into a market reaction. The correlation with the external interest rate is close to zero for both domestic interest rates, so no spurious correlation – caused by a third interest rate – exists.

The second step in the transmission is the effect of market rates on the gap between aggregate demand and output growth. Error correction estimates show the following type of relationship for quarterly (log) changes in total aggregate demand (*AD*):

$$\Delta AD_t = 0.62 * \Delta AD_{t-1} - 0.01 * \Delta UFrate_{t-1} + OtherEffects$$

with *OtherEffects* denoting lagged disposable income.[3] Thus, a 1% increase in the UF interest rate produces a 1% decline in the growth rate of aggregate demand after one quarter. This effect increases to 2.2% after one year (measured against the starting level).

[2] For simplicity this equation shows an operation that starts on the tenth day of the month.
[3] *OtherEffects* also include the error correction term.

The third step in the transmission of monetary policy is the impact of a decline in the gap between the growth rate of aggregate demand and that of output (*Gap*) on inflation, in particular non-traded goods inflation. Traded goods inflation follows international inflation and the rate of devaluation of the nominal exchange rate. Since the latter is managed inside a nominal band, traded goods inflation is indirectly controlled by the authorities. Non-traded goods inflation shows the following relationship:

$$\pi_t^{NT} = 0.60 * \pi_{t-1}^{NT} + 12.14 * \Delta Gap_{t-2} + 12.15 * \Delta Gap_{t-3} + OtherEffects$$

with *OtherEffects* including wage inflation and the nominal exchange rate. Thus, a 1% drop in the aggregate demand/output growth gap reduced inflation by 0.1 percentage points after two quarters. After three quarters this effect increases to 0.3 percentage points, after six quarters to 0.5 percentage points and after two years to 0.6 percentage points.

Finally, it is worth examining what happens empirically with the real exchange rate after an increase in domestic interest rates. With this exercise one can check whether a contractionary monetary policy is too costly in terms of the current account objectives. Theoretically, through the financial market channel a contractionary policy produces an appreciation of the real exchange rate, while through the goods markets it may produce a depreciation (following a fall in the demand for non-traded goods). If higher rates did not imply an appreciation of the real exchange rate one could conclude that the unremunerated reserve requirement has been effective in the sense of allowing a tight monetary stance without sacrificing the real exchange rate objective. Estimates using monthly data show the following relationship for the real exchange rate (*RER*):

$$\Delta RER_t = 0.185 * \Delta RER_{t-1} = 0.003 * \Delta UFrate_{t-1} + OtherEffects$$

with the parameter of the UF interest rate not being significantly different from zero. *OtherEffects* mainly comprise productivity measures. At all events, the point estimate shows that a 1% increase in the interest rate depreciates the real exchange rate by 0.3% after one month. This provides evidence that the exchange rate channel is not operating through the financial market (or that the unremunerated reserve requirement is working as designed).

In sum, the transmission mechanism of monetary policy in Chile follows the traditional interest rate/aggregate demand channel. An increase in central bank interest rates moves market rates, and these rates decrease the gap between aggregate demand growth and potential output growth. In turn, this fall in the gap reduces non-traded goods inflation with some lag. The exchange rate channel is fairly well controlled through capital flow measures (viz. the imposition of an unremunerated reserve requirement) and an active sterilisation policy.

# Monetary policy transmission: the Colombian case

Alberto Carrasquilla*

## Introduction

This paper seeks to present the Colombian experience regarding the transmission of monetary policy. The first part provides a general overview of the institutions and operating procedures which have been established in Colombia and of the financial markets in which monetary policy is implemented. The second part of the paper will focus on the basic empirical relationships between the instruments of monetary policy and its effects. The third part of the paper takes a preliminary look at micro data at the firm level.

## 1. The context: institutions, instruments and markets

*(i) The central bank*

Monetary and exchange rate policy in Colombia is implemented by an independent central bank, the Banco de la República, which functions in the context of simple yet rapidly evolving financial markets. The Bank was made independent by the 1991 Constitution, while the legislation implementing this constitutional principle was signed into law in 1992.

The Bank's governing body is the Board of Directors (Junta Directiva), which is made up of seven members: the Minister of Finance, the Governor (Gerente General) and five full-time members, two of whom are appointed by each succeeding government. It is worthwhile mentioning that these five members have no direct involvement in the

* The author wishes to thank Andres Arias and Andres Carvajal for assistance with the econometric estimations. Also, the paper benefited greatly from the sharp, detailed and constructive comments on the part of BIS staff. I learnt much in the seminar and wish to express my gratitude to its organisers and fellow participants for an enlightening and very enjoyable event. All opinions, errors and omissions are my own responsibility.

administrative nor technical departments of the Bank.[1] Currently, the seven members of the Board of Directors are all economists with links to one of the two political parties (liberal and conservative) which have dominated the country for the last century. All the members hold graduate degrees from foreign universities (and in two cases, doctorates) and most have served in prominent government positions, including ministries, at one time or another during the last 25 years. This underscores the fact that the Board, and as a consequence the Bank itself, is a technically oriented body, at least by Colombian standards, which at the same time has important roots in the tradition of policy-making prevalent in the country.

The staff in charge of drawing up proposals for the Board's consideration and of implementing Board decisions currently comprises 118 members, divided into a research department and a monetary operations department, the latter also in charge of managing foreign reserves and monitoring banking sector developments. Senior members of the staff hold regular formal meetings with the Board of Directors in the context of several committees. First, a weekly organising committee meets on the Monday following each session of the Board to draw up the agenda for work on topics where future decision-making is required. This work is itself discussed in technical sessions which are scheduled at least once a week. The second type of regular meeting between the Board and the technical staff is a weekly committee on exchange and open market operations. At this meeting the staff present the basic data on financial market developments: monetary aggregates, interest rates, the foreign exchange market and the financial sector balance sheet. This committee is not a decision-making entity; when decisions on short-term policy are needed, the Board has to formally delegate the relevant authority. Finally, there is a monthly committee dealing with international reserves.

Board meetings usually begin with a discussion on the current state of the money and foreign exchange markets and later turn to particular topics. The discussion of each topic centres on a staff paper, occasionally supplemented by a formal written commentary by one or more Directors. These papers will usually have been discussed beforehand in the technical sessions held during the week.

[1] They are, however, responsible for the setting of general administrative policy, as opposed to day-to-day functions.

Table 1
**Board Resolutions by subject**

| | 1995 | % | 1996 | % |
|---|---|---|---|---|
| Reserve requirements | 4 | 13.8 | 10 | 34.5 |
| Exchange regime | 14 | 48.3 | 15 | 51.7 |
| Interest rates | 6 | 20.7 | 1 | 3.5 |
| Discount policy | 3 | 10.3 | 1 | 3.5 |
| Other matters | 2 | 6.9 | 2 | 6.9 |
| Total | 29 | 100.0 | 29 | 100.0 |

The Board of Directors is responsible for fulfilling the duties which the Constitution and the Law entrust to the Bank, namely to "*defend the purchasing power*" of domestic currency and to preserve the stability of the financial system. This responsibility is assigned along with that for several (interrelated) policy instruments: the nominal exchange rate regime, open market operations, discount windows and reserve requirements. Though assigned the role of lender of last resort, the Bank is not the supervisor of banking sector activity; this function is performed by the Superintendency of Banks, which is a government agency.

The Board holds weekly meetings each Friday morning and sets policy by means of Resolutions which are usually made public the following Monday. In 1996 the Board issued 29 Resolutions, as many as in 1995. Table 1 provides a breakdown of these Resolutions by subject.

As can be seen from Table 1, during the last two years the Board has devoted 74% of all Resolutions to issues regarding reserve requirements and the exchange rate regime. One reason is that Colombia has a complex system of exchange controls, which were put in place in the context of the surge in capital inflows experienced since the early 1990s, and most of the Board Resolutions in this area have been aimed at clarifying particular issues or changing some of the basic underlying parameters. Moreover, during the period under review the Board has set itself the goal of gradually simplifying the initially complicated arrangements regarding reserve requirements.

*(ii) The instruments of policy*

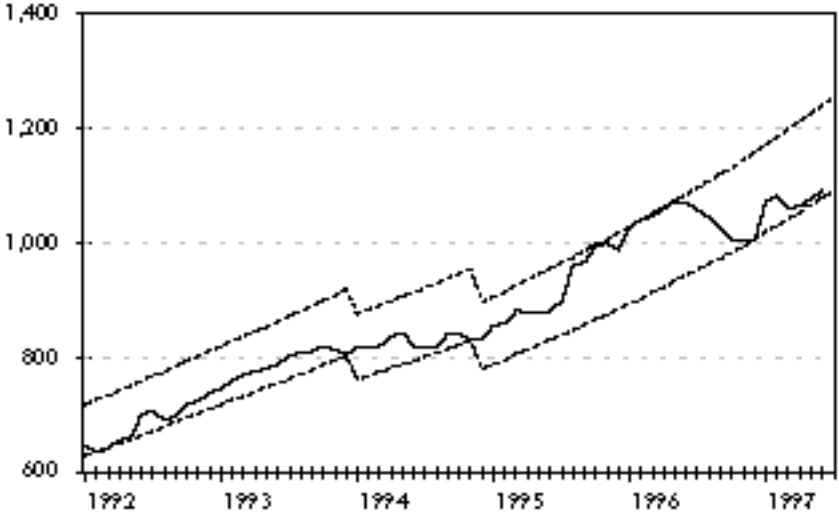
The Colombian exchange rate regime is built upon a dollar-based target zone or band which was introduced in 1994. Before that a crawling-peg

regime had been in operation. Between 1991 and 1994, however, a system which can be thought of as a band was put in place: the central bank issued dollar-denominated debt with a one-year maturity instead of high-powered money in exchange for foreign currency. The holder of this paper could redeem it at a 12.5% discount over the "official" exchange rate or sell it in the market. The exchange rate (pesos per dollar), of course, was established in the market for these bonds and hovered anywhere between the so called "official" exchange rate and a level 12.5% below it. Graph 1 shows the evolution of the exchange rate and of the bands, including the 1991–94 transitional implicit band just described.

In addition to this exchange rate commitment, the Board establishes bands for the money supply and for overnight interest rates. These three commitments obviously are not necessarily mutually consistent under many circumstances. Thus, an implicit hierarchy has been established with regard to the exit clauses to the system. Briefly, it can be said that during the last two years the Bank has given substantial weight to the exchange rate target and has, therefore, defended the band despite the fact that the money supply has not always evolved according to targets. A perception

Graph 1

**Exchange rate band – January 1992–July 1997**



that money demand might have been shifting led the Board to allow these departures from stated objectives. Moreover, the stability of the overnight interest rate has been an increasingly important goal of policy.

Operationally, the system is set up as follows. The Board defines an exchange rate zone, usually at the end of the year for the following year and in the context of a global discussion on economic policy with the Government. The first explicit band was implemented in January 1994 and its level was changed in December of that year (down by 5%) in the context of strong appreciation forces. The second change was implemented in January 1996 when the slope shifted from 11.5 to 13.5%, while the central parity was maintained. The third change became effective in January 1997, with the slope again changing from 13.5 to 15%.

The Bank acts at the margins; buying foreign exchange in the strong part of the band and selling in the weak part. During 1996 it has acted at both ends of the band, given the great volatility of the nominal exchange rate (see Graph 1). In addition to this form of intervention, the Bank also has the ability to intervene within the margins and has done so on some occasions, especially in 1996. The stated purpose of these intra-marginal interventions is to reduce volatility, and the rules governing these actions are designed with that goal in mind. For example, there is an explicit limit on the resources which traders can commit in intra-marginal interventions. There is also a rule which defines the precise exchange rate spread, between a moving average of the latest transactions and the marginal rate occurring in real time, which may trigger intervention.

The second market in which the Bank acts is the overnight money market. In this case, the Bank has established an interest rate band and commits itself to issuing one-day debt at the lower end of the band or, in the opposite upper case, offering one to seven-day liquidity through reverse repo operations on certain pre-defined assets.

The foreign exchange market is an interbank market in Colombia, owing to the nature of the relevant legislation. During the last three years, it has evolved as shown in Table 2.

Two salient pieces of information emerge from the data. First, relative to the stock of international reserves (US$ 8.5 billion), the size of the market is comparatively small (less than 3% in the highest individual daily case). Secondly, the market experienced a sharp increase in size during 1995, but flattened out in 1996.

Table 2
**Average daily transactions: foreign exchange market**
In millions of US$

| | 1994 | 1995 | 1996 |
|---|---|---|---|
| Q1 | 38.0 | 96.5 | 115.9 |
| Q2 | 41.0 | 106.2 | 120.5 |
| Q3 | 50.4 | 138.7 | 121.2 |
| Q4 | 61.3 | 117.8 | 127.6 |

The money market has developed as shown in Table 3. The size of daily transactions in the money market is a relatively stable proportion of the monetary base and is also relatively small. For example, in dollar terms and at current levels, with the nominal exchange rate at around pesos 1,000 to the US dollar, the daily money market is roughly equivalent to US$ 240 million, or 0.2 % of GDP.

Bonds are issued by the government and by the private sector, with financial entities a major supplier.

The equity market in Colombia is one of the most underdeveloped in the world. Recently, Demirgüç-Kunt and Levine (1996) compiled and examined stock market developments in 41 countries during the 1986–93 period. The indicators show that Colombia's is among the least developed markets in all categories relating to size and dynamics, namely in terms of the capitalisation ratio (38th), value traded (40th), number of listed companies (40th) and turnover (38th).

Table 3
**Average daily transactions: money market**
In billions of US$ and as a % of the monetary base

| | Size (US$) | % of M0 |
|---|---|---|
| 1995 Q4 | 205.4 | 3.7 |
| 1996 Q1 | 254.4 | 4.3 |
| 1996 Q2 | 251.5 | 4.3 |
| 1996 Q3 | 219.5 | 3.8 |
| 1996 Q4 | 238.1 | 4.1 |

## 2. Empirical aspects of the transmission process: the macro level

In the context of the simple yet rapidly evolving financial markets of Colombia, a detailed conventional analysis of the transmission process is difficult. In this section we seek to present basic macroeconomic data relating to the period 1980–96.

The precise identification of monetary policy is not a simple task, given that the authorities have pursued different objectives during the 1980–96 period. We can, however, provide a global view of the topic.

Our point of departure is given by the fact that the stance of economic policy in Colombia has been defined in the context of a global objective which has been to maintain moderate inflation, in the 20–30% range. Hypotheses regarding the internal logic behind this scheme have been advanced elsewhere.[2] For present purposes, it is sufficient to state the fact that the Colombian authorities can be adequately viewed as implementing a strategy that allows to keep the rate of inflation within the aforementioned band, while several real variables behave in a very stable fashion. Higher inflation taxes are traded off against lower volatility, with the financial sector acting as a fundamental component of the distribution of these resources. Indeed, Colombian macroeconomic volatility is comparable to that of the OECD countries.

The instruments of policy have been utilised within the constraints imposed by this general objective and by the presence of external shocks.

*(i) Preliminary discussion*

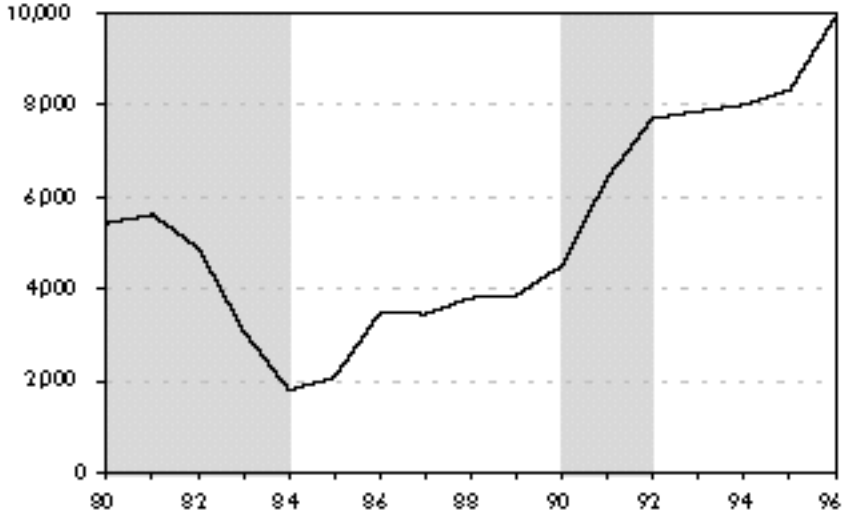
The sample period 1980–96 can be divided into three distinct subperiods, according to the nature of external factors. First, from 1980 to 1984 there is a substantial loss of reserves stemming from the defence of an overvalued exchange rate in the context of a reduction of capital inflows and sizable fiscal pressures. In 1985 an adjustment package is implemented, by means of which the fiscal deficit is drastically reduced and the nominal exchange rate devalued by 50%. The stock of international reserves increases and stabilises until 1990. The third period begins in 1990 and is associated with substantial capital inflows. The authorities

[2] See Carrasquilla (1995).

Graph 2

**Net international reserves**

In millions of US dollars




decided to defend the nominal exchange rate and thus implement expansionary monetary policies, at least until 1994. Since then, efforts have been aimed at regaining control of monetary and credit aggregates.

The sequence can be graphically illustrated. Graph 2 shows the evolution of the stock of international reserves between 1980 and 1996, where the aforementioned sub-periods are indicated by means of shading. The pattern outlined above emerges with some clarity.

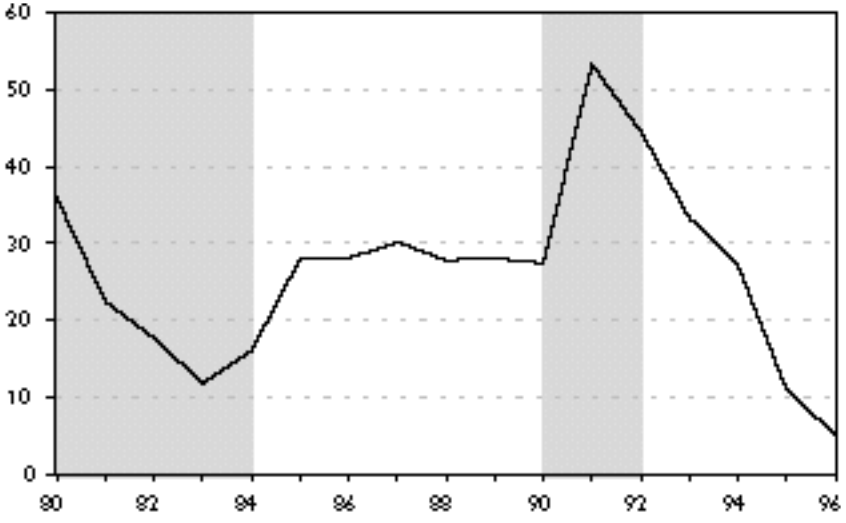
Graphs 3 and 4 show the rate of growth of the monetary base.[3] It is clear that the policy decisions are reflected in the dynamics of high-powered money. In the first subperiod the economy experiences a sharp reduction of the money supply, as agents perceive the exchange rate overvaluation and recompose portfolios away from domestic money, while the authorities insist on a strong currency. In the second sub-period (1990–92) the economy witnesses an increase in the money supply.

[3] Ceccheti (1995) suggests that the monetary base is the adequate measure of money for these studies.

Graph 3

**Nominal growth of the monetary base**

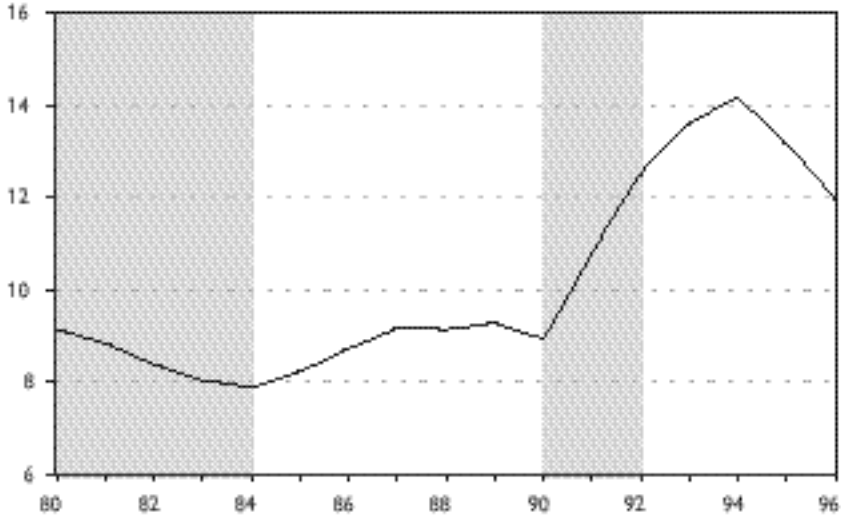
In percentages




Graph 4

**Real monetary base**

Index



In terms of the analysis of the transmission process, the Colombian experience is interesting in that it contains a substantial monetary contraction (1981–84) and a major monetary expansion (1990–92). Moreover, the former occurs in the context of financial markets which are regulated, while the latter occurs in the context of liberalisation efforts.

In both cases, the process reflects policy decisions regarding capital flows. In the first case the policy stance is characterised by the decision to maintain an appreciated exchange rate, and in the second the stance is characterised by the decision to defend a depreciated exchange rate.

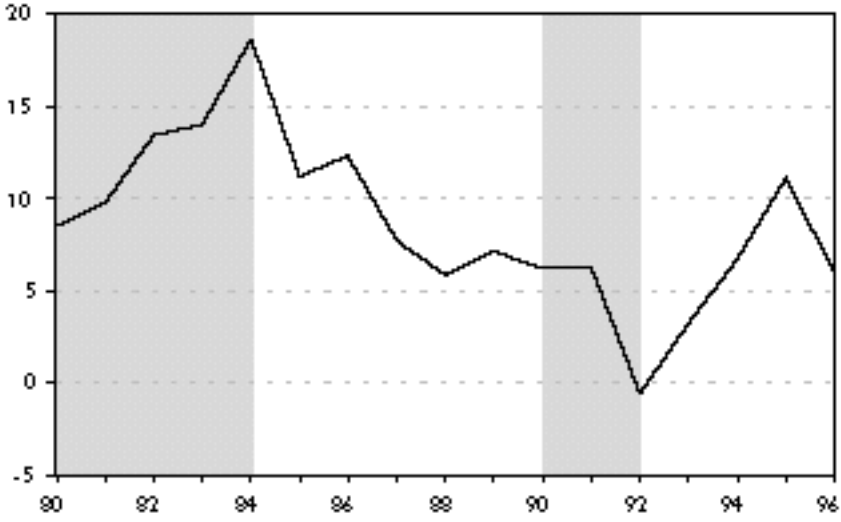
*(ii) A graphical exploration of specific channels*

The general outcome of these policy decisions can be explored using the following information set. Graph 5 shows the behaviour of the real (ex post) 90-day deposit interest rate. The 90-day market has been the most active for deposit-taking in Colombia. We concentrate on the two episodes outlined above; the contraction of 1980–84 is associated with a

Graph 5

**Real (ex post) deposit interest rate**

In percentages



sharp increase in domestic interest rates, while the expansion of 1990–92 is associated with a steep fall. Moreover, the tightening of monetary policy, which is clear from 1994 onwards, is associated with interest rate increases and sharp drops in money growth, with relatively stable foreign exchange reserves.

Mishkin (1995) has recently put forward a very simple, yet adequate, framework which allows a discussion of the different channels through which monetary policy may affect output in the short run. The first channel is the traditional interest rate channel which can be represented as follows:

$$\nabla M \rightarrow \Delta i \rightarrow \left\{ \frac{\nabla I}{\nabla C} \right\} \rightarrow \nabla Y$$

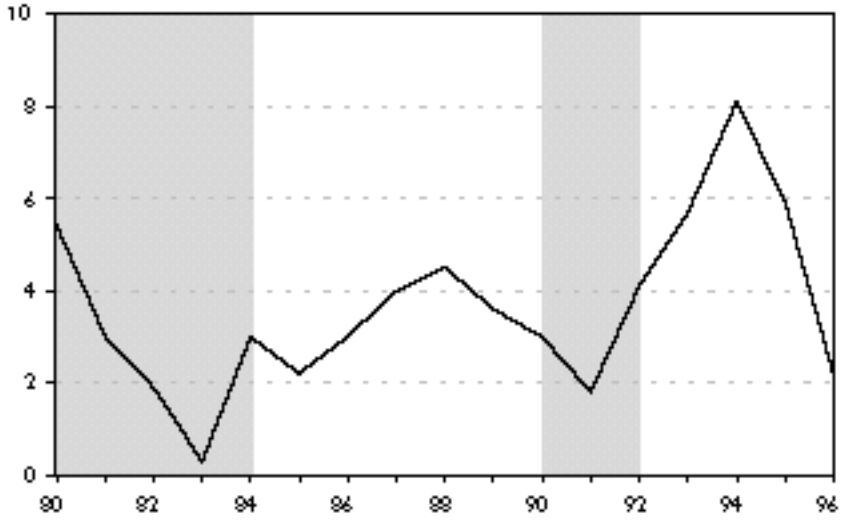
A monetary contraction increases the nominal interest rate (liquidity effect). This in turn decreases both consumption and investment and leads to a fall in output.

Is there an interest rate channel in Colombia? Graph 6 shows the rate of growth of private sector consumption. As can be seen, there is a

Graph 6

**Real growth of private consumption**

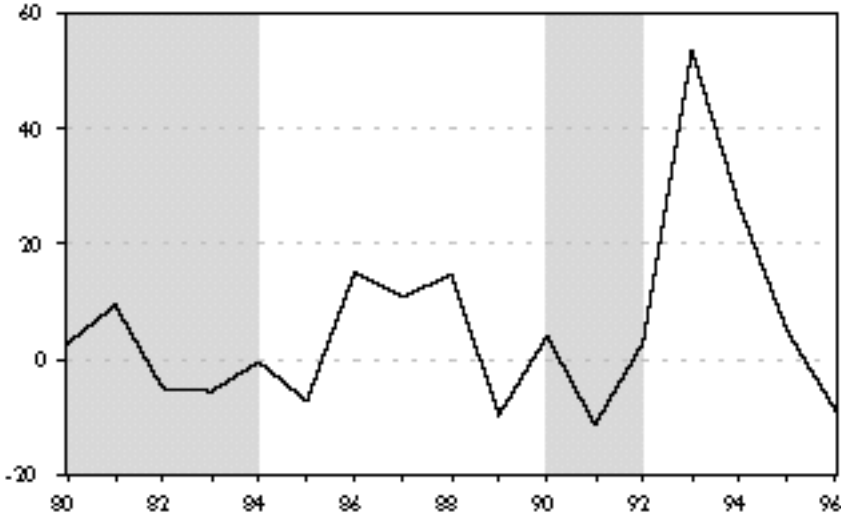
In percentages



Graph 7

**Nominal growth of private investment**

In percentages

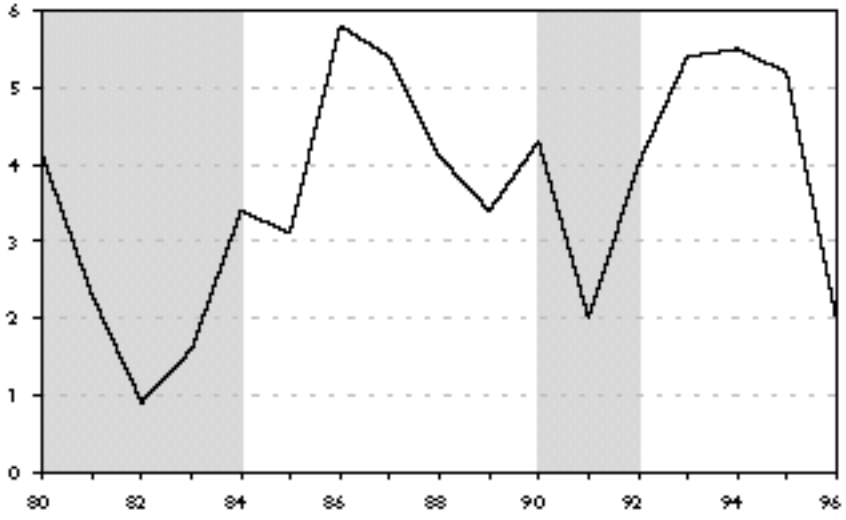



substantial fall in this rate from 1980 until 1983, a period of marked monetary contraction and interest rate increases. In the case of the monetary expansion of 1990–92, there is also a shift in the behaviour of private consumption, although the rate of growth accelerates belatedly, from near the beginning of 1992. There seems to be a lag in the response of this variable to the monetary policy shock. A similar response can be observed in the case of private investment, which is shown in Graph 7. Finally, Graph 8 shows the behaviour of the rate of growth of real output.

The data seem consistent with the existence of this basic interest rate channel, and also with the fact that it acts through both private consumption and private investment. A very basic caveat is in order. We have stated the idea that the two monetary policy decisions have much to do with exchange rate considerations in the context of important shifts in capital flows. These decisions are, in this sense, endogenous to choices which were made with respect to the exchange rate regime.

In other words, it could be argued that monetary developments have to do with a fixed exchange rate system in which money is endogenous. Our point is, first, that neither the nominal exchange rate nor the rate of

Graph 8
**Real GDP growth rate**
In percentages




devaluation has been fixed, as can be seen from Graph 9. Secondly, even if the argument were true, the decision to fix the nominal exchange rate, in the context of important developments in the determinants of the real exchange rate, is itself an exogenous choice of monetary policy. In 1980–84 the choice was contractionary, as the determinants of the real exchange rate implied a depreciation, and in 1990–92 it was expansionary, as they implied an appreciation.

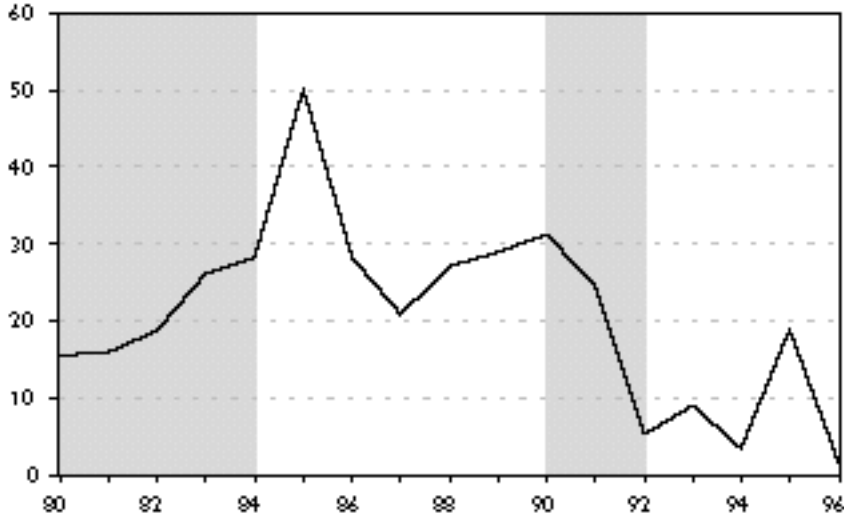
The second mechanism is linked to the credit channel. According to this view, the traditional interest rate channel is not sufficient to explain several stylised facts.[4] In order to account for these facts, which include issues of timing and of size of the responses of private spending to monetary policy, it has proved useful to broaden the analysis and include the banking sector and the peculiarities which it implies. A monetary shock affects the availability of loanable resources on the liabilities side of the

[4] See Bernanke and Gertler (1995). The most important limitation, according to the authors, is given by the size of the effects: small changes in short-term interest rates imply investment and consumption responses which are larger than those found in the estimation of the traditional behavioural equations.

Graph 9

**Nominal exchange rate devaluation**

In percentages




banking sector's balance sheet. An expansion, for example, increases these funds and induces lending on the part of banks both directly and indirectly, by altering the perceived costs of informational asymmetries.

Again using the simple scheme of Mishkin (1995), the credit channel operates as follows:

$$\nabla M \rightarrow \nabla \textit{Deposits} \rightarrow \nabla \textit{Loans} \rightarrow \textit{Firm problems} \rightarrow \nabla \textit{Loans} \rightarrow \left\{ \frac{\nabla I}{\nabla C} \right\} \rightarrow \nabla Y \left\{ \frac{P}{Y_R} \right\}$$

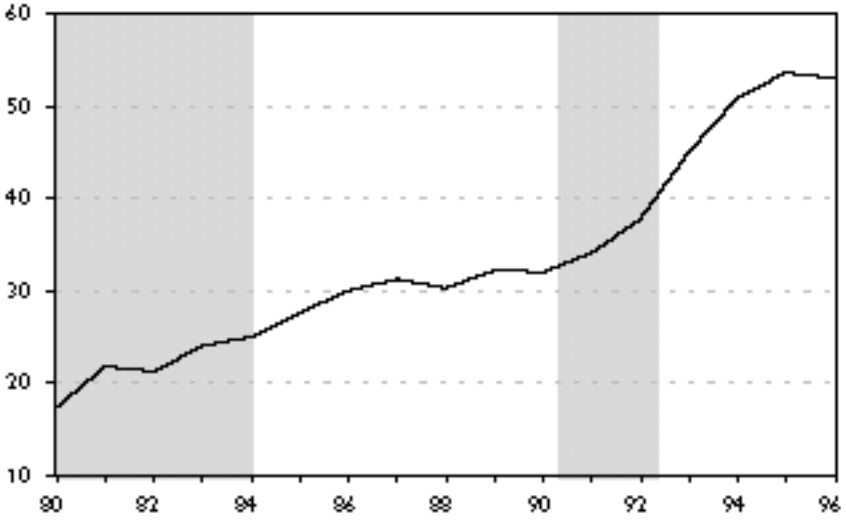
A contraction in high-powered money reduces deposits or, in an inflationary context, their rate of growth. A banking sector balance sheet constraint limits the ability to lend and thus creates cash-flow and other problems at the firm (and household) level. Perception of these problems further complicates the supply of funds on the part of banks. Thus, expenditure is credit-constrained and output falls.

Is this mechanism relevant in Colombia? Let us look at the basic data. First, we continue to associate the 1980–84 period with a contraction and the 1990–92 period with an expansion. Graph 10 shows the evolution of real deposits in the financial system. No particularly strong effect

Graph 10

**Real deposits in the banking sector**

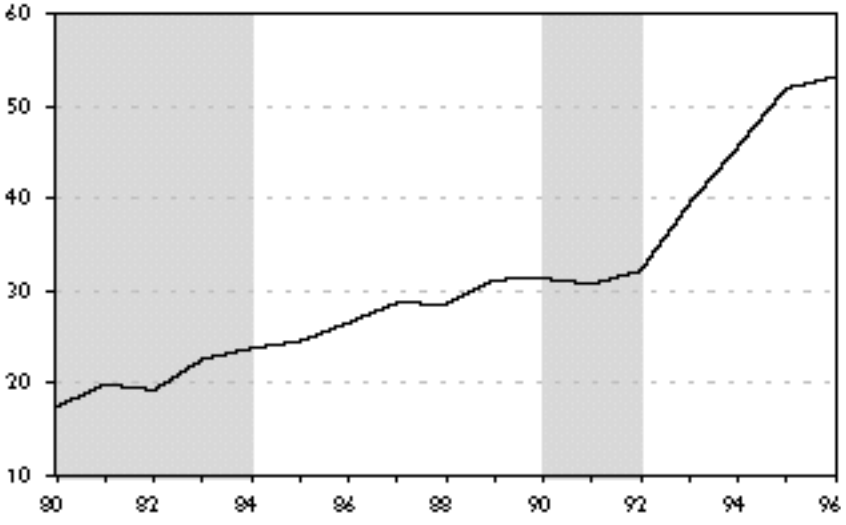
Index




Graph 11

**Real loans outstanding**

Index



can be clearly perceived in the contraction of 1980–84. On the other hand, it is very clear that the expansion of 1990–92 did imply a lagged response, which is particularly strong in 1994.

Financial sector loans outstanding are shown in Graph 11. Once more, there is a very different response to policy in 1980–84 compared with 1990–92. In the former case, the contraction did not limit banking sector lending, while in the latter the (lagged) response is very clear.

There are two possible explanations to the stylised fact. First, it could be true that there is a structural asymmetry between the effects of a monetary contraction and those of an expansion. McKinnon and Pill (1996), for example, have argued that informational imperfections could lead economies involved in a credible liberalisation process to what they call an "over-borrowing syndrome", in which banks overextend themselves. This type of imperfection emerges within the financial sector, and is crucially linked to excessively optimistic expectations on the part of agents, including the financial sector itself, domestic residents in general, international investors and policy-makers. In the initial phase of liberalisation, improved economic performance is indeed observed, as are large capital inflows. Part of this improvement turns out to be unsustainable, as debt levels rise beyond what is strictly feasible. Moreover, the phenomenon does not occur in the context of a contractionary environment.

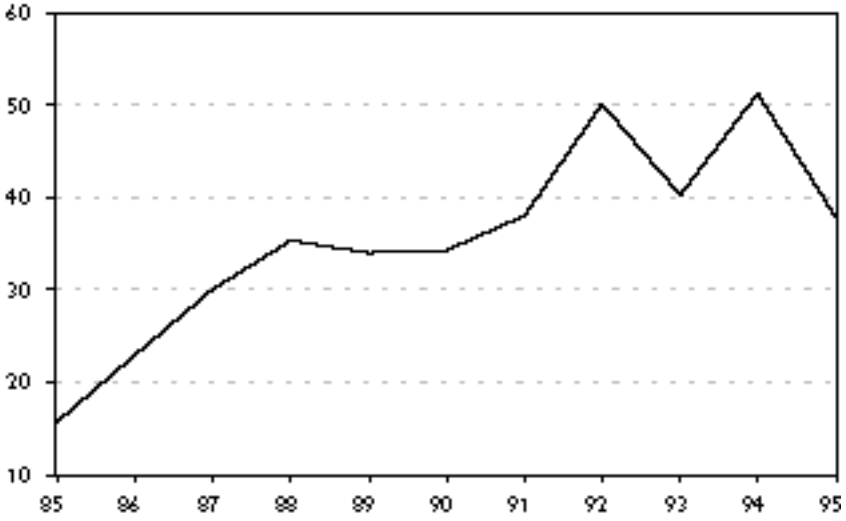
Secondly, the difference could be explained by the degree to which financial markets have developed. A monetary contraction, in the context of systems endowed with high levels of government involvement in the market-place and thus high degrees of moral hazard, might not lead bankers to implement the same type of behavioural adjustments as would be the case in a more liberal environment, in which risks are not transferred elsewhere. A banking crisis, in this sense, could well emerge as a consequence of a failure on the part of bankers, lacking adequate incentives, to perceive and respond to monetary policy decisions. This hypothesis implies that in the context of a high degree of moral hazard and other imperfections the credit channel might not operate as efficiently as in normal market circumstances, given the banking system's inability to adequately process information stemming from the monetary authorities.

In the case of Colombia both factors are relevant. First, the lack of adjustment to the significant contraction of 1980–84, which is shown in the data, is a major explanation of the banking sector crisis which clearly surfaced in 1985 and ultimately required heavy government involvement

Graph 12

**Asset price inflation**

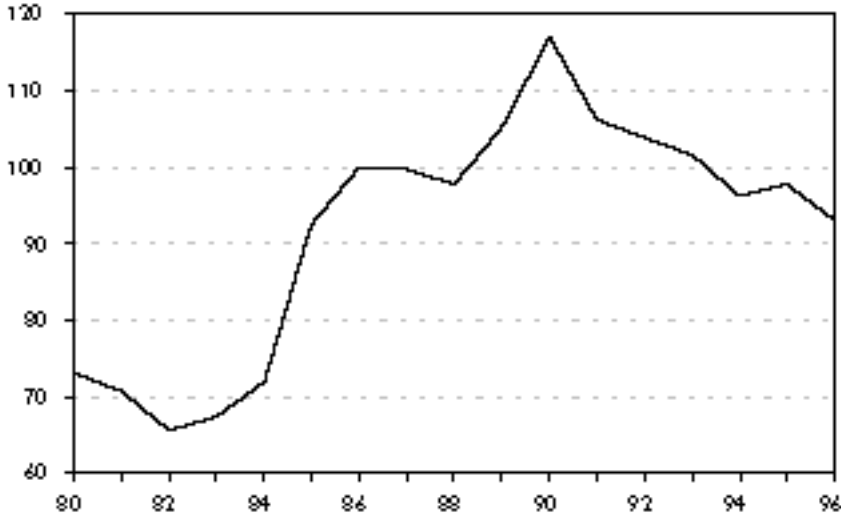
In percentages




Graph 13

**Real exchange rate**

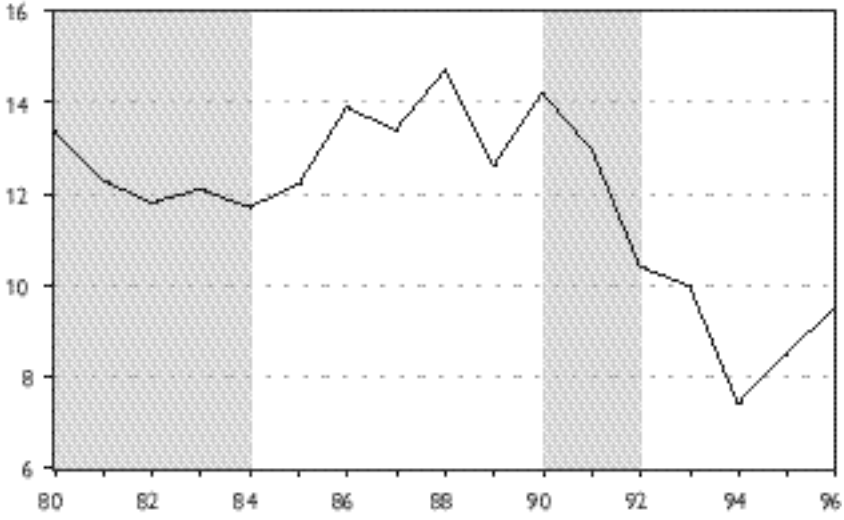
Index, 1985 = 100



Graph 14

**Private gross saving rate**

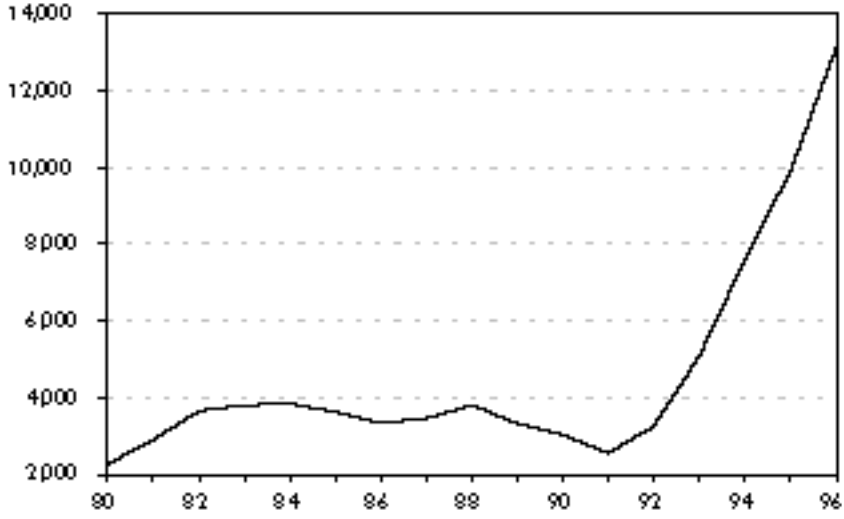
As a percentage of GDP




Graph 15

**Stock of private external debt**

In millions of US dollars



for its resolution.[5] It is thus clear that the perverse incentives facing bankers could well be a reason why the credit channel did not operate.

Secondly, in the 1990–92 expansion, there is some evidence that processes of the type described by McKinnon and Pill did in fact occur. Among these, it is appropriate to highlight substantial asset price inflation (Graph 12), real exchange rate appreciation (Graph 13), a sizable fall in private savings rates (Graph 14), and a rapid increase in private sector external indebtedness (Graph 15).

*(iii) VAR results*

In order to examine more formally the hypotheses outlined above, we constructed a conventional VAR model in which attempts were made to derive results with all the relevant variables discussed in the previous section. The technical details are contained in an appendix. Our results are consistent, robustly, with the following three basic findings:

1. There is a liquidity effect which stems from monetary policy. As can be seen from the upper panel of Graph 16, an expansion of the monetary base implies a reduction in the relevant (90-day) interest rate. This liquidity effect is significantly less than zero during the three quarters which follow the initial shock.

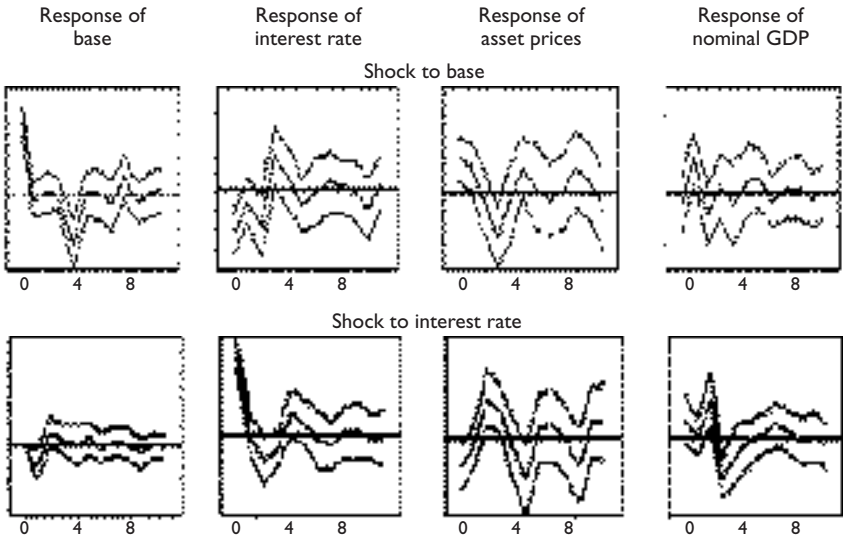
2. There is also a temporary asset price response, which is positive.

3. We were unable to find a significant response of expenditure to the monetary shock, though the interest rate shock does seem to anticipate a temporary nominal GDP adjustment.

[5] For a thorough discussion, see Montes-Negret (1996).

Graph 16

**Impulse responses**




## 3. Some basic micro level results

Systematic and comparable balance-sheet and earnings information at the firm level has been available since 1991. These data are gathered by the Superintendency of Industry, which is a government agency in charge of supervising the industrial sector. In this section we present the results of an analysis of the size effects present in this data set.

Our hypothesis stems from the type of issues raised, for example, by Bernanke and Gertler and has to do with the credit channel, in particular the differences between small and large firms in their adjustment to monetary policy shifts. Specifically, the question we had in mind was the possibility that smaller firms experience greater volatility of banking sector funds, while larger firms experience less volatility. Conceptually, this may arise because of the presence of scale economies in information gathering. In the face of a monetary contraction, banks may cease lending to smaller firms, where informational costs are high, before they cease lending to bigger firms, where they face smaller marginal costs of information and thus smaller risks of adverse selection.

To examine the issue, we randomly sampled 750 firms and examined their data for two of the five available years, one in which monetary conditions were relatively soft (1993) and another in which they were tighter (1995). In 1993 the ratio of total credit to GDP rose by 1.2 percentage points, while in 1995 it fell by 8 points. Real ex post 90-day deposit interest rates averaged 2.5% in 1993 and 10% in 1995.

After excluding firms whose reports were incomplete or presented inconsistencies, we chose the 100 largest and the 100 smallest firms in the sample, with size defined and ranked according to total capital outstanding.

Table 4 shows the implicit cost of external funds, measured as total financial outlays divided by total liabilities. The cost of funds is very similar when policy is expansionary. However, when policy is tightened, smaller firms experience a sharper increase in the cost of obtaining external funds than do large firms. There remains a question as to the availability of funds according to the stance of policy. A plausible presumption is that smaller firms are able to obtain proportionately more resources when policy is loose than when it is tight, relative to larger firms.

Table 4
**Implicit cost of funds and monetary policy**
In percentages

| | Expansionary stance | Contractionary stance |
|---|---|---|
| Large firms . . . . . | 17.0 | 29.8 |
| Small firms . . . . . | 16.2 | 34.0 |

Table 5 shows the growth in total liabilities according to the stance of monetary policy. There is a dramatic difference in the size of the adjustment experienced by small firms, relative to large firms.

Table 5
**Growth of liabilities and monetary policy**
In percentages

| | Expansionary stance | Contractionary stance |
|---|---|---|
| Large firms . . . . . | 26.8 | 38.5 |
| Small firms . . . . . | 138.4 | 29.4 |

Another point which has been raised has to do with the adjustment of inventories. The hypothesis is that larger firms do not cut production as much as smaller firms in the face of a contraction. Therefore, one should observe a greater build-up of inventories in larger firms than in smaller firms, as the former are able to fund these accumulations. Table 6 shows the rate of growth of inventory stocks in the two categories of firm.

Table 6
**Real growth of inventories and monetary policy**
In percentages

| | Expansionary stance | Contractionary stance |
|---|---|---|
| Large firms . . . . . | – 4.0 | 4.0 |
| Small firms . . . . . | –15.0 | 2.9 |

The evidence is clear. Both categories of firm experience a reduction of inventories in the expansionary phase and an accumulation in the contractionary phase. The difference between large and small firms is, however, very limited in the latter scenario.

## Appendix

In order to evaluate the transmission mechanisms of monetary policy at a macroeconomic level, we estimated a set of non-structural Vector Autoregression (VAR) models, including monetary policy variables and real sector variables, and made impulse-response functions accompanied by their respective confidence intervals (at a significance level of 90%).

The series used in the exercise were: nominal base, interest rate on three-month CDs, a series of asset prices,[6] the real exchange rate, aggregate credit, nominal GDP, real GDP, sectoral GDP of construction, manufacture, agriculture, transportation and commerce, and some components of aggregate demand (fixed investment, private consumption and public consumption). All the series were taken on a quarterly basis.

To achieve some variance stabilisation, the series were log-transformed and, when it proved to be necessary, some of them were seasonally adjusted by the X11-ARIMA procedure (which models the deterministic seasonal components) in order to avoid spurious results. Then, with the application of the Hasza-Fuller test, we evaluated the existence of unit roots on the autoregressive polynomial, at the zero and the seasonal frequencies. All the series were differentiated as indicated by the previous test.

Once we got second-order stationary series, we used the Akaike Info Criterion to evaluate the optimal lag structure to be used in any VAR system. In this case, the considered Akaike always corresponded to the equation where the real sector variable appeared as endogenous. With the chosen lag structure, we estimated the non-structural VAR and then orthogonalised the residuals (by the Cholesky decomposition) considering an order of the variables such that the most exogenous variable was the monetary instrument (the monetary base and/or the interest rate), the transmission variable (asset prices, the real exchange rate and the credit aggregate)[7] intermediated the process and, finally, the real sector variables (GDP, its sectoral components or the demand variables) were the most endogenous ones.

[6] This series was taken from Carrasquilla et al. (1994). It is constructed as a weighted average of the share price index at the Bogotá Bourse and an index of housing prices.

[7] A system that did not include any of these variables was intended to prove the existence of the traditional liquidity channel.

To conclude, the impulse-response analysis included confidence intervals (at 90% significance level) which were constructed by Montecarlo simulations implemented with the Monte Var procedure of the RATS System.

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# The transmission mechanism of monetary policy in Indonesia

Achjar Iljas

## 1. The objective of monetary policy

As stipulated in Act No. 13 of 1968 concerning the central bank, the main task of Bank Indonesia is to assist the Government in (1) managing, safeguarding and maintaining the stability of the rupiah, and (2) facilitating production and development with the aim of promoting employment creation and improving the living standards of the population. Accordingly, Bank Indonesia is responsible for formulating and implementing monetary policy which is directed towards achieving several objectives, namely low inflation, a sustainable balance of payments and relatively high economic growth so as to increase per capital income and provide adequate employment opportunities. This implies that the objective of monetary policy in Indonesia is rather broad, so that, as a consequence, Bank Indonesia bears a considerably more difficult and complex responsibility than some other central banks which are able to focus only on a single policy objective, such as inflation control.

The choice of a single or multiple objective of monetary policy has been a topic of discussion among central bankers for many years. Adoption of a single objective of monetary policy by central banks in industrial countries is based on the following arguments: (1) as the situation and environment have changed, the need exists for much lower inflation on a durable basis. As a consequence, monetary policy should concentrate its instruments on one objective, free from any policy trade-off, thereby strengthening the implementation of monetary policy; (2) a single objective will increase the transparency, accountability and independence of monetary policy; (3) a single objective is more realistic in a deregulated and globalised economic and financial system; and (4) it is easier to observe the channels of transmission and, therefore, easier to determine the right instruments.

Meanwhile, counter-arguments against a single objective are: (1) economic objectives should be achieved simultaneously (in harmony), and

a single objective may disrupt that harmony; (2) monetary policy alone may not be able to bring down inflation further and more might need to be done in other sectors. Thus, central banks may need not "independence" but rather "co-ordination"; (3) it may be unwise to aim for a very low rate of inflation, in particular if this can negatively affect economic growth and employment; and (4) certain sectors in the economy may still need financial support from the central bank, which may not be possible under a single objective.

Since the early 1970s, Indonesia has undergone a number of far-reaching structural adjustments in all economic sectors. As in many other countries, the adjustments were strengthened by faster globalisation processes and have major implications for monetary management. This paper will discuss the Indonesian experience in implementing adjustment reforms and dealing with the impact of reform on monetary policy as well as on the monetary policy transmission mechanism.

## 2. Structural adjustment measures and the effectiveness of monetary policy

Over the past quarter century, Indonesia has undergone a period of structural adjustments and implemented a wide-ranging package of economic reforms with the aim of putting in place all the essential elements for sustainable economic development in the long run. In the late 1960s and the early 1970s, Indonesia launched a bold stabilisation programme to restore the economic stability necessary for laying the foundation for sustainable growth. This was followed by reform in the area of the capital account, with the introduction in 1970 of a free foreign exchange regime, and further liberalisation in 1982. This reform was primarily aimed at attracting foreign capital, especially foreign direct investment, by building and maintaining foreign investors' confidence and creating an environment conducive to investment.

Adjustment measures were also taken in the financial sector. Beginning in June 1983, the Government took its first deregulatory step by liberalising interest rates and streamlining Bank Indonesia's liquidity credit scheme. Concurrently, Bank Indonesia moved away from direct monetary control through credit ceilings, and at the same time introduced new indirect instruments, namely open market operations. The process of

financial sector liberalisation was taken one step further in October 1988. The reform package introduced then removed the restrictions on the establishment of new private banks, the opening of branch offices of banks, non-bank financial institutions and rural credit banks, and permitted foreign banks to form joint ventures with local partners and to branch out to six major provincial cities. The package also included a reduction of reserve requirements for commercial banks from 15 to 2%.

In January 1990, Bank Indonesia took further steps to improve the credit system. The policy, necessary to curb inflationary pressures as well as the excess liquidity that could unfavourably affect savings mobilisation, was aimed at improving credit structure, removing the distortions in the market mechanism by promoting more market-oriented interest rates, and increasing the efficiency in the allocation of funds. Meanwhile, in line with efforts to develop a sound banking system, the central bank in February 1991 introduced a new set of measures that included capital adequacy requirements based on Basle standards, regulations on legal lending limits, net open positions, loan-to-deposit ratios, loan loss provisions, and limits on foreign commercial borrowing. More importantly, reforms were also carried out in the legal framework with the passing of a new Banking Act in March 1992, superseding the earlier banking act of 1967.

Reforms also have been implemented in other sectors. In 1987 and 1988, the Government took steps to energise the capital market with the aim of boosting investor confidence and a propitious climate for investment. Furthermore, a new capital market law was enacted in 1995 to strengthen the legal foundation of the market. In the fiscal area, the Government has carried out tax reforms in 1983 and 1984 and has also embarked on wide-ranging trade and investment reforms since 1984.

Overall, the adjustment measures have led to significant improvements in the efficiency of resource allocation, and this has in turn stimulated high economic growth. At the same time, the structure of the economy has undergone fundamental change. Financial deepening and the diversification of financial products through innovation have helped build a considerably larger role for the financial sector. On the other hand, monetary management has become a much more challenging task. Rapid changes in the global financial environment in recent years have led to a

situation in which control of capital inflows has become a major monetary policy concern in Indonesia. While foreign capital, especially long-term funds, has been necessary for financing domestic economic activity beyond the capacity of domestic resources, high capital mobility with large inflows of short-term capital seeking speculative gains, has complicated the task of monetary management.

## 3. The framework of monetary management

As discussed above, the difficulties in identifying a mechanism through which Indonesia's monetary policy is transmitted arise from a number of factors such as the multiplicity of objectives (as against a single objective), changes in monetary instruments (from direct to indirect instruments), far-reaching financial and other structural reforms, and increased economic and financial globalisation. Under these circumstances, monetary management in Indonesia still uses, as a starting-point, a standard and rather broad framework.

Since 1983, Bank Indonesia has sought to achieve the multiple objectives of monetary policy primarily through control of monetary aggregates (M1, M2) at levels that are adequate to support the targeted rate of economic growth but avoid internal and external macroeconomic disequilibrium. Under this framework, monetary aggregates have essentially become the intermediate target, to be influenced in turn by controlling the amount of reserve money (M0 – the operational target) through open market operations. Monetary management has thus relied on the linkages between M0 and M2 and between M2 and the ultimate objectives (see Annex 1).

So far, Bank Indonesia has continued to rely on open market operations as the primary instrument for conducting monetary policy. However, the changing financial environment has necessitated the use of other instruments to reinforce open market operations, such as the changeover from reserve requirements to statutory reserve requirements, and other prudential regulations enacted for the banking system. Another measure aimed at strengthening monetary control is moral suasion which is supported by the monitoring of bank credit expansion plans. Moreover, monetary management will be assisted by a more flexible exchange rate policy.

*(i) Stability of the demand for money, money multipliers and income velocity*

The framework adopted by Bank Indonesia requires stability of the money demand function, money multipliers and income velocity. Recent econometric work, presented in Annex 2, shows that these have been generally stable despite a noticeable trend towards greater volatility in recent years. The results of this study are discussed briefly below.

*Demand for money*

The error correction mechanism (ECM) model shows that the demand for money, defined as M1, is relatively stable. Therefore, monetary management using such a monetary aggregate as an intermediate target is still relevant. As regards the M2 function, however, although the explanatory power of the equation (as reflected by a rather high adjusted $R^2$) is good, its stability has to be interpreted carefully given that its behaviour is very sensitive to changes in the financial structure.

*Income velocity*

A tendency for the degree of stability of the demand for money function to diminish could also be reflected by a weakening in the long-run relationship between monetary aggregates and both output and prices. This could be verified by testing for the stability of income velocity. Using stationarity and cointegration techniques, it can be concluded that the income velocity of M1 is relatively stable but that it tends to decline in line with structural changes.

*Money multipliers*

The stability of money multipliers is an important consideration in monetary policy implementation because, operationally, the central bank cannot control the money supply directly. Less stable money multipliers create the risk of inappropriate monetary policy implementation. Therefore, the central bank should monitor the behaviour of money multipliers carefully. Using stationarity and structural equation techniques, it can be demonstrated that the money multiplier of M1 is still stable and predictable, while that of M2 is not. Structural changes in the financial system over the past eight years also are shown to have reduced the degree of predictability of the money multipliers for both M1 and M2.

*Relationship between intermediate targets and ultimate targets*

The effectiveness of monetary policy guided by quantitative targets depends not only on the stability of the demand for money equation, but also on the closeness of the relationship between monetary aggregates and ultimate targets, such as GDP growth and inflation. Current research on this relationship, using a Granger-causality and vector autoregression (VAR) approach, that has sought to establish which indicators (quantity indicators or price indicators) have a closer relationship with the ultimate targets, has yet to yield conclusive results, although it would appear that the relationship between monetary aggregates and the ultimate targets has become weaker and more blurred.

*(ii) The changing monetary policy transmission mechanism*

Another challenge confronting Indonesia's monetary authorities is the current trend of changing channels and the emergence of new ones in the transmission mechanism of monetary policy. In a rapidly changing environment, it is indeed very difficult to identify with precision the channels through which monetary policy affects the economy. The remarkable development of the financial system in recent years has provided the business community with a much wider array of financing alternatives. Businesses are now able to avail themselves of a great diversity of products offered by finance companies and other non-bank financial institutions, which have experienced very rapid growth in recent years The growing trend of securitisation has also led to a greater marketability and liquidity of every type of economic activity or transaction. Each process of securitisation creates new instruments, opens up new financial markets and builds new linkages between instruments and financial markets. These developments indicate that the process of transition from a heavily regulated economy to a freer and more open economy and globalised financial markets is still under way. The direction is quite clear, but the speed, magnitude and impact on other aspects such as the transmission mechanism are less clear.

In response to the new developments, Bank Indonesia has been following a rather pragmatic (eclectic) approach. In the transition to a new mechanism of monetary control, a pragmatic approach is important in the Bank's view. In order to strengthen the operations in open markets, Bank Indonesia activated the instrument of reserve requirements, with

the ratio being raised from 2 to 3% from February 1996 and to 5% from April 1997. Another measure aimed at strengthening monetary control is moral suasion, which is supported by the monitoring of bank credit expansion plans. Moreover, in order to stem the inflows of short-term capital that led to a rapid expansion of the stock of money, Bank Indonesia widened the intervention band for the exchange rate several times before finally abandoning the band on 14th August 1997. Finally, although quantitative targeting is still relied upon, more attention has been given to price indicators, namely interest and exchange rates.

*(iii) Monitoring broader indicators*

In line with the adoption of multiple objectives and the eclectic approach mentioned above, Bank Indonesia monitors and analyses a wide range of indicators to determine the monetary policy stance and its effectiveness. In addition to the standard ones, the monetary authorities have thus monitored closely other indicators, such as international economic and financial market developments, asset price trends, capital flows, consumption, investment, and capacity utilisation.

Research conducted in this area to date shows that a number of variables such as interest rate differentials, nominal exchange rate movements and the output gap may be used as leading indicators. With the rapid development of the financial system and the growing efficiency of the payment system, interest rates have become more important as an indicator of the effectiveness of monetary policy. In these circumstances, changes in short-term rates brought about by monetary policy are likely to be transmitted quickly to the entire spectrum of medium and long-term rates offered by banks and other financial institutions. The speed of transmission and the magnitude of the pass-through of interest rates depend on market efficiency and the public's expectations of future interest rates and inflation These expectations will influence the behaviour of real interest rates, which in turn will affect private investment and consumption. Further research in this area is still under way.

The increasing importance of interest rates as an indicator of the effectiveness of monetary policy has made interest rates themselves more of a policy target. In addition to controlling monetary aggregates, Bank Indonesia is therefore also active in monitoring and trying to influence domestic interest rate movements. This takes place, among other things,

through changes in the discount rates for Bank Indonesia bills (SBIs) and bank-endorsed commercial paper (SBPUs).

*(iv) Greater flexibility in exchange rate management*

As noted before, rapid capital mobility has given rise to a number of problems in managing monetary aggregates. These difficulties tend to be heightened under a relatively fixed exchange rate system in which capital inflows will immediately boost the growth of the money supply, thereby undermining the effectiveness of measures designed to control monetary expansion. When this situation arises, closing an existing open economic system is no longer a realistic option. Neither is it possible to fend off capital inflows through intervention. Hardly any country in the world has a sufficient cushion of foreign exchange reserves to counter international capital movements, leaving the monetary authorities with little option but to make continuous adjustments to domestic monetary policy in line with international trends.

To strengthen the effectiveness of monetary management, Bank Indonesia sought greater exchange rate flexibility through a gradual widening of the intervention band for the rupiah exchange rate against the US dollar. This policy aimed at stemming heavy flows of speculative short-term capital while at the same time promoting interbank foreign exchange transactions. Subsequently, in order to adjust to the new monetary policy stance in the South-East Asian region and to deal with speculative attacks, Bank Indonesia removed the intervention band and left exchange rate determination to market forces. However, if necessary, Bank Indonesia can intervene in the market. As a result, banks are no longer relying on Bank Indonesia for their foreign exchange transactions, thus easing some of the complexities of monetary management.

Reliance on market forces for establishing exchange rates may also lead to more exchange rate volatility in the interbank foreign exchange market. Large capital flows tend to encourage rapid appreciation. On the other hand, large capital outflows will result in rupiah depreciation. All economic agents will have to adjust to this new system of greater exchange rate uncertainty. As this will take some time, the Bank's priority for now is to stabilise the foreign exchange market and, at the same time, to find a new "equilibrium".

*(v) The co-ordination of macro and micro policy*

Monetary policy is inextricably linked to other policies at the micro level affecting the operations of individual banks in various areas, such as credit policy, foreign commercial borrowing and bank supervision. These policies all have the objective of strengthening the soundness of the banking system as one of the fundamental conditions for sustainable economic development.

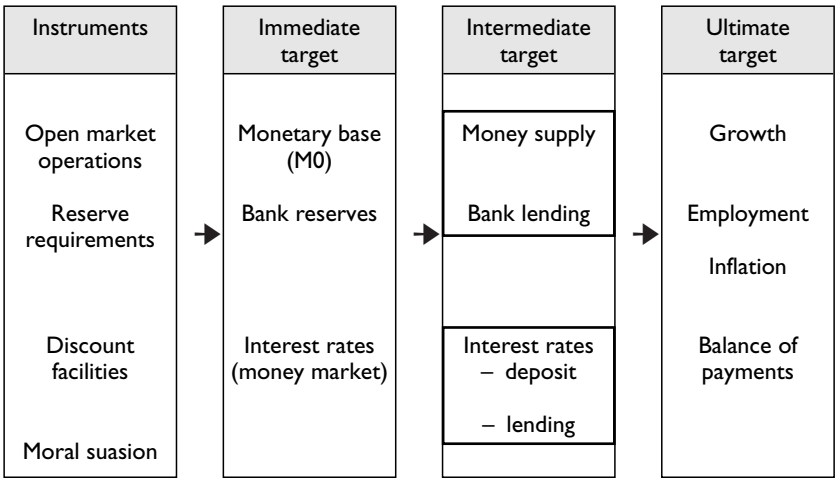
In view of the rapid growth of the financial and the banking system, the co-ordination of macro and micro policy has become a more important consideration in the conduct of monetary policy. Without such co-ordination, the achievement of the ultimate objectives of monetary policy becomes an impossible task. Poorly implemented monetary policy may disrupt macroeconomic stability which, in turn, will undermine the soundness of the banking system Conversely, a weak, vulnerable and badly managed banking system may undermine the effectiveness of monetary policy and put the entire economy at risk. The aim of co-ordination of macro and micro policy is to build optimum synergy for the achievement of policy objectives. Therefore, in the current era of globalisation it is important that the effort to build a sound and stable financial system be integrated into the overall task of macroeconomic management.

## 4. Concluding remarks

It is too early to have a clear view on how the process of financial reform has actually affected the monetary policy transmission mechanism in Indonesia. While searching carefully for the new transmission mechanism paradigm, Bank Indonesia has been following a pragmatic monetary policy approach by relying more on interest rates, by monitoring broad economic indicators, by applying much greater exchange rate flexibility, and by enhancing macro and micro co-ordination. Learning from other countries' experiences, including through the BIS, has been useful in the Bank's endeavours in this area.

## Annex I

### General framework of monetary policy



## Annex II

### 1. Demand for money

The cointegration and error correction model is used to estimate the demand for money function.[1] Using quarterly data and the sample period 1983–96, the estimation results are as follows:

*(i) Narrow money (M1)*

Long-run equation (*cointegration equation)*:

$$M1R_t = \underset{(-24.49)}{-7.613038} + \underset{(41.17)}{1.155174}\ GDPFIS_t + U_t \qquad (1)$$

Short-run equation (*dynamic error correction equation*):

$$DM1R_t = \underset{(3.57)}{0.020638} - \underset{(-2.44)}{0.111621}\ U_{t-1} + \underset{(2.63)}{0.182413}\ DM1R_{t-1} + \underset{(2.18)}{0.15357}\ DM1R_{t-2}$$
$$+ \underset{(5.61)}{0.499883}\ DGDPFIS_t - \underset{(-4.36)}{0.922932}\ DCPI_t$$
$$+ \underset{(1.79)}{0.003416}\ DDEP3BL_{t-1} + \underset{(12.14)}{1.501802}\ DFIND_t + e \qquad (2)$$

$R^2 = 0.88$; $R^2$ adj.$= 0.85$; SER $= 0.015$; LM F-stat $= 0.48$; WH-stat $= 1.13$

where:

| | |
|---|---|
| *M1R* = | narrow money, in real terms |
| *U* = | errors from long-run equation |
| *GDPFIS* = | quarterly GDP |
| *CPI* = | consumer price index |
| *DEP3BL* = | three-month deposit rate |
| *FIND* = | financial deepening index (M1/GDP) |
| *D* = | difference |

(all data are expressed in natural logarithms)

[1] Note that t-values are shown in parentheses. The *LM F-stat* is the F statistic derived from the Lagrange multiplier test for serial correlation. The *WH-stat* is the outcome of White's Heteroskedasticity test.

*(ii) Broad money (M2)*

*Long-run equation (cointegration equation)*:

$$M2R_t = -14.48588 + 1.871996\ GDPFIS_t + 0.006497\ DEP3BL_t - 0.007456\ DUMS + U_t \quad (3)$$

where:

*M2R* = broad money, in real terms

*DUM* = dummy for October 1988 deregulation (period before deregulation = 1, period after deregulation = 0)

*DUMS* = DUM times three-month deposit rates, used to capture a slope change

(all data other than the three-month deposit rates are expressed in natural logarithms)

Short-run equation (*dynamic error correction equation*):

$$DM2R_t = \underset{}{0.011976} - \underset{(-4.23)}{0.204534}\ U_{t-1} + \underset{(9.46)}{0.721591}\ DGDPFIS_t - \underset{(-3.09)}{0.310312}\ DGDPFIS_{t-5} - \underset{(-2.13)}{0.003227}\ DDEP\ 3BL_{t-3} - \underset{(-2.36)}{0.007893}\ DLIB_{t-1} + \underset{(9.72)}{0.439482}\ DFIND_t + \underset{(4.34)}{0.001011}\ DUM + e \quad (4)$$

$R^2 = 0.89$; $R^2$ adj. = 0.87; SER = 0.012; LM F-stat = 0.43; WH-stat = 1.14

where:

*LIB* = three-month LIBOR

*DUM* = dummy for Sumarlin shock in 1991

(all data other than the three-month deposit rates and the three-month LIBOR are expressed in natural logarithms)

Stability tests using the Chow-breakpoint test, the Chow-forecast test and the CUSUM-recursive test show that in general the demand for money (M1 and M2) is relatively stable.

## 2. Money multiplier

*(i) Stationarity tests*

The results of the stationarity test for the money multiplier of M1 (*mm1*) and M2 (*mm2*) using the Augmented Dickey-Fuller test are shown in the table below.

**ADF test statistics**

| | lag | 84.01–96.12 | 84.01–88.12 | 89.01–96.12 | 90.01–96.12 |
|---|---|---|---|---|---|
| *mm1* . . | 2 | −3.30** | −2.22 | −2.65* | – |
| | 4 | −3.24** | −1.85 | −2.60* | – |
| *mm2* . . | 2 | −2.51 | −2.00 | −2.45 | −3.02** |
| | 4 | −2.49 | −2.12 | −2.41 | −2.97** |

Note: The stationarity test for the period 1984–96 includes a dummy variable to catch the structural change after the 1988 financial deregulation (PAKTO 1988); observations after the 1988 financial deregulation =1.

* denotes rejection of the null hypothesis at the 10% significance level.
** denotes rejection of the null hypothesis at the 5% significance level.

Conclusion: For the sample period of 1984–96, *mm1* is stationary, which implies that *mm1* is stable. For the sample period of 1989–96, *mm1* still exhibits stationarity but the "degree of stationarity" decreases in line with structural change. By contrast, *mm2* is not stationary for the 1984–96, 1984–88 and 1989–96 periods. However, for the period 1990–96 (adjusted period), *mm2* displays stationarity. This implies that *mm2* tends to fluctuate around its long-run average.

*(ii) Parameter stability tests*

The structural equation for the *money multiplier* is based on the Beenstock approach.*

$$M^s = mm * M0$$

$$mm1 = \frac{CR + 1}{CR + RR * (QMR + 1)}$$

$$mm2 = \frac{CR + QMR}{CR + RR * (QMR + 1)}$$

* See Beenstock, Michael (1989): "The determinants of the money multiplier in the United Kingdom". *Journal of Money, Credit and Banking*, 21(4), pp. 464–80.

where:

| | |
|---|---|
| $M^s$ = | money supply |
| $CR$ = | currency ratio, i.e. CR/DD |
| $QMR$ = | time and savings deposit ratio, i.e. QM/DD |
| $RR$ = | total reserve ratio, i.e. total reserves/(QM+DD) |

The two-stage least squares (TSLS) method is used to estimate this structural equation. Using average quarterly data from 1987.3 to 1996.4, the following results are obtained:

$$\begin{aligned} LnCR = {} & 2.641 - 0.101 * LnPDBR - 0.005 * RDEPI(-1) - 0.044 * RDEP24 \\ & (4.03) \quad (-1.61) \quad (-1.76) \quad (-6.94) \\ & - 0.0003 * IHSG - 2.312 * FIND - 0.098 * DUM88 \\ & (-2.75) \quad (-4.76) \quad (-2.70) \\ & + 0.128 * DUM89Z - 0.045 * S3 \\ & (2.82) \quad (-2.57) \end{aligned}$$

$R^2 = 0.943$; SER = 0.038; LM F-stat = 0.145

$$\begin{aligned} LnQMR = {} & -6.585 + 0.193 * LnQMR(-1) + 0.809 * LnPDBR - 0.003 * RDEPI \\ & (-5.87) \quad (1.90) \quad (6.49) \quad (-1.85) \\ & + 0.010 * RDEP24 - 2.421 * FIND - 0.004 * DRdep24 \\ & (2.28) \quad (-6.63) \quad (-4.31) \\ & + 0.011 * Dinflows + 0.125 * DUM90Z - 0.070 * S3 \\ & (5.22) \quad (4.56) \quad (-5.60) \end{aligned}$$

$R^2 = 0.988$; SER = 0.024; LM F-stat = 0.068

$$\begin{aligned} LnRR = {} & 11.450 + 0.338 * LnRR(-1) - 1.219 * LnPDBR - 0.028 * RDEP24 \\ & (5.56) \quad (3.56) \quad (-5.90) \quad (-3.11) \\ & - 0.276\ DUM88 - 0.324 * DUM89Z + 0.580 * DUM96 \\ & (-3.83) \quad (-3.81) \quad (7.51) \end{aligned}$$

$R^2 = 0.975$; SER = 0.077; LM F-stat = 0.863

where:

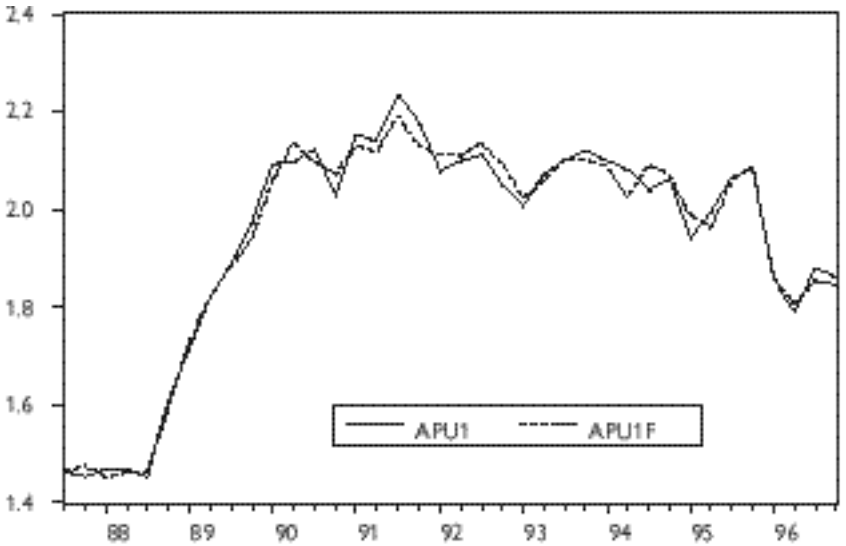
| | |
|---|---|
| *PDBR* = | GDP at constant price |
| *RDEP1* = | one-month deposit rate |
| *RDEP24* = | 24-month deposit rate |
| *IHSG* = | composite stock price index |
| *DUM88* = | dummy for observations after the 1988 financial deregulation (PAKTO 1988) = 1 |
| *DUM89Z* = | dummy for shocks in 1989.2 = 1 |
| *DUM90Z* = | dummy for shocks in 1990.4 = 1 |
| *DUM96* = | dummy for observations after the increase of reserve requirements = 1 |
| *DRDEP24* = | interaction dummy for *RDEP24* after PAKTO 88 |
| *Dinflows* = | interaction dummy for inflows (net foreign assets in the monetary system) after 1990.3 |
| *S3* = | seasonal dummy for the third quarter |
| *Ln* = | natural logarithm |

From the estimated parameters, it can be seen that the exogenous variables are able to explain the behaviour of each component of the money multipliers. An autocorrelation problem can only be seen in the time and savings deposit ratio (*QMR*) equation. However, "true auto-correlation" can be detected by applying the test for errors regression of each equation *mm1* and *mm2* in an integrated way. Jarque-Bera statistics and correlation analysis show that the errors of regression for *mm1* and *mm2* are normally distributed and free of autocorrelation problems.

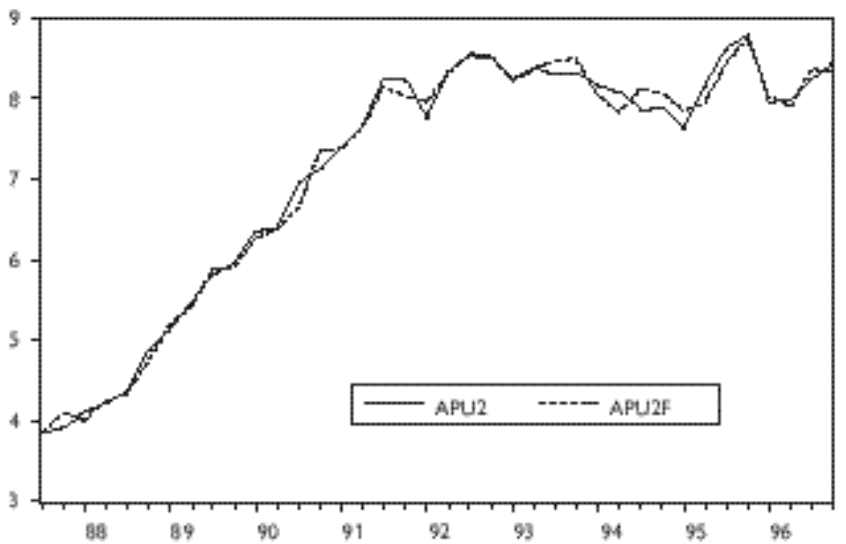
From the regressions above, the historical simulation for *mm1* and *mm2* can be presented as follows:

Graph 1

**(a) Historical simulation for *mm1***




**(b) Historical simulation for *mm2***



The structural equations developed above can explain the behaviour of the money multipliers. To test their predictability further, stability tests based on Chow's forecast test and the CUSUM of squares test should be conducted.

F-statistics from Chow's forecast test using a 1 to 2 year in-sample forecast are as follows.

| | 1995.1–1996.4 | 1996.2–1996.4 |
|---|---|---|
| Currency ratio . . . . . | 0.533 | 0.182 |
| Time and savings deposit ratio . . . | 1.205 | 2.249* |
| Total reserve ratio . . . . . | .. | 0.654 |

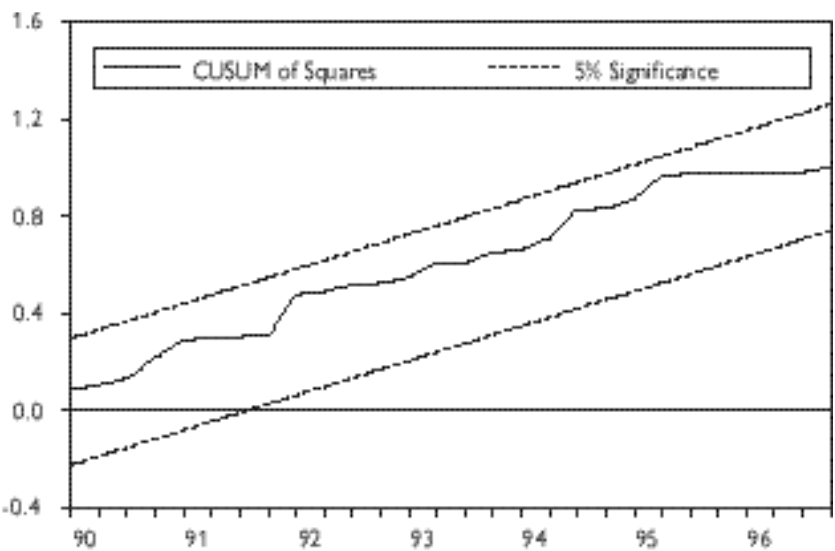
* denotes rejection of the null hypothesis at the 10% significance level.

The results indicate that the structural equation is correctly specified and has reasonable predictive ability. However, it should be noted that this predictive ability tends to decline in the equation for the time and savings deposit ratio.

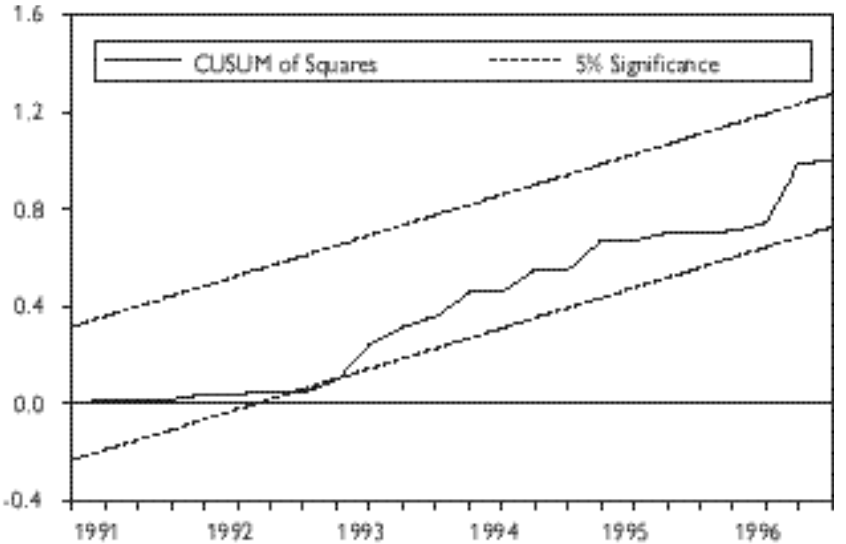
The results of the stability test using the CUSUM of squares (recursive estimates) test are as follows;

Graph 2

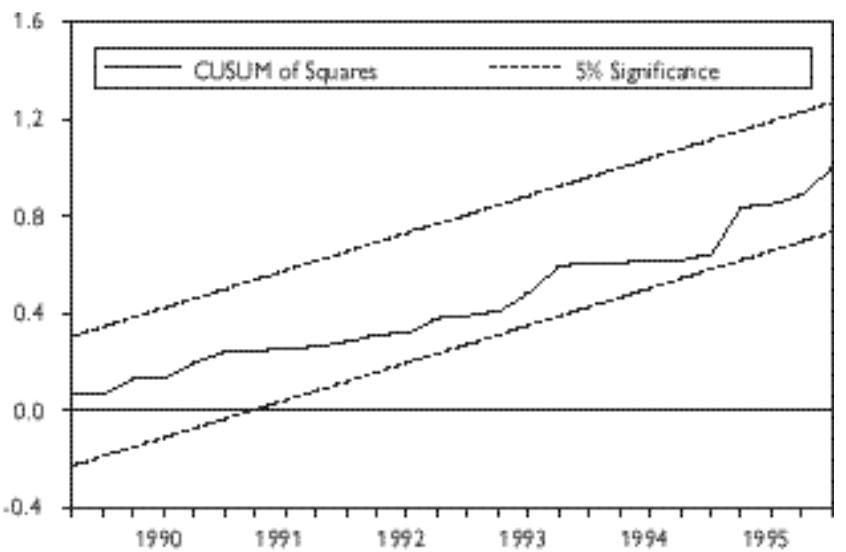
**(a) Currency ratio equation**



**(b) Time and savings deposit ratio equation**




**(c) Total reserve ratio equation**



The stability test for each component of the money multiplier shows that the behaviour of the money multiplier is generally rather stable. However, the potential for the errors of regression to move outside the toleration limit should be noted.

## 3. Income velocity

The stationarity tests for *income velocity* (M1 and M2) based on the Augmented Dickey-Fuller Test are shown in the table below.

**ADF test statistics**

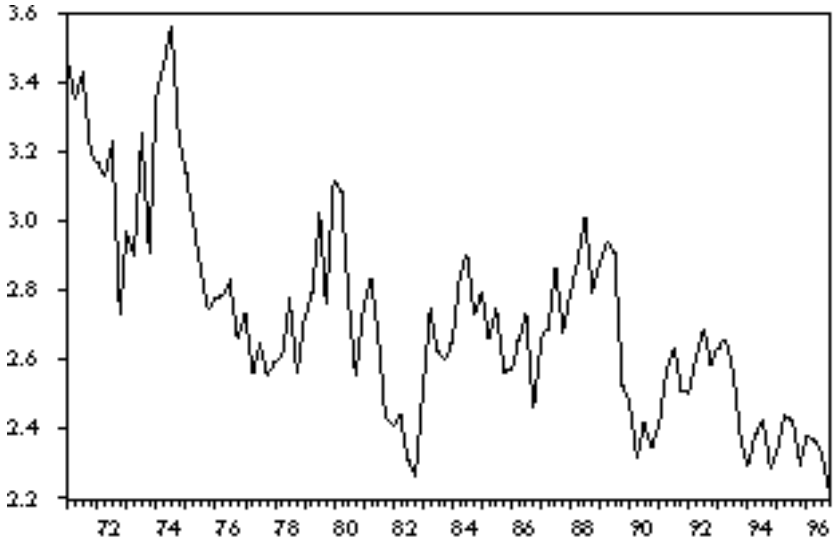
| | lag | 1971.1–1996.4 | 1971.1–1988.4 | 1989.1–1996.4 |
|---|---|---|---|---|
| Velocity M1 . . | 2 | −3.23** | −3.35** | −1.60 |
| | 4 | −2.84* | −2.83* | −2.54 |
| Velocity M2 . . | 2 | −2.16 | −2.20 | −1.27 |
| | 4 | −1.08 | −1.20 | −1.22 |

* denotes rejection of the null hypothesis at the 10% significance level.
** denotes rejection of the null hypothesis at the 5% significance level.

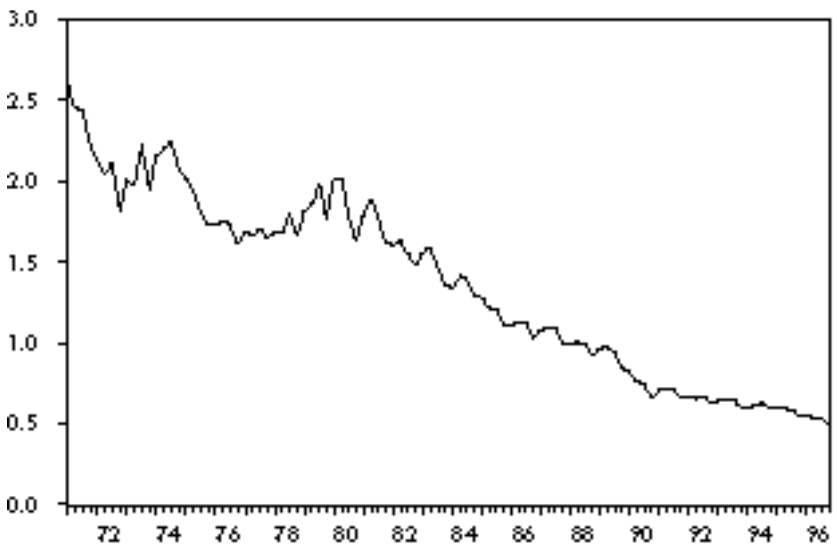
The table shows that the income velocity of M1 is stationary in the periods 1971–96 and 1971–88, although not in the period 1989–96. It can be seen that, in line with structural change, income velocity tends to fluctuate around its long-run average value. Meanwhile, the income velocity of M2 is not stationary in either of the three periods under review.

Graph 3

**(a) Income velocity of M1**




**(b) Income velocity of M2**



Another way to ascertain the stability of income velocity is to test the long-run relationship between money supply and output (nominal). A cointegration test is conducted by applying the two-step cointegration (Engle-Granger) method. The equation used is as follows:

$LnM = c + LnPDBN + error$

where:
*M* = M1 or M2
*PDBN* = GDP at current prices

The ADF test statistics for the stability of the errors of the equation are:

**ADF test statistics**

| | 1971.1–1996.4 | 1971.1–1988.4 | 1989.1–1996.4 |
|---|---|---|---|
| M1 . . . . . | −5.16*** | −3.83*** | −3.26** |
| M2 . . . . . | −2.14 | −2.57 | −1.56 |

** denotes rejection of the null hypothesis at the 5% significance level.
*** denotes rejection of the null hypothesis at the 1% significance level.

The ADF test statistics indicate that the errors of the regression of M1 on output are stationary, although the degree of stationarity declines over time. This implies that the income velocity of M1 is relatively stable. By contrast, the income velocity of M2 is not stable.

## 4. Relationship between intermediate targets and ultimate targets

Generally, the research was based on monthly and quarterly data for the sample period 1971–96. Owing to data limitations, the series of several variables, such as the (general) inflation rate and non-oil/gas imports, do not start in 1971. In order to capture shifts in the relationship between the various variables, the sample period is divided into three subperiods, namely 1971–83, 1984–88 and 1989–96. The first subperiod describes conditions before the first financial deregulation launched in June 1983, while the second subperiod relates to the period between the first

financial deregulation and the October 1988 deregulation. The third subperiod covers the period after the October 1988 deregulation.

Among the various monetary indicators used in this research are monetary aggregates (M0, currency, total reserves, M1, M2 and claims on the business sector), interest rates (interbank, three-month deposit rate, the rate on working capital credit and on investment credit, and the interest rate differential), and exchange rates (mid rates, interbank rates). In the analysis, the uncovered interest rate differential was used, i.e. the three-month deposit rate minus the three-month LIBOR rate, minus the depreciation of the rupiah. These variables are usually considered as intermediate targets. The ultimate targets are identified as the inflation rate (consumer prices), GDP at current prices and non-oil/gas imports.

To avoid problems of non-stationarity, all variables should be expressed in the form of annual growth rates. The methods to test the relationship between monetary indicators and ultimate target indicators are the Granger causality and vector autoregression (VAR) tests. The number of lags used in the Granger causality test were 2, 4 and 6. In the VAR test, 6 lags were used to explain the dynamic effect among the variables in the system, while the impulse response function and the variance decomposition were observed for 12 periods ahead. To obtain quarterly data of nominal GDP (period before 1980), annual data were interpolated by using the ACD-SEM interpolation method.

The results show that the shifting relationship between the variables is due to the structural changes in the economy. Unidirectional causality runs from monetary aggregates, such as M1, M2 and claims on the business sector, which have acted as intermediate targets to the indicators of the ultimate targets in the period before the second financial deregulation (October 1988). However, since the period after the second financial deregulation, the monetary aggregates have displayed bilateral causality. This indicates that the development of monetary aggregates also tends to be determined by the path of private consumption or aggregate demand. Therefore, the relationship between monetary aggregates and ultimate targets has become more weak and blurred.

Nonetheless, there are still several monetary indicators that consistently show unidirectional causality and play a significant role for the indicators of the ultimate targets. They include the interbank rate, the interest rate differential and the exchange rate (mid rate).

# Transmission channels of monetary policy in Israel

David Klein

## 1. Two preliminary comments

*(i) The ultimate target of monetary policy*

The Bank of Israel is, in most respects, an independent central bank. So much so that, once in a while, various proposals are brought forward to limit its independence. The main issue is, probably, the mission of the central bank.

Discussing the transmission mechanism of monetary policy assumes, in most countries, that the ultimate target of that policy is low inflation, or price stability. This is far from being the case in Israel, even among economists, let alone among politicians in the executive and the legislative branches, industrialists and financial market participants. In the ongoing public debate, two other goals of monetary policy are considered to be of greater importance than price stability, namely "maximum" growth, or "low" unemployment; and balance-of-payments equilibrium, or maintaining the competitiveness of exports.

The Bank of Israel Law, enacted in 1954, enumerates price stability as only one of the missions of the central bank, in addition to the encouragement of high levels of investment, employment and growth. Governments seem to be weary of fixing an inflation target, explaining that the "cost", in terms of unemployment, may be too high. Public figures can be heard from time to time saying, for example, that if they have to choose between a combination of 12% inflation and 3% unemployment or, on the other hand, a mix of 3% inflation and 12% unemployment – they prefer the former. Typically such statements do not distinguish between the short and the long run, giving the impression that this is a choice between two steady states.

This type of Phillips curve dilemma means that views differ not only with regard to the mission of the central bank, but also with regard to the very feasibility of reducing inflation. The Israeli economy, despite its

openness to international trade, tends to be riddled with monopolies and other structural constraints that introduce nominal rigidities even with respect to the rate of change of prices. So much so that if the economy "gets used" to an annual inflation rate of 18%, as recorded between 1986 and 1991, only a significant external shock that increases the productive capacity of the economy can extract it from that position. Without such a shock, applying "standard" restrictive monetary policy would not only increase unemployment but might even lead to the worse result of stagflation. On the other hand, if such a shock takes place and, as a result, the rate of inflation slows down in a given year, the job of the central bank is to seize the opportunity, nail down the lower level, and then wait until the next shock arrives.

Nevertheless, the transmission mechanism dealt with in this paper takes as given that the ultimate target of monetary policy is price stability. This is the case not because the central bank does not care about economic growth and balance-of-payments deficits, nor because it belittles the relevance of structural bottlenecks. Rather, we share the mainstream view that the relative advantage of monetary policy is in dealing with nominal phenomena; that real developments are better dealt with through fiscal policy; that structural reforms to improve the competitive structure of the economy should be implemented, regardless; and perhaps most importantly, that lower inflation promotes higher productivity and economic growth in the medium and long term. However, the fact that there is no consensus on those issues in Israel makes the conduct of monetary policy correspondingly harder and requires a more restrictive monetary policy than would otherwise be necessary to attain a given inflation target.

*(ii) The basic strategy in attaining the target*

Reviewing our experience in the last ten years, one can say that two basic strategies were followed for restraining inflation.

The first came into being with the stabilisation policy that successfully brought inflation down from a three-digit level in the first half of the 1980s to a low two-digit level in the second half of the same decade. That strategy adopted the exchange rate as a nominal anchor, assuming that stabilising the exchange rate, with the aid of a disciplined fiscal policy, would produce price stability.

Within the framework of this approach, the role assigned to interest rate policy was to stabilise the exchange rate. The mechanism is familiar from the experience of the European Exchange Rate Mechanism (ERM), from which we recognise also its limits. Interest rates can serve to stabilise capital flows, and thus help in maintaining a given exchange rate band, as long as these interest rates are consistent with domestic policy considerations. The United Kingdom, for example, had to leave the ERM in September 1992, because the increase in interest rates required to maintain the parity of the pound was deemed inconsistent with the high level of unemployment prevailing in the country at this time. In Israel, anchoring the exchange rate left much to be desired as a major instrument to reduce the pace of inflation, from the low two-digit level, in the second half of the 1980s. The stabilisation plan in the mid-1980s reduced inflation from 440% in 1984 to an average of 18% between 1986 and 1991, although its goal was price stability. The commitment to stabilise the exchange rate apparently was not very credible, specifically because the Government was considered to have a special responsibility in ensuring export competitiveness. The shekel was indeed devalued from time to time and the average annual inflation rate did not change much.

We shifted gradually to a second strategy in the first half of the 1990s when the horizontal exchange rate band was replaced by an upward-crawling one, and annual inflation targets were announced.[1] In this approach, monetary policy has a different focus. In particular, changes in interest rates are not determined so as to stabilise a given exchange rate but are designed to attain the inflation target, while the exchange rate is not fixed but can vary within the given "diagonal" band, whose limits around the central parity were widened from the original 3% to 7% in each direction. The slope of the band was determined by the difference between the inflation target at home and inflation abroad, and was supposed to decline to zero when the inflation differential was reduced to zero. We gradually reached the same conclusion as reached by others, namely that it is better to let the market play a significant role in determining the exchange rate.

The purpose of this paper is to delineate the channels through which, under the current approach, monetary policy affects inflation developments.

[1] A more detailed analysis of the shift to inflation targets in Israel can be found in Bufman, Leiderman and Sokoler (1995).

## 2. The monetary transmission mechanism

*(i) The operating target and interest rates*

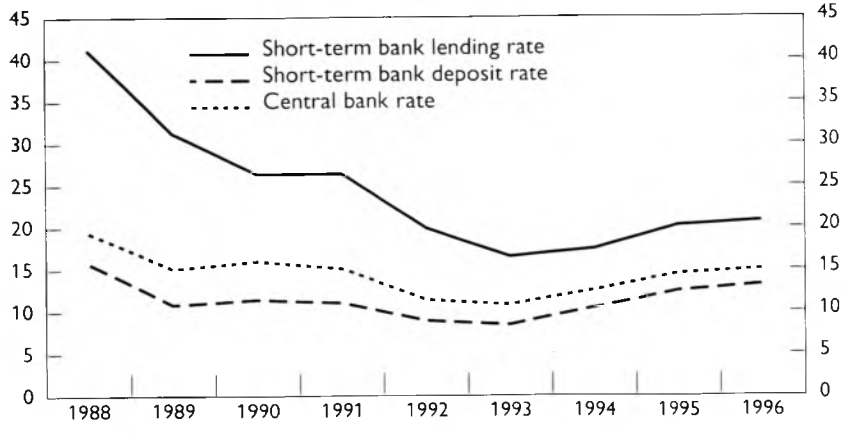
The main instrument of the Bank of Israel has been, in recent years, its "monetary" loans to commercial banks. The interest rate on this type of loan, usually for one day or one week, is determined in an auction, and is strongly influenced by a marginally increasing discount window rate schedule, fixed by the central bank. Banks resort to these loans mainly because they have to meet the central bank's reserve requirements, averaging nowadays around 4% of total deposits.

The interest rate on the monetary loans has become the key short-term interest rate in the economy. When it changes, the commercial banks' prime rate changes by an equal amount and, with it, changes take place in other deposit and lending interest rates (see Graph 1). The response is immediate, and sometimes occurs even in advance of an anticipated rate change. It is worth noting that apart from policy-induced changes in interest rates, interbank trading in liquid assets takes place every day and reflects minor changes in interest rates due to changes in the liquidity position of each bank. The cost of borrowing money from

Graph 1

**Banks' short-term lending and deposit rates, 1988–96**

Annual averages, in percentages




Note: The rates were, respectively, 26.4, 11.0 and 15.1% in 1991, and 20.7, 13.1 and 15.0% in 1996.

the central bank is the key determinant of interest rates in the interbank market.

Furthermore, commercial banks use part of their resources to invest in government bonds. One such bond is the "short-term note" – a Treasury bill with a maturity of up to one year – which serves exclusively, by law, as a monetary policy instrument and does not finance the government budget deficit. It is the main tool for open market operations of the central bank, and is a policy instrument in addition to the monetary loans. The significance of the short-term note is that it serves, on the one hand, as a substitute asset to bank deposits for financial investors and, on the other hand, as a substitute asset to loans from the viewpoint of the banks. Hence, the yield on the short-term note affects deposit and lending rates alike, and thus also has an impact on the banks' interest rate spread.

In addition, institutional investors, who manage roughly half of the public's financial portfolio, hold in their portfolio all types of government bonds, including the short-term note and bank deposits. As a result, any change in the central bank's key interest rate reverberates through the money and capital markets to short and long-term rates, and in turn affects the behaviour of the various economic agents.[2]

It should be noted that most of these links were created only in the last few years as a result of a policy of deregulation. Previously, the basic minimum conditions for the conduct of an efficient monetary policy did not exist, as markets were deeply segmented. Deregulating Israel's financial markets is still unfinished business, but I will not elaborate on it here since it is beyond the scope of this paper.[3]

Given the network of interest rates, how do they contribute towards attaining the inflation target? While a full-scale macroeconometric model that incorporates nominal as well as real variables and has a detailed financial sector is not available, some small structural and reduced-form models have been tested, mainly in the central bank but also elsewhere, and I will rely on some of their findings in the following description.[4]

[2] Not enough attention is usually given to analysing the various ways in which changes in the central bank rate are transmitted to other market rates. Much depends on the institutional set-up of financial markets and the degree of government involvement in these markets. An interesting exception can be found in Deutsche Bundesbank (1996).

[3] Not everybody realises how essential financial deregulation is for the efficiency of monetary policy, especially when markets are widely segmented, as was the case in Israel. See Klein (1994).

[4] The source for the quantitative estimates in this paper is a recent version of a research paper prepared by two senior economists from the staff of the Monetary Department of the Bank of Israel (see Elkayam and Azoulay (1996)).

It should be emphasised that the models used here deal only with the short-term effects of monetary policy.

*(ii) Money, prices and real interest rates*

It is only natural to start from the oldest observation that inflation cannot be sustained without a continued increase in the money supply.

The empirical issue in Israel, as in other countries, is whether the demand for money is stable, and what the pertinent monetary aggregate is for which there is a stable demand and which has a significant impact on prices.

The answer suggested by the empirical research is that if there is such a monetary aggregate, it is M1. Econometric tests prepared in the Monetary Department came up with statistically significant findings in two respects:

- the demand for M1 does indeed change positively, having a unit elasticity, with the change in economic activity, and negatively with the change in the central bank interest rate. A 1 percentage point change in the nominal interest rate changes real M1 by 1.4%;
- changes in M1, in excess of the demand generated by changes in economic activity, affect prices with a lag of two to three quarters.

Examining this traditional channel more closely, we attempted to test the impact of changes in nominal interest rates on the expected short-term real interest rate, and through it on long-term real interest rates and on total demand. The first question centres on the impact of a given change in short-term nominal interest rates on inflationary expectations, as these expectations serve to deflate the nominal interest rate in order to gauge the expected real interest rate. These expectations can be measured for periods of up to two years, since nominal as well as index-linked bonds exist for these maturities. Next, estimates of expected short-term real interest rates are derived by relating the central bank monetary loans rate to these inflationary expectations.

A casual look results in a tentative finding that a change in nominal rates does not always affect inflationary expectations, either at all or in the right, namely negative, direction. The desired impact seems to be achieved only when the change in the nominal rate is sizable and unexpected, or when the real expected interest rate is already above 5%.

Credibility, we assume, plays a significant role in determining these parameters. A well-established commitment and tradition of pursuing price stability, which we still lack in Israel, would require a smaller increase in nominal rates and lower initial real expected rates in order to attain a given change in inflationary expectations. Preliminary results of a more powerful statistical test lend support to the intuitive hypothesis that there is a significant negative impact of changes in the central bank's *real lagged* short-term interest rate on inflationary expectations.

Also, we do not know enough about the impact of a given change in short-term expected real rates on the yield curve as a whole. That particular issue has a special dimension in Israel because all government bonds having maturities of more than four years are index-linked – mainly to the cost of living but also to the exchange rate. Thus the only question we can try to answer is about the impact of a given change in short-term *nominal* rates on the long-term *real* yield on government bonds. Whoever attempts to answer that question should allow also for other factors affecting long-term rates such as the size of the budget deficit and the composition of its financing (domestic versus foreign borrowing, short versus long-term bonds, and the level of government debt), the degree of openness to foreign capital markets and some institutional characteristics of long-term savings in Israel. Here, too, preliminary statistical tests corroborate our intuitive feeling that a change in the central bank's interest rate has a stronger and more immediate impact on the yield of medium-term government bonds than on the yield of long-term bonds.

Finally, our research indicates that a 1 percentage point change in the short-term real interest rate brings about a negative *short-term* impact of 0.2–0.4 percentage points on domestic demand. It should be emphasised that this is only the impact effect. For policy purposes the medium and long term are more relevant.

To sum up, we have good reason to believe that increasing nominal short-term interest rates will dampen overall demand in the short term and thus lessen inflationary pressures. We assume that ultimately there is a negative relationship between inflation and growth or, at least, that such a relationship exists as long as we do not reach the average inflation level prevailing in countries with which we trade (2–3%) and that, in the meantime, we cannot attain higher durable growth by tolerating higher inflation.

*(iii) The impact through the nominal exchange rate*

The degree of liberalisation of the capital account achieved so far, and the degree of flexibility of the exchange rate in the current regime, set the conditions enabling interest rates to affect prices through changes in the exchange rate. Experience indicates that a large enough gap between domestic and foreign interest rates, relative to inflation differentials, will cause capital movements. In the early 1990s real domestic interest rates were either negative or very low, resulting in excess demand for foreign currency. The opposite has happened more recently and has tended to strengthen the domestic currency. Since international trade, exports plus imports, approaches the size of GDP in Israel and since some prices of non-tradable goods, housing in particular, are quoted in terms of US dollars, the exchange rate has a considerable bearing on domestic prices.

A recent econometric estimate, prepared by the staff of the Monetary Department, suggests that a 1% change in the exchange rate will change the pace of inflation by 0.6%. Other quantitative estimates find that the exchange rate impact is not immediate and that it may take one to two quarters until its effect on prices is complete.

The empirical findings also shed an interesting light on an issue which is raised, from time to time, in policy debates. The question is what are the implications of a government decision to devalue the currency (assuming that the exchange rate can be viewed as a policy variable) if it wants, at the same time, to maintain its inflation target? The estimate provided by the model is that to offset the impact of a 1% devaluation on prices, the interest rate should be *raised* by 0.5% to 1%, depending on how quickly one wants to erase the inflationary effects of the devaluation on prices.

Be that as it may, the exchange rate channel, from interest rates to prices through international capital flows, is certainly one of the relevant transmission channels of monetary policy in Israel.

*(iv) The credit channel*

There are two other channels through which monetary policy can be assumed to be transmitted, although they have yet to be researched rigorously. The first is the credit channel and the second is the asset price channel. We consider first the credit channel.

Usually the impact of credit is nothing more than the real interest rate

effect discussed above. If monetary policy succeeds, for example, in raising real interest rates the demand for credit should eventually decline and, with it, total demand in the economy.

However, in Israel there are two interesting twists to this straightforward story. The first has to do with the liberalisation of the capital account and the exchange rate regime. For some time now, as a result of our policy of foreign currency liberalisation, foreign currency credit has not been restricted, as far as the exchange control regulations are concerned. Hence, whenever domestic interest rates rise the tendency to borrow in foreign currency increases. The year 1995 was noteworthy in this regard as the share of foreign currency credit in the public's total liabilities portfolio increased from 23% to 29%, mainly because of interest rate differentials. Such a shift in the structure of the loan portfolio represents a large capital inflow that under a floating exchange rate regime should have strengthened the domestic currency, thus affecting prices through the exchange rate channel. But, since we have an exchange rate band – not the regular horizontal band but an upward-sloping one – the Bank of Israel intervened in the market, buying foreign currency, first to prevent the actual exchange rate from moving too far from the central parity of the band, and then to protect the limit of the band. The resultant increase in the quantity of money had to be sterilised, which we did, but not without a price. The main price we have paid, apart from the cost of sterilisation itself, was in reducing, in the eyes of the typical domestic borrower, the exchange rate risk. The whole episode weakened the effectiveness of our monetary policy.

The second special aspect of the credit channel, related to the first one, has to do with prudential guidelines regarding credit allocation by commercial banks, issued by the supervisor of banks. According to these guidelines, loan-loss provisions should increase whenever total credit to any given industrial branch by any given commercial bank rises above 20% of its total credit. It turned out that because of the boom in housing, from 1993 onwards, real estate lending by commercial banks exceeded the 20% mark, thus affecting their loan-loss provisions. The housing industry protested vigorously and there were those in the Government who tried to apply pressure on the Bank of Israel to modify the guidelines to prevent the increase in the cost of borrowing to the housing industry. Eventually, with some modifications, the guidelines remained in force and they probably played a role in the recent slowdown of housing price increases.

*(v) The equity/housing market channel*

When we come to asset prices we find ourselves, again, in barren territory as far as empirical research is concerned.

Hypotheses abound. The most common and well-known one is that expansionary monetary policy creates demand not only for goods and services but also for assets such as shares and real estate. Since the supply of such assets cannot be adjusted at the same pace to meet demand, share and housing prices rise, providing incentives to consume. A variant of this hypothesis rests on the discounted value of future income from assets, which increases as a result of lower interest rates, thus augmenting overall demand through the wealth effect.

The Israeli case has an additional feature – housing prices, rather than the cost of housing services, are included in the cost of living index. Casual examination of the data can support the hypothesis that interest rates were one of the factors behind the cycles in the equity and housing markets in the first half of the 1990s. The stock market reached a peak at the end of 1993, when interest rates recorded a trough, and housing prices surged in 1993 and 1994. On the other hand, when real interest rates started to climb in 1994, and stayed at a somewhat higher level in 1995 and 1996, the bull market in the stock exchange ended, and the increase in housing prices started to slow down.

However, no rigorous test was done to examine the validity of these hypotheses or to obtain some clues as to their quantitative importance. We assume that asset prices absorb and then emit inflationary impulses to the general price level.

## 3. Concluding observations

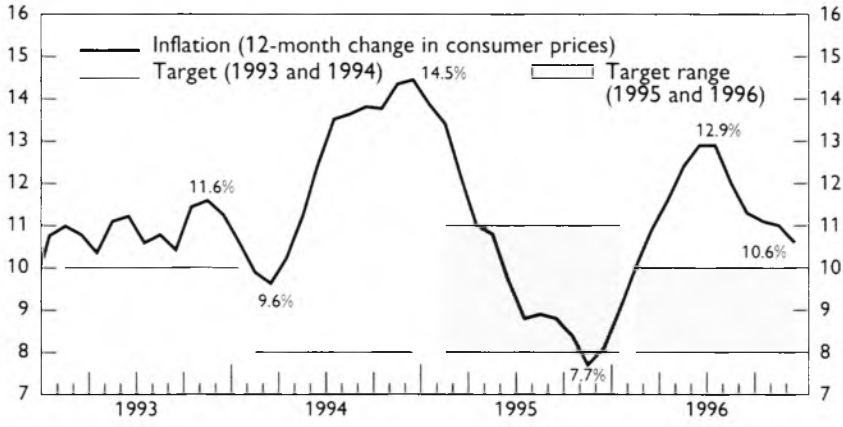
*(i) Attaining the inflation target*

The discussion above does not leave much doubt: monetary policy can reduce inflation, and Israel is not different in this sense from any other developed economy. Nevertheless, when one looks at the record of the last five years, since 1992, it seems as if we are marking time. The average annual inflation rate hovered around 11%, with significant ups and downs (see Graph 2).

Graph 2

**Inflation targets and actual inflation, 1993–96**

In percentages




The only explanation seems to be that we lack the political will, in the broader sense of the word, to reach "western" inflation levels. It is true that there are many influential economists and senior officials who keep warning and advising the government, any government, that any attempt to reduce inflation, no matter at what pace,[5] will turn economic growth into recession and will increase unemployment even in the long term. They like very much to cite the example of Spain, but also of some other European countries, such as Germany and France, which were able to reduce inflation but, at the same time, recorded unemployment levels of 10% and more.

Nevertheless, on 12th December 1996, the Government decided to take note of the Minister of Finance's decision, adopted in consultation with the Prime Minister and the Governor of the central bank, to fix the 1997 inflation target within a range of 7–10% (compared with 8–10% in 1996). The decision also included two other, new, elements:

- a medium-term inflation target was fixed, for the year 2001, when inflation in Israel is expected to equal the average rate of inflation

[5] The optimal speed of disinflation is the main issue in King (1996). The issue is especially relevant for countries which adopt inflation targets when actual inflation is still high. Israel is an extreme case in this regard, since inflation in 1991 – at the end of which the first target, for 1992, was announced – was 18%.

prevailing in the OECD countries. In 1996, for example, the rate of inflation in Israel was more than twice the average for the OECD;

- in the future, and within the framework of the medium-term target, the annual inflation target will be announced not later than the middle of the preceding year, so that it can serve as a guideline for the design of fiscal and monetary policies for the year ahead.

This decision opens up a third chance to start a process of reducing inflation to the level existing in our trading partners' economies. We missed the first chance in the second half of 1993, when we were quick to ease monetary policy in the light of a brief deceleration in the pace of inflation. As a result inflation picked up in 1994, reaching 14.5% by the end of that year. Following the surge in inflation, monetary policy was tightened throughout 1994, especially towards the end of the year. A second chance was missed in 1995, when we eased again under circumstances similar to those of 1993, namely after a few months of low cost-of-living increases. Inflation surged again in the second half of 1995 and the first half of 1996 to 15% on an annual basis.

We tightened monetary policy again towards the middle of 1996 and, not surprisingly, we consequently started to reap the fruits. In the second half of 1996 inflation was running at an annual rate of 7%. To meet the inflation target for 1997 there is no need to ease monetary policy much further, after the steps taken in the last few months of 1996. We certainly should take into account the fact that inflation in 1998 should be lower than that for 1997 – unless we are convinced that current monetary policy will result in an inflation rate *lower* than the government target. At present nobody views that outcome as very probable.

*(ii) Other reforms*

This is not the place to elaborate on labour market reform (there is currently a heated debate, for example, on whether to raise the minimum wage), restructuring and privatising government monopolies – especially some utilities – completing the reform of the financial markets[6] and

[6] Israel is already party to three international agreements in which it committed itself to financial liberalisation. It accepted the obligations under Article 8 of the IMF Articles of Agreement, joined the recent Uruguay Round Agreement that included a chapter on financial services, and updated its agreement with the European Union to include also a special reference to the financial sector. Israel is also one of many countries that adopted the Basle Committee rules on banking supervision, aimed at fostering financial stability. For an interesting recent survey of this aspect of financial development, see White (1996).

further reducing the relative size of the government sector. Various reforms have been accomplished so far, including trade liberalisation which opened the Israeli economy to international trade, the successful implementation of recovery and adjustment programmes for various corporations in the last decade (which is still going on), the reduction in employment taxes (also a subject of a heated debate in Israel) and the shift of wage agreements in the private sector from the national to the plant level. This progress should encourage us in the belief that we can also succeed on the inflation front.

At all events, it seems that, until now, the lack of resolve to make continuous progress in reducing inflation casts constant doubts on the future course of the economy. Such doubts hinder investment and slow down growth, which makes it more difficult to maintain fiscal discipline and return to durable equilibrium in the balance of payments, raising question marks about the future course of the exchange rate. What is required is a policy that will create the conditions for long-term non-inflationary growth. This is certainly within our reach and the recent decisions of the Government, providing a medium-term perspective for fiscal and monetary policies, may set the stage for that.

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# Korea's experience of the monetary transmission mechanism

Bank of Korea

## Introduction

In explaining the monetary transmission mechanism, attention has generally focused on the interest rate channel which works by affecting the cost of capital via changes in real interest rates. However, the validity of the interest rate channel has been questioned as the money demand function has become unstable in the wake of the process of financial reform and deregulation since the 1980s.

Accordingly, greater attention has been paid to the other channels through which monetary policy is transmitted. These include, in particular, the credit channel centring on changes in the volume of bank lending and in net worth, the exchange rate channel and the channels which operate through other asset prices.

It has become a pressing task for the central bank to make an accurate assessment of the impact of changes in monetary policy on the real sector, such as the time lags and the magnitudes involved, by gaining a better understanding of the interaction between the financial and the real sector. This necessitates a clearer specification of the monetary transmission mechanism.

In this context, the present paper, after outlining the chief characteristics of the various transmission channels, analyses the monetary transmission mechanism in Korea on the basis of the findings of recent empirical studies of the credit channel.

## 1. Theoretical underpinnings of the credit channel

The credit view contends that two channels of monetary transmission arise due to informational asymmetries between borrowers and lenders in financial markets. The bank lending channel emphasises the special role of bank loans, particularly for "bank-dependent" borrowers (e.g. small

firms), while the balance-sheet channel operates through the balance-sheet positions of business firms.

The bank lending channel rests on the idea that small firms, facing informational frictions in financial markets, must rely primarily on bank loans for external finance because it is prohibitively expensive for these borrowers to issue securities in the open market. When bank loans are of special importance for bank-dependent small firms, the effects of a monetary contraction may be amplified through the following two channels beyond those working through the interest rate channel: the direct channel operates through the reduced willingness of banks to lend at the going market interest rates owing to institutional factors such as regulatory action and moral suasion to restrain bank lending directly. This channel is direct because it does not depend on the extent to which market interest rates rise. The indirect channel becomes operative when the increase in market interest rates following a monetary contraction raises loan rates enough both to cover the increase in lenders' cost of funds as a result of the higher interest rates and to compensate them for the higher default risk. Banks also tend to tighten other non-price terms of lending, such as collateral requirements and the maturity of loans (Morgan (1992)). When either of these two bank lending channels operates, the banks are forced to reduce their total lending, and in most cases small firms which rely primarily on banks for credit must curtail their spending on investment.

Kashyap and Stein (1994) argue that banking firms may be subject to the same sort of capital market imperfections as their non-financial counterparts. According to their view, if a bank lending channel is effective, a monetary contraction should have a disproportionately large impact on the lending behaviour of small banks, which are more likely to experience difficulties offsetting a loss of reserves by expanding non-deposit sources of external finance. Consequently, they wish to cut loan supply by relatively more than do large banks.

The balance-sheet channel of monetary policy transmission arises because rising interest rates, following the adoption of a tight monetary policy, directly increase the interest expenses of those non-financial firms which rely heavily on short-term debt to finance inventories and working capital, reducing their net cash flows and weakening their financial positions. Furthermore, rising interest rates are also associated with falling asset prices, which indirectly erode the value of the firms' collateral.

These effects lead to a reduction in the firms' net worth, thereby raising the premium for external finance (the wedge between the cost of funds raised externally and the opportunity cost of internal funds). Small borrowers such as small firms are most likely to face a proportionately larger premium for external finance. One possible reason for this is that small borrowers have proportionately smaller collateralisable net worth. Therefore, small firms that have relatively poor access to short-term credit markets respond to the deteriorated balance-sheet positions principally by drawing down inventories and by cutting investment spending more than large firms.

It is worth emphasising that the credit channels provide support for an asymmetric effect of monetary policy: the sharpest differences in financing and investment behaviour between large and small firms arise mainly in tight-money periods and in recessions, thereby serving to amplify the impact of monetary policy on real spending and real activity that could be predicted via the interest rate channel.

## 2. An empirical study of the effectiveness of the bank lending channel in Korea

In the following section, we present a summary of the findings of recent research analysing the case for the existence of a bank lending channel in the transmission of monetary policy in Korea.

### *(i) Identification issue*

In order to identify a special role played by the bank lending channel in monetary policy transmission, it is important to correctly identify whether a reduction in bank lending following a tightening of monetary policy is largely the consequence of an inward shift in loan supply, rather than just an inward shift in loan demand. The identification problem boils down to the following question: can the central bank reduce the loan supply of banks merely by draining reserves?

Two rather convincing approaches to addressing the identification problem have been put forward in recent years.

First, Kashyap and Stein (1995) analyse cross-sectional differences in financing and lending decisions of banks of different size. They argue that

the relative movements in loan volumes and securities holdings across large and small banks may be able to provide useful information for identifying the loan supply effects – small banks' supply schedule shifts in by more when the central bank tightens its stance. Their analysis provides the following testable predictions: if both the volume of lending and the securities holdings of small banks decline more rapidly in response to a given contraction of reserves (deposits) than do those of large banks, the effects of a monetary contraction would be transmitted to the real economy through the lending channel, largely via the dampening effects on the loan supply behaviour of small banks.[1] This sort of identification of the loan supply effects rests on the idea that banking firms may also face the same sort of capital market imperfections as their non-financial counterparts. The intuitive case for the loan supply effects is as follows. A tightening of monetary policy should cause small banks to cut their loan supply by relatively more than large banks, reflecting the hypothesis that small banks face higher costs in attracting non-deposit sources of external finance to make up the funding shortfall.

Secondly, an alternative approach involves identifying independent monetary shocks on the basis of evidence derived from historical records. The central element of this "narrative approach" is to isolate periods of tight monetary policy when the central bank clearly shifts to an active policy of trying to reduce aggregate demand and bring down inflation (Romer and Romer (1989 and 1990)). The next step involves examining whether tight monetary policy following negative shocks causes lower output through a decline in bank loans.

*(ii) Test for the existence of the bank lending channel using disaggregated bank data*

We now focus on testing the theoretical predictions of the loan supply effects discussed above. Does the asset side (loan volume and securities holdings) of small banks shrink more in response to a monetary contraction than that of large banks? We tested the implication using the impulse

[1] For a more detailed discussion of the theoretical implication, see Kashyap and Stein (1995). Most notably, the identification of loan supply effects requires that loan demand facing small banks has to be sufficiently inelastic. It is likely that this requirement is satisfied in practice in Korea. Since small banks in Korea, compared with large banks, tend to lend to smaller, more recession-sensitive customers who rely heavily on bank loans for external funds, the loan demand curve facing them is likely to be inelastic in terms of changes in loan interest rates.

responses of the standard Vector Auto Regression (VAR). The VAR approach was applied to monthly Korean data for four time series variables from January 1987 to May 1994. The monetary base was chosen to proxy for changes in the stance of monetary policy (monetary policy indicator). The industrial production index and the consumer price index (CPI) were selected to proxy for the real sector variables. We followed Kashyap and Stein (1995) by dividing banks on the basis of their total assets into "small and medium-sized" and "large" categories that reflect differences in their cost of raising external funds. In our case, given data insufficiency, the six largest commercial banks were classified as banks in the "large" category and the other commercial banks and ten local banks as banks in the "small and medium-sized" category.[2] Furthermore, one class of primary assets (bank loans, cash and securities holdings) of each bank group was considered in the VAR analysis. Data used were logarithms of the nominal, seasonally adjusted, level data of all variables considered. Graph 1 provides a graphical illustration, tracing the impulse responses of loan volumes and securities holdings for banks in each category (large banks, small and medium-sized banks) to one negative standard deviation shock to the monetary base.

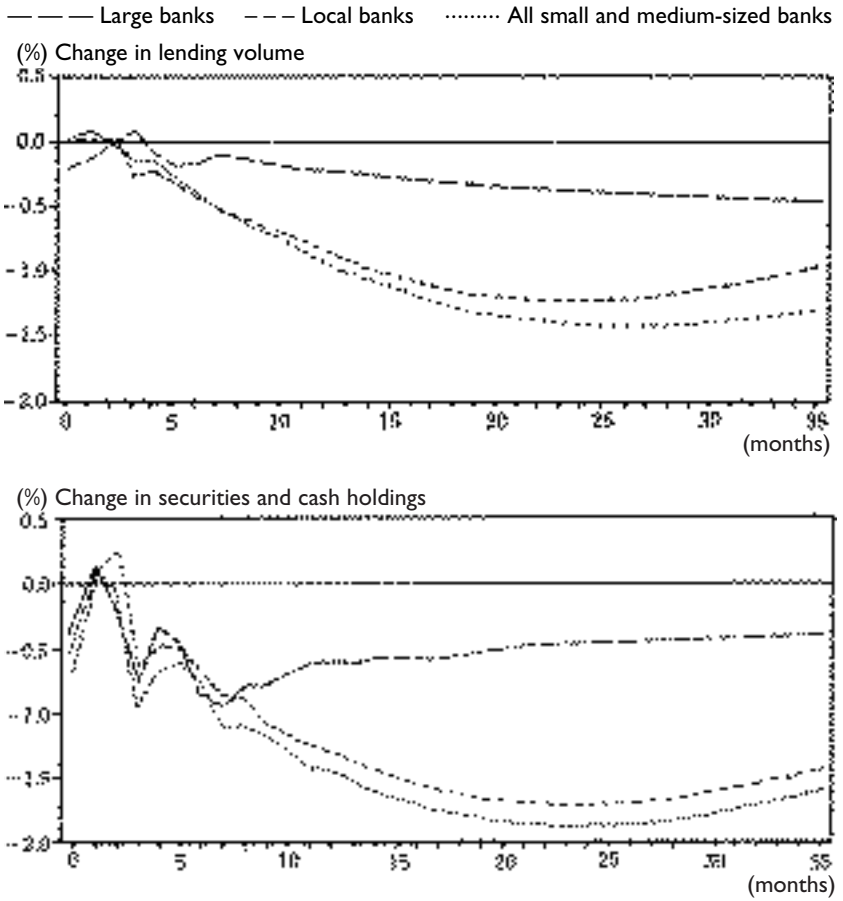
The impulse responses shown in Graph 1 indicate that a 1% decrease in the monetary base seems to have a much greater dampening effect on the lending volume and the securities holdings of small and medium-sized banks, as well as of the local banks alone, than on those of the six largest banks.[3] We interpret this evidence as being consistent with the prediction of the lending channel. The finding that the loan volume of smaller banks shrinks more in the wake of a monetary contraction may reflect the following tendency: since smaller banks tend to rely heavily on deposits for fund-raising and face higher borrowing costs compared with large banks, they appear to cut their lending volume (loan supply) by a relatively

[2] Small and medium-sized banks include ten local banks and the following eight nationwide commercial banks, excluding the six largest: Shinhan Bank (established in 1982), KorAm Bank (established in 1983), Donghwa Bank (established in 1989), Dongnam Bank (established in 1989), Daedong Bank (established in 1989), Hana Bank (established in 1991), Boram Bank (established in 1991), Peace Bank of Korea (established in 1992). Note that due to lack of data our estimates are restricted to the period from January 1987 to May 1995.

[3] It is the case in Korea that preferential access of small and medium-sized firms to bank credit at subsidised rates has been relatively easier at small and medium-sized local banks than at large banks. Interestingly, this practice seems in line with the theoretical requirement that needs to be satisfied for the bank lending channel to work well, namely that the loan demand facing small banks has to be sufficiently inelastic.

Graph 1

**Changes in lending volume, securities and cash holdings following a reduction in the reserve base**




greater extent than large banks do. Most notably, smaller banks are shown to attract external funds by resorting to larger issuance of CDs at a rather high interest rate cost, while they have comparatively lesser recourse to borrowing from the Bank of Korea and to foreign currency borrowings at low interest rates. As a result, it seems likely that smaller banks incur higher borrowing costs.

*(iii) Test for the existence of the bank lending channel on the basis of the narrative approach*

The central goal in this section is to provide a detailed examination of whether the focal episodes of tight monetary policy, identified by a narrative approach, caused the bank lending channel to play a distinctive role in amplifying the real effects of general tightening (Romer and Romer (1989 and 1990)). To this end, we conducted the following empirical tests.

First, we identified a sequence of four focal episodes of monetary contraction since the second half of the 1970s in which the Bank of Korea appeared to have deliberately been willing to accept output sacrifices to reduce inflation (anti-inflationary policy), around the time when business booms were peaking. Like Romer and Romer (1989 and 1990), we identified the focal episodes of monetary contraction on the basis of the main shifts in the policy stance of the Bank of Korea and on the basis of information from the historical trend of all available financial variables, including the growth rates of the monetary base, total reserves, M2 and bank loans; movements in interest rates; and the gap between the targeted growth rate of M2 and its actual rate. We thus selected four focal episodes of restrictive monetary policy: August 1978, October 1983, May 1984 and March 1990.[4] We then estimated the effects of the general tightening after each focal episode of restrictive monetary policy on the monetary base, M2 and bank loans.

Secondly, if monetary policy is indeed a relatively more important source of output fluctuations in the focal episodes than at normal times, and if monetary policy affects output through the lending channel as well, we would expect the effects of bank lending on output to be stronger in the focal episodes than at other times. Thus we tested for the implication.

To assess whether the effects of monetary contraction take place in the focal episodes, we proceeded as follows. We first regressed, from

[4] It could be pointed out that the focal episodes of restrictive monetary policy in this analysis were not selected solely on the basis of the official policy statements on the part of the Bank of Korea. Since there were no appropriate official statements available which could provide useful information for selecting with sufficient precision the focal episodes of monetary tightening, we instead relied on the historical trends of major financial variables, including monetary aggregates and short-term interest rates. To this end, before selecting each focal episode of monetary contraction, we verified whether the movements of these financial variables around the focal episodes as initially identified on the basis of major shifts in the policy stance of the Bank of Korea (such as a rapid increase in the reserve requirement ratio and official statements signalling the Bank's intention of bringing inflationary pressures down) were largely due to a monetary tightening.

January 1970 up to the month just before each episode, the monthly change in the logarithm of the monetary base on 12 own lags in a univariate forecast equation 1, and the monthly change in the logarithm of M2 (and the logarithm of bank loans) on 16 own lags, the contemporaneous value and eight lags and eight leads of the change in the logarithm of industrial production, as shown respectively in equations 2 and 3.[5]

$$\Delta \ln RB_t = a + \sum_{i=1}^{12} b_i \Delta \ln RB_{t-i} \tag{1}$$

$$\Delta \ln M_t = a + \sum_{i=1}^{16} b_i \Delta \ln M_{t-i} + \sum_{i=-8}^{8} c_i \Delta \ln Y_{t-i} \tag{2}$$

$$\Delta \ln L_t = a + \sum_{i=1}^{16} b_i \Delta \ln L_{t-i} + \sum_{i=-8}^{8} c_i \Delta \ln Y_{t-i} \tag{3}$$

where *RB* is the monetary base, *M* is M2, *Y* is the industrial production index, and *L* is bank loans. Note that a monthly dummy (*D*) for restrictive monetary policy was included (although not shown) in all equations and that they were estimated by OLS. We then used the actual paths of money (monetary base, M2) and bank lending up to the month before each focal episode and the estimated coefficients from those equations to construct dynamic forecasts of the paths of money and bank lending over the next 24 months. We cumulated the predicted changes to obtain forecasts for the levels of money and bank lending, finding the resulting forecast errors. If the cumulative forecasting errors (cumulative forecasts minus actual values) for money and lending are negative soon after the shift to an anti-inflationary policy, money and bank lending may be said to have fallen as a result of tight monetary policy after the individual focal episodes.

The plotting of the monetary base shown in Graph 2 indicates that the forecast errors for individual episodes as well as their average over the four episodes are consistently negative and their absolute values continue to increase over the forecasting period. The analogous forecast errors for M2 and bank lending, as shown in Graph 3, also indicate patterns that are quite similar to those for the monetary base. Note in particular that the deviations of actual lending from its predicted path are greater on average than the movements in the average forecast errors for M2. Our findings

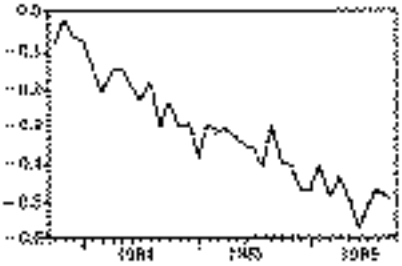
[5] The reason that we estimated the univariate forecast equation of the monetary base was to reflect Schwartz's comment that the best indicator of the central bank's actions is the growth of high-powered money (Schwartz (1989)).

Graph 2

**Accumulated forecasting errors in reserve money following focal points of monetary tightening**

Date of monetary tightening:
August 1978

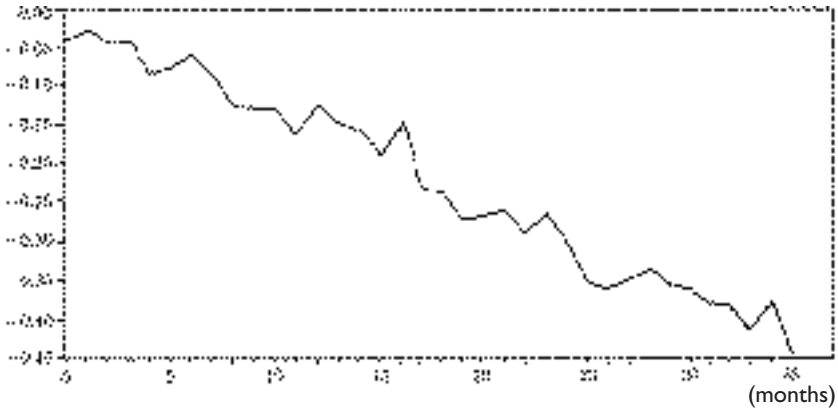
Date of monetary tightening:
October 1983



Date of monetary tightening:
May 1984

Date of monetary tightening:
March 1990

Average accumulated forecasting error of reserve money



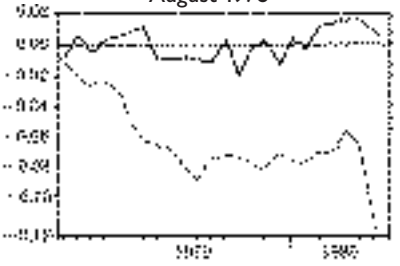
(months)

Graph 3

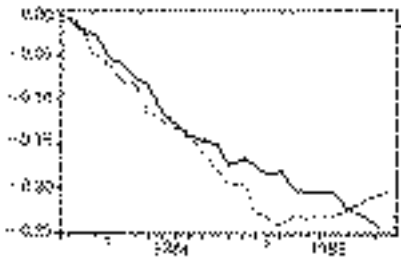
**Accumulated forecasting errors in M2 and bank lending following focal points of monetary tightening**

—— M2 – – – Bank lending

Date of monetary tightening: August 1978

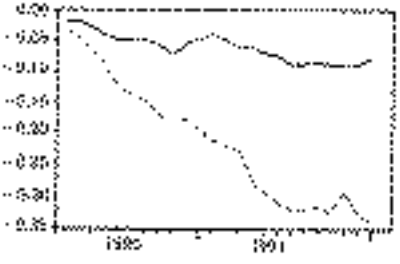


Date of monetary tightening: October 1983

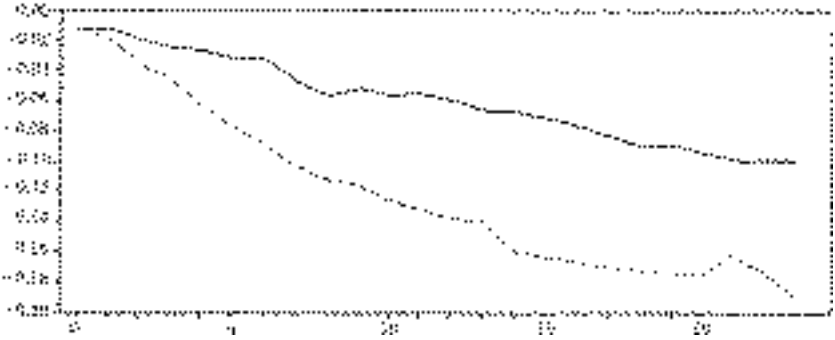


Date of monetary tightening: May 1984

Date of monetary tightening: March 1990



Average accumulated forecasting errors of M2 and bank lending



(months)

strongly suggest that the individual focal episodes we identified represented important monetary shocks and that the bank lending channel played a crucial role in the monetary transmission mechanism.

We now turn to the question of whether the strengths of the money/output and lending/output relationships are different in response to independent shifts in monetary policy than at other times (Romer and Romer (1990)). To address this question, we first considered the regressions of output on money (M2) and on bank lending (equations 4 and 5), using a "St. Louis"-like equation.

$$\Delta \ln Y_t = a + \sum_{i=1}^{16} b_i \Delta \ln Y_{t-i} + \sum_{i=0}^{16} c_i \Delta \ln M_{t-i} + \sum_{i=1}^{4} d_i D_{ti} \quad (4)$$

$$\Delta \ln Y_t = a + \sum_{i=1}^{16} b_i \Delta \ln Y_{t-i} + \sum_{i=0}^{16} c_i \Delta \ln L_{t-i} + \sum_{i=1}^{4} d_i D_{ti} \quad (5)$$

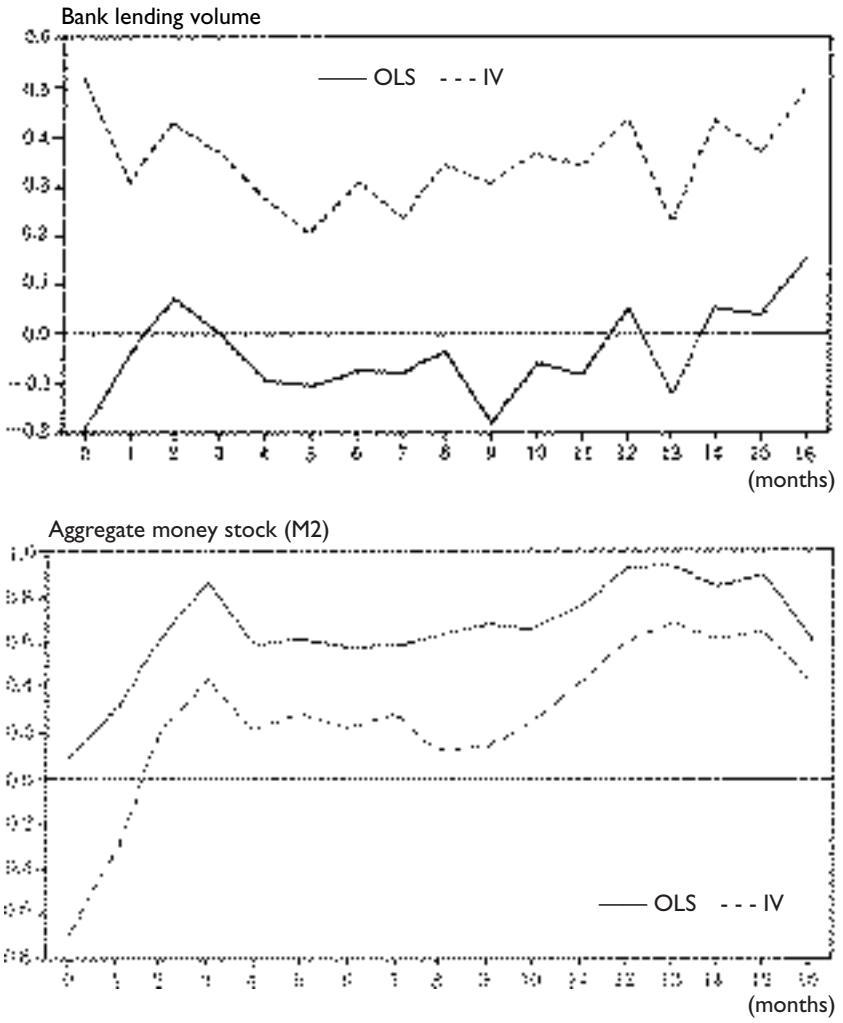
where $Y$, $L$ and $M$ are the same as in equations 1 to 3 and monthly dummies ($D$) for restrictive monetary policy are included in each equation. We first estimated equations 4 and 5 without dummies ($D$) by OLS and then estimated each equation with dummies ($D$) by two-stage least squares, instrumenting with the current and lagged values of a dummy that is equal to one during each of the four focal episodes in which we identify shifts to restrictive monetary policy. The next step is to show the dynamic responses of industrial production ($Y$) to money ($M$) or bank lending ($L$) implied by the OLS and IV estimates of the money/output or lending/output regressions.[6] We then need to compare the OLS and two-stage least squares (IV) estimates of equations 4 and 5 to examine the relative strength of the estimated relationships between money (or bank lending) and output. Note that the OLS estimates of equation 4 simply summarise the usual money/output relations, whereas the IV estimates summarise the relationship between movements in output and the average deviation of money from its usual behaviour in the focal episodes. Again, analogous comments apply to the difference of the OLS and IV estimates of the lending/output relationship. As just discussed, if we allow for the possibility that monetary policy affects output not only through money but also through bank lending, and if monetary policy is a relatively more important source of output fluctuations in the focal episodes than at other times, it may be the case that the tightened monetary policy in the

[6] For example, the response of $M$ to $Y$ at period zero is $c_0$ . The period one response is $c_0+(b_1c_0+c_1)$. The period two response is $c_0+(b_1c_0+c_1)+b_1(b_1c_0+c_1)+b_2c_0+c_2$; and so on.

focal episodes would cause the IV estimates to imply a weaker impact of money on output than the OLS estimates. In contrast, we may expect the IV estimates of the lending/output relationships to be stronger than the OLS estimates.

Graph 4

**Changes in M2 and bank lending and their resulting impact on industrial production**



Graph 4 presents the results of the OLS and IV estimates of equations 4 and 5. The top panel shows that the IV estimates of the impact of bank lending on industrial production are much larger than the OLS estimates at all horizons. However, as shown in the bottom panel, the responses of industrial production to money (M2) using the IV estimates are somewhat lower than those obtained using the OLS estimates. These results strongly support the view that bank lending has played an important independent role in amplifying the real effects of policy tightening implied by the interest rate channel in the major episodes of restrictive monetary policy since the second half of the 1970s.

## 3. Conclusions

As our empirical findings indicate, at times of tight monetary policy, banks (especially small and medium-sized banks) tend to reduce the volume of bank loans either in response to credit controls of the central bank,[7] or to moral suasion, or at their own discretion. This convincingly suggests that the effects of monetary policy tightening are transmitted to the real economy not only through the interest rate channel but also through the lending channel. If this is the case, the following policy implication may be derived: a tightening of monetary policy can have a greater-than-expected impact on aggregate economic activity (e.g. on investment behaviour) through the lending channel, with market interest rates rising more than would have been expected. In this respect, the real effects of a tightening of monetary policy may be amplified beyond what would be predicted by considering only the interest rate channel.

To make an accurate assessment of the timing and the magnitude of the impact of changes in monetary policy on aggregate economic activity in Korea and to adopt appropriate policy measures, the central bank needs to gain a better understanding of the transmission mechanism. In formulating policy, it should monitor an alternative indicator, such as the volume of bank loans which has shown a close link to aggregate spending, in addition to the money supply, interest rates and the exchange rate. Thus, it is desirable for the efficient conduct of monetary policy that

[7] Prior to moving to an indirect control system in December 1988, the Bank of Korea relied heavily on direct controls whereby it set and enforced bank-by-bank credit ceilings.

the central bank makes active use of the volume of bank lending as an information variable.

Since a monetary contraction tends to reduce the willingness of banks to lend, credit allocated to bank-dependent borrowers (small firms) might decline disproportionately, causing these borrowers to curtail their investment spending. Policy-makers, including the Bank of Korea, therefore need to bear in mind such distributional disadvantages and would have to take appropriate actions to facilitate steady credit extension to small firms from a long-term point of view.

The development of substitutes for demand deposits and currency may lessen the central bank's ability to control short-term interest rates. Similarly, as capital market opening proceeds rapidly and derivatives become more actively used, banks may come to rely heavily on non-deposit sources of funds, such as certificates of deposit, and on open market credits. The central bank's ability to influence the supply of bank loans through the lending channel may therefore be reduced to a great extent. Moreover, if derivatives facilitate asset-switching between different maturities in different currencies, hence producing large changes in exchange rates, the exchange rate channel of monetary transmission may be expected to become more important.

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# Monetary policy and its transmission channels in Mexico

Francisco Gil Díaz*

## Introduction

This paper first deals generally with monetary policy and the various mechanisms by which policy measures are transmitted to interest rates, the exchange rate, the price level and output. It then uses this framework to present some features of contemporary Mexican monetary policy which has undergone a gradual process of adaptation since 1995, moving from the determination of central bank daily intervention interest rates, to a signalling mechanism based on very small adjustments in the central bank's provision of liquidity.

The paper begins with a description of the frequently misunderstood roundabout process of money creation. These misunderstandings are the origin of considerable confusion about the role of a central bank, the scope of its instruments and the way monetary policy impacts on the economy.

The reference point for the discussion will be the widespread notion that central banks can achieve short-run increases or decreases in the quantity of money.[1] This notion is found in economics textbooks, in academic journals and in many non-specialised writings.[2] Two recent examples, randomly chosen, would be the following: "Tighter monetary policy: by end-December, the central bank began to retire liquidity from

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[1] The terms money and currency will be used interchangeably in this paper. Base or high-powered money can also be equated with currency because the payments mechanism in Mexico allows banks to hold practically no settlement balances.

[2] With notable, perhaps not widely known exceptions, such as Goodhart (1987) who writes: "On this thesis, the central bank undertakes open market operations, in order to vary its own liabilities, and, in the process, the reserve base of the banking system[...] In practice, however, the banking system has virtually *never* worked in that manner. Central banks have, indeed, made use of their monopoly control over access to cash and their power to enforce that by open market operations, but for the purpose of making effective a desired level of (short-term) interest rates, not to achieve a pre-determined quantity of monetary base or of some

the economy, trimming the monetary base by 4.9 billion pesos between December 27 and January 3."[3] Another statement, of an opposite nature, that seems to focus correctly on the issues is: "Since there are sound reasons (i.e., Christmas) for output to leap in the fourth quarter, this suggests that output growth causes money supply growth, and not the other way around: as consumers demand more money for their shopping, private and central banks increase the money supply."[4]

The presentation of some general principles of monetary policy in the next section will consider only some essential ingredients, so as to convey in the simplest possible manner the idea that, regardless of the institutional arrangements (whether or not commercial banks are subject to required reserves, or want to hold settlement balances), a central bank has no possibility of immediately altering even the narrowest of the monetary aggregates: the amount of currency in circulation. As Goodhart (1987) puts it, customary textbook presentations misleadingly take the traditional multiplier model as their starting-point. This approach contributes to propagating the erroneous idea that central banks can alter the quantity of money more or less as in the Patinkinesque money-from-a-helicopter parable. Because this thinking is so ingrained, the conceptual discussion will be elaborated in some detail.

The ultimate purpose of the presentation is to provide a framework for understanding the signalling procedures utilised by the Banco de México to ease or tighten monetary conditions. The final part of the paper and the two annexes deal with the Bank's utilisation of its instruments in the past two years. There is also a presentation of their impact on key variables to illustrate how the policy signals are transmitted to interest rates and the exchange rate, and from them to economic activity and prices.

monetary aggregate[...] Indeed, central banks have historically been at some pains to assure the banking system that the institutional structure is such that the system as a whole can *always* obtain access to whatever cash the system may require in order to meet its needs[...] In short, the behavioural process runs from an initial change in interest rates, whether administered by a central bank or determined by market forces, to a subsequent readjustment in monetary aggregate quantities: the process does *not* run from a change in the monetary base, working via the monetary base multiplier, to a change in monetary aggregates, and thence only at the end of the road to a readjustment of interest rates. In reality, the more exogenous, or policy-determined, variable is the change in (short-term) interest rates while both the monetary base and monetary aggregates are endogenous variables. This reality is, unfortunately, sharply in contrast with the theoretical basis both of many economists' models, and also of their teaching."

[3] JP Morgan, *Data Watch*: Mexico. 10th January 1997, p. 9.

[4] *The Economist*, 14th–20th December 1996, p. 80.

A monetary authority can make its credit dear or cheap and, in principle, it can also issue currency or act upon the monetary base. But the fact that it has the potential to issue currency does not mean it can do so at its discretion. It will be argued that even in the medium term, beyond a quarter or a year, for example, a central bank can increase or decrease the quantity of money only in an indirect fashion and never with the mechanical, immediate kind of result commonly portrayed as the outcome of open market operations.

The central bank will be able to modify the quantity of money only if it is able to influence the demand for money. Furthermore, the actual change in the quantity of money will take place only as the central bank responds passively to accommodate changes in the demand for money. An increase or decrease in the demand for money may have been induced months (or years) before.

One of the indirect channels for altering the quantity of money demanded is to influence interest rates. The latter can change because of modifications in the policy stance of the central bank or because international interest rate movements influence local ones. Interest rate changes induced by the central bank may act upon the exchange rate and upon aggregate demand. As they impinge upon output and/or prices, the demand for money will be affected in turn.

Movements in the demand for money may also be caused by non-monetary shocks such as an increase in the general price level brought about by a devaluation, perhaps provoked by a fall in the terms of trade or a political disturbance. But a terms-of-trade shock is also a supply shock and will cause changes in output that will influence the demand for money as well.

To construct a schematic model useful for analysing these influences a few general concepts are necessary.

The central concepts germane to the discussion are the public's demand for financial assets and the fact that banks operate under a fractional reserve system. Fractional reserve banking means that banks do not have the cash at hand to respond to variations in the public's demand for financial assets, which occurs daily as individuals' preferences shift between cash and deposits issued by commercial banks.

Typically, there are seasonal movements between cash and deposits issued by commercial banks that occur within any given week, within any given month, and also within the year. Because of fractional reserve banking these shifts have to be financed, lubricated as it were, by the central bank. But this continuous and passive accommodation by the central bank of the public's needs for cash does not mean that the central bank can go about injecting or withdrawing cash from the economy beyond what the public is demanding. Fractional reserve banking and the nature of the demand for currency do not allow it.

To substantiate this argument, fundamental to the understanding of monetary policy, it will be shown first why the central bank cannot bring about systematic and instant changes in the money supply. Afterwards, the diverse channels of money transmission and their implications for monetary policy will be explored.

To develop the argument it will be useful to start with a simplified accounting representation of the economy.

We shall consider that the central bank's only assets are credit to the commercial banks, A, and international reserves, IR. It has no capital and only one liability, represented by its own notes and coins (M0).

CENTRAL BANK

| | |
|---|---|
| A | M0 |
| IR | |

The consolidated balance sheet of the commercial banks will be:

COMMERCIAL BANKS

| | |
|---|---|
| G | D |
| | A |

The only asset of the commercial banks is government debt, G. They also have no capital and on the liability side they issue deposits, D, held by the general public, in addition to the credit they receive from the central bank, A.

The financial balance sheet of the general public is:

GENERAL PUBLIC

| | |
|---|---|
| D | |
| M0 | |

This skeleton model is sufficient for the exercise that follows. Any more "realism" would not change the outcome and would add unnecessary complications.

Consider an attempt by the central bank to reduce the supply of currency, M0. In principle it can do so by trying to reduce the size of its credit to the commercial banks, A. In response to the attempt by the central bank to reduce A, commercial banks would have to:

(a) reduce G, or
(b) reduce G and increase D, or
(c) increase D.

G cannot fall automatically as a consequence of monetary policy. Since a central bank cannot determine fiscal policy or synchronise its own monetary policy with it, unfeasible alternatives (a) and (b) will be ignored.

Given the fixity of G, commercial banks have to maintain the level of their funding. Therefore, for the central bank to be able to reduce its credit, A, to the commercial banks, it would have to induce an increase in the amount of deposits held by the public at commercial banks, D. An increase in D involves a very substantial rearrangement of the public's portfolio, away from cash and into bank deposits. If this occurred, the amount of financial assets held by the public would remain the same, the reduction in credit to the commercial banks from the central bank would be compensated by the rise in deposits from the public, and the central bank would be able to contract A and M0 by equal amounts. But since M0 is needed for transaction purposes, the increase in the interest rate necessary to entice the public to instantaneously relinquish the required amount of M0 in order to hold more D would be outlandish. It is not realistic to assume that short-run, or even longer-term monetary policy could rely on such a mechanism.[5]

A strong initial conclusion is that the prevailing idea, held by many economists and lay people, that the central bank can change the amount

[5] This conclusion holds even in systems where banks are required to hold reserves at the central bank. In those systems commercial banks' settlement balances have to be added to currency in circulation to calculate base money. Under these circumstances the central bank can increase or decrease the amount of base money since its immediate variations will come from the holdings of base money of commercial banks and not from currency.

of currency in circulation in the short run is simply wrong. To achieve this result we have been assuming, paradoxically, that the central bank can control the supply of currency, at least in principle. To be able to increase the supply of currency someone has to be willing to demand the expanded amount.

A change in the quantity of money brought about by the central bank's deliberate actions also requires a flexible exchange rate and an adjustment period. Under a fixed exchange rate regime the central bank can raise interest rates and bring about an increase in its foreign assets. However, in order to preserve the increase in reserves, the central bank has to prevent the credit expansion that would result from the exchange of local for foreign currency, by reducing its credit by the same amount.[6] If it does so, international reserves will increase and their expansionary pressure will have been prevented. This phenomenon should be viewed as a domestic interest rate rise with minimal, if any, short-run consequences on M0. It will, however, be an inducement to holders of foreign assets to shift their worldwide portfolio in favour of the assets of the country which has raised its interest rate. D will rise but not at the expense of a decrease in M0.

Sterilisation does not imply a modified stance of monetary policy, but only the achievement of a different portfolio structure. Sterilisation by the central bank of foreign capital inflows entails a reduction of A in order to accommodate the increase in IR. Commercial banks will experience a reduction in A but also a rise in D held by non-residents by the same amount. The domestic credit provided by the central bank, in this example simply A or (M0−IR), will have shrunk. This reduction in central bank credit to the commercial banks occurs simultaneously with a compensating increase in non-resident bank deposits, so that total credit to the economy is not diminished and no contraction in the amount of currency in circulation has taken place.

The conclusions derived above are arithmetically incontrovertible, as they are accounting identities. But it is useful to spell them out in detail in order to emphasise the relationship between the different variables considered, given that economists' reports, politicians' statements and press articles reveal a serious confusion about them.

[6] This action is called sterilisation.

An additional discussion of the fixed-exchange-rate special case (known in the literature as the Mundell-Fleming model)[7] would reinforce the original conclusion reached with the simplified accounting model used above: the central bank cannot induce immediate or short-run contractions in the money supply. This conclusion in no way contradicts the possibility for the money supply to increase if, for example, under a fixed exchange rate the demand for money is growing because nominal income is rising. Nominal income may increase as a result of economic growth and perhaps because of some imported world inflation, or as a consequence of the evanescent effects of past exchange rate depreciations. In such situations the central bank will automatically provide the increase in the demand for cash. The Bank will finance these increases from its own credit or from increases in international reserves, depending on the circumstances.

Furthermore, irrespective of the exchange rate regime, it should be emphasised that for money supply reductions to take place in the short run, unrealistic portfolio shifts by the public are required away from its daily cash needed for transactions into non-liquid, interest-bearing deposits. A symmetrical treatment would lead us to similar conclusions when dealing with money supply expansions.

It could be argued that the discussion so far has ignored the price level and that if prices fall when the central bank reduces the nominal supply of money, the real purchasing power of cash balances will be maintained. Large short-run price swings, however, can be ignored because, as will be argued, price movements reflect the delayed outcome of monetary actions in the distant past. Thus, while monetary policy tends to work as predicted in theory, i.e. inflation is a monetary phenomenon caused by excessive central bank credit expansion, contemporary price rises and money movements are the result of shocks, monetary or otherwise, that occurred months and sometimes even years earlier. This means that the monetary expansion witnessed at any moment is the outcome of past decisions taken by the central bank or by the government which have given rise to a delayed increase in the demand for money.

The reasoning and conclusions above can also be applied to a system in which banks hold settlement balances at the central bank either voluntarily or because of reserve requirements. If banks have cash

[7] See Mundell (1963) and Fleming (1962).

balances at the central bank, they will be able to reduce them if the central bank contracts M0. They will actually be forced to do so in order to fulfil their payment obligations. This withdrawal is equivalent to central bank credit or to rediscounting of government paper.

## The transmission channels of monetary policy

If the nominal money supply is neither a lever available to induce immediate changes in the stock of currency nor a trigger for short-run movements in the general price level, how does monetary policy work?

It was shown above how fixed exchange rate allows the central bank to vary the level of international reserves but not the monetary base. The reason is that under a fixed exchange rate the supply of money is demand determined even in the medium or long term. To induce changes in the demand for money, a flexible exchange rate is required. Under such an arrangement a monetary expansion can be brought about through the various channels that influence the nominal exchange rate. One is for the central bank to engage in non-sterilised purchases of foreign currency. In the central bank's balance sheet this will be reflected by parallel and equal movements in IR and in M0: as it purchases foreign currency, the central bank will induce an increase in the assets held by commercial banks on their central bank accounts. In our simplified accounts, commercial banks will hold a greater amount of M0 (non-interest-bearing deposits) at the central bank. As they withdraw these non-interest-bearing assets and try to place them among borrowers, lending rates will fall and banks will also be compelled to lower the interest rates paid to depositors. However, since in the simplified balance-sheet presentation the government is the only borrower from the banks, the excess non-interest-bearing cash in the hands of the banks will induce them to reduce the interest rate paid to depositors as well.

As interest rates fall people will either spend more on goods and services, thus putting pressure on the current account of the balance of payments, or purchase foreign assets. These outflows will tend to depreciate the exchange rate, since one cannot presume that a home-made credit expansion will automatically bring in compensatory foreign flows to match the additional aggregate demand and to finance the resulting balance-of-payments deficit.

The depreciated exchange rate will filter through to the price level via various channels. One is direct: the local currency cost of imports goes up, as do the prices of exportable goods sold domestically. These rises will encourage increases in the prices of local goods which are a substitute for or complementary to foreign ones. When imported inputs and capital goods become more expensive, firms will be induced to raise prices to maintain profit levels and to generate a flow of income sufficient to replace their capital goods. All these price rises will, in turn, increase the nominal demand for cash. Since depreciation shocks in Mexico have invariably been associated with a fall in internal demand, protracted price adjustments may also reflect the restoration of profit margins made possible by the gradual recovery of internal demand to its former levels.

How the increased demand for cash produced by higher inflation manifests itself and is then met is key to the transmission mechanism. Some of the additional currency is supplied as the demand for it rises in response to the immediate price increases. But the price adjustments triggered by a depreciation of the exchange rate are spread over time, partly because expectations take time to adjust, and partly because non-traded services contracts are frequently staggered so that prices may take several years to catch up (Gil Díaz and Carstens (1996a and b)). As price rises spread, the demand for nominal currency undergoes futher increases. This demand shows up as currency is withdrawn from the banks through the exchange of D for M0.

As noted above, the daily lubrication of the payments system traditionally performed by central banks ensures that the additional demand for money is properly taken care of. As banks lose deposits while providing currency to the public, they will turn to the central bank to replenish their shrinking liabilities with central bank credit for an equivalent amount. The central bank injects or withdraws credit every day in response to such fluctuations: it accommodates the demand for currency. In its endeavour to ensure that the payments system clears every day, the central bank automatically supplies the cash which the public demands. Thus, credit expansion fuels inflation through its effect on the exchange rate and the ensuing inflation, in turn, induces currency expansion.

The two-way mechanism described above is helpful to illustrate the linkage between policy actions and subsequent events, but is not likely to occur since it is uncharacteristic for central banks to cynically purchase

foreign currency in order to inflate. More realistic scenarios must be looked for.

One is to have the central bank determine interest rates.[8] Most central banks implement daily liquidity expansions or contractions by charging or paying an overnight or very short-run interest rate. This rate will influence the whole structure of interest rates in a variety of ways. Since the overnight rate is viewed by the market as a benchmark, arbitrage possibilities will ensure that market interest rates on some 28-day instruments will tend to equal $(1+d)^{28}$, where $d$ is the daily expected central bank interest rate. In turn, other term deposits will react to changes in the one-month rate so that the one-day rate will end up influencing the overall term structure of interest rates.

Another powerful transmission mechanism will be the implicit announcement effects of an interest rate change. An adjustment of the daily interest rate by the central bank may signal to the market that the central bank aims for a tighter or looser stance. Such a change could have an amplified effect on the level of interest rates beyond the impact via the arbitrage mechanism described above, if the markets believe that the change portends a trend, the continuation of a trend and even, if necessary, a future sharpening of the stance.

If, as argued above, the very short-run interest elasticity of the demand for currency is zero, what purpose can be served by trying to raise or lower interest rates? If a rise in the interest rate will have insignificant effects on the public's preferences between currency and deposits, the central bank would appear to be severely constrained in trying to influence the amount of currency in circulation. But we shall see that it can do so, albeit with a significant delay, through its power to influence the determinants of the demand for currency.

In the short run the central bank has virtually no possibility of altering the demand for currency and, consequently, its supply, but its ability to change interest rates has powerful, if delayed, effects on both variables. A rise in interest rates, for instance, will depress consumption and investment, resulting in a dampening of aggregate demand. As this happens, the general price level will fall or rise less than it would otherwise have done. The drop in inflation will make the nominal demand for currency lower

[8] The central bank can do this through various mechanisms: it can use keynote tender operations at fixed rates (fixed rate tenders), or it can target short-run or overnight interest rates through variations in its provision of liquidity.

than it would have been without the change in the policy position of the central bank.[9] Thus, the eventual fall in the supply of money, or its smaller increase, is brought about not by directly reducing its nominal supply but by influencing the economic determinants of its demand.

A higher interest rate will produce other effects that reinforce those already described. It will attract capital inflows and, through its negative impact on aggregate demand, will tend to reduce the demand for foreign currency or increase its supply through its effect on some current account transactions of the balance of payments. Both outcomes will tend to appreciate the exchange rate and, thereby, contribute to reducing inflation. In some countries the direct link between the exchange rate and prices will be immediate and strong. In others, the relationship between interest rates and aggregate demand may dominate.

It may also be of interest to consider the opposite case of a rise in inflation. If the central bank lowers its interest rate, the end-result may be to stimulate aggregate demand and depress the exchange rate. Both developments will tend to raise inflation. Higher inflation will increase the nominal demand for currency, and the daily lubrication of the payments mechanism by the central bank will translate this higher demand into a correspondingly higher degree of monetary accommodation.

An expansionary stance of the central bank therefore will gradually filter through to the price level and with it to the nominal demand for currency because of the time required to go through the different steps in the transmission mechanism and, as argued before, because of the fact that contracts are typically staggered over time. Inflationary expectations play an important part in determining the duration of contracts governing wages, rents, tuition, etc. To the extent that contracts are not revised every day and overlap over time, price adjustments may take years to work through, whether they originate in shifts in aggregate demand or changes in the exchange rate.

In this fashion, the observed contemporary price rises are the outcome of past modifications in the central bank's policy stance, or of previous supply shocks or political disturbances. It is in this sense that,

[9] The total effect of the policy change on the demand for money is somewhat more complicated. Sooner or later lower inflation will bring about a decrease in nominal interest rates. Therefore, the decrease in the demand for money due to lower inflation will be compensated, to some degree, by an increase in its quantity demanded. But from experience, it can be safely concluded that the first effect will eventually dominate and lower inflation will generally mean a lower nominal demand for currency than would otherwise have occurred.

following Friedman (1968), monetary policy has delayed and changing effects on prices.

## Mexico's monetary policy

While the transmission channels examined above differ in intensity across countries because a vast variety of institutional arrangements and historical experiences exist, they represent the range of options available to central bankers and policy-makers around the world. Depending on preferences, on the degree of central bank independence and credibility, on the level of present and past inflation, on the size and openness of the economy, among other variables, the central bank will choose a set of objectives and operational variables to carry out its task.

Some countries, such as Canada, have chosen a floating exchange rate, with foreign exchange interventions implemented in such a mechanical and predictable fashion that their regime can be likened to a free float. The central bank modifies its stance if it feels that circumstances call for such a change. Others, such as New Zealand, have also maintained a free float, albeit without lubricating interventions in the foreign exchange market. In the case of New Zealand, the central bank favours issuing statements that send a signal to the market and exert a subtle and sophisticated influence on freely determined market interest rates (see Reserve Bank of New Zealand (1992), p. 73).[10]

The reference to New Zealand seems appropriate because recently the course of monetary policy in Mexico has shown some parallels with that country's experience, although Mexico's evolved independently.

From the onset of the 1994 peso devaluation and the ensuing financial crisis, to the present day, the Banco de México has continued its practice of setting its settlement cash target daily to accommodate the demand for currency, but it has radically modified its mode of intervention. Before the crisis fixed rate tenders were often used to set each day the interest rates at which it would conduct its intervention to withdraw or inject liquidity.

[10] Signalling is a technique widely used by central banks (Borio (1997)). Regarding the supply of bank reserves by the Bank of Canada, Borio reports (p. 26): "Supplying, say, a somewhat larger amount than that targeted by banks is expected to put downward pressure on the overnight rate. It is still an open question, however, how much of the downward pressure occurs through a mechanical liquidity effect or, more fundamentally, through the signal conveyed regarding monetary intentions."

The crisis, however, brought about a nominal depreciation of the exchange rate of more than 100%, high and variable inflation and, initially, a severe slump in the real economy. The situation was further complicated by highly volatile perceptions abroad of Mexico's prospects.

In such a context it would have been highly inadvisable to attempt to set an interest rate for central bank transactions. Too low a rate, perhaps causing real interest rates to turn negative, would have encouraged lending and higher inflation. Too high a level would have aggravated the problems faced by borrowers and the portfolio difficulties experienced by commercial banks. Thus, it was decided that the accommodating stance of the central bank as regards the demand for currency would be complemented with a freely-floating, market-determined interest rate on the central bank's daily operations with commercial banks.[11]

Given this arrangement, the question arises as to the type of procedure the central bank could use if it considers that intervention is appropriate. A variety of circumstances could call for intervention: for example, the central bank might believe that inflation is rising too quickly; it could fear that rapid exchange rate movements might provoke a bandwagon effect; or it could view the rate of growth in total credit as excessive.

To influence monetary conditions, the Reserve Bank of New Zealand has relied on carefully prepared statements of its Governor or senior officials. The Bank for its part uses a daily announcement of its target for the cumulative or average amount of settlement balances for signalling purposes. Movements in the target for the cumulative balance are translated into changes in the amount of settlement balances that the Bank injects or withdraws at auction-determined interest rates in its daily operations with commercial banks. Movements in the cumulative target have been so minuscule that they amount to something akin to the moral suasion that many central banks have sought to impose through policy statements.[12]

[11] This strategy is not unique. Again quoting Borio ((1997, p. 50): "The initial move towards more market-oriented means of policy implementation away from standing facilities and, in some countries, the greater focus on quantitative objectives for operating and/or intermediate aggregates went naturally hand in hand with implementation strategies where central banks gave less guidance about desired interest rates. At a time when reducing inflation was paramount, these policies were also seen as a way of shielding central banks from social and political resistance to unpalatable increases in interest rates".

[12] See Tait and Reddell (1992, pp. 72–73). As to the question "How can mere announcements have such a critical effect?" Borio (1997, p. 57) notes: "The answer perhaps lies in the fact that as a monopolist supplier of settlement balances, the central bank *could*, if it so wanted, set the overnight rate."

With regard to current monetary management in Mexico, the daily operations of liquidity injection or withdrawal are effected in the context of a zero reserve requirement for the accounts of commercial banks at the central bank. Given the characteristics of the Mexican payments system,[13] banks are confident that they will be able to overdraw or add to their central bank accounts if on any given day there is insufficient or excess settlement cash. In practice, imbalances are relatively small because of the daily targeting procedures and the close co-ordination between the Treasury and the Bank. The Treasury will not issue a payment on *t* of which it did not give notice on *t*-1, and commercial banks, through which all tax revenues (including customs duties) are channelled, give notice on *t*–1 of Treasury income to be deposited on the Treasury's account at the central bank on *t*. With daily settlement cash targets always including compensation for *t*–1 errors, the amount of net settlement balances demanded by commercial banks on any given day is virtually nil. Complementing these procedures is a central bank policy of aiming for a zero, or near-zero, excess supply of settlement cash on any given day.

A crucial element of the zero average reserve requirement scheme is the daily announcement by the Bank of its target for the cumulative balance of commercial banks' accounts at the central bank for the next day's market opening. Thus, for example, announcing a zero objective for the cumulative balance implies a neutral monetary policy, while a movement to a negative target would signal a tightening of monetary conditions.

Overdrafts can be easily induced. The Bank injects or withdraws credit, as the case may be, in its daily operations in order to accommodate the fluctuations in the demand for currency. If less credit than

[13] Daily government operations are known with certainty one day prior to their taking place. Up to mid-1995 all the daily movements in the government and bank accounts at the central bank were offset daily through a second auction of settlement cash known as the "milkman's market", as it was conducted before banks open for business, at the previous closing-day value date. This system was transformed into the present one, which allows banks to draw settlement balances within the 28-day zero reserve requirement period. Within this period the market knows that the central bank will offset completely all movements on its accounts by means of a second daily auction of settlement balances which is conducted at least each closing 28th day of the cycle. The rule of fully offsetting account balances is altered only when the central bank deliberately modifies its stance, thereby forcing the banks to overdraw their current accounts at the central bank. But as noted in the text, these overdrawings are so small, that they can only be interpreted as signals: in 1995 the largest overdrawing amounted to 40 million pesos, or barely $5 million out of $200 billion of bank liabilities.

needed is injected, the banking sector as a whole will incur an overdraft on its central bank accounts.

Above conclusions do not hinge on a system of zero reserve requirements, nor on a banking system that holds practically no settlement balances, nor on the resulting identification of currency with the monetary base. If banks were required to hold a fraction of their liabilities deposited at the central bank, an error in targeting the daily cash needs (e.g. a shortfall) by the central bank would be cushioned by withdrawals from their accounts. This mechanism does not differ in any essential way from the workings of a system based on zero reserve requirements. The same applies to the process, favoured in some countries, of rediscounting of government paper by the commercial banks at the central bank. Under a system of zero reserve requirements the central bank can also set a daily cash target different from zero, or alter it if it wishes to influence monetary conditions, with effects that are indistinguishable, analytically and quantitatively, from what would occur under a system in which banks need to hold settlement balances or are required to maintain reserves at the central bank.

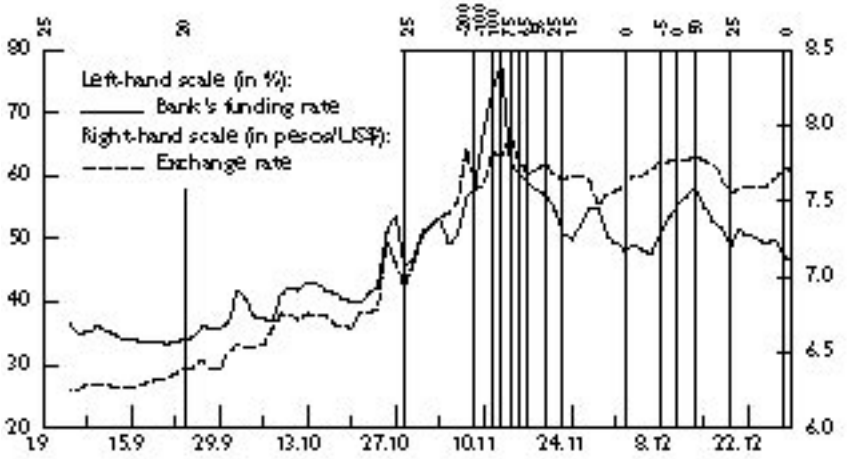
Graphs 1 and 2 illustrate the development of key monetary variables and their relationship with policy changes. The graphs show the behaviour of the spot exchange rate, of a leading market interest rate and of the changes in the Bank's target for settlement cash throughout 1995 and 1996. The interpretation of the latter is as follows: from 2nd to 23rd January 1996, the central bank merely accommodated the daily demand for currency, that is, it left at zero the amount of commercial banks' settlement balances at the central bank. On the latter date it changed its stance from neutral to −5 million pesos and on 25th January to −20 million, where it was held until 7th June, when it was changed to −30 million.

A 10 million peso shortage induced by the central bank until the closing 28th day of the cycle, meant that some commercial banks ended up paying twice the Treasury bill rate on the amount of their overdrafts at the end of the 28-day averaging period used to calculate their compliance with the reserve requirement. The reserve requirement, or the amount that banks have to hold on average in their accounts at the central bank, is at least zero.

The amounts involved mean nothing quantitatively: 10 million pesos amount to 0.0000063 of the average liabilities of the banking system in

Graph 1

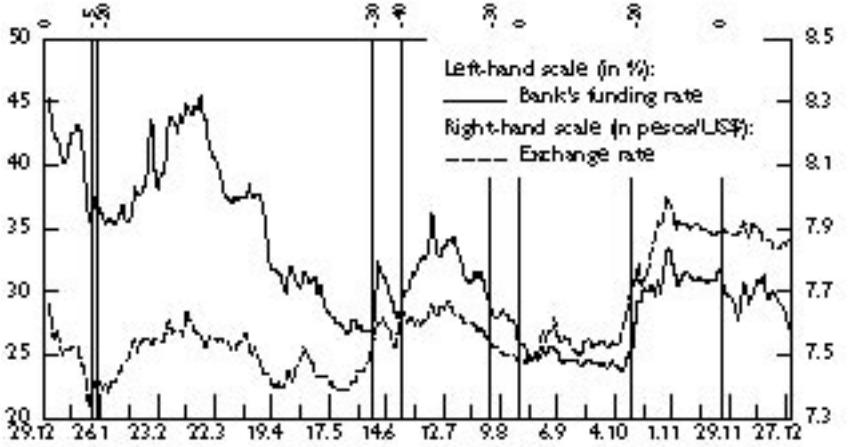
**Banks' funding rate, the spot exchange rate and the objective for accumulated balances, 1995***




* Accumulated settlement balances in millions of pesos are shown on the top scale.

Graph 2

**Banks' funding rate, the spot exchange rate and the objective for accumulated balances, 1996***




* Accumulated settlement balances in millions of pesos are shown on the top scale.

1996. The interest cost involved is also insignificant. Yet, as the graphs show, these small movements in the central bank's daily accommodation were signals that the market took into account and to which they reacted accordingly.

A few of the several instances in which the central bank felt it appropriate to act could be analysed. On 7th June 1996 the exchange rate started to depreciate too quickly. This led the Bank to withdraw 30 million pesos from the market instead of the previous 20 million. Shortly afterwards the exchange rate again showed some nervousness and the amount was raised to −40 million. Graph 2 illustrates how interest rates reacted immediately. It also shows that periods of exchange rate appreciation were associated with falling interest rates, as in the period from 22nd February to 14th May 1996. An example of the opposite movement is the period from 3rd to 29th July 1996. In both periods shifts in the exchange rate and in interest rates occurred in the absence of policy changes, simply as the result of natural market forces reflecting how, when the exchange rate depreciates, the demand for funds to purchase foreign exchange leads to higher interest rates, given that the neutrality of the central bank's stance implies that it will not inject excess funds into the system.

Another interesting feature of the variables depicted in the graphs, is that the announcement effect of shifts in the central bank's stance seems to fade rapidly. A negative (restrictive) stance maintained long enough can be found to be associated with falling interest rates and vice versa. Possibly because of the very small amounts involved, the changes in the stance more than its sign or absolute value therefore seem to be what matters.

The transmission channels of the Mexican economy have been well documented in several research papers, some of which are quoted in the list of references below. These channels are closely related to the degree of openness of the economy. Prices in Mexico have a long history of sensivity to the exchange rate. This relationship and its speed have been reinforced by the broad opening-up to trade of the Mexican economy since 1985: current account transactions, excluding interest flows, accounted for 34% of GDP in 1993, 38% in 1994, 58% in 1995 and 60% in 1996 (national accounts figures).

A recent study (Pérez-López (1996)) has shown that in Mexico the behaviour of the exchange rate and that of wages maintain a close

relationship with the evolution of prices. Moreover, this study suggests that a 10% rise in wages causes a 6% increase in the price level over a seven-month period, while a 10% depreciation of the exchange rate generates a 4.5% increase in the price level during the subsequent eight months.

The cause-and-effect relationships are more complex than what statistical correlations appear to corroborate. If the nominal exchange rate had remained fixed from 1994 until the present, for instance, most analysts would agree that nominal wages would have exhibited far smaller increases, so that, even though salary increases bear on prices, wages are also influenced by exchange rate depreciations. Nominal wages inevitably adjust upwards after a devaluation in response to the price increases provoked by the depreciated exchange rate, and wage hikes will be reflected in price jumps that, in turn, will feed into wages again until, if the nominal exchange rate remains at its new, depreciated level, these ever-smaller adjustments peter out. Causation thus appears to be from devaluation to prices, with wages playing catch-up and nudging along price increases with another ultimate cause.

Economic causality appears to be from interest rates to the nominal exchange rate and then to output, and from exchange rate movements to prices, from prices to wages and again from wages to prices. The output relationship has been left until the end because in recent years the impact of exchange rate movements on variations in real output in Mexico has been rather modest under conditions of high inflation. With fast inflation nominal exchange rate variations swamp real ones. Of course, from a welfare point of view, the output link is more important. Again, it has been the Mexican experience (documented in Pérez-López, (1995)) that deviations of the real exchange rate from its stationary level create fluctuations in output. A depreciation of the real exchange rate is associated with a fall in output and vice versa for an appreciation. Since shifts in monetary policy will have effects on the nominal exchange rate, the real exchange rate will be transitorily affected by modifications in the stance of the central bank. The effect of the real exchange rate on output will of course also feed into changes in the demand for money.

The graphs contain another lesson. A neutral accommodating stance is not equivalent to inaction on the part of the central bank. Free floating of interest rates and the exchange rate implies that both variables fluctuate in a sychronised way to absorb shocks. If capital flows out of the country

the adjustment will be spread between both variables, credit will become scarcer and the exchange rate more depreciated. An invariant supply of liquidity by the central bank, understood as modifying its credit solely to accommodate the daily fluctuations in the demand for cash, implies that speculators cannot count on the provision of central bank liquidity to finance their outflows. Therefore, interest rates rise as capital flows out, making speculation more expensive and helping to stem or halt the outflow. In a Canadian context, this would be equivalent to monetary conditions showing compensating movements with no intervention by the central bank. Therefore, a stance of merely accommodating the demand for currency is indeed a policy, viz. a policy consisting of not allowing conditions to loosen when there is a run. A symmetrical reasoning applies to ex ante capital inflows.

## Annex 1

### The operational framework of the Banco de México

The operational framework adopted by the Banco de México to implement its monetary policy comprises a reserve requirement with averaging around a level of zero reserves over a 28-calendar-day maintenance period. The regime was introduced in March 1995 to allow the Bank to send quantitative signals to the money market without determining interest rate levels.

Under the scheme, the Bank does not remunerate positive settlement balances nor does it charge for overdrafts posted at the end of each day in the commercial banks' current accounts at the central bank. However, it charges a penalty rate at the end of the maintenance period, if the cumulative (average) balance is negative. The cumulative balance is defined as the sum of the daily positive and negative (overdraft) settlement balances. The penalty is meant to give banks an incentive to end the maintenance period with a zero cumulative balance and is equal to twice a market-determined rate. The magnitude of the penalty is set at such a high level in order to make the net cost of end-of-period negative cumulative balances similar to the net cost of holding end-of-period positive cumulative balances.[14]

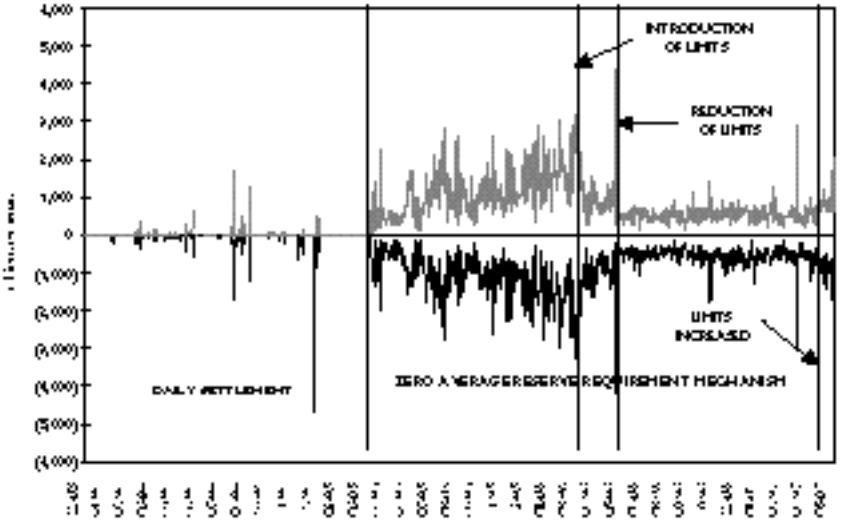
In order to prevent large fluctuations in commercial banks' account balances and to reduce the capacity of banks to take leveraged positions to influence interest rates, limits were established for the overdraft facility and for the amount of positive balances that count towards the cumulative balance (Graph 3). The limits were set on an individual basis related to each bank's capital.

The Bank intervenes every day in the money market injecting or withdrawing liquidity. The Bank determines the amount of its intervention so that the sum of all banks' cumulative balances at the end of the day adds up to a predetermined amount. The Bank announces every day the predetermined amount and uses it to signal its monetary policy intentions

[14] The net cost of an end-of-period negative cumulative balance is equal to twice a market-determined rate minus the return from investing at market rates the funds obtained through the overdraft. The net cost of an end-of-period positive cumulative balance is equal to the return forgone by not investing the funds in the market.

Graph 3

**Positive and negative balances in banks' accounts**




(Table 1). Thus, a reduction in the Bank's target for the cumulative balance would indicate its intention to tighten its monetary stance, whereas an increase would signal its intention to ease policy.

Table 1

**Daily information to the market**

In millions of pesos

| | |
|---|---|
| Notes and coins in circulation at the close of the previous day . . . . . | 84,809 |
| Net balance of banks' accounts at the close of the previous day . . . . . | 0 |
| Aggregate cumulative balance . . . . . | – 1 |
| Projected pre-intervention cash position of the system . . . . . | –3,981 |
| Central bank intervention in the money market . . . . . | –3,982 |
| Target for the cumulative balance . . . . . | 0 |

The Bank does not use an official interest rate nor does it set maximum or minimum levels for interest rates during its interventions in the money market. All interventions are carried out through auctions (Table 2) in which the Bank determines the quantities and the market freely sets the interest rates.

Table 2
**Instruments**

| Instrument | Provide liquidity | Withdraw liquidity | Maturity |
|---|---|---|---|
| Repos . . . . . | * | * | 1 to 56 days |
| Credits . . . . . | * | | 1 to 56 days |
| Deposits . . . . . | | * | 1 to 56 days |
| Purchases or sales of securities . . | * | * | 91 to 364 days |

The Bank intervenes every business day to bring the cumulative balance to the announced target. In doing so, it takes into account all transactions that have an impact on the balance in the banks' settlement accounts at the central bank, such as changes in currency demand, government receipts and disbursements, foreign exchange interventions and the falling-due of previous open market operations. The Bank has complete prior information on all these operations, except for cash deposits or withdrawals made by credit institutions to meet changes in the demand for currency. The Bank credits (or debits) banks' current accounts on the same day as banks deposit the notes taken from the public or withdraw them. Therefore, each day the Bank includes its own daily forecast of changes in the demand for notes and coins[15] in its estimate of the intervention in the money market (Graph 4 and Table 3).

Graph 4
**Demand for notes and coins**

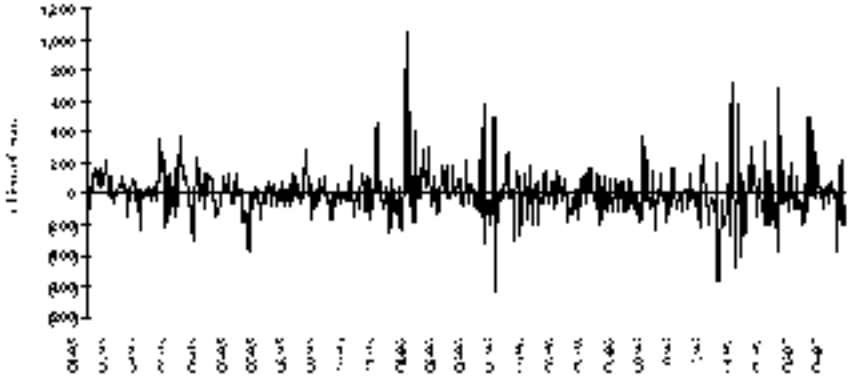


Table 3

## Daily demand for notes and coins: forecast errors

In millions of pesos

| Year | Mean | Standard deviation | Mean of absolute deviation | Volatility |
|---|---|---|---|---|
| 1995 . . . . | 8.7 | 128.5 | 85.7 | 147.1 |
| 1996 . . . . | −4.1 | 160.9 | 107.7 | 208.4 |
| 1997 . . . . | 3.6 | 183.5 | 130.4 | 161.7 |

Average monetary base in 1997 = 76.2 billion pesos.

Table 4

## Interbank market (May 1997)

In millions of dollars

| | Average number of daily transactions | Average daily transacted value | Average daily value per transaction |
|---|---|---|---|
| Government securities . . | 1,699 | 19,339.5 | 11.38 |
| Commercial and development banks' notes . | 1,010 | 30,638.3 | 30.33 |
| Pre-settlement market . . | 43 | 500.4 | 11.64 |

Average exchange rate: 7.9031 pesos/$.

[15] In Mexico, commercial banks' demand for settlement balances is relatively small, making the monetary base almost equal to the demand for notes and coins. This is due to the following reasons: (a) the Bank offsets all changes in the settlement balances of the commercial banks' accounts; (b) it provides daylight credit; (c) commercial banks can overdraw their accounts at the end of the day during the maintenance period; and (d) there is a pre-settlement market (see Table 4) in which commercial banks are allowed to borrow and lend among themselves after their settlement positions are known and third parties are no longer permitted to transact.

## Annex 2

### Interest rate impact of selected shocks: econometric evidence

To assess the effect on short-term interest rates of changes in the Banco de México´s target for the cumulative balance, a regression was run using the interbank overnight interest rate as the dependent variable and the 30-year US bond yield, the peso/dollar exchange rate, liquidity shocks[16] and the Bank's target for the cumulative balance (CB) as explanatory variables. The results obtained show that short-term interest rates react to the signals sent by the Bank but not to transitory (unintended) liquidity shocks.[17]

The sample period runs from early September 1995, when the Bank established the system of zero average reserve requirements with synchronised maintenance periods for all banks,[18] to end-December 1996, one month after it changed its monetary stance for the last time.[19] Daily data were used.

To provide a test of the stability of the coefficients obtained, the sample was divided in two. The first sub-period runs from 7th September 1995 to 14th March 1996, when the Bank imposed limits on the settlement balances counting towards the cumulative balance. The second sub-period runs from 15th March 1996 to 31st December 1996. The results for the whole period and for the two sub-periods are shown in Table 5.

[16] The source of the liquidity shock is a central bank error in its daily forecast for notes and coins in circulation. A negative shock occurs when the actual demand for notes and coins exceeds the demand forecast by the Bank and thus commercial banks end up overdrawing their accounts at the central bank to satisfy the public's demand for notes and coins.

[17] Juan-Ramón (1996) and Thorne (1997) found similar results.

[18] From March to August 1995 the maintenance period for reserve requirements of the various banks was overlapping in time.

[19] The last modification of the policy stance was on 8th November 1996 (this paper was completed in August 1997).

Table 5

## Interest rate impact of selected shocks

| | Interest rate effect in basis points | | | Days to complete the effect | | |
|---|---|---|---|---|---|---|
| | Whole period | First sub-period | Second sub-period | Whole period | First sub-period | Second sub-period |
| Transitory liquidity shock of 100 million pesos . . . | + 5 | + 14 | – | ..* | 1 | – |
| Increase of 10 million pesos in the Bank's target for the CB . . . . | – 70 | – 70 | – 90 | 4 | 4 | 3 |
| Depreciation of 10 cents in the peso/dollar exchange rate . . . . . | +222 | +231 | +217 | 3 | 3 | 3 |
| Increase of 1 basis point in the 30-year US bond yield . . . . . | + 5 | + 10 | – | 4 | 4 | – |

* The effect is purely transitory.

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# The transmission mechanism of monetary policy in Peru

Javier de la Rocha

## Overview

The far-reaching structural transformation that began in August 1990 has significantly changed the way in which monetary policy affects the Peruvian economy. The changes started with a stabilisation and reform programme which aimed at halting hyperinflation in excess of 7,000% in 1990 and bringing the economy back to a path of sustainable growth. As a result, inflation was brought down to single-digit level in 1997 (9.5% in the 12 months ending in June).

As in other recent reform programmes, the Peruvian liberalisation covered many markets simultaneously and was undertaken together with stabilisation. Between August 1990 and December 1991, all exchange controls were eliminated, full convertibility was restored, the current and capital accounts were liberalised and a floating exchange rate regime was established. At the same time interest rates were freed and reserve requirements were gradually lowered.

Financial reform was consolidated during 1991–92, with the approval of a new legal framework that allowed market forces to work freely. This legal framework included a new Constitution and special legislation for the central bank, financial institutions, the stock market and the private pension system.

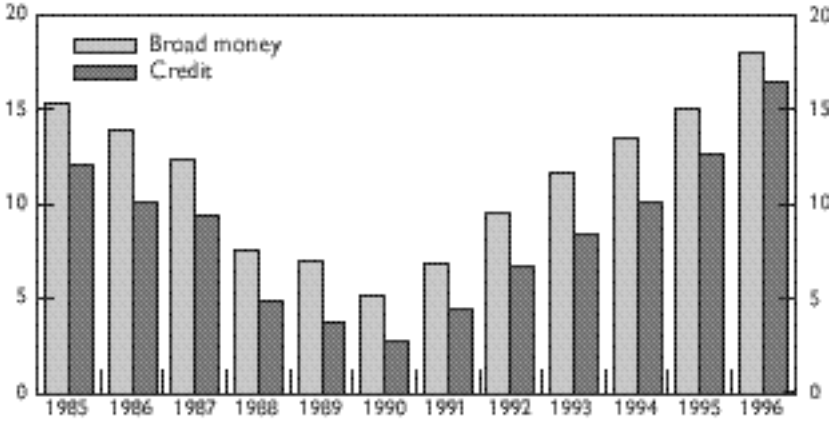
In this new legal environment, Peru adopted the principles of universal banking, competition in the financial system was fostered with the non-discriminatory treatment of foreign investment, public banks were privatised, prudential regulations consistent with the Basle standards were introduced, a deposit insurance scheme with partial coverage was implemented, and bank supervision was improved significantly. At the same time the stock markets were privatised, mutual funds started operations and employees were allowed to choose between contributing to private pension funds based on individual accounts and contributing to the old pay-as-you-go public pension system.

Reforms and successful stabilisation have helped to restore confidence in the Peruvian financial system and to promote the development of the domestic capital market. Financial intermediation has rebounded to its pre-hyperinflation levels. The ratio of broad money to GDP increased from 5% in 1990 to 18% in 1996. In addition, credit to the private sector rose from 3% of GDP to 16.5% of GDP over the same period (see Graph 1). Private bond issues in the domestic capital market started in 1993 and now amount to almost 2% of GDP.

Graph 1

**Broad money and credit to the private sector**

As a percentage of GDP




## 1. Reform of monetary policy and the role of the central bank

The reform of monetary policy and the central bank are among the main elements of the Peruvian economic programme. Under this reform the role of the central bank was redefined to allow it to concentrate on achieving price stability. For this reason, the new Charter of the Banco Central de Reserva del Peru states that *price stability is the sole objective of the Bank*. In accordance with this objective, monetary policy aims at achieving low international rates of inflation in the medium term. The Bank's further functions are: to regulate the money supply, to administer

the international reserves, to issue banknotes and coins, and to report periodically on the economy's financial situation.

The 1993 Peruvian Constitution (and the new central bank Charter) establishes two fundamental principles of monetary policy:

(i) The Banco Central de Reserva del Peru is autonomous, within its own Organic Law; and

(ii) the Bank's purpose is to preserve monetary stability.

The Bank's autonomy is a necessary condition for the technical management of its activities, free from any political pressures to finance, for instance, public spending by printing money. By establishing in the Constitution that monetary stability is the only purpose of the Bank, it is acknowledged that its contribution to growth is to eliminate inflation. Recent experience in Peru has shown that it is impossible for businesses to flourish or for investment to grow in the presence of high inflation.

To safeguard the Bank's autonomy, the Constitution provides that members of its Board of Directors may be impeached by Congress only for serious dereliction of their duties. Among the grounds for impeachment, the Bank's Organic Law tables the following:

- financing the public sector (except indirectly, through the purchase of bonds in the secondary market, up to 5% of the monetary base at the end of the previous year);
- financing any state development bank;
- granting guarantees;
- granting credit to any particular sector of the economy;
- establishing multiple exchange rate systems.

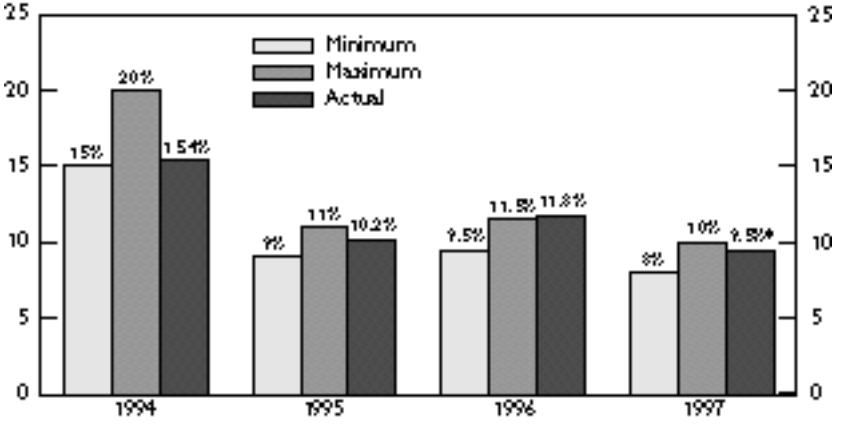
The previous law made the Bank responsible for achieving three objectives which could be mutually incompatible: price stability, promoting credit and exchange rate conditions consistent with the orderly development of the economy, and fostering high growth in production and employment.

Under its new legal framework, the Bank is establishing a record of meeting its inflation targets. At the beginning of each year the Bank announces a target range for annual inflation. In 1994 and 1995 Peru achieved inflation rates within its target range, and in 1996 inflation was only slightly above this range (see Graph 2).

Graph 2

**Annual inflation targets and actual inflation**

In percentages




* Twelve months to June.

## 2. Monetary programming

The Board of Directors of the Bank approves a monetary programme which includes liquidity and credit growth rates compatible with a consistent macro-economic scenario and with the inflation objective set. In formulating the monetary programme the Bank takes into account aggregate supply and demand trends. On the supply side, feasible growth rates by sector are factored in, identifying possible constraints or bottlenecks. On the demand side, consumption and investment growth in the public and private sectors are considered.

The aim of monetary policy is to gradually achieve low international levels of inflation (once a single-digit level has been reached, the speed of disinflation should be lower because of higher output costs). The Bank sets intermediate targets for base money growth consistent with its annual inflation targets. Base money targets are based on money demand forecasts. However, these targets are not made public, as changes in money demand might lead to their revision. Such changes could arise, for instance, as a result of financial innovation or improvements in the payments system. By selecting base money as an intermediate target, the

Bank accepts that exchange rates and interest rates should be freely determined by supply and demand.

In order to determine base money, the levels of liquidity required by economic agents need to be estimated. This is accomplished using the money equation (expressed in percentage changes):

$$\hat{M} = \hat{P} + \hat{Q} - \hat{V}$$

For programming purposes, the growth of liquidity ($M$) is obtained by determining the targeted inflation rate ($P$) and the sustainable rate of output growth ($Q$) and applying the estimated velocity of circulation of money ($V$). The growth of liquidity must have a direct relationship with the increase in prices and output and an inverse relationship with the change in velocity of circulation of money. Once liquidity has been estimated, base money ($H$) is obtained by dividing the former by the bank multiplier ($m$), which in turn is calculated from the estimated preference ratio for currency ($c$) and the bank reserve coefficient ($e$):

$$m = M/H = 1/[c + (1 - c)e]$$

At the beginning of the stabilisation programme a monetary aggregate was selected as an intermediate target. It was thought that inflation expectations would respond more to such a variable, as agents had observed a striking relationship between the explosive growth of base money and hyperinflation. Fixing the exchange rate was ruled out early on because of a lack of international reserves, negative experience with failed stabilisation attempts and difficulties in choosing an appropriate exchange rate. Moreover, flexible exchange rates were viewed as more desirable under capital mobility and potentially volatile capital flows. On the other hand, interest rate targeting was also ruled out, as it was difficult to determine an appropriate level for the nominal interest rate in an environment of disinflation (reflecting the difficulty of measuring inflation expectations) and as financial markets were not very deep.

The chosen intermediate target was base money, rather than a broader aggregate, because it could be more easily controlled by the Bank and because it had a close relationship with the policy objective (inflation).

*Monetary policy indicators*

Targets for monetary aggregates are revised during the year if new information on a set of selected indicators suggests that money demand

differs from the original forecast. The Bank examines the monetary stance by reference, inter alia, to the following indicators:

- the interbank interest rate;
- the exchange rate;
- projected inflation;
- the fiscal stance;
- aggregate demand;
- credit to the private sector.

*Instruments of monetary policy*

In order to achieve its inflation target, the Bank has gradually replaced its instruments of direct monetary control with market-based instruments. Direct credit allocation by the Bank was discontinued in 1991 and discount window borrowing has been significantly reduced and is only granted for very short periods (usually one business day). Reserve requirements for domestic currency liabilities have been reduced from 45% in 1990 to 9% in 1993 and to 7% in 1997.

Currently, monetary policy is based on two main instruments:

(a) intervention in the foreign exchange market through sales and purchases of foreign exchange to/from financial institutions. Under the floating exchange rate system, the Bank's intervention reduces abrupt and transitory changes in the exchange rate. Furthermore, intervention induces remonetisation and a gradual reversal of the dollarisation process and, at the same time, the Bank accumulates international reserves;

(b) intervention in the money market through open market operations conducted using central bank certificates of deposit which are auctioned to financial institutions and institutional investors. The Bank announces the amount to be issued, and the interest rate is freely determined through the auction process. Thus, the Bank can sterilise the excess reserves of the financial institutions, reducing the volume of base money.

Another instrument used by the Bank is the provision of short-term monetary regulation loans (rediscounts). These loans are used to offset temporary liquidity shortages of financial institutions, which arise from seasonal fluctuations in monetary aggregates and public finance. However,

if a bank uses this credit for 90 days in a period of 360 days, it is placed under surveillance by the institution in charge of banking supervision. The interest rate charged is higher than the yield on central bank CDs, so as to discourage banks from taking funds from the Bank instead of seeking interbank credits. The Bank modifies its discount rate to signal changes in the stance of monetary policy or in expected inflation.

Reserve requirements on foreign currency deposits and the interest rate paid on these reserves are used as supplementary instruments in order to control the expansion of monetary aggregates denominated in foreign currency. Currently, a 45% marginal reserve requirement applies to all foreign currency deposits. Required reserves are remunerated at LIBOR minus 1⅜%. Reserves are computed on the basis of monthly averages. Vault cash and demand deposits at the central bank count towards these reserves.

For the daily conduct of monetary policy, there is a Money and Foreign Exchange Committee that meets every morning to decide on intervention on the basis of the most recent information in the markets. The Committee decides:

- the amount of dollars to be purchased in the foreign exchange market;
- whether to auction central bank CDs and the amount to be auctioned;
- the discount rate.

## 3. Capital inflows

Large capital inflows constitute a challenge for monetary policy. They create pressure for an appreciation of the exchange rate and facilitate rapid credit expansion as external financing is readily available to domestic banks. Although over 70% of the inflows into Peru are long-term, the remaining 30% or so could be considered temporary. In view of the risks that the potential volatility of these capital flows poses to macroeconomic stability and the health of the financial system, the Bank has chosen an active approach to dealing with them.

To reduce the impact that capital flows have on the exchange rate and on aggregate demand the Bank maintains the 45% marginal reserve requirement on foreign currency deposits. This also acts as a buffer stock against potential outflows and encourages holdings of domestic currency. Furthermore, the Bank sterilises its net purchases of dollars in order to

keep base money growth under control. Sterilisation is carried out through sales of central bank CDs or through public sector deposits at the central bank.

## 4. Coordination with fiscal policy

Coordination between fiscal and monetary policies has been a key element of the success of Peruvian stabilisation. In the early stages of stabilisation, strict fiscal discipline made it possible to regain control of monetary policy. In addition, since 1994 public sector deposits and purchases of foreign exchange from the central bank have given the monetary authority room to intervene in the foreign exchange market and prevent a larger appreciation of the new sol.

The coordination of fiscal and monetary policies takes place at two levels:

- at the programming level: the macroeconomic assumptions for the fiscal budget, including the annual inflation targets, are set by the Ministry of Finance in coordination with the Bank;
- at the operational level: a Fiscal Committee meets each month to set government expenditure, foreign exchange purchases and deposits. The Bank participates in the meetings of this Committee.

## 5. The process of dollarisation

Prolonged high inflation turned Peru into a highly dollarised economy. While dollarisation has decreased somewhat as inflation fell, restoring confidence in the domestic currency after hyperinflation takes time. At the end of 1996, over two-thirds of deposits and credit to the private sector were denominated in dollars.

The Peruvian dollarisation process goes back to the 1970s when inflation rates started to rise steadily from 19% in 1972 to 74% in 1978. During this period it was prohibited to hold foreign currency, which led to a reduction in the ratio of broad money to GDP from 19.2% to 12.6% as residents acquired dollar deposits outside Peru. At the end of the decade, foreign currency deposits were allowed in the domestic financial system. When three-digit rates of inflation were reached during the first half of

the 1980s, a wide range of foreign assets started to be used as a store of value. The proportion of dollar deposits in the domestic financial system grew to 49% in 1984 (see Table 1). In 1985, this ratio declined to 30% as a result of the confiscation of foreign currency deposits, but this policy did not eliminate incentives to hold foreign currency. It instead resulted in a new outflow of capital via the acquisition of dollar deposits abroad. Thus, in 1987 the ratio of dollarisation shrank to 10%. However, if the dollar deposits abroad by Peruvian residents were included, the degree of dollarisation of assets held by Peruvians would amount to 39%.

In highly dollarised economies, the effectiveness of monetary policy in controlling inflation could be hampered. This, however, depends on the kind of dollarisation. If dollarisation reflects a process of asset substitution, rather than currency substitution, the monetary channel of transmission might still be operative. In the case of Peru, the current degree of dollarisation reflects mainly a process of asset substitution rather than currency substitution. In fact, local currency retains its role as

Table 1
**Degree of dollarisation**
In percentages

| | Dollarisation ratio | | Inflation rate |
|---|---|---|---|
| | (A) | (B)* | |
| 1981 . . . . . | 27 | 37 | 73 |
| 1982 . . . . . | 35 | 49 | 73 |
| 1983 . . . . . | 40 | 57 | 125 |
| 1984 . . . . . | 49 | 65 | 112 |
| 1985 . . . . . | 30 | 55 | 158 |
| 1986 . . . . . | 11 | 36 | 63 |
| 1987 . . . . . | 10 | 39 | 115 |
| 1988 . . . . . | 32 | 70 | 1,722 |
| 1989 . . . . . | 21 | 54 | 2,775 |
| 1990 . . . . . | 47 | 76 | 7,650 |
| 1991 . . . . . | 58 | 73 | 139 |
| 1992 . . . . . | 63 | 75 | 57 |
| 1993 . . . . . | 68 | 77 | 40 |
| 1994 . . . . . | 63 | 71 | 15 |
| 1995 . . . . . | 61 | 68 | 10 |
| 1996 . . . . . | 63 | 69 | 12 |

* Considers deposits of Peruvians abroad.

a means of payment, while foreign currency mainly serves as a store of value (due to the past history of high and persistent inflation). In this context, the effectiveness of monetary policy is not very much affected by dollarisation, since local currency remains the main monetary channel of transmission to aggregate demand.

The ratio of dollarisation including deposits abroad (indicative of asset substitution) shows that from 1990 to 1996 the degree of dollarisation fell together with inflation. Incentives to hold foreign currency remain, but as long as monetary policy can keep inflation low, the public's confidence in the local currency, not only as a means of payment but also as a store of value, should be gradually restored.

A breakdown of deposits in the Peruvian banking system shows that domestic currency deposits are mostly held in the form of current accounts and savings deposits, while foreign currency deposits are predominantly held as savings and time deposits (see Table 2). Furthermore, the withdrawal frequency (defined as the ratio of withdrawals to average balances outstanding) is more than twice as high in local currency as in foreign currency. Therefore, while there is a demand for foreign currency for some transactions, its main role is as a store of value.

Table 2
**Composition of bank deposits**

| | Local currency | | | Foreign currency | | |
|---|---|---|---|---|---|---|
| | Current accounts | Savings deposits | Time deposits | Current accounts | Savings deposits | Time deposits |
| 1992 . . . | 33 | 55 | 12 | 9 | 55 | 36 |
| 1993 . . . | 41 | 44 | 15 | 13 | 43 | 45 |
| 1994 . . . | 31 | 46 | 23 | 11 | 42 | 46 |
| 1995 . . . | 30 | 44 | 26 | 12 | 40 | 48 |
| 1996 . . . | 28 | 40 | 33 | 13 | 35 | 52 |

## 6. The transmission mechanism of monetary policy

The Peruvian economy has undergone radical change during the current decade as a result of stabilisation and reform. The new, liberalised financial environment, the ongoing process of financial innovation and the

recent development of open market operations by the central bank have changed and continue to change the ways in which monetary policy is transmitted. It is therefore still too early to draw definitive conclusions regarding the transmission mechanism of monetary policy in Peru. What follows is a preliminary overview of this unsettled issue.

In this liberalised financial system, with its high degree of dollarisation, monetary policy has two sets of instruments. The first, and the most important, is related to indirect monetary control of domestic currency aggregates, and the second is the reserve requirement on foreign currency deposits. As in other dollarised open economies, monetary policy operates mainly through three channels: money, credit and the exchange rate.

Research conducted at the central bank shows that the money channel is the most important channel of transmission. Since 1994, with the development of open market operations, the interest rate on central bank CDs has become a benchmark in the domestic financial markets. At the same time, the influence of broader monetary aggregates on aggregate demand and inflation is still sufficiently large to use them as intermediate targets.

Usually the Bank modifies the stance of monetary policy through changes in indirect instruments rather than through changes in reserve requirements on foreign currency deposits.

*(i) The money channel*

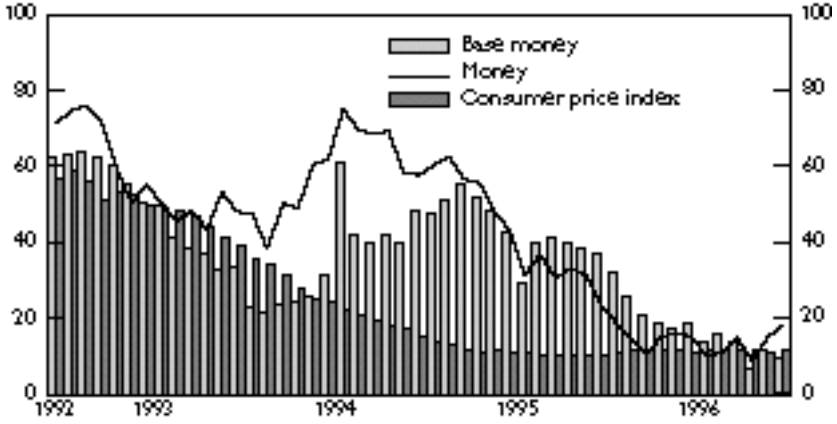
By controlling base money growth, the Bank can influence interest rates, which in turn affect aggregate demand and inflation (Graph 3). Through the interest rates on its instruments (the CD rate and the rediscount rate), the Bank signals to the market its stance of monetary policy, influencing expectations regarding the term structure of interest rates. Thus, for instance, a tightening of monetary policy increases the central bank CD rate, and leads to an increase of interbank and prime interest rates.

In addition, movements in base money induce similar movements in broader monetary aggregates, first in local currency and subsequently also in foreign currency. As a result, changes in the stance of monetary policy influence aggregate demand and inflation. Monetary policy implementation mainly focuses on bank reserves by influencing liquidity conditions in the banking sector. Therefore, interbank interest rates tend to reflect a

Graph 3

**Base money, money and prices, 1992–96**

Twelve-month growth rates, in percentages




shortage or a surplus of liquidity, depending on the direction of monetary policy.

For instance, during 1995 the Bank tightened monetary policy in order to prevent inflation pressures and to maintain a sustainable external position in a context of less fiscal discipline than in previous years. Thus, the central bank CD rate rose from 15 to 19% and the discount rate from 16 to 21%. As a consequence, the growth of liquidity in local currency slowed from a rate of 61% in April to 35% in September. Over the same period, the growth of liquidity in foreign currency decreased from 36 to 19% (Graph 4).

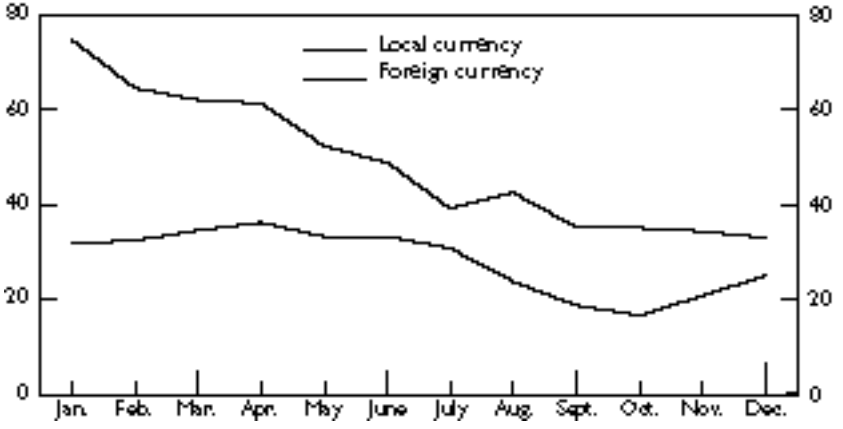
*(ii) The credit channel*

Monetary policy is transmitted via this channel mainly through that part of the stock of money denominated in foreign currency. There is only weak evidence of the existence of this channel for local currency as indirect monetary control affects the availability of credit. On the other hand, the 45% marginal reserve requirement on foreign currency deposits limits credit growth for any given increase in deposits. Changes in this marginal reserve requirement can be used to further affect credit availability.

Graph 4

**Liquidity in local and foreign currency, 1995**

Twelve-month growth rates, in percentages




The effectiveness of this channel is influenced by the degree of capital mobility, the level of financial intermediation and the development of the domestic capital market. For instance, in the past few years, higher capital mobility and the development of the domestic capital market have increased the availability of substitutes for bank credit, as some firms have access to financing through issues of debt or equity in the domestic and external capital markets. This tends to reduce the effectiveness of the credit channel. On the other hand, with the restoration of confidence in the banking system, higher bank intermediation tends to improve the effectiveness of this channel, as it replaces informal financing mechanisms.

*(iii) The exchange rate channel*

As long as domestic and foreign currency assets are imperfect substitutes, central bank intervention in the foreign exchange market will have an impact on the exchange rate. Thus, sterilised purchases of foreign exchange can produce a nominal depreciation of the domestic currency, and temporarily also a real one. However, as large-scale sterilised intervention induces higher interest rates, its impact on the exchange rate cannot be long-lasting. Rather, in the context of large capital inflows, a

strong fiscal position is essential to reduce real appreciation of the exchange rate.

The goal of the Bank's intervention in the foreign exchange market is to reduce exchange rate variability. In order to keep to the intermediate target for base money growth, this intervention is sterilised through net sales of central bank CDs. Prudent fiscal policy contributes to this sterilisation and helps monetary policy maintain control of base money.

In 1994, for instance, the Bank bought US$ 1,053 million (NS 2,288 million) and base money increased by only NS 869 million. The difference was sterilised mainly through public sector operations (NS 1,048 million), which include sales of dollars to the Treasury (for external payment purposes) and an increase in deposits at the central bank. In addition, the Bank sold CDs for NS 338 million (see Table 3).

Table 3

**Sources of base money**

Changes in millions of new soles

| | 1994 | 1995 | 1996 | 1997* |
|---|---|---|---|---|
| Base money | 869 | 986 | 338 | 325 |
| Net purchase of US$ from the financial system | 2,288 | 1,462 | 3,034 | 2,685 |
| *in millions of US$* | *1,053* | *653* | *1,240* | *1,014* |
| Public sector | −1,048 | − 754 | −3,332 | −2,416 |
| Net sales of US$ | − 978 | − 720 | −2,904 | −1,703 |
| *in millions of US$* | *− 447* | *− 314* | *−1,188* | *− 643* |
| Deposits at the central bank | − 70 | − 34 | − 428 | − 713 |
| Central bank CDs | − 338 | − 91 | 359 | − 99 |
| Credit to financial system | − 6 | 4 | 103 | 41 |
| Other | − 27 | 365 | 174 | 114 |

* January–July.

By contrast, in 1995 the Bank's purchases of foreign exchange amounted to only US$ 653 million as a less tight fiscal policy did not permit further sterilisation. The amount of sterilisation through public sector operations decreased from NS 1,048 million in 1994 to NS 754 million in 1995.

In 1996, a tighter fiscal policy resulted in higher sales of foreign currency to the public sector and higher public sector deposits at the central bank, offsetting intervention in the foreign exchange market.

# Financial reform and the monetary transmission mechanism: the case of Thailand

Tanya Sirivedhin

## Introduction

It is generally accepted that the financial liberalisation and reforms undertaken thus far in Thailand have opened up new avenues and increased opportunities for financial market development. The implications are, however, less clear for other areas of the economy. Moreover, in the new environment of closer financial integration and strong capital flows, the effectiveness of monetary policy has often been called into question. This paper attempts to explain the impact of financial deregulation on the real economy, as well as its effects on the operating procedures of monetary policy. The paper is organised into six parts. Section 1 provides a broad overview of current monetary policy management and mechanisms. Section 2 analyses the effects of financial liberalisation on various aspects of the economy and certain indicators, namely the financial sector, domestic interest rates, the capital market, the foreign exchange market and the private corporate sector. Section 3 briefly discusses the three main channels of monetary policy transmission: credit, interest rates and wealth. Section 4 is an empirical study on the implications of the transmission mechanism for the economy using a vector autoregression (VAR) model. Section 5 looks at future tasks and challenges for improving monetary management. Section 6 concludes the paper.

## 1. The framework of monetary policy management and mechanisms

This section reviews the framework of monetary policy management and mechanisms in Thailand. The overall objective of monetary policy is to achieve sustainable economic growth with a reasonable level of internal and external stability. Of particular concern is price stability, which is defined as a low and stable rate of inflation. In the past, the Bank of

Thailand used the money supply, bank credits and reserve money as intermediate targets. However, with the advent of global financial integration and reforms, the behaviour of the demand for money in Thailand has become more complicated and quantitative monetary targets less useful in guiding monetary policy. The Bank has therefore been focusing more on money market liquidity and short-term repurchase and interbank lending rates over a short horizon. Monetary aggregates are monitored very closely as they are still good indicators of monetary and economic conditions, although their explanatory power and predictability are not as great as in the past.

Within this framework, the primary instruments of monetary policy are operations through various so-called "windows". The *repurchase market* for government, state enterprise and Bank of Thailand bonds provides the Bank with the means to monitor developments in short-term liquidity and interest rates. In the past, the arrangement did not allow the Bank much liberty in its open market operations, as the Bank could only conduct its policy through the repurchase market as long as other participants came to the market. However, since the primary dealer system was set up in April 1997, the Bank has been able to conduct open market operations on its own initiative. The *loan window* embodies the traditional "lender of last resort" function of a central bank; commercial banks and finance companies may borrow from this window through seven-day repurchase agreements. It is, however, resorted to only when money is exceptionally tight.

In addition, the Bank operates *refinancing and other credit facilities*. These are generally related to the Bank's development role and its duty to preserve the stability of financial institutions. They therefore play a relatively minor part in the conduct of monetary policy. The refinancing window gives banks another channel for adjusting their liquidity position by selling eligible promissory notes to the Bank at concessional interest rates.

The *Exchange Equalisation Fund (EEF)* has served as a mechanism for implementing the basket-peg exchange rate policy (which was in place until mid-1997). It can perform a useful function as a "safety valve" for banks to manage their liquidity, especially during periods of heavy capital inflows or outflows. Experience has shown that banks tend to sell dollars to the EEF when money is tight and interest rates are high and, similarly, to buy dollars when liquidity is high and interest rates are low.

In all, monetary policy operations have mainly relied on intervention in the repurchase market as a way of containing sharp volatility in short-term interest rates, with sterilisation operations being carried out to counter the tendency towards large shifts in liquidity when necessary. This approach is normally supported by a strong *policy signal* as to the preferred direction of domestic interest rates, such as an adjustment of the "Bank Rate", as well as a systemic tightening of *prudential regulations* such as those on liquid assets, capital adequacy, loan loss provisions and foreign exchange exposure. For example, commercial banks are required to hold liquid assets, averaged over a fortnight, of not less than 7% of their deposit base;[1] the capital/risk asset ratio has been raised to 8.5% for commercial banks, and 7.5% for foreign bank branches and finance companies, while the reserve requirement against doubtful debt has been increased to 100%. The rule on net foreign exchange exposure limits has also been strengthened, allowing banks to run positions in terms of their first-tier capital of no more than 20% overbought and 15% oversold.

## 2. Financial liberalisation and its effects[2]

The country's financial liberalisation process can be generally characterised as following a gradual approach, implemented in steps so as to allow financial institutions and consumers to adjust to the new environment. Prior to reform, the level of competition between financial institutions was relatively low while monetary management was effected largely through the use of direct control measures, such as interest rate ceilings and exchange control regulations. With the rapid growth of the Thai economy and the wave of globalisation and reforms, the first comprehensive financial reform plan was formulated in 1990. The objectives of the plan were to increase the efficiency of the financial system and to enhance

[1] Liquid assets comprise at least 2% non-interest-bearing deposits at the Bank of Thailand, a maximum of 2.5% vault cash, and – making up the remainder – bonds issued by the Government, approved state enterprises, specialised financial institutions or the Bank of Thailand. The range of eligible securities was widened mainly on account of the declining supply of government bonds in the market. The maintenance period was also lengthened (from one week previously) in order to give banks more room to adjust their reserves and thus help somewhat to limit fluctuations in the money market.

[2] Sections 2 and 3 of this paper are drawn partly from Duriyaprapan and Supapongse (1996).

the competitiveness of Thai financial institutions. The first phase of the three-year Financial System Development Plan (1990–92) encompassed four major areas: financial deregulation and liberalisation; development of financial instruments and facilities; strengthening of the supervision and examination of the financial system; and development of the payment system.

The authorities took the initiative further under the second Financial System Development Plan (1993–95), aimed at increasing financial market efficiency, mobilising domestic savings and developing Thailand into a regional financial centre. It should also be noted that financial reform measures were introduced in parallel with economic reforms in other areas, including the fiscal and industrial sectors, and price deregulation. In addition, the objectives of the plan were consistent with national economic policy, as laid down in the Seventh National Economic and Social Development Plan (1992–96).

The third Financial System Development Plan (1996–98) was launched with four main objectives: to support the economy's growth potential and ensure the stability of the economic and financial system; to broaden, deepen and strengthen the financial system; to enhance the efficiency of supervision and examination; and to develop financial infrastructures, including information technology and human resources development.

The financial reforms undertaken so far entail many important changes to the financial system that include, for example, the removal of controls on interest rates, the liberalisation of the capital account – with only a few restrictions on capital outflows remaining, new entries into the domestic financial market, and the development of the country's debt market and instruments. Some of the major accomplishments are summarised in Annex 1.

The impact of financial liberalisation on the economy is examined in the five major areas below.

*(a) Growth of the financial sector*

During the last few years, Thailand's financial sector has grown significantly in terms of both depth and breadth. As shown in Table 1, the progress in financial deepening is revealed by the development of the money supply/GDP ratio. The M2/GDP ratio rose from 64.6% in 1989 to 78.7% in 1994. Moreover, the M3/GDP ratio (i.e. using the definition of the money supply including other financial institutions' deposits) also

Table 1

## Growth of the financial sector

In billions of baht, unless otherwise indicated

| | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|---|---|---|---|---|---|---|---|
| GDP at current prices | 1,868.4 | 2,186.0 | 2,507.0 | 2,827.2 | 3,163.9 | 3,597.4 | 4,169.4* |
| *percentage change* | *19.1* | *17.0* | *14.7* | *12.8* | *11.9* | *13.7* | *15.9* |
| M1 | 174.7 | 195.4 | 222.4 | 249.7 | 296.2 | 346.5 | 388.3 |
| *percentage change* | *17.6* | *11.8* | *13.8* | *12.3* | *18.6* | *17.0* | *12.1* |
| M2 | 1,207.1 | 1,529.1 | 1,832.4 | 2,117.8 | 2,507.1 | 2,829.4 | 3,310.6 |
| *percentage change* | *26.3* | *26.7* | *19.8* | *15.6* | *18.4* | *12.9* | *17.0* |
| M3 | 1,477.5 | 1,873.8 | 2,246.3 | 2,662.8 | 3,187.1 | 3,747.9 | n.a. |
| *percentage change* | *28.8* | *26.8* | *19.9* | *20.8* | *19.7* | *17.6* | *n.a.* |
| M1/GDP in % | 9.4 | 8.9 | 8.9 | 8.8 | 9.4 | 9.6 | 9.3 |
| M2/GDP in % | 64.6 | 69.9 | 73.1 | 74.9 | 79.2 | 78.7 | 79.4 |
| M3/GDP in % | 79.1 | 85.7 | 89.6 | 94.2 | 100.7 | 104.2 | n.a. |
| Total assets | 2,022.3 | 2,553.8 | 3,078.0 | 3,714.1 | 4,725.6 | 6,031.5 | 7,653.3 |
| *percentage change* | *25.5* | *26.3* | *20.5* | *20.7* | *27.2* | *27.6* | *26.9* |
| Total assets/GDP in % | 108.2 | 116.8 | 122.8 | 131.4 | 167.1 | 167.7 | 183.6 |

* Preliminary.

increased substantially, from 79.1% in 1989 to 104.2% in 1994. This implies that the role of other financial institutions in savings mobilisation also increased during this period.

In the meantime, the number of inhabitants per commercial bank branch declined from 26,721 in 1987 to 20,659 in 1994. This suggests that commercial banks are now able to provide more effective services, and this trend is likely to continue with the establishment of new types of financial institution such as the Export and Import Bank of Thailand and the Thai Rating and Information Services (TRIS).

*(b) Determination and movements of interest rates*

The removal of interest rate ceilings and other financial reforms promoted increasingly flexible capital movements, especially those related to short-term private loans. External factors are therefore playing an increasing role in the determination of domestic interest rates. As noted by Subhaswadikul (1995), the long-run equilibrium level of domestic interest rates is mostly determined by foreign interest rates.[3] This reflects the increasing degree of openness of the Thai financial market since exchange control deregulation.

At the same time, the reforms have also led to more variability and less predictability in domestic interest rates. Commercial banks' deposit and lending rates have tended to adjust more frequently and with a larger magnitude in the 1990s than in the 1980s (Table 2). This is because the

[3] Since 1989, foreign interest rates have gained greater influence on the Thai money market. Subhaswadikul (1995) estimated the domestic interest rate function as follows:

$$
\begin{aligned}
i_t = \; & .823 + .895\,(i^*+fp)_t + .00003\,SCBL_t + .504\,S\Pi^e_t \\
& (1.64)\;(18.99)^* \qquad (1.03) \qquad (.755) \\
& -.108\,smgth^u_t - .059\,smgth^u_{t-1} - .202\,smgth^u_{t-2} \\
& (-1.52) \qquad (-.810) \qquad (-2.83)^* \\
& +.280 D(i^*+fp)_t - .064\,SCBLgth_t - .045\,SCBLgth_{t-1} \\
& (2.44)^* \qquad (-2.45)^* \qquad (-1.76)^*
\end{aligned}
$$

where $i$ = domestic interest rate (interbank rate)
$(i^*+fp)$ = eurodollar rate
$SCBL$ = fiscal balance
$S\Pi^e$ = expected inflation
$smgth^u$ = money surprises
$D(i^*+fp)$ = change in the eurodollar rate
$SCBLgth$ = change in the fiscal balance
$t$ = time t

This study uses the cointegration method and the sample period 1989–95. It indicates that the long-run equilibrium level of the domestic interest rate is mostly determined by the foreign interest rate. The coefficient estimate of the foreign interest rate is about 0.9, implying that a 1.0 percentage point rise in the foreign interest rate will result in a rise in the domestic interest rate of 0.9 percentage points, other factors remaining constant.

Table 2

**Selected short-term interest rates, 1985–95**

| | | B/R | R/P | I/B | D/R | MOR | MLR | MRR* |
|---|---|---|---|---|---|---|---|---|
| 1985 | Q1 | 12.00, 13.50 | .. | .. | 11.00–13.00 | 16.50 | 16.20 | .. |
| | Q2 | 12.00, 13.50 | .. | .. | 11.00 | 16.50 | 16.50 | .. |
| | Q3 | 11.00, 12.00 | .. | .. | 10.50 | 15.50 | 15.50 | .. |
| | Q4 | 11.00, 12.00 | .. | .. | 10.50 | 15.50 | 15.50 | .. |
| 1986 | Q1 | 10.00, 11.00 | .. | .. | 9.00 | 14.00 | 14.00 | .. |
| | Q2 | 10.00, 11.00 | .. | .. | 8.50 | 14.00 | 14.00 | .. |
| | Q3 | 8.00 | .. | .. | 6.75 | 12.25 | 12.00 | .. |
| | Q4 | 8.00 | .. | .. | 6.75 | 12.25 | 12.00 | .. |
| 1987 | Q1 | 8.00 | .. | .. | 6.75 | 11.50 | 11.50 | .. |
| | Q2 | 8.00 | .. | .. | 6.75 | 11.50 | 11.50 | .. |
| | Q3 | 8.00 | .. | .. | 6.75 | 11.50 | 11.50 | .. |
| | Q4 | 8.00 | .. | .. | 6.75 | 11.50 | 11.50 | .. |
| 1988 | Q1 | 8.00 | .. | .. | 6.75 | 11.50 | 11.50 | .. |
| | Q2 | 8.00 | .. | .. | 6.75 | 11.50 | 11.50 | .. |
| | Q3 | 8.00 | .. | .. | 6.75–7.50 | 11.30 | 11.50 | .. |
| | Q4 | 8.00 | .. | .. | 6.75–9.50 | 12.00 | 12.00 | .. |
| 1989 | Q1 | 8.00 | 9.26 | 10.47 | 9.00–9.50 | 12.00 | 12.00 | .. |
| | Q2 | 8.00 | 9.24 | 9.80 | 9.50 | 12.00–12.50 | 12.00–12.50 | .. |
| | Q3 | 8.00 | 9.59 | 10.80 | 9.50 | 12.50 | 12.50 | .. |
| | Q4 | 8.00 | 10.44 | 11.30 | 9.50 | 12.50–13.50 | 12.50 | .. |
| 1990 | Q1 | 8.00 | 9.81 | 10.32 | 11.00–11.50 | 13.55 | 13.56 | .. |
| | Q2 | 9.50 | 10.98 | 12.01 | 11.50 | 14.48 | 14.48 | .. |
| | Q3 | 9.50 | 12.77 | 14.71 | 12.50–13.50 | 14.71 | 14.71 | .. |
| | Q4 | 12.00 | 13.01 | 14.43 | 13.00–15.50 | 15.69 | 15.41 | .. |

Table 2 (continued)

**Selected short-term interest rates, 1985–95**

| | | B/R | R/P | I/B | D/R | MOR | MLR | MRR* |
|---|---|---|---|---|---|---|---|---|
| 1991 | Q1 . . . . . | 12.00 | 12.25 | 13.64 | 14.00–14.50 | 16.38 | 16.13 | .. |
| | Q2 . . . . . | 12.00 | 11.00 | 12.81 | 13.25–14.50 | 15.54 | 15.37 | .. |
| | Q3 . . . . . | 11.00 | 10.36 | 10.70 | 12.50 | 15.99 | 15.99 | .. |
| | Q4 . . . . . | 11.00 | 6.70 | 7.46 | 10.50–11.50 | 14.66 | 14.66 | .. |
| 1992 | Q1 . . . . . | 11.00 | 5.39 | 5.48 | 8.50–9.00 | 13.16 | 13.16 | .. |
| | Q2 . . . . . | 11.00 | 6.34 | 7.66 | 8.00 | 12.06 | 12.06 | .. |
| | Q3 . . . . . | 11.00 | 6.39 | 7.38 | 8.00–9.00 | 12.00 | 12.00 | .. |
| | Q4 . . . . . | 11.00 | 5.95 | 7.21 | 7.50–9.50 | 11.80 | 11.80 | .. |
| 1993 | Q1 . . . . . | 11.00 | 5.79 | 8.12 | 7.50–9.50 | 11.40 | 11.40 | .. |
| | Q2 . . . . . | 10.00 | 7.53 | 8.60 | 7.50–9.50 | 11.25 | 11.25 | .. |
| | Q3 . . . . . | 9.00 | 6.02 | 6.34 | 7.50 | 11.25 | 11.25 | .. |
| | Q4 . . . . . | 9.00 | 3.55 | 3.10 | 6.50–7.00 | 10.95 | 10.95 | 12.50 |
| 1994 | Q1 . . . . . | 9.00 | 6.22 | 7.24 | 6.50–7.25 | 10.09 | 10.09 | 11.75 |
| | Q2 . . . . . | 9.00 | 7.49 | 8.00 | 7.50–8.75 | 10.44 | 10.44 | 11.75 |
| | Q3 . . . . . | 9.50 | 8.22 | 7.35 | 8.25–9.50 | 11.22 | 11.22 | 11.75 |
| | Q4 . . . . . | 9.50 | 7.27 | 6.41 | 8.75–10.00 | 11.54 | 11.54 | 12.00–12.25 |
| 1995 | Q1 . . . . . | 10.50 | 9.99 | 13.30 | 10.00–11.50 | 12.13 | 12.13 | 12.50–13.00 |
| | Q2 . . . . . | 10.50 | 11.29 | 11.41 | 10.25–12.00 | 13.43 | 13.43 | 13.00–13.50 |
| | Q3 . . . . . | 10.50 | 9.06 | 9.24 | 10.50–11.50 | 13.63 | 13.63 | 13.50–14.00 |
| | Q4 . . . . . | 10.50 | 9.25 | 10.17 | 10.50–12.50 | 13.83 | 13.83 | 14.00–14.50 |

Notes: B/R = Bank Rate (or Discount Rate)
R/P = Repurchase Rate (30 days)
I/B = Interbank Rate
D/R = Deposit Rate (3–6 months)
MOR = Minimum Overdraft Rate
MLR = Minimum Lending Rate
MRR = Minimum Retail Rate.

*Introduced from October 1993.

Source: Bank of Thailand Annual Bulletin (various issues).

liberalisation process allows greater flexibility for commercial banks and other financial institutions to adjust their interest rate policies to suit their strategies and financial environments. The task of maintaining stable money market rates has therefore become increasingly difficult.

*(c) Capital market developments*

Financial deregulation and reform have contributed significantly to the development of the Thai capital market. As shown in Table 3, market capitalisation as a percentage of GDP rose from 29.4% in 1990 to 85.9% in 1995. The SET (Stock Exchange of Thailand) index rose from 612.9 in 1990 to peak at 1,682.9 in 1993, before declining to 1,280.8 in 1995 in line with slowing economic activity. Meanwhile, the types of investor have widened to cover not only small investors but also institutional investors such as provident funds, mutual funds and insurance companies.

In parallel with this development, the private debt market has assumed an increasingly important role in the capital market. For the domestic market, new issues of debentures, which totalled Baht 8.8 billion in 1992, rose to Baht 50.5 billion in 1995 (Table 4). Convertible debentures

Table 3
**Stock market indicators, 1990–95**

| | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|---|---|---|---|---|---|---|
| Number of quoted companies . . . | 214 | 276 | 320 | 369 | 450 | 485 |
| Capitalisation | | | | | | |
| (in billions of baht) . . . . . | 613.5 | 897.2 | 1,485.0 | 3,325.4 | 3,300.8 | 3,564.6 |
| (as a percentage of GDP) . . . . . | 29.4 | 35.8 | 52.5 | 105.1 | 91.8 | 85.9 |
| New capital raisings[1] | | | | | | |
| (in billions of baht) . . . . . | 17.5 | 55.1 | 55.7 | 55.1 | 137.2 | 122.9 |
| Trading value | | | | | | |
| (in billions of baht) . . . . . | 627.2 | 793.1 | 1,860.1 | 2,201.1 | 2,113.9 | 1,535.0 |
| (as a percentage of capitalisation) . | 102.2 | 88.4 | 125.3 | 66.2 | 64.0 | 43.1 |
| Foreign/total turnover | | | | | | |
| (in percentages) . . . . . | 14.4 | 8.2 | 7.2 | 17.0[2] | 21.0[2] | 26.3[2] |
| SET index (1975 = 100) . . . . . | 612.9 | 711.4 | 893.4 | 1,682.9 | 1,360.1 | 1,280.8 |
| (percentage change) . . . . . | −30.3 | 16.1 | 25.6 | 88.4 | −19.2 | −5.8 |
| Average dividend yield | | | | | | |
| (in percentages) . . . . . | 3.63 | 3.59 | 2.91 | 2.01 | 1.86 | 2.25 |
| Average price/earnings ratio . . . . | 13.81 | 15.59 | 16.29 | 26.09 | 19.51 | 19.75 |

[1] At market prices. [2] Including transactions through sub-brokers.

Table 4

## Issuance of private fixed income securities

In millions of baht

| | 1991 | 1992 | 1993 | 1994 | 1995 |
|---|---|---|---|---|---|
| 1. Domestic issues | | | | | |
| 1.1 Debentures | 6,304.6 | 8,844.2 | 20,354.4 | 58,887.1 | 50,547.5 |
| 1.2 Bills of exchange issues by financial institutions[1] | 0 | 0 | 0 | 0 | 38,723.3 |
| 1.3 Negotiable certificates of deposit[2] (outstanding) | 50.1 | 1,562.6 | 17,945.3 | 17,312.1 | 21,390.9 |
| 1.4 Floating rate notes (outstanding) | 6,400.0 | 5,800.0 | 5,733.2 | 4,733.2 | 3,733.2 |
| 1.5 Commercial paper[3] (outstanding) | 271,283.8 | 311,008.5 | 390,402.8 | 525,431.5 | 574,447.9 |
| 2. Overseas issues | | | | | |
| 2.1 Debentures | 0 | 0 | 31,229.9 | 50,448.6 | 34,975.1 |
| 2.2 Floating rate notes and floating rate certificates of deposit | n.a. | 9,287.5 | 26,602.8 | 49,609.9 | 66,294.2 |
| 2.3 Negotiable certificates of deposit (outstanding) | n.a. | n.a. | 65,706.0 | 65,712.0 | 78,261.0 |
| 2.4 Asian currency notes | 0 | 0 | 1,000 | 1,300 | 2,130 |
| 3. Changes in commercial bank credit | 313,500 | 365,000 | 501,200 | 800,400 | 837,300 |
| 4. (1.1) + (2.1) as a percentage of (3) | 2.0 | 2.4 | 10.3 | 13.7 | 10.2 |

[1] Only those issued by finance companies and finance and securities companies. [2] Only those issued by commercial banks. [3] Estimated from bills availed by commercial banks and finance companies and investment in bills of financial institutions, and Citi notes and IFCT notes outstanding.

increased eightfold during 1993–95, while unit trusts also grew markedly before registering more moderate growth in 1995.

The volume of fixed income instruments placed in overseas markets also rose sharply, owing mainly to the higher degree of capital mobility resulting from the liberalisation process. The volume of debentures rose by 61.5% in 1994. Total fixed income issues overseas increased from Baht 58.8 billion in 1993 to Baht 103.4 billion in 1995.

The Thai capital market has therefore emerged as a more sophisticated market, substantially integrated into the world market. The degree of linkage can be observed in the growth of net private capital inflows, which has been persistently large over the past few years. Portfolio investment rose from Baht 36.6 billion in 1989 to Baht 84.9 billion in 1995, of which Baht 53.6 billion was equity investment (Table 5).

The increased openness of the capital account has led to a higher degree of capital mobility, largely reflected in the growing importance over the years of offshore credits through the Bangkok International Banking Facilities (BIBF) and non-resident baht accounts. Since their introduction in 1993, BIBF credits have grown at an annual rate of around 5%, while non-resident baht deposits increased more than eightfold during 1985–95. A large part of non-resident baht deposits are intended for investment on the SET. With the growing importance of the capital market and more accessible overseas markets, firms therefore have a larger choice of external financing options, and households a wider range of saving options.

*(d) Efficiency of the foreign exchange market*

The degree of capital movement can also be observed in the volume of transactions in the foreign exchange market, both spot and forward. Since domestic interest rates tend to move in the same direction as foreign interest rates, the differential between the one-month repurchase rate and the one-month eurorate plus the forward premium tended to decrease during 1989–94, as shown in Graph 1. This suggests that activity in arbitrage should show a generally declining trend, reflecting improved market efficiency.

*(e) Financing of activity in the private corporate sector*

The opening of the capital account has allowed overseas fund-raising to become an increasingly important source of financing. Total external

Table 5

## Net flows on private financial account

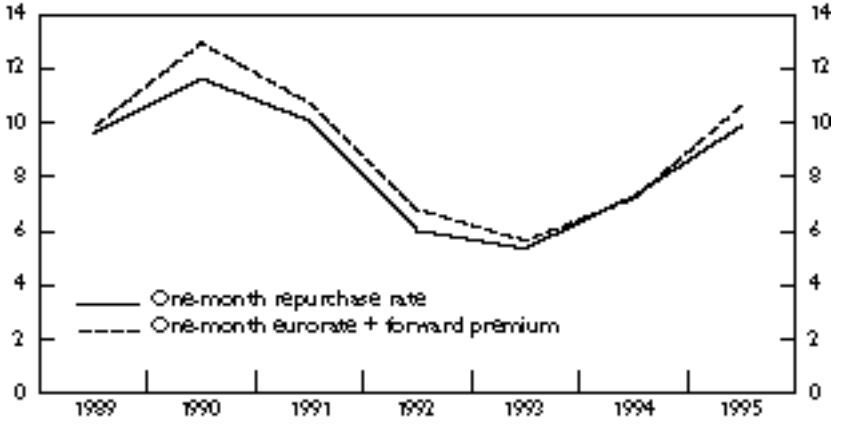
In billions of baht

| | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Banks | −14.2 | −22.0 | 5.9 | 21.5 | −7.7 | 40.9 | −6.6 | 49.1 | 91.0 | 349.9 | 279.7 |
| Commercial banks | −14.2 | −22.0 | 5.9 | 21.5 | −7.7 | 40.9 | −6.6 | 49.1 | −102.2 | 96.4 | 77.2 |
| BIBFs | – | – | – | – | – | – | – | – | 193.2 | 253.4 | 202.4 |
| 2. Non-banks | 19.6 | 12.5 | 16.5 | 74.1 | 159.9 | 238.6 | 268.8 | 188.1 | 169.9 | – 48.0 | 243.9 |
| 2.1 Direct investment | 4.4 | 6.9 | 4.7 | 27.3 | 44.4 | 61.1 | 47.1 | 50.2 | 36.4 | 22.7 | 29.6 |
| 2.1.1 Foreign direct investment | 4.4 | 6.9 | 9.0 | 28.0 | 45.7 | 65.0 | 51.4 | 53.7 | 43.8 | 33.2 | 49.7 |
| 2.1.2 Thai direct investment | – | – | – 4.3 | −0.6 | −1.3 | −3.6 | −4.3 | −3.5 | – 7.4 | – 10.6 | −20.1 |
| 2.2 Other loans | 2.1 | – 3.3 | −16.0 | 4.6 | 46.9 | 114.9 | 143.7 | 69.2 | – 61.2 | −146.7 | 35.3 |
| 2.3 Portfolio investment | 3.9 | 2.5 | 12.9 | 11.2 | 36.7 | 11.5 | 3.8 | 14.1 | 122.6 | 27.5 | 84.9 |
| 2.3.1 Equity securities | 3.9 | 2.5 | 12.9 | 11.2 | 36.7 | 11.5 | 0.9 | 11.5 | 67.9 | – 10.3 | 53.6 |
| 2.3.2 Debt securities | – | – | – | – | – | – | 2.9 | 2.6 | 54.8 | 37.8 | 31.3 |
| 2.4 Non-resident baht accounts | 10.8 | 9.7 | 10.6 | 21.7 | 28.1 | 34.3 | 52.4 | 44.5 | 67.8 | 51.1 | 87.9 |
| 2.5 Trade credits | – 2.0 | – 3.6 | 3.7 | 8.7 | 3.1 | 15.2 | 19.0 | 7.8 | 13.6 | 11.4 | 8.3 |
| 2.6 Other | 0.5 | 0.4 | 0.6 | 0.5 | 0.7 | 1.6 | 2.7 | 2.3 | – 9.4 | – 14.1 | – 2.2 |
| 3. Total | 5.4 | – 9.4 | 22.4 | 95.6 | 152.2 | 279.4 | 262.2 | 237.2 | 260.9 | 301.9 | 523.6 |

Graph 1

**One-month repurchase and eurorate**

In percentages




financing of Thai enterprises as a percentage of GDP rose from 15.7% in 1989 to 26.9% in 1995. As observed by Callen and Reynolds (1996), between 1980 and 1990 about two-thirds of investment is estimated to have been financed by internal funds. In 1991–95 the ratio fell to one-third. Within external finance, debt has been the most important financing source and, within this category, financial intermediaries predominate. At the same time, as the leverage ratio of firms increases, so too does the risk in their management because they become more susceptible to changes in overseas markets.

## 3. Channels of monetary policy transmission

The financial reform process has led to a close relationship of domestic money and capital markets with overseas markets and has complicated the task of implementing monetary policy. Moreover, the increased volatility of domestic interest rates and greater capital mobility have had a considerable impact on the real economy and have exerted pressure on the management of macroeconomic policy. Naturally, under the exchange rate arrangement in place until mid-1997, the coexistence of a fully independent monetary policy and perfect capital mobility has been

unattainable. The Bank of Thailand, therefore, needed to find an acceptable balance between monetary policy autonomy and openness of the capital account. To achieve that objective and formulate the appropriate monetary policy framework, it is necessary to understand how the real economy can be affected through the different channels of transmission of monetary policy.

*(a) Credit availability effects*

Following the introduction of the BIBF in 1993, borrowers now have more convenient access to foreign loans at a lower cost compared with domestic borrowing. As a result, the outstanding amount of commercial bank credits (including BIBFs and out-in lending) has risen sharply, from Baht 1,479 billion in 1990 to Baht 4,300.9 billion in 1995 (Table 6), and average credit growth during 1993–95 was almost 26% per year. The total private credits extended by commercial banks (including BIBF) and finance companies in 1995 accounted for 89.5% of total credit outstanding extended by all financial institutions in Thailand.

Although recent statistics show that about 90% of BIBF lending was used to finance productive sectors such as exports, manufacturing, trade and investment, the Bank deemed it necessary to restrain the excessive growth of BIBF lending by implementing a number of measures: first, BIBF units, besides commercial banks, are required to submit credit plans;

Table 6
**Commercial bank credits and property registration fees**
In billions of baht

| | Commercial bank credits | Property registration fees |
|---|---|---|
| 1985 | 514.30 | 2.07 |
| 1986 | 532.20 | 2.14 |
| 1987 | 666.80 | 3.21 |
| 1988 | 849.90 | 5.81 |
| 1989 | 1,107.50 | 8.62 |
| 1990 | 1,479.00 | 13.97 |
| 1991 | 1,792.70 | 10.62 |
| 1992 | 2,161.70 | 11.81 |
| 1993 | 2,662.90 | 13.80 |
| 1994 | 3,463.30 | 16.80 |
| 1995 | 4,300.90 | 14.74 |

secondly, the minimum size of BIBF loans was raised from US$ 0.5 million to US$ 2.0 million; thirdly, under the regulation on net open foreign exchange positions, certain types of BIBF lending can no longer be treated as foreign assets; finally, short-term foreign borrowing by BIBFs is subject to a 7% reserve requirement. Finance companies have since 1995 also been required to submit credit plans consistent with the Bank's guideline. In parallel with these developments, the private sector has increasingly relied on direct financing and foreign borrowing. The importance of the credit availability effect therefore seems to have been eroded over time.

*(b) Interest rate effects*

Under the current exchange rate regime and given the close linkages between domestic and foreign money markets, domestic money market rates, in the long run, cannot be significantly different from US dollar interest rates. However, if measures to reduce capital mobility are introduced or the expected rate of exchange rate depreciation increases, a differential between domestic and foreign money market rates can persist. As mentioned in the previous section, the increased linkage between domestic and foreign money markets has reduced the Bank of Thailand's autonomy in conducting interest rate policy. Hence, the Bank has needed to implement price-based capital control measures to enable it to pursue a high interest rate policy to regain economic stability.

With a higher degree of leverage in the household and corporate sectors, partly caused by financial liberalisation, the interest rate is likely to become a more important channel of monetary transmission. Moreover, long-term interest rates, namely time deposit rates and the Minimum Lending Rate (MLR), are now more responsive to changes in short-term money market rates. Therefore, the Bank of Thailand's policy has been geared towards maintaining stability in interbank rates and repurchase market rates.

*(c) Wealth effects*

Since the period of financial liberalisation, there has been a greater range of financial assets in the portfolios of the household and corporate sectors. As indicated in Table 3, stock market capitalisation increased five-fold and the stock index rose by 121.9% during 1991–94. The participation of foreign investors also expanded significantly, as evidenced by the increase in the share of non-residents' transactions on the SET from 8.2%

of total turnover in 1991 to 21% in 1994. During the same period, the value of properties also registered a marked increase (Table 6). Property registration fees, which are the proxy for property prices, climbed by 58%. However, the rapid rise in wealth seemed to have a negative correlation with households' average propensity to save, i.e. the ratio of household saving to disposable income, which declined from 14% in 1987 to 7% in 1995.[4] Although Thailand's national saving as a percentage of GDP has risen steadily, the contribution of the corporate sector to private saving has grown, while that of households has dropped significantly, especially since 1989. In other words, while there has been a declining trend in the average propensity to save of households, the household sector has also been receiving a somewhat smaller share of national income. A limited share of income, therefore, implies a limited contribution to national saving.

## 4. The transmission mechanism and some implications for real economic activity

The monetary transmission mechanism is usually defined by the impact of a change in the monetary policy instrument (e.g. the short-term interest rate or base money) on intermediate variables (such as broad money or domestic credit) and final objectives (output and inflation). This section examines a model using VARs[5] to characterise the dynamic relationship between the key indicators in the economy in order to understand the monetary policy transmission mechanism in Thailand. A VAR model can be used to predict the impact of a shock in the interest rate and domestic credit on real economic activity. This study therefore aims to compare the impact of such a change before and after financial deregulation. To this end, a VAR was estimated using the interbank rate, domestic credit, the

[4] For details, see Bank of Thailand (1996a).

[5] A VAR model is a system of OLS equations that estimate how each variable is related to the lagged values of all variables in the system. For example:

$$\chi_t = \alpha_1\chi_{t-1} + \alpha_2\chi_{t-2} + \cdots + \alpha_j\chi_{t-j} + \beta_1 Y_t + \cdots + \beta_k Y_{t-k} + e_t$$

where $\chi$ = vector of endogenous variables
$Y$ = vector of exogenous variables
$e$ = vector of error terms

private investment index and the consumer price index.[6] Exogenous variables introduced to isolate an external shock were LIBOR, an oil price index and the exchange rate. Monthly data for the period 1980:1–1996:6 were used. The study period was divided into two subperiods: 1980:1–1989:12 (before liberalisation) and 1990:1–1996:6 (after liberalisation).

Graphs 2 and 3 show the impulse response[7] of domestic credit, the private investment index and the consumer price index to an "interbank rate shock". Graph 2 demonstrates results for the period before the liberalisation. Domestic credit is predicted to rise to its initial value in three months and then to decline. The private investment index increases to its initial value in four months and then declines. The price index registers a steep fall for four months after the shock. The results for the period after liberalisation are given in Graph 3. Domestic credit is predicted to go down substantially for three months and then to rise slightly, with some fluctuations throughout the period. The private investment index increases after the shock and starts to decline after month six. However, the pattern of change in the private investment index seems to be a random walk, which implies that an "interbank rate shock" has no effect. The price index is predicted to remain almost unchanged for four months and then to increase substantially.

The impulse responses of economic variables to a "domestic credit shock" are analysed in Graphs 4 and 5 for the period before and after financial liberalisation, respectively. Graph 4 shows the results for the period before liberalisation. The interbank rate is predicted to rise substantially for three months and then to decline. The private investment index increases slowly for three months after the shock. The price index starts to rise in month two, then declines in month four. The results for the period after liberalisation are shown in Graph 5. The interbank rate is

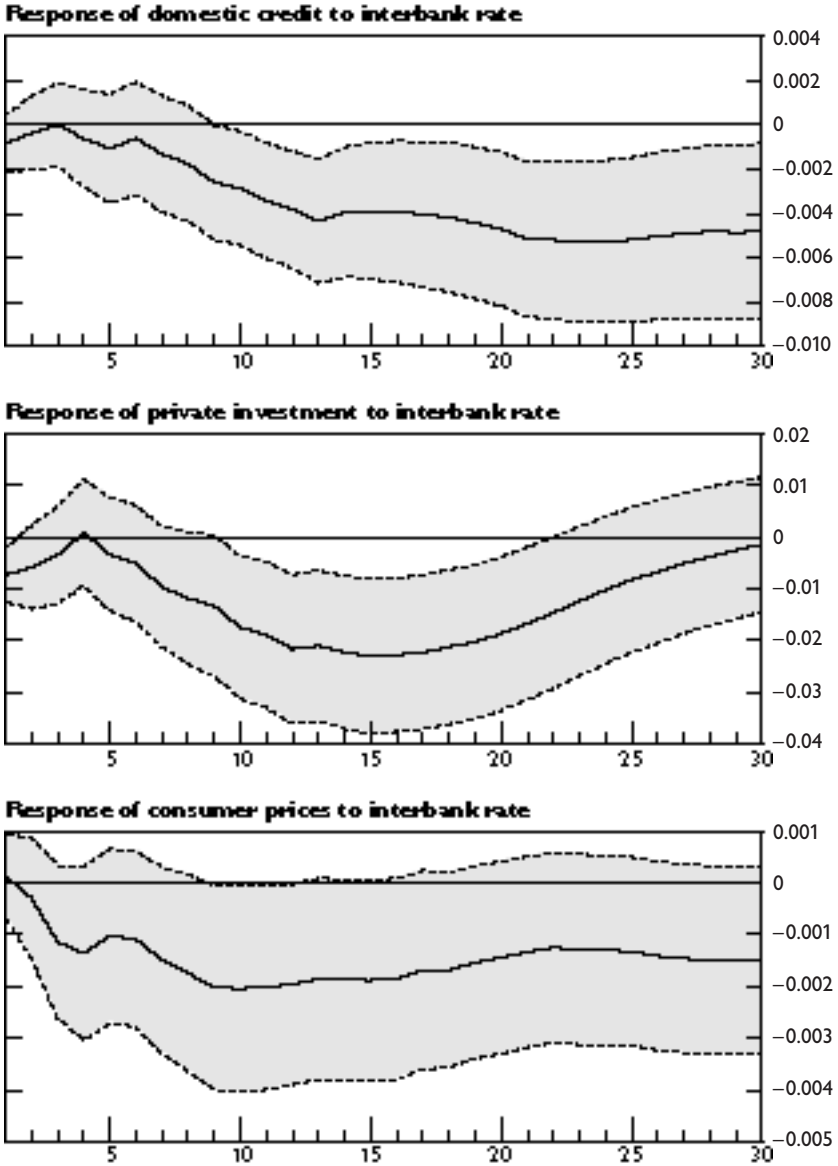
[6] These variables are listed in the order used, i.e. a shock of the interbank rate at time *t* can affect all variables in the system at *t*. However, the implications of VARs have some limitations, in view of the limited number of observations that are generally available in macroeconomic analysis and introduction of several lags of each variable can consume a lot of degree of freedom, especially for the period of post-liberalisation.

[7] In VARs, it is not always easy to interpret each coefficient, especially since the signs of the coefficients sometimes alternate. Therefore, the impulse response functions in the VAR model are shown. Eight lags of endogenous and exogenous variables were included in the VAR estimated. All variables appearing in this study were used in terms of logs except the interbank rate and LIBOR, where the log of domestic credit, the private investment index and the CPI are INDCREDIT, INPRI and INCPI, respectively.

Graph 2

**Impulse responses to an interbank interest rate shock***

Pre-liberalisation

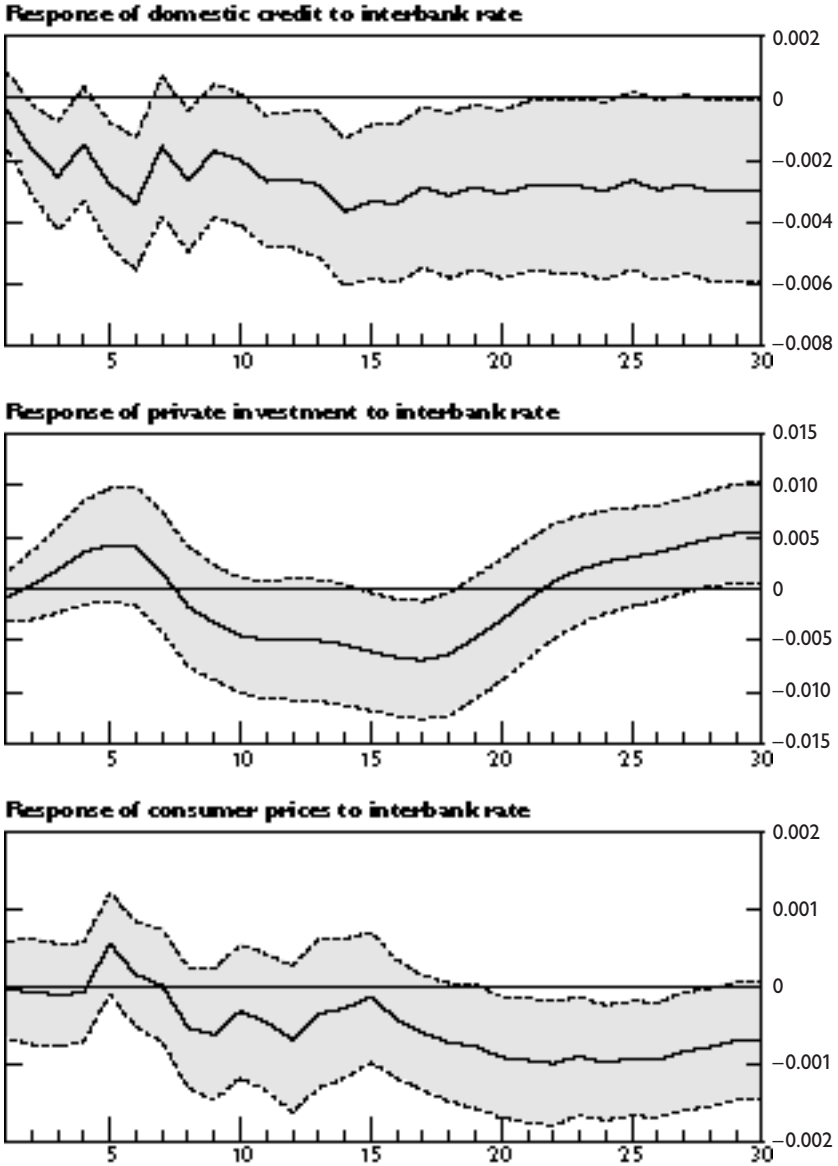



* Response to a one-standard deviation innovation ± 2 standard errors.

Graph 3

**Impulse responses to an interbank interest rate shock***

Post-liberalisation

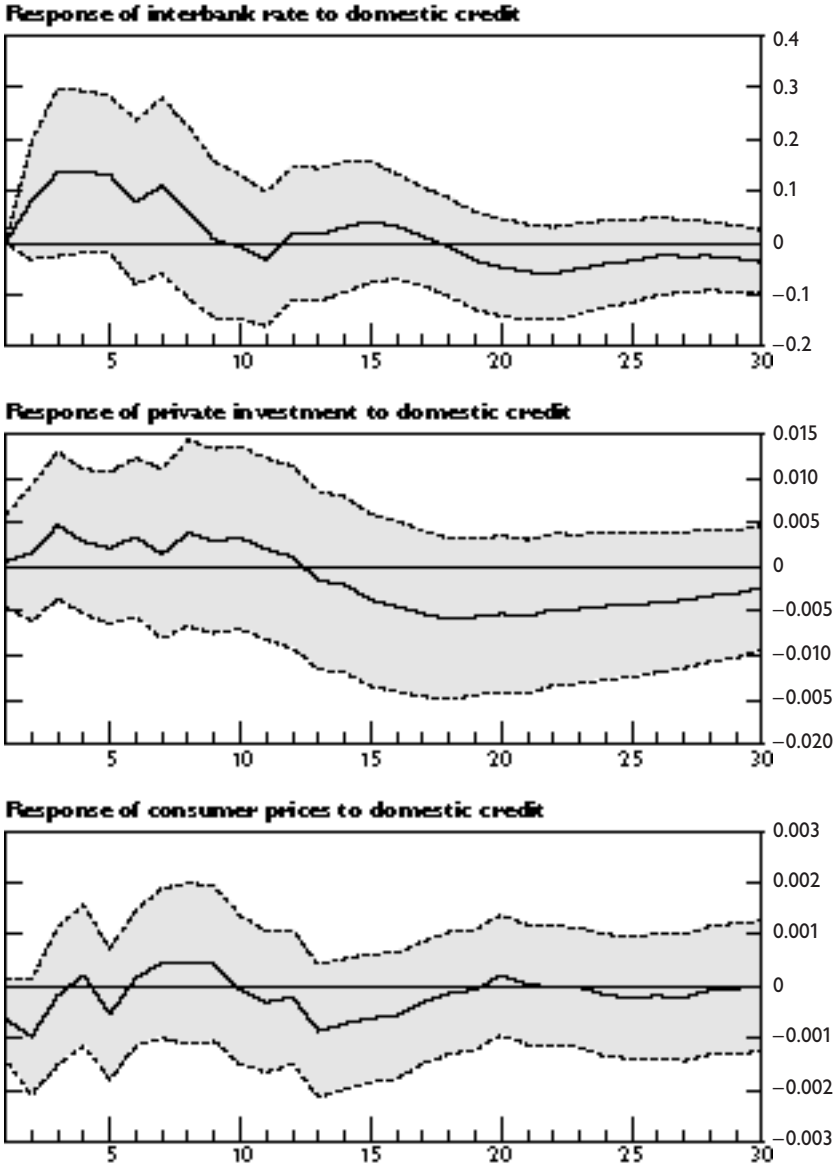



* Response to a one-standard deviation innovation ± 2 standard errors.

Graph 4

**Impulse responses to a domestic credit shock***

Pre-liberalisation

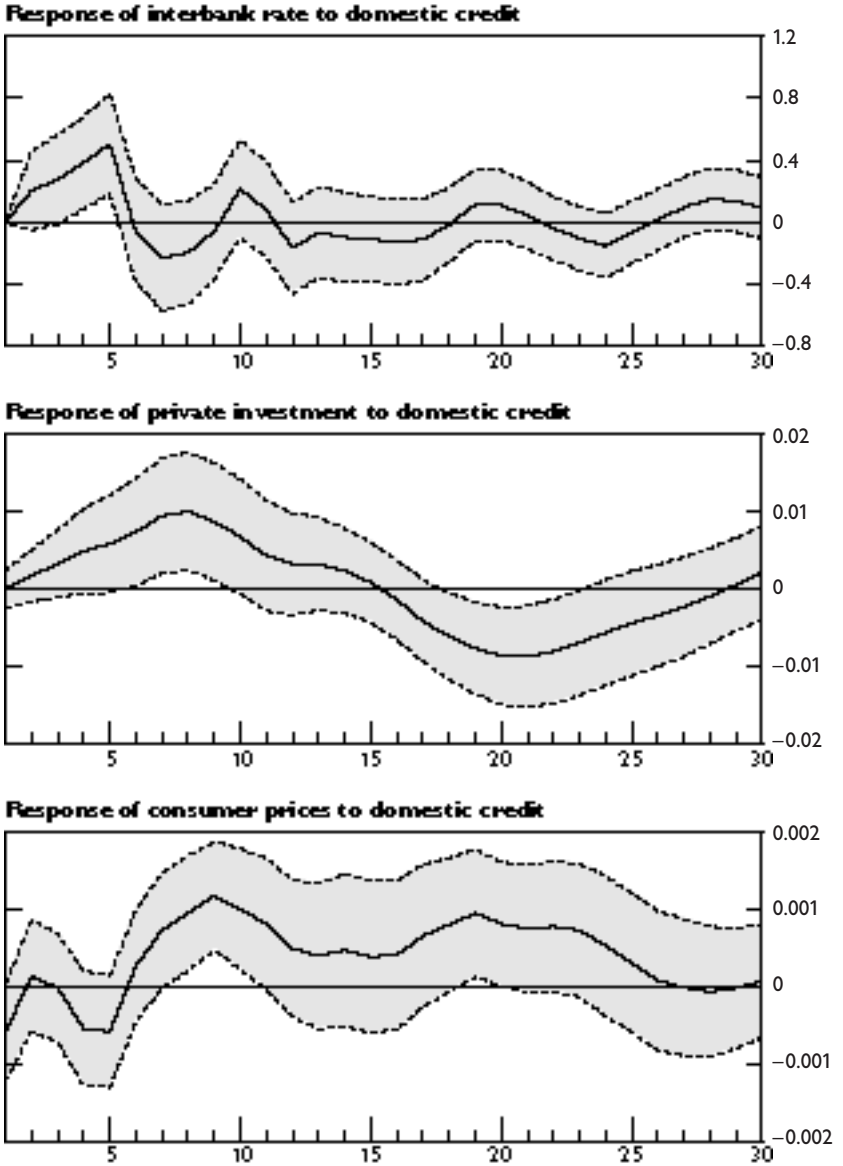



* Response to a one-standard deviation innovation ± 2 standard errors.

Graph 5

**Impulse responses to a domestic credit shock***

Post-liberalisation




* Response to a one-standard deviation innovation ± 2 standard errors.

predicted to rise substantially for five months and then to fall steeply. The private investment index goes up gradually for eight months and then declines. The price index is predicted to increase for two months and then to decrease.

As shown in Graphs 2 and 3, the responses of the economic activity variables to the "interbank rate shock" seem to be more distinctive after the liberalisation in 1990. Domestic credit starts to go down immediately. The "interbank rate shock" seems to have no effect on the private investment index after liberalisation. This may be due to the greater reliance on foreign financing. The adjustments of domestic credit and the price index seem to be more sensitive to shock after liberalisation. According to Graphs 4 and 5, the responses of all variables to the "domestic credit shock" are more significant after financial liberalisation. However, the patterns of change of all three variables are similar to the random walk in both periods. This implies that the "domestic credit shock" has no effect on all three variables in both periods. In all, interest rate policy seems to be more efficient than credit policy, especially after financial liberalisation.

## 5. Improving monetary controls

Although monetary policy management has so far proved adequate in influencing domestic financial conditions, new instruments for monetary control are needed in order to cope with the huge and volatile movement of foreign capital. As noted in two recent empirical studies,[8] the scope for sterilisation is found to be somewhat limited in the long run, although in the short run there appears to be some room for monetary policy. As a result, the Bank of Thailand has widened its range of market-based monetary policy instruments so as to improve the effectiveness of monetary management. In this regard, starting with foreign exchange swaps, new methods of monetary operations have been used more actively, so as to better influence the liquidity of the money market. Bank of Thailand bonds with maturities ranging from one month to two years have been auctioned every Friday since August 1995. This approach provides the Bank of Thailand with an additional channel to absorb liquidity on its own

[8] See the studies by Robinson, Byeon and Teja (1991) and Schadler, Carkovic, Bennett and Khan (1993) quoted in Nijathaworn (1995).

initiative and provides an essential operational framework that will help develop the securities market. In this connection, the planned appointment of primary dealers and outright purchases or sales of securities by the Bank of Thailand will be another significant development, as it will provide an important means of influencing the liquidity of the banking system and short-term interest rates. Finally, efforts to further develop the foreign exchange market will be intensified so that it can better withstand volatility and adverse shocks. On a broader scale, closer cooperation among regional central banks to exchange views and enter into liquidity support arrangements should help ensure financial stability within the region.

## 6. Conclusion

After a period of difficulty during 1979–84 and a period of consolidation in 1985–86, the Thai economy recorded unprecedented economic growth in the following four years. In parallel with this development, major steps were taken to liberalise the financial sector so that the momentum of economic growth could continue into the future.

The effects of financial liberalisation on the financial system and the economy as a whole have many facets. It is quite clear that financial liberalisation has spurred the pace of financial deepening and broadening and helped create a wider range of financial assets in the portfolios of the household and corporate sectors. It has also brought about a closer linkage between domestic and foreign markets. However, the task of monetary management has become more complex, with a lower degree of autonomy. As suggested by the impulse response functions of economic activities to a "domestic credit shock" in the VARs estimated, it is inadequate to monitor commercial banks' credits amidst the increasing popularity of direct financing and foreign borrowing. In addition, with respect to the study of the "interbank rate shock" using the VAR model, although domestic interest rates have become a major channel of monetary transmission, they are largely influenced by foreign interest rates. It also appears that the "interbank rate shock" has no impact on private investment. Moreover, the wealth effect seems to exert a stronger impact on household saving behaviour, and needs to be a major consideration in the conduct of monetary policy.

## Annex I

### Major financial liberalisation and reforms

| | |
|---|---|
| April 1975 | The Securities Exchange of Thailand begins trading (name changed to the Stock Exchange of Thailand (SET) in 1991). |
| 1979 | The repurchase market is established to help develop the money market and facilitate the free flow of money between foreign exchange and domestic markets, and to serve as a vehicle for the implementation of monetary policy. |
| March 1985 | The Bank of Thailand encourages commercial banks to introduce BIBOR – Bangkok Interbank Offered Rate – as a reference for the pricing of floating rate loans to customers. |
| May 1985 | Controls on the opening of letters of credit are lifted. |
| 1986 | The interest rate ceiling on credit to priority sectors is lifted. |
| June 1989 | The interest rate ceiling on time deposits with a maturity of more than one year is lifted. |
| March 1990 | The interest rate ceiling on time deposits with a maturity of one year or less is abolished. |
| May 1990 | Acceptance of obligations under Article VIII of the IMF's Articles of Agreement and relaxation of foreign exchange controls by liberalising all current account transactions and reducing restrictions on capital movements. |
| April 1991 | Second-stage liberalisation of foreign exchange controls, including more liberal outward transfer of funds for investment, provision for foreign investors to repatriate investment project dividends and proceeds from sales of stocks. |
| January 1992 | Removal of the interest rate ceiling on savings deposits.<br>Revision of the rural credit policy. |
| March 1992 | Expansion of the scope of activities of commercial banks, finance companies and securities companies.<br>Enactment of the Securities and Exchange Act (B.E. 2535). |
| June 1992 | Ceilings on savings deposit rates and all lending rates are abolished. |
| January 1993 | Adoption of the Basle standard (capital to risk asset ratio) for commercial banks. |

| | |
|---|---|
| March 1993 | The Bangkok International Banking Facility (BIBF) is established. Participants may provide three types of service: banking to non-residents in foreign currencies and baht ("out-out" transactions), banking to domestic residents in foreign currencies only ("out-in" transactions), and international financial and investment banking services. |
| July 1993 | The first credit rating agency, Thai Rating and Information Services (TRIS), is established. |
| August 1993 | The Export-Import Bank of Thailand Act (B.E. 2536) is promulgated, to be effective from 7th September 1993. The EXIM Bank is established in February 1994. |
| October 1993 | Commercial banks are required to announce the Minimum Lending Rate (MLR), the Minimum Retail Rate (MRR) and the maximum margin to be added to the MRR as a reference rate for customers other than those eligible for the MLR. |
| February 1994 | Third round of the liberalisation of foreign exchange controls.<br><br>1. The limit on the amount of baht that can be taken out to countries sharing a border with Thailand, and to Vietnam, is raised from Baht 250,000 to Baht 500,000.<br><br>2. The limit on the amount of foreign currency that may be taken out when travelling abroad is abolished.<br><br>3. The limit on the amount of foreign investment by Thai residents requiring no prior approval from the Bank of Thailand is raised from US$ 5 million to US$ 10 million.<br><br>4. Residents are permitted to use foreign exchange originating from abroad to service external obligations without surrendering it or depositing it in a domestic banking account. |
| March 1994 | Finance companies and finance and securities companies are permitted to open credit offices outside the Bangkok area. |
| May 1994 | Conditions are drawn up for BIBFs to open branches outside the Bangkok area. |
| July 1994 | Adoption of Basle standards for finance companies. Finance companies are required to maintain a 7% capital/risk asset ratio. |
| August 1994 | Finance companies are allowed to open representative offices abroad.<br>BIBFs are authorised to open provincial branches.<br>Guidelines are issued on the separation of finance business from securities business. |
| November 1994 | The Bond Dealers' Club is set up to function as a secondary market for debt instruments. |

| | |
|---|---|
| February 1995 | The Cabinet approves the Financial System Development Plan (1995–2000) drawn up jointly by the Bank of Thailand, the Ministry of Finance and the Securities and Exchange Commission. |
| March 1995 | Adjustment of the new calculation of the MRR based on total deposit cost. |
| May 1995 | Adoption of the Basle guidelines for commercial banks on risk management in derivatives trading.<br>Finance companies are authorised to mobilise funds from the public by issuing bills of exchange (B/Es). The minimum amount of each domestic B/E is Baht 10 million. Finance companies may also issue B/Es abroad after seeking approval from the Bank of Thailand.<br>Crédit foncier companies are allowed to operate as loan service agents.<br>Guidelines on mobilising funds in the form of contractual saving are issued. |
| July 1995 | Commercial banks are permitted to act as customers' unsecured debenture holder representatives. |
| August 1995 | Commercial banks are required to hold no less than 7% of non-resident baht accounts in the form of demand and time deposits at the Bank of Thailand. |
| September 1995 | Adjustment of the measurement of net foreign exchange exposure for Thai banks. |
| October 1995 | Finance companies are authorised to issue bills of exchange and certificates of deposit in foreign currency on the offshore market with a maturity of not less than one year. |
| January 1996 | New guidelines are adopted for central bank lending to commercial banks, finance companies and finance and securities companies. The loan window is henceforward operated via repurchase agreements instead of securities pledging. |
| March 1996 | Announcement of the issuance of long-term Bank of Thailand bonds:<br>1. Bonds with a maturity of one year will be auctioned every two months for Baht 1,000 million each, effective April 1996.<br>2. Bonds with a maturity of two years will be auctioned every quarter for Baht 500 million each, effective June 1996. Institutions qualified to participate in the auction include commercial banks, finance companies, the Government Savings Bank and the Financial Institutions Development Fund. |
| May 1996 | Adoption of a 100% ratio for provision against doubtful debt for finance companies, finance and securities companies, and crédit foncier companies. |

| | |
|---|---|
| June 1996 | Short-term offshore borrowing by financial institutions is subject to a 7% liquidity requirement. |
| July 1996 | The new electronic clearing system (ECS) begins operation. |
| October 1996 | The first-tier capital/risk asset ratio for commercial banks is raised from 5.5 to 6%, and the overall capital/risk asset ratio to 8.5%.<br>The capital/risk asset ratio of finance companies is increased from 7.0 to 7.5%, with the existing ratio for first-tier capital, effective 1st January 1997. (From 1st January 1998, the overall capital/risk asset ratio will increase to 8%, with the ratio for first-tier capital at 5.5%.) |
| November 1996 | Upgrading of seven new foreign BIBFs to full branch status. |

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# The monetary policy transmission mechanism in Venezuela

José Guerra, Pedro César Rodríguez and Gustavo Sánchez

## Introduction

The mechanism through which the actions of the central bank are transmitted to economic activity and prices continues to be a topic of discussion. The reason for this interest is twofold: first, there is the question of identifying the transmission channels of the monetary impulses; a second area of discussion centres on the problem of specifying the temporal structure of the relationships between a given set of variables affected by monetary policy decisions.

The aim of this paper is to contribute to the discussion from the perspective of Venezuela. It attempts both to identify the transmission channels of monetary policy and to provide empirical evidence of the extent to which monetary policy has an impact on economic activity and prices. Given the current inflationary environment in Venezuela, the study will be mainly concerned with the transmission of monetary policy to prices.

The paper is divided into three sections. The first section considers the main theories about the transmission channels of monetary policy. Policy implementation and the underlying transmission mechanisms in Venezuela are given special attention. In the second section, an empirical analysis is conducted using quarterly data for the period 1985–95. The analysis is based on a combination of VARs and error correction models in order to determine the impact of monetary policy variables on inflation. Finally, the implications of the estimated results for the conduct of monetary and exchange rate policies are analysed and some recommendations are made as regards monetary policy implementation.

## 1. The transmission mechanisms: theoretical aspects and recent experience in Venezuela

*(i) Theoretical frameworks*

Usually, the impact of changes in the money supply on prices and economic activity is not direct. Several ways exist by which such changes can be transmitted and will be finally reflected in prices and economic activity. The various relationships that over time bring about changes in the ultimate targets of economic policy in response to monetary policy shifts are known as the transmission channels of monetary policy.

Understanding the various transmission processes is important to appropriately select the policy instruments at the disposal of the monetary authorities and, at the same time, to assess the impact of the policy measures on the economy as a whole.

The discussion of the transmission mechanism has focused on three main approaches:

*(a) Transmission mechanism in closed economies*

This mechanism is implicit in the traditional IS-LM model and is known as the liquidity effect. According to this approach, changes in the monetary variables are transmitted indirectly to the target variables through variations in aggregate demand. Aggregate demand is influenced by interest rates which can be controlled by the monetary authorities.[1] The impact of changes in the monetary aggregates on the target variables depends on the shape of the aggregate supply curve.

*(b) Transmission mechanism in open economies*

For open economies the analysis can be confined to the case of a flexible exchange rate system, given that under fixed exchange rates the money supply is endogenous and cannot be used as a policy variable.

In a flexible exchange rate context, changes in the money supply influence the interest rate (except in the case of perfect capital mobility), which in turn affects consumption and investment as well as the exchange rate. The channel of transmission to aggregate demand is similar to the IS-LM model for closed economies. The effect on the exchange rate

[1] A complete description of this mechanism can be found in Mishkin (1996) and IMF (1996).

depends on the distribution of aggregate demand between tradable and non-tradable goods.

*(c) Transmission mechanism through bank credit*

Recently, a large body of literature has focused on identifying an additional channel of monetary transmission, originating in the allocation of bank credit.[2] The most important assumptions underlying this transmission mechanism are:

- there are three assets in the economy: money, bank loans and bonds;
- there exist economic agents for whom there is no substitute for bank credit for financing purposes;
- credit and bonds are not perfect substitutes for commercial banks.

Under these assumptions, monetary policy is not only transmitted through the liquidity effect but also through the supply of bank credit. This channel is not taken into consideration in the IS-LM model, given its assumption that bonds and bank loans are perfect substitutes (grouped together in a single category called "bonds") for all agents.

Although this model has been developed in the context of a closed economy, its extension to an open economy should not present too many difficulties. In any event, the final qualitative effect would again be that prices and economic activity are affected by aggregate demand; and the distinction between the short and long-term effects will depend on the assumptions made with respect to aggregate supply.

*(ii) Specific channels of monetary policy transmission*

(a) *Interest rate effects*: changes in interest rates affect the marginal cost and marginal yield of capital as well as the average interest rate on outstanding debt. These effects are crucial to economic agents' decisions concerning lending and borrowing. One of the key elements to take into account is the fact that monetary policy actions might not affect interest rates across the entire term structure in the same way.

(b) *Wealth effects*: changes in the availability of credit and in interest rates can lead to changes in asset prices, affecting agents' wealth perceptions and spending patterns, as well as the ability to borrow and the

[2] For exhaustive discussions of the credit channel see Bernanke and Blinder (1988), Bernanke and Gertler (1995), Brunner and Meltzer (1988), Cecchetti (1995), Hubbard (1995) and Tsatsaronis (1995).

desirability of lending. Such effects can be considerable when assets are used as collateral for loans.

(c) *Exchange rate effects*: when the exchange rate is sensitive to variations in interest rates, it has an impact on prices and economic activity by changing the cost of raw materials, the competitiveness of the tradable goods sector and resource allocation.

*(iii) The transmission of monetary policy in Venezuela*

To assess the impact of the monetary variables on the target variables of economic policy, monetary programming models have been adopted by the Central Bank of Venezuela as an instrument to improve the efficiency of monetary policy. Its use has entailed the selection of an intermediate variable, preferably a monetary aggregate, which guides policy in the process of influencing a final target variable, such as the rate of inflation, the level of economic activity or the external balance.

The choice of a monetary aggregate rather than an interest rate was based on the intuitive insight that, in a small economy with severe distortions, the imbalances between the supply of and demand for money are transmitted directly to aggregate demand, and indirectly to prices (Da Costa (1990)). In addition, the Venezuelan economic authorities put direct controls on interest rates in an attempt to control the domestic component of the monetary base through the availability of credit to the financial system.

From November 1960 to 18th February 1993, Venezuela used the exchange rate as a nominal anchor, thus limiting its ability to control the money supply. This exchange rate arrangement collapsed at the beginning of 1983 as a result of macroeconomic mismanagement, in particular chronic fiscal deficits and unsustainable exchange rate overvaluation. Table 1 shows that high domestic inflation in the context of a fixed exchange rate regime undermined the competitiveness of the Venezuelan economy, creating expectations of a future devaluation. The debt crisis, triggered when the international financial community stopped financing indebted countries in the wake of the Mexican crisis in 1992, also contributed to a worsening of the economic situation.

Between February 1983 and February 1989, a system of exchange controls based on multiple exchange rates was in place. This complicated monetary management even more since it operated like a fixed exchange rate system albeit with several exchange rates.

Table 1
**Economic indicators**

| | Current account (millions of US$) | Unemployment rate (in percent) | GDP | Inflation | M1 |
|---|---|---|---|---|---|
| | | | (Growth rate, in percent) | | |
| 1979 | 350 | 5.6 | 3.4 | 12.3 | 6.7 |
| 1980 | 4,728 | 5.7 | –1.7 | 21.6 | 13.7 |
| 1981 | 4,000 | 6.1 | 0.4 | 16.2 | 7.1 |
| 1982 | –4,246 | 7.1 | 0.8 | 9.6 | –8.4 |
| 1983 | 4,427 | 10.3 | –4.3 | 6.3 | 31.2 |
| 1984 | 4,651 | 13.4 | 0.1 | 12.2 | 7.5 |
| 1985 | 3,327 | 12.1 | 0.2 | 11.4 | 12.4 |
| 1986 | –2,245 | 10.3 | 6.5 | 11.6 | 22.1 |
| 1987 | –1,390 | 8.5 | 3.6 | 28.1 | 34.4 |
| 1988 | –5,809 | 6.9 | 5.8 | 29.5 | 22.8 |
| 1989 | 2,161 | 9.6 | –8.9 | 84.5 | 9.5 |
| 1990 | 8,279 | 9.9 | 6.2 | 36.5 | 41.2 |
| 1991 | 1,736 | 8.7 | 9.7 | 31.0 | 51.3 |
| 1992 | –3,365 | 7.1 | 6.1 | 31.9 | 8.3 |
| 1993 | –1,804 | 6.3 | 0.3 | 45.9 | 10.6 |
| 1994 | 2,541 | 7.5 | –2.9 | 70.8 | 130.0 |
| 1995 | 2,255 | 10.2 | 3.4 | 56.6 | 34.2 |

In 1984 a macroeconomic adjustment programme was implemented to deal with the distortions created by the exchange controls (a huge gap, of 130%, existed between the official and the free market exchange rate) and the high inflation rate. Included in this adjustment programme was the *Programa Económico Cuantificado* that was designed to serve as a reference for the implementation of the economic policy and the monetary programming exercise.

Although some studies suggested that a stable and close relationship could be observed between nominal income and money (M1), a broader concept of money (M2) was used as the intermediate target of monetary policy, while inflation was chosen as the ultimate target variable (León and Montiel (1990)). Hence, the Bank tried to control M2 in spite of its lack of policy instruments. This was the first stage of the monetary programming exercise in Venezuela.

León and Olivo (1988) reported econometric evidence in favour of a relationship between changes in the money supply (M1) and inflation.

However, the relationship was unstable and, furthermore, the model suggested a lag of an average 17 months for the money supply impulses to be fully transmitted to prices. For these reasons, they ruled out the use of M1 as an intermediate target in the short-term price stabilisation strategy.

The monetary programming approach based on M2 as the intermediate variable was applied only up to 1988, owing to the implementation in early 1989 of a new macroeconomic adjustment programme, this time supported by the IMF. As a result, the monetary programme was redefined to take account of the IMF approach. The aim of this new macroeconomic adjustment programme was to curb the current account deficit and halt the acceleration of inflation (see Table 1). Both the current account deficit and the higher rate of inflation were unwelcome results of the exchange controls and the fiscal imbalances. In December 1988, international reserves sank to their lowest level in the last 20 years.

In the context of the new economic programme, the role of monetary policy was defined as that of maintaining sound monetary and financial conditions in order to achieve both price and exchange rate stability (Banco Central de Venezuela (1991)).

In an environment of greater economic freedom and interest rate liberalisation which made it possible to improve the effectiveness of monetary policy, the Bank adopted a more flexible set of policy instruments. Thus, in November 1989 the Bank initiated open market operations using its own bonds (zero coupon bonds) and made these operations its main policy instrument.

In this second stage of the monetary programme under an extended facility agreement with the IMF, the transmission mechanism of monetary policy was redefined by the Bank. The monetary base became the intermediate variable and net domestic credit was adopted as the operational variable of the monetary programme. The inflation rate became the ultimate target variable (Banco Central de Venezuela (1991)).

Although it was clear from the start that the inflation rate was the main target of the adjustment programme, the deep recession of 1989 compelled the fiscal authorities to pursue economic growth as another target. Fiscal discipline therefore loosened. As a result, from 1990 there was an obvious contradiction between the promotion of economic growth and price stability. This conflict brought about a significant rise in interest rates, undermining solvency in the banking system.

During this stage, the monetary programming model was based on an estimate of M2 in real terms. Its nominal value was arrived at by using a price index consistent with the inflation target. The monetary multiplier was then computed and the demand for high-powered money estimated. The rest of the programme was designed to determine the appropriate level of central bank credit to the private sector in order to avoid substantial divergences between the supply of and the demand for high-powered money. The basic instrument used to manage credit to the private sector was the Bank's own bonds. With some changes, this model was applied rigorously between 1989 and the end of 1993, the year in which the transition was made to a new economic policy, which was introduced at the beginning of 1994, when a new Government was voted into power.

It should be noted that after two years of vigorous economic growth (1991 and 1992), two attempted coups d'état exacerbated the uncertainty about the implementation of the economic programme and put pressure on the foreign exchange reserves. This situation led the monetary authorities to introduce a crawling peg in October 1992 as a way of preserving the viability of the balance of payments; the inflation target was therefore abandoned.

In spite of the technical and conceptual improvements achieved during this stage of the implementation of the programme, there is not enough empirical evidence to support the change in the intermediate variable from M2 to the monetary base. It could perhaps be argued that, within the financial programming model of the IMF, domestic credit is the key variable for achieving both external balance and price stability.

Finally, as a result of the balance-of-payments crisis at the beginning of 1994 and the collapse of the crawling-peg system, following the banking crisis, caused by both the high level of interest rates and the lack of banking supervision, a system of exchange controls was introduced by the Government in the first half of 1994. This placed further constraints on the conduct of monetary policy. The Bank's response to the new situation was to redefine its intermediate and operational variables. The premise of its analysis was that exchange controls could be likened somewhat to a fixed exchange rate regime: the inflation objective could be pursued by treating net domestic assests as the operational variable so as to bring about a development of the international reserves that would support the current nominal exchange rate, the latter serving as the nominal

anchor (or intermediate target) for prices (Banco Central de Venezuela (1995)).

Again, the instrument used by the Bank to influence net domestic credit to the private sector and in turn the external assets, was the issuance of its own securities, now called "Monetary Stabilisation Bonds" (TEMs).

## 2. Empirical analysis

The aim of this section is to identify empirically the main channels through which monetary policy influences prices and economic activity. To this end, the period 1985–95 is analysed on the basis of quarterly data using a combination of VARs and error correction models. Given the lack of information about the underlying structural model for the transmission mechanism in that period, the study starts from a VAR to obtain a first approximation of the way in which the variables are interrelated and to determine which of them are indeed relevant for the analysis. Once some evidence has been obtained about the relationships between the variables, an error correction model is formulated for inflation, aimed at capturing both the direct and indirect effects of monetary policy on prices.

On the basis of the estimated results, the implications for the conduct of monetary and exchange rate policies are analysed and a number of recommendations are made for managing monetary policy.

### *(i) Model variables*

Given the estimation techniques employed, each of the variables used in the models was, as a first step, analysed in order to determine whether the series have unit roots. The variables and their corresponding definitions are as follows:

| | |
|---|---|
| *IPCP:* | Consumer price index of the metropolitan area of Caracas. |
| *PIB:* | Gross domestic product in constant prices. |
| *CRTBC:* | Bank credit to the private sector. |
| *TIA:* | Interest rate on loans. |
| *M1:* | Currency plus chequing deposits. |

*GAP:* Output gap defined as the residuals of the regression of economic activity on both a linear and a quadratic trend. This variable is viewed as a proxy for excess demand in the economy.

*XPTBC:* Value of oil exports in real terms, which represents a wealth effect in consumption and investment decisions.

*SAL:* Nominal private sector wages.

Unlike in other Latin American economies, it has been difficult to find a well-behaved inflation equation in which the exchange rate plays a significant role by itself in Venezuela. This may be explained by two factors. First, the exchange rate has been fixed for most of the sample period, with a number of discrete devaluations depending on the balance-of-payments position. Domestic disequilibria therefore showed up in other variables; as soon as they became unsustainable, a devaluation took place. Secondly, as a consequence of the State monopoly of oil revenues, exchange rate depreciation improves the fiscal balance in domestic currency, inducing monetary expansion. Hence, this implicit financial mechanism reduces the explanatory power of the exchange rate in the inflation equation, transferring its influence to the domestic fiscal deficit and the monetary aggregates.

The results of the Dickey-Fuller test shown in Table 2 point to the presence of a stochastic trend in the logarithms of the time series, except for *GAP*, which is stationary.[3] Once the relevant series are differentiated, the test indicates that the variables become stationary.

Once the integration order of the variables is determined, a set of models seeking to explain the target variables of the monetary policy can be formulated in order to establish how central bank action can influence those variables.

*(ii) The general model*

In order to study how monetary policy is transmitted to inflation and economic activity, an unrestricted VAR model including a set of variables that are supposed to interact with the final variables (inflation (*DLIPCP*)

[3] The following notation is used for the variables: *L* before a variable indicates logarithm; *D* means first difference. Consequently, *DL* denotes the first difference of the logarithm of the variable, that is, an approximation of the measurement of the growth rate of the variable.

Table 2
**Results of the Dickey-Fuller test**

| | Observed value | Critical value (95%) | DF test | Observed value | Critical value (95%) | DF test | Integration order |
|---|---|---|---|---|---|---|---|
| *LIPCP* . . . . | −1.7 | −3.5 | ADF(1), t | −3.84 | −3.5 | DF, t | I(1) |
| *LPIB* . . . . . | −3.1 | −3.5 | ADF(5), t | −2.81 | −2.9 | ADF(4) | I(1) |
| *LCRTBC* . . | −2.5 | −3.5 | ADF(1), t | −9.93 | −2.9 | DF | I(1) |
| *TIA* . . . . . | −3.2 | −3.5 | ADF(2), t | −6.31 | −2.9 | DF | I(1) |
| *LM1* . . . . . | −0.5 | −3.5 | ADF(6), t | −3.35 | −2.9 | ADF(4) | I(1) |
| *GAP* . . . . | −3.4 | −2.9 | ADF(4) | | | | I(0) |
| *LXPTBC** . . | −4.5 | −3.5 | DF, t | −6.43 | −2.9 | ADF(2), t | I(1) |
| *LSAL* . . . . | −2.6 | −3.5 | ADF(2), t | −7.44 | −3.5 | ADF(1), t | I(1) |

* Although the Dickey-Fuller test suggests that this variable is I(0), the analysis of the autocorrelation function and the visual inspection of the series suggest the need to take first differences to achieve stationarity.

and GDP) is estimated. Thus the model incorporates alternative monetary aggregates (M1, M2 or high-powered money), the interest rate on loans (*DTIA*) and a variable measuring the volume of credit to the private sector (*DLCRTBC*). It is worth emphasing that the money aggregate that showed the best result was M1. The explanatory power of both M2 or the monetary base was poor.

The formulation of an unrestricted VAR reflects the lack of information about the underlying structural model linking the variables mentioned above.[4] This type of model therefore provides an intuitive view of the way in which the relevant variables are interrelated in a given economic process.

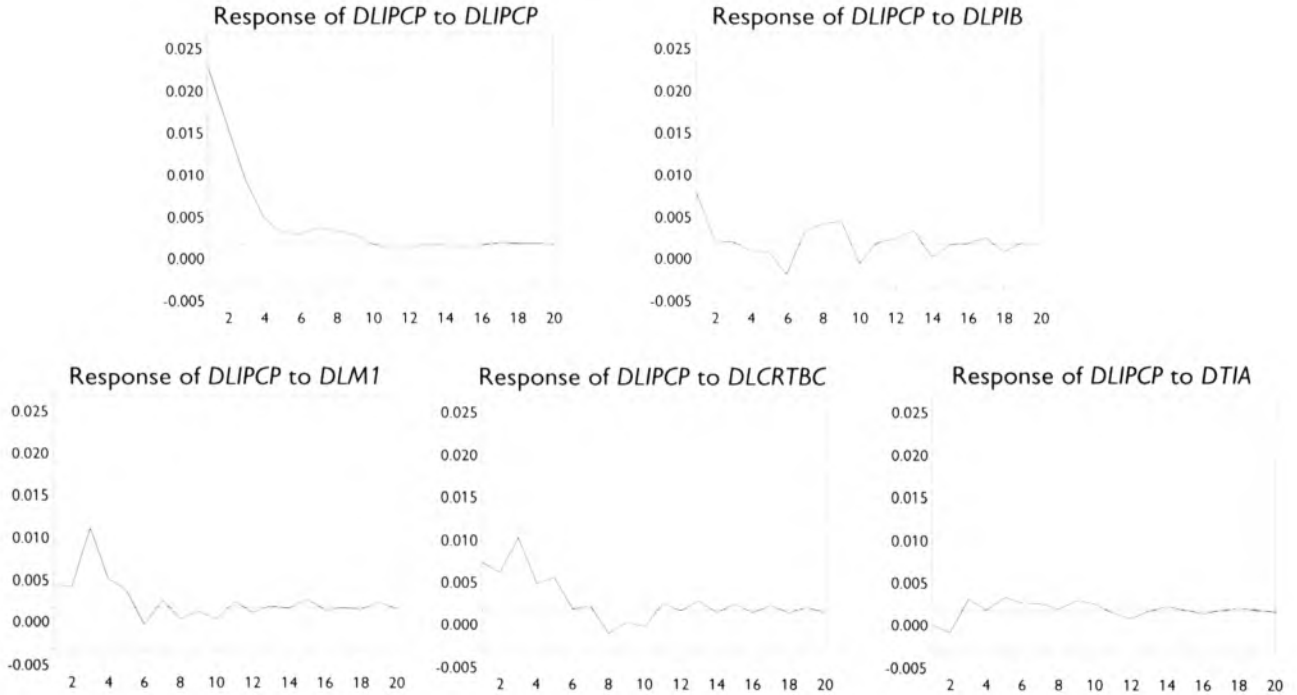
The empirical analysis, based on the estimate of a VAR with three lags,[5] reveals that the effects of changes in the monetary and credit variables are not very relevant in explaining the behaviour of either inflation or GDP, according to the impulse response functions and the variance decomposition of the forecast error. In fact, Graph 1 shows that the main impact on inflation derives from its own lags and that the effect lasts for approximately four quarters. Similarly, the variance decomposition for a

[4] This methodology has been used in other studies analysing the transmission mechanism (see Buttiglione and Ferri (1994), Fernández and Mendoza (1994) and Vargas (1995)).

[5] The lag structure was determined according to the Akaike and Schwartz criteria.

Graph 1

**Inflation: impulse response functions***




* Response to a one-standard deviation innovation.

Table 3

**Variance decomposition of the inflation error forecast**

In percentages

| Quarters | *DLIPCP* | *DLPIB* | *DLCRTBC* | *DTIA* | *DLM1* |
|---|---|---|---|---|---|
| 1 | 85.59 | 6.67 | 5.82 | 0.65 | 1.26 |
| 2 | 85.88 | 4.56 | 6.46 | 1.45 | 1.65 |
| 3 | 72.48 | 3.54 | 12.40 | 1.29 | 10.29 |
| 4 | 71.22 | 3.50 | 12.91 | 1.25 | 11.11 |
| 8 | 67.52 | 5.38 | 14.18 | 1.49 | 11.42 |
| 12 | 65.92 | 6.45 | 14.50 | 1.72 | 11.41 |
| 20 | 65.26 | 6.99 | 14.57 | 1.75 | 11.43 |

Order: *DTIA, DLCRTBC, DLMI, DLPIB, DLIPCP.*

forecast horizon of 20 quarters shows that 65% of the forecast error is explained by the inflation lags (Table 3). These findings are consistent with the results of other studies of inflation in Venezuela (Guerra and Sánchez (1996) and Montiel (1994)). It should be stressed that, even though shocks on M1 and bank credit seem to go in the right direction, only the latter has a certain significance for inflation according to the variance decomposition.

With regard to output, the results of the unrestricted VAR for GDP show the lack of significance of the variables of the system according to the impulse response functions shown in Graph 2.

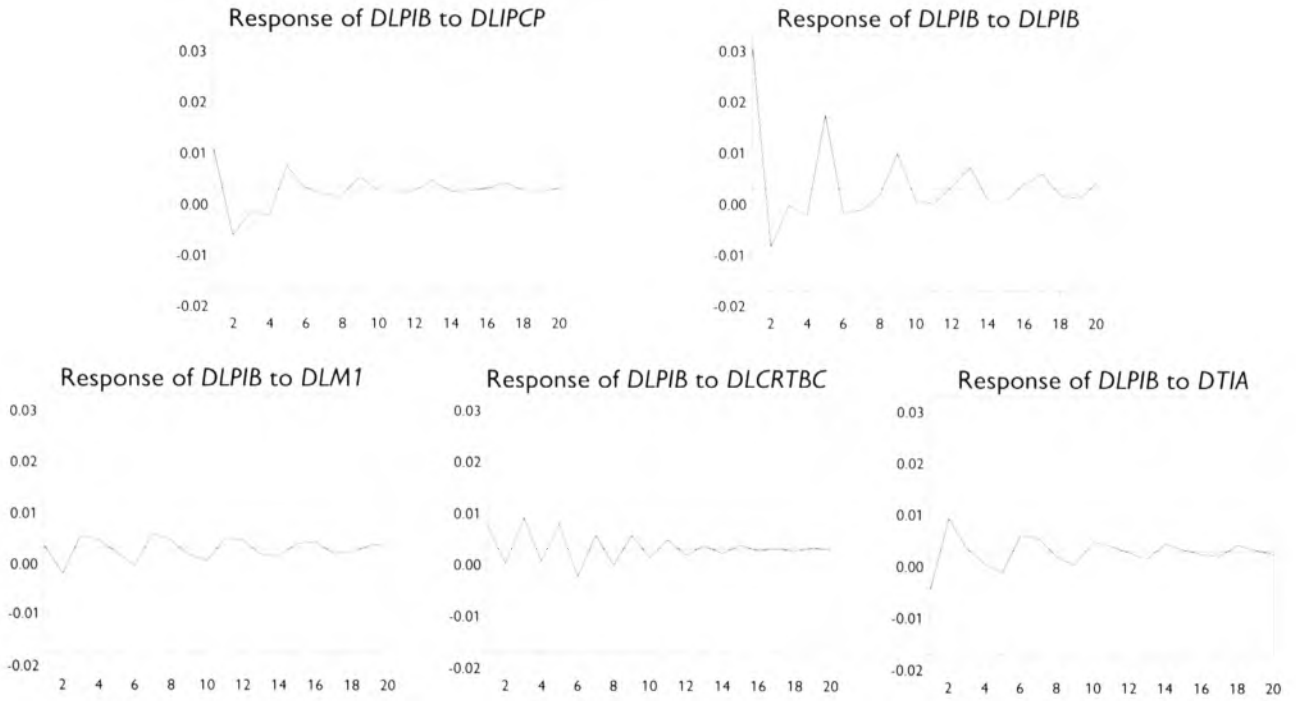
Two interpretations are possible in explaining this result. First, fluctuations in GDP may originate in supply factors not incorporated in the model. Secondly, the specification cannot capture the incidence of the explanatory variables on the demand components of GDP. This latter aspect is related to the effect of some variables on consumption and private investment, which cannot necessarily be captured when aggregate GDP is taken as the dependent variable.

Given the unsatisfactory results in the estimation of GDP, a different variable was specified as a proxy for economic activity. In the previous models, domestic aggregate demand was used in an attempt to account for the expansionary impact of increased spending on prices. However, the results were not encouraging, perhaps because in given phases of the economic cycle the level of spending was far below potential output.

In the light of these considerations and the assumption that the demand variables might influence the deviations of economic activity from

Graph 2

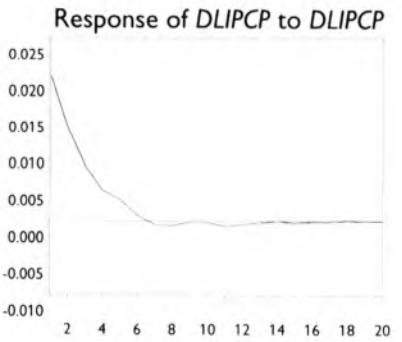
**GDP: impulse response functions***

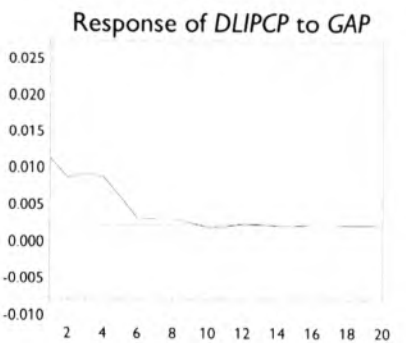


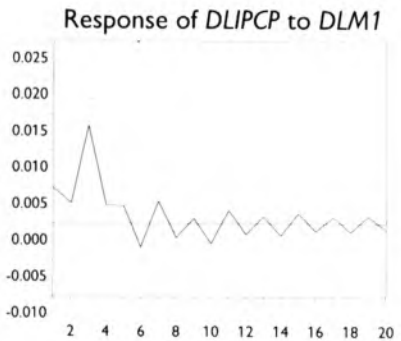

* Response to a one-standard deviation innovation.

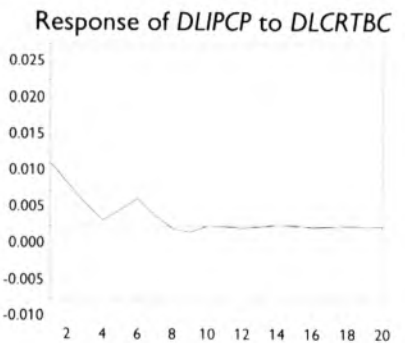
Graph 3

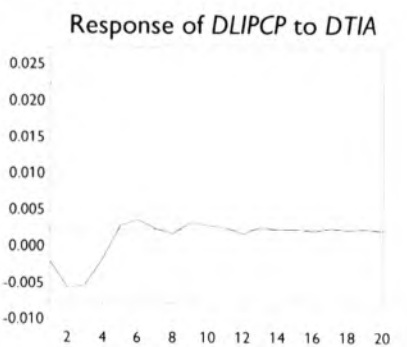
**Inflation: impulse response functions using *GAP**




* Response to a one-standard deviation innovation.

trend, the *GAP* variable was constructed using the residuals of a regression of GDP on a linear and a quadratic trend.[6] It should be pointed out that the trend in this variable is consistent with the Venezuelan business cycle.

In addition, given that *GAP* can be interpreted as the excess demand for goods, its explanatory power is superior to GDP since the observed levels of GDP only represent equilibrium values which may be insufficient to put pressure on prices if their level is below full-employment output.

Graph 3 presents the impulse response functions of an unrestricted VAR where *GAP* was substituted for GDP. The results validate the hypothesis of an inertial component of inflation. Nevertheless, the incorporation of *GAP* provides information on the impact of excess demand on the inflation process. Indeed, an innovation in this variable brings about a price change of the same sign as the shock, and the impact reaches a peak in the third quarter. At that point, it starts to decline until vanishing in the fifth quarter.

The contribution of *GAP* to the explanation of the forecast error of inflation is around 16%, which confirms its importance in the generation of inflation dynamics. M1 also makes an important contribution of approximately 19%. The influence of other variables is marginal as shown in Table 4. It should be noted that under this new specification the contribution of inflation to its own explanation is approximately 44% Although

Table 4

**Variance decomposition of the inflation error forecast using *GAP***

In percentages

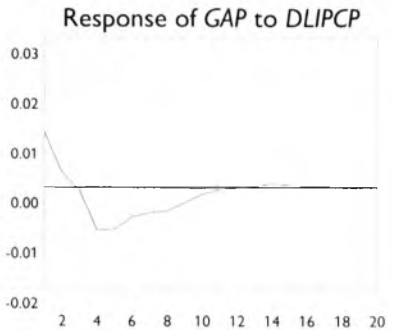
| Quarters | *DLIPCP* | *GAP* | *DLCRTBC* | *DTIA* | *DLMI* |
|---|---|---|---|---|---|
| 1 | 66.40 | 13.50 | 12.71 | 3.34 | 4.04 |
| 2 | 61.60 | 13.58 | 12.13 | 9.16 | 3.54 |
| 3 | 48.70 | 13.65 | 9.50 | 11.27 | 16.88 |
| 4 | 46.99 | 16.02 | 8.95 | 11.73 | 16.31 |
| 8 | 44.96 | 16.25 | 10.03 | 11.22 | 17.53 |
| 12 | 44.48 | 16.09 | 9.96 | 11.20 | 18.26 |
| 20 | 44.14 | 15.96 | 9.89 | 11.14 | 18.87 |

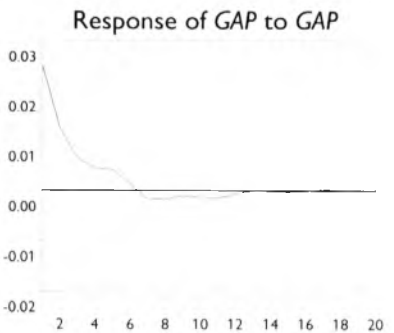
Order: *DTIA, DLCRTBC, DLMI, GAP, DLIPCP.*

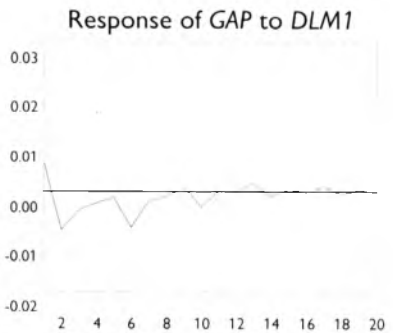
[6] This approach is also followed in Fernández and Mendoza (1994) and Walsh (1986).

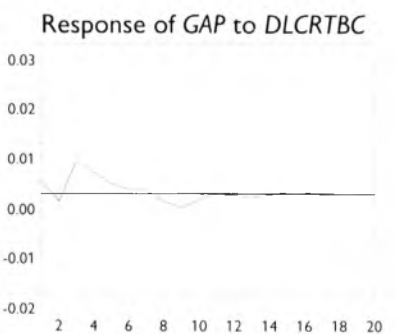
Graph 4

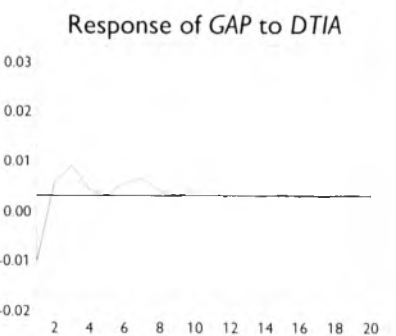
**GAP: impulse response functions***




* Response to a one-standard deviation innovation.

still high, this nevertheless represents an important decrease compared with the previous model.

As far as *GAP* is concerned, its own history is of greatest importance, since an excess demand shock has an impact on itself which lasts for approximately four quarters, and its contribution to the forecast error is about 50%. The impact of the other variables would not appear to be significant, and their sign runs contrary to expectations. Moreover, the individual contribution of those variables to the forecast error of *GAP* (with the exception of inflation) is significant. These results are shown below in Table 5 and Graph 4.

Table 5

**Variance decomposition of the *GAP* error forecast**

In percentages

| Quarters | *DLIPCP* | *GAP* | *DLCRTBC* | *DTIA* | *DLMI* |
|---|---|---|---|---|---|
| 1 | 13.16 | 64.71 | 0.64 | 18.23 | 3.25 |
| 2 | 11.38 | 64.95 | 0.73 | 15.21 | 7.73 |
| 3 | 10.30 | 61.83 | 3.64 | 16.27 | 7.95 |
| 4 | 14.56 | 58.13 | 4.60 | 15.02 | 7.68 |
| 8 | 21.26 | 50.62 | 4.30 | 13.82 | 9.99 |
| 12 | 21.47 | 49.82 | 4.75 | 13.62 | 10.35 |
| 20 | 21.40 | 49.57 | 4.78 | 13.60 | 10.65 |

Order: *DTIA, DLCRTBC, DLMI, DLIPCP, GAP.*

*(iii) Inflation as a target variable of monetary policy*

Although studies of the transmission mechanism usually consider the effects on both prices and economic activity, this analysis concentrates on the impact of the monetary variables on price changes. In particular, the importance of monetary and financial variables is analysed in the data generating process that determines inflation.

Once evidence about the relevant variables in the inflation dynamics has been obtained, the next step involves formulating a better specified model that takes into account the short and long-run relationships between the variables. The long-run relationship is estimated on the basis of a cointegrating vector between the consumer prices index (*IPCP*) and M1. The results are shown below.

*LIPCP* = 1.25 *LM1*.

| Null | Alternative | Statistic | 95% critical value | 90% critical value |
|---|---|---|---|---|
| r=0 | r>1 | 18.51 | 15.41 | 13.33 |

Some other variables were taken into account in the long-run relationship, such as *GAP* and *TIA*. However, as in previous studies about Venezuelan inflation, the only relevant variable was the stock of money.

An error correction model was then formulated incorporating the short-run dynamics through inflation's own lags and current and lagged values of *GAP*, the rate of change of wages and M1. In addition, the long-run relationship was included through the residuals of the cointegrating vector (*MCE*).[7]

The lag structure for the formulation of the general model was determined on the basis of the Akaike and Schwarz criteria. The results for the reduced fourth-order VAR model are shown below.

$$DLIPCP = \underset{(-1.668)}{-0.324} + \underset{(6.666)}{0.666}\, DLIPCP(-1) \underset{(-1.561)}{-0.206}\, DLIPCP(-2)$$
$$\underset{(-2.035)}{-0.25581}\, DLIPCP(-3) + \underset{(2.736)}{0.30722}\, DLIPCP(-4) \underset{(1.523)}{-0.15346}\, GAP(-1)$$
$$+ \underset{(3.462)}{0.310}\, GAP(-2) + \underset{(3.360)}{0.143}\, DLMI + \underset{(3.235)}{0.154}\, DLSAL(-1) + \underset{(1.609)}{0.079}\, DLSAL(-4)$$
$$\underset{(-1.78)}{-0.0322}\, MCE(-1) + \underset{(5.332)}{0.135}\, D89Q1 \underset{(-4.188)}{-0.099}\, D88Q1$$

t-statistics in parentheses.
$R^2$=0.858; $R^2$(adjusted)= 0.792.
Serial correlation test (LM1): F(1,25)= 0.55607 ; [0.465].
Serial correlation test (LM4): F(4,22)= 0.30524 ; [0.871].
Functional form test (Ramsey's reset): F(1,25)= 3.4219 ; [0.076].
Normality of errors test (Bera-Jarque): Chi-SQ(2)= 1.5037 ; [0.471].
Heteroskedasticy test: F(1,37)= 1.3593 ; [0.244].
p-values are shown in brackets.

Some striking features can be observed. First, the large inertial component, which is characteristic of countries with persistent inflation rates, can be seen. Secondly, the role of the output gap is evident, the global effect of which has a positive impact on prices. Finally, wages have a positive effect, reflecting the impact of cost push factors on inflation.

[7] The p-value of the *MCE* term is 8.7%, which is a reasonable level of significance.

As regards the monetary aggregate, it is clear that its influence on inflation is contemporaneous, although the size of the coefficient (0.143) is too small to support a monetarist explanation of inflation in the short run. However, it is possible to implement an anti-inflationary policy based on the control of the monetary aggregates even in the short term. The link between prices and money in the long term is captured by the cointegrating vector, which supports a speed of adjustment towards long-term equilibrium of approximately 3%.

Note that two dummy variables (*D89Q1* and *D88Q1*) needed to be incorporated to capture the effects of the introduction of the adjustment programme in the first quarter of 1989 and the deflation in March 1988.

In addition to the direct channels of monetary policy influence observed in the previous equation, it is important to analyse the indirect effects which occur via the impact of monetary policy on the output gap. An equation was therefore specified that could determine the impact of the real interest rate (*TIAR*) and of bank credit to the private sector on excess demand. The equation also assumed a close relationship between *GAP* and its historical levels, as well as between *GAP* and the development of oil exports which represent a wealth effect given the importance of oil for the Venezuelan economy.

$$
\begin{aligned}
GAP = {} & 0.142 + 0.936\,GAP(-1) - 0.195\,GAP(-3) - 0.0012\,DTIAR \\
& (1.923)\quad (0.943)\qquad (-2.254)\qquad (-2.296) \\
& + 0.0012\,DTIAR(-1) - 0.0009\,DTIAR(-3) + 0.162\,DLCRTBC(-2) \\
& (2.477)\qquad (-1.800)\qquad (4.1694) \\
& + 0.175\,DLXPTBC + 0.052\,D89Q1\,89Q3 + 0.046\,D92Q4 \\
& (4.999)\qquad (3.429)\qquad (2.551) \\
& - 0.0357\,S1 + 0.046\,S2 + 0.009\,S3 \\
& (-4.124)\qquad (4.084)\qquad (0.974)
\end{aligned}
$$

t-statistics in parentheses.
$R^2$=0.929; $R^2$(adjusted)= 0.901.
Serial correlation test (LM1): F(1,30)= 0.0016 ; [0.968].
Serial correlation test (LM4): F(4,27)= 0.8333 ; [0.516].
Functional form test (Ramsey's reset): F(1,30)= 1.1925 ; [0.284].
Normality of errors test (Bera-Jarque): Chi-SQ(2)= 0.76893 ; [0.681].
Heteroskedasticity test F(1,37)= 0.0096 ; [0.922].
p-values are shown in brackets.

The global effect of the real interest rate indicates a negative relationship between this variable and excess demand. It could be basically attributed to the stimulus that is exerted by negative real rates of interest on private consumption and some types of investment in Venezuela. The direct effect of bank credit to the private sector on the output gap can be seen as the manifestation of a natural expansionary effect resulting from the greater availability of bank credit.

Note that the variables *D89Q1 89Q3* and *D92Q4* are dummy variables to take into account the implementation of the adjustment programme (1989) and the political shock hitting the economy at the end of 1992. *S1*, *S2* and *S3* are seasonal dummies.

## 3. Conclusions and implications for monetary policy

The results obtained allow the identification of a multi-variable process in the generation of the inflation dynamics. On this basis, it can be derived that the greatest contribution that the central bank could make to inflation-fighting would be to control the pace of M1, given both its contemporaneous effect on prices and the long-term link between prices and money.

However, the inertial component of inflation also suggests that a policy aimed at disinflating the economy must give serious consideration to the role of expectations, the degree of indexation and the credibility of economic policy.

According to the model estimates, the implementation of monetary policy should take into account two relationships. The first is the cointegration observed between prices and money (M1). This result is important for the general orientation of monetary policy, but it contributes very little to the definition of short-term policy rules. The second relationship, that between inflation and its determinants, should therefore be considered when specifying policy actions. In particular, the results suggest that money has a contemporaneous influence on prices through its impact on interest rates, and in turn on aggregate demand.

In order to identify the specific transmission mechanism and to derive some policy implications, the impact of M1 on prices can be split into two related effects:

*(a) The direct impact of M1 on inflation*

An expansion in the money stock (M1) results in an increase of aggregate demand via an excess of real balances which produces a decline in real interest rates causing higher levels of consumption and investment and, as a result, inflation pressure.

In the short term, however, this effect is not fully transmitted to prices although the cointegrating vector suggests a close relationship between the path of prices and the quantity of money. The result is consistent with the nominal character of both variables. While this does not imply that there are no other determinants of the price level in the long term, it suggests that during the period under review the quantity of money has been the time series that was fundamentally related to the price trend.

*(b) The indirect effect via the impact of the real interest rate on the output gap*

In addition to the direct effect of M1 on inflation, there is an indirect component which operates via the effect of the real interest rate on the output gap. One explanation for this indirect channel is that changes in the real interest rate modify the cyclical position of the economy, exacerbating or dampening inflation pressures. In other words, this indirect effect captures the extent to which excess demand, due to a fall in interest rates, endures.

*Implications of selecting the money supply as an intermediate target of monetary policy*

Setting targets for M1 implies the selection of an exchange rate regime that offers the authorities some scope for controlling the stock of money. It is clear that a flexible exchange rate system is the most appropriate choice given that it affords better monetary control and that exchange rate changes would tend to reflect economic fundamentals and stochastic shocks to the demand for money. Another argument for choosing M1 as the intermediate target of monetary policy is the selection of the operational variable. In this context, the actions of the central bank must be targeted at controlling domestic credit to the private sector, given that the external component of the money base is determined by the choice of the exchange rate regime and that the financing needs of the public sector cannot be met by the central bank according to its legal code. In

addition, in order to determine the efficiency of the Bank's policy actions on the intermediate variable, the high degree of endogeneity of money creation within the banking sector must be taken into consideration, given the interaction between the commercial banks' portfolio decisions and the public sector's financing needs.[8]

The actions of the monetary authorities aimed at managing domestic credit to the private sector should be based on open market operations, since these are the natural instrument of monetary policy. However, as these operations have been carried out during the last few years by issuing central bank bonds, additional monetary expansion has been caused when the bonds reached maturity. Given this restriction, one strategy for the Bank to use in order to improve its intervention in the monetary market would be to perform open market operations using assets other than its own liabilities. This would not involve future monetary expansion, nor would it give rise to expectations of insolvency on the part of the monetary authorities.

*Suggestions for monetary policy implementation*

In order to improve the efficiency of monetary policy, to gain credibility and to have a positive impact on expectations, a number of operating criteria could be suggested to support policy decisions. First, it is recommended that money supply targets are determined not in terms of absolute levels, but rather in terms of a range which allows for random shocks beyond the control of the monetary authorities. Once a range for M1 has been defined, the Bank should make it public and monitor it on a regular basis.

When M1 moves out of the estimated range, the monetary authorities must provide a convincing explanation for the deviations, so that its commitment to controlling inflation is reinforced.

The information provided by the Bank on prices and monetary aggregates should be of sufficient quality to ensure that economic agents form appropriate expectations about the monetary authorities' final objective. This approach has been used in various countries (see Ammer and Freeman (1994)) and has strengthened the credibility of the monetary authorities in their pursuit of an anti-inflation policy.

[8] Only a passing reference can be made here to the complexity of the relationship between the operational and intermediate variables. A more detailed analysis must be the subject of another study.

An effective method of showing the monetary authorities' commitment is the publication of special inflation bulletins containing a careful analysis of the evolution of prices, price forecasts and the policy measures taken by central bank. In this way, the monetary authorities will gain credibility, at the same time as shaping the economic agents' expectations.

Finally, it is important to build a set of economic indicators which permit an ongoing evaluation of the various transmission mechanisms. These statistics would allow the policy-makers to analyse current economic conditions and identify the presence, nature and transitory character of price shocks. These indicators could be issued in conjunction with the announcement of inflation and money supply targets.

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