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Malcolm Edey,
Norbert Funke,
Mike Kennedy,
Angel Palerm

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MONETARY POLICY AT PRICE STABILITY: A REVIEW OF SOME ISSUES

by
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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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MONETARY POLICY AT PRICE STABILITY: A REVIEW OF SOME ISSUES

In this paper policy issues related to the operation of monetary policy in a low inflation environment are discussed. The successful reduction of inflation rates in a number of OECD countries in recent years arguably represents a regime shift that is likely to affect the operation of monetary policy. Some of the practical issues involved are the potential existence of a trade-off between inflation variability and output variability, asymmetries in the short-run Phillips curve, the interaction between monetary and fiscal policies, the effectiveness of monetary policy instruments, the appropriate specification of the price stability objective, as well as the credibility of monetary policy in a near price-stability environment. The results indicate that under many circumstances none of these issues should cause major difficulties at price stability. Furthermore, the analysis tends to strengthen the argument for maintaining relatively tight control over inflation. Sound fiscal policies are an important component for the move to price stability being both sustainable and credible.

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PROBLÈMES RELATIFS À LA CONDUITE DE LA POLITIQUE MONÉTAIRE DANS UN ENVIRONNEMENT DE STABILITÉ DES PRIX

Dans ce document sont discutés les enjeux de politique économique ayant trait à la mise en oeuvre de la politique monétaire dans un contexte de faible inflation. Le succès rencontré dans la réduction des taux d'inflation dans un certain nombre de pays de l'OCDE ces dernières années représente un changement de régime qui affectera vraisemblablement la conduite de la politique monétaire. Parmi les conséquences pratiques de ce changement, on peut noter l'existence potentielle d'un arbitrage entre la variabilité de l'inflation et celle de la production, l'asymétrie de la courbe de Phillips à court terme, l'interaction entre les politiques monétaires et budgétaires, la spécification appropriée des objectifs de stabilité des prix, ainsi que la crédibilité de la politique monétaire dans un contexte de prix presque stables. Les résultats indiquent que dans de nombreuses circonstances, aucune de ces questions ne pose de difficulté majeure en régime de stabilité des prix. L'analyse tend même à renforcer l'argument en faveur du maintien d'un contrôle assez strict de l'inflation. Par ailleurs, des politiques budgétaires saines sont une composante importante pour que le mouvement vers la stabilité des prix soit à la fois réalisable et crédible.

MONETARY POLICY AT PRICE STABILITY: A REVIEW OF SOME ISSUES

Table of Contents

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Malcolm Edey, Norbert Funke, Mike Kennedy and Angel Palerm[1]

I. Introduction

In recent years, a majority of OECD countries have succeeded in reducing inflation rates to levels not seen on a sustained basis since the 1960s. This remarkable achievement has been accompanied by a strengthening of commitments to price stability or at least very low inflation, as the primary objective of monetary policy. In this context a number of countries have specified inflation targets or objectives in numerical terms. There has also been an increasing emphasis more generally on credibility of monetary policies, and on the need for objectives with respect to inflation control to be effectively communicated to economic agents. Expected benefits of better inflation control include reductions in uncertainty, a lower inflation tax on cash balances, the elimination of distortions arising from interactions between inflation and tax systems and the improved efficiency of pricing systems, all of which contribute to improved productivity and growth in the longer run.

The reductions of inflation, and strengthening of anti-inflation commitments, arguably represent a regime shift that is likely to affect the operation of monetary policy specifically. In this paper a number of issues related to the move to a low inflation environment are discussed. In Section II questions concerning problems of macroeconomic management in the context of price stability are discussed. How price stability or low inflation affects the effectiveness and flexibility of monetary policy instruments, in particular interest rates, is discussed in Section III. Where practical, empirical evidence that may shed light on these topics is also reviewed. Section IV summarises the main findings.

II. Macroeconomic Management Issues at Price Stability

A paper recently published in *OECD Economic Studies* No. 23 addressed a number of issues related to the optimal rate of inflation over the medium to long term[2]. The main conclusions from that work were:

-- Conclusive empirical findings on the benefits of zero inflation remain limited. The available evidence supports the implication of a number of theoretical arguments that higher inflation may lead to significant efficiency losses and is detrimental to macroeconomic performance. On the other hand, practical examples of sustained near zero inflation rates in the post World War II period are rare. Little guidance thus exists as to the comparison of welfare effects of alternative inflation objectives within the low single-digit range.

-- Despite a number of possible alternative price indexes, national authorities often focus on measures for consumer price inflation. Research has shown that there exists a tendency for consumer prices to overstate the true rate of inflation. Estimates for the United States and Canada suggest that the overall bias may be in the range of 0 to 2 percentage points per annum, although these estimates are subject to considerable uncertainty. Thus price stability,

if achieved in a fundamental sense, is likely to be consistent with some very modest rate of increase in measured consumer prices.

The discussion below is focused on operational issues related to defining and implementing a low inflation/price stability objective and managing monetary policy under that objective. A key issue is the degree of tolerance toward temporary variations of inflation with respect to the objective or, in other words, the amount of practical short-run flexibility built into medium-term anti-inflation commitments. Among countries which have made their inflation objectives explicit in numerical terms, a variety of approaches have been adopted (Table 1). While, in some cases (Italy, Finland) only a central objective is specified with no explicit tolerance range, most of the countries with announced objectives specify tolerance ranges of the order of two percentage points, although the exact ranges differ. There is considerable variation in the time horizon over which objectives are specified, and also in the degree of operational significance given to short-term fluctuations of inflation relative to the desired range. In some countries such as Canada, the United Kingdom and New Zealand, target ranges are specified so as to define relatively clear rules of behaviour for the policy authorities whereas in other countries the commitment to take corrective action is more implicit and not focused on a tightly specified inflation indicator or time period. In general terms, an important trade-off faced in formulating anti-inflation policy commitments is between the risk of making an unrealistically tight (and, therefore, not credible) commitment in the short term and commitments that are insufficiently explicit to discipline future policies and therefore to influence inflation expectations. Some of the practical issues involved in setting monetary policy under price stability include:

-- whether or not there is a short-run trade-off between inflation variability and output variability;

-- the shape of the short-run Phillips curve or implied trade-off between inflation and unemployment;

-- the size of errors central banks are likely to encounter when trying to meet inflation targets and implications for credibility of anti-inflation policy;

-- the nature of interactions between monetary and fiscal policies; and

-- whether the price-stability objective should be specified with or without base-drift.

These issues, and where possible their empirical relevance, are discussed in the next five sub-sections.

A. Output stability versus price level or inflation stability in the short run

In implementing policies of price stability, policymaker face *ex ante* short-run trade-offs between variability of inflation/prices and variability of output and employment. Taylor (1994) argues that attempting to keep the inflation rate too stable over the business cycle could result in larger fluctuations of output; on the other hand, efforts to stabilise output in the short run could lead to more volatile inflation even if they do not result in any inflationary bias on average. Such a short-run trade-off may arise -- for both supply and demand shocks -- in the presence of sticky prices and time lags in monetary policy transmission or reaction.

While, *ex ante* it might be expected that the relationship between inflation/price and output variability would be negative, it may just as easily turn out to be positive. A policy rule that placed a high weight on resisting deviations of output from trend may result in a large deviation of inflation from its target following a supply shock. In the event that this created more uncertainty about expected inflation

(for example, by undermining policy credibility) or prevented adjustment on the real side from taking place in a timely manner, then there would be feedback effects of higher inflation back onto the real economy. For example, countries that tried to smooth the disruptive effects of an oil price shock by an accommodative monetary policy eventually ended up having to tolerate large swings in monetary conditions and in output to combat inflation expectations which later became entrenched. With monetary policy committed to price stability, inflation would not be allowed to creep up and subsequent disinflationary recessions would be avoided suggesting that *ex post* the variance of both output and inflation could be lower. A truly credible commitment would presumably prevent inflation expectations from rising in the event of a temporary deviation of inflation from its target.

Some evidence on the *ex post* short-run relationship between inflation variability and output variability in a cross-section perspective for four different time periods is presented in Figure 1. Volatility is measured by the standard deviation of the annualised per cent change of quarterly GDP and quarterly annualised inflation rates measured by the GDP deflator both measured from their trends [3]. To the extent that countries faced similar shocks within a sub-period, differing performances will tend to reflect outcomes due in part to differences in the application of macroeconomic policies. In general, the outcomes have differed over the time periods examined depending on the circumstances facing individual countries. This was certainly the case in the pre-1973 period. Differences in degrees of exposure to the large oil price shocks of the 1970s seem to have contributed to a slight positive cross-country relationship between output variability and inflation variability from 1973 to 1979: countries most heavily exposed would have experienced larger exogenous impacts on both prices and output. The experience of the 1980s was different again. Some countries (Sweden, the Netherlands and Italy) turned out to have lower output variability but at the expense of high inflation variability. Canada, the United Kingdom and to a certain extent the United States, seemed to experience the opposite. Japan, Germany and Belgium managed to have both low inflation and output variability in comparison. The experience of the 1990s seems broadly consistent with both the 1980s and the period 1965-72 when inflation was reasonably low throughout the OECD although in general inflation volatility was lower.

B. Shape of the short-run Phillips curve

The shape of the short-run Phillips curve will have implications for the conduct of monetary policy. In particular the curve may be asymmetric, in the sense that expansionary demand shocks would generate relatively little output gain to "compensate" for higher inflation, while contractionary demand shocks would deliver little inflation reduction in the short-term. From a policy perspective, short-run Phillips curves of this nature would tend to strengthen the case for active stabilisation policy in response to both expansionary and contractionary demand shocks, for two reasons. First, the temporary trade-offs between output and inflation in both cases of deviations from a steady state position would be unfavourable on average. Second, to the extent that a positive shock to inflation became entrenched in expectations, it would imply that the subsequent costs of the desired inflation reductions would be higher than the initial gains in output[4]. Evidence of asymmetric price behaviour would also tend to strengthen the case for very low inflation or price stability, since asymmetries are likely to be related to expectations of rising prices: as expected inflation falls, these types of asymmetric responses might disappear and the Phillips curve would become more linear.

There is some empirical evidence for the case of Canada that short-run Phillips curves may be asymmetric. Laxton *et al.* (1993) test this proposition by estimating Phillips curves for Canada with inflation depending on an expected-inflation proxy, an output gap term, and an additional term which is a function of positive output gaps only. In most of the specifications tried, the coefficient on the positive output gap term is reported to be statistically significant and positive, suggesting an asymmetric short-run Phillips curve of the form described in the preceding paragraph. Further work in the Secretariat (Turner,

1995) also provides some support for asymmetries in five of the G-7 countries, although a linear Phillips curve is decisively statistically rejected only for the United States, Japan and Canada[5]. One reason why clear-cut results are difficult to obtain is that errors in the measurement of potential output can be significant in the presence of asymmetries, and in particular the standard "trend" methods to obtain measures for potential output may be biased.

A further issue concerning the nature of short-run policy trade-offs is the possibility that the Phillips curve becomes flatter on average when inflation is low. This might arise from a greater importance of nominal rigidities when inflation is low, due to price and wage adjustments becoming less frequent under low inflation. A flattening of the Phillips curves at low inflation would be important from a policy perspective because it would imply that nominal demand shocks in either direction would have relatively less impact on prices, and more on output as inflation slows; the short-run costs of disinflation would thus become progressively greater as zero inflation was approached.

During the 1950s and the 1960s many countries experienced low inflation rates over reasonably long time periods. An analysis of the inflation unemployment trade-off in the 1950s/1960s, and a comparison with the post-1973 period, can provide some evidence on the (varying) costs of disinflation in a low and a higher inflation environment, although it needs to be kept in mind that institutional changes and changes in the composition of shocks might also have contributed to shifts in the apparent trade-offs when comparing the two periods. An examination of inflation-unemployment trade-offs for the three largest countries, shown in Figure 2, indicates that disinflation was in many cases accompanied by an increase in unemployment. This seems to have been true in the low inflation environment of the 1950s/1960s as well during periods of higher average inflation rates thereafter. The positions of any short-run Phillips curves implied by the charts are, however, somewhat unstable in the sense that they appear to shift over time.

It remains very difficult to determine the shape of the short-run Phillips curve. This point is emphasized by the analysis of Lipsett and James (1995). Applying rolling regressions -- both one period forward and fixed sample size -- to the G-7 countries, Australia and New Zealand, they show that estimated sacrifice ratios are generally quite unstable and often statistically insignificant. The size and significance of the sacrifice ratio is highly dependent on the period of estimation and may not only change dramatically between major sub-periods but also with the addition or exclusion of only a few data points. Specific policy recommendations can thus only be drawn on the basis of more detailed analyses of country-specific policy regimes.

C. Credibility and forecast errors

The credibility of monetary policy will depend in good part on the ability to establish track-records of inflation control and of keeping anti-inflation commitments. This in turn suggests a case for avoiding commitments that are narrowly specified relative to the inherent difficulties of forecasting and controlling the macro-economy. To shed some light on the magnitude of errors in forecasting inflation, time-series data on deviations of annual inflation rates from OECD projections made at the end of each preceding year, are reported in Table 2. Since these projections take expected monetary policies for the coming year into account, they illustrate the magnitude of forecasting errors, although to the extent that past errors reflected a less vigilant stance on monetary policy, moves to strengthen anti-inflation commitments should help to reduce such errors[6]. The main points to be retained from the Table are:

-- deviations of inflation from projected rates have been mostly of the order of 1 to 2 percentage points;

-- large errors appear to have occurred when supply shocks have been large, particularly in the 1970s;

-- in the period since 1985, when inflation rates have been relatively stable, there are nonetheless substantial cross-country differences in prediction errors. Sample standard errors are smallest for the United States, Japan, Germany, France and the Netherlands (of the order of 0.5 to 0.7 percentage points), compared with one percentage point or more in the other countries.

The meeting of announced commitments in the short-run is likely to become less important for credibility over time to the extent that track records can be established to demonstrate that any short-run flexibility in inflation control will not be abused to allow higher inflation on average. The experience of the Bundesbank is arguably a case in point. Despite having missed official targets for monetary growth half of the time since 1975 (Table 3), the credibility of the Bundesbank remains high largely because of a long-run record of keeping inflation relatively low; credibility seems to have remained intact despite a rise in inflation associated with unification (King, 1995).

D. Interactions between monetary and fiscal policies

Fiscal policies are also likely to have an important influence on the credibility of anti-inflation policies. High fiscal deficits or debts, by raising the risk of future inflation, may augment the difficulty of achieving credibility even if the monetary authorities are fully committed to inflation control; markets may fear that a central bank will be unable to deliver on such a commitment if there is insufficient fiscal discipline. Fiscal deficits may also pose a problem in the transition from high to low inflation, since, to the extent that public debt is financed by longer-term fixed-rate instruments, inflation reduction will imply a rising debt-service burden in real terms. These considerations suggest that sound fiscal policies will be an important component of the policy mix if the move to price stability is to be sustained and credible.

E. Medium-term price stability targeting, with or without base-drift

Monetary policy commitments for the medium to longer-run future can be specified either with or without base-drift: that is, they may imply a desired path for either the level of prices (or other nominal objectives) or its rate of change. Now that inflation has fallen to relatively low levels and a number of central banks are committed to price stability, this issue has taken on more importance. The two formulations have very different implications for the longer-run variability of prices. An objective that allows level drift implies an increasing forecast variance of prices the longer the forecast horizon (because shocks to the price level are not corrected once they occur). On the other hand, a policy of no drift, while limiting the long-run variance of prices, may induce higher short-run variability (because of the commitment to reverse all disturbances[7]). An intermediate case is also possible in which the monetary authority is committed to returning to a specified price level, but only over time. In this case the shorter-run variance of inflation (actually price level changes) will be less but would not be as low as in the pure base-drift case.

The choice between these formulations will depend upon the economic importance of longer-term contracting compared with the costs of higher short-run variation in the price level and of the activist policies that might be needed to correct cumulative deviations of price levels from their targets. A high level of long-term price stability was arguably achieved under the gold standard, a feature of which was the existence of consols and 100 year bonds. Whether this was important to overall economic efficiency is debatable, but such stability of expectations concerning the price level so many years into the future was remarkable and may have contributed to ease of raising capital. There were, however, major swings in output and employment as well as considerable short-run variability in prices. A policy aimed at reducing

variability of the price level over the short term, but which allows some drift in the longer term, may improve the functioning of the price system as a signal transmission mechanism and in the process increase market efficiency.

III. Implementing Monetary Policy at Price Stability

A second set of issues for monetary policy in a low inflation/price stability environment concerns the impact of that environment on the effectiveness of monetary policy instruments, particularly interest rates. Since lower inflation will mean lower average nominal interest rates, the existence of lower bounds on nominal rates might mean that policy has less room to manoeuvre in responding to negative demand shocks. The discussion below highlights two aspects of this issue: the zero interest rate floor for market interest rates, and the possible existence of floors for financial intermediaries' nominal lending rates.

A. The zero interest-rate floor

One important implication of the fact that nominal interest rates cannot fall below zero is that monetary policy may lose its ability to stimulate economic activity when market interest rates are already low, as they would be in price stability. The issues here are:

-- Does the inability of nominal rates to fall below zero represent a serious obstacle to stimulating output in the face of adverse shocks?

-- How much larger are the expected welfare losses of adverse shocks in a zero (low) inflation environment compared with an environment with moderate rates of inflation?

-- Are negative real interest rates necessary at certain times?

To answer the first two questions Fuhrer and Madigan (1994) simulate the effects of adverse shocks in a small forward-looking model for the U.S. economy. They compare the performance of stabilisation policies in response to shocks under moderate (4 per cent) and zero steady-state inflation rates. Three types of demand shocks are considered: permanent unanticipated, temporary unanticipated, and temporary anticipated. In each case the size of the shock is equivalent to a drop in aggregate demand of 0.4 per cent.

The simulation analysis supports -- qualitatively speaking -- the argument that a credible zero inflation would limit the ability of monetary policy to respond to adverse spending shocks in some circumstances, but also that in most cases the associated welfare losses are small. For relatively small and short-lived spending shocks, as well as for permanent and large shocks, the loss in output is in the order of one or two-tenths of a percent. Only if shocks are large and persist for a few quarters does a zero inflation regime result in large losses -- of the order of one per cent. The practical implications of this analysis depend on a number of issues that are not explicitly considered:

-- How quickly can a central bank recognise the type and size of shocks? How accurately can the central bank offset the effects of shocks?

-- Can other economic policies -- for example, fiscal policy -- help offset the shock when monetary policy is constrained by a zero interest rate floor?

-- If the shock is country specific, what role could the exchange rate play?

The historical experiences of negative real rates since 1950 is instructive on the issue of whether negative real interest rates are likely to have an important role in policy. Most cases of negative short-term real interest rates (Table 4) occurred in the 1970s, although there were also a number of cases in the 1950s and 1960s; with the exception of Switzerland, real rates have not been negative since the beginning of the 1980s. The large number of years in which negative real interest rates have prevailed, however, does not suggest that they were at certain times necessary. Short-term real rates were in many cases negative in periods, when either:

-- output growth was strong (e.g. the United States 1950, 1951; France 1962, 1963; Canada 1950, 1951, 1952);

-- nominal interest rates were still well above zero (e.g. above 2 per cent in Germany 1961, 1962, 1963; the United Kingdom 1952, 1953, 1955, 1956, Canada 1956) implying that the zero interest rate floor was not a practical constraint on policy;

-- large supply shocks had created inflation surprises (in all countries in the 1970s).

A similar picture emerges when looking at long-term real interest rates (Table 5). Most examples of negative long-term real rates occurred during the early 1950s, in some years in the 1960s, and in all countries in the 1970s. Again in many cases, negative real interest rates occurred when output growth was still strong, nominal rates well above zero or inflation rose unexpectedly.

A further consideration is that for much of this period, nominal interest rates were held artificially low in administered interest-rate systems. The historical analysis which shows that negative real interest rates appear to be correlated to general business cycle conditions and to periods of high inflation rates lends support to the findings of the simulation exercise, namely that under many circumstances the zero bound on interest rates should not cause major difficulties at price stability.

B. Floors on bank lending rates

Bank lending rates in some countries may have shown resistance to declining below a particular critical level in past periods of low inflation. Cozier and Lavoie (1994) identified a non-linear relationship between market rates and short-term bank lending rates in Canada; when the treasury-bill rate moves below 4.5 to 5 per cent, the prime rate remains unchanged or responds only very slowly and, consequently, the spread between both rates widens. One explanation for this phenomenon is that banks' deposit rates reach zero before market rates; assuming a constant spread between lending and deposit rates, then lending rates will on average stop responding to market rates even before zero average inflation is reached[8]. In general, however, there does not appear to be much support for a non-linear relationship between lending and market rates of interest, with the possible exceptions of Canada, the United States and the Netherlands (Figure 3).

Several qualifications should be borne in mind when considering the policy implications of an apparent floor to lending rates:

-- To assert that monetary policy would become less effective, it is necessary to assume that expansionary effects of reductions in market interest rates depend on such reductions being reflected in lending rates of banks. Higher bank lending rates may, however, lead borrowers to resort to market financing to a greater extent.

-- While floors may be observed now, they may yield after a period of low nominal market rates is observed, especially if there is competition in the banking sector, something that certainly has increased since the advent of deregulation.

-- Prime rates (like those used for the United States and Canada) are announced rates. Actual costs of borrowing can vary significantly as banks adjust policies regarding collateral, fees, and spreads from prime for different groups of customers.

IV. Conclusions

The major conclusions of this paper are as follows:

-- Evidence of a short-run trade-off between the variances of output and inflation does not appear to be strong in all countries. The evidence in fact suggests the relationship could just as easily be non-existent or positive. This suggests that, in general, the objective of tight inflation control should not be in conflict with maintaining reasonable stability of output.

-- Estimated sacrifice ratios have to be interpreted cautiously. There is some evidence in some countries that the Phillips curve may be asymmetrical. This would tend to strengthen the argument for maintaining relatively tight control over inflation.

-- Credibility is likely to depend on the track record of meeting announced goals. In setting objectives, policymakers face a trade-off between tightly specified goals that discipline future policies as against wider bands that would more likely encompass normal forecasting and control errors.

-- High fiscal deficits, by increasing the risk of future inflation, will make the establishment of credibility more difficult.

-- The existence of a zero interest rate floor, and the possibility of floors on bank lending rates, by themselves, would not pose significant operating issues for monetary policy at low inflation or price stability.

NOTES

1. The authors are grateful for helpful comments and suggestions from Constantino Lluch, Mike Feiner and Bob Ford (of the OECD) and David Longworth (of the Bank of Canada). The views expressed in this paper are those of the authors and are not necessarily those of the OECD.

2. See Edey (1994).

3. Trend output is measured by a Hodrick-Prescott filter.

4. Iacobacci (1994) discusses the microeconomic factors that may give rise to asymmetries in short-run Phillips curves.

5. Evidence for asymmetries is also provided by Laxton *et al.* (1994), using a pooled estimation technique for the G-7 countries. Such an approach has, however, to rely on the assumption that the inflationary process is generated similarly across the G-7 countries, despite their different institutional frameworks and macroeconomic histories.

6. For an assessment of the accuracy of OECD projections, see "How Accurate are Economic Outlook Projections?", *OECD Economic Outlook*, No. 53.

7. This argument is formalised by Fischer (1993).

8. A floor on bank lending rates can be derived by assuming that banks, by issuing liabilities that are close substitutes for base money, can obtain funds at a lower rate than the market rate. When the inflation tax on cash balances is high, banks can lower the real return offered on their own liquid liabilities. Furthermore, if the banking system is competitive, the lower (real) cost of funds for banks under higher inflation will be passed on to borrowers. The non-linearity at low interest rates would arise as a result of the constraint that nominal rates be positive.

Table 1. **Inflation objectives: selected countries**[1]

Percentage rates

1.	**Countries with formal inflation targets**		
	United Kingdom	1 - 4	Goal is lower half of range by 1997
	Canada	1 - 3	Target range through to 1998
	Sweden	1 - 3	Target for 1995
	Finland	2	Target for 1995
	New Zealand	0 - 2	Current target range
2.	**Others**		
	Germany	Maximum of 2	Medium-term inflation goal
	France	Maximum of 2	Medium-term inflation goal
	Italy	2	Medium-term inflation goal by 1996
	Switzerland	0 - 1	Medium-term inflation goal
	Australia	2 - 3	Acceptable medium-term average

1. The price indexes that these objectives refer to are as follows:

United Kingdom: Retail Price Index excluding mortgage interest payments;
Canada: The CPI is the official target, but an underlying CPI excluding food, energy, and temporary effects of indirect taxes is used as an operational objective;
Sweden: CPI;
Finland: CPI excluding indirect taxes, subsidies and housing capital costs;
New Zealand: CPI excluding indirect taxes;
Germany, France and Switzerland: Objectives are set out in conjunction with money growth, output and velocity assumptions, so implicitly refer to GDP deflators, although CPIs remain an important policy focus in each country;
Italy: Private consumption deflator.
Australia: CPI (adjusted for interest rates, energy, food and certain public sector goods) is an important focus but is not explicitly the definitive measure.

Table 2. **Inflation: OECD projection minus actual**[1]

(GDP deflators)

	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
United States	-3.6	1.2	1.5	-0.7	-1.3	-1.6	0.6	1.0	1.9	2.0	1.1
Japan	-11.9	7.4	-0.9	1.3	0.5	2.5*	2.6	2.2*	2.2*	2.2*	0.7
Germany	0.2	-1.8	0.7	0.4	0.1	-0.3	-0.3	-0.2	-1.3	0.2	0.9*
France	-3.3	-1.3	0.9	0.6	-1.4	-0.8	-0.5	-0.2	1.4	-0.2	0.3
Italy	-6.9	1.0	-5.3	1.4	-0.6	-2.4	-3.6	-0.9	-1.5	1.0	1.3
United Kingdom	-6.3	-7.8	1.1	-1.3	1.4	-4.6	-2.4	2.4	1.8	0.6	1.1
Canada	-7.1	1.2	-0.3	0.6	0.1	-3.5	-1.6	-0.6	0.9	1.9	2.0*
Netherlands	-1.0	-0.5	0.2	-0.7	0.2	0.5	0.5	0.7	0.8	2.3*	-0.2*
Sweden	-1.1	-3.1	-3.0	-2.5	1.7	0.5	-3.3	0.6	1.3	0.5	-1.9
Switzerland	0.4	0.7	2.2*	1.5*	-1.2	0.0*	0.3*	-4.4	-2.9	1.0	-0.8*

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	Standard error (1985-1994)
United States	0.5	1.2*	-0.1	0.2	0.4	0.3	0.9	0.2*	0.1*	0.3*	0.5
Japan	0.0*	-1.1*	1.1*	0.6*	-0.5*	0.7*	0.3*	0.5*	0.7*	0.6*	0.7
Germany	-0.1*	-1.5	-0.6*	0.3*	-0.6*	-0.4	-0.2	-1.0	0.7	0.7*	0.7
France	0.8	-0.5	-0.4*	-0.5	-0.6	0.4*	0.9*	0.7*	0.3*	0.4*	0.6
Italy	-0.2	-0.7	-1.6	-1.0	-2.3	-1.9	-0.3	1.3	0.9	0.5	1.3
United Kingdom	-1.4	1.4	-0.3	-1.3	-0.7	-0.3	-0.2	-0.1	1.6	1.0*	1.0
Canada	0.6	0.6*	-1.5	0.2	-0.9	2.0	2.0*	1.4*	1.1*	1.2*	1.3
Netherlands	0.1*	0.8*	0.6*	-1.0*	0.8*	-0.7*	-0.1	0.7*	0.8*	0.1*	0.6
Sweden	-0.8	-1.4	-1.1	-1.3	-0.9	-0.7	0.9	1.7*	-2.1*	-0.9*	1.3
Switzerland	-0.2*	-1.6	0.0*	0.0	-0.5	-2.0	-1.2	1.9*	1.1*	0.0*	1.1

1. OECD projections as of the previous December for the stated year.

* Inflation rate was below 3 per cent in the respective year.

Source: OECD Secretariat.

Table 3. **Deviations from announced target growth rates for monetary aggregates in Germany**[1]

	Target rate/path	Actual	Deviation[2]	Target missed[3]
1975	8.0[4]	9.9	1.9	Yes
1976	8.0	9.3	1.3	No
1977	8.0	9.0	1.0	No
1978	8.0	11.4	3.4	Yes
1979	6.0-9.0	6.4	-1.1	No
1980	5.0-8.0	4.8	-1.7	Yes
1981	4.0-7.0	3.5	-2.0	Yes
1982	4.0-7.0	6.0	0.5	No
1983	4.0-7.0	7.0	1.5	No
1984	4.0-6.0	4.6	-0.4	No
1985	3.0-5.0	4.5	0.5	No
1986	3.5-5.5	7.7	3.2	Yes
1987	3.0-6.0	8.0	3.5	Yes
1988	3.0-6.0	6.8	2.3	Yes
1989	5.0[4]	4.8	-0.2	No
1990	4.0-6.0	5.5	0.5	No
1991[5]	3.0-5.0	5.2	1.2	Yes
1992	3.5-5.5	9.4	4.9	Yes
1993	4.5-6.5	7.4	1.9	Yes
1994	4.0-6.0	5.7	0.7	No

1. Until 1987 targets refer to the growth rate of central bank money as defined by the Deutsche Bundesbank. Since 1988 they refer to M3.
2. Deviation is defined as actual value minus the target rate or minus the mean of the target path.
3. If only a precise target rate (instead of a target path) is announced, a range of plus or minus 1.5 percentage points is assumed in order to assess the target achievement.
4. Approximate.
5. Target 1991: adjusted in July 1991 from 4.0-6.0 per cent.

Sources: BIS, Deutsche Bundesbank.

Table 4. **Years of negative short-term real interest rates**[1]

	1950s										1960s									
	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
United States	X	X			X	X	X		X											
Japan																				
Germany		X							X			X	X	X						
France													X	X						
Italy																				
United Kingdom	X	X	X	X		X	X													
Canada	X	X	X		X		X													
Netherlands												X		X	X	X				
Belgium		X				X	X	X						X	X	X	X			
Sweden																				
Switzerland																				

Table 4. (continued)

	1970s										1980s										1990s			
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
United States		X	X		X	X	X	X	X															
Japan			X	X	X		X	X	X															
Germany		X	X			X			X															
France		X	X			X	X	X	X	X														
Italy		X	X	X	X	X	X	X	X	X	X													
United Kingdom	X	X	X		X	X	X	X	X	X	X													
Canada			X	X	X	X																		
Netherlands		X	X	X		X	X	X																
Belgium		X	X	X	X	X		X																
Sweden		X	X	X	X	X	X	X	X		X													
Switzerland		X	X	X	X	X	X		X	X	X	X	X	X			X	X	X					

1. Nominal short-term interest rate minus percentage change in GDP deflator. If GDP deflator is not available the consumer price index is used as deflator. Starting date 1950, except Japan (1957), the Netherlands and France (1960), Sweden (1966), Italy and Switzerland (1969).

Sources: IMF, OECD.

Table 5. **Years of negative long-term real interest rates**[1]

	1950s										1960s									
	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
United States	X				X	X	X		X											
Japan																				
Germany																				X
France													X						X	
Italy	X											X	X	X						X
United Kingdom	X	X			X	X														
Canada	X	X				X														
Netherlands	X			X			X				X		X	X	X	X				
Belgium		X																		
Sweden	X	X			X	X	X			X					X	X				
Switzerland		X						X			X	X	X	X		X	X			

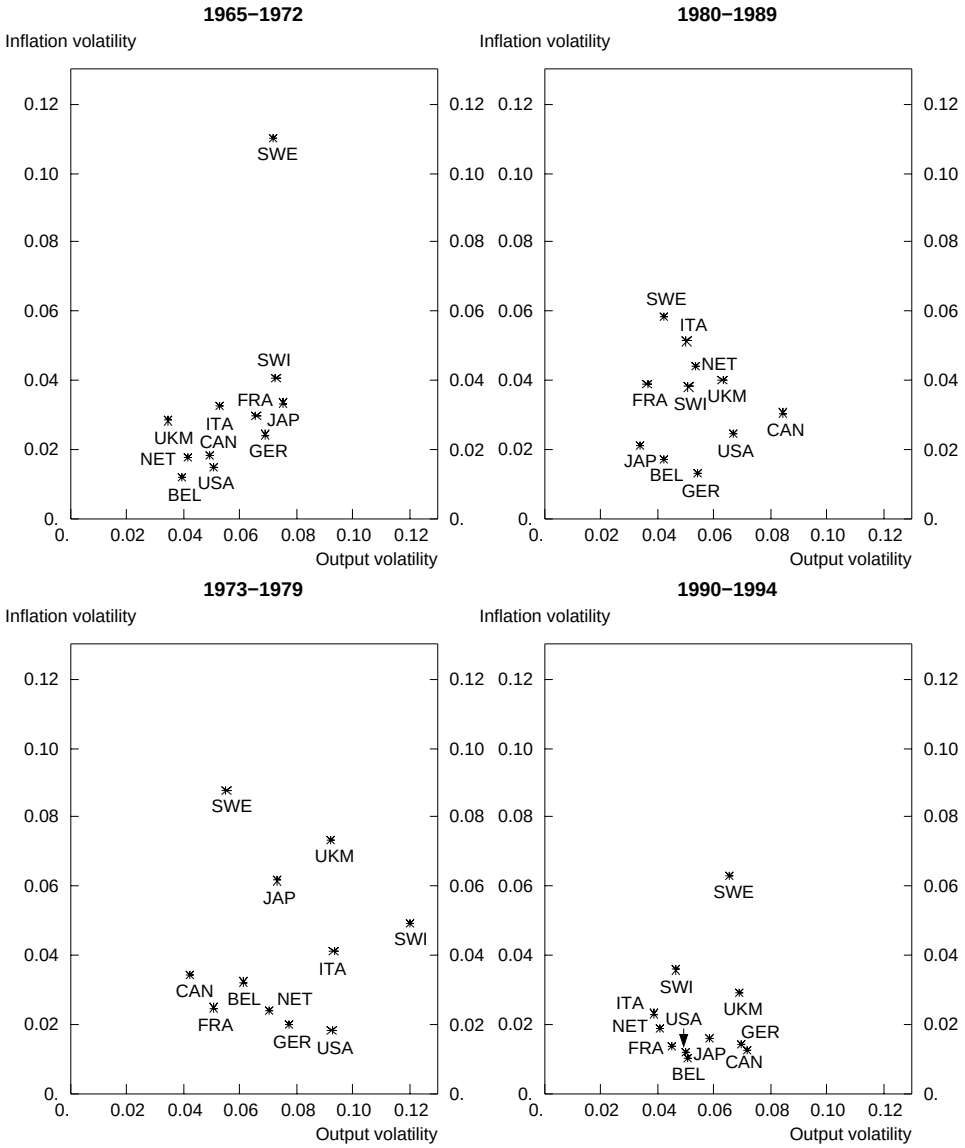
Table 5. (continued)

	1970s										1980s										1990s			
	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
United States			X	X	X			X	X															
Japan			X	X																				
Germany																								
France			X	X	X	X	X	X	X	X														
Italy			X	X	X	X	X		X	X	X													
United Kingdom	X			X	X	X			X	X														
Canada			X	X	X				X	X														
Netherlands		X	X	X	X	X																		
Belgium			X	X	X																			
Sweden				X	X	X	X			X														
Switzerland	X	X	X	X							X	X							X	X				

1. Nominal long-term interest rate minus percentage change in GDP deflator one year ahead. If GDP deflator is not available the consumer price index is used as deflator. Starting date 1950, except Germany (1955), France (1960) and Japan (1966).

Sources: IMF, OECD.

Figure 1. **Inflation versus output volatility (1)**



1. Volatility is measured by the standard deviation of the annualised quarterly GDP deflators from its trend and the standard deviation of the annualised deviation of GDP from its trend.Trend values are measured by an Hodrick−Prescott filter.Germany refers to West Germany.

Figure 2. **Inflation and unemployment**

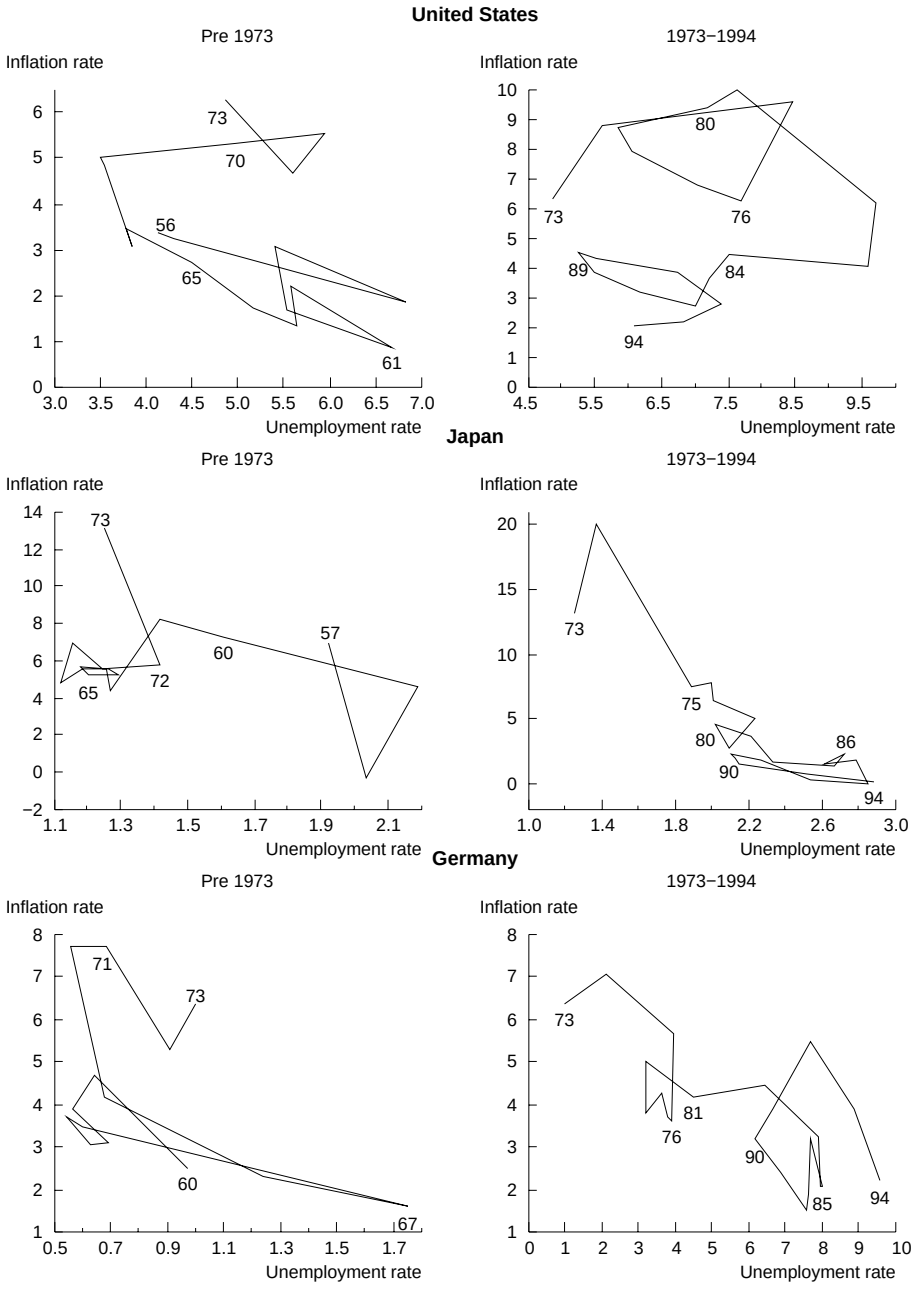


Figure 3. **Floors on bank lending rates**

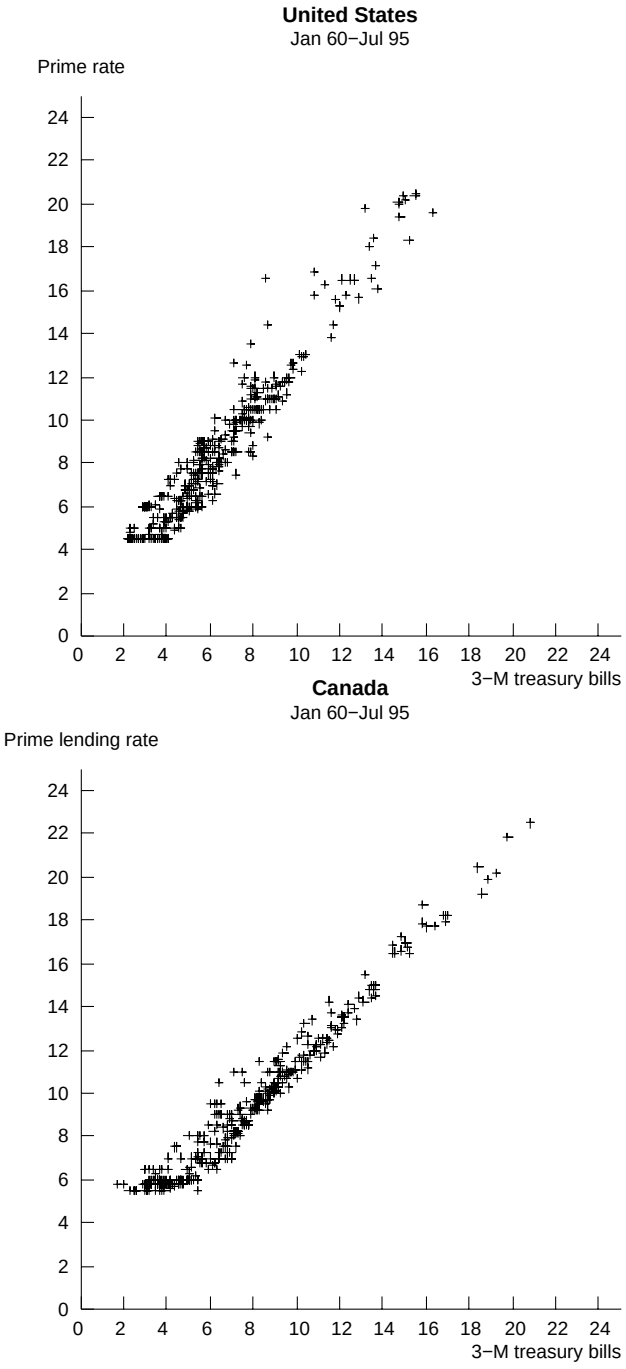


Figure 3. **Floors on bank lending rates (cont'd)**

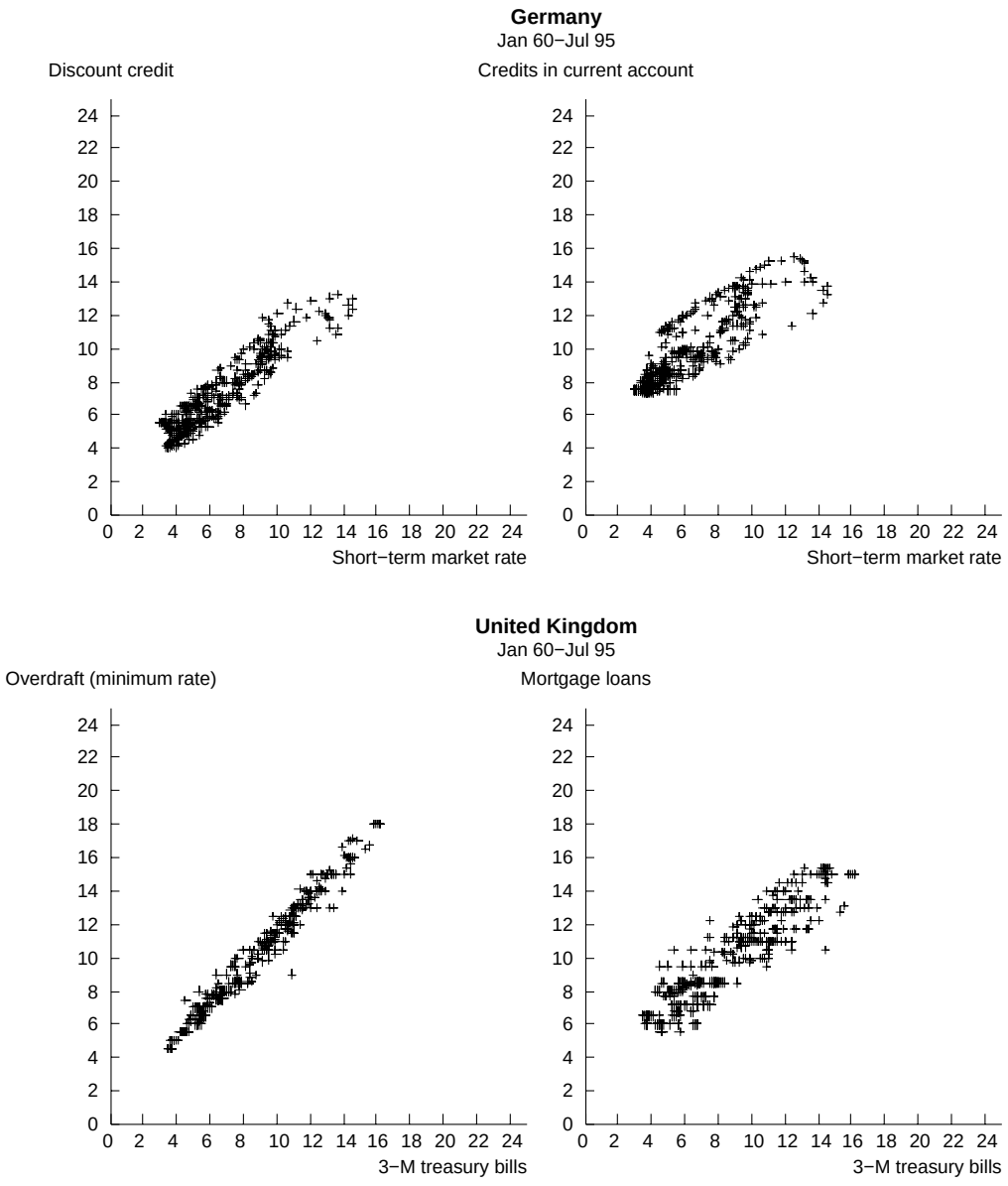
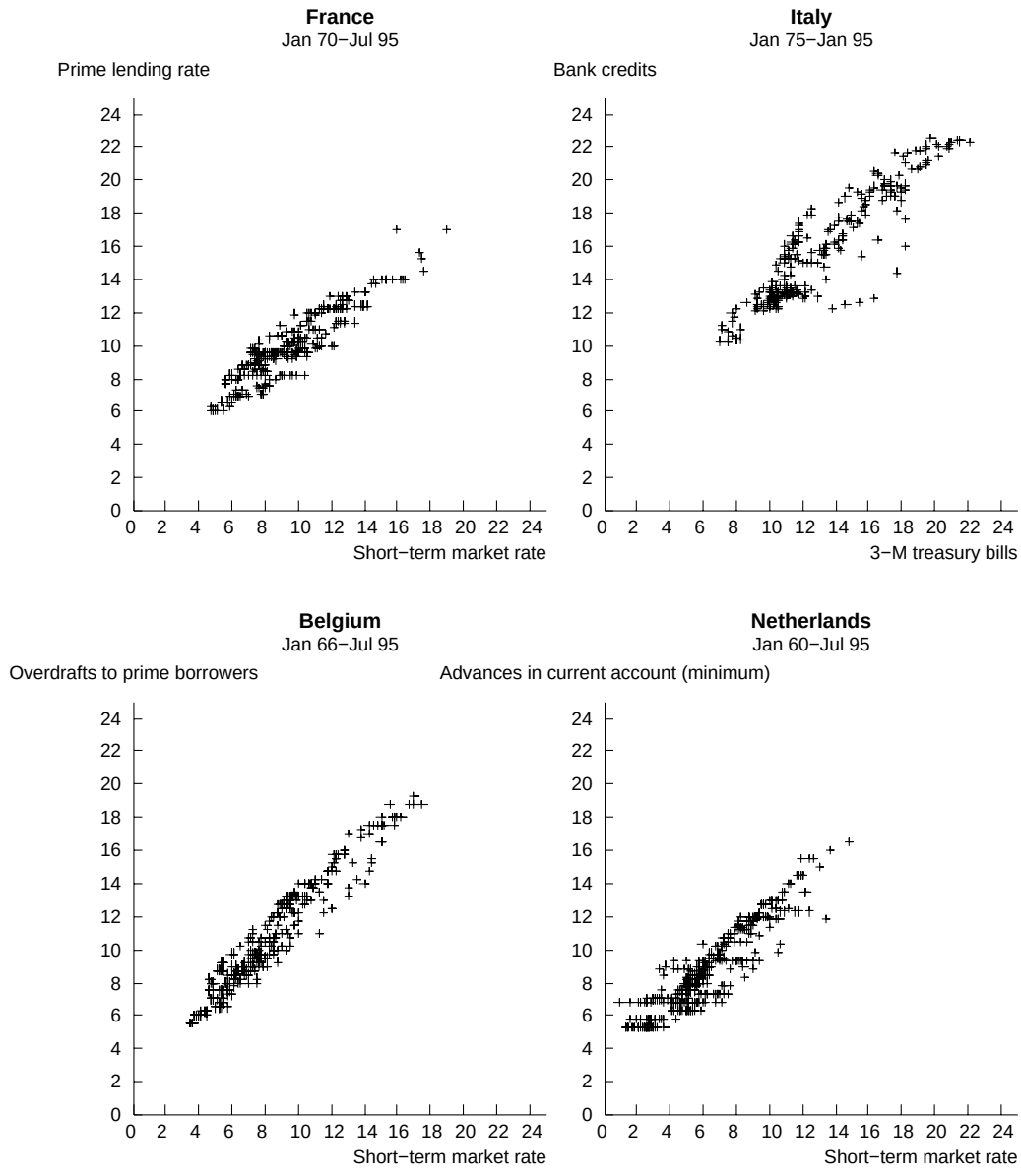


Figure 3. **Floors on bank lending rates (cont'd)**



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